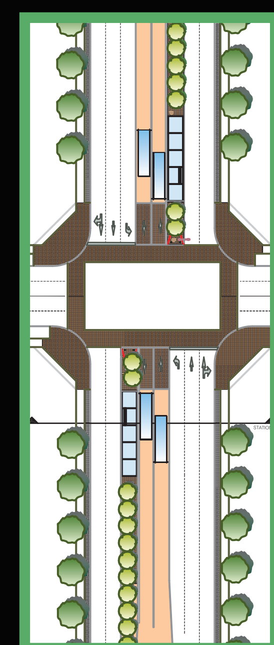
HIGHWAY 7 CORRIDOR & VAUGHAN NORTH-SOUTH LINK PUBLIC TRANSIT IMPROVEMENTS

Environmental Assessment Report



York Region Rapid Transit Plan August 2005

FINAL

E. EXECUTIVE SUMMARY

E.1 BACKGROUND

York Region's *Official Plan* places a strong emphasis on significantly increasing public transit use to accommodate future transportation needs and support the Plan's vision of sustaining the natural environment, optimizing economic vitality and ensuring healthy communities.

The Region's approved *2002 Transportation Master Plan* (TMP), undertaken in accordance with the municipal Class Environment Assessment (EA) Master Plan process, has reaffirmed the need to achieve a balanced transportation system by implementing rapid transit in four corridors. The TMP incorporates the Government of Ontario's Smart Growth vision for fostering and managing growth.

In the planned rapid transit network, shown in **Figure E-1**, three of the corridors comprise north-south rapid transit facilities. These are the Yonge Street corridor connecting Newmarket Regional Centre to the Yonge Subway, a link from the Vaughan Corporate Centre to the Spadina Subway (Vaughan North-South Link) and a link from the proposed Markham Centre to the Sheppard Subway (Markham North-South Link). The fourth corridor is an east-west rapid transit facility in the Highway 7 corridor connecting to all three of the north-south rapid transit lines, to the Region of Peel in the west and to the Region of Durham in the east.

Figure E-1
Rapid Transit Network

Transportation and environmental planning studies for the Highway 7 Corridor and Vaughan North-South Link (VNSL) were commenced in August 2002 and continued through 2003 and 2004. On July 2004, the Ministry of the Environment (MOE) approved the *Terms of Reference* for the Environmental Assessment of Public Transit Improvements in the Highway 7 Corridor and VNSL. Following *Terms of Reference* approval the studies were updated during 2004 and 2005 and assembled to form the content of this report.

The Study Area used to evaluate the route alternatives for improved public transit service extends from the York-Peel boundary (Highway 50) in the west to the York-Durham boundary (York-Durham Line) in the east. The southern limit of the Study Area is Steeles Avenue while the northern limit is Major Mackenzie Drive as illustrated in **Figure E-2**. The City of Toronto and TTC are conducting a parallel EA for the Spadina Subway Extension between Downsview Station and York University in Toronto.

E.2 PURPOSE OF THE UNDERTAKING

The purpose of the "Undertaking", Public Transit Improvements in the Highway 7 Corridor and VNSL, encompasses two fundamental objectives:

- Firstly, to improve accessibility to current and planned development by providing a high quality public transit alternative to reduce automobile dependence; and

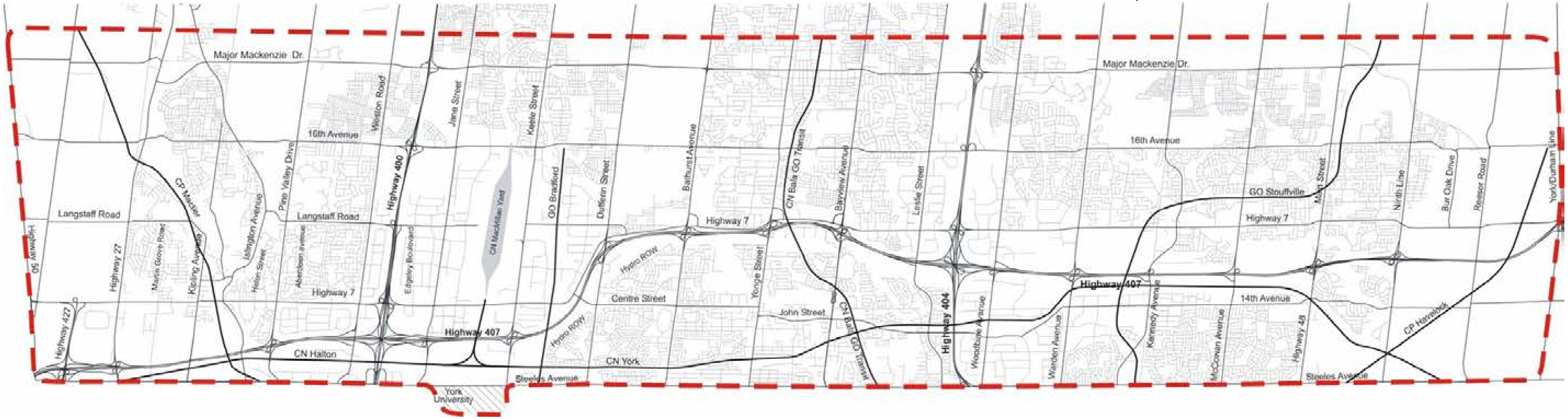


Figure E-2
Proposed Study Area Limits

- Secondly, to contribute to the achievement of the *Regional Official Plan* objectives of sustainable natural environment, economic vitality and healthy communities. The undertaking must help make the Region's urban centres more liveable, pedestrian-oriented and economically viable by providing a valuable tool for structuring and achieving land use and social objectives.

In the Highway 7 Corridor and VNSL, the purpose can be summarized as:

- Providing improved public transit infrastructure and service in the Regional network's primary east-west corridor and western north-south corridor capable of producing significant increases in transit ridership both within the corridor and across the network and regional boundary. This objective will be supported by interconnection with other corridors and GTA transit systems such as GO Transit and the TTC; and
- Integrating public transit facilities in a manner that improves and enriches streetscapes with new amenities by using a holistic urban design approach to support the Region's goals for higher density mixed-use transit-oriented development along the corridor in accordance with approved official plans.

The Undertaking, for which Ministry approval is sought, will comprise all infrastructure, systems, vehicles and subsequent operational requirements necessary to achieve a significant improvement in public transit service and its attractiveness in the Highway 7 Corridor including the VNSL.

E.3 RATIONALE FOR THE UNDERTAKING

E.3.1 Need and Justification

A study of the need and justification for improved public transit in the Highway 7 Corridor and VNSL was initiated by York Region and completed in mid-2002. This study, *Highway 7 Corridor Transitway Environmental Assessment Need and Justification* (December 2002), examined the growing transportation demands in the Highway 7 Corridor and VNSL associated with the projected growth in the Region's population (from 800,000 to 1.2 million) and employment (400,000 to 655,000) during the planning period to 2021.

In the context of York Region's *Official Plan* objective of achieving a significant increase in transit's share of peak period travel, this initial study and subsequent further analysis using updated modelling in 2004, investigated a range of transportation solutions for the Corridor. In accordance with the requirements of the EA Act, these solutions were defined and evaluated as alternatives to the proposed Undertaking.

E.3.2 Alternatives to the Undertaking

Five alternatives were defined and compared in terms of their ability to address the shortfall in transportation system capacity and their effect on the environment. These included:

- Do Nothing;
- Current Commitments Strategy Including Priority Transit and Transportation Demand Management or base case comprising committed improvements to highway and arterial road networks along with on-going increases in local and inter-regional bus services, and Transportation Demand Management strategies;
- Road Expansion Strategy – an auto-focussed alternative adding enough road system capacity beyond that currently committed to eliminate the capacity shortfall;
- Enhanced Richmond Hill Commuter Rail and Inter-regional Bus Service Strategy - the current commitments alternative combined with enhanced inter-regional bus and rail transit service and capacity on the existing GO commuter rail lines and the 400-series highways; and
- York Region Rapid Transit Corridor Initiatives Strategy - the proposed Undertaking, namely current commitments plus public transit improvements such as the Region's planned rapid transit network comprising bus and light rail service in dedicated transitways on the surface and assuming the extensions of Toronto's existing subway system into the Region to Highway 7 in the Yonge and VNSL Corridors.

Evaluation of these alternatives led to the conclusion that:

- Both the "Do Nothing" and the "Current Commitments" strategy would not address the estimated road capacity deficiency and further expansion of the road system beyond the current commitments was not possible without unacceptable disruption of the social environment, degradation of the natural environment and cost,
- Enhancing inter-regional bus and rail services in the corridor will not reduce the road capacity shortfall significantly because more frequent rail service attracts primarily downtown-Toronto destined trips. Inter-regional bus service on Highway 407 does not penetrate many core development nodes along the corridor and functions primarily as a longer distance commuter service. In addition, the location of the inter-regional transit routes does not support the urban form envisioned in the Region's *Official Plan* and thus will not encourage transit-oriented development within the region.
- If the Region's *Official Plan* urban form and development vision is to be achieved in a sustainable manner, public transit improvements in the form of a higher order rapid transit service, fully integrated with the GTA rapid transit network will be required.
- The "York Region Rapid Transit Corridor Initiatives" Strategy is best able to meet long-term growth needs and planning objectives while offering the opportunity to mitigate high costs and local environmental impacts by maximizing the use of existing transportation corridors.

As a result, the "**York Region Rapid Transit Corridor Initiatives**" Strategy was selected as the preferred transportation strategy for the Undertaking.

E.3.3 Alternative Methods of Improving Public Transit – Rapid Transit Routing

For the analysis of routes for surface rapid transit service, the findings of the *2002 Need and Justification Study* were used as the basis for the initial screening of alternatives. This analysis, described in detail in **Chapter 5**, led to the recommendation to retain the routes shown in red in **Figure E-3** for further analysis and detailed comparative evaluation.

A similar analysis, based on prior studies carried out for the City of Vaughan and described in **Section E8 and Chapter 12**, analyzed route and alignment options for the extension of the Toronto Spadina Subway as the ultimate technology phase for the VNSL.

E.3.4 Alternative Methods of Improving Public Transit – Rapid Transit Technology

As part of the assessment of alternative methods of improving public transit, an analysis and evaluation of potential rapid transit technologies in **Chapter 5** identified two candidates for surface transit application in the Highway 7 Corridor and VNSL. These consisted of the bus rapid transit (BRT) and light rail transit (LRT) technology families, illustrated opposite.

Bus Rapid Transit (BRT)

Light Rapid Transit (LRT)

In addition, the Region's *Need and Justification Study* and subsequent EA demand forecasting and network analysis identified the opportunity for the Vaughan North-South Link to be converted to subway technology as an extension of Toronto's Spadina Subway Line in the longer term, assuming it has been extended from its present terminus at Downsview to York University on the Region's southern boundary.

The role of the improved Highway 7 Corridor and VNSL transit service in the planned York Rapid Transit Network, discussed above, is a key factor in selection of the appropriate technology for the corridor. Studies of potential network configurations (route and technology options) have indicated that the Highway 7 Corridor and VNSL is one in which the rapid transit technology could evolve over time. As growth and development patterns change, increases in demand may justify or even mandate transitions from an initial technology application, such as partially segregated BRT (segregated operation with at-grade intersections), to either light rail or subway as noted above.

In the assessment of the effects of implementation and operation of rapid transit on the environment, the basic characteristics of each surface technology family have been taken into account. These are described in detail in **Chapter 5** of the EA Report and encompass elements summarized in **Table E-1** below.

Table E-1
Key Characteristics of Technologies Considered

System Element	Technology Characteristics	
	Bus Rapid Transit (BRT)	Light Rail Transit (LRT)
Practical system capacity (passengers per hour per direction)	2,000 to 12,000 (depending on degree of separation from street traffic, separate right-of-way needed for higher volumes at high frequency)	5,000 to 15,000 (depending on degree of separation from street traffic, separate right-of-way needed for higher volumes at high frequency)
Right-of-way required and staging flexibility	Service in mixed traffic can be converted to 8.5 – 10 m wide transitway in 2 - 4 km increments. Storage and maintenance garage required or space in existing bus garage.	Minimum initial operable segment length is 8-12 km with 8-10 m wide running way and LRV storage and maintenance facility
Vehicle type and characteristics	Conventional buses or special purpose hybrid diesel-electric, rubber-tired rapid transit vehicles 12-25m long	Generally articulated, 23-30m long, coupled cars with overhead electric power supply for propulsion
Station characteristics	Platform length can vary from 18 – 90m with simple shelter or elaborate passenger facilities	Platform length can vary from 30 – 90m with simple shelter or canopy or elaborate passenger facilities
Service planning options	A blend of line-haul and branched services is possible as rubber-tired vehicles can leave the transitway to reduce transfers	All service is line-haul with feeder bus access and transfers at stations. Requires more emphasis on park and ride.
Range of capital costs including vehicles	Varies from $10 to $40 million per km depending on degree of transitway separation	Varies from $25 to $55 million per km depending on degree of track separation

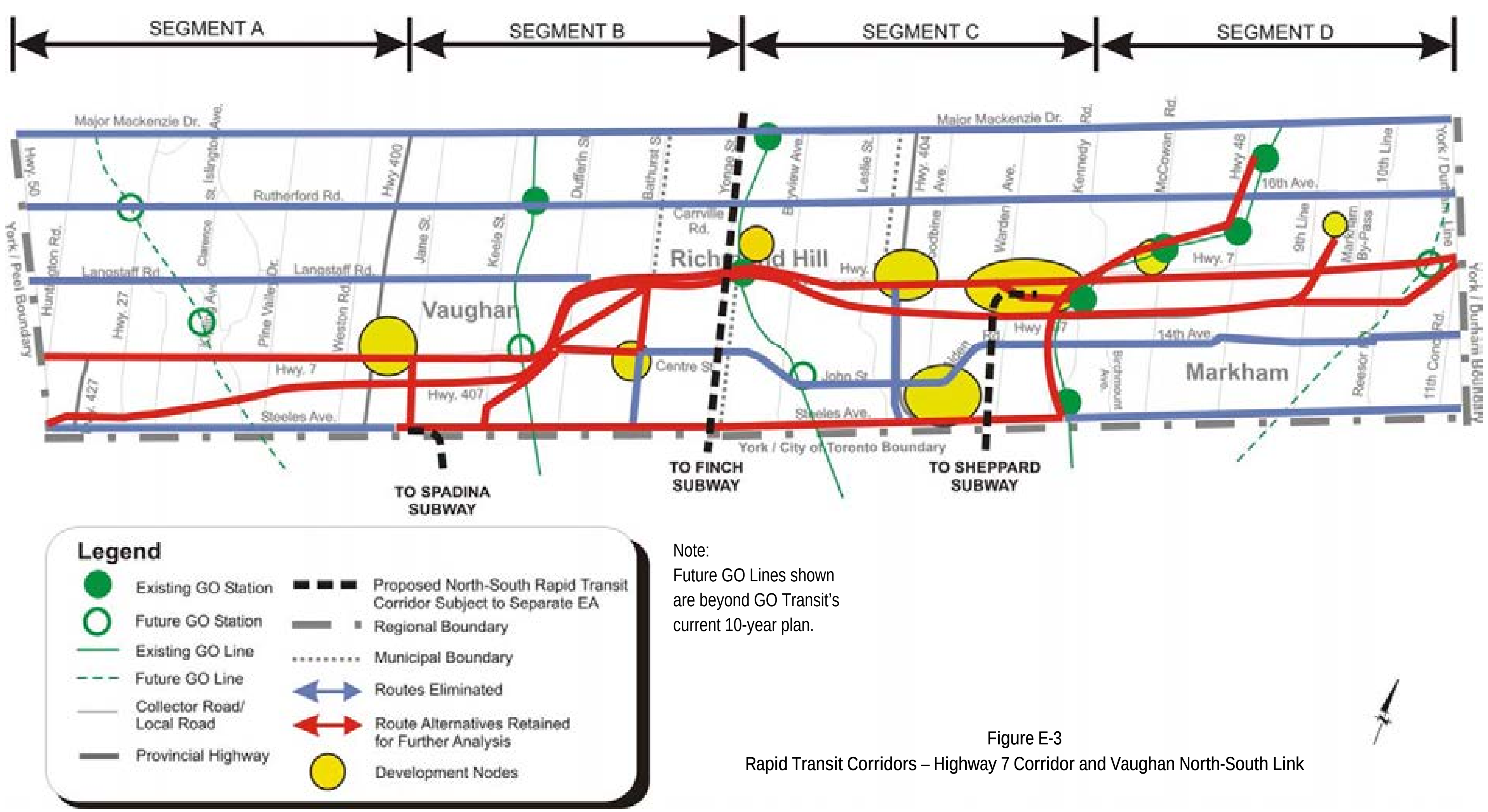
For the assessment of subway technology in the VNSL, the general characteristics of Toronto's present subway system and extensions in planning were assumed.

E.3.5 Alternative Methods of Improving Public Transit – Surface Rapid Transit Infrastructures

E.3.5.1 Planning and Design Objectives

In designing the rapid transit infrastructure and service, the primary objectives are to achieve the following:

- A flexible, permanently integrated high-performance system with a strong customer-oriented identity;
- An integrated assembly of elements appropriate urban environment for current and future market(s) to be served;
- High service speeds offering superior travel times competitive with those of the private automobile;



Note:
Future GO Lines shown are beyond GO Transit's current 10-year plan.

Figure E-3
Rapid Transit Corridors – Highway 7 Corridor and Vaughan North-South Link

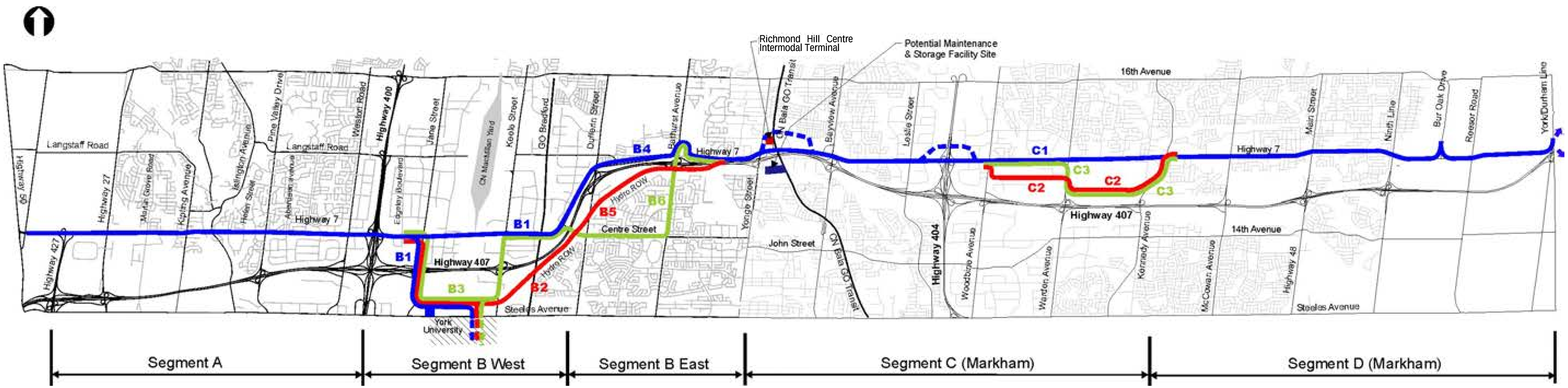


Figure E-4
Alignment Alternatives Evaluated

- Demonstrated service reliability providing high frequency (an average wait of 5 min) and a high degree of on-time performance;
- Comfort and convenience by providing a smooth ride, level boarding in a user-friendly, quality station environment, easy transfers between systems and innovative fare pre-payment and passenger information services; and
- Environmental compatibility manifested by reductions in energy use, pollution, noise and visual intrusion as well as environmentally sensitive urban design.

E.3.5.2 Surface Rapid Transit Alignment Alternatives

The Alternatives Analysis phase of the Highway 7 Corridor and VNSL EA developed alignment alternatives along the five primary route options identified in the *Terms of Reference* and shown in **Figure E-3**. It should be noted that the alignment analysis was neutral regarding the type of technology and the findings would apply to either a BRT or LRT technology given that the alignments were developed to accommodate design standards of both technologies and possible transition from one to the other. The primary route alternatives are shown in **Figure E-4**.

Segment A: Highway 50 to Highway 400

In this segment, the only feasible route alternative is to locate the transitway in the median of the existing Highway 7 right-of-way. The existing and planned general traffic lanes will be retained.

Segment B West: Highway 400 to Centre Street

This segment required analysis of three primary route alternatives:

- Primary Route Alternative B1: Along Highway 7 from Highway 400 to Centre Street combined with Jane Street/ Hydro right-of-way to York University (Vaughan North-South Link);
- Primary Route Alternative B2: Along Highway 7 from Highway 400 and Jane Street/Hydro Right-of-way, to York University and then north-easterly in the Hydro Right-of-way to Centre Street;
- Primary Route Alternative B3: Along Highway 7 from Highway 400 and Jane Street/Steeles Avenue-York University-Keele Street/Keele Street and back on Highway 7 to Centre Street.

Segment B East: Centre Street to Yonge Street

Three alternatives were compared:

- Primary Route Alternative B4: Along Highway 7 between Centre and Bathurst Streets (Hunters Point Road);
- Primary Route Alternative B5: The Hydro right-of-way between Centre and Bathurst Streets (Hunters Point Road);
- Primary Route Alternative B6: Centre and Bathurst Streets to Highway 7 and then east to Hunters Point Road.

Segment C: Yonge Street to Kennedy Road

In Segment C, the alignment runs primarily on Highway 7 except for three identified primary route options between Woodbine Avenue and Kennedy Road. These are:

- Primary Route Alternative C1: Highway 7 between Woodbine Avenue and Kennedy Road
- Primary Route Alternative C2: Woodbine Avenue Area, Yorktech Drive to Markham Centre and Kennedy Road to Highway 7
- Primary Route Alternative C3: Highway 7 from Woodbine Avenue to South Town Centre Boulevard and Kennedy Road to Highway 7

Segment D: Kennedy Road to York-Durham Townline

For this remaining 12 km segment, Highway 7 was recommended as the most logical continuous route to serve major trip generators such as Markville Mall and the Markham-Stouffville Hospital.

E.3.5.3 The Preferred Surface Rapid Transit Alignment

The detailed evaluation, presented in **Chapter 8** of this report, considered the ability of each of the routes to respond to the five main objectives of YRTP. These included:

- Improving mobility and attractiveness of public transit.
- Protecting and enhancing the social, cultural and heritage environment.
- Protecting the natural environment.
- Promoting smart growth and economic development.
- Maximizing cost-effectiveness of the rapid transit system.

For each of the above objectives, a range of goals and indicators was established to provide a measure of the effectiveness of each alternative in meeting the objectives.

This effectiveness is reflected in the qualitative assessments summarizing the quantitative analysis carried out under each objective. The Preferred Alignment and station locations are summarized in **Figure E-5**.

Segment A

In this 8.5 km segment, the EA is seeking approval for a transitway alignment mostly in the median of Highway 7 between Highways 50 and 400.

Segment B West

The primary route **Alternative B1**, in combination with a partially segregated rapid transit service on Highway 7 between Jane and Keele Streets, is preferred because:

- Projections show that the combination will attract the highest ridership on east-west Highway 7 service by providing a direct link from Richmond Hill and Markham to both the Vaughan Corporate Centre and York University. The latter could include access to an extension of the Spadina Subway to Steeles Avenue.
- The route conforms to the Regional Official Plan's "nodes and corridors" policy by linking Vaughan Corporate Centre to the eastern YRTP network and the TTC system as well as serving the Jane/Highway 7 and Keele/Steeles redevelopment nodes on the corridors.
- The continuation of the Region's initial Quick Start service as partially segregated rapid transit on Keele Street between Highway 7 and Steeles Avenue would offer an additional opportunity especially if Spadina Subway is extended initially to York University.
- The route combination supports Vaughan's vision for the ultimate development of land use along Avenue 7 and serves the planned major redevelopment to the south and east of the Jane Street intersection.
- A connection to a future 407 Transitway service is possible at either Jane or Keele Street interchanges.
- A connection to a future station on GO Transit's Bradford Line is feasible.
- Adverse effects on the social and natural environment are either minimal or able to be mitigated.

Segment B East

The primary route **Alternative B6** was selected as the preferred alignment in this segment because:

- It has the potential to attract ridership from existing commercial and residential land uses on both sides of the alignment, as well as future transit-oriented intensification and redevelopment at the Dufferin and Bathurst nodes on Centre Street.
- The route serves existing community facilities and a major shopping area while also providing the opportunity for urban design improvements in the rights-of-way.
- A connection to a future 407 Transitway service can be achieved at the Bathurst and Highway 7 intersection.
- Connections to local transit serving large residential areas north of Highway 7, such as the Carrville Community, can be made at the Bathurst and Dufferin nodes on the alignment. The local services will need to be configured as feeders to the rapid transit stations, using parts of Highway 7 where beneficial.
- Effects on the natural environment are negligible or minor and traffic management measures and improved transit vehicle technology can mitigate social environmental impacts.

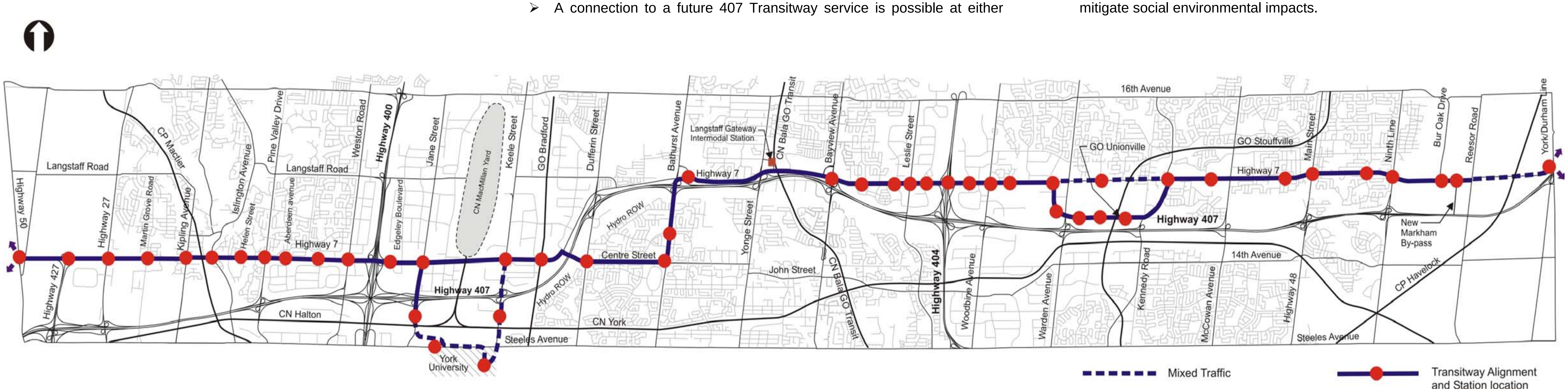


Figure E-5
Summary of Preferred Alignment and Station Locations

Measures to protect for future implementation of parallel express rapid transit service entirely on Highway 7 are also recommended for this section between Centre and Bathurst Streets.

Segment C

Evaluation of the primary route alternatives has led to the selection of **Alternative C3** as the preferred alternative because:

- It provides direct service to, and through, the planned Markham Centre from both east and west.
- It provides the best linkage of the existing Markham Civic Centre facilities to the major mixed-use Markham Centre development.
- A good connection to GO Transit's Stouffville Rail service and a future 407 Transitway service can be achieved at Unionville GO Station.
- Proposed station locations will offer convenient access to both existing and future mixed-use development along most of the route.
- It offers the greatest potential for urban design improvements in the Highway 7 corridor through a combination of arterial road and civic mall rights-of-way.
- Although, not as minimal as a Highway 7 only route, effects on the natural environment are confined to a single new crossing of a Rouge River tributary.
- Capital costs are estimated to be similar to the other alternatives and land acquisition costs are limited to approx. 0.6 km of the route.
- Traffic interface concerns on the Highway 7 and Kennedy sections can be mitigated and attenuation of noise and vibration on the civic mall is feasible if required.

Segment D

Developing the transitway, mostly in the median of Highway 7 offers good access to stations and local transit, and can support a major improvement in the urban design of the corridor.

E3.5.4 The Preferred VNSL Subway Route

Updating of prior studies presented in **Chapter 12** has confirmed that the north-south right-of-way west of Jane Street protected in the City of Vaughan's OPA 529 is still the preferred route for the subway phase of the VNSL undertaking. South of Highway 407, the preferred alignment to link this route to the Toronto/TTC's preferred Spadina Subway Extension alignment will be identified, assessed and documented in an amendment to this EA report AFTER THE Toronto/TTC EA is approved.

E.4 THE UNDERTAKING

E.4.1 System Capacity

By the year 2021, ridership forecasts indicate that the transitway service will require a capacity of 800-1,500 passengers per hour per direction (pphpd) through and west of the Vaughan Corporate Centre in Segment A, 1,600 pphpd approaching the York University from the east in Segment B, 1,900-2,600 pphpd in Segment C between Yonge Street and Kennedy Road and 1,800 pphpd in Segment D approaching Markham Centre from the east. The proposed two lane exclusive transitway, with at-grade intersections and either BRT or LRT technology, is able to accommodate the above volumes as well as some additional growth beyond 2021.

E.4.2 System Technology

In order to carry the projected ridership volumes in 2021, the service levels listed in **Table E-**2 would be required on the Highway 7 transitway for each technology under consideration.

Table E-2
Service Levels Required on the Highway 7 Transitway for Each Technology Under Consideration

Segment	Bus Rapid Transit (BRT)	Light Rail Transit (LRT)
A	30 buses (standard or articulated) per hour per direction. Buses at approx. 0.5km spacing or one per traffic signal cycle.	8 two-car LRT trains per hour (58m length)
B	30 buses (standard or articulated) per hour per direction or two buses per traffic signal cycle.	8 two-car LRT trains per hour (58m length)
C	30 buses (standard or articulated) per hour per direction or one bus per traffic signal cycle.	8 two-car LRT trains per hour (58m length)
D	30 buses (standard or articulated) per hour per direction or one bus per traffic signal cycle.	8 two-car LRT trains per hour (58m length)
Vaughan N-S Link	30 buses (standard or articulated) per hour per direction or one bus per traffic signal cycle.	8 two-car LRT trains per hour (58m length)

As noted previously, terminal access improvements at Downsview Subway Station would be required to accommodate the vehicle frequencies listed above for the Vaughan North-South Link service to the TTC subway network when they are combined with future TTC BRT volumes. These would not be required if Toronto proceeds with the planned extension of the Subway to York University

E.4.3 System Infrastructure

The preferred transitway infrastructure for Rapid Transit comprises:

- A 41 km two-lane, median transitway on the preferred alignments in the Highway 7 corridor between Highway 50 and the Markham By-Pass designed to both BRT and LRT standards;
- Surface transitway forming the Vaughan North-South Link between Highway 7, at the Vaughan Corporate Centre and York University, as well as the eventual replacement of this transitway by an extension of the Spadina Subway from Steeles Avenue at York University to Highway 7;
- Short sections of transit operation in mixed traffic through constrained sections of ROW and existing underpasses of major north-south arterial roads (e.g. Bathurst Street and Bayview Avenue);
- Stations at approximately one kilometre spacing, located generally at major intersections;
- Access to an intermodal terminal facility in the Langstaff area and at Markham Centre to provide connection to GO Transit and the proposed Yonge Street Transitway;
- Development of a terminal facility at the northwest corner of Steeles Avenue and North West Gate at York University and park-and-ride lot in the hydro corridor to provide connection to the proposed Spadina Subway Extension;
- Access to a maintenance facility for transit vehicles, potentially located south of Highway 407 on the east side of Yonge Street; and
- Access facilities at stations to encourage and support pedestrian and bicycle modes of transportation.

E.5 PROJECT RELATED EFFECTS AND MITIGATION

The assessment of project-related effects was performed using the primary Rapid Transit Plan objectives and related goals developed for the evaluation of alternatives in selecting the preferred alignment. These objectives are:

- To improve mobility by providing a fast, convenient, reliable and efficient rapid transit service;
- To protect and enhance the social environment in the corridor;
- To protect and enhance the natural environment in the corridor;
- To promote smart growth and economic development in the corridor.

The effect of the proposed Undertaking in terms of each environmental value was rated using a qualitative scale ranging from a positive or beneficial effect through negligible to a potentially significant negative effect as described in the methodology outlined in **Chapters 11 and 12** of the report.

Generally, the Undertaking has the ability to improve mobility within the region and provide good connectivity with inter-regional transit services. It features connections between the City of Toronto via York University (initially BRT and in future the Spadina Subway Extension) and via the Richmond Hill Centre Intermodal Terminal at Yonge Street to access .York Region's rapid transit service to Finch subway station. It connects to GO Transit's Richmond Hill Line at the Langstaff GO Station, their Stouffville Line at Unionville GO Station, and potentially their Bradford Line as GO finalizes new station locations for this service. The Undertaking is also capable of connecting to future 400 series highway rapid transit services. From this point of view, the proposed transitway will have an overall positive effect on transit ridership and accessibility in the region.

Overall, the various goals set to protect and enhance the social environment are largely achieved. Most adverse effects are generally mitigated by the built-in attributes of the design and benefits for the communities within the corridor can be maximized.

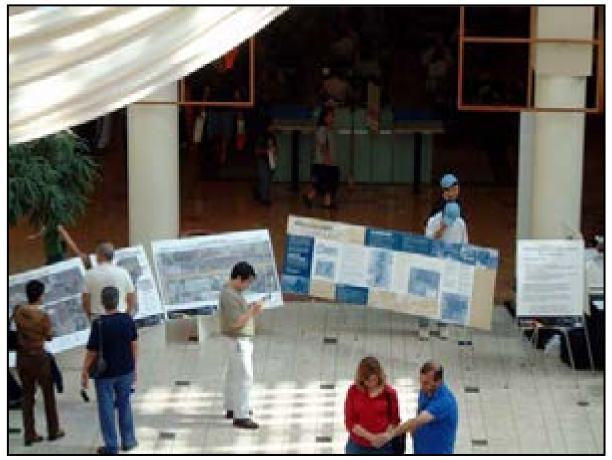
The protection and enhancement of the natural environment within the corridor can be achieved. By definition, the Undertaking along the Highway 7 and local arterial rights-of-way is set in a highly developed urban environment, where natural features have mostly been disturbed by previous development. Nevertheless, there are watercourses crossing Highway 7 within the Humber, Don, Rouge and Petticoat Creek watersheds. Similarly, nearby urban green spaces still exist and must be protected. Effects on aquatic and terrestrial ecosystems are either negligible or insignificant when built-in mitigation measures are implemented or construction and operation methods required for sensitive areas are respected. The widening of existing bridges, lengthening of existing culverts or installation of new bridges and culverts along the transitway will incorporate mitigation measures where required to preserve or enhance the aquatic habitat.

One of the main purposes of the Rapid Transit System is to support the smart growth policies of the Provincial and Regional Governments and simultaneously encourage economic development. From this perspective, the Highway 7 Transitway strongly supports Regional and Municipal planning policies, such as the Centres and Corridors urban form. In many respects, the Undertaking will contribute to the intensification of underutilized sites within the corridor and encourage transit-oriented development at infill locations and vacant land along the routes. At the same time, several built-in design characteristics are aimed at reducing the potential for adverse effects on business or access to residential neighbourhoods and community facilities.

The transit system will support the overall objective of the Region's Planning Policies and contribute to a sustainable environment by improving access to new and existing development leading to increased business and economic activity along the corridor.

E.6 IMPLEMENTATION CONSIDERATIONS

The Highway 7 Corridor and Vaughan North-South Link Transitway Undertaking, described in **Chapter 9**, is the primary east-west corridor and secondary north-south corridor, respectively, in York Region's proposed four-corridor Rapid Transit Plan. In addition, travel demand modelling has indicated that rapid transit service in some segments of Highway 7 corridor will attract a reasonably high transit ridership. Consequently, the Region's plans for the evolution of the network place a high priority on early implementation of facilities and service in this corridor.



Following approval of the Environmental Assessment by both provincial and federal agencies, further preliminary design and subsequently, detailed design will constitute the first stage of the Region's plan for implementation.

Selection of bus rapid transit (BRT) as the preferred initial technology allows the facilities to be constructed and the service to be operated in stages along the length of the corridor. The timing and extent of each stage implemented and operated will depend on the availability of funding and the period required for construction of each stage.

It is likely that the design phase for transitway infrastructure will be completed sequentially in three segments along the route, each timed to allow sufficient time for post-EA approvals prior to the scheduled start of construction in each segment.

The Construction Phase

Implementation of the transitway by segment was introduced in the discussion on design approach above. Assuming continuity in the availability of funding for construction, it is anticipated that construction of the transitway and associated station facilities will commence in year 2008 in the segment between Yonge Street and Markham Centre. Work in this 9 km segment will continue through the 2009 and 2010 construction seasons.

Prior to commencing construction in the Highway 7 corridor right-of-way, a comprehensive, detailed Traffic Management Plan will be prepared in consultation with regional and local municipal traffic operations staff, emergency services personnel and owners of businesses generating major traffic movements. The plan will include:

- traffic signal modifications to control left and U-turns;
- distribution of available roadway width for traffic lane diversions;
- sequencing of shifts of construction and traffic between sides of Yonge Street;
- measures to preserve vehicle and pedestrian access to adjacent properties;
- measures to maintain access for emergency vehicles;
- locations and details of signage and barriers;
- methods to permit transit operations during construction.

Within each of the segments discussed above, road-widening works, to develop the median right-of-way for transit, will be staged to minimize the temporary disruption due to traffic lane diversions and narrowing.

E.6.1 Vaughan North-South Link Ultimate Subway Extension Phase

The timing of construction of the extension of the Spadina Subway into York Region will depend on decisions on the timing and extent of the project to expand the system in Toronto between Downsview Station and Steeles Avenue Station. If subway expansion into York Region can be funded as part of this project, the construction along the Vaughan North-South Link would be integrated with the schedule for the overall expansion project. In the event that the Toronto project is terminated at Steeles Avenue, the timing of the VNSL subway segment will be predicated on availability of funding and the need to support Vaughan's regional centre development growth.

E.6.2 Public Outreach

The Highway 7 Corridor and Vaughan North-South Link Public Transit Improvements Environmental Assessment Study conducted a public consultation program comprising four series of information centres. These have afforded the general public and other stakeholders the opportunity to view design alternatives and their evaluation, express concerns related to environmental effects and provide input to the development of mitigation measures.

E.7 HIGHWAY 7 CAPACITY IMPROVEMENTS: WOODBINE AVENUE TO SCIBERRAS ROAD

E.7.1 Background

In addition to the Public Transit Improvement initiative studied in this Environmental Assessment (EA), the *2002 York Region Transportation Master Plan* identified future road network capacity needs in the Highway 7 Corridor to improve the capacity and operational and physical characteristics of arterial roads. The Region's 2004 Ten-Year Road Construction Program scheduled the implementation of improvements to Highway 7 between Woodbine Avenue and Sciberras Road for the Year 2007. Also, the Town of Markham Council has passed a resolution requesting the Region to advance the execution of the widening of this section of Highway 7 from 2007 to 2005/2006.

During the Public Transit Improvements EA, the Region re-activated the assessment of the Highway 7 Road Widening as a component of the Highway 7 Corridor and Vaughan North-South Link (VNSL) Public Transit Improvements EA. This approach was considered desirable since the road widening and transitway insertion are interdependent with each having a significant influence on the other.

E.7.2 Need and Justification

Currently, Highway 7 is a six-lane road west of Woodbine Avenue reducing to four lanes from Woodbine Avenue eastward. The Region, in response to the dramatic growth in recent years and future committed development, especially Markham Centre West, included the implementation of road improvements and a capacity increase in the sector between Woodbine Avenue and Sciberras Road in the 2004 ten-year Capital Works Program confirming the recommendations of the Region's overall Transportation Master Plan.

The need and justification for improvements in this segment of road as one of the priorities within the *Ten-Year Capital Program* stems from the following:

- As the development currently in progress or already committed and awaiting final approval by the Town of Markham takes place, traffic congestion will exceed permissible levels at peak hours.
- York Region's *Transportation Master Plan* recommends the widening of this section of Highway 7 as one of its priorities.
- The future Transitway recommended for the median of Highway 7 will require widening of the road west of Town Centre Boulevard (or Warden Avenue).
- By virtue of its role as the main arterial through Unionville Central District, the Town of Markham intents to provide an urban image and operation to this stretch of Highway 7.
- Future development and the Transitway will generate pedestrian circulation resulting in the need of pedestrian facilities such as sidewalks.

The main objectives of the proposed improvements are to:

- alleviate traffic congestion on this sector of Highway 7;
- serve the traffic needs of existing and approved adjacent developments;
- support the York Region and Town of Markham Official Plan policies; and
- provide additional east-west traffic capacity to accommodate long term growth.

E.7.3 Assessment of Alternatives to the Undertaking

Consistent with the requirements of the Environmental Assessment Act, the proponent must examine transportation alternatives to the undertaking itself. In this context, six planning alternatives were considered and analysed. These comprised Doing Nothing, Limiting Development, Increasing Vehicle Occupancy (Transportation System Management), Improving Public Transit Service, Improving the capacity of Highway 7 and, Improving other roadways.

As a result of the evaluation, the **Improvements to Highway 7 Alternative** is recommended. The traffic demand generated by the continuing developments in the study area and the implementation of Markham Centre West regional node will only be properly addressed by increasing the capacity of Highway 7. This is best achieved by a combination of widening of the cross section and the implementation of a dedicated transitway along Highway 7. Service on the latter must also be closely integrated with that of other transit systems serving the area. In addition, Highway 7 improvement is an essential element in achieving the Region's Centres and Corridors urban form objective.

E.7.4 Evaluation of Alternative Methods of Carrying Out the Undertaking (Design Alternatives)

The future operational and physical plans of the Region and the Town for Highway 7, including the transitway and the road network expansion within the study area were considered to identify and evaluate design and implementation alternatives for widening the road. The evaluation was divided in two sections, the west section where the future transitway is planned for the median, and the east section where no transitway is planned.

E.7.4.1 <u>West Section: Montgomery Court to Town Centre Boulevard or Warden Avenue (future BRT Corridor)</u>

Three design alternatives were considered for this section:

- **Alternative 1:** Widening not considering future transitway in the interim stage
- **Alternative 2:** Allowing space for future transitway with a wide median, and
- **Alternative 3:** Allowing space for future transitway with wide boulevards

Conclusion: The evaluation indicates that **Alternative 2** ranks consistently higher than the other two alternatives and consequently, was selected as the preferred Alternative due mainly to the following advantages:

- By building the road cross-section to its ultimate stage, the overall capital cost of the widening works will be substantially less than in the other two alternatives since it would require only minimum road reconstruction when rapid transit is implemented.
- Reconstructing the road when the transitway is built, as is required with Alternatives 1 and 3, would have a negative effect on the public and property owners due to the inconvenience caused during construction (traffic delays, noise, utility relocation, sidewalks relocation, etc.).

E.7.4.2 <u>East Section: Town Centre Boulevard to Sciberras Road</u>

As indicated in their planning studies, the Region and the Town support the urbanization of this section of the Highway 7 (just north of the future Markham Centre) that include wide landscape medians, boulevards, and bicycle facilities.
From Town Centre Boulevard or Warden Avenue to Sciberras Road two design options were evaluated:

- **Alternative 1:** A raised, landscaped wide median; and

- **Alternative 2:** A reversible seventh lane for left turns between traffic directions.

Alternative 1 was selected as the preferred alternative. It supports the Town of Markham and York Region objective of an enhanced streetscape with full urban characteristics for this section of Highway 7, since it will function as the gateway to Unionville and communities to the east as well as the northern perimeter of the planned Regional Centre. It must also support new mixed-use developments either in construction and/or awaiting approval.

In summary, the preferred method of carrying out the undertaking is construction of the widening to six lanes to the ultimate cross-section with a raised median sized to accommodate the future transitway in the west section and landscaped divider in the east. Sidewalks are proposed on both sides of Highway 7 supplemented by a bicycle path along the south side between Warden Avenue and Sciberras Road. This arrangement will support the expected pedestrian/cycling demand. The intersection operational analysis indicated an overall level of service improvement particularly noticeable in the operation of the critical movements.

E.8 VAUGHAN N-S LINK ULTIMATE CONVERSION TO SUBWAY TECHNOLOGY

E.8.1 Background

The study's Terms of Reference included an assessment of a potential extension of the TTC's Spadina Subway from the York Region boundary north of York University to Vaughan's planned Corporate Centre at Highways 400 and 7 in response to both a request by the City of Vaughan and the Region's Centres and Corridors Strategy initiatives. The VCC is the western Regional Centre which is intended to focus on higher order development needed as the Region increases the emphasis on the growth priority of city-building within the urban boundary. The objective of the City of Vaughan is to ensure the link between the VCC and the existing and planning rapid transit facilities established through the broader Regional policies and the local Official Plan is confirmed and protected for, and if necessary refined. This study assessed and compared a range of alignments for possible future subway extensions to provide the basis for selection of a preferred alignment for which right-of-way could be protected.

E.8.2 Relationship to the TTC's Spadina Subway Extension Environmental Assessment

In October 2004, the TTC initiated an Individual Environmental Assessment for an extension of the Spadina Subway from the present terminal at Downsview to York University including the York Region transit terminal site north of the University on Steeles Avenue.
The TTC expects to complete their EA by the end of 2005 and obtain approval of the recommendations during 2006. At the time of completion of the Region's Highway 7 and Vaughan N-S Link EA, the on-going TTC study had identified a preferred route (Route 1 in their study) and a series of alignment alternatives for the subway extension up to the area of the Steeles Avenue terminal site. These alternatives were presented to the public in May 2005 as candidate alignments for evaluation in subsequent phases of the EA study. Alignment alternatives for an extension of the subway into Vaughan will have to be compatible with any of these candidate alignments from the south.

E.8.3 Recommendation of Alternative Routes – York University to VCC

E.8.3.1 Vaughan Corporate Centre Station Location

The previous VCC study (*Vaughan Corporate Centre Transportation/ Transit Planning and Functional Design Study*) recommended the **Millway Alignment** (see **Figure E-6**) as the preferred alignment north of Highway 407 within which the higher order transit service could be provided. Its merits include flexibility of transit technologies and excellent coverage of the VCC node as well as acceptable inter-connection of transit service going to and from the west along Highway 7.

E.8.3.2 Routes linking Vaughan Corporate Centre to York University

From the evaluation of the several routes shown in **Figure E-7**, the *Higher Order Transit Corridor Protection Study* recommended that both **Routes A and B** be considered further given their commonality and proximity (in fact, they can be considered route options within the same overall corridor). Not only did both routes provide the most direct link between the Vaughan Corporate Centre and the Spadina subway (via York University), but they also provided a high level of service to the future 407 Transitway and the associated commuter parking facility. In addition, they would both serve future adjacent developments well and promote further intensification of the adjacent land uses.

E.8.4 Future Subway Elements of the Undertaking: York Transit Terminal to VCC

Having established that the most appropriate routes for a rapid transit service connecting the Vaughan Corporate Centre to York University were Routes A and B, the Study then developed specific alignments along each route. The alignment alternatives had to satisfy a range of criteria including operational efficiency, convenient station access points, future extension opportunities and minimal impacts on existing and future developments in addition to the social and natural environments.

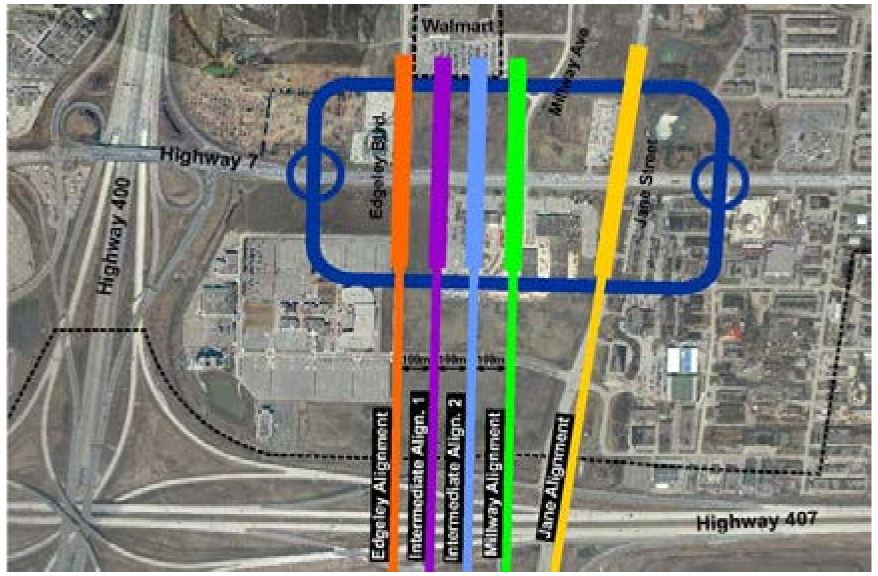


Figure E-6
Vaughan Corporate Centre Station Location Alternatives

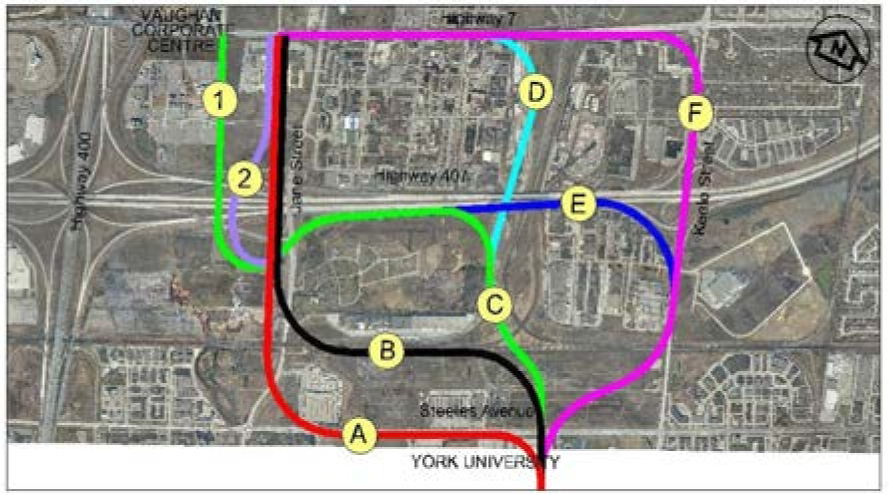


Figure E-7
Route Alternatives between Vaughan Corporate Centre and York University

E.8.4.1 Analysis of Alternative Alignments

A total of five alignment alternatives were assessed in the *Higher Order Transit Corridor Protection Study*. As shown in **Figure E-8**, Alignments A-1 and A-2 were located along Steeles Avenue/Jane Street/Millway Avenue, (i.e. along Route A) whereas Alignments B-1, B-2 and B-3 were located

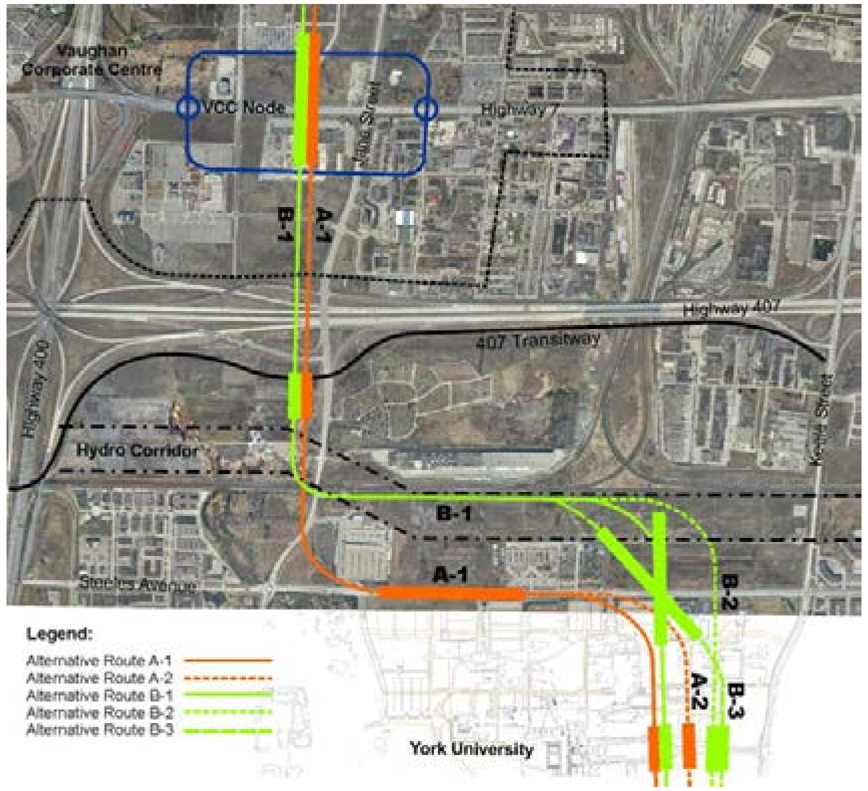


Figure E-8
Alignment Alternatives between VCC and York University

along the north edge of Steeles Hydro Corridor/Jane Street/Millway Avenue (i.e. along Route B).

Based on the evaluation, the City of Vaughan Study recommended **Alignment A-1** for a subway extension extending from York University to the Vaughan Corporate Centre.

E.8.5 Subway Facilities Included in the Undertaking

The scope of the *Higher Order Transit Corridor Protection Study*, described above, did not allow for the detailed station planning necessary to define property requirements for ancillary rapid transit terminal station facilities.

Following an analysis of the available alternatives, a subsequent City of Vaughan study identified the preferred configuration and property requirements for facilities at the proposed Steeles Avenue interim terminal station.

Based on the conclusions of both City of Vaughan studies, Vaughan Council adopted *OPA 529* which defined the location and width of the transit right-of-way and station locations. Most of the land required for the transit terminal has been acquired by the Region and acquisition of the remaining parcels including those required for the east-west access road is in progress.

Consequently, the site has been identified by the TTC as the end point of their routes and alignments to be studied in their on-going EA for the extension of the Spadina Subway. At the time of completion of this Highway 7 Corridor EA, the TTC/City of Toronto EA study had not yet identified the preferred alignment for the subway south of this end-point. Hence it is not possible to confirm that the preferred subway alignment A-1 selected in the City of Vaughan studies will be compatible with the alignment south of Steeles Avenue selected through the TTC/City of Toronto EA. Therefore this EA is seeking approval of the underground Alignment A-1 with the option of amending, if necessary, the portion south of Highway 407 to tie into the approved TTC station and tail track alignment at the York Region transit terminal site. The likely limits of TTC alignment alternatives are shown shaded on **Figure E-9**.

Planning to date by the TTC's study has identified three potential alignments on which the subway could reach the Region's terminal site. The TTC work to date indicates that the preferred horizontal and vertical alignment of the Toronto subway extension will fall within the shaded zone shown on **Figure 12-4** between Highway 407 and Steeles Avenue.

In addition to the recommendation and assessment of a preferred subway alignment at the Region's transit terminal site, the TTC/City of Toronto EA will be developing and evaluating alternative locations and configurations for ancillary inter-regional transit terminal facilities serving the initial subway terminus at Steeles Avenue. These facilities, which are not part of the undertaking for the York Region's EA, will include:

- a feeder bus terminal(s) for bus-to-rail passenger transfer for all transit systems serving the proposed subway extension, These terminal facilities will incorporate the bus loading and unloading activities envisioned for the Region's transit terminal site described earlier in this chapter;
- a passenger pick-up/drop-off facility on the north side of Steeles Avenue; and
- an ultimate park-and-ride lot for commuter parking, potentially sharing land in the hydro corridor.

The above facilities will be included in the works constituting the TTC/City of Toronto EA undertaking and consequently are excluded from this undertaking.

Summarizing, this York Region EA undertaking includes the following components of a future conversion of the Vaughan North-South Link to subway technology by extension of the TTC subway system to Highway 7:

- the alignment for subway right-of-way from the northern limit of the tail track at the Highway 7 Station to the north end of the interim terminal tail track at the Steeles West Station (defined by the TTC/City of Toronto EA).
- Stations at Highway 7 and Highway 407.
- Development of transit terminal facilities on York Region's site at the northwest corner of Steeles Avenue and North West Gate/Street 'C', in a facility of the type shown conceptually in **Chapter 9**, **Figure 9-25**.
- An initial phase of the proposed park-and-ride lot within the Hydro Corridor north of Steeles Avenue (500parking spots).
- Transit terminal facility at the northwest corner of Highway 7 and Millway Avenue.

E.9 ASSESSMENT OF THE PREFERRED SUBWAY DESIGN

Generally, a subway extension from York University, the ultimate form of the undertaking for the Vaughan N-S Link, has the ability to significantly improve mobility within the western portion of the corridor and provide good connectivity with all intra-regional transit services. It provides connections to the City of Toronto subway network via York University and is also capable of connecting to future Highway 407 rapid transit services near Jane Street. The subway technology will have an overall positive effect on transit ridership in the region. Station locations will support medium-long term development in the VCC and York University area where high residential density, high employment numbers or a mixture of the two will capitalize on the effectiveness of implementing a subway system extension. All stations, ancillary facilities and the transit system itself will be accessible for the mobility impaired providing ramps, elevators, etc.

Overall, the various goals set to protect and enhance the social environment can be achieved. Most adverse effects are generally mitigated by the built-in attributes of the design and benefits for the existing and future communities served by the route can be maximized. In particular, the subway phase of the undertaking will improve community mobility, access to commercial and community facilities planned for each end of the extension, the VCC and York University and environs.

Preserving and improving public safety and security along the route was an important consideration in development of the design concept. While fulfilling its role as a major transit interchange node in VCC, the features of the Highway 7 station precinct design will create a pedestrian-friendly environment as planned in the recently-completed VCC Streetscaping Study. In addition, noise and vibration studies at representative sensitive receptors have demonstrated that the use of the TTC's standard floating slab track support system will mitigate any noticeable increase in noise or vibration levels for residents of future developments that may be implemented along the route.

The limited natural environment along the subway extension route of the can be protected and enhanced in a small way. Most of the preferred subway extension alignment is set in a developed urban environment where natural features have already been disturbed by previous development. Nevertheless, within the Don watershed, the Black Creek watercourse crosses Highway 7 east of the proposed subway terminal station at Millway Avenue and the proposed subway alignment south of Highway 407. At the Highway 7 crossing, the subway tunnel, station and surface works will be remote from the watercourse and outside the floodplain while at the crossing south of Highway 407 the tunnel profile can be designed to allow the subway to pass under the creek leaving the station and associated surface works as the only components with potential to effect the watercourse and related vegetation.

The extent of effects on the Black Creek watercourse cannot be identified and mitigation measures developed until after the Toronto/TTC's Spadina Subway Extension EA is approved in 2006 when further study of the connection to the preferred alignment in Toronto and an addendum to this EA Report is completed. This addendum will include a recommendation for the subway alignment between Highway 407 and the approved Steeles Avenue Station tail track as well as an update of the environmental effects of the recommended alignment.

Effects on aquatic and terrestrial ecosystems are either negligible or insignificant when built-in mitigation measures are implemented or sensitive construction and operation methods are respected.

One of the main purposes of the Rapid Transit System is to support the smart growth policies in the Region and simultaneously encourage economic development. From this perspective, the conversion of the Vaughan North-South link to subway technology strongly supports Regional and Municipal planning policies, such as the Centres and Corridors urban form. The undertaking will contribute to the intensification of underutilized sites and encourage transit-oriented development at infill locations and vacant land along the corridor.

The subway extension will create a sustainable environment and increase development leading to increased business activity along the corridor. Through the increase in business activity, infill locations and vacant land could be developed, maximizing the density of development and leading to a more viable alternative of rapid transit in York Region.

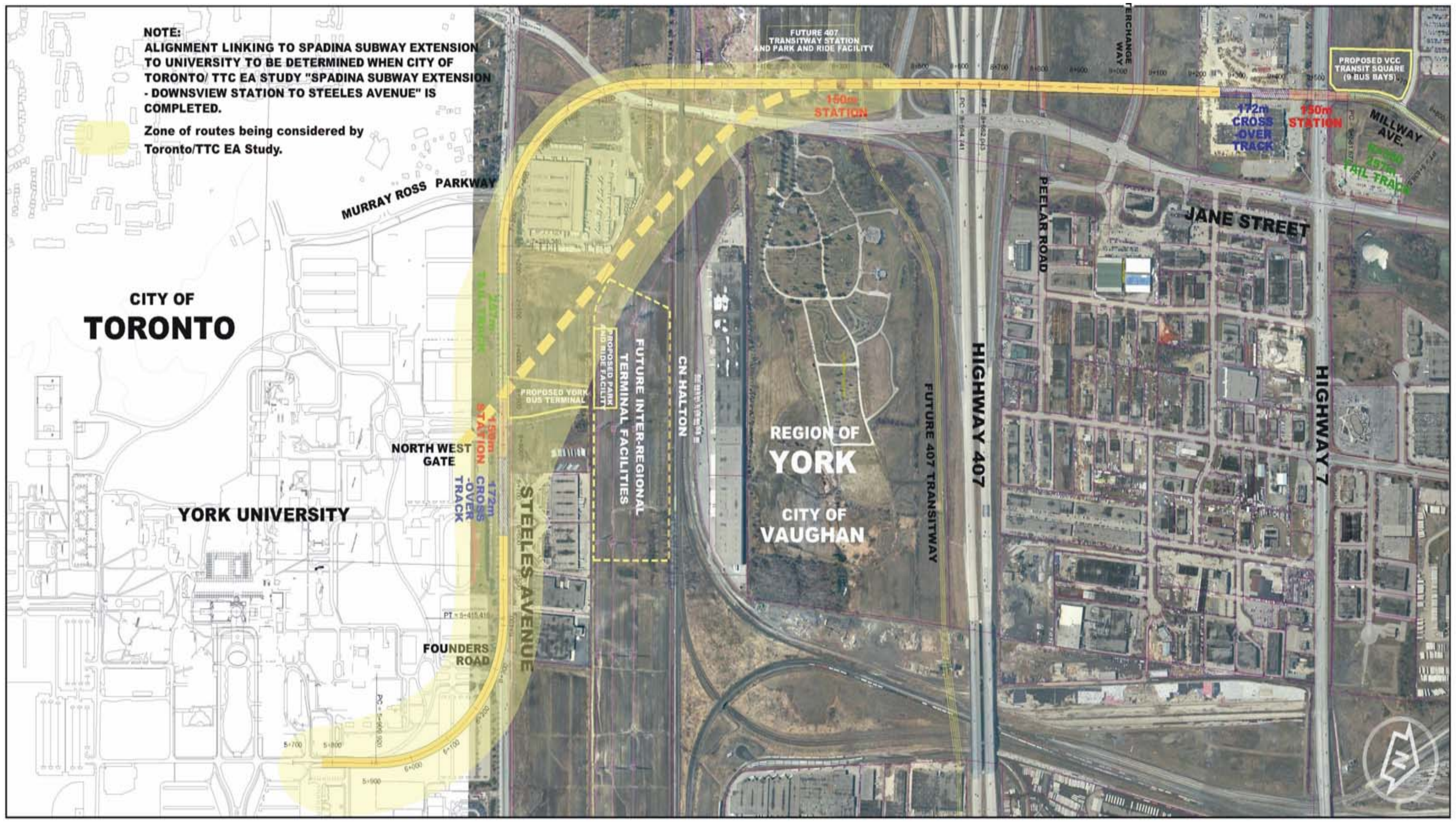


Figure E-9
Zone of Routes Being Considered by Toronto/TTC EA Study

TABLE OF CONTENTS

LIST OF APPENDICES

LIST OF FIGURES

LIST OF FIGURES

LIST OF FIGURES

LIST OF FIGURES

LIST OF FIGURES

LIST OF FIGURES

LIST OF TABLES

LIST OF TABLES

LIST OF TABLES

LIST OF TABLES

LIST OF TABLES

1. INTRODUCTION

1.1 PURPOSE OF THE REPORT

In July 2004, the Regional Municipality of York (Region), the proponent of the York Region Rapid Transit Plan, obtained formal approval of the Terms of Reference (ToR) for an Environmental Assessment (EA) of the proposed Public Transit Improvements in the Highway 7 Corridor and Vaughan North-South Link, the primary east-west corridor of the Plan. In accordance with clause 6.2 of the *Ontario Environmental Assessment Act*, the Region initiated the EA to fulfil its obligations under Clause 3 of the Act. The EA studies, meeting the requirements of the approved ToR, carried out between late 2002, and the end of 2003, were updated following ToR approval and assembled to form the content of this report.

The purpose of this report is to document the scope and findings of the EA study assessing the effects of both the construction of the Highway 7 and Vaughan North-South Link Public Transit improvements and the operation of transit service in the corridor. The report and its appendices, including the approved ToR, constitutes the Region's application to the Ontario Ministry of the Environment for approval to proceed with the undertaking, submitted under subsection 6.2 (1) of the EA Act. In addition, approval under the *Canadian Environmental Assessment Act* (CEAA) is being sought through an integrated parallel process.

1.2 PURPOSE OF THE UNDERTAKING

1.2.1 Statement of the Problem

York Region has had the greatest proportional increase in population and employment amongst the four suburban regions of the Greater Toronto Area over the past 10 years. Within the 2021 planning horizon, the population of the Region is forecast to increase from the current 0.8 million residents to 1.2 million residents, while employment is estimated to increase from the existing 385,000 jobs to 655,000 jobs.

Much of this growth is targeted to live and/or work in the southern areas of the Region that include the Highway 7 Corridor. This growth will generate a proportionate increase in travel demand. While it is expected there will be a greater segment of the population living and working within the Region itself, north-south travel demand between the Region and the City of Toronto will also remain a dominant feature amounting to 35% of total travel demand. Part of this travel will occur in the Vaughan North-South Link Corridor.

York Region's Official Plan (Office Consolidation, as of July 1, 1998) places a strong emphasis on significantly increasing public transit use to accommodate future transportation needs and support the Plan's vision of sustaining the natural environment, optimizing economic vitality and ensuring healthy communities. The Plan identifies four regional centres and two main regional corridors. The four existing and/or developing centres, intended to be focal points for business, government and culture with complementary medium and high density mixed-use development, are:

- The Langstaff Community area in southern Richmond Hill surrounding the Yonge Street/Highway 7 intersection,
- Newmarket, at the top of the primary north-south corridor on Yonge Street and home to the Regional Council offices,
- Markham Centre to the east in the vicinity of Highway 7 and Warden Avenue, and
- Vaughan Corporate Centre to the west in the vicinity of Highway 7 and Highway 400.

Three of the above regional centres are located along the Highway 7 Corridor – Vaughan Corporate Centre, Richmond Hill Centre, and Markham Centre. In addition, York University is immediately adjacent to the corridor, being on the boundary between York Region and the City of Toronto.

The long-term vision for Highway 7 is for it to develop into a multi-use, transit-supportive, urban street, providing an integrated community for residents to live, work, play, and learn. The Highway 7 Corridor will link the three regional centres that serve as compact mixed-use areas intended as focal points for business, government and culture. Complementary medium and high-density residential development as well as historical and main-street areas, employment and business parks and rural and natural areas will round out the development in the corridor.

The Region's 2002 Transportation Master Plan (TMP), included in **Appendix P**, has reaffirmed the need to achieve a balanced transportation system by implementing rapid transit in four corridors. The TMP incorporates the Government of Ontario's Smart Growth vision for fostering and managing growth. This study and others completed recently have confirmed that most of the major east-west roads in southern York Region are at, or approaching, capacity and cannot sustain the Region's continual growth trend in auto traffic. Public transit has been identified to have an essential role to meet future travel needs, increase accessibility for residents, reduce dependence on automobiles, support the planned urban structure of the Region, and accommodate planned growth.

In the planned rapid transit network, shown in **Figure 1.2-1**, three of the four corridors comprise north-south rapid transit facilities. These include a link from the Vaughan Corporate Centre to the Spadina Subway; the Yonge Street Corridor connecting Newmarket Regional Centre to the Yonge Subway; and a link from the proposed Markham Centre to the Sheppard Subway. The fourth corridor is an east-west rapid transit facility in the Highway 7 Corridor connecting to all three of the north-south rapid transit lines, to the Region of Peel in the west and to the Region of Durham in the east.

Figure 1.2-1
Rapid Transit Network

Much of the Region's transportation system centres on the two primary corridors identified in the Official Plan (OP), which are the north-south leg on Yonge Street and Highway 7, the major east-west leg. The TMP established a comprehensive blueprint for road and transit developments in the Region through 2031 and articulated the goals in a set of twelve, desirable 'end states' for the transportation system:

- Reduced vehicular trips and shorter work trips;
- Employer based Travel Demand Management initiatives;
- Reduced dependence on automobiles;
- Universal access to public transit;
- Integrated transit services and fares among GTA transit operators serving York Region;
- Transit accessible human services;
- Efficient and safe movement of goods;
- Efficient use of infrastructure;

- Infrastructure in a 'state of good repair';
- Strong protection for the environment;
- Adequate and dedicated long-term funding sources; and
- Effective public consultation.

1.2.2 The Purpose of the Undertaking

The purpose of this "Undertaking", the Highway 7 Corridor and Vaughan North-South Link Public Transit Improvements encompasses two fundamental objectives:

- Firstly, to improve accessibility to current and planned development by providing a high quality public transit alternative to reduce automobile dependence; and
- Secondly, to contribute to the achievement of the Regional Official Plan objectives of sustainable natural environment, economic vitality and healthy communities. The undertaking must help make the Region's urban centres more liveable, pedestrian-oriented and economically viable by providing a valuable tool for structuring and achieving land use and social objectives.

Following adoption of the TMP by Regional Council, the Region initiated the planning and project development phase of the Rapid Transit plan by entering into a public-private partnership with York Consortium 2002. The scope of this first phase included network-wide transportation planning in parallel with, and in support of, Environmental Assessments of public transit improvements in each of the four corridors.

A key activity has been travel demand analyses, using the recently published results of the *2001 GTA-wide Transportation Tomorrow Survey* and the current demographic projections of York Region and the City of Toronto. This demand forecasting across the network has confirmed the findings of the Highway 7 Corridor Rapid Transit Need and Justification Study, specifically by showing that the shortfall in the Highway 7 road capacity at the 2021 planning horizon can be reduced by attracting a significant share of corridor trips to public transit. These travel demand forecasting results, combined with the smart growth and sustainable environment objectives of the Region's TMP reflect the purpose of the "Undertaking", the Highway 7 Corridor and Vaughan North-South Link Public Transit Improvements.

The purpose can be summarized as:

- Providing improved public transit infrastructure and service in the Region's network's primary east-west corridor and western north-south corridor capable of producing significant increases in transit ridership both within the corridor and across the network and regional boundary. This objective will be supported by interconnection with other corridors and GTA transit systems such as GO Transit and the Toronto Transit Commission (TTC); and
- Integrating public transit facilities in a manner that improves and enriches streetscapes with new amenities by using a holistic urban design approach to support the Region's goals for higher density mixed-use transit-oriented development along the corridor in accordance with approved official plans.

The undertaking, for which Ministry approval is sought, will comprise all infrastructure, systems, vehicle types and subsequent operational requirements necessary to achieve a significant improvement in public transit service and its attractiveness in the Highway 7 Corridor from Highway 50 to York-Durham Line during the planning period.

1.3 RELATIONSHIP WITH OTHER CORRIDORS

As a primary corridor on York Region's proposed rapid transit network and major inter-regional connector with the adjacent regions, Peel and Durham, Highway 7 Corridor public transit improvements fulfil several roles relative to other corridors in the Region's network as well as those of other transit operators interfacing with it. These roles can be summarized as follows:

a) Providing the high quality transit link between the three southern Regional Centres in the Highway 7 Corridor that serve as compact mixed-use areas intended as focal points for business, government and culture. The long-term vision for Highway 7 is for it to develop into a multi-use, transit-supportive, urban street, providing an integrated community for residents to live, work, play, and learn. Complementary medium and high-density residential development as well as historical and main-street areas, employment and business parks and rural and natural areas will round out the development in the corridor.

b) Providing the principal east-west public transit feed to the Richmond Hill Centre intermodal terminal station at the junction of the Yonge Street and Highway 7 Corridors in the Bayview Glen area of Richmond Hill.

c) Distributing trips from the Yonge Street Corridor to the east-west corridor.

d) Providing feeder public transit service to the network's outer north-south links across the Steeles Avenue regional boundary in Vaughan and Markham to Toronto's subway system.

e) Establishing improved public transit in the Vaughan North-South Link (VNSL) Corridor between Vaughan Corporate Centre (VCC) and the TTC's existing Spadina subway and any future extension to York University and into the Region. The Undertaking for this EA includes a potential ultimate phase of rapid transit in VNSL comprising a further extension of Toronto's subway system from York University to Highway 7 at the VCC.

f) Providing improved public transit access to the GO Transit Bradford, Richmond Hill and Stouffville commuter rail corridors.

g) Providing rapid transit access to the future 407 Transitway, the inter-regional bus rapid transit corridor, at the Unionville, and Langstaff terminals. GO Transit has recently undertaken an Inter-regional Bus Rapid Transit study, in which the main objective was to identify a feasible inter-regional bus rapid transit alignment and implementation

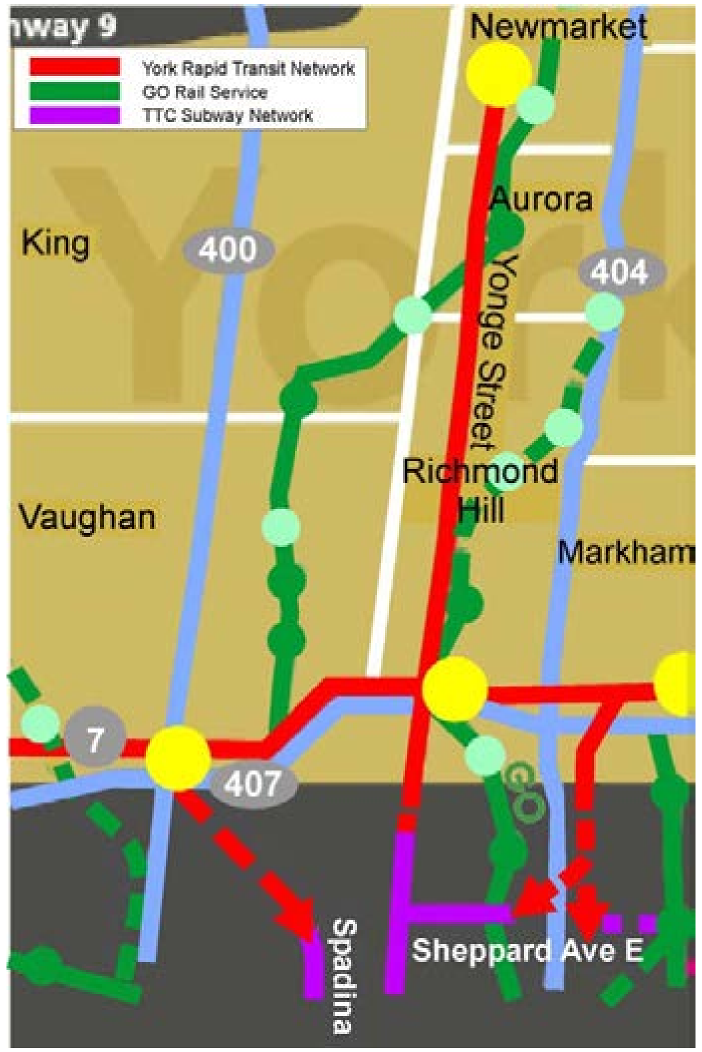


Figure 1.3-1
Corridor Relationship

strategy that complements and supports GO Transit's existing rail and bus network.

h) Permitting convenient connections between rapid transit and local transit services.

The relationship of the Highway 7 Transitway Corridor to the other inter-connected corridors mentioned above is illustrated in **Figure 1.3-1**.

1.4 STUDY PROCESS

The study of public transit improvements in the Highway 7 and Vaughan North-South Link Corridor followed an Individual Environmental Assessment (IEA) process in accordance with the Ontario Environmental Assessment Act (Part II). This IEA was carried out in a *Harmonized* manner so as to comply with the Canadian Environmental Assessment Act (CEAA). Federal funding will almost certainly be required because of the size and importance of this project. Funding by a federal agency is considered a *trigger* under the CEAA. The harmonization would ensure that the process followed would fulfill the requirements of both acts.

Funding could flow from Industry Canada through the Strategic Infrastructure Fund and as such Transport Canada is likely to be designated the *Responsible Authority*. Other approvals or triggers under CEAA for this project include approval for a TransCanada Pipeline crossing under the jurisdiction of the National Energy Board and DFO (Department of Fisheries of Oceans).

The four phases followed as part of this process are illustrated in **Figure 1.4-1**. The first two phases have utilized findings of transportation studies completed prior to the commencement of the EA and their content is summarized in **Chapters 3** and **4** of this Environmental Assessment Report.

The third and fourth phases are the focus of this assessment. Within these phases the following key tasks were completed:

- Detailed and focused investigation of existing conditions;
- Development of alternative functional designs;
- Assessment of environmental effects of alternative functional designs;
- A comparative evaluation of the functional design alternatives;
- Selection of Preferred Functional Design;
- Detailed description of the project including phasing and built-in mitigation;
- Detailed assessment of the environmental effects of the preferred design;
- Identification of lands needed for the implementation of the Preferred Functional Design;
- Recommendations for actions to prevent, change, mitigate, or remedy adverse effects, including monitoring provisions;
- Conclusions of the effects of the project on the human and natural environment; and
- Documentation of the Study in an EA Report.

The outcome of these tasks included:

- Opportunities to minimize identified potential adverse effects through the implementation of effective mitigation measures;
- Opportunities to restore, enhance, or improve overall environment quality of the Study Area including the preparation of a streetscape plan;
- Definition of the Preferred Functional Design for infrastructure of public transit improvements and the potential service plan for operations;
- Right-of-way (ROW) protection requirements for the preferred design to allow for orderly development or redevelopment of lands in proximity of the transit facilities; and
- A staged implementation process for construction of the improvements based on development pressures and ridership requirements.

1.5 REPORT ORGANIZATION

This report is divided in fourteen Chapters. The purpose of the study and the vision of transit within York Region are provided in **Chapter 1** including the planning and approval process. **Chapter 2** provides the background to the study and describes the Study Area identified in the Terms of Reference. **Chapter 3** identifies the Alternative Transportation Strategies to the need addressed by the undertaking and describes the findings of a comparative evaluation of these solutions. **Chapter 4** sets out the findings of the travel demand analysis carried out. In **Chapter 5**, the alternative methods of carrying out the preferred Transportation Strategy are presented and evaluated.

A description of existing conditions within the Study Area that could be affected by the undertaking is presented in **Chapter 6**. **Chapter 7** describes fundamental planning and design parameters that were used in developing alignments and alternatives. A description of the route

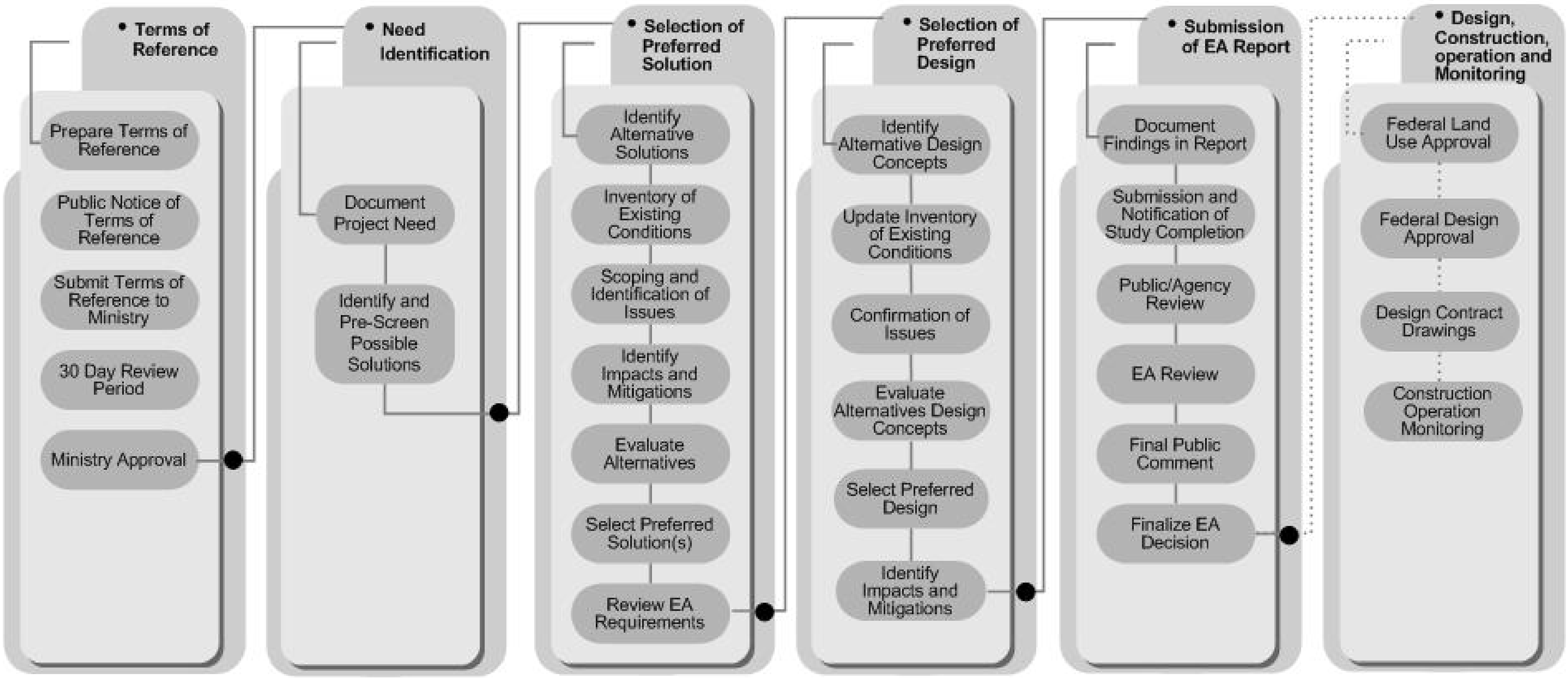


Figure 1.4-1
Harmonized Environmental Assessment Process

alternatives and the factors influencing their development is provided in **Chapter 8** which also includes the evaluation methodology, criteria used for the evaluation and the initial screening of local alignment alternatives.

In addition, **Chapter 8** evaluates primary route alternatives through each segment of the corridor. A more detailed description of the preferred design solution including project development activities that might affect the environment is presented in **Chapter 9**.

Results of the assessment of the environmental effects, recommended mitigation measures and proposed monitoring are summarized in **Chapter 10**. **Chapter 11** outlines the Implementation Plan. A description of the assessment of a future TTC subway extension from York University to Vaughan Corporate Centre is presented in **Chapter 12**. **Chapter 13** describes the assessment of Highway 7 road widening associated with rapid transit implementation in Markham between Woodbine Avenue and Unionville. Public and agency consultation formed an integral part of all phases of this study and is summarized in **Chapter 14**.

2. STUDY AREA BACKGROUND

2.1 DEFINITION OF STUDY AREA

The proposed geographic limits of the EA Study Area for the Highway 7 Corridor Transitway are shown in **Figure 2.1-1**. It is generally located along the Highway 7 Corridor and bounded by the York-Peel boundary (Highway 50) to the west and York-Durham boundary (York-Durham Line) to the east. The southern limit of the Study Area is Steeles Avenue while the northern limit is Major Mackenzie Drive.

The geographic limits of the EA Study Area for the development of the undertaking were selected using the following guidelines:

- The constraints and opportunities within the selected corridor as identified through the inventory of the existing and planned environment completed as part of a Need and Justification analysis carried out in advance of ToR preparation;
- The configuration of the rapid transit network proposed in York Region's Transportation Master Plan considering integration with the existing TTC network; and
- The forecast level of transit ridership along the length of the corridor within the planning period to 2021.

2.2 OVERVIEW OF EXISTING CONDITIONS IN STUDY AREA

In order to provide the setting for evaluation of alternatives to the undertaking, an overview of the Study Area is presented below with existing conditions described in more detail in **Chapter 6**.

2.2.1 The Built Environment

Highway 7 is one of the busiest transportation corridors in York Region. It serves a number of communities with a variety of land uses, links the Region's southern municipalities, and acts as a connector to the major north-south transportation and transit networks. Currently single-use districts of alternating employment, residential and commercial uses dominate the Highway 7 Corridor.

In the York Region Official Plan, the Highway 7 Corridor is designated as a primary development corridor with a mix of residential and employment use. The corridor will link the three designated regional centres (Vaughan Corporate Centre, Richmond Hill's Bayview Glen Centre, and Markham Centre) that serve as compact mixed-use areas intended as focal points for business, government and culture. Complementary medium and high-density residential development as well as historical and main-street areas, employment and business parks and rural and natural areas will round out the development in the corridor. Also, York University constitutes a major activity node on the edge of the corridor in the west.

During the Environmental Assessment, the existing and planned development was inventoried in detail and is described in **Chapter 6**.

2.2.2 The Natural Environment

Natural Heritage Features of the Study Area are presented in **Figures 2.2-1** to **2.2-3**.

2.2.2.1 Abiotic

The Study Area is primarily located in the Peel Plain physiographic region. The underlying geological material of the Peel Plain is a till or boulder clay which contains large amounts of Palaeozoic shale and limestone. The general elevation is from 500 to 750 feet above sea level and there is a gradual and fairly uniform slope towards Lake Ontario. A lobe of the Oak Ridges Moraine extends into the Study Area southerly to approximately Rutherford Road between Keele Street and Bathurst Street in the City of Vaughan. This provincially significant landform is protected by the Oak Ridges Moraine Conservation Act.

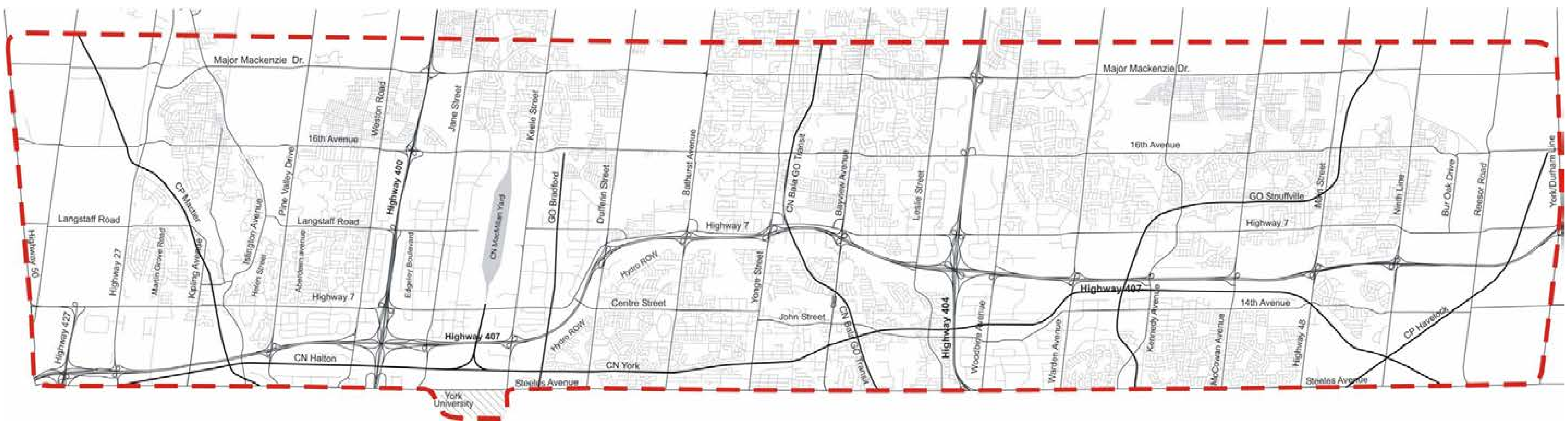


Figure 2.1-1
Proposed Study Area Limits

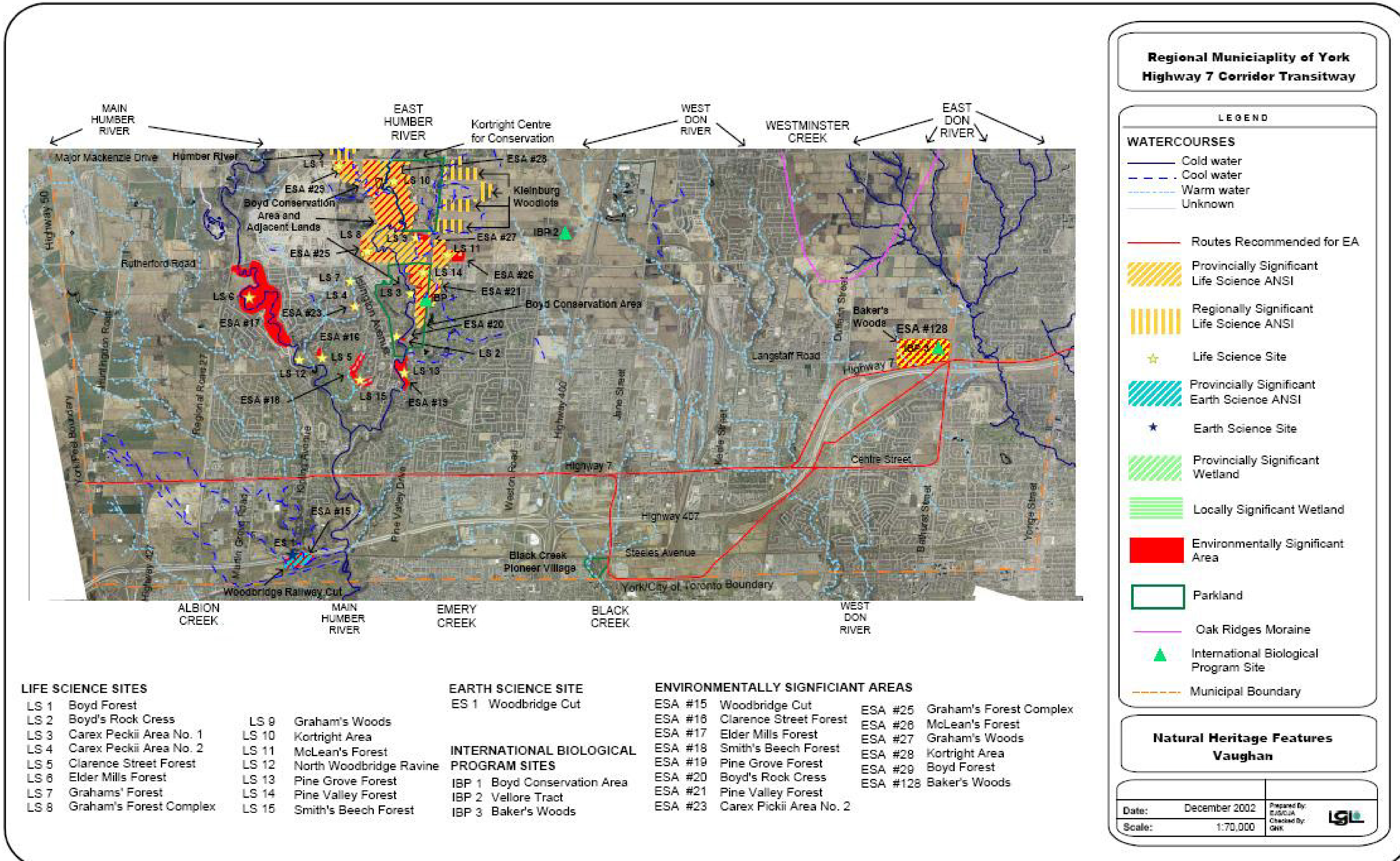


Figure 2.2-1
Natural Heritage Features in Vaughan

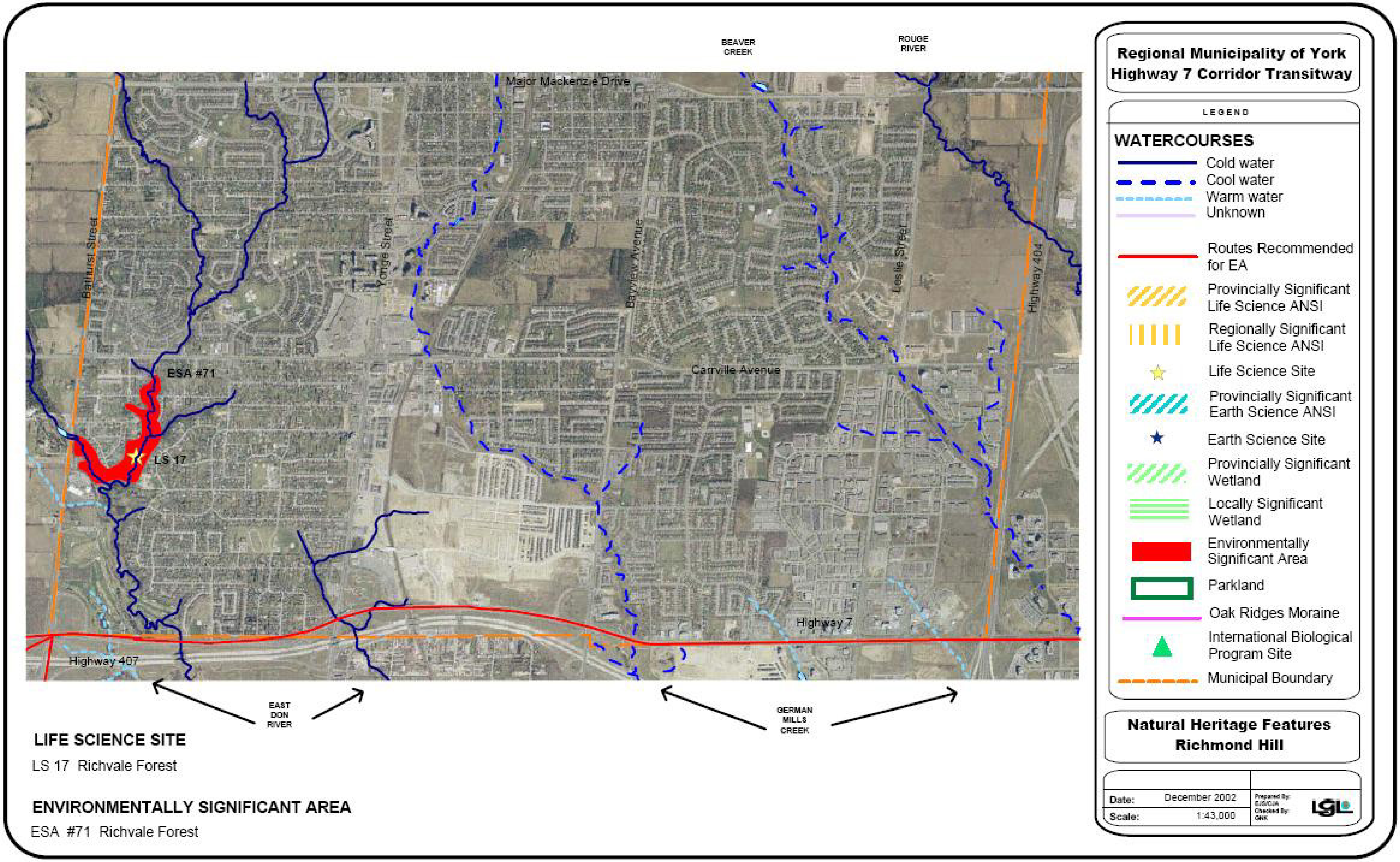


Figure 2.2-2
Natural Heritage Features in Richmond Hill

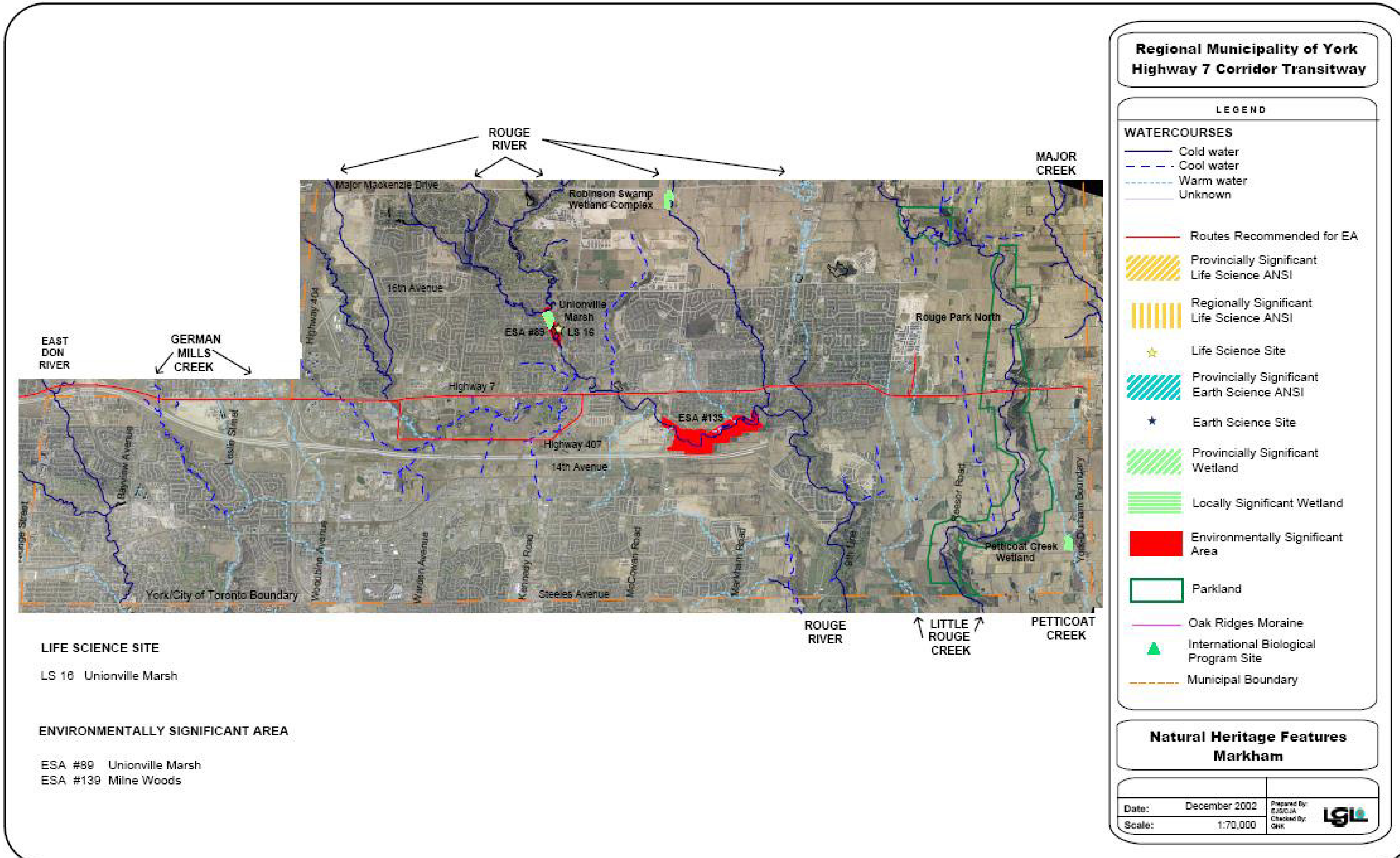


Figure 2.2-3
Natural Heritage Features in Markham

The Study Area lies within the Humber, Don, Rouge, Petticoat and Duffins watersheds although Petticoat Creek and Duffins Creek are not crossed by Highway 7 itself. Highway 7 traverses a total of 35 watercourses including tributaries of the West Humber River (e.g. Albion Creek), the main and east branches of the Humber River and associated tributaries (e.g. Emery Creek, Black Creek), the east and west branches of the Don River and associated tributaries (e.g. Westminster Creek, German Mills Creek), and the Rouge River and associated tributaries (e.g. Beaver Creek, Little Rouge Creek). These watercourses flow generally in a north to south direction from their headwaters in the Oak Ridges Moraine to their mouths at Lake Ontario. All watercourses fall within the jurisdiction of the Toronto and Region Conservation Authority (TRCA) and the Ministry of Natural Resources (MNR) Aurora District.

2.2.2.2 Aquatic Ecology

Watercourses crossed by Highway 7 that directly support fish habitats are identified as cold, cool and warm water. The Humber River, Rouge River and several of their tributaries within the Study Area support redside dace, a fish species of special concern nationally.

2.2.2.3 Terrestrial Ecology

Designated natural areas within the Study Area include Areas of Natural and Scientific Interest (ANSIs), evaluated wetlands and Environmentally Significant Areas (ESAs). These natural areas are classified as provincially, regionally and locally significant. Three International Biological Program (IBP) sites are located in Vaughan and major parklands dedicated to the protection of the natural environment are found in Vaughan and Markham.

2.2.2.4 Opportunities and Constraints

Most of the corridor is currently urbanized and, as a result, potential additional damage from the construction of a transitway will be minimal.

Natural environment features are typically viewed as constraints that should be avoided to the extent possible. When avoidance is not feasible, environmental management measures, including mitigation, restoration and compensation are used to reduce or offset the adverse effects of transitway development.

A summary of designated natural areas in the Study Area is presented in **Table 2.2-1**. A comprehensive list of these areas was included in Appendix B of the Region's *Highway 7 Corridor Transitway Environmental Assessment Need and Justification Study, December 2002*. While these constraints are not considered absolute, every effort should be made to avoid these natural areas to the extent possible. To achieve this, the public transit improvements should be sited within developed areas, including existing highway/road and utility corridors, to prevent further fragmentation or new crossings of aquatic and terrestrial ecosystems.

Table 2.2-1
Summary of Designated Natural Areas in the Study Area by Municipality

Designated Natural Areas	Municipality			Study Area Total
	Vaughan	Markham	Richmond Hill	
Cold Water Streams	2	4	3	9
Cool Water Streams	4	5	1	10
Warm Water Streams	12	6	3	21
Total Watercourses (Crossing Highway 7)	18	15	7	40 (*35)
Provincially Significant Life Science ANSIs	2	0	0	2
Regionally Significant Life Science ANSIs	2	0	0	2
Life Science Sites	15	1	1	17
Provincially Significant Earth Science ANSIs	1	0	0	1
Earth Science Sites	1	0	0	1
Total ANSIs, Life Science Sites and Earth Science Sites	21	1	1	23
Provincially Significant Wetlands	0	2	0	2
Locally Significant Wetlands	0	1	0	1
Total Wetlands	0	3	0	3
ESAs	14	2	1	17
Provincially Significant Landform	1	0	0	1
Parklands	3	1	0	4
International Biological Program Sites	3	0	0	3

* A total of 2 watercourses crossing Highway 7 are shared between Vaughan and Richmond Hill and a total of 3 watercourses crossing Highway 7 are shared between Markham and Richmond Hill. Consequently, the total number of watercourses in the study area is 35

2.2.3 The Transportation Infrastructure

2.2.3.1 Major Road Network

A grid of north-south and east-west highways and arterial roads characterizes the network of major roads in the Study Area. Provincial north-south highways in this grid comprise Highway 427 in the extreme west of Vaughan, Highway 400 through the centre of Vaughan and Highway 404 between Richmond Hill and Markham to the east. The tolled Highway 407 is the only east-west provincial highway through the Study Area.

Major municipal roads filling in the grid consist of the north-south and east-west arterials generally at 2 km spacing (the original concession roads). These arterial roads are depicted on **Figure 2.1-1** along with the provincial highways mentioned above.

The average annual daily traffic (AADT) along Highway 7 varies from 8,270 to 74,450 vehicles as illustrated by the 2002 AADT's for representative locations listed in **Table 2.2-2**.

Table 2.2-2
Average Annual Daily Traffic Volumes on Highway 7

Highway 7	
Location	2002 AADT (Vehicles per Day)
SEGMENT A	
East of Highway 50	54,930
East of Highway 427	38,690
East of Highway 27	37,970
West of Martin Grove Road	38,470
West of Kipling Avenue	42,080
West of Islington Avenue	44,060
East of Islington Avenue	38,600
West of Weston Road	52,180
West of Highway 400 West Ramp	71,480
SEGMENT B	
East of Highway 400 East Ramp	74,450
East of Jane Street	52,290
East of Keele Street	44,140
East of Centre Street	30,680
West of Bathurst Street	38,480
East of Bathurst Street	43,500
SEGMENT C	
East of Yonge Street	58,350
West of Leslie Street	58,420
East of Leslie Street	63,260
East of East Beaver Creek Road	61,100
East of Highway 404 East Ramp	65,380
East of Allstate Parkway	52,250
East of Woodbine Avenue	43,040

Highway 7	
Location	2002 AADT (Vehicles per Day)
West of Warden Avenue	40,880
East of Warden Avenue	39,000
SEGMENT D	
East of Kennedy Road	37,630
East of McCowan Road	27,880
West of Highway 48	27,210
West of Ninth Line	15,950
East of Ninth Line	8,270
East of Markham By-Pass	10,390
West of York-Durham Line	15,070

Note: Based on automatic traffic recorder (ATR) counts provided by the Region of York

The AADT along other route links varies from 20,200 to 45,190 vehicles as illustrated by the 2002 AADT's for representative locations listed in **Table 2.2-3**.

Table 2.2-3
Average Annual Daily Traffic Volumes on Other Route Links

Other Route Links	
Location	2001 AADT (Vehicles per Day)
SEGMENT B	
Jane Street north of Steeles Avenue	26,920
Jane Street south of Highway 7	31,840
Steeles Avenue west of Keele Street	45,190
Keele Street south of Highway 7	30,930
Centre Street west of Dufferin Street	20,200
Centre Street east of Dufferin Street	22,230
Bathurst Street south of Highway 7	35,900
SEGMENT C	
Warden Avenue south of Highway 7	30,380
Kennedy Road north of Helen Avenue	39,000
Kennedy Road south of Highway 7	28,150

Note: Based on automatic traffic recorder (ATR) counts provided by the Region of York

2.2.3.2 Railway Lines

Existing rail lines in southern York Region are illustrated in **Figure 2.1-1**. The CN York Subdivision, the only east-west rail line in southern York Region, crosses the southern portion of the Study Area between Highway 27 and 9th Line. It serves the CN MacMillan Yard, located between Jane and Keele Streets.

Other rail lines in the Study Area are north-south rail lines, as listed below, from west to east.

- CP Mactier Subdivision
- GO Newmarket Subdivision
- CN Bala Subdivision
- GO Uxbridge Subdivision
- CP (St. Lawrence and Hudson) Havelock Subdivision

The GO Newmarket, CN Bala, and GO Uxbridge Subdivisions currently accommodate GO train service, as described in the next section.

2.2.3.3 Transit Services

York Region Transit provides a network of local bus service through most of the Study Area operating from three main terminals in Thornhill (Promenade Mall), Richmond Hill (Bernard and Yonge) and Toronto (Finch Subway Station). On the major east-west route in the corridor, approximately 8,550 passengers were carried on a weekday in 2004.

GO Transit provides rail and bus service within York Region with several routes crossing the Study Area. North-south peak-period commuter rail service in the area comprises the following:

- Stouffville GO Line on the GO Uxbridge subdivision,
- Richmond Hill GO Line on the CN Bala subdivision, and
- Bradford GO Line on the GO Newmarket subdivision.

In addition to the Newmarket 'B' bus service on Yonge Street, GO Transit operates off-peak bus service in the above rail corridors and peak-period east-west service along Highway 407 across the Study Area.

Also, TTC buses travel from Toronto into York Region across the Study Area in a north-south direction on many major arterials. Both peak and off-peak service is provided along with lower frequency weekend service.

While the TTC subway network does not enter the Study Area, the present terminal stations at Finch Avenue on the Yonge Line and Downsview on the Spadina Line constitute major intermodal nodes for many transit services in the Study Area. As well, the new Don Mills Station on the Sheppard Line is emerging as an additional major bus-rail transfer node serving the eastern portion of the Study Area.

3. ANALYSIS AND EVALUATION OF ALTERNATIVES TO THE UNDERTAKING

In accordance with the information requirements set out in Section 6.2 (1) of the *Environmental Assessment Act*, the approved *Terms of Reference* for this study required the Proponent to identify, analyze and evaluate all reasonable alternatives to the proposed undertaking, public transit improvements in the Highway 7 Corridor and Vaughan North-South Link. For this undertaking, the alternatives comprise functionally different transportation strategies to the problem summarized in the study context in **Chapter 1** and addressed in *York Region's Transportation Master Plan (TMP)*. This chapter presents the findings of this step in the EA process.

3.1 DESCRIPTION OF THE ALTERNATIVES TO THE UNDERTAKING

The alternatives to the undertaking or the alternative transportation strategies that could be considered to respond to the Region's mobility needs and Official Plan objectives are outlined below. Components assumed in each alternative are shown in **Table 3.1-1**. In addition to the existing (2001) conditions, five alternative strategies have been examined. These have been built incrementally around different components of the *TMP* and represent a broad range of approaches with different transportation modes.

3.1.1 Do Nothing

The purpose of this "base case" alternative is to confirm the need and justification for an undertaking by assessing the effect of utilizing only the road and public transit infrastructure and services in place in 2001, without improvements throughout the planning period to 2031. For public transit, this assumption applies to all bus and rail transit service providers including GO Transit, York Region Transit (YRT) and the Toronto Transit Commission (TTC).

3.1.2 A Current Commitments Strategy Including Priority Transit and Transportation Demand Management

This base case strategy comprises all road infrastructure improvements currently committed in York Region's 10-year capital plan, the committed service and infrastructure improvements of the local and inter-regional transit authorities, YRT, TTC and GO Transit, and all TMP excluding regional rapid transit network. Also included are Transportation Demand Management (TDM) strategies which the Region and local municipalities are currently pursuing. Examples include *Smart Commute North Toronto, Vaughan* and *Smart Commute Markham, Richmond Hill.* In this solution, the above commitments are assumed to be the full extent of transportation improvements through the planning period.

Table 3.1-1
Summary of Alternative Strategies

Alternative Transportation Strategy	Components In Each Strategy			
	Road Network	Inter-regional Transit Network (GO Transit)	Local Transit System Network	Public Transit Improvements (e.g. Rapid Transit Network & subway extension)
Do Nothing	• Existing (2001) road network	• Existing GO Rail network	• Existing Transit Network	• No improvements in York Region
Current Commitments Including Priority Transit and TDM	• Planned improvements based on York Region 10 year capital plan and TMP network • Expanded provincial highway system	• Capacity and Service improvements consistent with GO Transit 10 year Capital Plan	• Committed YRT local transit service improvements	• No improvements in York Region
Road Expansion	• Expansion of road network and widenings to meet travel demand	• Existing GO Rail network	• Committed YRT Improvements	• No improvements in York Region
Enhanced Richmond Hill Commuter rail and Inter-regional Bus Service	• Planned improvements based on York Region 10 year capital plan and TMP network • Expanded provincial highway system	• All day and reverse peak service on all existing GO Rail lines • Freeway HOV on Highways 407, 400 and 404	• Committed YRT Improvements • Connections to new GO services	• No improvements in York Region
York Region Rapid Transit Corridor Initiatives (in the Highway 7 Corridor and Vaughan North-South Link as represented by the Region's Transportation Master Plan)	• Planned improvements based on York Region 10 year capital plan and TMP network • Expanded provincial highway system	• Capacity and Service improvements consistent with GO Transit 10 year Capital Plan	• Committed YRT Improvements • Connections to new Rapid Transit	• Rapid transit in all proposed corridors identified in TMP • Implementation of transit priority network in TMP • Extension of Yonge Subway to Highway 7 • Extension of Spadina Subway to Highway 7 • Extension of Sheppard Subway to Scarborough

3.1.3 A Road Expansion Strategy

The focus of this solution is an increase in road capacity only beyond the "Current Commitments" Strategy's road and public transit improvements. Road capacity is assumed to be increased to whatever level is required to meet the demand at the 2021 and 2031 planning horizon.

3.1.4 An Enhanced Richmond Hill Commuter Rail and Inter-regional Bus Service Strategy

In this strategy, the transportation system would comprise all current road and local transit service commitments plus an enhanced inter-regional transit system consisting of both commuter rail and 400 series highway bus services such as those operated by GO Transit.

3.1.5 York Region Rapid Transit Corridor Initiatives Strategy

This strategy focuses on a significant improvement in public transit services in York Region in addition to all components of the "current commitments" strategy. This strategy comprises the implementation of the York Region's Rapid Transit Plan (YRTP) recommended in the *2002 Transportation Master Plan* with associated local service connections encompassing initiate and ultimate technology phases for both surface and subway-based rapid transit.

3.2 ANALYSIS OF ALTERNATIVE TRANSPORTATION STRATEGIES

Evaluation of the above alternative strategies must consider the advantages and disadvantages of each in terms of a broad range of criteria reflecting both the problem faced by the Region and the opportunities presented. These criteria, based on the primary objectives introduced in **Chapter 1**, the Purpose of the Undertaking will be identified later in this section. Initially, it is necessary to analyze and quantify the performance of the existing transportation system and improvements currently committed in meeting the forecast travel demand during the planning period.

3.2.1 Forecast of Future Travel Demand

York Region has had the greatest proportional increase in population and employment amongst the four suburban regions of the Greater Toronto Area over the past 10 years. Within the 2021 planning horizon, the population of the Region is forecast to increase from the current 0.8 million residents to 1.2 million residents, while employment is estimated to increase from the existing 385,000 jobs to 655,000 by the year 2021.

A large proportion of this growth is targeted to live and/or work within the Highway 7 Corridor between Steeles Avenue and Major MacKenzie Drive. This growth will generate a proportionate increase in east-west travel demand. While it is expected there will be a greater segment of the population living and working within the Region itself, north-south travel demand between the Region and the City of Toronto will remain the dominant feature amounting to 35% of total travel demand.

3

3.2.1.1 The Demand Forecasting Model

A comprehensive, state-of-the-art transportation demand forecasting model has been developed to provide an effective planning tool for York Region's Public Transit Improvements program. The model, developed from an extensive survey of travel behaviour, the 2001 Transportation Tomorrow Survey (TTS), has been successfully validated as a forecasting tool. With sensitivity to transportation and transit system connectivity, levels of service and prices, demographic characteristics and land use, the models can be used to analyze alternative policies (e.g., fares, service levels), investments (rapid transit, intermodal connections) and design details. The model estimates a.m. peak period travel for five modes:

- Auto driver and passenger;
- Public transit (YRTP, YRT, TTC, GO Bus) with walk access;
- Public transit with park/kiss-and-ride access;
- GO Rail with public transit or walk access; and
- GO Rail with park/kiss-and-ride access.

Travel is estimated for work, post-secondary school, secondary school and other trip purposes. The Program's model encompasses the Greater Toronto Area (GTA and Hamilton) and is based on the 2001 GTA zone system comprising 1,717 traffic zones. Additional traffic zone detail was included in the YRTP corridors to reflect walk access and station location assumptions. Level-of-service sensitive and behaviour based trip distribution (gravity model) and modal split (logit model) techniques are employed within the four-stage modelling process, described as follows:

- **Trip Generation:** estimates the number of trips that will be made within the study time period. A conventional approach using trip rates and regression equations is used for work, school and other trips. For work and school purpose trips, sub-categories are defined with trip rates developed that reflect the different travel behaviour of social groups by occupation type (professional, manufacturing, general office/sales) and schooling level (secondary and post secondary), respectively;

- **Trip Distribution:** links the trip productions and attractions by trip purpose and type to determine travel flows. A gravity model is calibrated to estimate work trip flows, again accounting for socio-economic differences within the population by calibrating separate models for each occupation type. The process is sensitive to level-of-service, with the resulting travel orientations reflecting the assumed improvements in public transit facilities and other major transportation system changes. A standard Fratar proportional balancing process is used for school and other trip purposes;

- **Mode Split:** determines the trip travel mode. A multinomial logit model is used to determine the breakdown by mode (auto, transit, commuter rail) for work (by occupation group) and post-secondary school trips. It also distinguishes the transit access mode (park-and-ride or all-way). Existing modal split rates are assumed for non-work trips, based on defined origin-destination superzones; and

- **Trip Assignment:** determines the trip route through the given transportation system. The standard assignment algorithms within EMME/2 are used, involving a multiple path transit assignment and user equilibrium auto assignment.

In recognition of the interaction between the four components of travel behaviour, equilibration is achieved by iterating through the three stages of trip distribution, modal split and trip assignment until a reasonable level is achieved. In addition, a link between the trip distribution and modal split components is maintained to incorporate the interdependence between them.

For preliminary planning purposes, the model forecasts can be translated from the a.m. peak 3-hour period to an a.m. peak hour or daily forecasts using relevant conversion factors. A factor of 0.6 was developed for the a.m. peak hour based upon comparisons of actual auto and transit traffic data, with 0.55 used for the higher volume Yonge Street Corridor. The daily trips were converted using a factor of 3.5, calculated from 2001 TTS data relationships between the time periods.

The model outlined above was used to forecast the travel patterns and mode choice within the region and across regional boundaries in both the 2021 and 2031 horizon years for each of the alternative transportation solutions, including the "Do Nothing" option. Population and employment data, based on the Regional and City of Toronto Official Plans and described in **Chapter 4**, was utilized as the primary input for the modelling. **Chapter 4** also provides details of the basic transportation network modelled using the assumptions outlined below for each transport mode.

3.2.1.2 Key Assumptions for Demand Modelling

Components and key assumptions used for the demand modelling are described below.

Road Network

The base case road network includes all arterial improvements identified in the TMP and the 10-year York Region capital programme. It also includes planned collector roads such as the Rodick Road extension, Birchmount Extension and Enterprise Drive as outlined in area municipality transportation plans. Expansion of the provincial highway system within York Region included the proposed extensions of Highway 427 and Highway 404 and the widening of Highway 400. In the alternative scenario involving road expansion, an iterative approach was used to expand roads to meet projected auto demand.

Inter-Regional Transit Network (GO Transit)

Improvements considered under the Enhanced Richmond Hill Commuter Rail and Inter-Regional Bus Services Alternative are generally consistent with the GO Transit 10-year Capital Plan and 2021 Plan and included full all-day and reverse peak service on the Richmond Hill, Bradford and Stouffville GO Rail Services.

Peak headways of 15 minutes were assumed for the Richmond Hill and Bradford services while headways of 10 minutes were assumed for the Markham to Union portion of the Stouffville Service. This latter assumption was made to explore the upper end potential of commuter rail service in the Markham North-South Corridor of the Region's proposed rapid transit plan.

In addition to the changes to the GO Rail services, this alternative solution includes an extensive network of Freeway Express Bus or Bus Rapid Transit (BRT) inter-regional transit services including:

- A Highway 400 service from Newmarket (with connections to Barrie) to the Spadina Subway (Downsview);
- A Highway 407 service across York Region; and
- A Highway 404 service from Newmarket to the Bloor Subway (Castle Frank Station).

In all cases, these services included connections to major transit routes in South York and Toronto.

Local Transit System Network

For all future strategies except the base case "Do Nothing" Alternative, most of the recommendations from the York Region Transit 5-Year Service Plan have been included. This includes route extensions, route restructuring and expansion of service to new communities.

For the York Region Rapid Transit Corridor Initiatives Alternative, YRT services overlapping with rapid transit services (e.g. Express services from Markham and Unionville) have been removed to avoid duplication.

In the existing transit network within the demand model, transit speeds were estimated from timetables and vary by route segment. Assumed speeds for regular bus services generally range from 20–25 km/hr. With future traffic growth, transit speeds on major routes such as Highway 7 and Yonge Street, where minimal road expansion is planned, will likely degrade due to congestion. In order to reflect this condition in the model, speeds for all regular bus routes were reduced by 20% on average. For example, a route that was coded with a 20km/hr speed in the existing network was reduced to 16km/hr in the future network. This reduction was not applied for the Road Expansion Alternative or the York Region Rapid Transit Corridor Initiatives Alternative, as these options include significant improvements to reduce congestion (e.g. road expansion) or improve bus times in key corridors (e.g. bus-rapid transit and transit priority).

Improved Public Transit

For the York Region Rapid Transit Corridor Initiatives Alternative, several major transit improvements were incorporated. These included:

- Bus Rapid Transit operating in all YRTP corridors at average speeds of up to 30 km/hr;
- Implementation of transit priority on most major arterials in South York Region, consistent with Figure 20 of the *York Region Transportation Master Plan*. The effect of transit priority was assumed to provide an improvement of 5 km/hr over the base case bus speeds on the transit priority routes; and
- Extension of subways including Yonge Subway to Highway 7, Spadina Subway to York Region (Steeles Avenue) and Sheppard Subway to the Scarborough Town Centre.

The above assumptions formed the basis for forecasting both the 2021 and 2031 travel demand and mode choice, and the ability of the five alternative transportation strategies to carry the forecast travel demand.

3.2.2 Modelling of Alternative Transportation Strategies

An established technique for assessing the performance of any transportation system is to compare the relationship between overall travel demand and roadway capacity at selected locations or screenlines in the system. In any scenario being assessed, this method also recognizes the capacity of other non-auto modes contributing to the total capacity across any one screenline.

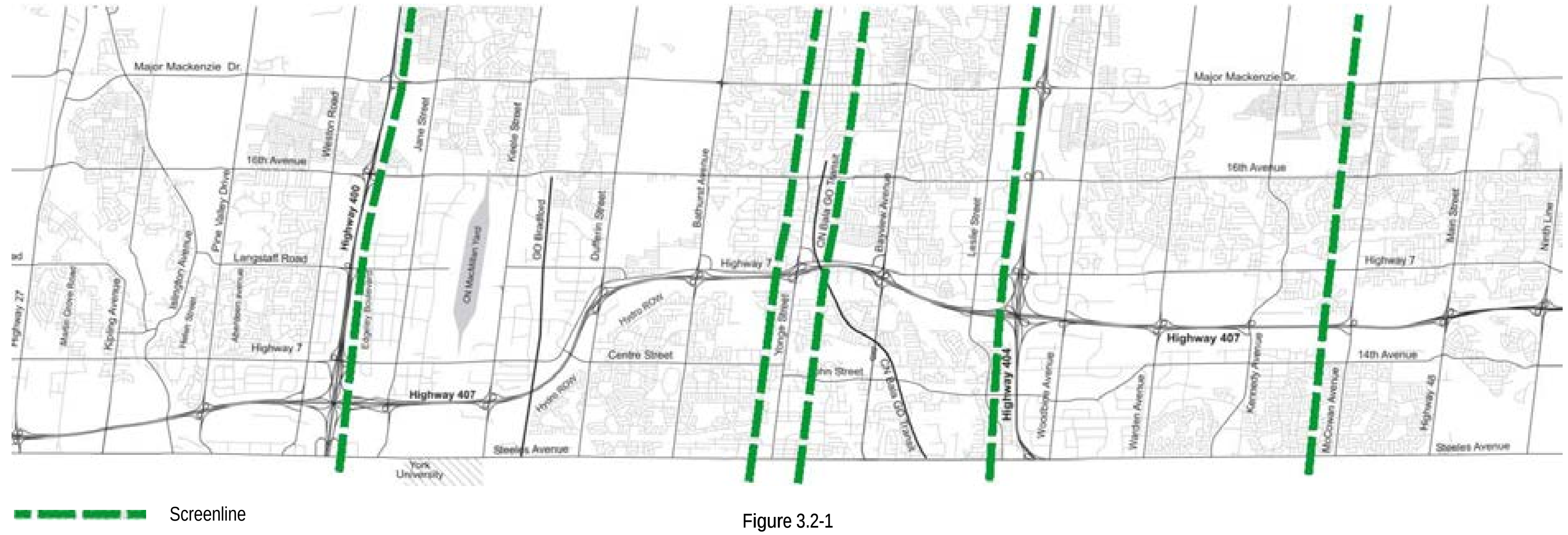


Figure 3.2-1
Selected Screenlines across the Highway 7 Corridor

Screenlines across the transportation network are selected to provide an improved basis for analysis for the following reasons:

i) because of parallel facilities, there are a number of alternative routes available and the choice between routes can vary from the most direct route in order to reduce travel time and avoid local congestion.
ii) comparison of historical and future trends must be based on roadway groupings as present roadways are expanded or new parallel roadways are added.
iii) the traffic characteristics, i.e. local vs through traffic and modal split vary due to the type and location of the roadway facility and transit service.

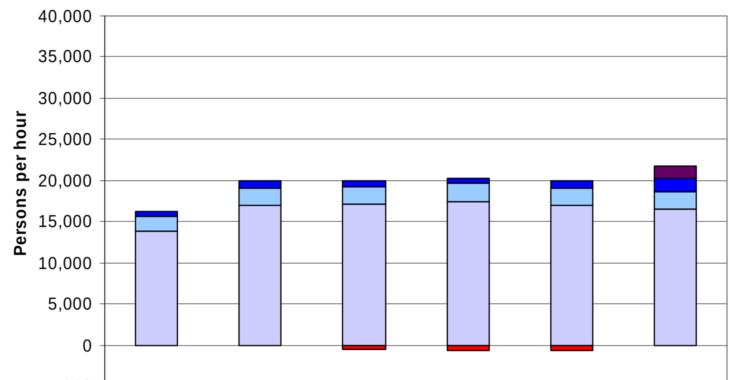
For analysis purposes, five north-south screenlines across the Highway 7 Corridor were selected as illustrated in **Figure 3.2-1**. The screenlines extended from Steeles Avenue to Major Mackenzie Drive. The first was located along the Highway 400 right-of-way, the second and third along the west and east sides of the Yonge Street arterial respectively, the fourth along the Highway 404 right-of-way and the fifth in Markham on the west side of the McCowan Road arterial.

3.2.3 Alternative Strategies: Demand vs Capacity Analysis

The effectiveness of each transportation strategy in meeting both the near/medium and long-term travel demand within the Region and across regional boundaries was analyzed by modelling 2021 and 2031 a.m. peak period travel. Analysis was done using a network-wide approach adopting similar system components for all corridors of the Region's Transportation Master Plan network. In order to reflect the effectiveness of each transportation alternative in its mature form, the 2031 planning horizon adopted in the TMP was used for this analysis. **Figures 3.2-2** to **3.2-11** illustrate the projected near/medium and long-term relationship between demand and capacity in persons per hour during peak period at the five selected screenlines for peak direction travel in each of the alternative strategies in 2021 and 2031.

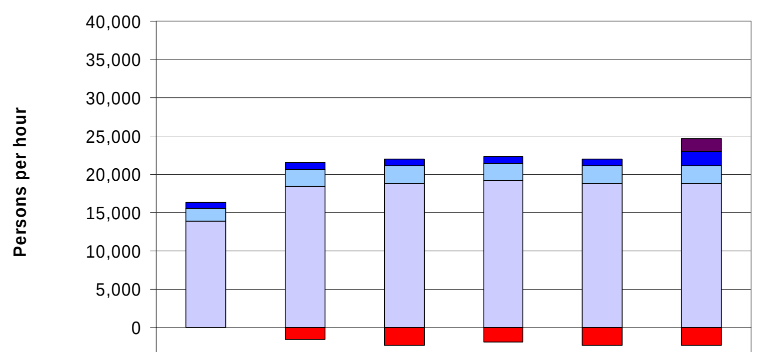
In the Highway 7 Corridor, there is a clear need to address transportation capacity deficiencies at key screenlines through a broad range of improvements. Under the Do Nothing Alternative, road capacity shortfalls would be significant and without other travel options, travel demand would be severely constrained. In both the Do Nothing and Current Commitments Alternatives, the demand on the existing bus system would be significant; the projected demand would require buses operating at 3 to 5 minute headways on all four major arterials along the screenline (assuming 50 passengers per bus).

For the east of Yonge Street, west of Highway 404 and west of McCowan Road Screenlines the only alternative that would address corridor travel demand in 2031 is an alternative involving significant improvements to the public transit system – a combination of BRT and Subway in the Highway 7 Corridor.



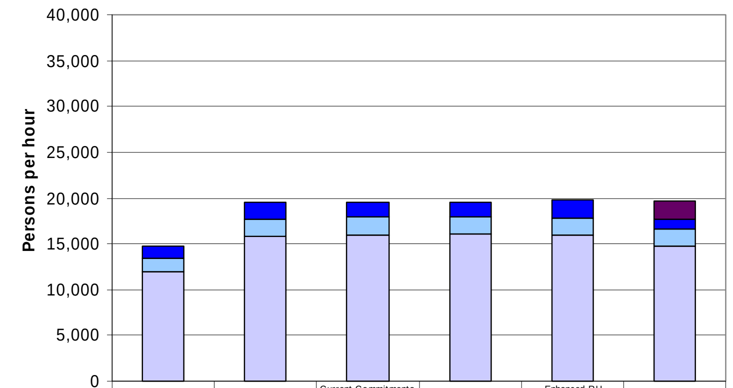
	Existing	Do Nothing	Current Commitments + Priority Transit + TDM	Road Expansion	Enhanced RH Commuter Rail & Inter-regional Bus	York RT Corridor Initiatives
Auto Driver (above road capacity)	0	0	-500	-600	-600	0
GO Rail	0	0	0	0	0	0
Rapid Transit	0	0	0	0	0	1,500
Bus	700	900	800	700	900	1,700
Auto Passenger	1,700	2,000	2,100	2,100	2,000	2,000
Auto Driver (up to road capacity)	13,900	17,000	17,100	17,500	17,000	16,600

Figure 3.2-2
Eastbound across Screenline at East of Highway 400 - 2021



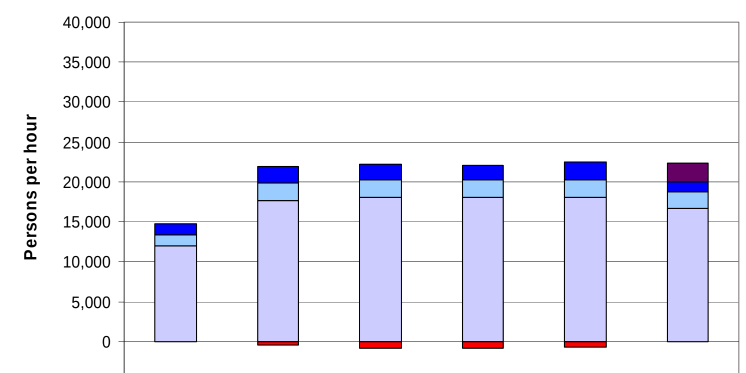
	Existing	Do Nothing	Current Commitments + Priority Transit + TDM	Road Expansion	Enhanced RH Commuter Rail & Inter-regional Bus	York RT Corridor Initiatives
Auto Driver (above road capacity)	0	-1,600	-2,300	-1,900	-2,300	-2,300
GO Rail	0	0	0	0	0	0
Rapid Transit	0	0	0	0	0	1,700
Bus	700	900	900	800	900	1,900
Auto Passenger	1,700	2,200	2,300	2,300	2,300	2,300
Auto Driver (up to road capacity)	13,900	18,500	18,800	19,200	18,800	18,800

Figure 3.2-3
Eastbound across Screenline at east of Highway 400 - 2031



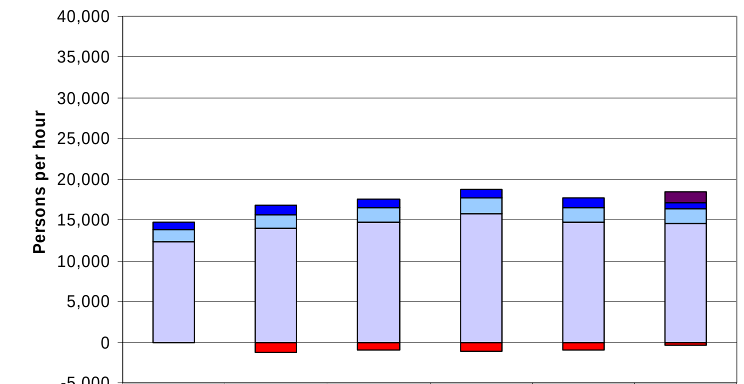
	Existing	Do Nothing	Current Commitments + Priority Transit + TDM	Road Expansion	Enhanced RH Commuter Rail & Inter-regional Bus	York RT Corridor Initiatives
Auto Driver (above road capacity)	0	0	0	0	0	0
GO Rail	0	0	0	0	0	0
Rapid Transit	0	0	0	0	0	2,000
Bus	1,300	1,900	1,700	1,500	2,000	1,100
Auto Passenger	1,400	1,900	1,900	1,900	1,900	1,800
Auto Driver (up to road capacity)	12,000	15,800	16,000	16,100	15,900	14,800

Figure 3.2-4
Eastbound across Screenline at East of Yonge Street - 2021



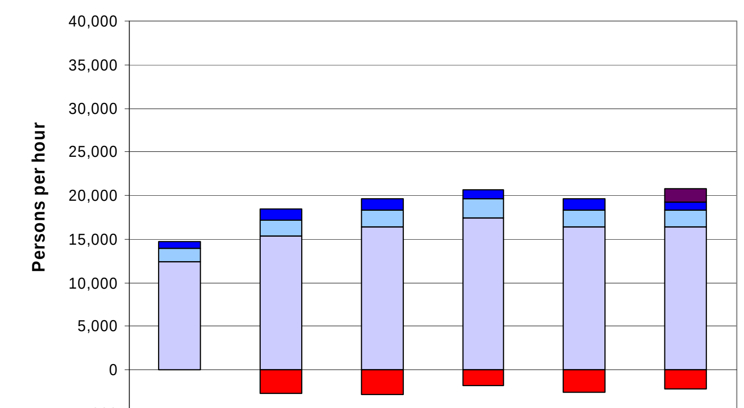
	Existing	Do Nothing	Current Commitments + Priority Transit + TDM	Road Expansion	Enhanced RH Commuter Rail & Inter-regional Bus	York RT Corridor Initiatives
Auto Driver (above road capacity)	0	-400	-800	-800	-700	0
GO Rail	0	0	0	0	0	0
Rapid Transit	0	0	0	0	0	2,300
Bus	1,300	2,100	1,900	1,700	2,300	1,300
Auto Passenger	1,400	2,100	2,200	2,200	2,200	2,000
Auto Driver (up to road capacity)	12,000	17,700	18,100	18,100	18,000	16,700

Figure 3.2-5
Eastbound across Screenline at East of Yonge Street - 2031



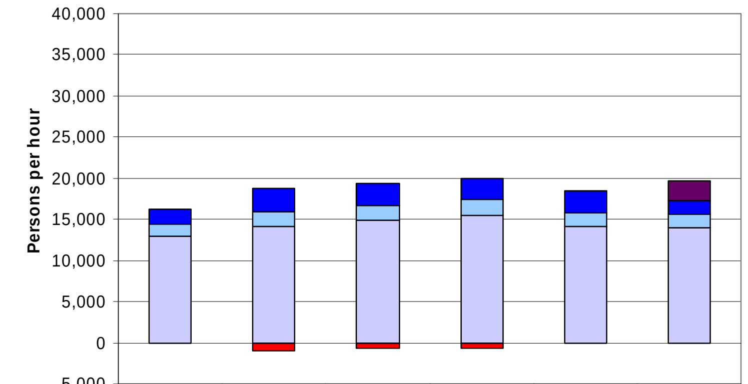
	Existing	Do Nothing	Current Commitments + Priority Transit + TDM	Road Expansion	Enhanced RH Commuter Rail & Inter-regional Bus	York RT Corridor Initiatives
Auto Driver (above road capacity)	0	-1,300	-1,000	-1,100	-900	-400
GO Rail	0	0	0	0	0	0
Rapid Transit	0	0	0	0	0	1,400
Bus	800	1,100	1,100	1,000	1,100	700
Auto Passenger	1,500	1,700	1,800	1,900	1,800	1,800
Auto Driver (up to road capacity)	12,400	14,000	14,700	15,800	14,800	14,600

Figure 3.2-6
Eastbound across Screenline at West of Highway 404 - 2021



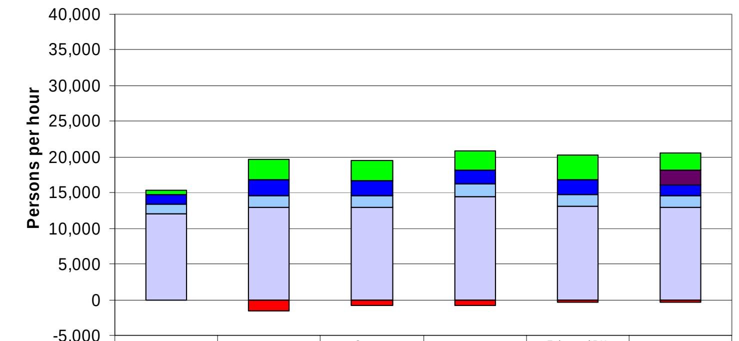
	Existing	Do Nothing	Current Commitments + Priority Transit + TDM	Road Expansion	Enhanced RH Commuter Rail & Inter-regional Bus	York RT Corridor Initiatives
Auto Driver (above road capacity)	0	-2,700	-2,800	-1,800	-2,500	-2,200
GO Rail	0	0	0	0	0	0
Rapid Transit	0	0	0	0	0	1,600
Bus	800	1,300	1,200	1,100	1,200	800
Auto Passenger	1,500	1,800	2,000	2,100	2,000	2,000
Auto Driver (up to road capacity)	12,400	15,400	16,400	17,500	16,400	16,400

Figure 3.2-7
Eastbound across Screenline at West of Highway 404 - 2031



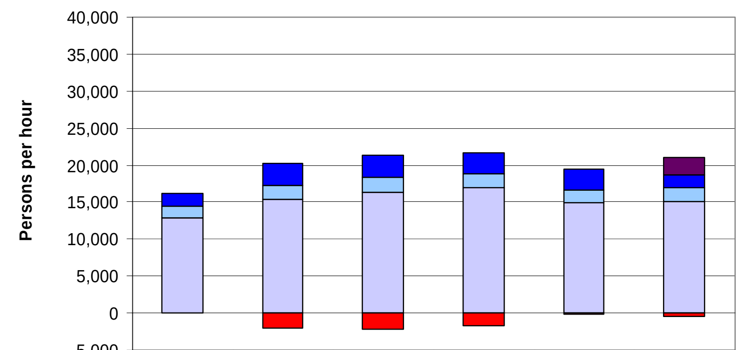
	Existing	Do Nothing	Current Commitments + Priority Transit + TDM	Road Expansion	Enhanced RH Commuter Rail & Inter-regional Bus	York RT Corridor Initiatives
Auto Driver (above road capacity)	0	-900	-700	-700	0	0
GO Rail	0	0	0	0	0	0
Rapid Transit	0	0	0	0	0	2,300
Bus	1,800	2,800	2,700	2,500	2,600	1,600
Auto Passenger	1,500	1,700	1,800	1,900	1,700	1,700
Auto Driver (up to road capacity)	12,900	14,200	14,900	15,500	14,100	14,000

Figure 3.2-8
Westbound across Screenline at West of Highway 404 - 2021



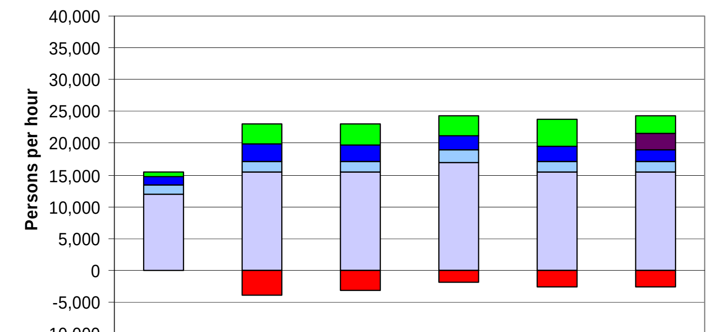
	Existing	Do Nothing	Current Commitments + Priority Transit + TDM	Road Expansion	Enhanced RH Commuter Rail & Inter-regional Bus	York RT Corridor Initiatives
Auto Driver (above road capacity)	0	-1500	-800	-800	-300	-300
GO Rail	700	2,800	2,800	2,800	3,500	2,400
Rapid Transit	0	0	0	0	0	2,100
Bus	1300	2,300	2,100	1900	2,100	1500
Auto Passenger	1400	1600	1600	1700	1600	1600
Auto Driver (up to road capacity)	12,000	13,000	13,000	14,500	13,100	13,000

Figure 3.2-10
Westbound across Screenline at West of McCowan Road - 2021



	Existing	Do Nothing	Current Commitments + Priority Transit + TDM	Road Expansion	Enhanced RH Commuter Rail & Inter-regional Bus	York RT Corridor Initiatives
Auto Driver (above road capacity)	0	-2,000	-2,100	-1,700	-100	-400
GO Rail	0	0	0	0	0	0
Rapid Transit	0	0	0	0	0	2,500
Bus	1,800	3,000	3,000	2,700	2,800	1,700
Auto Passenger	1,500	1,800	2,000	2,000	1,800	1,800
Auto Driver (up to road capacity)	12,900	15,400	16,400	16,900	14,900	15,100

Figure 3.2-9
Westbound across Screenline at West of Highway 404 - 2031



	Existing	Do Nothing	Current Commitments + Priority Transit + TDM	Road Expansion	Enhanced RH Commuter Rail & Inter-regional Bus	York RT Corridor Initiatives
Auto Driver (above road capacity)	0	-3,900	-3,200	-1,800	-2,600	-2,700
GO Rail	700	3,300	3,300	3,300	4,100	2,800
Rapid Transit	0	0	0	0	0	2,500
Bus	1,300	2,600	2,500	2,200	2,400	1,800
Auto Passenger	1,400	1,800	1,800	2,000	1,800	1,800
Auto Driver (up to road capacity)	12,000	15,400	15,400	16,900	15,400	15,400

Figure 3.2-11
Westbound across Screenline at West of McCowan Road - 2031

3.2.4 Criteria for Evaluation of Alternative Strategies

The framework adopted for evaluation of the alternative strategies was that of the *Regional Official Plan* objectives or themes stated in **Chapter 1** in describing the Purpose of the Undertaking. These principle themes incorporate the criteria proposed in the approved Terms of Reference (Section 5.7.2) within the following categories of criteria for the evaluation:

3.2.4.1 Effects on the Social Environment (reflecting the "Healthy Communities" theme)

Criteria in this category address the impact on the socio-economic environment and include the need for acquisition of residential or commercial property for new or widened road rights-of-way, level of traffic congestion, the potential for traffic infiltration through neighbourhoods, the effect of increased noise and vibration during construction and operation and the likelihood of adverse effects on archaeological resources and heritage or cultural features.

3.2.4.2 Effects on the Natural Environment (reflecting the "Sustainable Natural Environment" theme)

The focus of this category of criteria is to assess the potential effect of a transportation strategy on elements of the natural environment such as fisheries and aquatic habitat, wildlife habitat, natural vegetation and wetlands, ground and surface water resources, regional and local air quality and ecosystems.

3.2.4.3 Effects on the Economic Environment (reflecting the "Economic Vitality" theme)

This category addresses the economic aspects of the socio-economic environment and the impact on urban form by encompassing criteria that assess either opportunities to promote existing and increased economic activity or the potential adverse effects on current business activity in the corridor. The criteria measuring benefits include support of the Region's overall vision, approved urban structure and development distribution, improved access to business and community centres, increased pedestrian activity around facilities, the quality of commuting options for employees and the effect on congestion levels in the corridor.

Potential adverse effects of the strategies are assessed by criteria such as disruption or modification of access to businesses, displacement of businesses due to right-of-way widening and convenience of goods movement.

Direct costs in the form of public sector capital funding needed and the travel time delay costs are also addressed in this category.

3.2.4.4 Effectiveness of the Transportation Strategy in Meeting Travel Demand

3

The purpose of this category is to compare the effectiveness of the alternatives in terms of their capacity to contribute to the forecast travel demand at the 2031 horizon year. A qualitative assessment of the long-term growth capacity is also considered in this category.

3.2.5 Evaluation of Alternative Transportation Strategies

The selection of the preferred transportation strategy stems from the multi-criteria comparative evaluation presented in tabular form in **Table 3.2-1**. Each transportation alternative was assessed in terms of the criteria described previously and its ability to meet the overall planning objective for each category.

A "quality of response" rating for each criterion was assigned to each alternative to provide a graphical indication of their relative merits on the basis of this qualitative and quantitative evaluation. The findings lead to the following conclusions:

a) Clearly, "Doing Nothing" cannot be considered a valid alternative because although it would be the least capital cost alternative it is not responsive to any of the key objectives in addressing the transportation problem.

b) Although the "Current Commitments" strategy includes several road improvements in various parts of the Region, it is unable to reduce the capacity shortfall across the entire Highway 7 Corridor. Without corresponding improvement in public transit, continued operation of existing conventional transit service will not provide an effective alternative to the severe traffic congestion predicted for the arterial roads and their intersections in the corridor.

c) A strategy focussed on "Road Expansion" until the shortfall is eliminated is not practical in that one to three extra traffic lanes in each direction over and above the *Transportation Master Plan* commitments still leaves a shortfall in capacity of three lanes at the Highway 404 screenline. Clearly, widening of arterial roads to this extent will result in major social impacts in the form of property acquisition, a decrease in air quality, a higher accident potential and community barrier effects. In addition to the lane increases above, this strategy also requires the conventional bus service to carry over 2,700 passengers/hour/direction across the screenline. This capacity translates into a service comprising standard buses at six-minute headways on all arterial roads in the corridor.

d) "Enhancing Richmond Hill Commuter Rail and Inter-regional Bus Services" in the corridor will not reduce the road capacity shortfall significantly because more frequent rail service attracts primarily downtown-Toronto destined trips and inter-regional bus service on Highway 407, while passing close to some core development nodes along the corridor, functions primarily as a longer distance commuter service. In addition, the location of the inter-regional transit routes does not support the urban form envisioned in the *Region's Official Plan* and thus will not encourage transit-oriented development within the Region.

e) As noted previously, the ***"York Region Rapid Transit Corridor Initiatives"*** strategy is the only alternative that reduces shortfall in road capacity across most screenlines in the corridor. By providing an effective alternative to auto use, this strategy supports both York Region and local municipal Official Plan objectives. At the same time, the improvements can incorporate significant flexibility to expand the system capacity over time for the long-term travel needs in the Region.

   As well as responding best to the transportation demands, this alternative can be implemented with minimal adverse effects on the natural environment and will make a positive contribution to the reduction of harmful vehicle emissions. In addition, adverse effects on the social environment can be mitigated and the strategy offers the opportunity to support the desired urban form, enhance streetscapes and encourage development of more liveable communities.

As a result, the **"York Region Rapid Transit Corridor Initiatives"** Strategy was selected as the preferred transportation strategy for the undertaking.

3.2.5.1 Effect of Alternative Strategies on Transit Mode Share

Improving public transit is fundamental to the York Region Growth Strategy from a social, environmental and economic perspective. In order to evaluate the ability of each alternative to improve the attractiveness and use of public transit in York Region, this section presents a summary and discussion of the impacts of each alternative on transit mode shares.

As shown in **Table 3.2-2**, transit mode shares are expected to remain relatively constant under the "Do Nothing" and "Current Commitments" alternatives. The exception is in corridors where severe congestion contributes to significant shifts from auto to transit (a result that is mostly related to the underlying model assignment procedures that do not reflect capacity constraints on the transit system).

An alternative involving enhanced Richmond Hill Commuter Rail and Inter-regional Bus Services will have some impacts on east-west transit mode shares, but not as great as the Rapid Transit Corridor Initiatives alternative.

Not surprisingly, the only option that could contribute to significant improvements in transit mode shares is an option involving public transit improvements, and in particular rapid transit. With the combination of transit improvements considered, mode shares could be expected to more than double across several of the screenlines.

Table 3.2-1 Evaluation of Alternatives to the Undertaking

Evaluation Categories and criteria	ALTERNATIVE TRANSPORTATION STRATEGIES				
	Do Nothing	Current Commitments Including Priority Transit and Transportation Demand Management	Road Expansion	Enhanced Richmond Hill Commuter Rail and Inter-regional Bus Service	York Region Rapid Transit Corridor Initiatives
Effects on Social Environment ▪ acquisition of residential or commercial property for new or widened road rights-of-way; ▪ the level of traffic congestion; ▪ the potential for traffic infiltration through neighbourhoods; ▪ the effect of increased noise and vibration; and ▪ effects on archaeological resources and heritage or cultural features.	Congestion due to a significant road capacity shortfall in corridor will cause: ▪ neighbourhood traffic infiltration, ▪ a loss of community mobility, ▪ an increased accident potential ▪ degraded transit service making it less attractive as a travel option.	Residual road capacity shortfall in corridor will, to a lesser degree, still cause: ▪ neighbourhood traffic infiltration, ▪ some loss of community mobility and pressure on existing road rights-of-way, ▪ an increased traffic accident potential ▪ the present low transit mode split to continue in the absence of an enhanced transit service.	Road widening beyond current commitments minimizes capacity shortfall but will: ▪ require commercial/ residential property to achieve wider rights-of-way on major arterials, ▪ initially reduce neighbourhood traffic infiltration but create more of a barrier between communities, ▪ perpetuate reliance on auto use in an already congested corridor, ▪ not reduce traffic accident potential.	Residual road capacity shortfall in corridor will, to a lesser degree, still cause: ▪ neighbourhood traffic infiltration, ▪ some loss of community mobility and pressure on existing road rights-of-way, ▪ an increased traffic accident potential, ▪ Higher service frequency on rail rights-of-way increases noise intrusion potential, ▪ Little opportunity for streetscape enhancement. A focus on inter-regional transit enhancement will not improve mode split for internal travel.	Replacing most of road capacity shortfall by greater transit use will: ▪ reduce neighbourhood traffic infiltration, ▪ reduce traffic accident potential, ▪ offer improved access to community amenities by providing a convenient alternative to auto use, Insertion of new transit infrastructure can act as a catalyst for streetscape improvement and urban renewal. However dedicated surface transitways in existing road rights-of-way often require modified access patterns to adjacent properties. Underground rapid transit technology does not have this requirement.
	◔	◑	◔	◑	◕
Effects on Natural Environment The potential effect on: ▪ fisheries ▪ aquatic habitat ▪ wildlife habitat ▪ natural vegetation and wetlands ▪ ground and surface water resources ▪ regional and local air quality ecosystems	Continued reliance on auto use for growing travel demand will increase overall vehicle trips and congestion resulting in increased vehicle emission and energy consumption.	Continued reliance on auto use for growing travel demand will increase overall vehicle trips and congestion resulting in increased vehicle emission and energy consumption.	Continued reliance on auto use for growing travel demand will increase overall vehicle trips and congestion resulting in increased vehicle emission and energy consumption. Marginally better than "Do Nothing" since added road capacity will reduce overall traffic congestion. Road widening will require more new or widened bridges at creeks and rivers.	▪ A higher mode split for inter-regional travel will reduce vehicle total number of vehicle trips thereby reducing emissions and GHG effects. ▪ Expansion of transit infrastructure in existing rail and freeway rights-of-way minimizes adverse effects on natural features.	▪ A higher transit mode split for all travel destinations will contribute to the greatest reduction in vehicle trips and have the greatest overall benefit to reducing emission and GHG effect as compared to the other alternatives. ▪ Expansion of transit infrastructure in existing road or rail rights-of-way minimizes adverse effects on natural features. Road widening for transit facilities will require some new or widened bridges at creeks and rivers.
	◔	◔	◑	◕	●
Effects on Economic Environment and Smart Growth ▪ opportunities to promote existing and increased economic activity; ▪ potential adverse effects on current business activity in the corridor; ▪ support for the Region's vision and approved urban structure ▪ access to community centres, increased pedestrian activity around facilities; ▪ the quality of commuting options and the effect on congestion levels ▪ access to and displacement of, businesses and convenience of goods movement. ▪ Direct costs ▪ Travel time delay costs	Resulting significant loss of mobility will: ▪ discourage business investment, ▪ prevent achievement of O.P. land use and development objectives, ▪ degrade employees' work commute in and to, the Region, ▪ significantly increase time-related cost of travel in the Regional economy. Doing nothing minimizes public sector capital costs and business displacement but will increase indirect business costs due to inefficiency of goods and people movement. Indirect cost due to urban sprawl requiring additional facilities	Continuing corridor congestion without an effective non-auto alternative will: ▪ slow business investment, ▪ not promote regional/municipal O.P. urban form and development objectives, ▪ degrade employees' work commute in and to, the Region, ▪ gradually increase time-related cost of travel and goods movement in the Region off-setting lower public sector capital spending Region's TMP current commitments will require fairly significant on-going public sector capital spending. Worsening congestion over time will gradually increase time-related cost of travel and goods movement in the Region,	A focus on meeting travel demand by increasing road capacity alone: ▪ does not promote regional/municipal O.P. urban form objectives and constrains development levels, ▪ downgrades viability of the transit option forcing people and goods to share the enhanced road system, ▪ requires significant investment in capital works and high property acquisition costs due to lack of road right-of-way for extensive widening. ▪ implies a higher unit travel cost by general public who will have no alternative to auto use on the enhanced road system. Increase in time-related costs is considered less significant assuming road capacity increases can be achieved.	▪ Use of existing rail or provincial highway rights-of-way offers limited opportunities to support regional/municipal O.P. urban form and development pattern objectives. ▪ Improves goods movement by providing some reduction in auto volumes on arterial roads. ▪ Requires significant government investment in capital works and inter-regional transit operations and maintenance. ▪ Longer term congestion related costs for goods and people movement will still increase for intra-regional travel	▪ Improvement such as a rapid transit network supports Region's O.P. centres and corridors urban form and municipal development objectives. ▪ Improves goods movement by providing some reduction in auto volumes on arterial roads. ▪ Requires substantial and likely the highest, government investment in capital works and regional transit operations and maintenance. ▪ Reduces land acquisition costs for transportation facilities by promoting greater use of high capacity vehicles. ▪ Offers a lower unit travel cost option to the general public.
	◔	◑	◔	◑	◕
Effectiveness of Transportation Solution in meeting travel demand ▪ their capacity to contribute to the forecast travel demand at the 2031 horizon year; and ▪ the long-term growth capacity is also considered in this category.	Forecast major shortfall in corridor road capacity (2 - 7 traffic lanes each direction depending on screenlines) indicates that ▪ relying on existing systems is not an effective solution to future intra- and inter-regional travel needs, ▪ system operational performance will be severely degraded.	Forecast continuing shortfall in corridor road capacity (2 - 7 traffic lanes each direction depending on screenlines) indicates that: ▪ focus on auto-based system without TMP rapid transit initiative is not an effective solution to future intra- and inter-regional travel needs, ▪ local transit system operational performance will be severely degraded. ▪ Reduction in transit person trips is between 100 and 200.	▪ Requires 1 – 8 arterial lanes (depending on screenlines) in addition to current commitments to provide 2031 capacity. ▪ Reduces road capacity shortfall and provides limited reserve capacity for long-term growth. ▪ Relies primarily on auto use for connectivity to inter-regional transit services. ▪ Solution discourages the use of committed transit services.	▪ Forecast continuing shortfall in corridor road capacity (1 - 7 traffic lanes each direction depending on screenlines) indicates this solution cannot increase transit mode split for shorter intra-regional trips. ▪ Requires enhanced local transit service and large park-and-ride lots to attract ridership and reach employment centres. ▪ Enhanced bi-directional inter-regional rail and 400 series service offers long-term reserve capacity for some origin-destination pairs. ▪ Solution increases transit person trips between 200 and 800 (depending on screenlines). ▪ Auto use reduces between 100 and 3,500 (depending on screenlines).	▪ Rapid transit in dedicated lanes reduces road capacity shortfall and provides reserve transit capacity for long-term growth, particularly in the case of subway system extensions. ▪ Provides improved access and connectivity to inter-regional services operating in Region. ▪ Offers long-term growth capacity for several origin-destination pairs. ▪ Solution increases transit trips between 100 and 2,800 (depending on screenlines). ▪ Auto use reduces between 200 and 3,000 (depending on screenlines).
	◔	◑	◕	◑	●

LEGEND: Least Responsive ○ ◔ ◑ ◕ ● Most Responsive

3

Table 3.2-2
Effect of Alternative Strategies on Transit Mode Share

Corridor	Screenline	Direction	Transit Modal Shares Including GO Rail						
			Existing	Do Nothing	Current Commitments + Priority Transit + TDM (Base Case)	Road Expansion	Enhanced RH Commuter Rail & Inter-regional Bus Service	York Region Rapid Transit Corridor Initiatives	York Region Rapid Transit Corridor Initiatives vs. Base Case (% change)
Yonge Street*	N of Steeles	NB	11%	10%	9%	9%	9%	13%	*43%*
	N of Steeles	SB	24%	40%	39%	39%	40%	50%	*27%*
	S of Rutherford	NB	7%	5%	5%	5%	5%	6%	*32%*
	S of Rutherford	SB	17%	32%	33%	33%	33%	41%	*23%*
	S of Stouffville	NB	5%	4%	4%	4%	4%	5%	*24%*
	S of Stouffville	SB	14%	33%	34%	34%	35%	40%	*15%*
Highway 7	E of Highway 50	EB	1%	1%	1%	1%	2%	3%	*86%*
	E of Highway 50	WB	0%	1%	1%	1%	1%	2%	*179%*
	E of Highway 400	EB	4%	4%	4%	4%	4%	14%	*256%*
	E of Highway 400	WB	4%	4%	4%	4%	4%	12%	*191%*
	W of Yonge	EB	12%	13%	13%	13%	14%	20%	*55%*
	W of Yonge	WB	7%	9%	9%	9%	13%	18%	*114%*
	E of Yonge	EB	9%	10%	9%	9%	10%	16%	*84%*
	E of Yonge	WB	15%	20%	23%	23%	24%	28%	*22%*
	W of Highway 404	EB	6%	6%	6%	6%	6%	11%	*95%*
	W of Highway 404	WB	11%	14%	14%	14%	14%	20%	*47%*
	W of McCowan	EB	6%	5%	5%	5%	6%	12%	*167%*
	W of McCowan	WB	13%	23%	22%	22%	25%	27%	*19%*
Vaughan Link	S. of Highway 7	NB	20%	13%	13%	13%	15%	30%	*138%*
	S. of Highway 7	SB	9%	10%	9%	9%	8%	40%	*369%*
Markham Link	S of Finch	NB	16%	15%	13%	13%	14%	18%	*38%*
	S of Finch	SB	20%	26%	24%	24%	26%	27%	*11%*
	N of Steeles	NB	7%	7%	6%	6%	7%	12%	*85%*
	N of Steeles	SB	10%	19%	16%	16%	20%	23%	*39%*
	S of 14th Avenue	NB	6%	6%	5%	5%	6%	10%	*88%*
	S of 14th Avenue	SB	8%	17%	15%	15%	18%	21%	*40%*
	S of Highway 7	NB	5%	5%	5%	5%	7%	11%	*105%*
	S of Highway 7	SB	10%	19%	16%	16%	19%	19%	*20%*

Note: * Yonge Street Screenlines include ridership from both the Richmond Hill and Bradford GO Lines.

4. FORECAST OF TRAVEL DEMAND WITH PUBLIC TRANSIT IMPROVEMENTS

4.1 FUNCTION OF THE PROPOSED HIGHWAY 7 CORRIDOR PUBLIC TRANSIT IMPROVEMENTS

4.1.1 Existing Transit Travel Patterns

Existing transit ridership to, from and within York Region is approximately 48,000 trips per weekday on services provided by all operators (York Region Transit (YRT), Toronto Transit Commission (TTC) and GO Transit) and modes (local bus, express bus and commuter rail). In the past, most of this ridership has had an ultimate origin or destination in Toronto, either via the TTC subway (the Yonge or Spadina Lines) or GO Transit commuter rail or bus services to Union Station in downtown Toronto. However, data from the recently completed 2001 *Transportation Tomorrow Survey* (TTS) indicates that the proportion of trips destined to Toronto by all modes is decreasing. This trend towards greater intra-regional trip-making stems from the growth in employment opportunities within the Region. This pattern is now bringing into focus the lack of a frequent, Region-wide transit service as a travel alternative for internal trips resulting in the very low transit mode-share.

Currently transit services in the Highway 7 Corridor include buses operated by YRT, TTC (on major arterial roads.) and GO Transit on Highways 404 and 407.

YRT bus services in the Highway 7 and Vaughan North-South Link Corridor carry approximately 8,500 transit passengers per day. The services include some of the heavily used services of the YRT. Major east-west services are Route #1 Highway 7 and Route #77 Highway 7 serving passengers travelling from the east and west and accessing the Finch Subway station to other parts of the City of Toronto. Others such as Route #4/4A serves along Major Mackenzie Drive, Route #85/85A/85B/85C serves along 16th Avenue/ Rutherford Road, and Route #2/2A/2B serves 14th Avenue and John Street originating from Finch Subway station. Approximately 20 routes run as north-south trunk routes crossing the corridor and/or service local areas such as institutions, business, commercial and residential areas in the vicinity of the corridor.

GO rail services crossing the corridor cater almost entirely to transit passengers travelling to Toronto City centre. It carries approximately 2,400 passengers per day inbound in the morning peak and outbound in the evening peak period. Some 70% of these GO Rail users board the trains at Richmond Hill, with the rest boarding at Langstaff Station.

Of the GO bus services running on Highway 407, the 407-YorkU is the major service route in terms passengers carried. This route served about 8,000 to 9,000 passengers daily.

TTC operates about 11 north-south services on major arterials crossing the regional boundaries.

4.2 TRANSIT RIDERSHIP PROJECTIONS

On the basis of the recommendations of the Region's TMP, it was concluded that public transit improvements in the Highway 7 Corridor should take the form of the primary east-west spine of the proposed York Region Rapid Transit Network. This section summarizes the projected ridership on the proposed rapid transit service on the Highway 7 and Vaughan N-S Link Transitway during the planning period. The TMP developed forecasts for three planning horizons, namely 2011, 2021 and the long term 2031. For analysis of the alternative methods of implementing the rapid transit network, the 2021 horizon year was selected as representing 20 years from the 2001 base year to which the model was calibrated. This period is typically used as the timeframe over which demographic trends and travel patterns can be predicted with reasonable reliability. Passenger volumes on the various portions of the corridor are made up of transit riders entering the transitway from zones along and primarily north of Highway 7. These riders comprise those transferring from north-south services crossing the transitway and those boarding along the transitway itself.

Significant amount of the ridership on Highway 7 services are destined for the TTC subway terminus at Finch and Downsview. The proposed service to the present Sheppard Subway Terminal at Don Mills Road and the York University are also key destinations for projected ridership on the improved corridor transit service model.

4.2.1 The Demand Forecasting Model

The transportation demand forecasting model described in **Chapter 3** and used for analysis of the response of alternative transportation solutions to long term travel demand was again used to develop forecasts of the ridership to be carried by the improved public transit alternative.

Consequently, demand forecasts presented in this chapter reflect the potential ridership attracted to rapid transit service operating on the planned network in the 2021 demographic scenarios outlined below. The performance characteristics (speeds, headways) assumed for the service are also identified in the following discussion.

4.2.2 Modeling Scenarios and Assumptions

The following sections present the assumptions used to derive the 2021 YRTP ridership forecasts for a network of rapid transit service in the YRTP corridors.

4.2.2.1 Population and Employment

Population and employment projections at the traffic zone level from the Official Plan forecasts provided by York Region and the City of Toronto have been used. No modifications were made to concentrate future development in nodes and corridors served by YRTP, which typically occurs with the introduction of new rapid transit facilities. This reflects a conservative assumption for the development of YRTP ridership forecasts.

Table 4.2-1 shows the population and employment projections to 2021 in tabular form, along with the trend in the past 15 years (1986 to 2001) for York Region municipalities and other Regions in GTA. This growth is also shown graphically in **Figures 4.2-1 to 4.2-4**.

Population and employment growth and its spatial distribution will have an impact on the travel pattern and trip demand in the Highway 7 Corridor. Of the 423,000 growth in York Region population in the 2001-2021 period, about 40%, or 169,000 will be concentrated in the three municipalities (Vaughan, Markham, and the southern portion of Richmond Hill) served by the corridor. Similarly, approximately 40% of the employment growth of 269,000 in York Region will be within these three municipalities.

Strong population and employment growth in the adjacent regions, Durham and Peel, will also result in an increased east-west travel demand between York, Durham and Peel Regions. The Highway 7 Corridor, the major spine through York Region connecting to its neighbours, will attract a significant portion of this increased demand.

Table 4.2-1
Population and Employment -York Region and GTA/Hamilton, 1986 – 2021

REGION/ MUNICIPALITY	1986	2001	2011	2021	1986-2001 Growth		2001-2021 Growth	
					Absolute	%	Absolute	%
POPULATION								
YORK REGION	353,300	772,000	1,008,000	1,195,000	418,700	119%	423,000	55%
Aurora	20,900	43,000	56,000	69,000	22,100	106%	26,000	61%
East Gwillimbury	14,600	23,000	32,000	51,000	8,400	58%	28,000	122%
Georgina	22,600	39,000	51,000	67,000	16,400	73%	28,001	72%
King	16,000	20,000	25,000	32,000	4,000	25%	12,000	60%
Markham	115,100	218,000	281,000	326,000	102,900	89%	108,000	50%
Newmarket	35,300	71,000	87,000	95,000	35,700	101%	24,001	34%
Richmond Hill	47,200	140,000	191,000	212,000	92,800	197%	72,001	51%
Vaughan	66,500	194,000	254,000	305,000	127,500	192%	111,000	57%
Whitchurch-Stouffville	15,100	24,000	31,000	38,000	8,900	59%	14,000	58%
OTHER	3,826,600	4,792,100	5,681,700	6,226,000	965,500	25%	1,433,900	30%
PD1	132,000	152,200	217,700	241,400	20,200	15%	89,200	59%
Rest of Toronto	2,066,200	2,298,500	2,502,400	2,558,700	232,300	11%	260,200	11%
Durham	330,000	502,800	710,000	900,000	172,800	52%	397,200	79%

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Table 4.2-1
Population and Employment -York Region and GTA/Hamilton, 1986 – 2021

REGION/ MUNICIPALITY	1986	2001	2011	2021	1986-2001 Growth		2001-2021 Growth	
					Absolute	%	Absolute	%
Peel	599,400	967,000	1,214,500	1,351,800	367,600	61%	384,800	40%
Halton	274,400	371,800	505,900	607,400	97,400	35%	235,600	63%
Hamilton	424,600	499,800	531,200	566,800	75,200	18%	67,000	13%
EMPLOYMENT								
YORK REGION	152,300	386,000	540,000	655,000	233,700	153%	269,000	70%
Aurora	7,300	16,000	22,000	30,000	8,700	119%	13,999	88%
East Gwillimbury	1,000	5,000	9,000	16,000	4,000	400%	11,000	220%
Georgina	4,100	8,000	13,000	20,000	3,900	95%	12,000	150%
King	2,100	6,000	8,000	11,000	3,900	186%	5,000	83%
Markham	60,600	119,000	169,000	200,000	58,400	96%	81,000	68%
Newmarket	12,600	33,000	41,000	45,000	20,400	162%	12,000	36%
Richmond Hill	16,600	59,000	94,000	115,000	42,400	255%	56,000	95%
Vaughan	44,000	132,000	172,000	202,000	88,000	200%	70,000	53%
Whitchurch-Stouffville	4,000	8,000	12,000	16,000	4,000	100%	8,000	100%
OTHER	1,961,300	2,462,900	3,092,400	3,473,600	501,600	26%	1,010,700	41%
PD1	410,100	423,000	480,800	523,900	12,900	3%	100,900	24%
Rest of Toronto	868,200	1,030,600	1,134,400	1,195,000	162,400	19%	164,400	16%
Durham	118,200	166,900	279,800	374,000	48,700	41%	207,100	124%
Peel	280,800	488,300	703,800	799,100	207,500	74%	310,800	64%
Halton	107,000	166,600	281,900	351,900	59,600	56%	185,300	111%
Hamilton	177,000	187,500	211,700	229,600	10,500	6%	42,100	23%

Sources: Regional Official Plans; Greater Toronto Coordinating Committee (Durham)

4.2.2.2 Base Assumptions for Demand Modelling

The following key assumptions provide the basis for generating 2021 travel demand forecasts for the YRTP Network Scenario, as described below:

Road Network: Improvements to the arterial road system in York Region based on the TMP network and the 10-year York Region capital programme have been incorporated in the model. Expansion of the provincial highway system within the Region included the proposed extensions of Highway 427 and Highway 404, and the widening of Highway 400.

York Region Transit (YRT) Network: For transit improvements at the 2021 planning horizon, most of the recommendations from the *York Region Transit 5-Year Service Plan: Conventional Transit* are assumed to have been incorporated. This includes route extensions, transfer of YRT services to TTC service extensions, other route restructuring, and new services in newly developed and previously unserviced areas. Highway 7 is an integral part of an overall network of transit routes within York Region. The ridership forecasting assumed that a variety of feeder routes will connect and feed ridership into this corridor. A detailed service plan will be developed as part of the ongoing planning process in order to ensure effective and convenient transit connections. The base transit system in York Region for each horizon year is defined by York Region Transit's Five-Year Service Strategy route structure. The main components include:

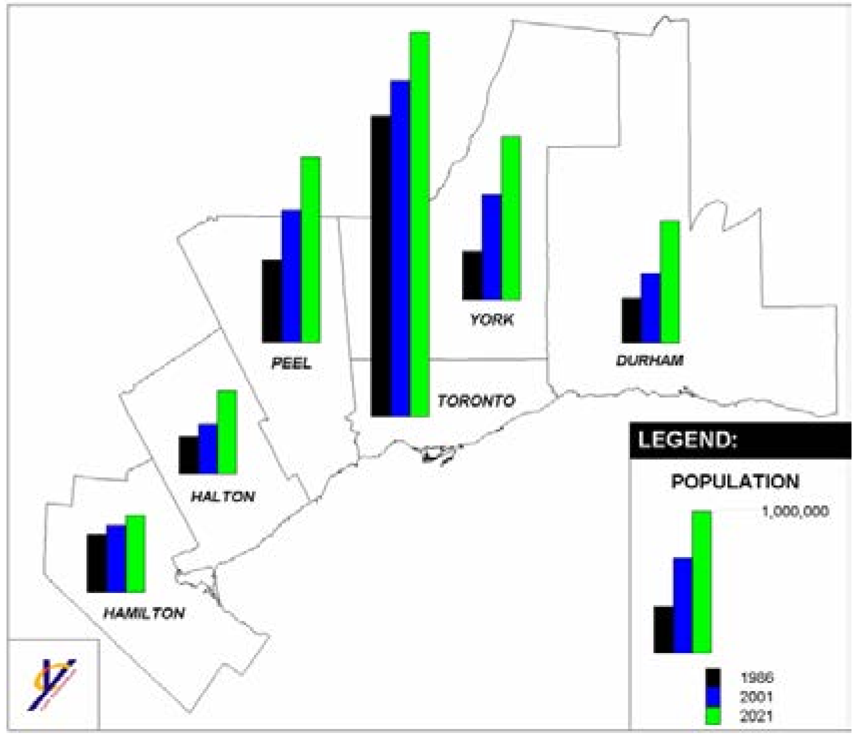


Figure 4.2-1
GTA/Hamilton Population, 1986 – 2021

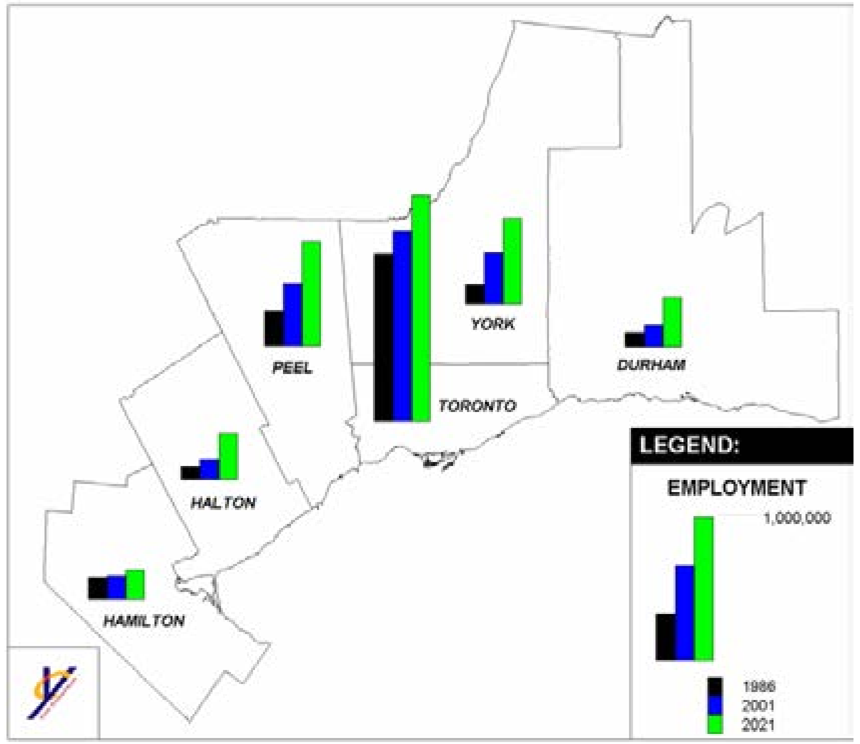


Figure 4.2-2
GTA/Hamilton Employment, 1986 – 2021

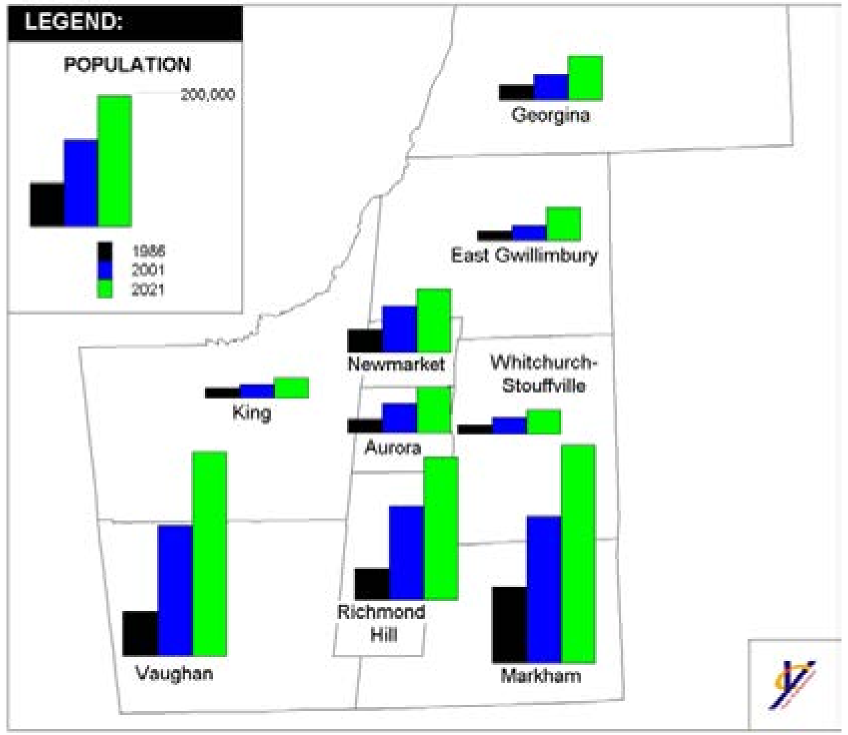


Figure 4.2-3
York Region Population, 1986 – 2021

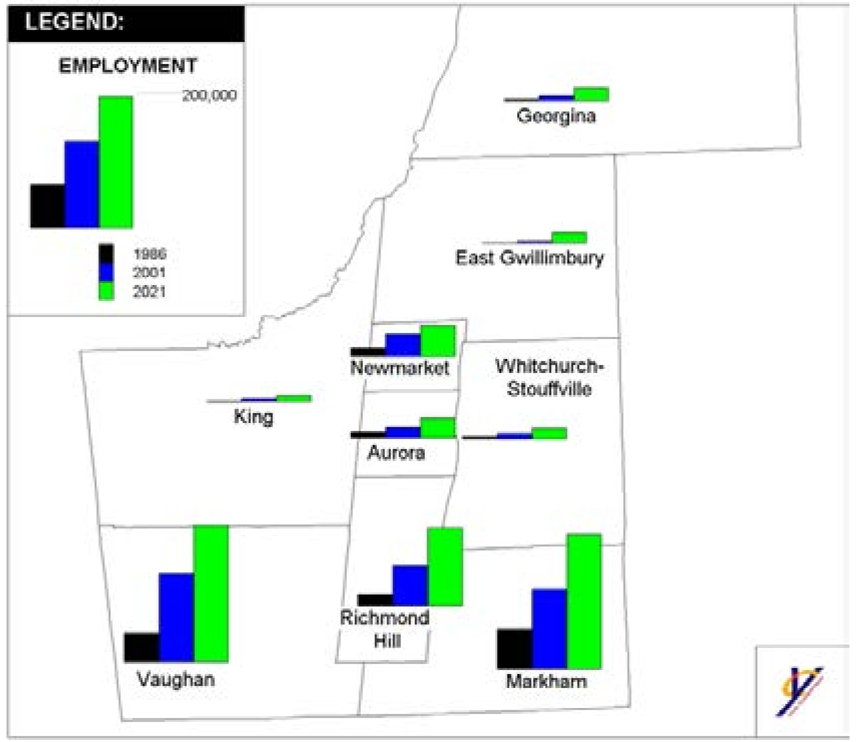


Figure 4.2-4
York Region Employment, 1986 – 2021

- Route extensions to new areas of development;
- Re-orientation of existing routes to connect to York University/ Downsview TTC Station, Don Mills TTC Station and new GO Rail stations;
- Enhancements including the filling in of a basic grid system; and
- Enhanced continuous through-services, between York Region and Toronto.

YRT Route Restructuring: the following YRT services are assumed to be removed to avoid duplication with Quick Start or YRTP services:

- YRT Highway 407 Express Buses – Markham;
- YRT Highway 407 Express Bus – Unionville; and
- GO Yonge 'B' Bus.

GO Rail: Increased services in all GO Rail corridors, consistent with GO Rail's 10 Year Capital Plan and 2021 Plan. This includes full all-day service on the Bradford, Richmond Hill and Stouffville GO Rail lines and new GO Stations located at Kennedy/Bloor-Danforth Subway, Leslie/Sheppard Subway and York University/ Bradford Line.

GO Bus: Highway 407 Express Bus added to network, with York Region stops at Unionville, Langstaff and York University. A peak period headway of 10 minutes is assumed.

TTC: Rapid transit system is based on the present system, with extension of the Spadina Subway assumed to York University by 2021.

Socio-economic Factors: The model utilizes three transit friendliness measures within the mode choice sub-model, relating to urban density, land use mix, and auto ownership. The first two were estimated using population and employment forecasts at the traffic zone level. Auto ownership has been projected using a multi-variate auto-ownership model, relating car-ownership with such variables as average household income, household size, level of transit service, and urban density.

Auto Costs: Parking costs in real dollars are assumed to increase by 15% over existing conditions within the City of Toronto. The existing spatial coverage of parking costs will expand, consistent with strategies of the Toronto Parking Authority. Within York Region, a $5 parking charge is assumed at major nodes (e.g. Markham Centre, Vaughan Corporate Centre) and at employment locations in the YRTP corridors of Yonge Street and Highway 7. No parking charge is assumed at GO stations.

Fares: Current fare structure is assumed with the YRT three-zone system, GO Transit fare by distance and TTC flat fare. No increase in fares in real dollars is assumed for TTC, GO Transit and YRT services. YRTP is assumed to have the same fare as YRT services, with free transfers between YRT and YRTP services.

Fare Integration: It is assumed that current fare policies would be in effect in 2021, with no fare integration between TTC and YRT/YRTP and a double fare for many short cross-boundary transit trips across the York/Toronto boundary, consistent with current policies.

Service Policies: Closed door services of YRT/YRTP routes in Toronto is assumed. This reflects current policies, with YRT services operating in Toronto not permitted to serve internal Toronto trips.

4.2.2.3 YRTP Networks

The YRTP networks are assumed to operate in all four YRTP corridors. The rapid transit program, planned for implementation in stages commencing in 2005, is designed to begin building long-term rapid transit ridership and serve the Region's Corridors and Centres land use plans designed to support higher transit usage.

For purposes of this report, full implementation of YRTP is modelled assuming Bus Rapid Transit (BRT) in each of the four corridors. The ultimate YRTP network configuration could involve combinations of BRT, Light Rail Transit (LRT) or subway with the technology transitions taking place over time as required by demand and when funds are available. BRT ridership levels are also considered representative of the potential ridership that might be achieved with LRT technology operating the same corridors. However, the improvement in service speed and reliability provided by subway extensions generally attracts significant ridership increases.

In the scenario modelled, BRT is assumed to be operating in dedicated bus lanes with traffic signal priority treatment at signalized intersections and other transit priority treatments, as required to maximize transit operations.

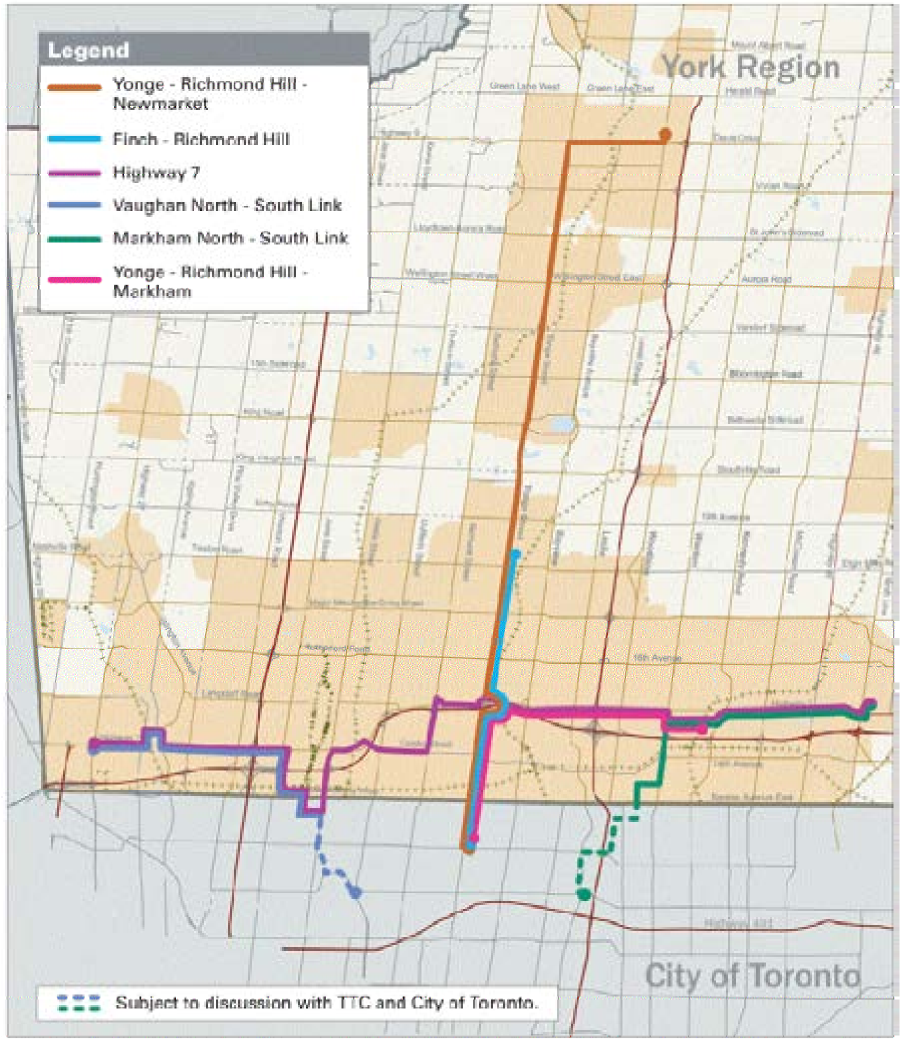
Route Structure

The route structure for YRTP services is comprised of six services as described below and shown in **Figure 4.2-5**.

Yonge: Newmarket-Finch TTC – An all day service operating on Yonge Street between Newmarket and the TTC Finch subway station in Toronto;

Yonge: Richmond Hill-Finch TTC – An all day service operating on Yonge Street between north Richmond Hill and the TTC Finch subway station in Toronto;

Markham Centre-Finch TTC – A peak period only service operating from Markham Centre on Highway 7 to the TTC Finch subway station via



Note: Alignments are representative; final alignment to be determined through the EA process

Figure 4.2-5
York Region Rapid Transit Plan Network

Highway 7, the Richmond Hill Centre Intermodal Terminal and Yonge Street;

Highway 7 – An all day service operating on Highway 7 between Markham-Stouffville Hospital in Markham and Highway 27 in Woodbridge with the route deviating to serve York University using a loop to the university via Keele Street and Jane Street;

Vaughan-Downsview TTC – An all day service operating on Highway 7 from Highway 27 to Jane Street, extending south to York University.

Markham-Don Mills TTC – An all day service operating on Highway 7 from Markham-Stouffville Hospital in Markham through Markham Centre to south on Warden Avenue, west on Denison Street, south on Esna Parkway, continuing south on Pharmacy Avenue, west on Finch Avenue to Seneca College, south on Don Mills Road to the TTC Don Mills subway station.

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Speed and Headway

Table 4.2-2 shows the speed and headway assumptions for YRTP services. The speeds are indicated by corridor segment and are based on speed and delay studies of existing conditions in the respective YRTP corridors, and estimates of performance based on posted speed limits, stop spacing, level of transit priority and other factors. Lower speeds are assumed on the Yonge Corridor south of Highway 7, given the high volume of buses, in the order of 80-120 buses per hour, in the peak direction.

Table 4.2-2
Speed and Headway Assumptions

Corridor/Segment	Segment Length (km)	YRTP (BRT)	
		Speed (km/h)	Service Frequency (Buses per Hour)
Yonge Street			
Finch Station to Steeles	1.9	20	120
Steeles to Hwy 7/Langstaff	4.3	25	120
Highway 7/Langstaff - Major MacKenzie	4.0	25	120
Major MacKenzie to 19th Avenue	4.1	25	120
19th Avenue to Newmarket	21.1	35	60
Finch Station to Newmarket	35.4	29.6	
Highway 7 (West)			
Highway 27 to Islington	5.8	35	30
Islington to Highway 400	4.3	30	30
Highway 400 to York U.	3.3	30	30
York U. to Yonge	13.6	35	30
Highway 7 (East)			
Yonge to Bayview	1.9	35	30
Bayview to Leslie	2.0	35	30
Leslie to Woodbine	2.1	35	30
Woodbine to Warden	2.1	30	30
Warden to Kennedy	2.5	35	30
Kennedy to MSH	8.1	35	30
Highway 27 – MSH	45.6	33.1	
Vaughan NS Link			
Highway 7 to Steeles	2.1	30	30
Steeles to York U.	2.2	30	30
York U. to Downsview TTC	5.9	30	30
Markham NS Link			
Markham Centre to Highway 407	1.7	30	30
Highway 407 to Steeles	3.0	30	30
Steeles to Don Mills TTC	6.3	30	30

In the case of scenarios including segments with subway extensions, appropriate higher speeds and frequencies comparable with the TTC network have been modelled.

Stations

The station spacing is assumed to be approximately one kilometre in the denser, built-up portions of the corridors and two kilometres in the lower density areas. The following inter-modal stations are assumed in York Region, allowing transfers between Go Rail, YRT/YRTP, and park-and-ride facilities:

- Langstaff Station – interface between YRTP/YRT services and the GO Richmond Hill Line and GO BRT on Highway 407;
- Unionville/Markham Centre Station – interface between YRTP/YRT and GO Stouffville Line and GO BRT on Highway 407; and
- York University Station - interface between YRTP/YRT services and the GO Bradford Line and GO BRT on Highway 407.

YRTP services extending into the City of Toronto will link to the TTC subway system at Finch Station (Yonge Line), York University Station (on an extended Spadina Line) and Don Mills Station (Sheppard Line).

Park-and-Ride Facilities

Table 4.2-3 shows the assumed location and number of parking spaces at park-and-ride lots serving YRTP services in 2021. Approximately 1,500 parking spaces are assumed for the 2021 model runs, with Richmond Hill Centre Intermodal Terminal at Yonge Street/Highway 7 as the main location. The Finch park-and-ride lot at the northern terminus of the Yonge Subway line is assumed at its current capacity.

Table 4.2-3
Park-and-Ride Lot Capacities

Rapid Transit Corridor	Station	No of Parking Spaces
Highway 7	Highway 7 & Highway 50	200
	Highway 7 & Highway 27	300
	Highway 7 & Highway 400	300
	Highway 7 & Bayview	200
	Hwy 7 east of Hwy 404	200
	Warden & Hwy 407	300
	Highway 7 & Markham Stouffville Hospital	200
Highway 7/ Vaughan NS	Steeles	500

4.3 2021 RIDERSHIP FORECASTS

The following section presents the 2021 ridership forecasts for rapid transit services in the Highway 7 Corridor and Vaughan North-South Link. Rapid transit in dedicated lanes with extensive transit priority treatments is assumed, with each service operating on a two-minute headway during peak periods.

4.3.1 Rapid Transit Passenger Volumes

Table 4.3-1 presents a 2021 ridership summary for the YRTP services using Highway 7 and Vaughan North-South Link. The peak hour volumes in the peak direction are 2,600 at Markham Centre and 2,200 at York University. On a daily basis, the Highway 7/ Vaughan North-South Link Corridor rapid transit services are projected to carry approximately 85,000 riders.

Table 4.3-1
2021 Ridership Summary

Statistic	Highway 7: Vaughan - Markham	Vaughan N-S Link: Vaughan – York U
Headway (min)	2	2
Average Speed (km/h)	33	30
Route length (km)	37.3	10.2
AM Peak (3-Hour) Period		
Passenger Boardings	20,920	3,240
Passenger-km	136,800	20,300
Peak Hour Volume	2,600	2,200
Peak Point Location	WB @ Markham Centre	SB @ York U
Daily Boardings	73,200	11,300

Figures 4.3-1 and 4.3-2 provide plots of the link volumes for the rapid transit services, with total loadings at various sections of the network. On Highway 7, the a.m. peak hour, peak direction volume decreases from about 2,600 at the Markham Centre to 1,900 at Langstaff. West of Bathurst Street, the peak direction volume decreases from 1,600 at Keele Street, serving trips travelling towards York University, to 950 at Highway 400. On the Vaughan North-South Link, the a.m. peak hour peak direction volume increases from 1,500 at Highway 7 to 2,200 at York University.

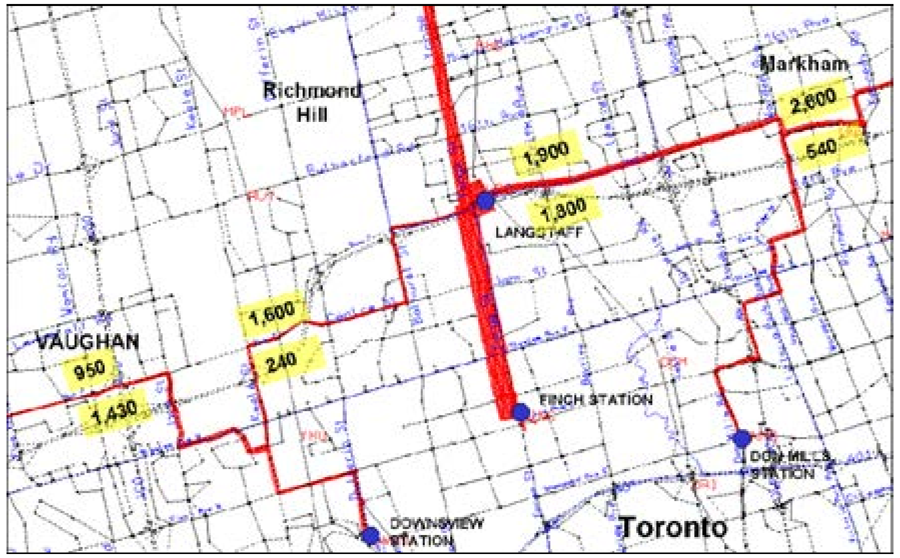

Figure 4.3-1
Highway 7 Corridor AM Peak Hour Link Volume – 2021 BRT

Early in the rapid transit program and prior to the construction of new dedicated transitway infrastructure, York Region proposes to introduce new services with rapid transit characteristics but operating in mixed traffic with signal priority measures. This initiative is not part of the scope for this EA. Ridership on these services has also been modelled and is presented below for comparison, as a Base Case, to provide an indication of the attractiveness of full-featured surface rapid transit service.

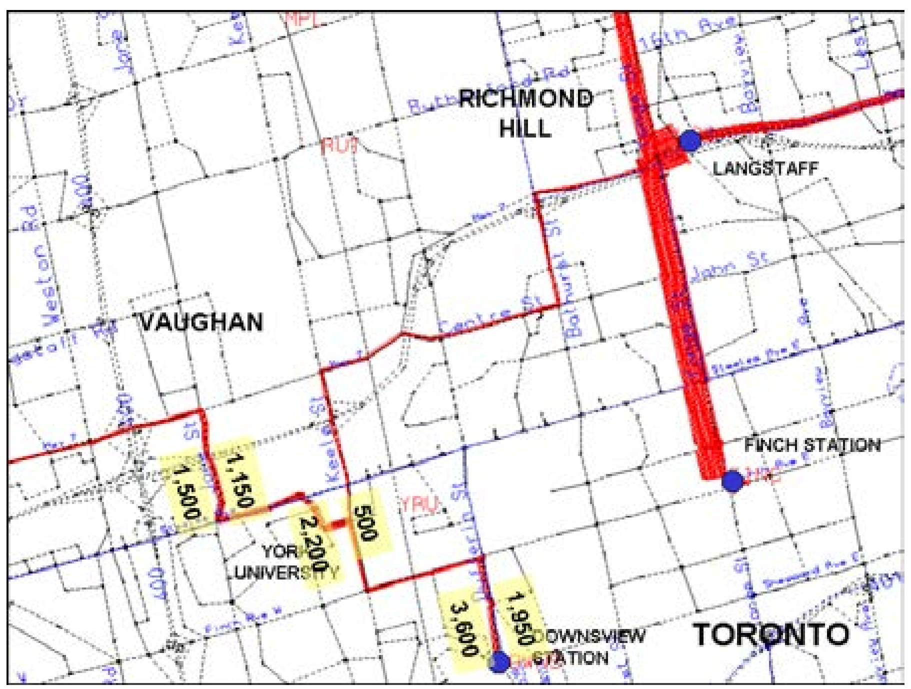

Figure 4.3-2
Vaughan North-South Link AM Peak Hour Link Volume – 2021 BRT

Table 4.3-2 shows various ridership indicators such as peak volume, boarding, alighting, and passenger-km by segment within the corridor, for the a.m. peak hour for the Base Case and full YRTP scenario. With YRTP services, the passenger boardings in the Highway 7 west corridor is projected to increase from approximately 1,610 in the Base Case to 3,400, an increase of 111%. The peak load point volume at York University in the southbound di1rection increases from 700 to 1,600 (129%). Meanwhile, the passenger boardings in the Highway 7 east corridor is projected to increase from approximately 5,050 to 9,590, an increase of 90%. The peak load point volume at Woodbine (Markham Centre) in the westbound direction increases from 2,200 to 2,600 (18%). In the Vaughan North-South Link, the passenger boardings is projected to increase from 940 to 1,940, an increase of 106%. The peak load point volume at York University in the southbound direction increases from 1,000 to 2,200 (220%).

Table 4.3-2
2021 AM Peak Hour Ridership by Link

Segment	Base Case				YRTP			
	Link Volume (Peak Direction)	Ons	Offs	Passenger-km	Link Volume (Peak Direction)	Ons	Offs	Passenger -Km
Highway 7 (West)								
Hwy 27 to Islington	400	460	150	1,600	800	790	250	3,400
Islington to Hwy 400	800	530	360	3,100	1,500	980	600	6,300
Hwy 400 to York U.	800	0	300	1,400	1,500	0	450	2,500
York U. to Yonge	700	620	940	8,300	1,600	1,630	2,290	21,600
Total	2,700	1,610	1,750	14,400	5,400	3,400	3,590	33,800
Highway 7 (East)								
Yonge to Bayview	1,000	950	420	6,200	1,900	3,360	3,010	11,600
Bayview to Woodbine	1,000	770	920	5,800	1,800	920	1,610	13,000
Woodbine to Kennedy	2,200	1,300	1,020	6,400	2,600	2,100	1,800	13,200
Kennedy to 9th Line	1,300	2,030	790	8,800	2,400	3,210	1,100	15,200
Total	5,500	5,050	3,150	27,200	8,700	9,590	7,520	53,000
Highway 7 Total		6,660	4,900	41,600		12,990	11,110	86,800
Vaughan NS Link								
Hwy 7 to Steeles	800	70	180	3,000	1,500	210	360	5,700
Steeles to York U.	1,000	870	840	3,000	2,200	1,730	1,800	6,500
Total		940	1,020	6,000		1,940	2,160	12,200

a) York/Toronto Screenline Volumes

Highway 7 Corridor

An examination of changes in travel in the Highway 7 Corridor is shown in **Table 4.3-3** in the form of a screenline summary for Yonge Street from Royal Orchard Boulevard and Major Mackenzie Drive. The analysis compares peak period southbound passenger volumes in 2001 with 2021 rapid transit conditions. Over the 2001 to 2021 period, east-west transit trips in the Highway 7 Corridor increase from 2,130 passengers in the a.m. peak (3-hour) period westbound direction in 2001 to 5,200 passengers in 2021 with rapid transit, representing an approximate 144% increase in transit ridership due to rapid transit. Diversion from auto trips along the screenline is essentially replaced by new auto trips absorbing the available capacity created, resulting in marginal changes in auto volumes.

Table 4.3-3
Highway 7 Corridor AM Peak (3-Hour) Period Volume at Screenline
East of Yonge St. (Royal Orchard and Major Mackenzie)

Service/Mode	2001 - Modelled		2021 - YRTP	
	WB	EB	WB	EB
YRT / GO Bus	2,130	860	2,070	1,110
YRTP Routes on Hwy 7	-	-	3,130	3,000
Transit subtotal	*2,130*	*860*	*5,200*	*4,110*
Auto-person trips	27,700	33,350	27,860	32,740
Total Yonge Screenline	29,830	34,210	33,060	36,850

Trips attracted to rapid transit routes over the planning period, comprise those presently using local YRT and GO bus services on Highway 7, with most of the former slated to be replaced by rapid transit in the corridor. The remaining transit trips in the corridor are those attracted to the corridor from feeder services due to the improved service of the Highway 7 rapid transit services.

Vaughan North-South Link

Table 4.3-4 presents the changes in travel in the Vaughan North-South Link Corridor based on a screenline at Steeles Avenue between Jane Street and Dufferin Street. The screenline summary compares a.m. peak (3-hour) period northbound and southbound volumes in 2001 (base year) with 2021 forecasts with surface rapid transit in the Vaughan North-South Link. Total trips in the corridor over the a.m. peak 3-hour period increased from 21,850 in 2001 to 35,330 in 2021 with surface rapid transit. Surface rapid transit routes attract about 7,970 new transit trips in the southbound direction in the corridor at Steeles Avenue, with approximately 1,100 trips being diverted from other YRT/TTC routes in the corridor. Surface rapid transit routes attract approximately 410 trips from the Bradford GO Rail line.

The YRTP screenline volumes shown are forecast surface rapid transit volumes for 2021. In the event that the Vaughan North-South Link has been converted to subway technology by this horizon, an increase in the YRTP ridership in the order of 20% can be expected on the VNSL.

Table 4.3-4
Vaughan North-South Link AM Peak (3-Hour) Period Volume at Screenline
Steeles Avenue (Jane St. to Dufferin St.)

Service/Mode	2001 - Modelled		2021 – YRTP	
	SB	NB	SB	NB
YRT / GO Bus	790	1,050	1,490	1,100
GO Rail	1,320	-	3,340	-
YRTP Routes on Jane and Keele	-	-	5,250	2,660
Transit subtotal	2,110	1,050	10,080	3,760
Auto-person trips	19,740	8,550	25,250	15,300
Total	21,850	9,600	35,330	19,060

Note:
GO Rail includes Bradford Line (only the trips from King, Maple, and Rutherford to Toronto are included in this corridor)

b) Travel pattern and modal split

Highway 7 Corridor

The primary market sector served by this route is for travel to and from Vaughan and Markham. **Table 4.3-5** shows the a.m. peak 3-hour period total trips and transit trips for 2001and 2021 with surface rapid transit. This table presents the total travel flows on an origin-destination basis, indicating growth over the next twenty years and the transit and modal split implications under BRT scenarios for the key travel market.

Table 4.3-5
Highway 7 Corridor AM Peak (3-Hour) Period Total Trips and Transit Modal Split

From	To	Total Trips (000's)			Transit Trips (000's)		Transit Modal Split	
		2001	2021	Growth	2001	2021-YRTP	2001	2021-YRTP
Vaughan	Vaughan	33.5	61.4	27.9	0.8	2.8	2.4%	4.5%
	Toronto	40.5	56.0	15.6	6.7	24.3	16.5%	43.3%
	Other	18.5	30.8	12.4	0.3	1.0	1.5%	3.2%
Toronto	Vaughan	31.6	42.1	10.5	2.5	4.9	7.8%	11.6%
Other		13.6	22.4	8.8	0.2	0.7	1.6%	3.2%
Vaughan	All	92.5	148.3	55.9	7.7	16.9	8.4%	11.4%
All	Vaughan	60.0	86.6	26.6	2.9	6.7	4.9%	7.7%
Markham	Markham	41.7	69.0	27.3	1.2	4.2	2.9%	6.2%
	Toronto	45.0	59.1	14.1	10.2	17.3	22.7%	29.3%
	Other	14.4	22.8	8.4	0.3	1.1	2.3%	4.7%
Toronto	Markham	35.9	47.6	11.8	10.2	17.3	28.5%	36.4%
Other		33.7	40.2	6.5	0.3	0.8	1.0%	2.0%
Markham	All	101.1	150.9	49.8	11.8	22.6	11.6%	15.0%
All	Markham	69.5	103.1	33.6	3.4	8.5	5.0%	8.2%

Currently, there are approximately 92,500 total trips (auto+transit+GO) from Vaughan, and 101,100 total trips from Markham in the a.m. peak 3-hour period and this is projected to increase to 148,300 trips and 150,900 trips respectively, by 2021. With surface rapid transit, transit trips originating from Vaughan are projected to increase from 7,700 to 16,900 trips in the a.m. peak 3-hour period. The corresponding modal split increase for a.m. peak period trips originating from Vaughan is 8.4% in 2001 increasing to 11.4% in 2021 with surface rapid transit.

Transit trips originating from Markham are projected to increase from 11,800 in 2001 to 22,600 by 2021 with surface rapid transit routes, with the corresponding modal split increase from 11.6% to 15.0%.

A target market for the Highway 7 route is travel within and between the Municipalities of Vaughan and Markham. For trips within Vaughan, surface rapid transit services on Highway 7 produce an increase in transit modal split from 2.4% in 2001 to 4.5% in 2021 with surface rapid transit, with transit trips increasing from 800 to 2,800. For trips within Markham, modal split increase from 2.9% in 2001 to 6.2% in 2021 with surface rapid transit, with corresponding increase in transit trips from 1,200 to 4,200 during the a.m. peak 3-hour period.

Vaughan North-South Link

Travel to and from Vaughan during the a.m. peak period is shown in **Table 4.3-6** for 2001 and 2021 with BRT scenarios. This table presents the total travel flows on an origin-destination basis, indicating growth over the next twenty years and the transit and modal split implications for surface rapid transit.

Currently, there are approximately 55,000 total trips (auto+transit+GO) originating from Vaughan in the a.m. peak 3-hour period and this is projected to increase to 80,500 trips by 2021. With surface rapid transit, transit trips originating from Vaughan are projected to increase from 5,300 to 10,400 trips in the a.m. peak 3-hour period. The corresponding modal split increase for a.m. peak period trips originating from Vaughan is 9.7% in 2001 increasing to 12.9% in 2021 with surface rapid transit.

A target market for the Vaughan North South Link is travel between Vaughan and PD1 and the western part of Toronto. For these trip interchanges, total trips increase from 26,600 to 39,400 between 2001 and 2021, with transit modal split projected to increase from 33.7% in 2001 to 40.5% in 2021 with surface rapid transit for Vaughan to PD1. For the western part of Toronto, transit modal split increases from 5.4% in 2001 to 8.8% in 2021 with surface rapid transit.

For trips within Vaughan, both Vaughan North-South Link and Highway 7 services combined produce an increase in transit modal split from 2.4% in 2001 to 4.4% in 2021 with surface rapid transit, with corresponding transit trips increasing from 800 to 2,700. For trips destined for Vaughan in the a.m. peak period, the transit modal split is projected to increase from 4.5% in 2001 to 7.1% in 2021 with surface rapid transit.

Table 4.3-6
Vaughan North-South Link AM Peak (3-Hour) Period Total Trips and Transit Modal Split

From	To	Total Trips (000's)			Transit Trips (000's)		Transit Modal Split	
		2001	2021	Growth	2001	2021-YRTP	2001	2021-YRTP
Vaughan	Vaughan	33.5	61.4	27.9	0.8	2.7	2.4%	4.4%
	RH & Markham	3.5	6.8	3.3	0.2	0.7	5.3%	10.0%
	PD1	8.8	13.1	4.3	3.0	5.3	33.7%	40.5%
	Toronto (East & Central)	13.9	17.6	3.7	1.1	1.9	8.1%	10.8%
	Toronto (West)	17.7	25.3	7.5	1.0	2.2	5.4%	8.8%
	Other	11.0	17.6	6.6	0.1	0.3	0.7%	1.6%
RH & Markham	Vaughan	12.5	18.3	5.9	0.2	0.8	1.6%	4.3%
Toronto (East &Central)		13.0	13.9	0.8	0.8	1.5	6.2%	11.0%
Toronto (West) / PDI		17.8	26.3	8.6	1.6	3.3	9.2%	12.7%
Other		19.2	31.6	12.4	0.2	0.8	1.0%	2.4%
Vaughan	All	55.0	80.5	25.5	5.3	10.4	9.7%	12.9%
All	Vaughan	62.5	90.2	27.7	2.8	6.4	4.5%	7.1%
To / From / Within Vaughan		151.0	232.1	81.0	9.0	19.5	5.9%	8.4%

c) Boarding and alighting patterns

Figures 4.3-3 and 4.3-4 present the station boarding and alighting for the Highway 7 Corridor for the a.m. peak 3-hour period in graphical form for eastbound and westbound directions respectively. The passenger boarding includes all those transferring from the north-south routes as well as the park-and-ride travellers accessing YRTP to travel to Toronto. Richmond Hill Centre Intermodal Terminal is the major transportation hub on the YRTP network allowing transit riders from Vaughan, Markham, and Richmond Hill/Aurora/Newmarket to get between those places as well as to and from Toronto, highlighted by the boarding/ alighting patterns. The figures account for the overlapping of services. For example, the cumulative load between Cornell and Markham Centre includes both Highway 7 and the Markham link volumes, but the alightings at Markham Centre and Warden Avenue are true Highway 7 alightings, not those that come from the south. The same patterns apply to Richmond Hill Intermodal Terminal. Passenger boarding at Richmond Hill Centre for the two Highway 7 YRTP routes during the a.m. peak (3-hour) period is of about 2,000 passengers, which represents 9% of the total boarding of 21,500 for the three routes.

For the two Highway 7 rapid transit services combined, approximately 3,000 passengers alight at Richmond Hill Centre Intermodal Terminal during the a.m. peak (3-hour) period.

At the Markham Centre station where the overlapping of services from the Highway 7 and Markham Centre-Finch TTC occurs, up to 74% of those on board eastbound leaves the Highway 7 system to head south with the Markham North-South Link system. At the same station, approximately 26% of those on board heading east towards the Unionville GO station are made up from the Markham North-South Link system.

Similarly, at the Jane station where the Highway 7 and Vaughan-Downsview TTC services separate, approximately 53% of those on board in the eastbound direction head south towards the York University or City of Toronto with the Vaughan North-South Link services, and 37% joins the Highway 7 system westbound from York University of City of Toronto. At Keele station, 60% of those on board westbound head south towards York University or City of Toronto, and 39% join the Highway 7 system from York University or City of Toronto.

The park-and-ride facilities assumed in the travel demand modelling along the corridor at Highway 50, Highway 27, Highway 400, Bayview Avenue, Highway 404 and Markham-Stouffville Hospital can serve up to 37% of the passenger volumes boarding and/ or alighting at the facility locations in both directions.

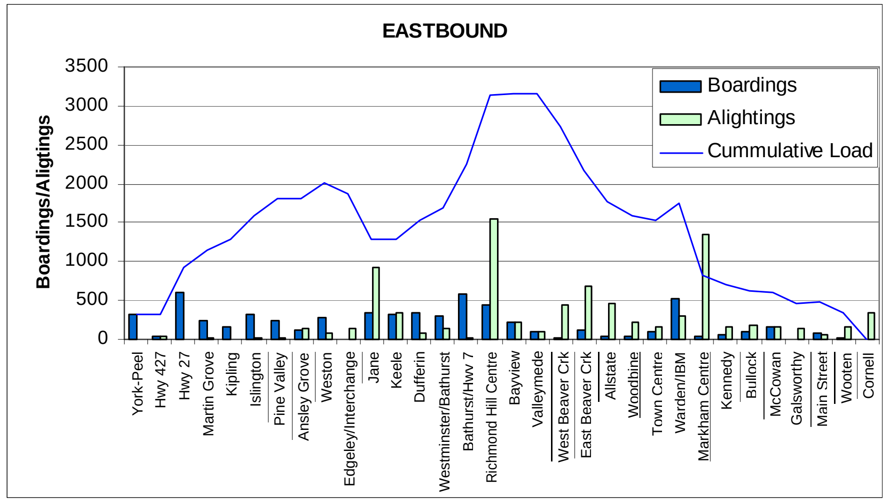

Figure 4.3-3
AM Peak (3-Hour) Period Boarding / Alighting on Highway 7 Corridor – 2021 BRT - Eastbound

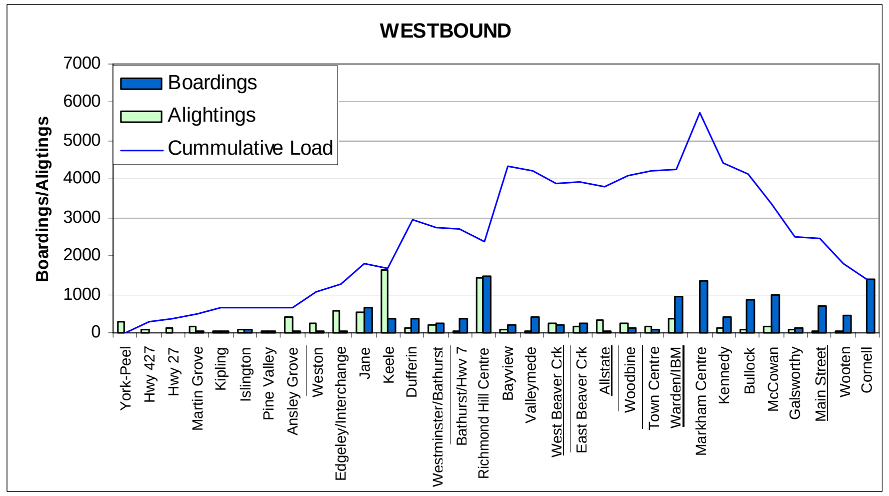

Figure 4.3-4
AM Peak (3-Hour) Period Boarding / Alighting on Highway 7 Corridor – 2021 BRT - Westbound

5. ALTERNATIVE METHODS OF IMPROVING PUBLIC TRANSIT

This chapter describes the analysis and initial screening of the alternative methods of improving public transit in the Study Area. Both the 1995 *HOV/Rapid Transit Study* and the Region's subsequent *Transportation Master Plan* (TMP) completed in 2002, recommended the introduction of rapid transit service as the most effective method of achieving a significant increase in transit mode split for the major travel patterns within the Region and across its boundary with Toronto. These studies analyzed a range of corridors leading to the rapid transit network of north-south and east-west corridors recommended in the TMP for implementation by 2031. As a first step in assessing the alternative methods, the findings of both prior studies provide the basis for the initial screening of east-west corridor alternatives.

Secondly, the potential rapid transit technologies are introduced and evaluated for application on the network. Following this network-wide technology screening, the analysis focuses on the Highway 7 Corridor study area (including the Vaughan North-South Link Corridor) for an assessment and initial screening of route alternatives. As a precursor to the detailed evaluation of rapid transit alignments along the routes, described in **Chapter 8**, this chapter then compares generic alternatives for location of surface rapid transit infrastructure in a road right-of-way forming all or part of a route.

5.1 RAPID TRANSIT CORRIDORS

Primary corridor alternatives were developed mostly on the basis of potential ridership within the study area set up in the *York Region HOV/Rapid Transit Study* (1995) and *Highway 7 Corridor Transitway Environmental Assessment Need and Justification* (2002). As well, the location of the planned regional centres and the potential subway extensions in Toronto were a significant determinant in developing potential network configurations during these studies. The updated ridership analysis undertaken in the *Need and Justification* (*N&J*) study, as described in **Section 5.4**, confirmed the findings of the *York Region HOV/Rapid Transit Study (HOV/RT Study)* as to the high demand corridors in the Region.

The rapid transit network consists of three north-south corridors identified in the previous studies including the *Yonge Street Transitway Need and Justification* Study (2002). Two of the corridors are:

- Yonge Street and Highway 404 corridors in combination with sections of the GO Transit Richmond Hill and Bradford rail corridors; and
- Highway 404/ Leslie/Woodbine and Markham Road corridors south of Highways 7/407 in the east.

These two corridors are being studied separately in three concurrent EA studies, which comprise this study, the *Yonge Street Corridor Public Transit Improvements EA*, the *North Yonge Street Corridor EA*, and the *Markham North-South Link EA*.

The selection of the third north-south corridor and a primary east-west corridor in the Region is discussed in detail in the following sections.

5.1.1 Screening of Broad Transportation Corridor Alternatives

5.1.1.1 General Objectives for Corridors

In identifying the Corridor Alternatives for the east-west roads and rapid transit improvements for the southern part of York Region in the west, the following general objectives have been identified:

- Provide access to the major Regional Centres in the corridors;
- Allow access to major generators/ attractors of potential ridership, such as employment centres, hospitals, universities, community facilities;
- Service existing medium to high-density residential development;
- Provide inter-connectivity with other modes, such as the 400 series highways to promote park-and-ride;
- Facilitate network inter-connectivity with existing and planned GO Transit and TTC services;
- Promote opportunities for intensification of development or new transit-oriented development in un-developed parts of the Corridor;
- Minimize the impact on environmentally sensitive features in the Corridor; and
- Feasible implementation in potential rights-of-way.

Generally, the Corridor Alternatives could consist of different route combinations and the route options available follow the existing east-west arterial road rights-of-way, as these represent the only continuous routes along the mostly developed corridor.

The Study Area extends from Major Mackenzie Drive in the north to Steeles Avenue to the south and from the York-Peel Boundary to the west and York-Durham Boundary to the east. The CN Railway's York Subdivision represents another possible route in the entire Corridor; however, it was not included for further analysis, due to the high volume of freight traffic using the existing tracks and the incompatibility of the candidate transit technologies with the heavy rail freight traffic. Placing Light Rail Transit (LRT) in such rights-of-way requires either strengthened vehicles to withstand collision loadings or significant separation of transit and heavy rail tracks and is not generally practical in the constrained right-of-way of the York Subdivision.

5.1.1.2 Identification of East-West Corridor Alternatives

Route options for surface rapid transit have been identified on a segment-by-segment basis for the four Segments noted below. These routes are listed below and illustrated in **Figure 5.1-1**.

Most of the route options extend the full length of the Corridor in an east-west direction. Short north-south elements were included to assess the merits of transferring from one east-west route to another.

Segment 'A': York / Peel Boundary to Highway 400 (Vaughan Corporate Centre VCC)

Available route options comprise:

a) Major Mackenzie Drive
b) Rutherford Road
c) Langstaff Road
d) Highway 7
e) Highway 407
f) Steeles Avenue

Segment 'B': Highway 400 (VCC) to Yonge Street (Richmond Hill Centre / Bayview Glen)

Route options available include:

a) Major Mackenzie Drive
b) Rutherford Road / Carrville Road
c) Langstaff Road between Highway 400 and Dufferin Street
d) Highway 7
e) Highway 407
f) Centre Street between Dufferin Street and Yonge Street
g) Vaughan Corporate Centre (VCC) to York University
h) Bathurst Street between Steeles Avenue and Highway 7
i) Jane Street and Steeles Avenue
j) Steeles Avenue

Segment 'C': Yonge Street (Richmond Hill Centre/Bayview Glen) to Kennedy Road (Markham Centre)

Available route options consist of:

a) Major Mackenzie Drive

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b) Sixteenth Avenue
c) Highway 7
d) Highway 7 combined with a new right-of-way through Markham Town Centre
e) Highway 407
f) John Street - Alden Road – Fourteenth Avenue
g) Steeles Avenue and Stouffville GO line right-of-way
h) Hydro right-of-way east of Warden Ave. between Markham Town Centre and Steeles Avenue

Segment 'D': Kennedy Road (Markham Centre) to York / Durham Boundary

Route options available include:

a) Major Mackenzie Drive
b) Sixteenth Avenue
c) Stouffville GO Line right-of-way
d) Highway 7
e) Highway 407
f) Fourteenth Avenue
g) Steeles Avenue

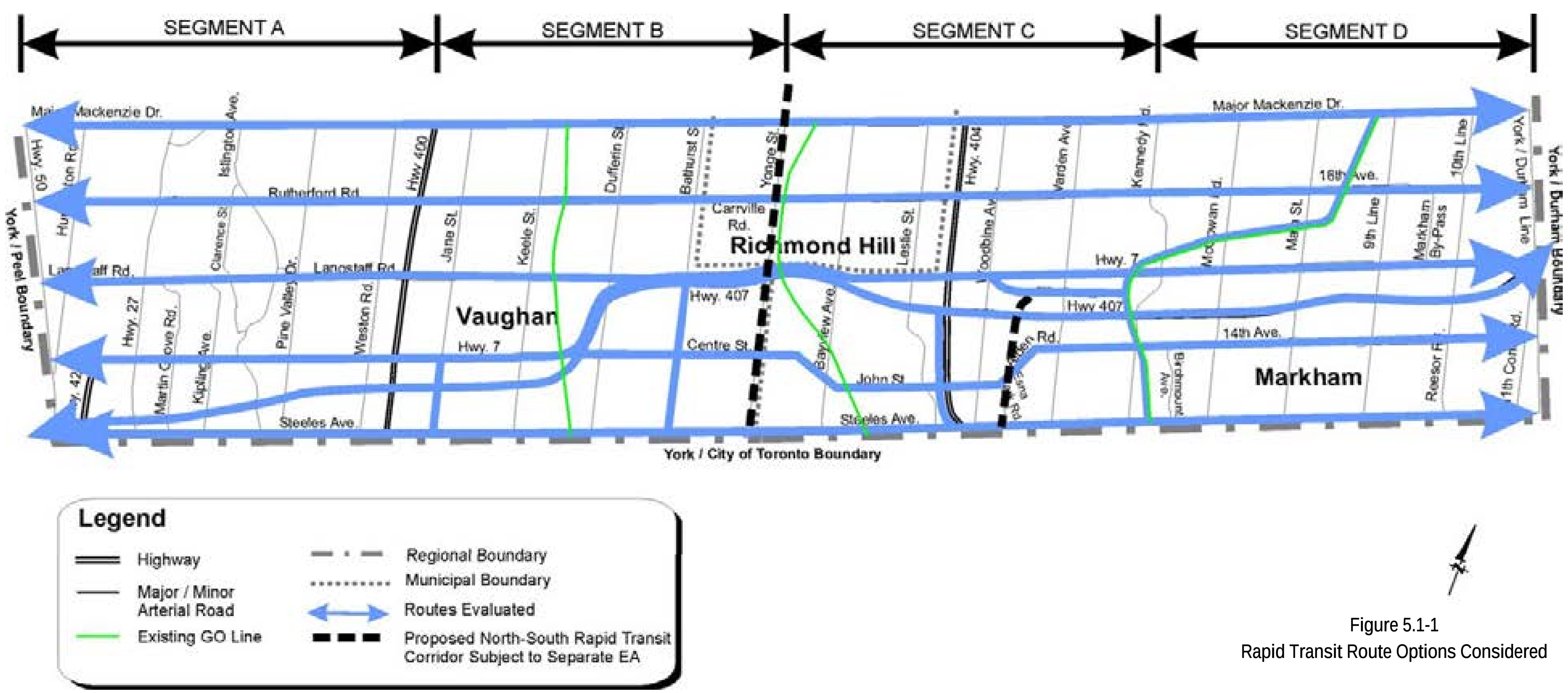

Figure 5.1-1
Rapid Transit Route Options Considered

5.1.1.3 Assessment /Evaluation of Alternative Routes

The route options listed above were assessed in terms of the general objectives noted in **Section 5.1.1.1**. An initial evaluation was undertaken to screen out alternatives that clearly would not meet the needs of rapid transit in the Corridor and/or may not be feasible due to significant community or environmental impact or unacceptable property requirements. The findings of this evaluation are presented below in tabular form in **Tables 5.1-1 to 5.1-4**, on a segment by segment basis and summarized graphically in **Figure 5.1-2**.

Table 5.1-1
Preliminary Screening of Route Options
Segment A: York/Peel Boundary – Highway 400

Table 5.1-1
Preliminary Screening of Route Options
Segment A: York/Peel Boundary – Highway 400

a)	Major Mackenzie Drive Route eliminated from further consideration	Major Mackenzie Drive provides a mostly continuous route through the segment but could not accommodate rapid transit without mitigation of impact on the Kortright Centre for Conservation at Pine Valley Dr. Also, this route would not serve any regional centre, development node or redevelopment opportunity and offers no inter-connection with GO Transit or other transit mode.
b)	Rutherford Road Route eliminated from further consideration	Rutherford Road provides a continuous route through the segment but would require mitigation of impact on the Kortright Centre property at Pine Valley Dr. Although a future GO Station is proposed where the route crosses the proposed Bolton GO line, this route serves only one regional centre (Cambridge Mills Shopping Centre), major development node or significant re-development opportunity.
c)	Langstaff Road Route eliminated from further consideration	Langstaff Road neither provides a continuous route through the segment nor serves any regional centre, major development node or significant re-development opportunity. Also, it is discontinuous in the adjacent segment.
d)	Highway 7 Route retained for detailed evaluation	Highway 7 provides a continuous route through the segment, serves both the proposed Vaughan Corporate Centre (VCC) and the proposed development node west of Highway 27. Rapid transit could be accommodated without major community or environmental impact.
e)	Highway 407 Route retained for detailed evaluation	Highway 407 provides a continuous route through the segment and contains protection for a transit right-of-way. While it would serve the proposed VCC indirectly, it is south of the proposed Highway 27 development node. Rapid transit could be accommodated without major community or environmental impact.
f)	Steeles Avenue Route eliminated from further consideration	Although continuous in this segment, Steeles Avenue serves none of a regional centre, major development node or significant redevelopment opportunity.

Table 5.1-2
Preliminary Screening of Route Options
Segment B: Highway 400 – Yonge Street

a)	Major Mackenzie Drive Route eliminated from further consideration	Major Mackenzie Drive provides a continuous route through the segment. Although it serves Canada's Wonderland, York Central Hospital and Richmond Hill GO Station, this route would not serve the proposed Vaughan and Richmond Hill regional centres. Other development nodes served or redevelopment opportunities are limited.
b)	Rutherford Road Route eliminated from further consideration	Rutherford Road combined with Carrville Road provides a continuous route through the segment and a connection to GO Transit's Bradford line near Keele St. Although this route serves the proposed Cambridge Mills Centre and the Hillcrest Mall area in Richmond Hill, it passes north of the proposed Richmond Hill Regional Centre. Most adjacent development is single family residential with limited opportunity for higher density development.
c)	Highway 7 Route retained for detailed evaluation.	Although it requires a north-south jog, Highway7 provides a continuous route in the segment. Both the proposed Vaughan Corporate and Richmond Hill Regional Centres are served and rapid transit could be inserted without unacceptable community or environmental impact. Also, it offers access to a future Bradford Line GO Station and significant land use redevelopment potential.

Table 5.1-2
Preliminary Screening of Route Options
Segment B: Highway 400 – Yonge Street

d) Highway 407 and Hydro right-of-way Route retained for detailed evaluation	The protected transit right-of-way along Highway 407 continues through the segment. Adjacent Hydro ROW is also available as a potential alignment. Although it does not serve the proposed VCC and Richmond Hill Centre directly, passing to the south, the route allows insertion of rapid transit with minimal community or environmental impact. Access to adjacent local trip generators is confined to major interchange nodes which could be problematic.
e) Jane Street and Steeles Avenue Route retained for detailed evaluation including north-south links	Steeles Avenue offers a continuous route across the segment and while it does not serve the VCC and Richmond Hill Regional Centres directly, it provides direct access to York University. North-south rapid transit links from the centres to Steeles Ave. are feasible on Jane and Bathurst or Yonge Street. The impact of inserting rapid transit between Jane and Yonge St. could be mitigated.
g) Centre Street Route retained for detailed evaluation	Centre Street is a continuation of the Highway7 ROW where it jogs northward at Dufferin Street, provides access to the Promenade Shopping Centre area and a more southern direct link to the Yonge corridor. While it is more remote from expanding communities north of Highway 7, it allows more rapid access to the Finch Subway Station. Adjacent communities are sensitive to insertion of rapid transit and effective mitigation of impacts will be required.

Table 5.1-3
Preliminary Screening of Route Options
Segment C: Yonge Street – Kennedy Road

a) Major Mackenzie Drive Route eliminated from further consideration	Major Mackenzie Drive provides a continuous route across this segment. Although it allows a direct connection to the Richmond Hill GO Station, it does not serve any regional centres and passes north of the Beaver Creek employment area. Also, it offers limited opportunity to serve future higher density development as adjacent land use is zoned as mostly lower density residential.
b) Sixteenth Avenue Route eliminated from further consideration	Sixteenth Avenue provides a continuation of Carrville Road at Yonge Street and across the segment to Kennedy Road. Although it provides access to Hillcrest Mall and the north side of Beaver Creek employment area, it bypasses the proposed Richmond Hill and Markham Centres and offers little opportunity to serve higher density re-development given the existing residential land use.
c) Highway 7 Route retained for detailed evaluation	Highway 7 is a continuous route across the segment serving the proposed Richmond Hill Centre, the Highway 404 / Highway 7 employment area and the north edge of the Markham Centre. It allows inter-connection with GO Rail at the Langstaff station and the proposed Yonge Street transitway at the same node. Direct connection at GO Unionville Station is not feasible. Higher density development opportunities exist and environmental impact would be limited to Unionville.
d) Highway 7 & new Markham Town Centre ROW. Route retained for detailed evaluation	This composite route can be made continuous and would serve the Markham Centre directly. Opportunities for higher density residential and commercial development exist and a direct connection could be made to the Unionville GO Station. Community and environmental impact could be mitigated through the Markham Centre planning process.
e) Highway 407 Route retained for detailed evaluation	The protected Highway 407 transitway right-of-way continues across this segment offering indirect access to the Richmond Hill Centre node but bypassing most of the Highway 404 / Highway 7 employment area. Community and environmental impacts of rapid transit insertion would be minimal along this route segment but access to new higher density development could be problematic.
f) John Street/Alden Road/14th Avenue Route eliminated from further consideration	This composite route is less continuous across the segment, the available right-of-way is limited and the route does not provide access to any regional centres or development nodes. Community impacts from rapid transit insertion would be significant and could be unacceptable. Inter-connection with the Richmond Hill GO Line is feasible. While adjacent land use includes some commercial, residential densities are mostly low.
g) Steeles Avenue Route retained for detailed evaluation	Steeles Avenue offers a continuous route across this segment but no opportunity to interchange with the Richmond Hill GO Line. While the adjacent land use is primarily mature low to medium-density residential, there is limited opportunity for redevelopment. The route could provide a link between Highway 404 corridor and an extended Yonge subway line.

Table 5.1-4
Preliminary Screening of Route Options
Segment D: Kennedy Road - York/Durham Boundary

a) Major Mackenzie Drive Route eliminated from further consideration	As in the adjacent segment, Major Mackenzie Drive does not serve any major traffic generating nodes such as Markville Shopping Centre or Markham-Stouffville Hospital and, in addition, is not continuous. While connection to the proposed Mount Joy GO Station is feasible, adjacent mostly low-density land use does not support rapid transit.
b) Sixteenth Avenue Route eliminated from further consideration	As in the adjacent segment, Sixteenth Ave. does not serve any major traffic generating nodes directly although it is continuous. While indirect connection to the proposed Mount Joy GO Station is feasible, adjacent mostly low-density residential land use does not support rapid transit.
c) Stouffville GO Line Route retained for detailed evaluation	The Stouffville GO Line north of Highway 7 offers an opportunity to serve existing and developing residential areas north of 16th Ave. and the Cornell Community. However, the route would not serve the Markham-Stouffville Hospital area and accommodating transit in the existing rail R.O.W. may be impractical.
d) Highway 7 Route retained for detailed evaluation	Highway 7 is continuous to the regional boundary and beyond, serves Markville Shopping Centre directly and also offers a feasible connection to the Markham-Stouffville hospital and the higher-density Cornell development. New development opportunity exists east of Ninth line on the south side of the route. Mitigation of community and environmental impacts will be necessary.
e) Highway 407 Route retained for detailed evaluation	Highway 407 continues across the entire segment and beyond into Durham Region. Access to major ridership generators such as Markville Shopping Centre and the Hospital is indirect only. N-S link to Hospital would serve Ninth Line development opportunity. Protected transit Right-of-way on Highway 407 minimizes community / environmental impact.
f) Fourteenth Avenue Route eliminated from further consideration	Fourteenth Avenue, although continuous across the segment, is remote from major ridership generators. The adjacent land use is mainly low-density residential or commercial. Some community and environmental impacts may be unacceptable.
g) Steeles Avenue Route eliminated from further consideration	Steeles Avenue, although continuous across the segment, is remote from major ridership generators. The adjacent land use is mainly low-density residential or recreational. Some community and environmental impacts may be unacceptable such as the Rouge Valley Park.

5.1.1.4 Short-List of Rapid Transit Corridors with Route Options

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Based on the segment-by-segment assessments presented in **Tables 5.1-1 to 5.1-4** inclusive, a short-list of rapid transit corridors with route options was identified for further assessment in the second step in the alternatives analysis process. The short listed corridors, namely Highway 7 Corridor and a Vaughan North-South Link, are shown on **Figure 5.1-2** and summarized below:

Segment 'A': York/Peel Boundary – Highway 400

- Highway 7
- Highway 407.

Segment 'B': Highway 400 to Yonge Street

- Highway 7
- Highway 407/Hydro Right-of-Way
- Jane Street and Steeles Avenue to create a Vaughan North-South link from the Vaughan Corporate Centre (VCC) to York University (the third north-south corridor)
- Centre Street between Highway 7 and Bathurst St. returning north to Highway 7 on Bathurst St.

Segment 'C': Yonge Street to Kennedy Road

- Highway 7
- Highway 7 with a diversion through the planned Markham Centre
- Highway 407
- Steeles Avenue linking Don Mills Subway Station to the Markham Centre (confirming the *HOV/RT Study* for the proposed Markham North-South Link Corridor)

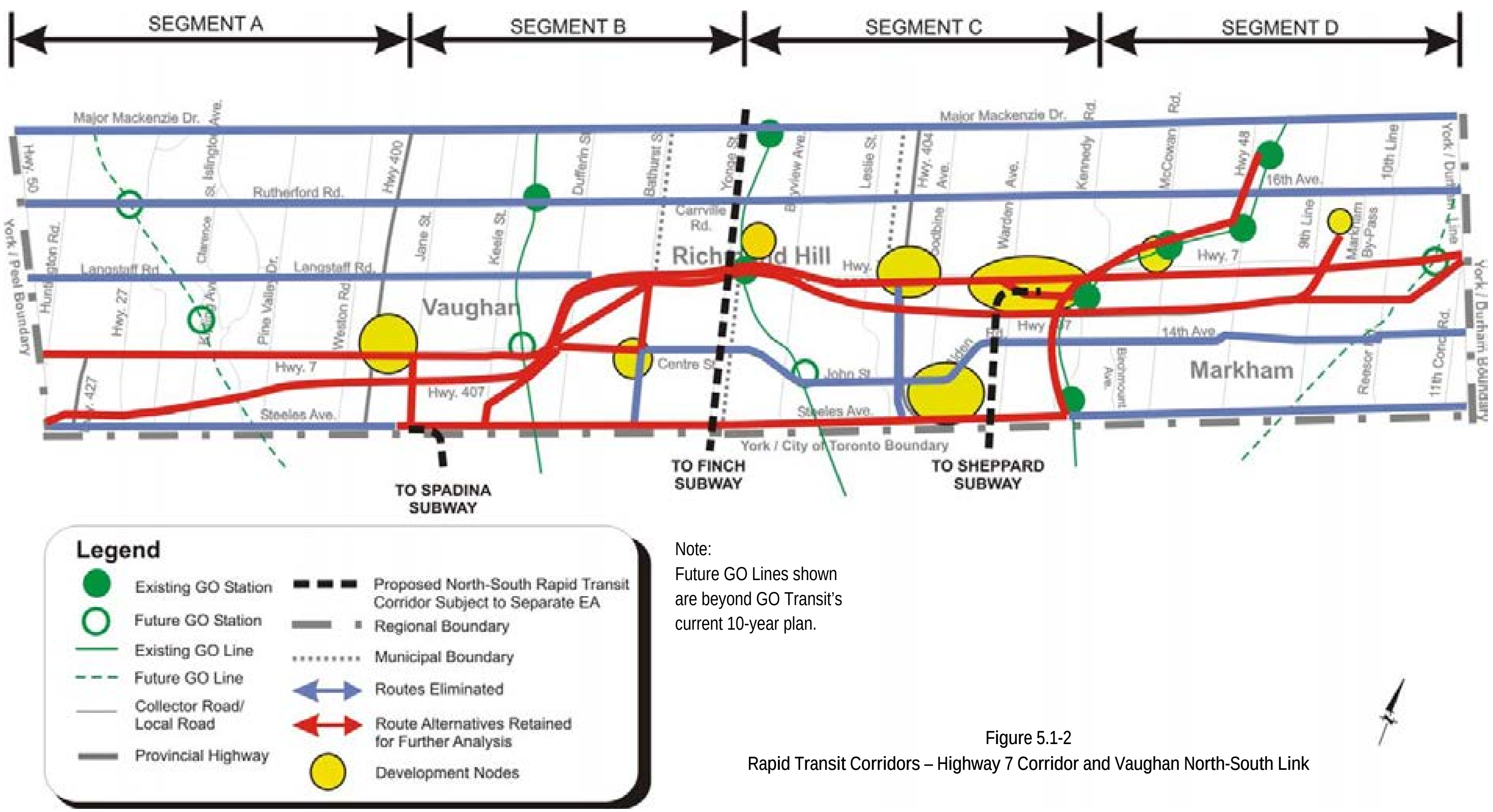

Figure 5.1-2
Rapid Transit Corridors – Highway 7 Corridor and Vaughan North-South Link

Segment 'D': Kennedy Road to York/Durham Boundary

- Highway 7
- Highway 407
- Stouffville GO Line north of Highway 7

Highway 7 Corridor and Vaughan North-South Link will be carried forward as two of the corridors considered in the rapid transit network analysis in **Section 5.2.2** in order to assess the technology alternatives.

The analysis to select a preferred route within the combination of the subject corridors is described later in this chapter in **Section 5.3**. Using existing transportation corridors such as these mitigates the impact of new rights-of-way on existing and planned development in the highly urbanized portions of the study area.

5.2 RAPID TRANSIT TECHNOLOGIES

There are seven primary categories of transit technology that should be considered in developing a response to the need for rapid transit in the Highway 7 Corridor. While there is a much larger variety of vehicles and right-of-way conditions in the public transit arena, generally, the technologies can be grouped into the categories listed below.

- Conventional Bus Service;
- Bus Rapid Transit;
- Light Rail Transit;
- Automated Light Rail Transit – a version of the Automated Guideway Transit;
- Commuter Rail - diesel locomotive-hauled or multiple units; and
- Subway - heavy rail electric technology.

Moving down the list, the technologies require a greater degree of physical separation from adjacent traffic and land use, but as a result, provide a higher quality of service and ridership capacity. As with many technology choice decisions, the preferred solution for any given corridor will be a trade-off between several factors. Cost and exclusivity of right-of-way will be balanced against implementation flexibility and long-term capacity (ridership) requirements.

Each of the technologies was described and assessed by considering four major areas: vehicles, station stops, right-of-way requirements and implementation issues. An outline of the respective characteristics of each option follows is presented in the next section.

5.2.1 Characteristics of Rapid Transit Technology Alternatives

5.2.1.1 Conventional Bus Service

This technology option can best be described as the status quo. A fleet of conventional transit buses would operate on one or more east-west routes, in mixed traffic, providing an increased level of service in the corridor. Facilities at stops could be upgraded to provide a more visible service, but the existing roads would provide the operating rights-of-ways.

Vehicles

This option would use a fleet of conventional transit buses. They could be the standard 9 - 12m length or articulated 18m length buses and may be combined with smaller buses for segments of the corridor where demand is lower. Modern, low-floor buses would likely be used to increase accessibility of the service to all segments of society.

Vehicle capacity ranges from 60 - 80 passengers with approximately 40 seats. Average operating speed in mixed traffic is usually scheduled at 15 - 18 km per hour, including stops. Hourly passenger volumes depend on scheduled headway and size of vehicles, with 2 - 3 minute service, as an example providing a potential capacity of 1,200 - 2,400 passengers per hour per direction. This capacity is often provided incrementally by buses entering the corridor from neighbourhood circulation at various points along the route. High volume corridors with several feeder routes can result in peak hour volumes of 5,000 - 6,000 passengers in the peak direction after buses have merged in the corridor and operate at headways of less than one minute.

In some applications, the buses are given a distinct livery and operate exclusively on the route for which they are designed.

Station Stops

Existing bus stops combined with enhanced bus stops could be used to provide access to the system. Bus shelters and expanded bus waiting areas would be provided at higher use stops.

Distinct shelters, benches, stop treatments, lighting, colours, banners or poles can also be used to highlight or brand the service. A consistent approach would be used at all stops along the corridor to define the system.

Right-of-Way Requirements

Right-of-way requirements are minimal, as the vehicles would operate on existing roadways within the existing road allowance. Some additional land may be required at station stops. Minor lane additions for bus bays and queue jump lanes would be required to allow skip-stop and express bus operation but, generally, this option uses the existing road allowance.

Implementation

Implementation is relatively easy if buses were chosen as only improved bus stops and an augmented fleet are required to initiate a new service. More elaborate station stops could be installed as and when needed. Vehicle procurement would follow the traditional timeframes, with the potential to use existing buses on the route in the interim if immediate, staged implementation was required. Priority signal systems or other congestion reducing measures could enhance service reliability thus promoting ridership growth.

Overall Assessment

This option provides flexibility and ease of implementation, but is constrained to the level of service of conventional transit. Improved frequencies and definition of a distinct service can be provided, but service reliability and speed will continue to be congestion-dependent as buses will operate, for the most part, in mixed traffic.

5.2.1.2 Bus Rapid Transit (BRT)

This technology category consists of the operation of conventional transit vehicles, or purpose built rubber-tired vehicles, or both, on an exclusive or partially exclusive right-of-way to provide a higher quality rapid transit service than conventional bus service, nearer to that of high speed rail-based systems.

Commonly known as a Transitway or Bus Rapid Transit (BRT), this option provides a travel time advantage over conventional bus service by removing the transit vehicles from general traffic over all or part of the route. However, the services may still be subject to delays at intersections that are not grade-separated.

At the same time, the use of conventional buses allows for route interlining. Local routes are circulated through neighbourhoods and then enter the transitway for a direct connection to major centres along the rapid transit corridor. This flexibility reduces the need for transfers and provides a convenient, higher speed trip along the transitway route.

Guided BRT is a variation of this technology that has been under development over the past decade but is only now being pursued as an intermediate capacity lower cost alternative to rail-based rapid transit. Its primary feature is the guidance of rubber-tired vehicles by various means to achieve a segregated right-of-way of minimum width combined with the flexibility to operate unguided on normal road pavements away from the transitway or guideway.

Examples in service include the German O-Bahn system in Adelaide, Australia; Bombardier's single-rail electric GLT vehicles in French cities and Civis optically-guided articulated buses in Rouen, France and Las Vegas. Conventional buses fitted with horizontal guiding wheels are operating on short constrained segments on German transit networks such as in Essen and in Leeds, UK.

Vehicles

Since this technology is based on a paved right-of-way (transitway), conventional transit vehicles of all sizes can be used in addition to purpose-built, larger rubber-tired vehicles. The latter are evolving as "tram-like" low-floor streamlined vehicles with either diesel, electric or hybrid propulsion. While conventional vehicles can join the transitway after circulating through adjacent neighbourhoods, the purpose-built vehicles are generally used for line haul services on the transitway itself.

As the transitway is a separate roadway, longer double articulated buses are used in some cities in Europe and South America to provide a higher capacity line haul service. Vehicle capacity ranges from 60 - 80 passengers for conventional buses to 100 - 130 passengers for articulated and purpose-built buses depending on length.

Guidance systems offered include a central, retractable steel wheel guided by an embedded steel rail, raised curbs guiding small horizontally mounted rubber wheels and more recently optical or magnetic guidance by strips in the centre of the roadway. Optical guidance, as currently offered, requires measures to keep guidance markings exposed on the pavement in a winter environment. Propulsion for the purpose-built vehicles can be either diesel-electric, overhead electrification or a hybrid of both.

On a completely separate right-of-way, average speeds of 20 - 35 km per hour, including stops, can be achieved. Speed reduces as the level of separation from general traffic is decreased, such as through signalized intersections. Transitway capacity ranges from the upper end of conventional bus transit, about 4,000 up to 12,000 passengers per hour, if vehicles are operated at headways less than a minute.

Station Stops

Formal stations at key locations along the route are provided. Station spacing (0.8 - 1.5km) is generally larger than for mixed traffic bus operation, and would be focused at major cross street intersections and at major trip origins and destinations.

Station stops on systems using guided BRT technology are generally similar to the range found on un-guided BRT systems. One main difference is that provision to overtake is not often provided as these systems are operated more like light rail systems. Another rail-like feature is the ability to load and unload at platforms with a small clearance due to the guidance system allowing more precise docking. The stations can vary from simple curb-height platforms and shelters to more elaborate enclosed, intermodal facilities with fare pre-payment, park-and-ride and feeder bus transfer areas.

The stations can range from shelters on simple curb-height platforms, to large inter-modal transfer stations at key locations with park-and-ride lots and passenger pick-up/drop-off facilities. Transitions for vehicles to enter or leave the transitway are included at strategic locations. Facilities at stations are aimed at a high level of convenience and comfort with enclosures providing more protection from the elements. Equipment to allow fares to be paid before boarding should be included to reduce boarding time and a consistent design philosophy reinforces the transitway concept to enhance public recognition and perception of the overall service.

Right-of-Way Requirements

Transitways for BRT can be developed in a variety of ways depending on the local road network and the right-of-way available. They can comprise:

- Shoulder lanes of a highway;
- Physically separated lanes in the median or along one or both sides of an existing road; and
- A separate road right-of-way accessible only to transit vehicles.

The key objective in developing a BRT transitway is to provide a separate lane or roadway for the transit vehicles to improve average operating speed and increase service reliability. Typically, a width of 10 - 12 metres is required to develop a segregated bi-directional transitway allowing for drainage and separators, such as landscaped median islands or rumble strips. At stations or stops a larger right-of-way is needed to accommodate platforms (approx. 3 - 4 m wide) and passenger accessways. If the operation assumes that express service will overtake local service at stations, a much larger local right-of-way, up to 16 m, may be needed for stopping lanes each side of the through lanes.

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Transitways can cross major streets at new or existing intersections. Priority measures to reduce transit delays are often incorporated to assist in keeping average speeds high.

Usually, the right-of-way for guided systems is fully segregated. However, in the case of systems with single rail, optical or magnetic guidance, the guideway can cross street intersections at grade. At-grade intersections are also possible with curb-guided systems if a transition section can be developed each side of the crossing. The guidance system permits a narrower right-of-way of between 7.5 and 8 metres in width including a separator treatment. If overhead electric propulsion is used, poles to support the catenary system must be installed in the right-of-way or the system must be supported by suspension from lighting poles.

Implementation

Given the range of right-of-way types noted above, implementation of a BRT system offers significant design and construction staging flexibility. The infrastructure along a corridor can be implemented in segments with progressively greater segregation from general traffic as the demand increases. Also, a fully segregated segment can be operated with partial-segregation or mixed traffic sections each side permitting staged investment in the implementation of the facility. However, a certain minimum investment must be made to achieve a noticeable impact on transit travel times and to attract the travelling public to any new transitway service.

Guided rubber-tired systems also permit some flexibility in staging of their implementation if diesel-powered vehicles are used and they are suitable to operate in non-guided mode in conventional reserved bus lanes. This would allow implementation by segment along the corridor. However, if electric vehicles were adopted, the optimal minimum length of guided segment would be in the 7 - 10 km range to justify the investment in infrastructure and more costly vehicles.

At this time guided technology has not been operated in North America although a demonstration project in Las Vegas is planned to go into service in 2004. Also, the city of Eugene in Oregon is planning a system based on this technology.

Overall Assessment

While the primary attraction of BRT technology is the implementation flexibility discussed above, there are two principal concerns expressed in the industry. These are firstly, that the technology is not sufficiently innovative and comfortable to encourage a major shift to transit by choice patrons, and secondly, that the infrastructure is not perceived as permanent enough to be a catalyst for major transit oriented development and commercial investment.

In many people's minds it is still just a bus service regardless of the improved frequency, travel time and convenience. Nevertheless, Ottawa's significant investment of $680 million, in current dollars excluding vehicles, has over the past two decades produced a well-utilized, showcase system in the North American transit industry. Also, Ottawa operates only conventional standard and articulated buses as their transitway vehicles.

Guided BRT technology offers an interesting compromise between bus-based rapid transit and LRT variants in that it can operate in both guided and non-guided mode and the vehicle design is more representative of rail vehicles such as streetcars. These features offer more implementation flexibility than rail as well as overcoming the negative perception of bus transit by some potential riders with choice.

While the technology inherently shows potential as a cost-effective and attractive option, the lack of an extensive in-service record, particularly in a climate such as in Canada, adds an element of risk in considering its suitability for York Region.

5.2.1.3 Light Rail Transit

Light Rail Transit (LRT), has evolved from the electric streetcar or tramway systems operated in the mid to late 1900s. In its current form, it usually comprises electric rail vehicles operating singly or coupled to form short trains on a partially or fully segregated right-of-way.

Generally, the trains operate independently of other traffic except where intersections are crossed at-grade. The electrification is mostly an overhead catenary system allowing safe operation through such intersections and parallel to other traffic lanes. Being a fixed guideway steel-wheel on steel-rail technology, LRT requires that passengers transfer from feeder bus routes, necessitating inter-modal transfer stations at key locations to pick up and drop off passengers.

Vehicles

Most LRT vehicles are electric, although a few diesel-propelled variants are now becoming available, primarily for use on existing or converted railway lines. Modern LRT vehicles are designed to carry 120 - 170 passengers, with a seating capacity of 45 - 70, and have low floors over 70 - 100% of their length.

As the system ridership increases longer trains of 3 or 4 cars can also be operated to maximize capacity. Multi-unit trains can carry 600 - 650 passengers in standard configurations and can also be separated to allow for single or dual vehicle operation in off-peak hours. This flexibility allows passenger capacity to be tailored to ridership without introducing extremely wide intervals between trains (headways).

Many newer LRT vehicles are substantially larger than the traditional streetcar. The vehicles have operating cabs at both ends to allow for bi-directional operation and can be as large as 2.8 m in width and 29 m in length. Vehicle construction is now based on the assembly of modular body units that are articulated to allow the trains to negotiate sharper curves in the street network.

Where LRT can operate in a separate right-of-way, average speeds of 20 - 50 km/hr are possible depending on station spacing and intersection priority. High levels of reliability can be achieved.

Station Stops

Station stops are generally spaced more widely than for bus or transitway systems. In commercial centres, stations can be 400 - 600 metres apart, with the spacing increasing along less densely-developed portions of the line. Typical suburban stop spacing can be in the 800 - 1,000 m range, wider if necessary.

Platforms at the stations are generally matched to the height of the vehicle floor. The current generation of LRT vehicles is being designed with low floors, which allow for easy passenger movements and low platform station stops. Where high floor vehicles are used, high platforms are desirable or steps on the vehicle can be used to board and alight. A few vehicles have the potential to operate at both high and low platform station stops, but generally all stops in the system are set to the same platform height. This can be a design constraint on the system.

Stops can comprise simple curb-height platforms and shelters or more elaborate enclosed, intermodal stations with facilities for transfer from feeder buses and park-and-ride.

Right-of-Way Requirements

LRT requires an 8 - 10 metre wide right-of-way. Generally, it is separated from parallel traffic by a physical barrier such as a curb or curb and railing treatment. In many cases perpendicular roadways are crossed at-grade with signalized intersections through which the LRT is often given signal priority when headways permit.

Since overhead electric propulsion is used, poles to support the catenary system must be installed in the right-of-way or the system must be supported by suspension from lighting poles. In some key locations, the LRT may be grade separated from the road traffic to improve intersection function or to provide access to a multi-modal station. The grade separation can be either overhead or below grade.

Right-of-way along rail lines requires additional space for safety clearances. Operation along existing railway lines requires complete separation of freight traffic and LRT traffic. Normally, LRT vehicles do not comply with railway impact loading requirements. Where LRT service shares existing rail lines, LRT operation is restricted to hours when no freight traffic is allowed on the line.

Implementation

LRT is usually implemented in stages after an initial operating segment is in service. The initial operating segment is generally at least 8 - 10 km in length to make the initial investment viable. This segment must also be connected to a storage and maintenance facility that is required to support the line. These operating considerations make the initial capital cost relatively high.

Expansion of LRT systems can proceed in segments as short as a single station, but most are expanded in longer segments sometimes with intermediate partial openings for revenue service. This is done primarily to minimize mobilization costs associated with starting and stopping construction activity.

Overall Assessment

Light rail transit has, over the past three decades, emerged as a cost-effective solution for corridors where the travel demand may never reach levels that justify the high capital investment necessary for subway or high capacity, fully- segregated, automated systems. Experience in medium-sized cities, such as Calgary, has shown that incremental development of a network over ten or more years can provide the backbone of an attractive, efficient rapid transit system. Calgary's 3-line, 29 km network, now being expanded, was constructed in the eighties for $860 million, in current dollars including vehicle costs.

5.2.1.4 Automated LRT

The primary consequence of implementing automated LRT (ALRT) systems such as those in Vancouver, Scarborough and Lille, France is that the automated driverless (in most cases) operation requires that the rail right-of-way be totally separated from other traffic over its entire length. This implies the need for significant investment in initial infrastructure to grade separate the system from all roads crossing the right-of-way. Vancouver's elevated Skytrain is an example as is Scarborough's use of part of the segregated GO Stouffville line right-of-way with grade separated crossings.

On the other hand, a major benefit of the larger initial investment is the ability to expand the capacity of these systems to subway capacity levels by increasing the frequency of the trains under automatic control without major unit operating cost increases.

Automated LRT systems have electric propulsion and additional equipment on the vehicles and along the tracks to achieve computerized automatic train control. In some automated systems all functions are controlled by the remote system including door operation.

Vehicles

Automated LRT vehicles also use electric propulsion; however the fully segregated secure right-of-way allows the power to be distributed to the vehicles by a third rail at track level. The addition of communications and computer systems to control and regulate operations reduces the size of driver cabs, but requires a larger central control facility for the system.

Vancouver's new vehicles comprise a permanently coupled two-car vehicle with an overall length of 34.7 m and a capacity of 250 passengers. With trains consisting of two vehicles operated at 1.5 minutes headways, system capacities around 20,000 passengers per hour per direction are possible.

Station Stops

Station stops are generally spaced more widely than for transitway or conventional LRT systems. In the CBD, or commercial centre, stations can be 500 - 800 metres apart, with the distance increasing towards the ends of a line. Typical suburban spacing can be in the 1 - 1.5 km range, wider if necessary.

Platforms at the stations are generally matched to the height of the vehicle floor. The current generation of ALRT vehicles is being designed with high floors, requiring high platform station stops. Stations tend to be more elaborate, often elevated to accommodate the fully grade separated right-of-way and with circulation facilities for the larger ultimate system passenger capacity.

Right-of-Way Requirements

ALRT requires a 7.5 - 9 metre wide right-of-way. Generally it is elevated or, if at-grade, separated from parallel traffic by a physical barrier. In all cases the right-of-way is grade-separated from perpendicular roadways. Computerized control systems can react to intrusions into the track area, and can handle the passenger interface issues, but they are not sufficiently advanced to handle interaction with other vehicular traffic.

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Implementation

ALRT is usually implemented with an initial operating segment of at least 8-10 km in length and often much longer. This segment must also be connected to a storage and maintenance facility to support the line. Vancouver added short extensions to the initial 18 km line and is nearing completion of a second major line in excess of 10 km. The need for full segregation precludes interim operation with partial segregation beyond an initial segment.

As with LRT systems, expansion of ALRT systems can proceed in segments as short as a single station, but they are often expanded in longer segments with intermediate partial openings for revenue service. This is done primarily to minimize high mobilization costs associated with starting and stopping construction activity.

Overall Assessment

Automated LRT offers significant benefits if the high initial investment can be recovered by carrying large passenger volume growth in the mid to long-term periods of the system life. In corridors where peak demand is unlikely to ever exceed 10,000 - 15,000 passengers per hour, the investment cannot be justified despite reduced operating costs achieved by using centralized control for driverless train operation.

5.2.1.5 Commuter Rail

North-south GO Transit service provides an example of the commuter rail technology in York Region. A new commuter rail service would have similar operating characteristics and would require a dedicated corridor designed to standards similar to the existing rail corridors. This would limit the route opportunities and result in a limited service with wide station spacing.

The only east-west rail line existing near the Highway 7 corridor is the CN York Subdivision that parallels the Region's southern boundary south of Highway 407 for most of the corridor. Being CN's main east west route through the GTA it carries significant freight traffic to and from their major McMillan yard in Vaughan. Consequently commuter service could not be added to this line without adding tracks and grade separations with the north-south GO lines.

Also, commuter rail technology is generally used to carry large volumes of passengers to a central work zone on a limited stop fixed schedule as opposed to the local intra-regional role envisioned for rapid transit in the Highway 7 corridor.

Passenger volumes on commuter rail lines are heavily dependent on the frequency of service, which also contributes to its limited effectiveness.

Vehicles

Generally operated on freight or mixed freight/passenger rail corridors, the vehicles are typically full-sized rail cars. Many systems now use bi-level cars in the order of 26 metres (85 feet) long.

Commuter rail vehicles are incompatible with low platforms, especially where accessibility issues are concerned. The "heavy rail" design of the current GO train vehicles is typical of North American commuter rail vehicles, generally pulled by diesel locomotives. In Europe, there are now vehicles available that are self-propelled, diesel or electric multiple units. Ottawa's demonstration project is using an example of these regional rail vehicles supplied by Bombardier. These 48 m long units have a capacity of 285 passengers.

Station Stops

Station stops are generally spaced at 2 - 3 km intervals. The stops are often multi-modal with parking and bus access to collect passengers from local neighbourhoods. The larger vehicles and longer trains imply a larger passenger load which in turn requires larger stations to accommodate passenger movement.

Right-of-Way Requirements

Commuter rail requires an exclusive right-of-way with limited level crossings. Signalized gates control all crossings where rail traffic takes priority over road traffic. Rights-of-way are generally a minimum of 20 m wide to accommodate side slopes from the track grading.

There are also geometric limitations to commuter rail facilities. Railways require a relatively flat track profile and space for large radius curves. These limitations are especially challenging in built-up urban corridors.

Implementation

Similar to LRT and other rail-based systems, an initial operating segment is usually implemented, with incremental expansion after that. The high cost to construct the right-of-way and maintenance and storage facilities would require a significant length of 15 - 20 km for the initial operating segment. Most new commuter rail services are implemented on existing under-utilized freight rail lines.

Overall Assessment

As noted above commuter rail technology is usually adopted for long haul inter-regional services primarily to move large volumes of passengers commuting to major employment centres in CBDs. Its use in the Highway 7 corridor is not compatible with the objectives for rapid transit in the corridor and would only make sense as an east-west feeder line to existing north-south commuter rail corridors.

5.2.1.6 Subway

Subway or heavy rail rapid transit technology is traditionally adopted for congested, densely-developed urban corridors or to carry large volumes of passengers to major CBDs. In most cases the high cost underground solution is employed when space for a surface right-of-way is not available. As with automated light rail, establishing a fully segregated right-of-way allows the use of longer trains at close headways giving a high capacity, high-speed system such as the Toronto or Montreal systems.

Vehicles

The longer trains, operating mostly in tunnels with larger radius curves, lead to the general use of rigid body multi-door subway cars with high floors. Most subways are steel wheel on steel rail systems, the exception being the Montreal and French rubber-tired systems. The underground system necessitates electric propulsion with power usually distributed by third rail. Trains generally comprise a combination of motorized and trailer vehicles with widths often exceeding 3 m to provide higher capacity than LRT vehicles.

Station Stops

The fully segregated underground or depressed right-of way results in complex, costly stations with long platforms and access elements for large volumes of passengers. In the past, platforms have been high-level to provide access at vehicle floor level.

Passenger circulation usually requires a concourse with fare-paid zone and often, an extensive stair/escalator system depending on station depth.

Feeder bus platforms and park-and-ride facilities are also needed at many stops.

Right-of-Way Requirements

As subways are generally underground, the right-of-way width required is dependent on the method of tunnel construction. Cut-and-cover tunnels usually require a width of 12 - 14 m on the surface while twin bored tunnels occupy 18 - 20 m at the mid-height of the tunnel. Tunnels must allow a minimum cover of about 3 m to permit the crossing of utilities.

The alignment required for high-speed subway operation generally consists of curve radii exceeding 300 m and profile grades of less than 3.5%.

Implementation

Given the established TTC subway network in the Toronto area, any further implementation of this technology would almost certainly entail an extension of the existing Yonge and Spadina lines using compatible technology. The Sheppard Subway project provides a recent example of the investment needed to expand the subway network in North Toronto. This project required a capital cost of close to $150 million per km, including underground stations and rolling stock.

Surface extension of this heavy-rail technology would lower the cost significantly but developing a right-of-way would add considerable property acquisition cost and could result in unacceptable environmental impact.

Overall Assessment

The high initial investment cost for subway technology is justifiable only in corridors with high line-haul ridership potential or as short extensions of an existing line. Extension of the TTC's Yonge and Spadina lines northward to the Highway 7 corridor has merit but further use of this technology as intra-corridor transit does not seem appropriate given the urban form, land use and trip generating potential.

5.2.2 Screening of Alternative Technologies

The previous section outlined the key characteristics of the six technologies that could be considered for the Highway 7 corridor. This section will provide a comparative evaluation of the technology alternatives to assess their applicability for the Highway 7 corridor or segments thereof.

As noted earlier on this chapter, conventional bus service reliability and speed will continue to be congestion-dependent as buses will operate, for the most part, in mixed traffic. Hence, this alternative is not considered as a suitable public transit improvement.

High capacity ALRT cannot be supported by existing and planned development density and dispersion of nodes throughout the corridor despite the plan for a major regional centre in Markham. Further, visual intrusion of the elevated ALRT guideway would be problematic in residential or other sensitive zoning and could not be mitigated. Therefore, ALRT is not considered as a suitable public transit improvement.

Commuter rail technology was eliminated from further consideration because its primary purpose is long-haul inter-regional service with wider station spacing to minimize travel time for long distance commuters. This function is not compatible with the role defined for rapid transit in the Highway 7 Corridor.

As a result of this screening, for the comparative evaluation only three of the six alternatives are assessed to establish their applicability in the Highway 7 Corridor.

5.2.2.1 Alternative Technologies

Candidate technologies for rapid transit in the Highway 7 Corridor identified earlier in this chapter of the report include bus rapid transit (BRT), light rail transit (LRT) and, as an ultimate phase, for the Vaughan North-South Link, heavy rail in the form of a Spadina Subway extension. As noted in **Section 7.2**, all alignment alternatives developed for consideration meet the design criteria for both of the surface technologies, BRT and LRT. In addition, prior studies have identified subway alignment options meeting the TTC System's design criteria.

The transit ridership forecasts for the planning period to horizon year 2021, described in **Section 4.3.1**, indicate that the peak direction passenger volume per hour at the peak load point in the corridor, 2,600 at Markham Centre, can be carried by both surface technology options. Therefore, within the study area, system capacity alone will not dictate technology selection during the planning period. Reliability of operations within congested portions of the corridor will become a major consideration.

5.2.2.2 Evaluation of Alternative Technologies

In order to assess the merits of various applications of the two surface rapid transit alternatives, BRT and LRT, a Rapid Transit Network Configuration Analysis was undertaken to ensure that the findings of EA's for each corridor in the network support a comprehensive and coordinated network of rapid transit lines and technologies. This analysis was undertaken prior to making final recommendations in any single corridor, recognizing that decisions on investment and operations in one corridor will have impacts on the others and the network as a whole. However, within Toronto it was assumed that subway extensions to York University and eastward from Don Mills Road to Scarborough Town Centre would be in service by 2021.

The analysis summarized below focused on the relationships between the corridors, examining the degree to which decisions on technology, routing and termini in each corridor will influence, and in turn, was influenced by decisions in the other corridors.

After an initial screening and assessment of the effects of various Toronto Subway System extension options, the six network alternatives shown in **Figures 5.2-1 to 5.2-6** were compared. For the network evaluation, two sets of criteria were developed, one allowing a quantitative assessment and the other a qualitative comparison. The evaluation comprised analysis of the alternatives in terms of both sets with the combination forming the basis for selection of the preferred technology. Criteria used were the following:

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5.2.2.2.1 Quantitative Criteria

- Capital cost (total cost of infrastructure and vehicles for full length of route);
- Operating and maintenance costs (annual cost to operate service required for projected demand in 2021);
- Ridership to be carried (link volume at the maximum load point in the peak hour, peak direction and the total incremental daily riders on the rapid transit network over and above the baseline alternative, bus service in mixed traffic with some signal priority).

5.2.2.2.2 Qualitative Criteria

- Network connectivity with each technology alternative (direct connections with other GTA operators and modes, service to logical termini, ability to provide direct service to most important markets);
- Quality of service provided by each technology alternative (expected total O/D trip times for key markets, speed and reliability at forecasted demand levels, proportion of service and ridership under conditions approaching capacity of alternative);
- Influence of technology alternative on land use (Smart Growth potential at planned station locations, ability to influence development along route);
- Effect of technology on environment (significant natural, social and heritage environmental issues);
- Risk of technology choice (implementation time and difficulty, flexibility to address changes in expected markets, investment risk if system is upgraded/ expanded or unexpected changes occur).

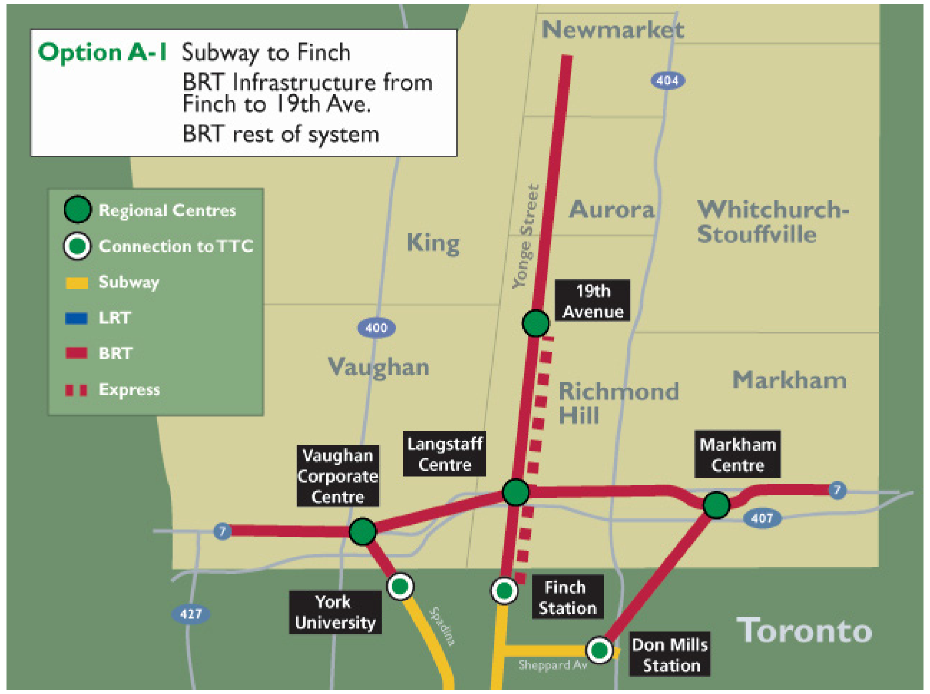

Figure 5.2-1
Option A-1 Subway to Finch BRT Infrastructure from Finch to 19thAvenue

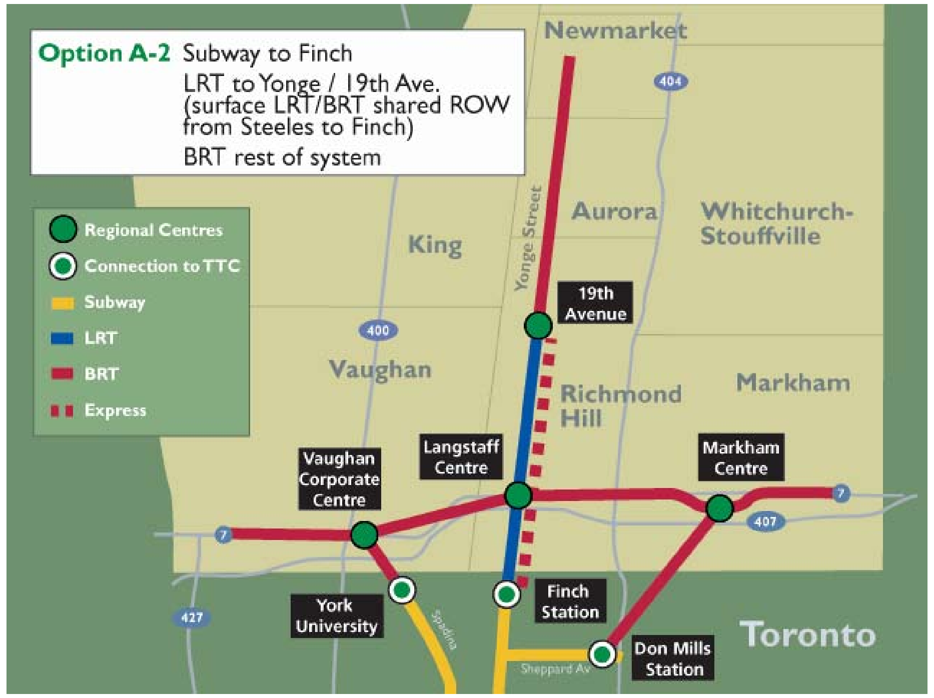

Figure 5.2-2
Option A-2 LRT to Yonge Street / 19th Avenue

Figure 5.2-3
Option A-3 LRT to Yonge Street / 19th Avenue

Figure 5.2-4
Option B-1 Subway to Langstaff

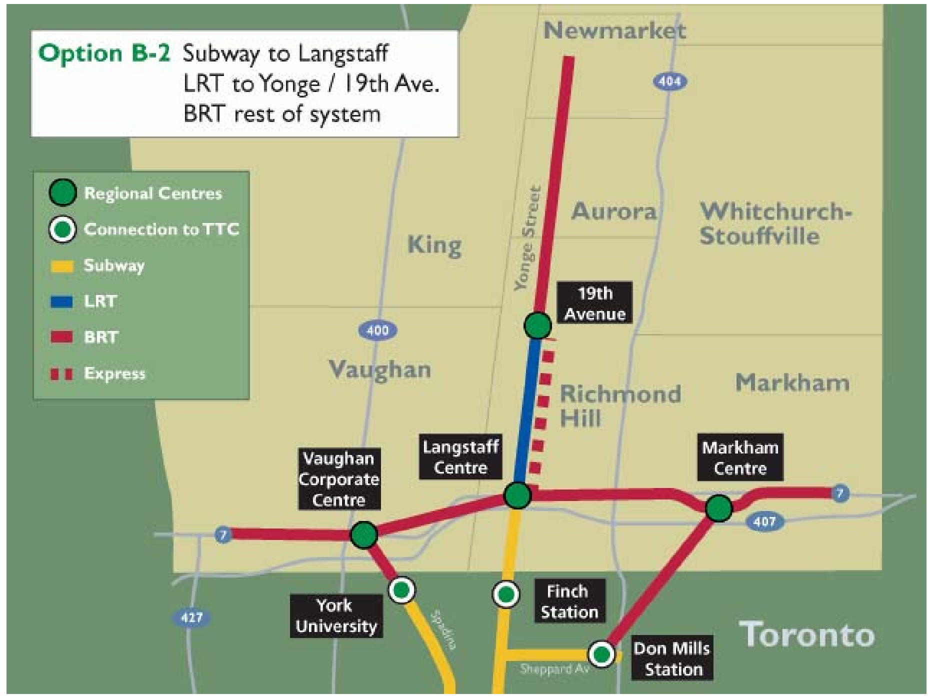

Figure 5.2-5
Option B-2- Subway to Langstaff

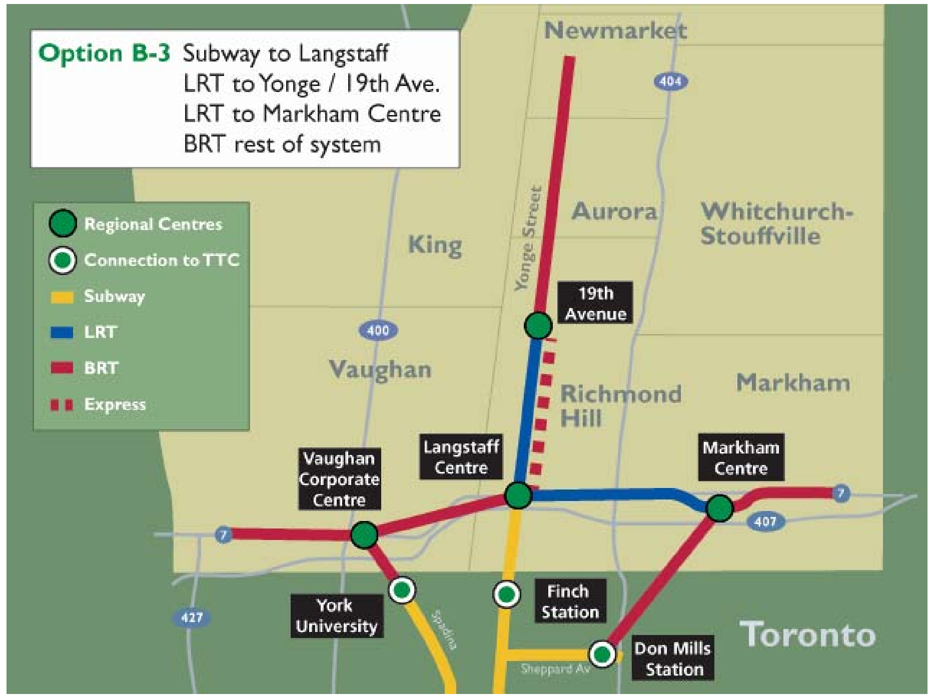

Figure 5.2-6
Option B-3- Subway to Langstaff

Also, assuming the Yonge subway terminal remains at Finch Station, the study assessed the practical capacity of the existing and planned facilities for BRT and LRT alternatives between Finch and Steeles Avenues. It was determined that operating BRT and LRT vehicles in a shared right-of-way between Finch and Steeles Avenues was feasible, but would require reconfiguration of transit access to Finch Station. An allowance for this cost was included in the evaluation of capital cost estimates of both technology alternatives.

At this time, it is not possible to be more specific concerning infrastructure modifications at Finch Station to accommodate the significantly increased service levels expected in the future (e.g., a BRT or LRT ramp into the terminal or tunnel section). The need for, and nature of, modifications will depend on the conclusion of the transitway EA currently being carried out by the City of Toronto on the portion of Yonge Street between Steeles Avenue and Finch Station.

The results of the network evaluation are summarized in **Tables 5.2-1 and 5.2-2**. Actual numerical data reflect the relative merits of the alternatives for the quantitative criteria while, for the qualitative criteria, the alternatives have been assessed in terms of their response to the goals of each criterion. Findings are presented graphically depicting the rating incrementally from least desirable to most desirable.

Table 5.2-1
Evaluation Matrix (Quantitative)

	Baseline	A-1	A-2	A-3	B-1	B-2	B-3
Capital Cost (millions)	$525	$1,056	$1,800	$2,000	$2,700	$3,030	$3,230
Capital Cost in Region (millions)	$35	$35	$60	$60	$400	$400	$400
Annual O & M Cost (millions)	$72.5	$102	$99	$96.5	$108.5	$107.5	$104
Additional System Riders	N/A	30,000	30,000	30,000	42,500	42,500	42,500

Table 5.2-2
Evaluation Matrix (Qualitative)

	Baseline	A-1	A-2	A-3	B-1	B-2	B-3
Network Connectivity	⊙	◎	⊙	⊙	●	◎	⊗
Quality of Service	○	⊙	◎	◎	●	●	●
Land Use	○	⊙	◎	◎	⊗	●	●
Environmental Riders	⊙	⊙	◎	◎	●	●	●
Risk	○	●	◎	◎	●	◎	⊗

QUALITY RATING:

Least desirable ⊗ ○ ⊙ ◎ ● Most desirable

Based on this analysis of the alternatives, the following can be concluded:

1. The implementation of **Alternative A-1**, the all-BRT alternative as an initial phase, would provide a high proportion of the benefits of all of the other rapid transit systems examined.

2. The decision to convert rapid transit service from BRT to LRT will be based on the need to achieve the benefits of LRT technology or overcome potential deficiencies in BRT service noted below:

   - The higher capacity of LRT vehicles coupled to form trains reduces the frequency of transit movements through congested intersections and improves the overall reliability of the rapid transit service.
   - BRT service requiring vehicle frequency over 60 per hour without full grade separation is likely to lose attractiveness due to difficulties in maintaining schedule.
   - The need for more substantial, potentially grade-separated infrastructure at the key terminal locations such as Richmond Hill Centre and Finch subway station will justify design for, and operation of LRT technology at the outset.
   - When ridership levels reach more significant loadings, LRT vehicles will yield reduced operating costs due to the improved driver/passenger ratio achieved with LRT.
   - When general traffic congestion in the Highway 404/Highway 7 Business Park and interchange areas increases to levels causing significant delay through signalized intersections, the widening of interchange bridges should logically coincide with conversion to LRT technology.

3. The eventual extension of the Yonge subway to Highway 7 is highly desirable for the Region because:

   - It would create a high quality, high passenger volume transit node at Richmond Hill's Regional Centre providing the intermodal connection of surface rapid transit (BRT and LRT) lines in all YRTP corridors to GO Transit commuter rail, inter-regional BRT lines, and the TTC subway system.
   - It would eliminate the double transfer problem with LRT alternatives,
   - It would offer significantly better development opportunities than any surface rapid transit connection to Finch Subway Station.
   - It would overcome a potential problem with Alternatives A-1 through A-3. By 2021 the high passenger volume using surface transit (BRT and/or LRT) on Yonge Street moving to and from the Finch terminal on both TTC and YRTP services will likely test the ability of a surface transitway to provide a reasonable level and quality of service.

The above subway extension benefits are based on current projections of future demand prepared by the Region. At this time, the extension is not among the TTC's priorities for future subway extension as identified by its 2003 Ridership Growth Strategy and 2001 rapid transit Expansion Study.

5.2.2.3 Strategy for Technology Application on Highway 7 Corridor Transitway

Based on the above conclusions and consideration of the characteristics of each alternative, the following incremental approach for technology use in the Highway 7 Corridor and Vaughan North-South Link is proposed to meet the overall goals of the Region's strategic rapid transit vision in a cost-effective and proactive manner:

Step 1: Outside of this EA study and approval process, initiate a higher frequency, limited stop transit service in the network corridors, including Highway 7 and the Vaughan N-S Link, with new vehicles operating initially in mixed traffic and incorporating rapid transit service features such as multi-door boarding, fare pre-payment and priority at signalized intersections. This is the Quick Start Program that the Region has been implementing and it will be in service at the end of 2005.

Step 2: When EA approvals have been obtained, implement **Network Alternative A-1** incrementally by 2010 initially using BRT technology in all corridors. The BRT infrastructure would be constructed to design standards facilitating an ultimate conversion to LRT technology when warranted. Network design would also include a master plan for the creation of a major intermodal hub at Richmond Hill Centre Intermodal Terminal adjacent to the Langstaff GO Station.

Step 3: By 2012 following monitoring of ridership between 2007 and 2011, undertake a major review of the rapid transit plan to determine if the underlying assumptions about growth (population, employment and other activities), in York Region have taken place and if the ridership response to the rapid transit service has also met expectations. During the monitoring, consult with the City of Toronto and TTC staff in relation to capacity and technology requirements and service integration. In addition, the consultations will review the TTC subway extension priorities at that time to establish if, and when an extension of the Yonge Subway to Highway 7 will be forthcoming.

Step 4: If the subway extension on Yonge Street to Highway 7 is not programmed to be in place by 2021, implement Network Alternative A-2 by 2016 completing the transition from initial BRT to an LRT line from Finch Avenue to 19th Avenue on Yonge Street.

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If LRT technology is implemented initially on Yonge Street, an extension from this line eastward along the Highway 7 Corridor rapid transit alignment to Markham Centre would reinforce the planned growth along Highway 7 (Network Alternatives A-3 or B-3). BRT lanes in Segment C could be converted to LRT and the higher capacity rail-based service could be provided at low incremental cost.

In order to carry the projected ridership volumes in 2021, the service levels required on the Highway 7 and Vaughan N-S Link Transitway for each of the surface technologies under consideration are listed in **Table 5.2-3**.

Table 5.2-3
Service Levels Required

Segment	Bus Rapid Transit (BRT)	Light Rail Transit (LRT)
A (Highway 50 to Highway 400)	30 buses (standard or articulated) per hour per direction. Buses at approx. 0.5km spacing or one per traffic signal cycle.	8 two-car LRT trains per hour (58m length)
B (Highway 400 to Yonge Street) Vaughan N-S Link (Jane Street) (Keele Street) (NOTE: for subway service levels, see Chapter 12)	30 buses (standard or articulated) per hour per direction or two buses per traffic signal cycle.	8 two-car LRT trains per hour (58m length)
C (Yonge St. to Kennedy Rd.)	30 buses (standard or articulated) per hour per direction or one bus per traffic signal cycle.	8 two-car LRT trains per hour (58m length)
D (Kennedy Rd. to York-Durham Line)	30 buses (standard or articulated) per hour per direction or one bus per traffic signal cycle.	8 two-car LRT trains per hour (58m length)

Demand forecasts indicate that BRT technology may not be capable of providing the capacity and reliability needed in 15-20 years in some segments of the YRTP network. Consequently, this EA is seeking approval for the use of BRT as an initial technology and conversion to LRT technology for the rapid transit service when BRT reliability cannot be assured or benefits to the planned growth along the Highway 7 transitway justify the technology conversion. The decision to convert to LRT technology as defined in this EA would be subject to Regional Council Approval during open session. A further technology transition forming part of this undertaking is the ultimate replacement of BRT service on the Vaughan North-South Link by the logical extension of the City of Toronto/TTC's proposed extension of the Spadina Subway Line to the Regional Centre on Highway 7 from York University. A similar Regional Council approval would be required for this transition to achieve the most significant contribution to the Region's Centres and Corridors urban form policy in the City of Vaughan.

5.3 RAPID TRANSIT ROUTES

5.3.1 Analysis and Evaluation of Alternative Technology/ Route Combinations

5.3.1.1 General Approach

In **Sections 5.1** and **5.2**, both the routes and the applicable technology strategy warranting further consideration have been identified through an initial evaluation process. The purpose of this section is to analyze and evaluate the alternative combinations to develop a recommended focused scope for the rapid transit in the Highway 7 Corridor and Vaughan North-South Link based on the *Highway 7 Corridor Transitway EA N&J*.

Following an inspection of all routes under consideration, analysis of the combinations was carried out using the year 1999 aerial mapping of the corridor provided by the Region's Planning Department as a basis for assessing technology integration impacts, constraints and opportunities. A multi-criteria evaluation framework was established structured around the four primary factors adopted for the initial analysis.

Again using the four corridor segments identified previously, the technology/ route combinations were evaluated in terms of each factor by assessing their relative merits against the criteria listed below.

This evaluation has assessed both BRT and LRT as candidate technologies given that the network configuration analysis presented earlier indicated a possible evolution from initial BRT to LRT.

5.3.1.2 Criteria for Evaluation of Alternative Technology/ Route Combinations

a) Transportation Considerations

- Initial and long-term system capacity required
- Opportunity to extend an existing technology
- Opportunity to contribute to a future network (intra and inter-regional)
- Network connections and transfer requirements
- Nodes, gateways and intersections with higher order transportation systems

b) Transit / Land Use Opportunities

- Ability to serve designated density intensification areas
- Designated densities sufficient for the technology
- Ability to serve major trip generators/attractors
- Opportunities to influence development pattern and urban design
- Role in supporting OP objectives
- Redevelopment opportunities

c) Environmental Considerations

- Watercourses on route
- Wetlands on route
- ANSIs, Life Science Sites, Earth Science Sites
- Environmentally Significant Areas, Parklands
- Areas sensitive to Noise and Vibration
- TDM potential (offset other infrastructure development)

d) Implementation Considerations

- Cost-effectiveness of capital investment
- Operating cost implications
- Staging opportunities
- Investment by others to achieve network connectivity

5.3.1.3 Evaluation Findings

The evaluation findings are presented in a tabulation of the impacts and benefits of the alternatives for each segment in **Tables 5.3-1 to 5.3-4**. This assessment of the relative merits of the combinations forms the basis for the recommendation of alternatives to be considered in more detail as outlined below and illustrated in **Figures 5.3-1 to 5.3-4**.

Table 5.3-1

Highway 7 Corridor: Analysis of Alternative Rapid Transit Route & Technology Combinations (Segment A)

SEGMENT A: YORK-PEEL BOUNDARY TO HIGHWAY 400	Impacts and Benefits of Route Options
Analysis Criteria	Candidate Technologies: BRT and LRT Route Options : Highway 7 ; Highway 407
Transportation Considerations i) Initial and long-term system capacity required ii) Opportunity to extend an existing technology iii) Opportunity to contribute to a future network (intra and inter-regional) iv) Network connections and transfer requirements v) Nodes, gateways, intercept points and intersections with higher order transportation systems	▪ BRT technology could provide the long-term system capacity required in the segment. The projected long-term demand is lower than the optimum LRT capacity. ▪ No rapid transit technologies exist adjacent to, or have influence on, the route or technology in this segment. ▪ Both candidate technologies could be extended beyond the segment limits and across the York/Peel boundary. ▪ On a Highway 7 route a BRT transitway permits access by feeder buses without a passenger transfer. On Highway 407, this access is possible at interchanges only. ▪ Both technologies could be interconnected with a future Bolton GO Transit Rail Line as an inter-modal station can be located adjacent to either Highway 7or Highway 407 right-of-way.
Transit Supportive Land Use Opportunities i) Ability to serve designated density intensification areas ii) Designated densities sufficient for the technology iii) Ability to serve major trip generators/attractors and Regional Centres iv) Opportunities to influence development pattern and urban design v) Role in supporting OP objectives vi) Redevelopment opportunities	▪ A Highway 7 route provides good access to designated development nodes north of the highway while the Highway 407 option would place rapid transit further from these nodes. ▪ Designated densities served by Highway 7 are adequate for BRT, but marginal for LRT technology. On Highway 407 they are likely marginal for LRT. ▪ A Highway 7 route allows both technologies to serve both Highway 27 Regional and Vaughan Corporate Centres directly. However rapid transit on Highway 407 would be more remote from both centres. ▪ There are urban design opportunities at east and west extremities of Highway 7 in this segment where new or redevelopment opportunities exist. Urban design opportunities on the freeway environment of Highway 407 are minimal. ▪ The Highway 7 route provides a continuous spine for access to Vaughan Corporate Centre from communities to the north and would serve redevelopment of employment areas to the south. A Highway 407 route is less accessible for communities to the north and provides only indirect access to Vaughan Corporate Centre. However, adjacent redevelopment areas could be served.
Environmental Considerations i) Watercourses on route ii) Wetlands on route iii) ANSIs, Life Science Sites, Earth Science Sites iv) Environmentally Significant Areas, Parklands v) Areas sensitive to Noise and Vibration vi) TDM potential (opportunity to offset infrastructure development in sensitive corridors elsewhere)	▪ Highway 7: 8; Highway 407: 7 ▪ None on routes ▪ Highway 7: Baker's Wood ANSI; Highway 407: Woodbridge Cut ES ▪ Highway 7: Baker's Wood ESA; Highway 407: Woodbridge Cut ESA ▪ Parts of the Highway 7 route passing through sensitive residential land use in a narrow right-of-way will require mitigation while all land use along Highway 407 is insensitive. ▪ Areas available for new development in the west of the segment and VCC west of Highway 400 provide opportunities for residential and commercial transit-oriented developments and concentration of institutional facilities.
Implementation Considerations i) Cost-effectiveness of capital investment ii) Availability of right-of-way iii) Operating cost implications iv) Staging opportunities v) Investment by others to achieve network connectivity	▪ The LRT option would result in a higher capital cost per passenger-km on both routes due to its higher system unit cost and because the projected demand is less than optimum for this technology. ▪ On Highway 7, the existing road would have to be widened to provide a transit right-of-way in the median or along one side while on Highway 407 a transit right-of-way has been protected on the south side of the highway. ▪ BRT operating cost per passenger will be competitive with LRT as the latter's capacity will be under-utilized thus reducing its operating cost advantage. ▪ For the Highway 7 option, a BRT transitway could be extended incrementally westwards from Highway 400 as traffic volumes demand segregation for rapid transit. LRT staging is practical if line is an extension from the adjacent segment. On Highway 407, BRT transitway staging is possible in increments matching the interchange spacing. Again, LRT staging would be practical if the line is an extension from the adjacent segment. ▪ On Highway 407, extension of rapid transit westward is possible using the protected right-of-way for the 407 transitway in Peel Region. Extension westward on Highway 7 would require a commitment to rapid transit on Highway 7 in Peel Region. If GO Transit implemented rail service to Bolton, an inter-modal station would be required at either the Highway 7 or 407 intersection with CP Rail's McTier Subdivision.

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Table 5.3-2
Highway 7 Corridor: Analysis of Alternative Rapid Transit Route & Technology Combinations (Segment B)

Segment B: Highway 400 to Yonge Street	Impacts and Benefits of Route / Technology Options
Analysis Criteria	Candidate Technologies: BRT and LRT; Route Options: Highway 7; Highway 407; Highway 7 – Steeles Avenue – Highway 407 – Centre Street – Highway 407
Transportation Considerations i) Initial and long-term system capacity required ii) Opportunity to extend an existing technology iii) Opportunity to contribute to a future network (intra and inter-regional) iv) Network connections and transfer requirements v) Nodes, gateways, intercept points and intersections with higher order transportation systems	▪ BRT technology could provide long-term system capacity required for this segment. The optimum LRT capacity of 7,000 to 10,000 passengers per peak hour per direction exceeds the projected long-term demand. ▪ No rapid transit technologies exist adjacent to any of the route options in this segment. However, an extension of the Spadina Subway to York University offers the opportunity to feed this node with any of the technologies on the route using Steeles Avenue, while a subway extension to VCC could connect to a Highway 7 route. ▪ All candidate technologies could be extended beyond the segment limits in both directions on any of the route options. ▪ A BRT transitway on Highway 7 or the Steeles Avenue route permits access by feeder buses without a passenger transfer. On Highway 407 this access is only possible at interchanges with transit access ramps. ▪ All technologies could be interconnected with the Bradford GO Transit Rail Line at a new station where the line crosses each route option. In addition, the Steeles Avenue route allows an interconnection at a York University Subway Station when the Spadina line is extended. The Highway 407 route limits opportunity of developing the Bradford GO Station that serves Highway 7. If Bradford GO Station is developed south of Highway 407, the opportunity for development along Highway 7 will be lost. Note: for subway technology in the Vaughan North-South Link Corridor, see Chapter 12.
Transit Supportive Land Use Opportunities i) Ability to serve designated density intensification areas ii) Designated densities sufficient for the technology iii) Ability to serve major trip generators/attractors and Regional Centres iv) Opportunities to influence development pattern and urban design v) Role in supporting OP objectives vi) Redevelopment opportunities	▪ Highway 7 provides good access to designated residential development nodes north of Highway 7 between Dufferin and Keele Streets. The Steeles / Highway 407 option is slightly more remote at Bathurst Street interchange. ▪ Designated densities are adequate to support BRT, but marginal for LRT technology. ▪ A Highway 7 route allows all technologies to serve the future Vaughan Corporate Centre directly. The Highway 407 route places all technologies more remote from the Centre while the Highway 7/Steeles Ave/Highway 407 option serves VCC via a circuitous route although it benefits from University trips. Long walking distance is required from the Highway 407 routes. ▪ There are urban design opportunities surrounding Highway 7 at the western limit of this segment where new or redevelopment opportunities in the proposed Vaughan Corporate Centre exist. The Highway 407 freeway environment allows minimal urban design opportunities. A York University intermodal interchange also has urban design potential. ▪ Routes using Highway 7 provide a continuous spine for access to Vaughan Corporate Centre which is supportive of OP direction of connecting regional centres and consistent with Highway 7 identified as a major transit spine. This would not be the case for the Steeles Ave. option. A Highway 407 route provides indirect access to Vaughan Corporate Centre and does not support OP objectives. ▪ Significant opportunities for redevelopment for routes along Highway 7 which is consistent with the Vision for the corridor. Highway 407 route does not support redevelopment of Highway 7 and has little potential for land use intensification along the Highway 407 Transitway since developable land is more than 400m away.
Environmental Considerations i) Watercourses on route ii) Wetlands on route iii) ANSIs, Life Science Sites, Earth Science Sites, International Biological Program sites iv) Environmentally Significant Areas, Parklands v) Areas sensitive to Noise and Vibration vi) TDM potential (opportunity to offset infrastructure development in sensitive corridors elsewhere)	▪ Highway 7: 7 (new crossing is not required, widening will be required); Highway 407: 8 ; Highway 7-Steeles-Highway 407-Centre-Highway 407: 8 (new crossings would be required) ▪ None on routes ▪ Highway 7: Baker's Woods International Biological Program site. ▪ None on routes ▪ Most of the Highway7 route passes through insensitive land uses while all land use along Highway 407 is insensitive. Land use along Steeles Avenue could be sensitive. ▪ Transit-oriented development opportunities are available north of Highway 7 in the centre of segment and in the eastern section of VCC. Also smaller zones of opportunity along Steeles-Centre-407 route.
Implementation Considerations i) Cost-effectiveness of capital investment ii) Availability of right-of-way iii) Operating cost implications iv) Staging opportunities v) Investment by others to achieve network connectivity	▪ Capital cost per passenger-km will be higher for the LRT option as projected demand is less than optimal for this technology. Highway 407 Transitway alignment requires new structures (e.g. Highway 407 crossing, CN Bradford Crossing, Don River Crossing, CN Macmillan Yard Crossing) ▪ On Highway 7 and Steeles Avenue the existing road would have to be widened to provide a transit right-of-way in the median or along one side. A Highway 407 option could use the transitway right-of-way protected on the south and north sides of the highway. ▪ Longer York University-Centre Street route will have higher total operating cost but would carry more passengers thus reducing unit O&M cost. ▪ To achieve the LRT operating cost advantage, ridership would have to be nearer the optimum for LRT, i.e. 70,000-10,000pphpd. ▪ A BRT transitway on Highway 7 or Steeles Avenue could be extended incrementally westwards from Yonge Street as traffic volumes demand segregation for rapid transit. LRT staging within this segment is practical if the line is an extension from the adjacent segment or a feeder to a subway extension. ▪ Extension of the Spadina and Yonge Subway lines is needed to connect to Toronto's rapid transit network. GO Transit would have to construct an inter-modal station where the Bradford Line intersects any of the route options.

Table 5.3-3

Highway 7 Corridor: Analysis of Alternative Rapid Transit Route & Technology Combinations (Segment C)

Segment C: Yonge Street to Kennedy Road	Impacts and Benefits of Route Options
Analysis Criteria	Candidate Technologies: BRT and LRT — Route Options: Highway 7 / Markham Centre; Highway 407; Steeles Ave / GO Stouffville Line
Transportation Considerations i) Initial and long-term system capacity required ii) Opportunity to extend an existing technology iii) Opportunity to contribute to a future network (intra and inter-regional) iv) Network connections and transfer requirements v) Nodes, gateways, intercept points and intersections with higher order transportation systems	▪ BRT technology could provide the long-term capacity required in this segment. The projected long-term demand is lower than the optimum LRT capacity of 7,000 to 10,000 passengers per hour per direction. ▪ At present, no rapid transit technologies operate adjacent to the three route options. A northward extension of the Yonge Subway could intersect E-W rapid transit at Steeles Avenue or, if the extension was longer, at the other two route options, Highway 407 and Highway 7. ▪ All candidate technologies on all three routes could be extended beyond the segment limits although the Steeles Ave route would have to rejoin Highway 7 or 407 at Kennedy Road to become part of an inter-regional network. ▪ On the Highway 7-Markham Centre and Steeles Avenue routes, a BRT transitway permits access by feeder buses without a passenger transfer. On the Highway 407 route this access is possible at interchanges or station access ramps only. ▪ All technologies on the Highway 7 or Highway 407 routes could be interconnected with the existing GO Transit Richmond Hill and Stouffville Lines at Langstaff and Kennedy. ▪ A Steeles Avenue route would cross the Richmond Hill GO line approx. 1.5km north of the Old Cummer Station making an inter-modal connection impractical but it could be diverted northward adjacent to the Stouffville Line to interconnect with GO Rail Service at Unionville Station.
Transit Supportive Land Use Opportunities i) Ability to serve designated density intensification areas ii) Designated densities sufficient for the technology iii) Ability to serve major trip generators/attractors and Regional Centres iv) Opportunities to influence development pattern and urban design v) Role in supporting OP objectives vi) Redevelopment opportunities	▪ A Highway 7 route provides good access to designated development nodes north and south of the highway while the Highway 407 option would place rapid transit further from these areas around Leslie Street and Highway 404 but could be diverted through Markham Centre. A Steeles option serves mostly mature commercial and low-medium density residential areas ▪ Designated densities served by Highway 7 are adequate for BRT and approaching desirable levels for LRT technology. On Highway 407 they are likely marginal for LRT due to the mature lower density areas to the south. A Steeles Avenue route is likely similar. ▪ The Highway 7 route allows all technologies to serve the Richmond Hill Centre, East Beaver Creek and Markham Centre directly. Rapid transit on Highway 407 could be diverted to serve the Regional Centres but would be more remote from Beaver Creek. Steeles Avenue is well south of all nodes but would serve the Centrepoint Shopping Centre at Yonge Street and the commercial zone between Woodbine and Warden Avenues. ▪ There are urban design opportunities at east, central and Markham Centre sections of Highway 7 in this segment where new or redevelopment opportunities exist. Urban design opportunities on the freeway environment of Highway 407 are minimal. Steeles Avenue would require redevelopment to include urban design initiatives. ▪ The Highway 7 route provides a continuous spine for access to Richmond Hill Centre and Markham Centre from communities to the north and east. A Highway 407 route is less accessible for communities to the north but provides access to areas south of Highway 407. However, opportunities for adjacent redevelopment are limited.
Environmental Considerations i) Watercourses on route ii) Wetlands on route iii) ANSIs, Life Science Sites, Earth Science Sites iv) Environmentally Significant Areas, Parklands v) Areas sensitive to Noise and Vibration vi) TDM potential (opportunity to offset infrastructure development in sensitive corridors elsewhere)	▪ Highway 7: 4; Highway 407: 4; Steeles Avenue: 2 ▪ None on any routes ▪ None on any routes ▪ Unionville Marsh, 1.2km north of Highway 7 ▪ Most of the Highway7 route passes through insensitive land uses while all land use along Highway 407 is insensitive. Land use along Steeles Avenue could be sensitive. ▪ Residential and commercial densification is in progress along Highway 7 and north of Highway 407. Major employment and residential densification planned in Markham Centre and Highway 7 redevelopment areas. Mature land use along Steeles Ave offers minimal redevelopment opportunity for transit-oriented development initiatives.
Implementation Considerations i) Cost-effectiveness of capital investment ii) Availability of right-of-way iii) Operating cost implications iv) Staging opportunities v) Investment by others to achieve network connectivity	▪ The LRT option would result in a higher capital cost per passenger-km on all routes due to its higher system unit cost and because the projected demand is marginally less than optimum for this technology. ▪ On Highway 7, the existing road would have to be widened to provide a transit right-of-way in the median or along one side while on Highway 407 a transit right-of-way has been protected on the south side of the highway. Through MARKHAM CENTRE a new transitway could be developed however a route on Steeles Avenue would have to displace traffic lanes or be underground at high capital cost. ▪ To achieve the LRT operating cost advantage, ridership would have to be nearer the optimum for LRT, i.e. 7-10,000pphpd. ▪ For the Highway 7 and Steeles Avenue option, a BRT transitway could be extended incrementally within the segment as traffic volumes demand segregation for rapid transit. LRT staging is practical if the line is an extension from the adjacent segment. On Highway 407, BRT transitway staging is possible in increments matching the interchange spacing. Again, LRT staging would be practical if the line is an extension from the adjacent segment. ▪ On Highway 407, extension of rapid transit eastward is possible using the protected right-of-way for the 407 transitway. If TTC implemented an extension of the Yonge Subway northward, an inter-modal station would be required at either the Steeles Avenue intersection, Highway 7 or Highway 407 intersection at the Langstaff gateway node. A north-south route from the Sheppard Subway would be required to connect route options in the east of this segment to the Toronto Network. This would be shortest for the Steeles option.

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Table 5.3-4
Highway 7 Corridor: Analysis of Alternative Rapid Transit Route & Technology Combinations (Segment D)

Segment D: Kennedy Road to York-Durham Boundary	Impacts and Benefits of Route Options
Analysis Criteria	Candidate Technologies: BRT, LRT Route Options: Highway 7 ; Highway 407 ; Stouffville Go Line
Transportation Considerations i) Initial and long-term system capacity required ii) Opportunity to extend an existing technology iii) Opportunity to contribute to a future network (intra and inter-regional) iv) Network connections and transfer requirements v) Nodes, gateways, intercept points and intersections with higher order transportation systems	▪ While the projected demand is near the limit for conventional bus service, BRT technology could provide the long-term capacity required in this segment. The projected long-term demand is lower than the optimum LRT capacity of 7,000 to 10,000 passengers per hour per direction. ▪ At present, no rapid transit technologies operate adjacent to the three route options. ▪ All candidate technologies on Highway 7 and 407 routes could be extended beyond the regional boundary to become part of an inter-regional network. ▪ On the Highway 7 or Stouffville GO line route, a BRT transitway permits access by feeder buses without a passenger transfer. On the Highway 407 route this access is possible at interchanges or station access ramps only. ▪ All technologies on Highway 7 and 407 routes could be linked to the Markham-Stouffville hospital node. At present no higher order transportation systems exist in this segment.
Transit Supportive Land Use Opportunities i) Ability to serve designated density intensification areas ii) Designated densities sufficient for the technology iii) Ability to serve major trip generators/attractors and Regional Centres iv) Opportunities to influence development pattern and urban design v) Role in supporting OP objectives vi) Redevelopment opportunities	▪ A Highway 7 route provides good access to designated development nodes north and south of the highway east of 9th line. The Highway 407 route option would place rapid transit further from these areas but would better serve future longer term development south of Highway 407. ▪ Designated densities served by Highway 7 are adequate for BRT. On Highway 407 they are more marginal due to the lower density and parkland areas adjacent to the highway. ▪ The Highway 7 route allows all technologies to serve both the Markville Centre and Markham-Stouffville Hospital area most directly. Rapid transit on Highway 407 would be more remote requiring a 0.8 km link. The Stouffville GO Line route does not serve the Hospital or Cornell development. ▪ There are urban design opportunities between Kennedy and Markham Rds. and in the Hospital area north and south of Highway 7 in this segment where new or redevelopment is planned. Urban design opportunities on the freeway environment of Highway 407 are confined to the link to the hospital. ▪ The Highway 7 route provides a continuous spine for access to Markham's Hospital from communities to the north and west. A Highway 407 route is less accessible for communities to the north but provides good access for areas south of Highway 407. However, opportunities for adjacent redevelopment are limited.
Environmental Considerations i) Watercourses on route ii) Wetlands on route iii) ANSIs, Life Science Sites, Earth Science Sites iv) Environmentally Significant Areas, Parklands v) Areas sensitive to Noise and Vibration vi) TDM potential (opportunities to offset other infrastructure development)	▪ Highway 7: 5; Highway 407: 3; GO Stouffville Line: 4 ▪ None on any of the routes ▪ None on any of the routes ▪ Highway 7 and Highway 407 routes pass through Rouge Park North ▪ Most of Highway 7 route is insensitive. Freeway environment makes all of Highway 407 route insensitive. Residential areas along Stouffville GO Line will be sensitive. ▪ Undeveloped land adjacent to Highway 7 and 407 routes east of 9th line provides opportunity to locate employment and community facilities in Highway 7 corridor.
Implementation Considerations i) Cost-effectiveness of capital investment ii) Availability of right-of-way iii) Operating cost implications iv) Staging opportunities v) Investment by others to achieve network connectivity	▪ The higher cost of guided BRT technology would only be warranted on routes with right-of-way width constraints such as Highway 7. LRT capital investment could only be justified it were an extension of the technology in Segment C. ▪ On Highway 7 the existing road would have to be widened to provide a transit right-of-way in the median or along one side where limited access permits. A Highway 407 route would use the protected transit right-of-way on the south side of the highway. The GO Stouffville line right-of-way has limited width to accommodate both a transitway and GO commuter rail service. ▪ For projected ridership levels in this segment, operation of BRT would be the most cost-effective. ▪ Implementation of all technologies could be staged in an eastward direction within the segment as traffic volumes demand segregation for rapid transit. On a Highway 407 route the staging would have to match interchange spacing. The GO Stouffville line could be accessed at existing arterial road crossings. ▪ Interconnection with GO Transit commuter rail is possible on the Stouffville GO line route and indirectly from Highway 7 at the proposed McCowan Rd. GO Station.

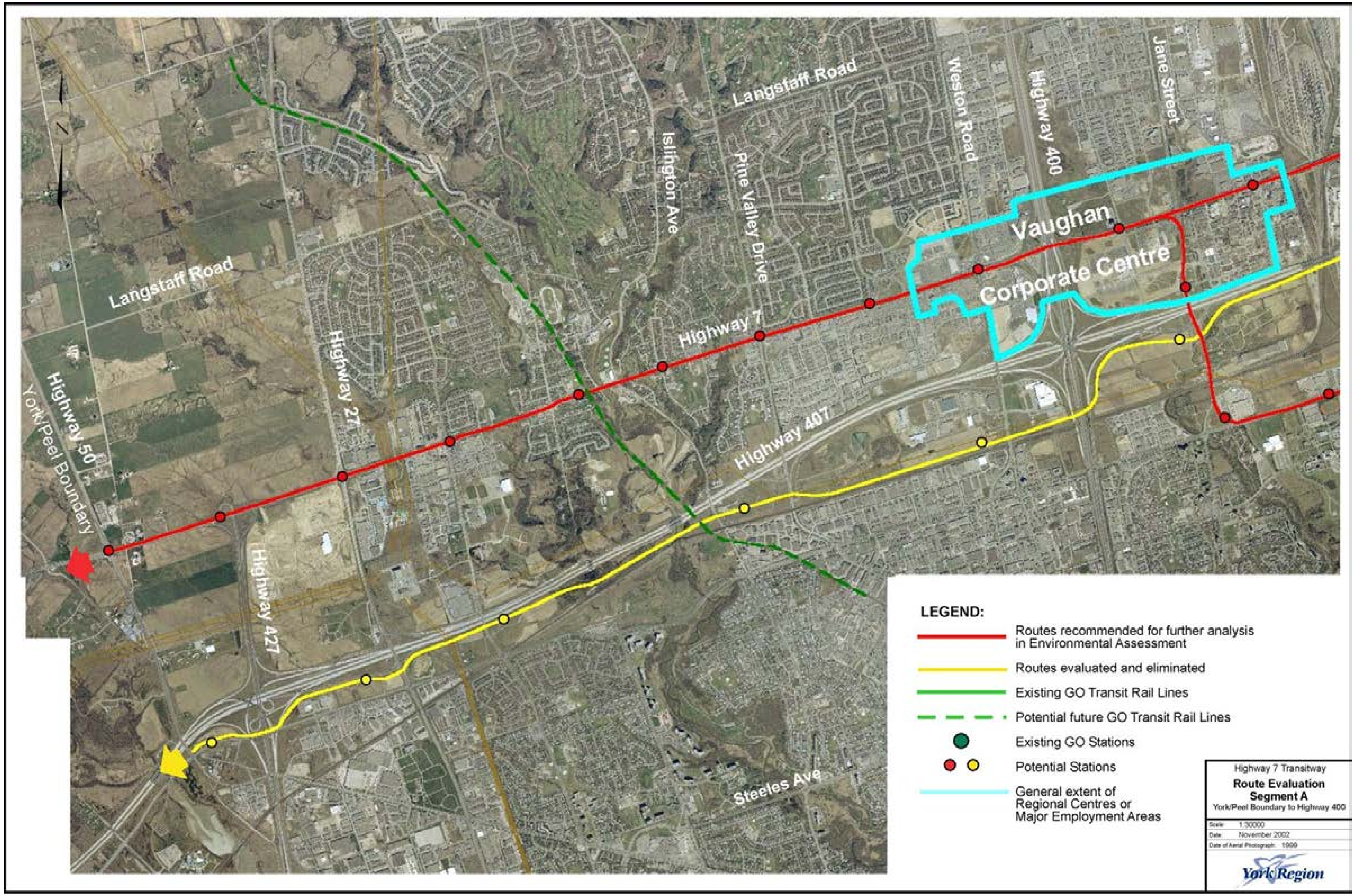

Figure 5.3-1
Routes Recommended for Further Analysis (Segment A)

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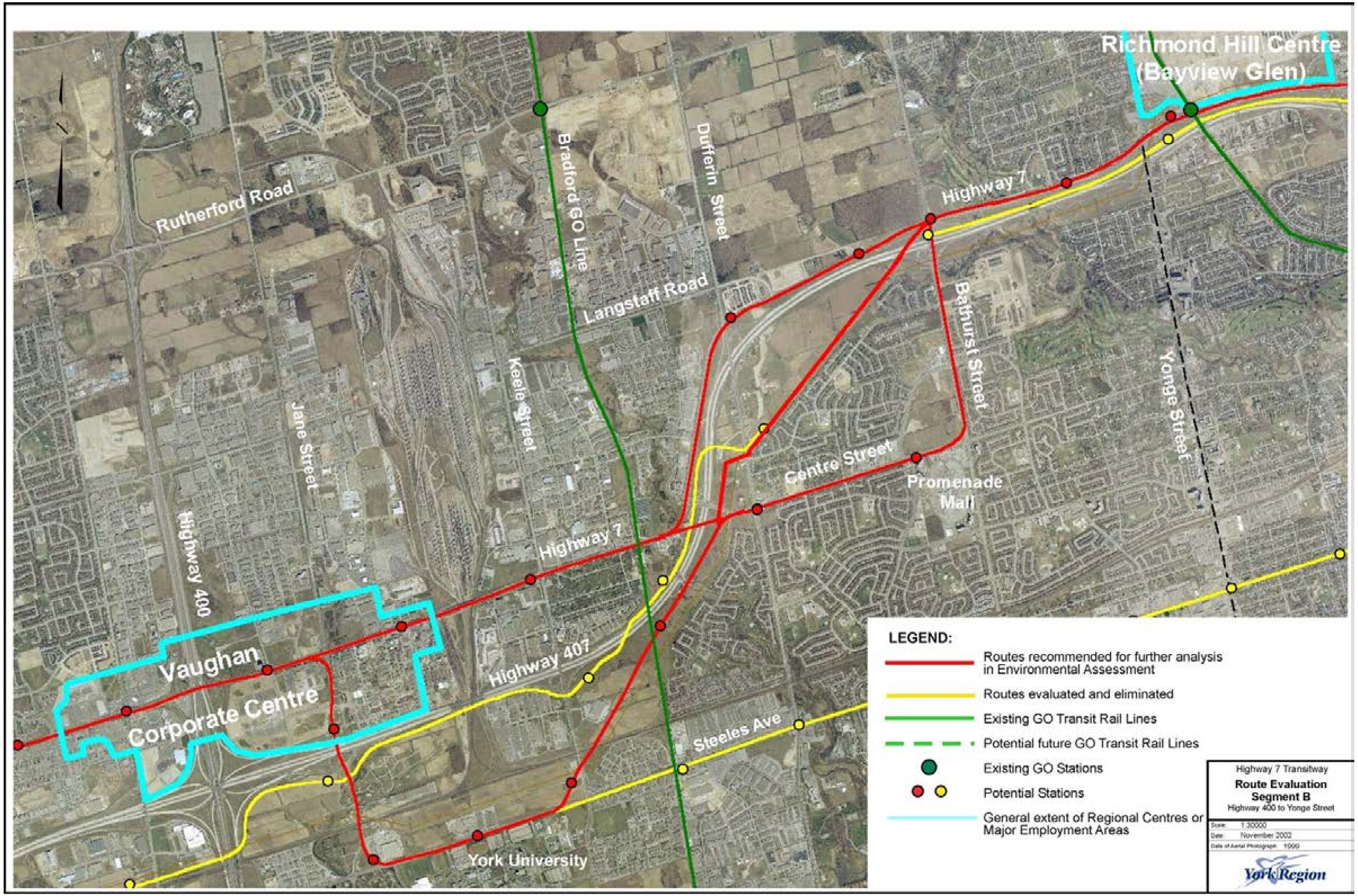

Figure 5.3-2
Routes Recommended for Further Analysis (Segment B)

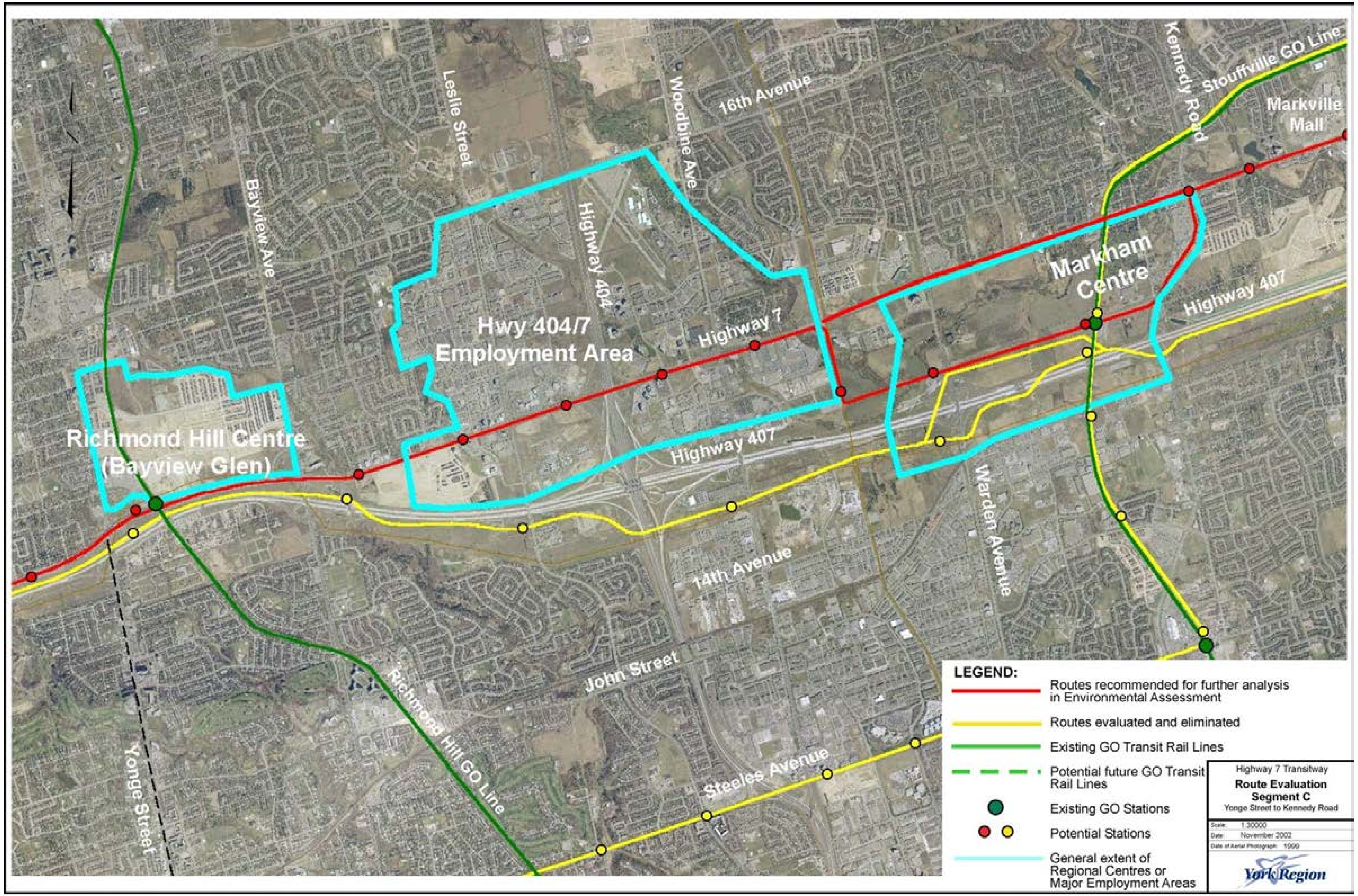

Figure 5.3-3
Routes Recommended for Further Analysis (Segment C)

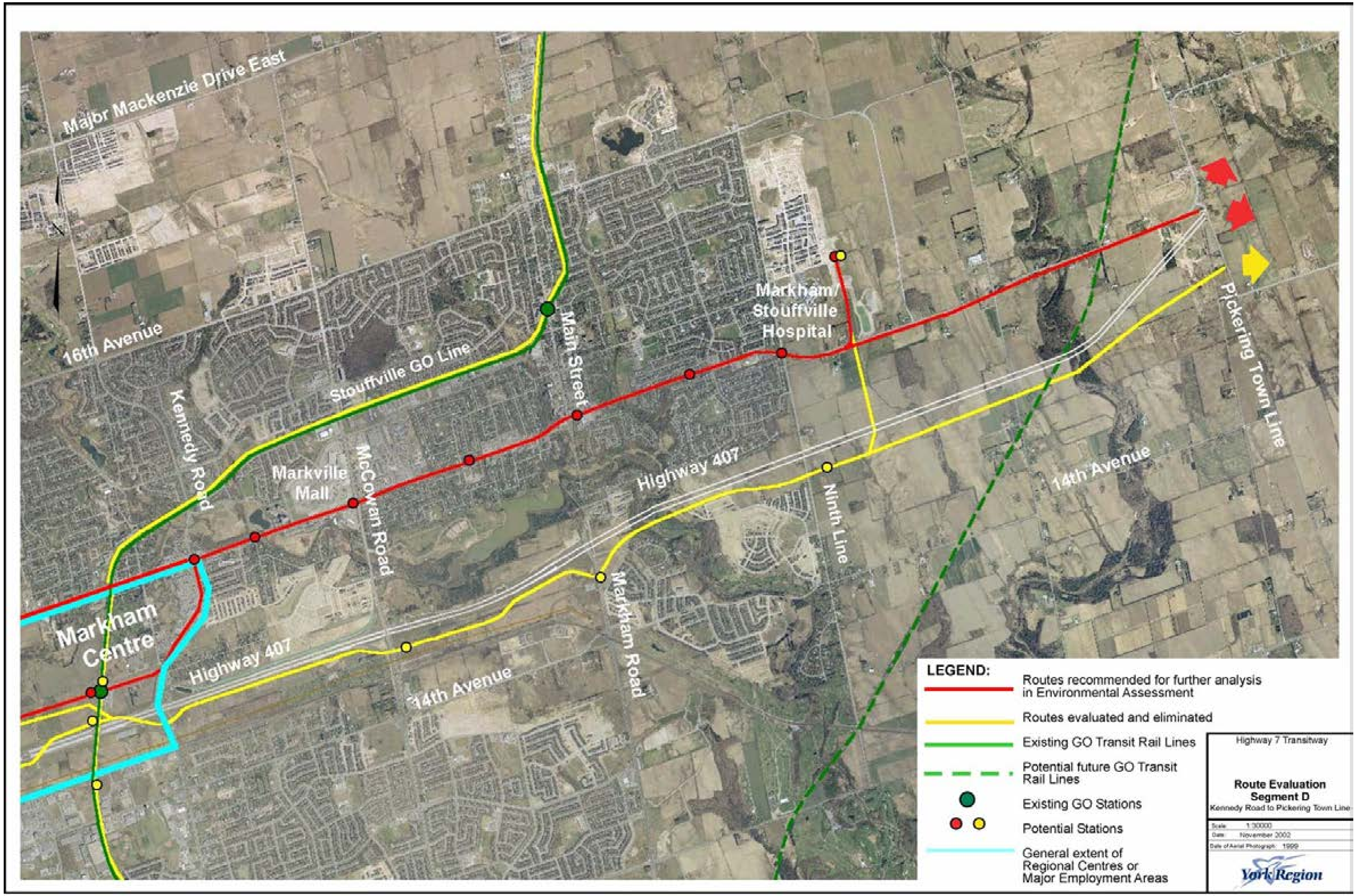

Figure 5.3-4
Routes Recommended for Further Analysis (Segment D)

Segment A: York/Peel Boundary – Highway 400 (Vaughan Corporate Centre)

BRT or LRT on Highway 7 is recommended for further analysis because:

- The forecast demand in 2021 requires the capacity of at least segregated BRT and likely LRT, if this technology was extended from Segment B in the longer term;
- Highway 7 serves Vaughan Corporate Centre and the planned Highway 27 regional centre more directly, has the potential to serve new transit-oriented development and offers good urban design opportunities; and
- Highway 7 will attract more walk-in ridership and allow no-transfer access for BRT vehicles, although road widening and mitigation of community impact will be needed at some locations.

Segment B: Highway 400 (VCC) – Yonge Street (Richmond Hill Centre /Bayview Glen)

Routes recommended for further analysis and comparisons are:

- BRT & LRT on Highway 7 combined with BRT on Jane Street initially and an extension of the Spadina Subway in the medium term, or
- BRT & LRT on Highway 7 to Jane Street and south to York University, and then north-easterly to Centre Street and Bathurst or along the Hydro right-of-way adjacent to Highway 407.

These are recommended because:

- The forecast demand in 2021 requires the capacity of at least segregated BRT to provide communities north of Highway 7 with high capacity service between the VCC and Richmond Hill Centre. In addition, forecasts confirm the need for a north-south rapid transit link to the TTC subway and York University. This link could be provided by BRT initially or Subway if demand increases in the medium term;
- The longer 13.4 km Highway 7-York University-Richmond Hill Centre route links three major trip-generating nodes and supports some designated new or re-development zones with good access and urban design potential. The shorter, more direct Highway 7 route, at 10.2 km links VCC and Richmond Hill Centre and offers good access to new or re-development areas north of Highway 7. This latter route would be combined with a separate link in the Jane Street corridor between the VCC, York University and the Spadina Subway. This link would also be the potential corridor for a future extension of the Subway; and
- All technologies and both routes could interconnect with the Bradford GO Rail Line, although the station on the southern route would have to be south of Highway 407 making it remote from future re-development along Highway 7.

Segment C: Yonge Street (Richmond Hill Centre/Bayview Glen) – Kennedy Road (Markham Centre)

BRT or LRT on the Highway 7-Markham Centre route is recommended for further analysis because:

- The forecast 2021 demand requires the capacity of at least segregated BRT and very likely LRT, as a higher capacity feeder to an extended Yonge subway at least to Steeles Avenue, in the future;
- A Highway 7 route provides the best access to Richmond Hill Centre, the Highway 7/404 Employment Area and potentially, Markham Centre as well as several urban design opportunities not possible on Highway 407; and
- Better accessibility on a Highway 7-Markham Centre route outweighs the more difficult transitway integration in environmentally sensitive areas on Highway 7 and the Stouffville GO Line right-of-way when compared with the available, protected right-of-way on Highway 407.

Segment D: Kennedy Road (Markham Centre) - York/Durham Boundary

BRT or LRT on the Highway 7 route is recommended for further analysis because:

- The 2021 demand requires at least partially segregated BRT and warrants protection for LRT, if selected for Segment C, as an extension in the longer term;
- A Highway 7 route provides the best access to Markville Mall, the Hospital zone and planned new development as well as urban design opportunities associated with renewal of commercial development along the route; and
- The limited-width GO line right-of-way bypasses the Hospital/Cornell zone and transitway insertion is difficult or impractical without some property impact. A Highway 7 route can be extended to Durham or linked to Highway 407.

5.4 EVALUATION OF ALTERNATIVE PHYSICAL INFRASTRUCTURE LOCATION

This section described the process of selecting a typical location for the two lane bi-direction transitway on the Highway 7 Corridor and Vaughan North-South Link. This physical infrastructure location is crucial to the impacts, caused by implementing the Transitway, to the adjacent environment. The alternatives of the locations are described in **Section 5.4.1**.

5.4.1 Alternative Locations within a Road Right-of-way

The following alternative locations for rapid transit within an existing road right-of-way such as Highway 7 and other route links were considered in the evaluation:

- an exclusive two-way running way and stations in the median of the roadway with general vehicular traffic lanes in each direction either side of the transitway;
- an exclusive two-way transitway, including stations, on one side of the roadway adjacent to one curb; and
- a partially-exclusive one-way transit lane in each direction adjacent to both curbs similar to the current arrangement on Yonge Street south of Clarke Avenue to Finch Avenue e.g. HOV.

The configuration of the above alternatives is shown in **Figure 5.4-1** and an evaluation of the relative merits of each is presented in **Table 5.4-1**.

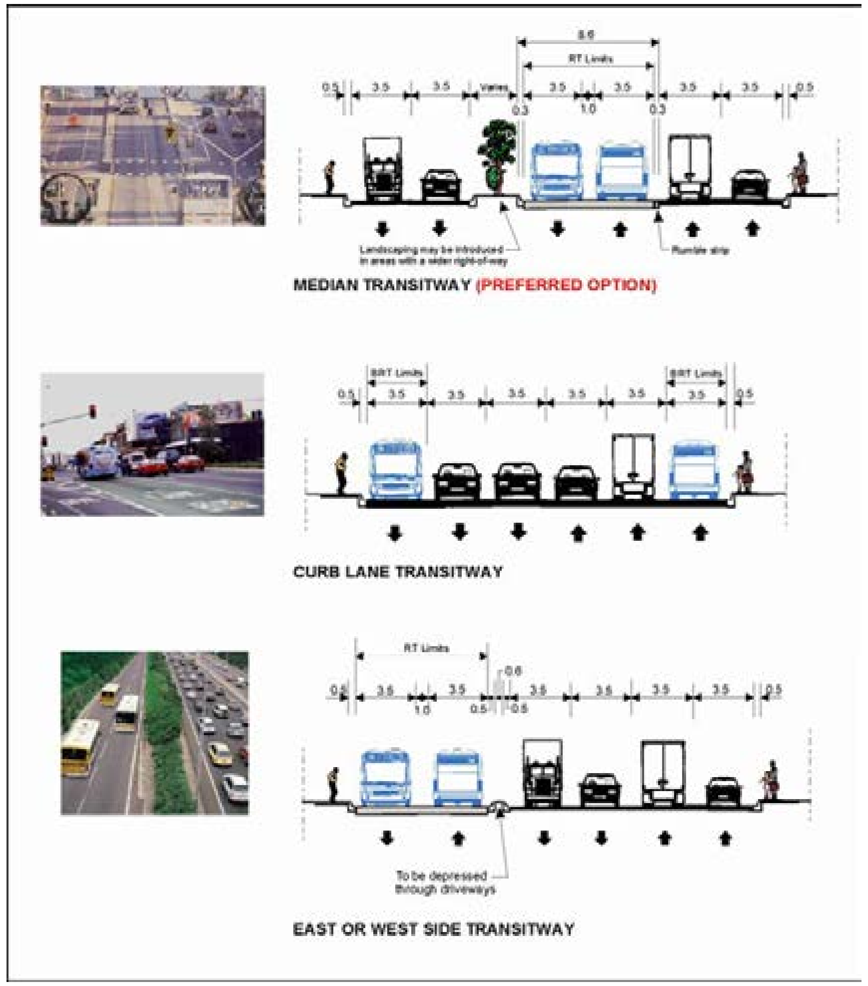

Figure 5.4-1
Options to locate Transit in a Roadway

5

Table 5.4-1
Evaluation of Options to Locate a Transitway in a Roadway

FACTOR & INDICATOR	ALTERNATIVE: Median Transitway	ALTERNATIVE: One-Way Transitway along each curb	ALTERNATIVE: Two-Way Transitway alongside one curb	EXPLANATION OF RANKING
TRANSPORTATION ENVIRONMENT				
Transit Service Reliability	●	○	◐	• With a median transitway left turns across the transitway are confined to signalized intersections. This reduces the potential for interference by vehicular traffic and increases service reliability especially if transit can be given priority at signals when required. • A one-way curb side transitway requires right-turning vehicular traffic to share the lane with transit vehicles. Frequent interference due to this conflict and the potential for illegal parking reduces transit reliability significantly. • A two-way transitway on one side reduces interference to one side only but requires control of vehicular access to driveways to achieve reliability and safety.
Effect on Traffic Operations	◕	◕	◔	• A median transitway requires all left-turns to be at signalized intersections. Also U-turning must be permitted to allow traffic to reach mid-block destinations. This decreases the capacity at intersections. • A one-way curb-side transitway results in conflicts with both left and right-turning traffic at intersections and between them if mid-block left turns are permitted.
Overall level of safety in right-of-way	◕	◐	○	• A median transitway is considered the safest as it has the least number of conflicts with road traffic. The interface with pedestrians and left turning vehicles can be controlled at signalized intersections. • A two-way transitway along one side is considered the least safe due to the potential for confusion with transit vehicles running in the opposite direction to vehicular traffic on one side of the roadway and the conflicts with both left and right-turning vehicles.
Vehicle Access to Adjacent Properties	◐	◕	◔	• A one-way curb-side transitway must be shared by right-turning vehicles if access to adjacent properties is to be protected. A two-way curb-side transitway requires strict control of access across the transit lanes or the addition of a service road to avoid conflicts with transit vehicles and provide access between intersections.
				• The median transitway option requires the provision of U-turns, either dedicated or at intersections, to maintain access to adjacent properties.
HUMAN ENVIRONMENT				
Noise & Vibration Impacts	●	◐	◔	• A median transitway places transit operations be furthest from adjacent sensitive buildings and therefore has least impact on them. • A two-way curb transitway will be closest to adjacent buildings on one side producing the most severe noise and vibration impacts.
Passengers Convenience & Comfort in Accessing Transit Facilities	◐	●	◕	• A one-way curb-side transit permits a more familiar platform arrangement for transit users but still requires a road crossing for one of the trip directions. Curb side platforms can be wider and feel safer as they are more remote general road vehicles. • Median transitway station platforms require protective measures to overcome passenger discomfort due to road traffic passing behind a platform. • All locations require a road crossing for some passengers and trip directions. The two-way transitway on one side avoids a crossing for passengers originating on the same side.
Streetscape Improvement Opportunities	●	◔	◕	• A median transitway allows more opportunity for a distinctive streetscaping treatment. It also establishes a more visible identity for the transitway system. • Streetscaping enhancements are limited to station sites on a one-way curb-side transitway. • A two-way curb-side transitway offers an unsymmetrical opportunity for streetscape improvements
ECONOMIC ENVIRONMENT				
Capital & Operating Costs	◐	●	◕	• A median transitway will have the highest capital costs due to the wider cross-section required at intersections where left turn lanes are reinstated. • Capital costs of curb-side transitway will be increased if service roads are required to permit mid-block access to adjacent properties. • A one or two-way curb-side transitway provides opportunities for combining platform with adjacent sidewalks.
Land Acquisition Costs	◐	●	◕	• Where right-of-way must be acquired to accommodate the wider roadway, the relative costs will be similar to that of construction cost due to the cross-sectional requirements for each alternative.

QUALITY RATING:

Most Preferred ● ◕ ◐ ◔ ○ Least Preferred

5.4.2 Preliminary Evaluation

A multi-criteria comparative evaluation of the alternative locations for transit within the road right-of-way considered the effect of each location under three main factors:

- Transportation;
- Human environment; and
- Economic.

Within each primary factor, the merits of each alternative were assessed against indicators considered most pertinent to the evaluation. The result of the evaluation is presented in **Table 5.4-1**.

5.4.3 Conclusion

The evaluation indicated that a median transitway was the preferred location for the following reasons:

- Transportation service quality will be highest;
- It is deemed the safest as it had the least potential conflicts with general traffic along the transitway and at intersections;
- It provides good opportunity to mitigate the impact of local traffic and property access issues; and
- It allows better streetscaping opportunities and reinforces the identity and visibility of the rapid transit system.

6. DETAILED EXISTING CONDITIONS IN CORRIDOR

Chapter 6 summarizes the existing conditions in the selected transit corridor, namely the Highway 7 Corridor. These existing conditions include:

- Transportation Environment;
- Natural Environment;
- Social Environment;
- Cultural Heritage Resources;
- Existing Noise and Vibration Levels; and
- Air Quality.

6.1 TRANSPORTATION ENVIRONMENT

This Section introduces the various aspects of the transportation environment in which the project is proposed to take place. A detailed report, *Transportation Assessment*, is presented in **Appendix C**.

6.1.1 Local/Regional Public Transit Network

The existing bus routes operate in mixed traffic on Highway 7 without designated lanes, HOV lanes, or signal priority on Highway 7. The existing routes are operated as York Region Bus Routes. There are currently no east-west Toronto Transit Commission (TTC) Routes that operate on Highway 7 from within the limits of the Highway 7 EA. TTC and GO Transit operate a number of routes on the major north-south arterial roads intersecting Highway 7 between Highway 27 and Ninth Line.

6.1.1.1 Existing York Region Transit Bus Routes in the Corridor

Two main east-west York Region Transit (YRT) bus routes operate along Highway 7 between Highway 27 and Ninth Line. They are Bus Routes #1 and #77. Many other routes run as north-south trunk routes crossing the corridor and/or service local areas such as institutions, business, commercial and residential areas in the vicinity of the corridor. They include Bus Routes #2A/2B, #3/3A/3B, #7, #8, #10, #11, #12, #13, #20, #23, #40, #41, #42, #45, #77, #82, #83/83A, #85/85AB/85C, #88, #90, #91, and #99. Their peak period headways are between 11 and 45 minutes.

6.1.1.2 Existing TTC Bus Routes in the Corridor

In addition to YRT bus services, the TTC also provides services on north-south arterial roads connecting the City of Toronto to York Region. The Bus Routes include #24D/224D, #25D, #35D, #60, #68B, #102D, #105, #107CF/BCF, #129A, #160, and #165D. Their peak period headways are between 11 to 45 minutes.

6.1.1.3 Existing GO Transit Bus Routes in the Corridor

GO Transit operates numbers of express buses in the Highway 7 and Vaughan North-South Link Corridor. The 407-York U Service runs along Highway 407 between Highway 50 and Ninth Line including services to/from York University. Stouffville Service runs along Highway 404 between Toronto and Stouffville. Newmarket "B" Service runs along Yonge Street between Finch Station and Barrie. Bolton Service, a rush-hour service, operates on Highway 27 between Bolton and York Mills.

6.1.1.4 Existing GO Rail Services in the Corridor

Within the Corridor, GO Transit operates three rail services – Richmond, Stouffville and Bradford Lines. Richmond Line runs between Toronto Union to Richmond Hill, Stouffville Line between Toronto Union to Stouffville, and Bradford Line between Toronto Union to Bradford.

6.1.1.5 GO Transit Terminals and Other Major Transit Terminals or Centres

There are four GO Transit Terminals in proximity to Highway 7 within York Region:

GO Langstaff Terminal – Located on Langstaff Road south of Highway 7 and Highway 407 in Markham, on the Richmond Hill Line. GO Trains operate on 30 minute headways during the weekday AM and PM peak periods and 60 minute headways until 8:15 PM. There is no off-peak train service to this station. There is GO Bus service to the terminal throughout the day;

GO Unionville Terminal – Located at Kennedy Road and Helen Avenue in Markham, on the Stouffville and Highway 407 Lines, with primary access via Kennedy Road. GO Trains operate on headways of between 30 and 70 minutes during the weekday AM and PM peak periods. Several GO buses service the terminal, on approximately 60-minute headways, throughout the day;

GO Centennial Terminal – Located at the intersection of Bullock Drive and McCowan Road in Markham, on the Stouffville and Highway 407 Lines. Primary access to the terminal is via Bullock Drive. GO Trains operate on headways of between 30 and 70 minutes during the weekday AM and PM peak periods. Several GO buses service the terminal, on approximately 60-minute headways, throughout the day; and

GO Markham Terminal – Located at Main Street north (Highway 48) and Station Street in Markham, on the Stouffville and Highway 407 Lines. Primary access to the terminal is via Station Street. GO Trains operate on headways of between 30 and 70 minutes during the weekday AM and PM peak periods. GO buses service the terminal throughout the day with approximately 60-minute headways.

The major transit terminals or centres where transit is prevalent are generally located at the Malls. A new terminal opened in Oct/Nov 2004 on Jane Street south of Rutherford Road, providing service to the Vaughan Mills area. Additional terminals and centres are located within the Highway 7 Corridor and along the proposed links include:

- **Vaughan Mills Mall Terminal** at Jane Street south of Rutherford Road;
- **Promenade Mall Terminal** at Bathurst Street and Centre Street;
- **York University Terminal** at Steeles Avenue and Keele Street;
- **Markville Mall** at Highway 7 and McCowan Road; and
- **Markham Stouffville Hospital** at Ninth Line north of Highway 7.

6.1.2 Existing Roadway Network

6.1.2.1 Arterial and Collector Roadways

Highway 7 is an arterial roadway that travels across central Ontario connecting Ottawa in the east to London in the west. The road changes jurisdiction from a provincial highway to a regional road between the Town of Markham and the City of Brampton.

Included in **Table 6.1-1** is a summary of the basic lane cross-sections through the Study Area on Highway 7 and on the other routes that the proposed rapid transit system will operate on.

Table 6.1-1
Roadway Cross-Section Summary

Highway 7 Cross-Section	
Road Section	Cross-Section
York-Peel Boundary (Highway 50) to Highway 427	Six lane
Highway 427 to Kipling Avenue	Seven lane
Kipling Avenue to Humber River	Four lanes
Humber River to Bruce Street	Four lanes
Bruce Street to Weston Road	Seven lanes
Weston Road to just east of Fairburn Drive/Montgomery Court	Six lanes
Fairburn Drive/Montgomery Court to Markham By-Pass	Five lanes
Markham By-Pass to Locust Hill area	Two lanes
Cross-Section of Other Proposed Route Links	

6

Table 6.1-1
Roadway Cross-Section Summary

Road Section	Cross-Section
Jane Street from Highway 7 to north of Highway 407	Four lanes
Jane Street from north of Highway 407 to south of Highway 407	Six lanes
Jane Street from south of Highway 407 to Steeles Avenue	Four lanes
Steeles Avenue from North West Gate to Keele Street	Six lanes
Keele Street from Steeles Avenue to Snidercroft / Ron Rose Drive	Four lanes
Keele Street from Snidercroft / Ron Rose Drive to Jardin Drive / Doney Crescent	Six lanes
Centre Street from Highway 7 to Dufferin Street	Four lanes
Centre Street from Dufferin Street to New Westminster Gate	Five lanes
Centre Street from New Westminster Gate to Bathurst Street	Four lanes
Bathurst Street from Centre Street to Flamingo Road/Worth Boulevard	Six lanes
Bathurst Street from Flamingo Road/Worth Boulevard to Bathurst Street Connection Ramp	Four lanes
Bathurst Street from Flamingo Road/Worth Boulevard to Bathurst Street Connection Ramp	Six lanes
Woodbine Avenue from Highway 7 to Yorktech Drive	Six lanes
Town Centre Boulevard from Highway 7 to IBM	Four lanes
Warden Avenue from Highway 7 to Enterprise Drive	Four lanes
Kennedy Road from Helen Avenue to Highway 7	Four lanes

6.1.2.2 Intersection Control

Existing intersections were inventoried. There are a total of 141 intersections on Highway 7 and the other route links, 94 of them are signalized and 47 are unsignalized. **Table 6.1-2** summarizes the number of signalized and unsignalized intersections along the various route links.

Table 6.1-2
Summary of the Numbers of Signalized and Unsignalized Intersections

Roadway	Signalized	Unsignalized*
Highway 7	70	37
Jane St. between south of Highway 7 & north of Steeles Ave.	3	1
Steeles Ave. between east of Jane St. & west of Keele St.	1	1
Keele St. between south of Highway 7 & north of Steeles Ave.	4	1
Centre St. between east of Highway 7 & Bathurst St.	6	0
Bathurst St. between north of Centre St. & Bathurst St. Connection Rd.	5	2
Woodbine between south of Highway 7 & Yorktech Drive	1	0
Town Centre Blvd. between south of Highway 7 & IBM Entrance	0	3
Warden Ave. between south of Highway 7 & Enterprise Dr.	1	1
Kennedy Rd. between south of Highway 7 & Helen Ave.	3	2
TOTAL	93	50

Note:
* Stop sign on minor streets

6.1.2.3 Traffic Volume and Composition

The average annual daily traffic (AADT) along Highway 7 varies from 74,450 to 8,270 vehicles. **Tables 6.1-3** and **6.1-4** summarize the 2002 AADT's for representative locations along the Highway 7 and other route links, respectively. Segment A and Segment B have a steady flow of traffic throughout, but their AADTs peak around Highway 400. The AADT in Segment C peaks around the middle of the segment near Leslie Street while the AADT in Segment D declines rapidly at Ninth Line. In the meantime, other route links share the similar demand.

Table 6.1-3
Average Annual Daily Traffic Volumes on Highway 7

Highway 7	
Location	2002 AADT (Vehicles per Day)
SEGMENT A	
East of Highway 50	54,930
East of Highway 427	38,690
East of Highway 27	37,970
West of Martin Grove Road	38,470
West of Kipling Avenue	42,080
West of Islington Avenue	44,060
East of Islington Avenue	38,600
West of Weston Road	52,180
West of Highway 400 West Ramp	71,480
SEGMENT B	
East of Highway 400 East Ramp	74,450
East of Jane Street	52,290
East of Keele Street	44,140
East of Centre Street	30,680
West of Bathurst Street	38,480
East of Bathurst Street	43,500
SEGMENT C	
East of Yonge Street	58,350
West of Leslie Street	58,420
East of Leslie Street	63,260
East of East Beaver Creek Road	61,100
East of Highway 404 East Ramp	65,380
East of Allstate Parkway	52,250
East of Woodbine Avenue	43,040
West of Warden Avenue	40,880
East of Warden Avenue	39,000
SEGMENT D	
East of Kennedy Road	37,630
East of McCowan Road	27,880
West of Highway 48	27,210
West of Ninth Line	15,950
East of Ninth Line	8,270
East of Markham By-Pass	10,390
West of York-Durham Line	15,070

Note: Based on automatic traffic recorder (ATR) counts provided by the Region of York

Table 6.1-4
Average Annual Daily Traffic Volumes on Other Route Links

Other Route Links	
Location	2001 AADT (Vehicles per Day)
SEGMENT B	
Jane Street north of Steeles Avenue	26,920
Jane Street south of Highway 7	31,840
Steeles Avenue west of Keele Street	45,190
Keele Street south of Highway 7	30,930
Centre Street west of Dufferin Street	20,200
Centre Street east of Dufferin Street	22,230
Bathurst Street south of Highway 7	35,900
SEGMENT C	
Woodbine Avenue south of Highway 7	33,170
Warden Avenue south of Highway 7	30,380
Kennedy Road north of Helen Avenue	39,000
Kennedy Road south of Highway 7	28,150

Note: Based on automatic traffic recorder (ATR) counts provided by the Region of York

Truck movements fluctuate along Highway 7 with a higher percentage west of Highway 427 at approximately 11% of the vehicle composition during the daily traffic. West of Pine Valley Drive, the truck percentages average approximately 7% and decreases to approximately 6% east of Weston Road. In the east end of the study limits the truck percentage is approximately 4%.

6.1.2.4 Peak Traffic Periods

The subject section of Highway 7, as well as the other proposed route links, serves traffic and pedestrian movements associated with neighbourhood access, retail/commercial development demands, and through commuter traffic demands. The peak travel demands occur during the weekday AM and PM peak hours associated with commuter/work related travel.

Generally, off-peak and weekend traffic levels are considerably less than those experienced during the weekday AM and PM peak periods.

6.1.2.5 Intersection Operations

Intersection capacity analysis was undertaken using the Highway Capacity Manual (HCM) methodology and in particular, the Synchro 6.0 software package. A calibration exercise was conducted to ensure the results of the Synchro analysis best reflected the peak hour field observations. The saturation flows, peak hour factor and lost times were adjusted to simulate the existing conditions. The analysis reflects the 2002 or 2003 counts, current signal timings, and existing lane configurations. The AM and PM peak hour analysis results for signalized intersections on Highway 7 and other route links are included in **Appendix C Exhibits 3-10** and **3-11**, respectively. Full analysis summaries are included in **Appendix C-B**.

Table 6.1-5 summarizes the overall signalized intersection performance in the AM and PM peak hours on Highway 7 on a segment by segment basis in terms of the percentage of intersections operating at each level of service (LOS).

Table 6.1-5
Summary of the Overall Signalized Intersection Performance in the AM and PM Peak Hour on Highway 7

Overall LOS	Seg. A (18 int.)		Seg. B (13 int.)		Seg. C (24 int.)		Seg. D (15 int.)		All Segments	
	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
A	27.8%	11.1%	30.7%	23.1%	16.7%	16.7%	33.3%	26.7%	25.7%	18.6%
B	16.7%	11.1%	23.1%	30.7%	33.2%	29.1%	26.7%	33.3%	25.7%	25.7%
C	27.8%	33.3%	23.1%	15.4%	29.2%	33.3%	13.3%	20%	24.3%	27.1%
D	11.0%	16.7%	7.7%	15.4%	16.7%	12.5%	26.7%	6.7%	15.7%	12.9%
E	0	5.6%	15.4%	15.4%	4.2%	4.2%	0	13.3%	4.3%	8.6%
F	16.7%	22.2%	0	0	0	4.2%	0	0	4.3%	7.1%

Note:
LOS A – Free flow
LOS B – Stable flow
LOS C – Stable Flow with lower level of comfort and convenience
LOS D – High-density but stable flow
LOS E – At or near capacity level
LOS F – Forced or breakdown flow

Generally, the LOS in the AM peak hour is higher than the LOS in the PM peak hour. The signalized intersections in Segment D operate at a much better LOS than the other segments. The signalized intersections in Segment A perform poorly in comparison, with 16.7% at LOS F in the AM peak and 22.2% at LOS F in the PM peak.

As for the other route links, percentage of LOS does not represent the signalized intersection performance very well simply because there is not a large number of intersections on each link. Therefore, **Table 6.1-6** summarizes the actual number of signalized intersections on other route links with respect to LOS in the AM and PM peak hours.

Table 6.1-6
Summary of the Overall Signalized Intersection Performance in the AM and PM Peak Hour on Other Route Links

Over all LOS	Jane St. (4 int.)[1]		Steeles Ave. (1 int.)		Keele St. (5 int.)[2]		Centre St. (6 int.)		Bathurst St. (5 int.)		Woodbine Ave. (1 int.)		Warden Ave. (1 int.)		Kennedy Ave. (3 int.)	
	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
A	2	1	0	0	0	2	3	0	2	0	0	0	0	0	0	0
B	1	1	1	1	4	2	0	4	1	2	0	0	1	1	2	0
C	0	1	0	0	1	0	2	1	2	3	0	0	0	0	0	0
D	0	1	0	0	0	1	1	1	0	0	1	1	0	0	1	1
E	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
F	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1

Note:
1. Jane St. and Steeles Ave. intersection included.
2. Keele St. and Steeles Ave. intersection included.

The critical movements are defined as, turning movements approaching a vehicle to capacity (v/c) ratio of 1.0 and/or LOS "E" or "F". The following locations on Highway 7 are operating at an acceptable level of service during the AM and PM peak hours with v/c ratios below 1.0.

- Hy and Zel Plaza / Leisure Lane;
- Woodstream Boulevard / Parkfield Court;
- Bruce Street;
- Helen Street / Wigwoss Drive;
- Whitmore Road / Ansley Grove Road;
- Nova Star Drive;
- Weston Road;
- Colossus Drive / Highway 400 N-E/W Off-Ramp;
- Highway 400 S-E/W Off-Ramp;
- Millway Avenue;
- Creditstone Road;
- Baldwin Avenue / Bowes Road;
- Saddlecreek Drive;
- Highway 404 N-E/W Off-Ramp;
- Frontenac Drive/Cochrane Drive;
- Lunar Crescent;
- Rodick Road;
- Warden Avenue;
- Verclair Gate;
- Village Parkway;
- Shoppes of Unionville Plaza;
- Main Street Unionville;
- Swansea Road;
- Bullock Drive / Plaza;
- Markville Mall Main Entrance;
- Laidlaw Boulevard / Rivermede Road;
- Langstaff Road;
- Thornhill Woods Drive;
- Bathurst Street Connection Road;
- Hunter's Point Drive;
- Yonge Street Connection Road;
- Red Maple Road;
- Silver Linden Drive;
- Chalmers Road / South Park Drive;
- Conservation Avenue;
- Robinson Street / St. Patrick School Entrance;
- Grandview Boulevard / Galsworthy Drive;
- Albert Street / Cosburn Road;
- Wooten Way;
- Markham By-Pass; and
- York-Durham Line.

The following locations on the proposed by-pass routes are operating at acceptable levels of service during the AM and PM peak hours with v/c ratios below 1.0.

- Jane Street and Interchange Way;
- Jane Street and Highway 407 N/S-W and E-N/S Ramp;
- Jane Street and Highway 407 W-N/S Ramp;
- Steeles Avenue and Founders Road;
- Keele Street and Highway 407 W-N/S Ramp;
- Keele Street and Highway 407 E-N/S Ramp;
- Keele Street and Jardin Drive / Doney Crescent;
- Centre Street and Concord Road / Wade Gate;
- Centre Street and New Westminster Drive;
- Centre Street and North Promenade;
- Bathurst Street and Westminster Drive / Atkinson Avenue;
- Bathurst Street and Highway 407 W-N/S Ramp;
- Bathurst Street and Highway 407 E-N/S Ramp;
- Bathurst Street and Bathurst Street Connection Road; and
- Kennedy Road and Unionville Gate.

Existing operational constraints or issues within the Study Area are contained in the **Appendix C Section 3.5.2**.

Based on a review of the analysis and from field observations, the following overall deficiencies are apparent:

- ➢ The majority of the capacity constraints are located at the major arterial roadways;
- ➢ During the peak hours, long east-west queues are observed at Islington Avenue. The AM peak hour shows eastbound queues spilling back occasionally to Kipling Avenue and during the PM peak hour westbound queues extend to Bruce Street. This section of Highway 7 consists of a 4-lane cross section;
- ➢ The Highway 7 Corridor between Weston Road through the Highway 400 Interchange to Interchange Way/Edgeley Boulevard represents a key constraint in the road network in the AM and PM peak hours;
- ➢ The Highway 7 Corridor in the Beaver Creek Business Park area from the intersection of Valleymede Drive/Times Avenue through the

Highway 404 Interchange to Allstate Parkway/Valhalla Drive experiences long delays and frequent queues during the peak hours; and

- The northbound left movements in the east limits at Reesor Road and Ninth Line during the AM peak period experience frequent queues and long delays as a result of home to work oriented trips.

6.1.2.6 Neighbourhood Traffic Concerns

Based on field investigations and through discussions with area municipality staff, a number of roadways and neighbourhoods were identified as having existing neighbourhood traffic concerns. Provided below is a summary of the primary locations/neighbourhoods identified.

Monsheen Drive/Wigwoss Drive Neighbourhood

6

The Monsheen Drive/Wigwoss Drive Neighbourhood in Woodbridge includes the areas bounded by Highway 7, Islington Avenue, Pine Valley Drive and Willis Road to the north. Under existing conditions, traffic diverts to these local roadways during the peak hours to avoid congestion along Highway 7 and specifically the Islington Avenue/Highway 7 intersection. Motorists attempting to negotiate a southbound left turn at Islington Avenue/Highway 7 intersection may use Monsheen Drive, Wigwoss Avenue, and Arrowhead Drive to gain access to the southbound left at the Helen Street/Highway 7 intersection.

Willis Road/Chancellor Drive Neighbourhood

The Willis Road/Chancellor Drive neighbourhood in Woodbridge is bounded by Highway 7, Islington Avenue, Weston Road and Langstaff Road. Traffic speed and volume concerns are generally associated with traffic along Willis Road and Chancellor Drive as it is a wide two-lane collector road with direct residential access. These roadways are used as alternates to Highway 7 for commuter traffic to avoid traffic congestion between Islington Avenue and Weston Road during peak periods. During the weekday peak hours the Highway 7/Islington Avenue and Highway 7/Pine Valley Drive intersections operate at capacity. As a result of these congested conditions, motorists choose to use the neighbourhood streets to circumvent the intersections.

Embassy Drive/Blue Willow Drive Neighbourhood

Embassy Drive is a residential collector road that runs parallel to Highway 7 on the north side between Pine Valley Drive and Ansley Grove Road. From Ansley Grove Road, the road name changes to Blue Willow Drive continuing easterly to Weston Road. This road provides driver's destined to/from Pine Valley Drive north from Highway 7 east with an opportunity to avoid several signals on Highway 7 and in particular the intersection of Pine Valley Drive and Highway 7.

Wilshire Neighbourhood

The Wilshire neighbourhood is located between Dufferin Street and Bathurst Street, north of Centre Street. The collector roads of Beverley Glen Boulevard, Concord Road, Worth Boulevard and New Westminster Drive in the neighbourhood provide accessible routes for vehicles travelling to and from Centre Street west and to and from Bathurst Street north. By utilizing Concord Road, Beverley Glen Boulevard and Worth Boulevard or New Westminster Drive, motorists can avoid the Bathurst Street / Centre Street intersection thus decreasing their travel time.

Yorktech Drive to Warden Avenue Ramps

Yorktech Drive connects Woodbine Avenue to the south end of South Town Centre Boulevard at IBM. The road runs through a commercial area at Woodbine Avenue and is mainly industrial towards South Town Centre Boulevard. It provides drivers with an alternative east-west route avoiding several signalized intersections on Highway 7 between Woodbine Avenue and Warden Avenue.

Historic Unionville

Historic Unionville is located north of Highway 7 between Kennedy Road and Warden Avenue. Main Street Unionville is a 2-lane collector road with on-street parking and has direct access to a variety of land uses including many heritage buildings. Traffic infiltration issues are associated with excessive travel along Carleton Road, east-west collector road north of Highway 7 and existing and future north-south travel through the neighbourhood. A neighbourhood traffic management committee, the Unionville Community Coalition, has been established for this neighbourhood and current initiatives have focused on the potential for north-south travel through the neighbourhood resulting from the future development of the Markham Centre. Improvements along Village Parkway and Carleton Road have been identified as key components of the traffic calming plan as well as key traffic calming measures such as medians, curb extensions, bike lanes, through prohibitions and turn restrictions.

6.1.3 Existing Right-of-Ways

Existing Right-of-Way (ROW) widths vary along Highway 7. Over the years property acquisition through widening and redevelopment has characterized Highway 7 by a mix of different widths. In general, Highway 7 has a width varying from 20 metres to 60 metres of ROW from Highway 50 in the west to York-Durham Line in the east. Most buildings are well set back from property lines in these areas. There are four cemetery locations whose tombstones are very close to the ROW, which are Brown's Corners Church and Cemetery on the northwest corner of Highway 7 and Frontenac Drive; Elmwood Cemetery and St. Andrews Cemetery on the northeast and southeast corners of Highway 7 and Savannah Crescent; and the Locust Hill United Cemetery on the southwest corner of Highway 7 and the Little Rouge River.

6.1.4 Pedestrian/Cycling Network

Sidewalks are provided along most of the lengths of Highway 7, Jane Street, Steeles Avenue, Keele Street, Centre Street, Bathurst Street, Woodbine Avenue, Town Centre Boulevard, Warden Avenue and Kennedy Road.

6.1.4.1 Pedestrian Demand

The pedestrian volumes within the Highway 7 Corridor vary significantly from one area to the next and are a function of adjacent land uses and transit facilities. There are pockets of developed commercial areas, industrial areas and recent and established residential areas, which generate significant pedestrian traffic.

The east and west limits of the Study Area are presently undeveloped with minimal commercial/industrial accesses and therefore the pedestrian/cycling demand in this area is negligible. As a result the speed limits in these areas are relatively high at 70 to 80 km/hr. The central section of Highway 7 from Centre Street to Bayview Avenue also operates at relatively high speeds due to a wide right-of-way, minimal adjacent development and low pedestrian volumes.

Included in **Table 6.1-7** and **6.1-8** are summaries of the existing high or active pedestrian areas along Highway 7 and the proposed rapid transit routes, for retail and industrial areas respectively.

Table 6.1-7
High Pedestrian Area - Retail

Location	Characteristics
Highway 7/ Martin Grove Road	▪ Woodbridge Mall
Highway 7/Lansdowne Avenue / Mackenzie Street	▪ Woodbridge Public Elementary School
Bruce Street	▪ Woodbridge High School
Islington Avenue	▪ Key transit transfer area ▪ Woodbridge Pool and Memorial Arena

Table 6.1-7
High Pedestrian Area - Retail

Location	Characteristics
Marycroft Avenue / Aberdeen Avenue to Weston Road	▪ High density commercial area, Colossus Centre, Seven and 400 Power Centre, Piazza al Sole, Woodbridge Square. ▪ The Colossus Movie Theatre
Steeles Avenue between Jane Street and Keele Street	▪ York University and Seneca College ▪ Black Creek Pioneer Village
Keele Street	▪ Key transit transfer area
Centre Street/Bathurst Street	▪ Promenade Mall
Bathurst Street/New Westminster Drive	▪ Westmount Collegiate ▪ Benjamin Vaughan Complex
Chalmers Road to Commerce Valley Drive East	▪ Commercial area ▪ Office area
Woodbine Avenue	▪ Key transit transfer area
Fairburn Drive / Montgomery Court	▪ Woodside Centre, First Markham Place ▪ Cineplex Odeon Movie Theatre
Warden Avenue	▪ Key transit transfer area ▪ Markham Town Square
McCowan Road and Bullock Drive intersections	▪ Markville Shopping Centre ▪ Strip malls and fast food restaurants
Main Street Markham	▪ Small Town feel with stores fronting main street, north of Highway 7. ▪ On-street parking on north approach of intersection.

Table 6.1-8
High Pedestrian Area - Industrial

Location	Characteristics
West Woodbridge Industrial Park	▪ Highway 7 from Highway 27 to Martin Grove Road
Pine Valley Business Park	▪ South of Highway 7 from Pine Valley Drive to Weston ▪ Road.
Canadian National Freight Classification Yard	▪ Highway 7 from Jane Street to Bowes Road
Steeles East Industrial Area	▪ Steeles Avenue between Jane Street and Keele Street
Langstaff Business Park	▪ Highway 7 from North Rivermede to Dufferin Road
Bayview Glen Business Park	▪ Highway 7 between Red Maple Road and Bayview Avenue
Beaver Creek Business Park	▪ West Beaver Creek to Highway 404
Buttonville Airport Industrial Park	▪ Highway 7 from Highway 404 to Woodbine Avenue
IBM	▪ Town Centre Boulevard south of Cedarland Drive

There are no off-road recreational pedestrian routes provided within the Study Area.

6.1.4.2 Pedestrian Facility

Pedestrian signal heads are provided at the majority of the signalized intersections in the Study Area. At the following locations Audible Pedestrian Signals (APS) have been installed to accommodate the visually challenged:

- Bullock Drive / Markham Mews Plaza / Highway 7; and
- McCowan Road / Highway 7.

6.1.4.3 Cycling Demand

During field investigations, minimal bicycle travel was observed on Highway 7. Given the volume and speed of traffic on Highway 7, bicycle travel is limited to commuter/recreational intermediate to serious riders, i.e., inexperienced, casual and young cyclists would generally not be comfortable riding on Highway 7.

An off-road recreational cycling route exists along the east side of the Don River, which runs through the City of Vaughan. The pathway intersects Highway 7 west of Centre Street between the Keele Industrial Area and Langstaff Business Park. Another off-road cycling route is provided on the east side of Hunter's Point Drive from Highway 7 north through the South Richvale neighbourhood.

The Bikeway Implementation Strategy Phase 1 Report prepared by Marshall Macklin Monaghan, designates Town Centre Boulevard as a bicycle route to Cedarland Drive. Highway 7 is not designated as an on-road route within the Town of Markham.

6.2 NATURAL ENVIRONMENT

This Section describes the existing conditions in the Study Area related to natural sciences, including physiography and soils, geology/hydrogeology, aquatic habitat and communities, vegetation and vegetation communities, wildlife and wildlife habitat and designated natural areas. The detailed description of the Natural Environment is presented in the *Natural Sciences Report* in **Appendix D**. A summary of the main Natural Environment features is presented **Figures 6.2-1 and 6.2-2**.

6.2.1 Physiography and Soils

The Study Area is located in the Peel Plain physiographic region. The Peel Plain is a level to undulating tract of clay soils with imperfect drainage. The underlying geological material of the Peel Plain is a till or boulder clay which contains large amounts of Palaeozoic shale and limestone. The general elevation is from 500 to 750 feet above sea level and there is a gradual and fairly uniform slope towards Lake Ontario.

The soils surrounding Highway 7 in the Study Area include Peel clay, Malton clay, Cashel clay, Chinguacousy clay loam, Simcoe clay loam, Jeddo clay loam, Oneida clay loam, Milliken loam, Woburn loam, Lyons loam, Fox sandy loam, Berrien sandy loam, Bookton sandy loam, Brady sandy loam, Brighton sandy loam, and Bottom Land (associated with watercourses). The majority of the Study Area is dominated by Peel clay and Chinguacousy clay loam with Milliken loam becoming more predominant in the eastern portion of the Study Area.

The Study Area lies within the Humber, Don, Rouge, Petticoat and Duffins watersheds although Duffins Creek is not crossed by Highway 7 itself. Highway 7 traverses a total of 42 watercourses including tributaries of the West Humber River (e.g. Albion Creek), the main and east branches of the Humber River and associated tributaries (e.g. Rainbow Creek, Emery Creek, Black Creek), the east and west branches of the Don River and associated tributaries (e.g. Westminster Creek, German Mills Creek), the Rouge River and associated tributaries (e.g. Beaver Creek, Little Rouge Creek), and Petticoat Creek. There are 22 crossings along the various route alternatives within the study limits. These watercourses flow generally in a north to south direction from their headwaters in the Oak Ridges Moraine to their mouths at Lake Ontario. All watercourses fall within the jurisdiction of the Toronto and Region Conservation Authority (TRCA) and Ministry of Natural Resources (MNR) Aurora District.

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6.2.2 Geology/Hydrogeology

Hydrogeologic conditions were reviewed for the Highway 7 Corridor transitway. The Study Area included 500 metres on either side of the Highway 7 and the route alternatives under consideration.

6.2.2.1 Surficial Geology

The surficial geology within the study is predominantly comprised of the following soil units:

- glacial till deposits, comprised of sandy silt to sand, known as Newmarket Till;
- glacial lake deposits, comprised of silt and clay;
- glacial lake deposits, comprised of sand and gravel;
- glacial till deposits, comprised of clayey silt to silt, known as Wildfield Till and Halton Till; and,
- alluvial deposits, comprised of silt, sand, and gravel.

About 80% of the Highway 7 Corridor is underlain by the permeable sandy silt to sand glacial till and by the silty and clayey glacial lake deposits, with the remaining 20% underlain by the three other soil types.

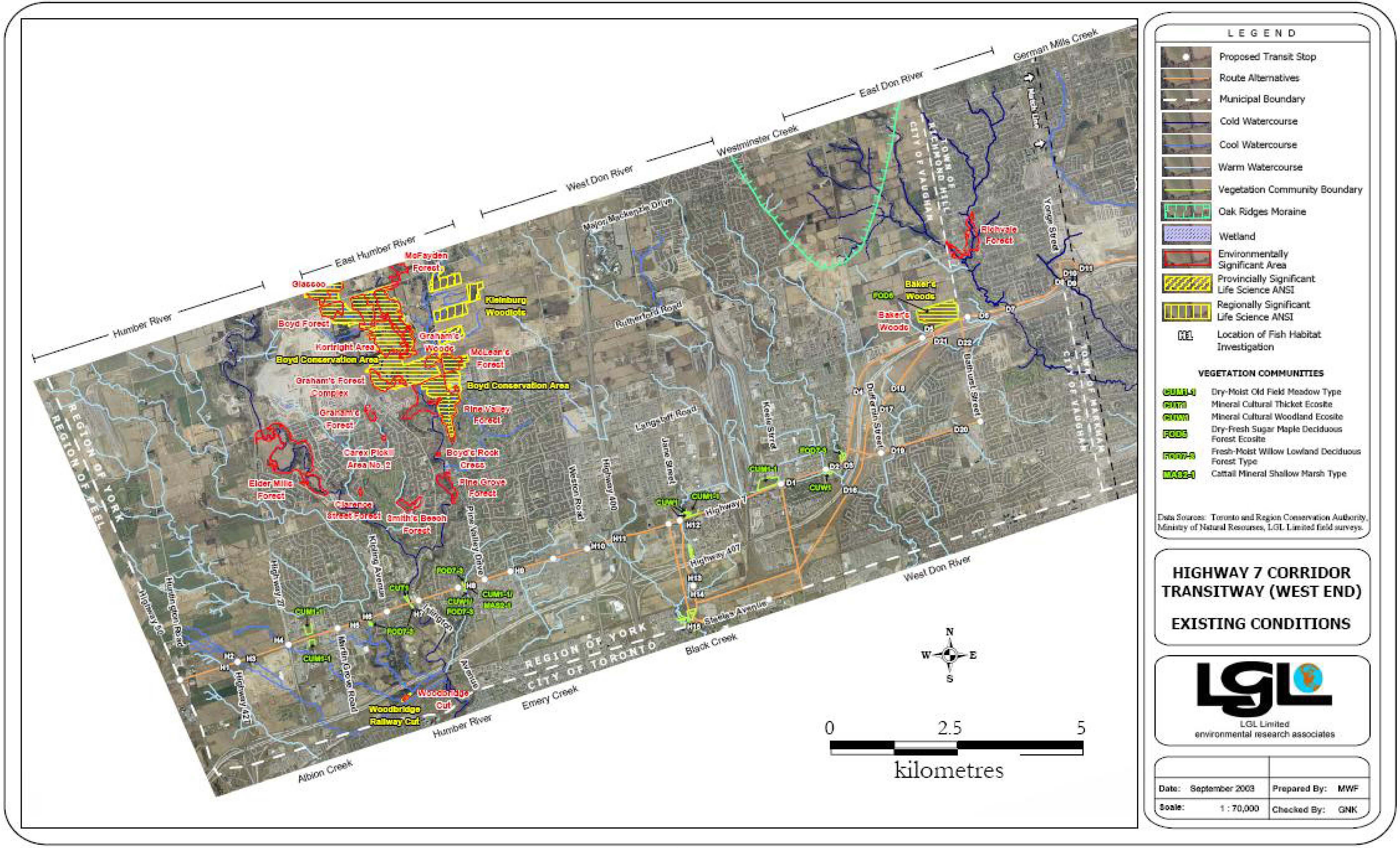

Figure 6.2-1
Existing Natural Enviornment in the Highway 7 Corridor West Section

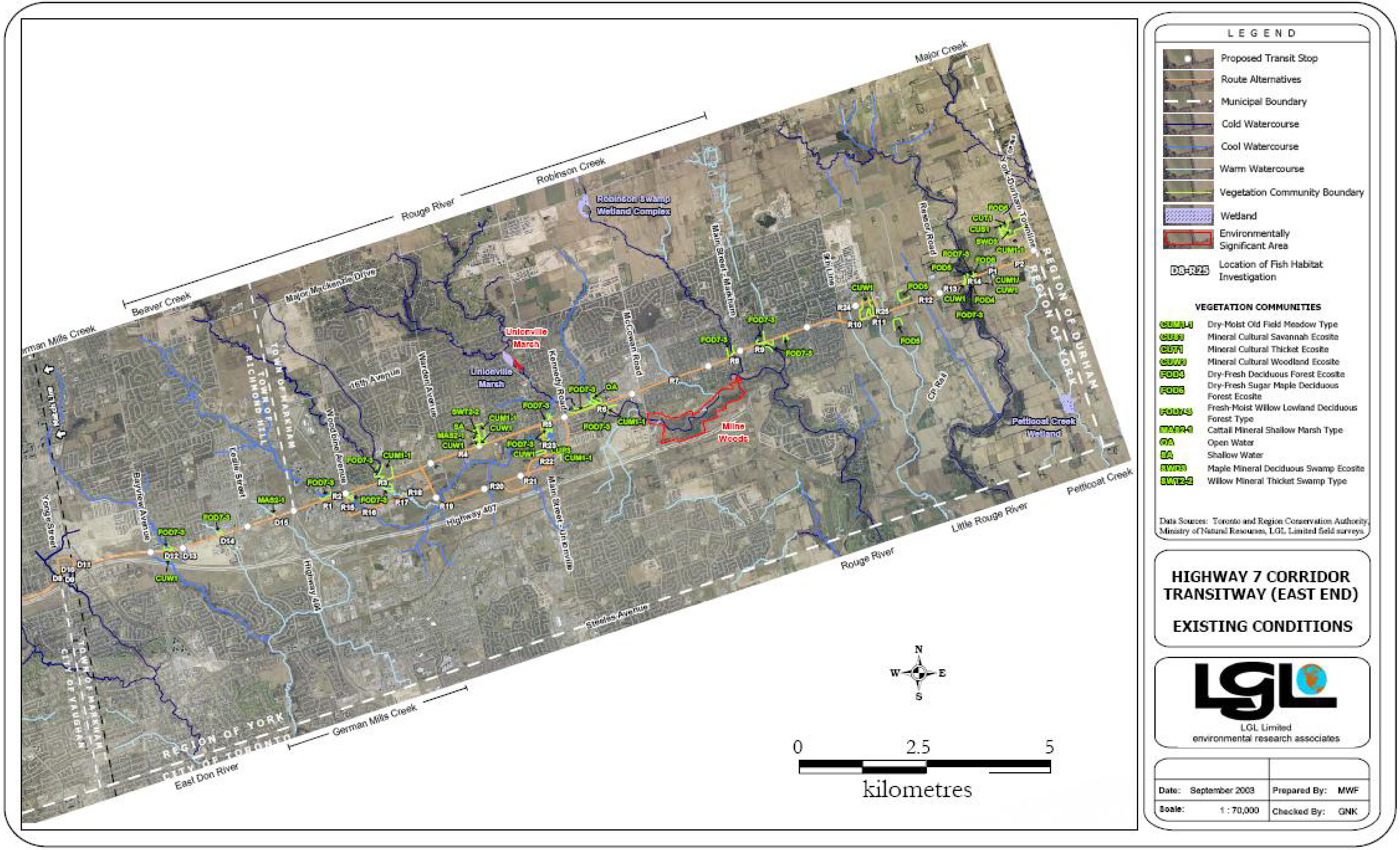

Figure 6.2-2
Existing Natural Enviornment in the Highway 7 Corridor East Section

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6.2.2.2 Distribution of Aquifers

Hydrogeological cross sections along Highway 7 Corridor are based on information from the Ministry of the Environment (MOE) water well database. These cross-sections are presented in **Appendix D**, and indicate that the geology of the study areas consists of relatively thick overburden (soil) resting upon bedrock. The thickness of overburden along the Highway 7 Corridor ranges from about 4 metres at a location (13+900) in the Rainbow Creek valley west of Kipling Avenue, to over 130 metres at a location (27+600) west of Bathurst Street. The vertical profile of overburden materials indicates variable soil conditions ranging from clay to gravel. There does not appear to be a strong consistent correlation of the soils into coherent strata. Clayey materials appear to predominate in the subsurface, with some local groundwater aquifers provided by lenses or localized layers of granular materials within the finer grained deposits. Some sections of the corridor do not have water well records that would provide information for interpretation of subsurface conditions, or in other areas water wells located are relatively shallow compared to the thickness of overburden.

6.2.3 Horizontal Groundwater Movement

The water table surface within the Study Area is interpreted to be a subtle reflection of the ground surface topography. Shallow groundwater movement generally mimics surface topography gradients, flowing in a predominantly southward direction within the Study Area. In areas relatively close to surface watercourses (within 100 – 200 m), shallow groundwater flow will be directed more toward the surface watercourse.

6.2.4 Groundwater Recharge/Discharge Areas

Groundwater discharge areas occur at surface watercourses and in floodplain areas adjacent to them. There are approximately 35 locations where a surface watercourse is crossed by Highway 7 within the Study Area, as shown on **Appendix E-A Figures 1 to 13**. Water wells with static water levels that are above or close to ground surface within the Study Area may indicate the presence of discharge areas. The MOE records indicate two clusters of wells with a water level either located above or within 1 m of ground surface, which are along Highway 7 between Highway 400 and Jane Street, and along Highway 7 between Leslie Street and McCowan Road. Wetlands are sometimes indicators of discharge areas, but none were identified on published mapping within the Study Area.

Groundwater recharge areas occur to varying degrees over the majority of the Study Area in areas located away from floodplains and between discharge areas along surface watercourses, typically areas that have exposed soil or vegetation covered soils, including parks, lawns, golf courses, school yards, undeveloped lots, open fields, and the grassed medians in roads.

6.2.5 Well Distribution

The MOE water supply well database reports the historic presence of approximately 1200 water supply wells within the Study Area. Additional water supply wells may be located in the Study Area, but their records are not included in the MOE database. Based on discussions with Region of York staff, it is considered likely that the majority of the wells are no longer active, and have been either demolished, buried over, or decommissioned following urbanization. Most residential, commercial, and industrial sites are fully serviced by municipal water supplies. Discussions with municipal public works staff indicate that some individual residents continue to obtain their water supplies from private wells in the areas along Highway 7 between Highway 50 and Highway 27, between Yonge Street and Bayview Avenue, and between Ninth Line and the York-Durham Townline. There are no municipal water supply wells in the Study Area.

6.2.6 Aquatic Habitats and Communities

The study limits are within the Humber River, Don River, Rouge River, Petticoat Creek, and Duffins Creek watersheds. A total of 42 watercourses cross Highway 7 or are piped under Highway 7 between Highway 50 and the York-Durham Townline. There are 22 crossings along the various route alternatives within the study limits. There are no crossings of Duffins Creek or its tributaries within the study limits. A summary of the watercourse crossings is presented in **Appendix D Table 1**. The locations of the watercourses and representative photos of watercourse crossings are presented in **Appendix D Figure 2 and Appendix D-C**.

6.2.6.1 Humber River

The western portion of the Study Area, from Highway 50 to immediately east of Weston Road passes through the Humber River watershed. Tributary systems of the Humber River watershed crossed by the proposed transit alignments include Albion Creek, Rainbow Creek, West, Main, and Lower Branches of the Humber River, Emery Creek and Black Creek. A total of 15 watercourses cross the alternative transitway alignments. One of them is coldwater, five are coolwater and nine are warmwater. **Table 6.2-1** summarizes the location and fish community of these watercourses.

Table 6.2-1
Summary of the Watercourse Crossings in the Humber River Watershed

Waterbody Name	Ref. No.	Fish Community	Location
Albion Creek	H1	Warmwater	Crosses Highway 7 west of Highway 7/ Highway 427 interchange
Tributaries of Main Humber River	H2, H3	Coolwater	Cross Highway 7 between Huntington Road and Highway 27
Tributary of Main Humber River	H4	Coolwater	Crosses Highway 7 immediately west Highway 27
Rainbow Creek	H5	Coolwater	Crosses Highway 7 between Martin Grove Road and Kipling Avenue
Tributary of Rainbow Creek	H6	Coolwater	Crosses Highway 7 between Martin Grove Road and Kipling Avenue
Main branch of the Main Humber River	H7	Coldwater	Crosses Highway 7 immediately west of Islington Avenue
Tributary of Main Humber River	H8	Warmwater	Crosses Highway 7 between Islington Avenue and Pine Valley Drive
Emery Creek	H9	Warmwater	Crosses Highway 7 between Pine Valley Drive and Weston Road
Tributaries of Black Creek	H10, H11	Warmwater	Cross Highway 7 between Weston Road and Highway 400
Black Creek	H12	Warmwater	Crosses Highway 7 immediately east of Jane Street
Black Creek	H13	Warmwater	Crosses Jane Street between Highway 407 and Steeles Avenue
Tributary of Black Creek	H14	Warmwater	Crosses Jane Street between Highway 407 and Steeles Avenue
Black Creek	H15	Warmwater	Crosses Jane Street at the intersection with Steeles Avenue

6.2.6.2 Don River

The central portion of the Study Area, from immediately east of Jane Street to Highway 404, passes through the Don River watershed. Tributary systems of the Don River watershed crossed by the proposed transit alignments include West Don River, Westminster Creek, East Don River and German Mills Creek. A total of 22 watercourses cross the alternative transitway alignments. Five of them are coldwater, two are coolwater and fifteen are warmwater. **Table 6.2-2** summarizes the location and fish community of these watercourses.

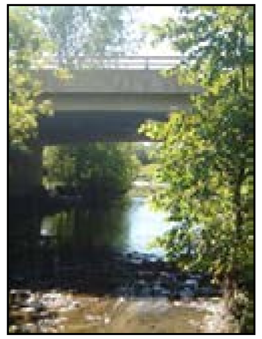

Table 6.2-2

Summary of the Watercourse Crossings in the Don River Watershed

Waterbody Name	Ref. No.	Fish Community	Location
Tributary of West Don River	D1	Warmwater	Crosses Highway 7 immediately east of Keele Street
Tributary of West Don River	D2	Warmwater	Crosses Highway 7 immediately east of Bowes Road
West Don River	D3	Warmwater	Crosses Highway 7 between Bowes Road and Rivermede Road
Westminster Creek	D4	Warmwater	Crosses Highway 7 between Bradwick Drive and Dufferin Street
Tributary of East Don River	D5	Warmwater	Crosses Highway 7 between Maple Sugar Lane and Bathurst Street
Tributary of East Don River	D6	Warmwater	Crosses Highway 7 approximately 0.48 km east of Bathurst Street
East Don River	D7	Coldwater	Crosses Highway 7 approximately 1 km east of Bathurst Street
Tributary of East Don River	D8	Coldwater	Crosses Highway 7 at Yonge Street
Tributary of East Don River	D9	Coldwater	Crosses Langstaff Road and Highway 407 between Yonge Street and the CN Rail Line
Tributary of East Don River	D10	Coldwater	Crosses Highway 7 between Yonge Street and the Highway 7/Yonge Street E-N/S ramp
Tributary of East Don River	D11	Coldwater	Crosses Highway 7 between Highway 7/Yonge Street E-N/S ramp and the CN Rail line
German Mills Creek	D12	Coolwater	Crosses Highway 7 between Bayview Avenue and Chalmers Road
Tributary of German Mills Creek	D13	Coolwater	Crosses Highway 7 between Bayview Avenue and Chalmers Road
Tributary of German Mills Creek	D14	Warmwater	Crosses Highway 7 at Chalmers Road
Tributary of German Mills Creek	D15	Warmwater	Crosses Highway 7 between West Commerce Drive and Highway 404
West Don River	D16	Warmwater	Crosses Hydro One Corridor between Highway 407 and Glen Shields Avenue
Westminster Creek	D17	Warmwater	Located in the Hydro One Corridor east of Dufferin Street
Tributary of Westminster Creek	D18	Warmwater	Located in the Hydro One Corridor between Highway 407 and Venice Crescent
Westminster Creek	D19	Warmwater	Crosses Centre Street between Dufferin Street and Concord Road
Tributary of East Don River	D20	Warmwater	Crosses Centre Street between New Westminster Drive and Bathurst Street
Tributary of East Don River	D21	Warmwater	Located in the Hydro One Corridor between Highway 407 and Hammerstone Crescent
Tributary of East Don River	D22	Warmwater	Crosses Bathurst Street between Highway 407 and Worth Boulevard

6.2.6.3 Rouge River

The middle and eastern portions of the Study Area, between Highway 404 and the CP Rail crossing at Locust Hill, passes through the Rouge River watershed (both Upper and Lower Rouge). Tributary systems of the Rouge River watershed crossed by the alternative transitway alignments include Beaver Creek, Rouge River, Robinson Creek, Exhibition Creek and Little Rouge River. A total of 25 watercourses cross the alternative transitway alignments. Five and a half of them are coldwater, twelve are coolwater and seven and a half are warmwater. **Table 6.2-3** summarizes the location and fish community of these watercourses.

Table 6.2-3

Summary of the Watercourse Crossings in the Rouge River Watershed

Waterbody Name	Ref. No.	Fish Community	Location
Tributary of Beaver Creek	R1	Coolwater	Crosses Highway 7 between Allstate Parkway and Frontenac Drive
Beaver Creek	R2	Coolwater	Crosses Highway 7 between Frontenac Drive and Woodbine Avenue
Main branch of Upper Rouge River	R3	Coldwater upstream; warmwater downstream	Crosses Highway 7 between Montgomery Court and Rodick Road
Tributary of Lower Rouge River	R4	Coolwater	Crosses Highway 7 between Verclair Gate and village Parkway
Main branch of Lower Rouge River	R5	Coolwater	Crosses Highway 7 between Main Street Unionville and Meadowbrook Line
Main branch of Lower Rouge River	R6	Coldwater	Crosses Highway 7 between Oakcrest Avenue and Bullock Drive
Tributary of Lower Rouge River	R7	Warmwater	Crosses Highway 7 between Bakerdale Road and Thatcher's Mill Way
Robinson Creek	R8	Coldwater	Crosses Highway 7 between McPhillips Avenue and Main Street Markham
Exhibition Creek	R9	Coldwater	Crosses Highway 7 between Albert Street and Savannah Court
Tributary of Little Rouge River	R10	Warmwater	Crosses Highway 7 approximately 0.4 km east of Ninth Line
Tributary of Little Rouge River	R11	Warmwater	Crosses Highway 7 approximately 0.4 km west of the Markham Bypass
Tributary of Little Rouge River	R12	Coolwater	Crosses Highway 7 approximately 0.3 km west of the Reesor Road
Tributary of Little Rouge River	R13	Coldwater	Crosses Highway 7 approximately 0.3 km east of the Reesor Road
Main branch of Little Rouge River	R14	Coldwater	Crosses Highway 7 approximately 0.65 km east of the Reesor Road
Beaver Creek	R15	Coolwater	Crosses Woodbine Avenue immediately south of Highway 7
Beaver Creek	R16	Coolwater	Located between Yorktech Drive and Fairbairn Drive (Woodside Centre Mall)

Table 6.2-3

Summary of the Watercourse Crossings in the Rouge River Watershed

Waterbody Name	Ref. No.	Fish Community	Location
Main branch of Upper Rouge River	R17, R18	Warmwater	Located on the IBM property between the south end of Rodick Road and the IBM building complex
Main branch of Upper Rouge River	R19	Coolwater	Located west of Warden Avenue within the IBM complex
Tributary of Lower Rouge River	R20	Coolwater	Situated 100 m north of the proposed Enterprise Boulevard within the proposed Markham Centre area, approximately 840 m east of Warden Avenue
Tributary of Lower Rouge River	R21	Coolwater	Situated 150 m west of the south end of Main Street Unionville
Tributary of Lower Rouge River	R22	Coolwater	Crosses Main Street Unionville, located 90 m north of Kennedy Road
Main branch of Lower Rouge River	R23	Coolwater	Crosses Main Street Unionville, approximately 390 m south of Highway 7
Tributary of Little Rouge River	R24	Warmwater	Located between Markham-Stouffville Hospital and Highway 7, approximately 0.4 km east of Ninth Line
Tributary of Little Rouge River	R25	Warmwater	Located at the outlet of Coyote Pond, between Markham-Stouffville Hospital and Highway 7, approximately 0.7 km east of Ninth Line

6.2.6.4 Petticoat Creek

The far eastern portion of the Study Area, between the CP Rail crossing at Locust Hill and the York-Durham Townline, passes through the headwater area of the Petticoat Creek watershed. A total of 2 watercourses, both warmwater, cross the alternative transitway alignments. **Table 6.2-4** summarizes the location and fish community of these watercourses.

Table 6.2-4

Summary of the Watercourse Crossings in the Petticoat Creek Watershed

Waterbody Name	Ref. No.	Fish Community	Location
Tributary of Petticoat Creek	P1	Warmwater	Crosses Highway 7 approximately 0.2 km east of the CP Rail crossing at Locust Hill
Main branch of Petticoat Creek	P2	Warmwater	Crosses Highway 7 immediately west of the south intersection of Highway 7/York-Durham Townline

A summary of fish recorded by the TRCA within the Study Area and the locations of TRCA sampling stations are presented in **Appendix D Table 2 and Figure 3**, respectively.

6.2.6.5 Rare, Threatened or Endangered Aquatic Species

Watercourses crossed by Highway 7 that directly support fish habitats are identified as cold, cool and warm water. The Humber, Don and Rouge Rivers and several of their tributaries within the Study Area support redside dace, a fish species of special concern nationally and threatened provincially. The Humber and Rouge Rivers and several of their tributaries within the Study Area support American Brook lamprey, a fish species noted as rare to uncommon provincially. The Humber River and several of its tributaries within the Study Area supports central stoneroller, a fish species noted as rare to uncommon provincially.

6.2.7 Vegetation and Vegetation Communities

Much of the vegetation within/adjacent to the Study Area is of anthropogenic origin, resulting from past/present land use. A total of 53 natural/semi-natural vegetation communities comprising 12 community types have been identified within/adjacent to the Study Area. These communities include culture meadows, cultural thickets, cultural savannahs, cultural woodlands, deciduous forests, deciduous swamps, thicket swamps, shallow marshes, shallow aquatic and open aquatic communities. These communities are delineated and described in **Appendix D Figure 2 and Table 3**, respectively.

To date, a total of 196 vascular plant taxa have been recorded. Seventy-two (72) taxa, 37 percent of the recorded flora, are considered introduced and non-native to Southern Ontario. A list of vascular plants identified within the Study Area is presented in **Appendix D Table 4**.

6.2.7.1 Rare, Threatened or Endangered Plant Species

A total of six species considered rare in the Greater Toronto Area (GTA) and/or the Region of York were documented during field investigations. A total of eight species considered uncommon in the GTA and/or Region of York were documented during field investigations. In most cases these species are planted within/adjacent to the Study Area and are not naturally occurring. The remaining, predominantly herbaceous species that are listed as rare or uncommon occur within wetland or forest habitats well back from the Highway 7 right-of-way.

6.2.8 Wildlife and Wildlife Habitat

The majority of the Study Area is open habitat of anthropogenic origin with little to no natural heritage features. Wildlife habitat is typical of an urban setting with species that are very tolerant of human disturbance. The most significant habitat constitutes the natural areas surrounding the main branches and tributaries of the Humber, Don, and Rouge Rivers. To date 126 species of birds, 23 species of mammals, and 10 species of herpetofauna have been documented in the Study Area. Wildlife habitat located within/adjacent to the Study Area is summarized in **Appendix D Table 5** and the species of wildlife documented in the study during the field investigations are summarized in **Appendix D Table 6**.

6.2.8.1 Rare, Threatened or Endangered Wildlife Species

Three species of significance were documented in the Study Area: rough-legged hawk, northern shrike, and milk snake. Both bird species are designated by the MNR as non-breeding migrant/vagrant with extremely rare to uncommon breeding occurrences. Eastern milk snake is designated by COSEWIC (Committee on the Status of Endangered Wildlife in Canada) as 'special concern' and by the MNR as 'rare to uncommon'.

6.2.9 Designated Natural Areas

Designated natural areas within the Study Area include Areas of Natural and Scientific Interest (ANSI's), evaluated wetlands and Environmentally Significant Areas (ESA's). These natural areas are classified as provincially, regionally and locally significant. A summary of designated natural areas in the Study Area by municipality is presented in **Table 6.2-5**.

Table 6.2-5
Summary of Designated Natural Areas in the Study Area by Municipality

Designated Natural Areas	Municipality			
	Vaughan	Markham	Richmond Hill	Study Area Total
Cold Water Streams	3	5	3	11
Cool Water Streams	5	13	2	20
Warm Water Streams	21	11	3	16
Total Watercourses (Crossing Highway 7) (Alternative Routes)	 17 10	 15 11	 10 1	 42 (*35) 22**
Provincially Significant Life Science ANSIs	2	0	0	2
Regionally Significant Life Science ANSIs	2	0	0	2
Life Science Sites	15	1	1	17
Provincially Significant Earth Science ANSIs	1	0	0	1
Earth Science Sites	1	0	0	1
Total ANSIs, Life Science Sites and Earth Science Sites	21	1	1	23
Provincially Significant Wetlands	0	2	0	2
Locally Significant Wetlands	0	1	0	1
Total Wetlands	0	3	0	3
ESAs	14	1	1	16
Parklands	3	1		4
International Biological Program Sites	3	0	0	3

Note: [1] A total of 2 watercourses crossing Highway 7 are shared between Vaughan and Richmond Hill and a total of 3 watercourses crossing Highway 7 are shared between Markham and Richmond Hill. Consequently, the total number of watercourses in the Study Area is 35.

6.2.9.1 Environmental Significant/Sensitive Areas

There are three ESAs in the Study Area and within 1 km of the alignments under consideration. These are Baker's Woods (#128) located in the northwest corner of the intersection of Highway 7 and Bathurst Street in the city of Vaughan; Milne Woods (#139) located on the main branch of the Rouge River between McCowan and Markham Roads; and Unionville Marsh (#89) located on the main branch of Rouge River just west of Kennedy Road, upstream of the Study Area.

6.2.9.2 Provincially Significant Wetlands

There is one Provincially Significant Wetland (PSW) in the Study Area and within 1 km of the Study Area. It is Unionville Marsh located on the main branch of the Rouge River just west of Kennedy Road, upstream of the potential alignments.

6.2.9.3 Areas of Natural and Scientific Interest

There is one provincially significant ANSI within the Study Area, which is Baker's Woods located in the northwest corner of the intersection of Highway 7 and Bathurst Street in the City of Vaughan.

6.2.9.4 Designated Woodlots

Very few woodlots exist within/adjacent to the Study Area. The most significant woodlot within the Study Area is Baker's Woods. There are a number of small woodlots adjacent to the Study Area between Ninth Line and Reesor Road and a small woodlot at the eastern end of the Study Area, just west of York-Durham Townline.

6.2.9.5 Natural Corridors

Wooded areas along watercourses in the Study Area act as corridors for wildlife tolerant of an urban environment. These areas allow for wildlife movement along the watercourses to and from more protected areas surrounding the Study Area such as PSW's, ESA's and ANSI's. The Study Area is highly urbanized and very few natural areas in locations other than along watercourses are linked together.

6.2.9.6 Rouge Park North Management Plan

Rouge Park North Management Plan includes the valleylands surrounding the Rouge River, Beaver Creek and the Little Rouge River, and their tributaries south of Highway 7. According to the Plan, valleylands surrounding the Rouge River and the Little Rouge River are designated 'Special Management Zones', and land surrounding Walden Pond to the northwest of the intersection of Highway 7 and Kennedy Road is designated a 'Natural Area'.

6.2.10 Natural Heritage System

The Study Area is located in the Regional Municipality of York, City of Vaughan, Town of Richmond Hill and the Town of Markham. The upper tier and lower tier official plans designate natural areas for protection.

According to York Region's Official Plan, land surrounding Highway 7 between Reesor Road and York-Durham Townline is designated 'Agricultural Policy Area'. Valleylands surrounding Rainbow Creek, the Humber River, the Don River, East Don River, German Mills Creek, the Rouge River and Little Rouge River are designated part of the 'Greenlands System'.

According to the City of Vaughan Official Plan, lands within/adjacent to the Study Area are predominantly employment areas, community areas, 'Vaughan Corporate Centre', urban village, and major open space and valley lands. Rainbow Creek, Humber River, Black Creek, Don River and the East Don River are designated as major open space and valley lands. Within Carrville Urban Village 2, lands between Dufferin Street and Bathurst Street north of Highway 7 are designated medium density residential/ commercial and 'Parkway Belt West Plan'.

According to the Town of Richmond Hill Official Plan, land use within/ adjacent to the Study Area is predominantly residential, industrial, and 'Parkway Belt West'. 'Parkway Belt West' land is located between Bathurst Street and Hunter's Point Drive and between Yonge Street and Bayview Avenue. Hazards Lands surround a tributary of the East Don River in the northwest corner of Highway 7 and Yonge Street and German Mills Creek in the northeast corner of Highway 7 and Bayview Avenue. Land designated major open space is located midway between Valleymede Drive and West Beaver Creek Road.

According to the Town of Markham Official Plan, land use within/adjacent to the Study Area between Yonge Street and Ninth Line is predominantly urban residential, commercial and industrial. Land use within/adjacent to the Study Area between Ninth Line and Reesor Road is predominantly open space, urban residential and commercial. Between Reesor Road and York-Durham Line land use within/adjacent to the Study Area is predominantly 'A1 Agricultural' and open space, with the Village of Locust Hill designated 'Hamlet'. Land surrounding the East Don River, German Mills Creek and two tributaries of German Mills Creek, Beaver Creek, Rouge River, two tributaries of the Rouge River, Little Rouge River and one tributary of the Little Rouge River are designated 'Hazard Lands/Valleylands'. Land designated 'Special Policy Area' is associated with 'Hazard Lands/Valleylands' of the Rouge River within/adjacent to the Study Area at Main Street Unionville, Kennedy Road and McCowan Road. Land designed 'Parkway Belt West' surrounds Highway 407 and Highway 404 adjacent the Study Area.

6.2.11 Contaminated Sites

A review of data collected through searches of various public databases was completed to assess the potential for environmentally affected sites (potential chemical contamination) along the proposed route and route options. The databases included the MOE databases and publications, the Technical Standards and Safety Authority, research at the Metro Toronto Reference Library, York Region and a visual reconnaissance of the proposed route options.

The databases provide information related to property uses, recorded spills, or other environmental data and is detailed in **Appendix F Table 1** and their locations are illustrated on **Appendix F Exhibits 1 to 23**. As such the degree of site contamination at a particular site may be unknown, the risk rankings were assigned on the assumption that a chemical release had occurred in order to provide a relatively conservative assessment of potential risks along the route options. A detailed discussion of the risk ranking scheme and the criteria used is provided in **Appendix F**.

A total of 74 properties along the Highway 7 Corridor and adjacent route options are identified as potential environmental concern. Thirty-two of them are ranked high risk, thirty are medium risk, and twelve are low risk. Although the properties with a ranked risk for potential environmental concern are identified, the potential for actually encountering environmental affected soils or groundwater within the construction for the transit corridor is unknown at this time. If the ranked properties are found to exhibit environmental degradation, the effects of this degradation may or may not be encountered within the proposed construction since the work may be shallow (e.g. associated with pavement reconstruction), or be outside the immediately affected area (e.g. a spill may be registered for a property, but outside the area of construction). Additional investigation will be required for future design phases of this work.

6.2.12 Drainage Patterns

6.2.12.1 Watersheds

The overall drainage flows in a southerly direction and the main watercourses outlet to Lake Ontario. Highway 7 is an east-west corridor and crosses four watersheds – Humber River, Don River, Rouge River and Petticoat Creek. The watersheds are all within the jurisdiction of the TRCA. The watersheds and drainage patterns are shown in **Figures 6.2-3 to 6.2-5**.

The main watercourse crossings within each of the watersheds are as follows:

- **Humber River watershed** – Albion Creek, Main Humber River and tributaries, Rainbow Creek and tributaries, Emery Creek, and Black Creek and tributaries.
  - There are 12 watercourse crossings of Highway 7.
  - There are 3 watercourse crossings of alternative alignments.
- **Don River watershed** – West Don River and tributaries, Westminster Creek and tributaries, East Don River and Tributaries, and German Mills Creek and tributaries.
  - There are 14 watercourse crossings of Highway 7.
  - There are 8 watercourse crossings of alternative alignments.
- **Rouge River watershed** – Beaver Creek and tributaries, Rouge River and tributaries, Robinson Creek, Exhibition Creek, and Little Rouge River and tributaries.
  - There are 14 watercourse crossings of Highway 7.
  - There are 11 watercourse crossings of alternative alignments.
- **Petticoat Creek and tributary**
  - There are 2 watercourse crossings of Highway 7.

6.2.12.2 Regulatory Flood Lines

Flood line mapping is available from TRCA for the main watercourses and some of the tributaries. Within the Humber River watershed, the flood line mapping includes crossings H6, H7, H13 and H15. Flood line mapping also extends to the downstream side of crossings H8, H12 and H14.

The Don River flood line mapping includes crossings D2, D3, D7, D12 and D16 and extends to the downstream side of D1, D6 and D22.

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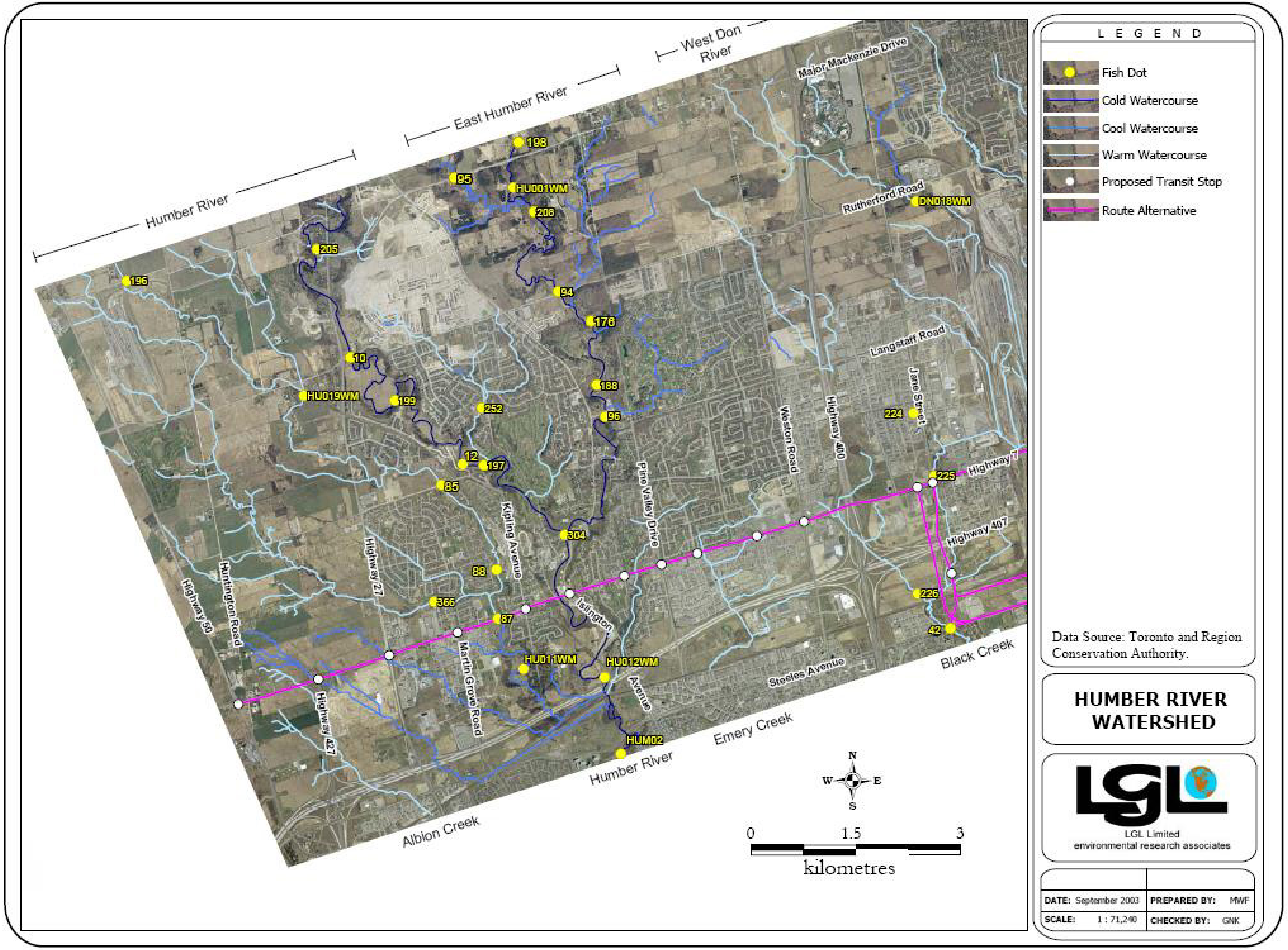

Figure 6.2-3
Humber River Watershed

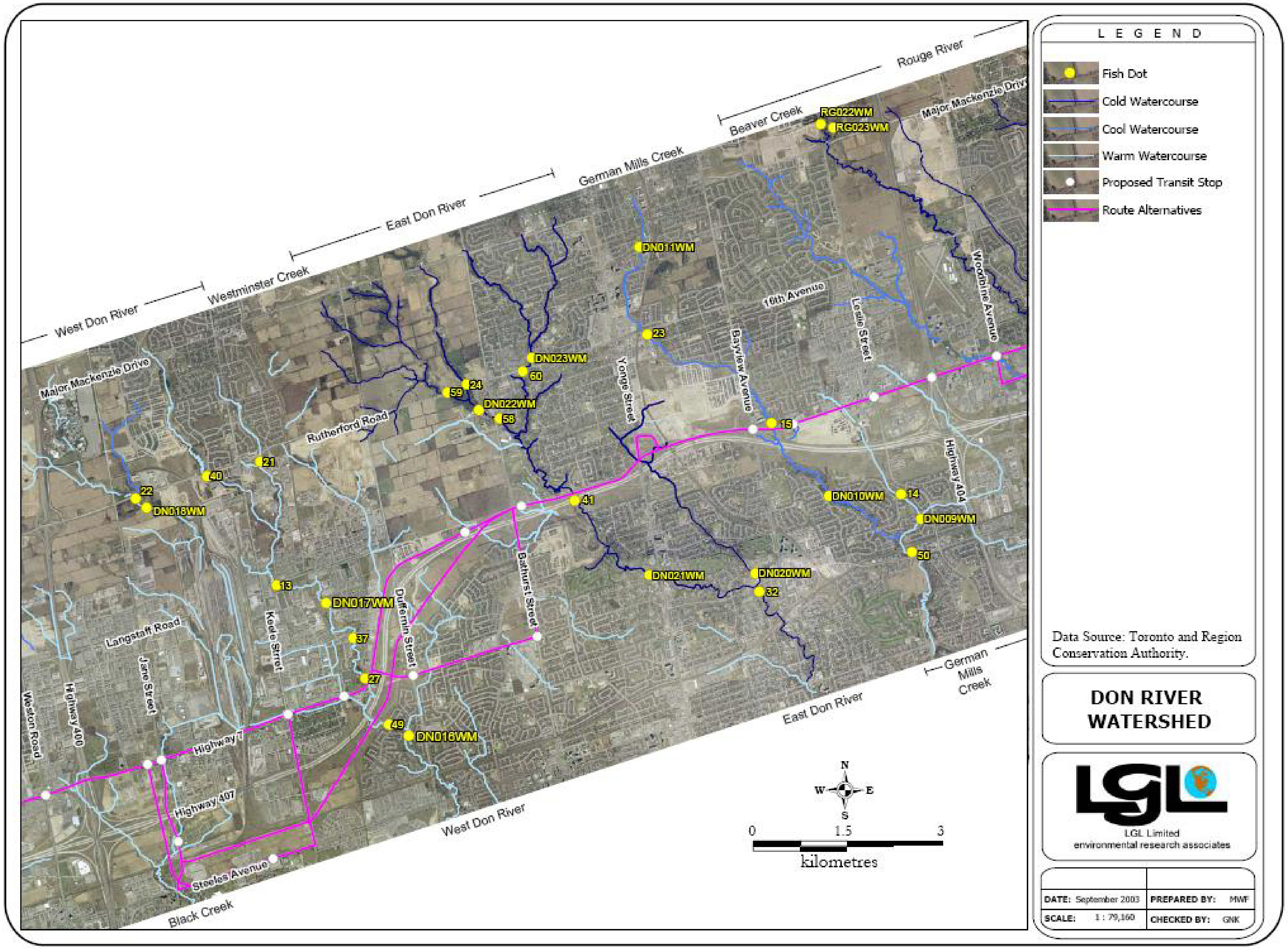

Figure 6.2-4
Don River Watershed

6

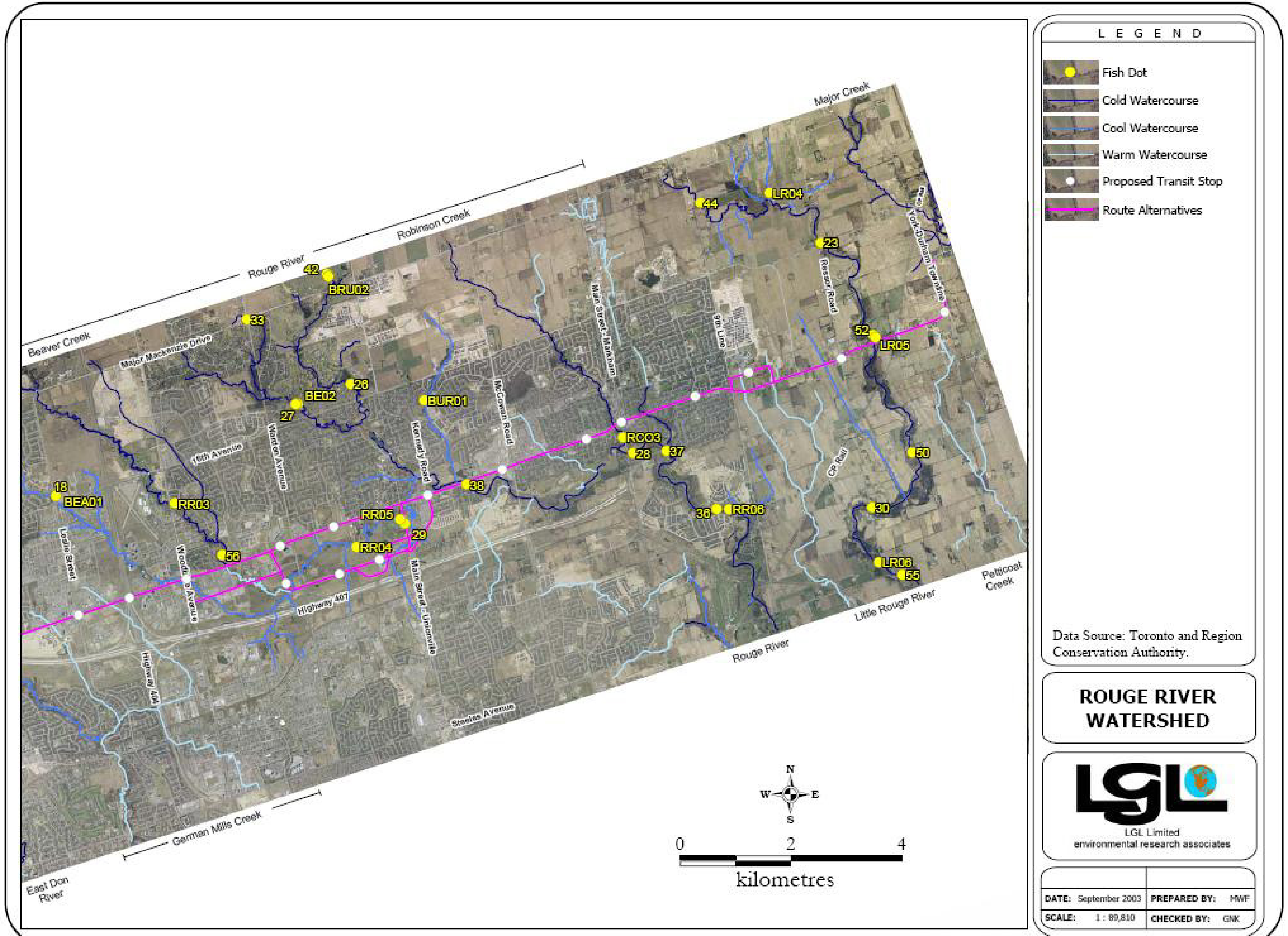

Figure 6.2-5
Rouge River Watershed

The Rouge River flood line mapping includes crossings R3, R5, R6, R14, R17, R18, R19 and R23. Flood line mapping also extends to the downstream side of crossings R7, R8, R9, R20 and R22.

The flood line mapping for Petticoat Creek does not extend into the Study Area.

Fill regulation lines have also been established by TRCA for a number of watercourses. The fill regulation lines encompass the flood plain area and are used to define erosion hazard impact zones. The fill regulation line contains the area in which the placing or dumping of fill is regulated by the Conservation Authority in order to control flooding, pollution, and conservation of land. Fill regulation line extensions have been defined by TRCA for other watercourses within the Study Area; however these lines have not gone through the registration process and do not have the same legal standing as the registered fill regulation lines.

TRCA regulates all activities within Regulatory flood plain areas, whether currently mapped or not, as well as the lands within fill regulation lines. Therefore all proposed construction activities involving work that crosses or is adjacent to a watercourse will require approval from the TRCA.

6.2.13 Water Quality

6.2.13.1 Surface Water Quality and Quantity

The aquatic habitat provided by the watercourses is an indication of the current water quality. As noted in **Section 6.2.6**, the fish community varies from watercourse to watercourse and includes coldwater, coolwater and warmwater. In a few locations there is not a defined channel and there is no fish community.

Within the overall Study Area 53% of the crossings are classified as warmwater, 28% coolwater, 14% coldwater and 5% do not have any fish community.

Much of the Highway 7 Corridor is highly urbanized and many of the older storm drainage systems discharge directly to the watercourses. Newer developments typically discharge to storm water management facilities that provide quantity and/or quality controls prior to storm runoff entering the watercourses.

Water quality data in the Toronto Region watersheds is available from the Toronto and Region Conservation Authority's Regional Watershed Monitoring Network. The following water quality monitoring stations are located in the vicinity of the Highway 7 transitway and the data can be used as an indication of the current water quality at the Highway 7 crossings.

- Station H 14.3 - Lower Humber River, Steeles Ave west of Islington Avenue
- Station H 16.5 - Black Creek, Pioneer Village
- Station D 85004 - West Don River, Highway 7 west of Centre Street
- Station D 17.8 - West Don, Steeles Ave east of Dufferin Street
- Station D 85003 - East Don River, Bayview Avenue and Steeles Avenue
- Station D 17.0 - German Mills Creek, Leslie Street south of Steeles Avenue
- Station R 7.2 - Little Rouge River, Steeles Avenue at Reesor Road
- Station R 10.5 - Rouge River, Steeles Avenue west of Ninth Line
- Station R 97777 - Rouge River, Warden Avenue, south of Hwy 7

The available data for these stations are summarized in **Tables 6.2-6** to **6.2-14**.

Table 6.2-6
Water Quality Data at Station # H 14.3

Humber River, Lower Humber River, Steeles Avenue west of Islington Avenue Station #: H 14.3 (data collected from May 27, 1996 to October 6, 1998)1 Data from TRCA's Regional Watershed Monitoring Network								
	Monitoring Season	#Obs	Min	Max	Mean²	Median	Guideline	% Meet Guideline
E. Coli (counts/100 mL)	May -Oct	9	5	600	119	270	100	22%
Water Temp. (°C)	May - Oct	10	10.8	24.1	18	18.4	21³	90%

Obs. = observations.
1. Samples were not collected during the cold season (Nov.-Apr.)
2. Geometric mean used for E. Coli.
3. Approximate upper threshold for cold water fisheries.

Table 6.2-7
Water Quality Data at Station # H 16.5

Humber River, Black Creek, Pioneer Village Station #: H 16.5 (data collected from May 27, 1996 to October 6, 1998)1 Data from TRCA's Regional Watershed Monitoring Network								
	Monitoring Season	#Obs	Min	Max	Mean²	Median	Guideline	% Meet Guideline
E. Coli (counts/100 mL)	May -Oct	11	130	3900	532	500	100	0%
Water Temp. (°C)	May - Oct	11	11.6	22.4	17.1	17.8	21³	91%

Obs. = observations.
1. Samples were not collected during the cold season (Nov.-Apr.)
2. Geometric mean used for E. Coli.
3. Approximate upper threshold for cold water fisheries.

Table 6.2-8
Water Quality Data at Station # D 85004

Don River, West Don River, Highway 7 west of Centre Street Station # D 85004 (data collected from April 29, 1999 to December 13, 2000)1 Data from TRCA's Regional Watershed Monitoring Network								
	Monitoring Season	#Obs	Min	Max	Mean²	Median	Guideline	% Meet Guideline
Suspended Sediment (mg/L)	May-Oct	9	2.0	15.0	6.7	6.0	25.0	100%
	Nov-Apr	5	3.0	44.0	14.0	6.0		80%
	all	14	2.0	44.0	9.3	6.0		93%
Chloride (mg/L)	May-Oct	9	11	335	170	160	250	89%
	Nov-Apr	5	208	4580	1175	405		20%
	all	14	60	4580	529	203		64%
E. Coli (counts/100 mL)	May-Oct	9	5	2600	53	120	100	44%
	Nov-Apr	4	5	5	5	5		100%
	all	13	5	2600	26	5		62%
Phosphorus (mg/L)	May-Oct	9	11	0.11	0.06	0.06	0.03	32%
	Nov-Apr	5	0.04	0.13	0.08	0.05		0%
	all	14	0.03	0.13	0.07	0.06		14%
Unionized Ammonia (mg/L)	May-Oct	4	0.000	0.026	0.012	0.010	0.02	75%
	Nov-Apr	4	0.000	0.059	0.017	0.004		75%
	all	8	0.000	0.059	0.014	0.004		75%
Nitrate (mg/L)	May-Oct	9	0.72	2.22	1.34	1.23	0.3	0%
	Nov-Apr	4	1.29	1.67	1.49	1.50		0%
	all	13	0.72	2.22	1.38	1.40		0%
Water Temp. (°C)	May-Oct	5	15.4	21.2	18.1	18.0	21³	80%
	Nov-Apr	4	-0.3	13.7	7.1	7.6		100%
	all	9	-0.3	21.2	13.2	15.4		89%

Obs. = observations.
1. Prior to May 17, 1999, samples were not collected during the cold season (Nov.-Apr.)
2. Geometric mean used for E. Coli.
3. Approximate upper threshold for cold water fisheries.

Table 6.2-9
Water Quality Data at Station # D 17.8

Don River, West Don River, Steeles Avenue east of Dufferin Street Station # D 17.8 (data collected from May 30, 1996 to October 27, 1998)1 Data from TRCA's Regional Watershed Monitoring Network								
	Monitoring Season	#Obs	Min	Max	Mean²	Median	Guideline	% Meet Guideline
E. Coli (counts/100 mL)	May -Oct	5	370	1600	782	700	100	0%
Water Temp. (°C)	May - Oct	5	11.8	22.5	15.8	14.5	21³	80%

Obs. = observations.
1. Samples were not collected during the cold season (Nov.-Apr.)
2. Geometric mean used for E. Coli.
3. Approximate upper threshold for cold water fisheries.

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Table 6.2-10
Water Quality Data at Station # D 85003

Don River, East Don River, Bayview Avenue and Steeles Avenue Station # D 85003 (data collected from May 30, 1996 to November 28, 2001)1 Data from TRCA's Regional Watershed Monitoring Network								
	Monitoring Season	#Obs	Min	Max	Mean[2]	Median	Guideline	% Meet Guideline
Suspended Sediment (mg/L)	May-Oct	13	2.0	28.0	10.6	7.0	25.0	92%
	Nov-Apr	10	1.0	22.0	7.1	6.5		100%
	all	23	1.0	28.0	9.1	7.0		96%
Chloride (mg/L)	May-Oct	13	8	241	97	94	250	100%
	Nov-Apr	10	94	3120	477	179		70%
	all	23	8	3120	262	127		87%
E. Coli (counts/100 mL)	May-Oct	14	5	2500	129	260	100	43%
	Nov-Apr	7	5	1600	68	160		43%
	all	21	5	2500	104	160		48%
Phosphorus (mg/L)	May-Oct	13	0.01	0.17	0.05	0.05	0.03	31%
	Nov-Apr	10	0.01	0.06	0.09	0.03		50%
	all	23	0.01	0.17	0.04	0.04		39%
Unionized Ammonia (mg/L)	May-Oct	8	0.000	0.031	0.008	0.002	0.02	75%
	Nov-Apr	9	0.000	0.003	0.001	0.000		100%
	all	17	0.000	0.031	0.004	0.001		88%
Nitrate (mg/L)	May-Oct	13	0.05	1.30	0.66	0.67	0.3	15%
	Nov-Apr	9	0.28	2.10	1.28	1.30		11%
	all	22	0.05	2.10	0.92	0.76		14%
Water Temp. (°C)	May-Oct	13	7.0	29.3	17.0	16.0	21[3]	77%
	Nov-Apr	9	-0.1	14.5	6.0	5.0		100%
	all	22	-0.1	29.3	12.5	12.9		86%

Obs. = observations.
1. Prior to May 17, 1999, samples were not collected during the cold season (Nov.-Apr.)
2. Geometric mean used for E. Coli.
3. Approximate upper threshold for cold water fisheries.

Table 6.2-11
Water Quality Data at Station # DGM 17.0

Don River, German Mills Creek, Leslie Street south of Steeles Avenue Station # DGM 17.0 (data collected May 30, 1996 to October 27, 1998)1 Data from TRCA's Regional Watershed Monitoring Network								
	Monitoring Season	#Obs	Min	Max	Mean[2]	Median	Guideline	% Meet Guideline
E. Coli (counts/100 mL)	May -Oct	5	5	1900	154	160	100	20%
Water Temp. (°C)	May - Oct	5	10.6	20.4	14.3	13.0	21[3]	100%

Obs. = observations.
1. Samples were not collected during the cold season (Nov.-Apr.)
2. Geometric mean used for E. Coli.
3. Approximate upper threshold for cold water fisheries.

Table 6.2-12
Water Quality Data at Station # RL 7.2

Rouge River, Little Rouge River, Steeles Avenue at Reesor Road Station #: RL 7.2 (data collected from May 14, 1996 to September 24, 1998)1 Data from TRCA's Regional Watershed Monitoring Network								
	Monitoring Season	#Obs	Min	Max	Mean[2]	Median	Guideline	% Meet Guideline
E. Coli (counts/100 mL)	May -Oct	5	0.5	600	125	500	100	20%
Water Temp. (°C)	May - Oct	5	8.8	21.0	16.4	19.9	21[3]	100%

Obs. = observations.
1. Samples were not collected during the cold season (Nov.-Apr.)
2. Geometric mean used for E. Coli.
3. Approximate upper threshold for cold water fisheries.

Table 6.2-13
Water Quality Data at Station # R 10.5

Rouge River, Steeles Avenue west of Ninth Line Station #: R 10.5 (data collected from May 14, 1996 to September 24, 1998)1 Data from TRCA's Regional Watershed Monitoring Network								
	Monitoring Season	#Obs	Min	Max	Mean[2]	Median	Guideline	% Meet Guideline
E. Coli (counts/100 mL)	May -Oct	5	60	4400	312	220	100	20%
Water Temp. (°C)	May - Oct	5	9.3	21.5	17.0	20.0	21[3]	80%

Obs. = observations.
1. Samples were not collected during the cold season (Nov.-Apr.)
2. Geometric mean used for E. Coli.
3. Approximate upper threshold for cold water fisheries.

Table 6.2-14
Water Quality Data at Station # R 97777

Rouge River, Warden Avenue south of Highway 7 Station #: R 97777 (data collected from June 26, 2001 to May 30, 2002) Data from TRCA's Regional Watershed Monitoring Network								
	Monitoring Season	#Obs	Min	Max	Mean[1]	Median	Guideline	% Meet Guideline
Suspended Sediment (mg/L)	May-Oct	3	4.0	19.0	9.7	6.0	25.0	100%
	Nov-Apr	1	8.0	8.0	-----	-----		-----
	all	4	4.0	19.0	9.3	7.0		100%
Chloride (mg/L)	May-Oct	3	58	271	146	109	250	67%
	Nov-Apr	1	94	94	-----	-----		-----
	all	4	58	271	133	102		75%
Phosphorus (mg/L)	May-Oct	3	0.01	0.07	0.04	0.05	0.03	33%
	Nov-Apr	1	0.04	0.04	-----	-----		-----
	all	4	0.01	0.07	0.04	0.05		25%
Unionized	May-Oct	3	0.000	0.002	0.000	0.000	0.02	100%

Table 6.2-14
Water Quality Data at Station # R 97777

Rouge River, Warden Avenue south of Highway 7 Station #: R 97777 (data collected from June 26, 2001 to May 30, 2002) Data from TRCA's Regional Watershed Monitoring Network								
	Monitoring Season	#Obs	Min	Max	Mean[1]	Median	Guideline	% Meet Guideline
Ammonia (mg/L)	Nov-Apr	1	0.000	0.000	-----	-----		-----
	all	4	0.000	0.002	0.000	0.000		100%
Nitrate (mg/L)	May-Oct	3	0.10	0.71	0.46	0.57	0.3	33%
	Nov-Apr	1	1.00	1.00	-----	-----		-----
	all	4	0.10	1.00	0.60	0.64		25%
Water Temp. (°C)	May-Oct	3	6.9	22.5	15.7	17.8	21[3]	67%
	Nov-Apr	1	9.9	9.9	-----	-----		-----
	all	4	6.9	22.5	13.8	12.9		75%

Obs. = observations.
1. Geometric mean used for E. Coli.
2. Approximate upper threshold for cold water fisheries.

6.3 SOCIAL ENVIRONMENT

This Section introduces all aspects pertaining to the Social Environment within the Study Area. It includes a summary of the land use distribution, the cultural environment and quality of life indicators such as noise, vibration and air quality.

6.3.1 Land Ownership Patterns

The Highway 7 Corridor is a diverse stretch of roadway covering approximately 40 kilometres in York Region. Commencing in the currently undeveloped land at both the east and west extremes of the road's limit in the Region, to its clustering of development in it's three Regional Centres, Highway 7 is a driving force behind the success and future development patterns for not only the Region, but for the surrounding areas as well.

6.3.1.1 City of Vaughan

Commencing at the shared Peel Region–York Region boundary Line (Sunset Corners), Highway 7 is surrounded by agricultural/rural land on both the north and south sides as it heads towards the east into the City of Vaughan. East of Highway 427, on the south side of Highway 7 is the Royal Group Technologies Campus, which is a conglomerate of industrial warehouse and manufacturing buildings. On the north side of Highway 7 adjacent to Highway 427, the land currently sits vacant, but with the imminent development of the Corporate Business Park by the Sorbara Group and the creation of the Vaughan West Business Park, (NW corner of Highways 7 and 27) both of which are components of the Vaughan

Enterprise Zone (development of around 1,500 acres of land for industrial and commercial expansion and would include the northerly expansion of Highway 427), this land will not remain vacant for long.

Moving eastwards, land development intensifies with the emergence of some more industrial buildings in the West Woodbridge Industrial Area on the south side of Highway 7 and as the corridor reaches Martin Grove Road, the first residential community becomes visible. The Woodbridge Town Centre (101,020 SF) is on the south side, east of Martin Grove Road and across the street on the north side is the Woodbridge Mall. To the south of Highway 7 and east of Martin Grove Road is the Woodstream Centre (66,000 SF). Immediately to the south of this retail commercial shopping centre is a recently completed Vaughan Grove Sports Park (regional park).

As the route continues, between Martin Grove Road and Pine Valley Drive, the development takes on a small to medium scaled commercial district merged with newer single density neighbourhoods with reverse frontage onto Highway 7 and older houses with direct access from Highway 7. The historical core of Woodbridge is located within this subsection between Kipling Avenue and Islington Avenue. This area is also dissected by varying tributaries of Rainbow Creek as well as the Humber River, creating large, well-forested ravine and open space areas that contribute to the overall low intensity identity of this area of the corridor.

The section of Highway 7 approaching Highway 400 is the most intensely developed area within the City of Vaughan. On the north side of Highway 7, east of Pine Valley Drive, is a large residential area with reverse frontage on Highway 7. Directly opposite is a strip of highway commercial uses including shopping plazas and the Pine Valley Industrial Area, which is a medium-sized industrial park. East of the industrial area begins the domination of the big box users, which can be found both north and south of Highway 7. On the east side of Highway 400 is the continuing-to-develop Vaughan Corporate Centre, which is designated as a regional centre by the Region of York in its Official Plan.

Industrial users continue to dominate the urban environment as the corridor travels east past Jane Street. East of Jane Street, the frontage onto Highway 7 is hindered with the presence of the CN Freight Classification Yard, which breaks the corridor away from its at-grade development pattern. The CN railway car marshalling yard and the associated long overpass creates a gap in the continuity of Highway 7. When Highway 7 returns to its at-grade configuration, it resumes a primarily industrial character along both its north and south sides.

It should also be noted, that Jane Street provides the first diversion from Highway 7 with an alternative route option heading south along Jane Street and along a variety of eastern alignments before returning to Highway 7 via Steeles Avenue/ Keele Street or the Hydro Corridor. Along Jane Street, industrial users focus near Highway 7. Land around Highway 407 is vacant due to the highway right-of-way. Beechwood Cemetery is located on the east side of Jane Street immediately south of Highway 407. Further south, small intermittent farm lands scatter within the Hydro Corridor south of the CN Halton Subdivision. Steeles Avenue is the boundary between York Region and City of Toronto. Steeles East Industrial Area is on the north side of Steeles Avenue bound by Jane Street and Keele Street. The City of Vaughan plans to redevelop this area to a mixed use area with a York Region Intermodal Terminal. York University is situated on land south of Steeles Avenue. Land along Keele Street is comprised of industrial and residential use with pockets of vacant land.

Centre Street provides the second divergence from Highway 7 with the possibility of travelling east on Centre Street and then north on Bathurst Street back up to Highway 7. Between Centre Street and Bathurst Street the majority of the corridor is a single loaded or single sided street, because of the proximity of Highway 407 to Highway 7. As Highway 7 curves north from Centre Street, the west side is primarily small-scale strip commercial and industrial developments. When it curves to the east and a return to its east-west alignment, the north side contains new residential development with reverse frontage along Highway 7. This is the end of the Highway 7 Corridor within the City of Vaughan as it travels briefly into the Town of Richmond Hill and then into the Town of Markham.

6.3.1.2 Town of Richmond Hill

Highway 7 enters into the Town of Richmond Hill as it passes to the south of the Richmond Hill Golf & Country Club at the NE corner of Highway 7 and Bathurst Street. To the east of the golf course, at the NW corner of Highway 7 and Hunter's Point Drive, is the Hunter's Point Village Shops. The remaining land north of Highway 7 between Bathurst Street and Yonge Street consists primarily of single density residential lots with a reverse frontage on Highway 7.

The Bayview Glen Area is designated a regional centre by York Region; a mix of office, retail and other commercial space including a Famous Players Silvercity complex. To the east of the development that straddles Red Maple Road, a Sam's club and Loblaws currently occupy part of the land and the rest remains vacant. All of the uses are set back away from Highway 7, and have a more direct access point from High Tech Road (another possible diversion from the Highway 7 Corridor). Again, no development is present on the south side of Highway 7 as the lack of separation between Highway 7 and Highway 407 deems the land unusable for development.

On the east side of Bayview Avenue, a high-density residential development exists on the NE corner of Highway 7 and Bayview Avenue and then is separated from the rest of the development because of the German Mills Creek, which is to the immediate east of the development.

From east of German Mills Creek to another tributary of the river just to the west of Commerce Valley Drive West, the development is a mixture of commercial, retail, office and residential uses. Commerce Valley Drive east to Highway 404 (Town of Richmond Hill easterly limit) the corridor travels through the Beaver Creek Business Park. On the north side which is a mixture of office, retail and industrial users and on the south side (Town of Markham) sits land that continues to develop with office, retail and other industrial uses.

6.3.1.3 Town of Markham

The Highway 7 Corridor crosses Highway 404 and continues to the east, the remaining corridor is located within the jurisdiction of the Town of Markham. On the south side of Highway 7 is the Woodbine/Cochrane Drive Business Park and on the north side is the Valleywood Business Park. This area contains some of the largest uses (notably Compaq Canada Inc and Hyundai Auto Canada Inc to name a few). This area to Woodbine Avenue is for the majority, developed, but some infill development opportunities are available.

On the east side of Woodbine Avenue, there is a mix of retail and office uses. On the south side of Highway 7 is the Woodside Centre (325,897 SF) and First Markham Place (281,086 SF) which are big box developments including among others, a Home Depot, Chapters and a

Cineplex Odeon movie theatre. On the north side of Highway 7, opposite the big box development, is a low-density residential neighbourhood with reverse frontage onto Highway 7 complemented by an open space area known as Apple Creek Park containing a tributary of the Rouge River.

The land east of Rodick Road to just west of Kennedy Road on the south side of Highway 7 is all apart of the Markham Centre plan (this area is designated as a regional centre by the Region of York). For the most part, this land remains vacant, with the exception of a few spots of development on and around Warden Avenue, including the Hilton Suites Toronto/Markham Conference Centre & Spa at 8500 Warden Avenue. On the north side of Highway 7 east of Rodick Road, new medium density residential development is occurring around the Town of Markham's Municipal Offices at the NE corner of Highway 7 and Town Centre Boulevard. On the NE corner of Highway 7 and Warden Avenue is the Markham Town Square (179,706 SF). From this retail complex to Main Street Unionville, the north side of Highway 7 is a mixture of low-density residential development and vacant land. It should also be noted that north of Highway 7 on Main Street Unionville is the Unionville Historical District Village.

Continuing east, past Kennedy Road, the north side of Highway 7 is dominated by an open space area containing several small bodies of water draining into Milne Lake on the south side of Highway 7, east of McCowan Road. To the east of the open space on the north side of Highway 7 is the Markville Shopping Centre (985,764 SF- regional shopping centre). The south side of Highway 7 is dominated by commercial users fronting onto Highway 7 and a small area of residential townhouses closer to Kennedy Road.

From McCowan Road east to Ninth Line, Highway 7 is a mixture of developments for the most part though; consisting of small-scale commercial development and low density residential. As Highway 7 continues eastwards, past Ninth Line and past the Markham-Stouffville Hospital to the York-Durham Line, the land becomes more rural in nature with single-family residential units scattered along both the north and south side of the corridor. Plans for the development of the Cornell community SE of Highway 7 and Ninth Line will provide an anchor for development along the easterly edge of the corridor.

6.3.2 Land Use Designations

6.3.2.1 Regional Official Plan

The *Regional Official Plan* (Consolidated November 1, 2002) states as Objective 6 of Section 6.2 Transit Network that the Region would like to "promote the implementation of a regional rapid transit network." The Official Plan further indicates that the rapid transit network would include, but not be limited to "f) a transitway in the Highway 407 corridor."

The implementation of a rapid transit system along the Highway 7 alignment would create an efficient regional transit system linking designated Regional Centres.

Map 5 Regional Structure of the Plan designates the lands located at the intersection of Highway 7 and Highway 400 as the Vaughan Regional Centre, the lands located to the east of Highway 407 and Yonge Street as the Richmond Hill Regional Centre and the lands at the southeast corner of Highway 7 and Warden Avenue as the Regional Centre for Markham. The Plan intends the designated Regional Centres to be compact, pedestrian-friendly, safe and accessible.

The Commissioner of Planning and Development Services (senior management team) submitted a report to York Region's Planning and Development Committed for their February 5, 2003 meeting (adopted February 20, 2003) entitles "Advancing the Region's Urban Structure-Policy Principles." This report recommended transit supportive development with the highest densities being located within the Regional Centres. Further, it recommended overall densities in the Regional Corridors and Centres should achieve an average density of 2.5 FSI while simultaneously supporting stable residential communities.

The development of high-density uses along the corridor will support the introduction of a rapid transit system along the Highway 7 Corridor. Without the intensification of development along the corridor, the extent of potential benefits from the transit system would not be realized. The Region will have to work proactively and not allow for the possibility of lower density development along the corridor.

6.3.2.2 Municipal Official Plans

City of Vaughan

The City of Vaughan recognizes the need for a rapid transit system, as they are currently undertaking policy planning studies dealing with the Highway 7 Corridor. The two studies that revolve around the corridor are the "*Highway 7 Land Use Futures Study*" and the "*Jane/7 Employment Area Redevelopment Study*" (final draft, April 2003), beginning the process of designating the Highway 7 Corridor as a Community Improvement Plan Area.

The City of Vaughan's Official Plan (OPA 600) states that the City's transportation and public transit system wants to develop and facilitate efficient links between the two centres and the communities, and encourage the evolution of the Vaughan Centre and the Vaughan Corporate Centre as the focal points of the City.

Town of Richmond Hill

The Town of Richmond Hill states in their Official Plan (consolidated December 31, 1998) in Section 2.2.3.3.2 that "Local transit routings shall be integrated with, and supportive of inter-regional and inter-municipal public transit systems" and in Section 2.2.3.3.4 which states that "Adequate facilities to maximize the level of transit service such as bays, bus shelters, exclusive bus lands where warranted and additional right-of-ways and/or pavement widths which will accommodate bus or other forms of transit will be provided."

Town of Markham

The Town of Markham recognizes the need for a formidable form or transit as they encourage and promote it within their Official Plan January 1999, (updated July 2000). It states in Section 5.6 (Public Transit) "public transportation shall include local and high speed bus services, intra-regional transit and commuter rail services. The Town is willing to co-operate with other public agencies to achieve integration with other public agencies to achieve integration of these facilities and services." As well, "the town supports, in principle, a regional transit system and the establishment of a York Region Transit Operating Authority."

6.3.2.3 Municipal Zoning By-Law

The municipal zoning by-laws were created and amended to support the development of a rapid transit system along the Highway 7 Corridor. Therefore, the zoning by-laws conformed the streetscape to be compatible to the implementation of such a system.

6.3.3 Land Use along the Corridor

6.3.3.1 Residential Neighbourhoods

City of Vaughan

The City of Vaughan has two distinct communities within the threshold of the rapid transit line. Commencing in the west, the Woodbridge community forms the first major residential area along the corridor. The present-day Woodbridge community encompasses the former hamlets of Brownsville, Elder's Mills, Vaughanville, and Pine Grove. Woodbridge currently has a residential population of 40, 000.

The second community that the Highway 7 Corridor encounters is the Thornhill community. Thornhill is divided in half between the City of Vaughan and the Town of Richmond Hill and runs along both the east and west sides of Yonge Street. Today, Thornhill is a large urban community with over 59,000 residents.

Town of Richmond Hill

The Town of Richmond Hill has only two of its residential communities with direct access to the Highway 7 Corridor, those being, South Richvale on west side of Bayview Glen and on the east side of the Bayview Glen Area, the Doncrest residential community. North of the Bayview Glen area is an emerging mixed-use residential neighbourhood including various medium and high-density residential developments along Red Maple Road.

Town of Markham

The Town of Markham consists of a wide variety of residential districts in and around the Highway 7 Corridor. This transit corridor dissects the Unionville community, the Old Markham Village Area and the developing Cornell Community.

As the line heads further east, it will enter into the Old Markham Village residential community near the Highway 7 and Main Street Markham intersection.

The Cornell community includes some 1,500 acres between the Little Rouge, Ninth Line and Highway 407 would serve as an anchor residential community at the eastern extreme of the transitway. This community, designed by the Duany Plater-Zyberk & Co., envisioned this as its first venture into Canada using their New Urbanism concept, refined through various projects in the United States, most notably, Seaside, Florida. Cornell will provide employment opportunities for up to 10,000 and homes for up to 27,000 in a variety of garden cottages, larger single-family homes, semi-detached units, fourplex villas, street townhouses and apartment units limited to six storeys all of which are integrated with one another.

6.3.3.2 Commercial Areas

The Highway 7 Corridor travels through many diverse commercial zones as it crosses York Region from west to east. Retail centres are scattered along Highway 7, but for the purpose of this EA, only the major centres will be focused on. The first major commercial area is the one in the City of Vaughan at the intersection of Highway 7 and Highway 400. Big box users on both the north and south sides of the street dominate this section of the corridor. Future development of the Vaughan Corporate Centre will greatly affect and increase the scale of development on the west side of Highway 400.

The next major commercial area is near the intersection of Highway 7 and Yonge Street in the Town of Richmond Hill. This complex includes large-scale big box development as well as a Silvercity Movie Complex and surrounding restaurants. From here Highway 7 continues eastward, passing smaller scale commercial areas on the west side of Highway 404 and then it passes by the next major commercial area, the Woodside Centre and First Markham Place on the south side of Highway 7, just east of Woodbine Avenue. This commercial area lies within the Town of Markham and includes a movie theatre and a Home Depot amongst other big box retailers.

Following this commercial area is the Markham Town Square. This may be on a smaller scale than the other commercial areas, but should be noteworthy as it is the site of the designated "Regional Centre" by the Region of York for the Town of Markham. The next large commercial area is the Markville Shopping Centre, at the NW corner of Highway 7 and McCowan Road, also within the Town of Markham.

6.3.3.3 Business Areas

The Highway 7 Corridor travels through many business/employment areas as it transects the southern area of York Region. Commencing in the west, the corridor begins in the Highway 427 East and 427 West Employment Areas. These two comprise what is also known as the Vaughan Enterprise Zone, which consists of developed and undeveloped parcels of employment land scheduled for expansion.

On the east side of Highway 27 and for the most part, south of Highway 7, is the West Woodbridge Employment Area, which is home to approximately 4,700 employees. The next set of employment areas is east of Pine Valley Drive and south of Highway 7 which is the Pine Valley Employment Area stretching all the way down to the northern boundary of Highway 407. On either side of Highway 400 are the Weston 400 Employment Area (on west side) and the Vaughan 400 Employment Area (on east side) as well as the Jane Street South Employment Area, which lies on the south side of Highway 7 from Highway 400 to Keele Street.

As Highway 7 continues eastwards, the next employment area it crosses is the Keele Employment Area, on the north side of Highway 7, east of Keele Street and west of the Don River, and is home to the largest amount of employees of all the employment areas in the City of Vaughan with over 18,000 employees. Beside the Keele Employment Area is the Langstaff Employment Area, which extends from the Keele Employment Area boundary to Dufferin Street.

Land along Steeles Avenue between Jane Street and Keele Street has been established as the Steeles Employment Area and the Steeles Campus Employment Area, together representing some additional 8,000 employees.

6

As Highway 7 dissects the Town of Richmond Hill and the Town of Markham, it crosses through many employment areas. On the north side, in the Town of Richmond Hill, Highway 7 passes through the Bayview Glen Area, and as it heads toward Highway 404, the Beaver Creek Business Park on the north side and the Highway 407/Highway 404 Business Park on the south side of Highway 7 in the Town of Markham.

As Highway 7 crosses beneath Highway 404, the remaining corridor exists all within the Town of Markham. On the north side of Highway 7, between Highway 404 and Woodbine Avenue, is the Valleywood Business Park and on the south side from Highway 404 to Rodick Road is the Woodbine/Cochrane Drive Business Park and beside that is the developing Markham Centre Business Park. On the north side of the road is the City Centre Business Park, which includes the Markham Civic offices just west of Warden Avenue.

The last major employment area that the transitway passes is the Bullock Drive Business Park on the north side of Highway 7, east of McCowan Road. East of this small employment area, the transitway continues to its' eastern limit into the mostly rural area east of Ninth Line.

6.3.4 Future Development Plans

Recently designated and emerging areas of land development identified within the corridor include:

- The Vaughan Enterprise Zone at Highway 7 and Highway 427, which would see the expansion of the current industrial/commercial area with the construction of approximately 1500 acres of land for future industrial and commercial uses;
- The Milestone Corporate Group and Giffels have developed conceptual plans for industrial, office and retail facilities on a 40 acre site on the NW corner of Steeles Avenue and Keele Street in Vaughan (north of York University);
- Northeast Corner of New Westminister Dr. and Centre St. (Lot 6, Concession2) - Senior Residences;
- The Metrontario Group owns land at the NW corner of Centre Street and Bathurst Street, adjacent to Promenade Mall (705,148 SF), where plans for development include a new seniors' retirement building;
- Northwest Corner of Bathurst St. and Centre St. (Lot 6, Concession2) General Retail - Walmart;
- The development and intensification of the Vaughan Corporate Centre at Highway 7 and Highway 400, which is a designated regional centre in the Region of York Official Plan;
- The Bayview Glen Area in Richmond Hill at Highway 7 and Yonge Street, which is a designated regional centre in the Region of York Official Plan;
- Galleria Shoppes - Times Avenue and Highway 7
- Liberty Group Mixed Use Development - South Town Centre and Highway 7;
- Stringridge Developments at South Town Centre and Clegg Road;
- The Markham Civic Centre and the future development of the Town Centre Business Park (all part of Markham Centre), a 17.6 acre site on the south side of Highway 7, just west of Warden Avenue;
- The Markham Centre at Highway 7 and Warden Avenue, which is a designated regional centre in the Region of York Official Plan;
- The Cornell and Box Grove Communities east of Ninth Line in the Town of Markham; and
- Any other infill development or development east of Ninth Line, including possible expansion of the Markham-Stouffville Hospital.

6

6.3.5 Recreation and Tourism Areas

The recreation and tourism areas within the Highway 7 Corridor cater to all members of society. From the vast majority of parks, community centres, arenas, libraries to the many shopping locales, the Highway 7 Corridor provides a plethora of activities.

Commencing in the City of Vaughan, the more prominent areas include the large big box outlet areas that exist on the SW and SE corners of Highway 7 and Highway 400. On the SW side is the Colossus Movie Theatre, a re-development of the old Highway 400 Drive-in. On the SE corner is the AMC 30 Interchange movie theatre that exists within a large big box complex that also contains Dave and Buster's, a multi-faceted entertainment complex. Amongst these two anchor areas of development, other retail developments including Walmart, the Seven/400 Power Centre surround the area creating a large retail area in a prime location to capture visitors from both the Highway 7 traffic and more importantly, Highway 400 traffic.

As Highway 7 moves into the Town of Markham, the major tourist attractors include the historical areas of Main St. Unionville as well as Main St. Markham. Both showcase the historical elements of past development through the restoration of historical buildings and the small-town retail shops fronting the two streets.

Many other tourist attractions surround Highway 7 as it passes from west to east through the Region including shopping centres, golf courses, and parks and open spaces, all of which are within a reasonable distance of the corridor itself.

6.3.6 Services and Utilities

The major utilities located in the vicinity of the Highway 7 alignment have been identified through direct contacts with the respective companies, and these utilities are the following:

- Markham Hydro;
- Vaughan Hydro;
- Richmond Hill Hydro;
- Watermains;
- Sanitary Sewers;
- Enbridge Gas;
- Bell Canada;
- Rogers Cable;
- Futureway Communications Inc.; and
- Allstream Corporation (formerly AT&T Canada).

A thorough review of the necessary relocations or modification of utility plants will be undertaken during the detailed design stage.

6.3.6.1 Vaughan/ Markham/ Richmond Hill Hydro

Along Highway 7, an extensive network of services is provided by three providers - Vaughan Hydro, Markham Hydro and Richmond Hill Hydro, respectively. Vaughan Hydro operates both aerial and buried facilities along Highway 7 from Highway 50 to Yonge Street; it also operates both aerial and buried facilities along the Jane-Steeles-Keele Alignment and the Centre-Bathurst Alignment. Markham Hydro operates both aerial and buried facilities along Highway 7 from Yonge Street to York-Durham Line, and it also operates both aerial and buried facilities along the Markham Centre Alignment. Richmond Hill Hydro operates buried facilities along the north side of Highway 7 from Bathurst Street to East Beaver Creek Road.

6.3.6.2 Watermains

The Regional Municipality of York operates extensive network of watermains within the Highway 7 Corridor:

- Crossing Highway 7 at Highway 27;
- Along Highway 7 on the east side of Kipling Avenue;
- Along Highway 7 on the west side of Weston Road;
- Along Highway 7 from Jane Street to Keele Street;
- Along Keele Street crossing Highway 7;
- Along Highway 7 from Dufferin Street to Woodbine Avenue;
- Along Bathurst Street crossing Highway 7;
- Crossing Highway 7 at McCowan Road; and
- Crossing Highway 7 at Ninth Nine.

Further, the City of Toronto owns a watermain crossing Highway 7 at Dufferin Street, and a watermain along Centre Street from Dufferin Street to Bathurst Street.

6.3.6.3 Sanitary Sewers

The Regional Municipality of York operates extensive network of sanitary sewers within the Highway 7 Alignment, the Jane-Steeles-Keele Alignment, and the Markham Centre Alignment:

- Crossing Highway 7 at Islington Avenue;
- Along north side of Steeles Avenue between Jane Street and Keele Street;
- Crossing Highway 7 between Keele Street and Dufferin Street;
- Crossing Highway 7 between Bathurst Street and Yonge Street;
- Crossing Highway 7 on the east side of Yonge Street;
- Crossing Highway 7 on the east side of Bayview Avenue;
- Crossing Highway 7 at Rodick Road between Woodbine Avenue and Warden Avenue, turning eastward to Town Centre Boulevard, then travelling southward to hit Enterprise Boulevard;
- Parallel to the E-W portion of the Markham Centre Alignment, turning northward and crossing Highway 7 at Main Street Unionville, then travelling eastward and crossing Highway 7 again between Kennedy Road and McCowan Road; and
- Crossing Highway 7 on the east side of Main Street Markham.

6.3.6.4 Enbridge Consumers Gas

Enbridge Consumers Gas operates pressure gas mains along both sides of the Highway 7 Alignment, the Jane-Steeles-Keele Alignment, the Centre-Bathurst Alignment, and at a number of side roads. It also operates pressure gas mains along Town Centre Boulevard and Kennedy Road on the south side of Highway 7.

6.3.6.5 Bell Canada/ Rogers Cable/Futureway Communications Inc./Allstream Corporation

Bell Canada, Rogers Cable, Futureway Communications Inc. and Allstream Corporation all have extensive networks of services within the Highway 7 Alignment. Bell Canada owns both buried and aerial plants along Highway 7; it also operates aerial plants along the Jane-Steeles-Keele Alignment. Rogers Cable operates only aerial plants along the Highway 7 Alignment and on Centre Street. Futureway Communication Inc. has both buried and aerial network plants along the Highway 7 Alignment and the Jane-Steeles-Keele Alignment; it also operates aerial plants on Centre Street and buried plants on Town Centre Boulevard. Allstream Corporation operates plants along Highway 7 from Leslie Street to Warden Avenue, it also has plants on Warden Avenue just north of Steeles Avenue and on Highway 7 between Reesor Road and York-Durham Line.

6.4 CULTURAL HERITAGE RESOURCES

This section summarizes the main feature of the cultural heritage resources found within the Study Area. It presents a synopsis of the historical development of the study corridor and identifies built heritage features and cultural landscape units that may be adversely affected by the undertaking. A detailed report, *Cultural Heritage Resource Report*, can be found in **Appendix I**.

6.4.1 Historical Summary

6.4.1.1 19th Century Development

The British Government bought the territory that became York County from the native Mississaugas under the Toronto Purchase Act in 1787. The County of York was created as a territorial unit and electoral division within the Home District in 1792. Abraham Iredell conducted a partial survey of the Township of Markham from Concession 2 to Concession 6 in 1794. The Township of Vaughan was first surveyed in 1795 along Yonge Street and completed in its entirety in 1851. The survey method was similar throughout York County with concession roads parallel to Yonge Street and ranges of 200-acre lots separated by road allowances running east to west every fifth lot.

Vaughan Township

The earliest settlers in Vaughan were Pennsylvanian Germans from the United States who settled primarily in the southeast corner of the township. Although there was some immigration from Britain in the years after the War of 1812, the population growth was slow until the 1820s when the Crown and Clergy Reserve land became available for purchase. This land release coincided with a substantial increase in British immigration.

Vaughan Township was generally opened up by 1840 with about one third of its land cleared for agriculture. The years between 1840 and 1867 saw the township prosper as a farming area with Toronto as a major market. By the late 1880s two railways had been built through the township increasing market availability to the south.

Several 19th century settlements were established along the route of Highway 7, which include:

Brownsville (Islington Avenue)

John Brown settled on the west half of Lot 5, Concession 7 in 1842 and built a cabin on the hill overlooking the Humber flats. The log house became part of the Mackenzie house on Highway 7 and Islington Avenue. This building was moved to Black Creek Pioneer Village in 1973. A sawmill was established as well as a blacksmith shop and foundry where small equipment for the Abell Agricultural Works was manufactured. The development at Islington and Highway 7 was named Brownsville although only the Brown's had a residence located there. Eventually the settlement was incorporated into the community of Woodbridge.

Edgeley (Jane Street)

Once consisted of a store, hotel, church, various mills and other buildings in the 19th century. A post office operated from 1872 to 1960. The building was demolished when Highway 7 was widened. A Town of Vaughan Historic Plaque commemorating Edgeley is located on Jane Street north of Highway 7.

Concord (Keele Street)

A store was built on the southeast corner of Highway 7 and Keele Street in 1846. A post office was opened in 1854.

Thornhill (Yonge Street ad Centre Street)

A small number of permanent settlers arrived in the Thornhill area in the mid 1790s to claim their Crown Grants on Yonge Street. A prosperous hamlet grew on the banks of the Middle Don. The first major sawmill was built on the Don, west of Yonge Street in 1801with a gristmill the following year. Benjamin Thorne, who arrived in 1820, built a large gristmill on the remains of Purdy's Mills. By 1830 he operated a gristmill, sawmill and tannery. The hamlet became known as Thorne's Mills and then Thorne's Hill. A post office was established in 1820 and the community was officially called Thornhill. Smith's Canadian Gazetteer (1846) notes Thornhill as a settlement on Yonge Street with a grist and sawmill and tannery on a tributary of the Don River as well as other commercial enterprises. The commercial area developed on Yonge Street between Centre Street and John Street. The settlement became a stagecoach stop on Yonge Street.

Markham Township

William Berczy was granted 64,000 acres in Markham Township in the same year as part of Lieutenant-Governor John Graves Simcoe's settlement plan for Upper Canada. Under Berczy's leadership German settlers arrived in Upper Canada from New York State and were assigned land in the newly surveyed township by the winter of 1794-95.

An immigration initiative of French émigrés under Comté de Puisaye settled in Markham along Yonge Street in 1798. Most of the émigrés had returned to France by 1815. Pennsylvania German settlers under Peter Reesor's leadership came to Markham in the early 1800s. British and American immigrants began settling in the township circa 1820. Most of the land is quickly cleared for agricultural use. Smith's Canadian Gazetteer (1846) describes Markham Township as "…well-settled, and contains many excellent and well cultivated farms".

As transportation improved along Yonge Street along with a growing population, urbanization occurred. By 1857, most of the township had been cleared of timber and the land was under cultivation. Several 19th century historical settlements grew up along Highway 7 within Markham Township, which include the following:

Langstaff (Yonge Street)

John Langstaff arrived in the area around 1807-08 and acquired the northeast corner of Yonge Street and Highway 7. After the War of 1812 he built several small industries as well as a store and blacksmith's shop on the northeast corner of Yonge Street and Langstaff Sideroad. A post office was opened in 1870. The property remained in the Langstaff family ownership until the early 1890s.

Abner Miles and family moved to Lot 45, Markham Township at the corner of Yonge Street and Major Mackenzie Drive in 1801. He built a log house and operated a store and hotel. Across the road he owned a farm and ashery. His tavern site became known as Miles' Hill and was a popular stop for travellers on Yonge Street. This intersection formed the village nucleus for the settlement, which stretched north on both sides of Yonge Street in Markham Township on the east side and Vaughan Township on the west.

Hugh Shaw divided Lot 46, Markham Township into the first village lots in 1802. The settlement was renamed Mount Pleasant and then Richmond Hill. Smith's Canadian Gazetteer describes Richmond Hill as a small village located on Yonge Street with 140 inhabitants and two churches. A stagecoach ran daily between Richmond Hill to Toronto.

The settlement was incorporated into a village in 1872. St. Mary's (Anglican) Church, Richmond Hill was built in 1876. Both the Richmond Hill Methodist (United) Church and the Richmond Hill Presbyterian Church were built in 1880. Despite the loss of the Patterson & Bro. Company factory in the late 1880s, Richmond Hill maintained a relatively stable commercial centre in the latter part of the 19th century.

Dollar (Leslie Street)

Second half of 19th century had a store, post office, church. No visible reminders along Highway 7 are left today among the 20th century commercial and industrial development.

Browns Corners (Woodbine Avenue)

A crossroads hamlet that became known as Brown's Corners developed at Highway 7 and Woodbine Avenue. The first Presbyterian church in Brown's Corners was built on Highway 7 west of Woodbine Avenue in 1843. Early businesses included blacksmith shops, a shoemaker and an inn. The McPhillips Map (1853-54) depicts a subdivision plan in the northeast corner of the intersection. The Tremaine Map (1860) indicates that Brown's Corners comprised the northeast and northwest corners of Highway 7 and Woodbine Avenue.

Unionville (Main Street and Kennedy Road)

The land along Sixth Line was granted to William Berczy. Berzcy settlers established farmsteads on the 6th Line north of the Rouge River in the late 1790s. The Union Mills were established in 1841. A post office was opened in 1849 and the settlement was named Unionville. Development increased in 1871 with the arrival of the Toronto and Nipissing Railway, which drew business south to the station. Unionville became a police village in 1907. The development of Highway 7 in the 1920s pulled development further south from the village core.

Markham (Highway 48)

The village was founded in the early 1820s near a grist and saw mill, a tannery and an inn on the Rouge River. Originally named Mannheim and Reesorville by early German settlers, it acquired the name of Markham Village in 1829 when a post office was established.

Early mills were established on the Rouge River and taverns and inns appeared to serve the traveling public on Highway 48 (Main Street). Other service industries and stores developed near the mills and inns and store. Industry gradually crept northward from south of Highway 48. With the arrival of Toronto and Nipissing Railway in 1871 Markham's manufacturers and tradesman, such as the Speight Wagon Works, moved further north. In 1872, the Village of Markham was incorporated. In May of this year, a fire destroyed a number of buildings on Main Street. Although once a manufacturing hub, Markham's growth declined due to the accessibility of Toronto markets by rail and road.

Locust Hill

Located in lots 10 and 11, Locust Hill grew up around the railroad station, which opened in 1884. Prior to this, the nucleus of the settlement had been situated around the schoolhouse on lot 5, concession 9, later on lot 13, concession 10. The Tenth Line Methodist Church was built in 1855-56. In 1844 Captain William Armstrong of Markham Village purchased 50 acres from Azariah Reynolds. His son William Armstrong bought another 36 acres in 1866 and built Locust Hill Farm. The Ontario & Quebec Railway station was placed next to Colonel William Button's "St. Clair Farm" on lot 11, concession 10 in 1884 and soon after the Nighswander store, the blacksmith shop and the Wesleyan Methodist Church were surrounded by a number of fine homes, a mill and elevators east of the station and a co-operative creamery. In 1886, the Locust Hill post office was opened. The Methodist Church was rebuilt on the north side of Highway 7 in 1890.

The Ontario & Quebec Railway was a major transportation link for the south and central western portions of Markham Township and the central western part of Pickering Township. Locust Hill station became one of the busiest between Toronto and Peterborough transporting the factory goods produced in Whitevale and Green River and the area farmer's produce and supplies. A substantial number of late nineteenth century and early twentieth century homes, and a nineteenth century store remain today.

6.4.1.2 20th Century Development

Vaughan and Markham Townships were still agricultural in use and rural in character during the first half of the 20th century.

The Department of Highways extended from Highway 7 easterly from Brampton, through Vaughan and Markham, to Highway 12 at Brooklin and on to Peterborough in 1927. The extension was paved initially from Thornhill on Yonge Street through Markham to just past the York-Durham town Line at Green River. Despite the highway improvement the land on the north and south of Highway 7 generally remained as agricultural use until after World War II.

In the 1950s the character of the area began to undergo a perceptible change in land use with the development of residential subdivisions, commercial areas and individual residential subdivision. During the 1950s and 1960s, numerous changes were made to the routing of Highway 7 throughout Central Ontario. North of Toronto, a diversion was opened in 1963 to bypass the historical hamlet of Langstaff, as well as bypass the short but very congested route of Highway 7 and Highway 11 via Yonge Street through Thornhill. The new Highway 7 continued west of Highway 11 and turned south at Bathurst Street. At the junction of Bathurst Street and Centre Street, Highway 7 once again turned west.

Urbanization along Highway 7 accelerated in the late 1980s and 1990s. The old route of Highway 7 through downtown Thornhill on Centre Street was renamed Highway 7B. In the mid-to-late1980s, Highway 7 was upgraded to a six-lane expressway between Bayview Avenue and Centre Street with a major realignment of Highway 7 between Bathurst Street and Centre Street to accommodate the construction of Highway 407.

The Province of Ontario downloaded significant portions of Highway 7 in 1997-1998. After Highway 407 was opened from Highway 410 in Brampton to Highway 404 in Markham in June 1997, Highway 7 was transferred to the Regions of York and Peel between Highways 410 and 404. Highway 7 from Highway 404 easterly to Highway 48 in Markham was downloaded in January 1998.

6.4.2 Identification of Built Heritage Features & Cultural Landscapes

The Ministry of Culture (MCL) describes heritage buildings and structures, cultural heritage landscapes and archaeological resources as cultural heritage resources.

MCL Guidelines state two basic ways of visually experiencing cultural heritage resources in the environment: as cultural landscapes and as built heritage features. Cultural landscapes units are a geographical area perceived as a collection of individual person-made built heritage features set into a whole such as historical settlements, farm complexes, waterscapes, roadscapes, railways, etc. They emphasize the interrelationship of people and the natural environment, and convey information about the processes and activities that have shaped a community. Built heritage features are individual, person-made or modified, parts of a cultural landscape such as buildings or structures of various types, cemeteries, planting and landscaping structures, etc.

The cultural heritage resources in the Study Area include those aboveground, person-made heritage features over 40 years old. The application of this rolling forty-year principle is an accepted federal and provincial practice for the preliminary identification of cultural heritage features that may be of heritage value. Its application does not imply however that all built heritage features or cultural landscapes that are over 40 years old are worthy of the same levels of protection or preservation.

For the purposes of built heritage feature and cultural landscape identification, the following section provides a brief description of the existing environment, the principal built heritage features and the principal cultural landscape units identified within the Highway 7 Corridor Study Area including the alternative alignments.

6.4.2.1 Description of the Existing Environment

The Highway 7 Study Area is located in four municipalities, namely, the City of Vaughan, City of Toronto, City of Richmond Hill and the Town of Markham. The Highway 7 Corridor is an area of primarily late 20th century urban development consisting of residential, commercial, industrial areas and discrete of parkland or open spaces, hydro-electric transmission corridors and linear transportation corridors such as roads and railway lines. The CN Railway crosses Highway 7 west of Kipling Avenue, the CN MacMillan Yard is located north of Highway 7 west of Keele Street and the Go Richmond Hill train tracks cross east of Yonge Street, and the GO Stouffville train tracks west of Kennedy Road and CP Havelock at Locust Hill.

Highway 7 crosses over the Humber River and its tributaries in the west, the Don River and tributaries and the Rouge River and its tributaries in the east. Larger parkland areas include lands at the Humber River at Islington Avenue and Black Creek Pioneer Village on the south and north side of Steeles Avenue in the City of Toronto and City of Vaughan are included in the Study Area. Black Creek Village is a collection of buildings moved to the site and restored to a 19th-century rural Victorian community.

Individual 19th century and early twentieth century buildings of varying types are located along the length of the Highway 7 Corridor. Usually these cultural heritage resources indicate the location of former 19th or twentieth farm complexes or historical settlements. Larger areas of remnant agricultural land are still evident west of Highway 48 in Markham, particularly east of Ninth Line. A few surviving individual farm complexes are also found. Late twentieth century commercial and municipal development and access roads to residential subdivisions are prominent features along the length of Highway 7.

6.4.2.2 Description of Identified Built Heritage Features and Cultural Landscape Units

Table 6.4-1 lists the cultural heritage landscapes and **Table 6.4-2** lists the built heritage features that were identified as standing within or adjacent to the Highway 7 Corridor Study Area between Highway 50 in the west and the York-Durham Line in the east. There were 17 cultural heritage landscapes identified including farm complexes, historical settlements and heritage conservation districts. There were 19 built heritage features identified, principally residences and railway overpasses and a cairn.

Table 6.4-1
Identified Cultural Heritage Landscapes in the Highway 7 Corridor Study Area from Highway 50 to Steeles Avenue including route alternatives

Number	Feature	Type	Location/Description
1.	CLU	Farm Complex	No. 6701 Highway 7, south side at Huntington Road, City of Vaughan.
2.	CLU	Historical Settlement	Originally known as Brownsville at Highway 7 and Islington Avenue, City of Vaughan. Includes some 19th and 20th century residences on Wallace Ave. west of Islington Avenue and on north and south sides of Highway 7 east of Islington Avenue.
3.	CLU	Waterscape	Humber River at Highway 7 and Islington Ave. Recognized as a Canadian Heritage River, City of Toronto.
4.	CLU	Cemetery	Hillcrest Cemetery, north side of Highway 7 east of Islington Ave., City of Vaughan, opened in 1916, was recorded by the Ontario Genealogical Society, Toronto Branch.
5.	CLU	Museum Village	Black Creek Pioneer Village with buildings and the Townline Church Cemetery/ Stong Family Cemetery located on the northwest (City of Vaughan) and southeast corners of Steeles Ave. and Jane Street. (City of Toronto). Opened in 1960 the Village is owned and operated by the Toronto Region Conservation Authority. Includes 35 buildings representing the life in a rural Victorian community of the 1860s and designated under Part IV of the Ontario Heritage Act such as the Dalziel Barn, Robert Nesbitt Sawmill and John Dalziel log house all located at No. 7060 Jane Street. The cemetery was recorded by the Ontario Genealogical Society, Toronto Branch.
6.	CLU	Farm Complex	No. 3105 Steeles Ave., south side, City of Toronto, part of York University grounds. Former Stong farmscape includes a farmhouse (vacant) and a barn.
7.	CLU	Waterscape	West Don watercourse at Dufferin Street.
8.	CLU	Church/ Cemetery	Brown's Corners Church and Cemetery (1843), north side of Highway 7 east of Woodbine Avenue. Listed on the Markham Inventory of Heritage Buildings. Cemetery was recorded by the Ontario Genealogical Society, Toronto Branch.
9.	CLU	Farm Complex	No. 7996 Helen Ave. (at Unionville Go Station), Town of Markham. 19th century complex with a farmhouse, barn and outbuildings.
10.	CLU	Unionville HCD	Located at Highway 7 and Main St. Unionville, Town of Markham. Designated under Part V of the Ontario Heritage Act.
11.	CLU	Markham HCD	Located at Highway 7 and Highway 48 /Main Street Markham intersection, Town of Markham. Designated under Part V of the Ontario Heritage Act. Includes No. 6040 Highway7, which is designated under Part IV of the OHA.
12	CLU	Cemetery	Elmwood and St. Andrew Cemeteries located on both sides east of Savannah Crescent and recorded by the Ontario Genealogical Society, Toronto Branch.
13.	CLU	Farm Complex	No. 6937 Highway 7, John Reesor Farmhouse. Located on the south side, east of Ninth Line, Town of Markham. 19th century farm complex with farmhouse, barn, outbuildings. Listed on the Markham Inventory of Heritage Buildings.
14.	CLU	Farm Complex	No. 7323 Highway 7, south side, west of Reesor Road, Town of Markham. Complex contains a farmhouse, barn, silo and outbuildings. Listed on the Markham Inventory of Heritage Buildings.
15.	CLU	Reesor Road	North of Highway 7 rural roadscape.
16.	CLU	Historical Settlement	Locust Hill. Proposed heritage conservation district extends form east side of Reesor Rd. east to Town Line. Includes numerous buildings located outside and in centre core of village listed on the Markham Inventory of Heritage Buildings. The Locust Hill United Cemetery (1843), south side of Highway 7 east of Reesor Rd., was designated under Part IV of the Ontario Heritage Act.
17.	CLU	Railscape	Level crossing of CP Havelock line.

Note: CLU Cultural Landscape Unit
HCD Heritage Conservation District

6

Table 6.4-2
Identified Built Heritage Features in the Highway 7 Corridor Study Area from Highway 50 to Steeles Avenue including route alternatives

Number	Feature	Type	Location/Description
1.		Former Residence	No. 5298 Highway 7, north side west of Kipling Aveue, City of Vaughan. Integrity compromised due to renovation.
2.		Former Residence	No. 5263 Highway 7, south side west of Kipling Aveue, City of Vaughan. Integrity compromised due to renovation.
3.	BHF	Residence	No, 7765 Kipling Avenue, south side at Highway 7. Listed on City of Vaughan Inventory of Significant Structures, Group 3.
4.	BHF	Railway Overpass	Over Highway 7, City of Vaughan, between Islington Ave. and Kipling Ave.
5.	BHF	Residence	No. 2061 Highway 7, City of Vaughan, south side. Much altered early 20th century house.
6.	BHF	Residence	No. 2063 Highway 7, south side, City of Vaughan. Much altered late 19th century house.
7.	BHF	Residence	No. 1929 Highway 7, City of Vaughan, south side at railway crossing. 19th century house set back from the road.
8.	BHF	Residence	No. 1863 Highway 7, south side at Baldwin St., City of Vaughan. Much altered early 20th century house.
9.	BHF	Railway Overpass	GO Bradford crosses over Highway 7 at Baldwin Street, City of Vaughan. Construction date of 1963 noted on structure.
10.		Railway Overpass	CN Halton crosses over Jane Street, north of Steeles, City of Vaughan.
11.	BHF	Residences	Nos. 1453, 1445 and 1423 and No. 1137 Centre St., south side, City of Vaughan. Post W.W. II houses.
12.	BHF	Residence	No. 5011 Highway 7, south side, by Bullock Drive, in plaza, close to road, known as Sabiston House. Listed in the Markham Inventory of Heritage Buildings.
13.	BHF	Residence	No. 5429 Highway 7, south side on southwest. corner of Conservation Drive. 20th century house facing onto Highway 7. Listed in the Markham Inventory of Heritage Buildings.
14.	BHF	Former Residence	No. 6040 Highway 7. Former 19th century residence, now a Tim Hortons. Designated under Part IV of the Ontario Heritage Act and located in the Markham HCD.
15.	BHF	Residence	No. 6881 Highway 7, south side, east of Ninth Line, Town of Markham. Lewis J. Burkholder property listed on the Markham Inventory of Heritage Buildings.
16.	BHF	Residence	No. 7170 Highway 7, north side, west of Markham Bypass. Pre-1900 construction. Francis Pike property, listed on the Markham Inventory of Heritage Buildings.
17.	BHF	Residence	No. 7265 Highway 7, south side, east of Markham Bypass. Pre-190 brick construction. Abram Reesor property, listed on the Markham Inventory of Heritage Buildings.
18.	BHF	Residence	No. 7482 Highway 7, northeast corner of Highway 7and Reesor Rd. Early 19th century stone house. Listed on the Markham Inventory of Heritage Buildings.
19.	BHF	Cairn	Located on northeast corner of Reesor Road and Highway 7 in a small parkette. Commemorates Reesor Family in Canada.

Table 6.4-2
Identified Built Heritage Features in the Highway 7 Corridor Study Area from Highway 50 to Steeles Avenue including route alternatives

Note: BHF Built Heritage Feature
HCD Heritage Conservation District

There are no national or provincially recognized built heritage features along Highway 7 or the alignment alternatives in the City of Vaughan, City of Toronto.

No cultural heritage features are located in the City of Richmond Hill.

6.4.3 Archaeological Resources

The detailed report, *Stage 1 Archaeological Assessment*, examining the potential for archaeological resources within the Study Area is presented in **Appendix J**.

6.4.3.1 Previous Archaeological Research and Retained Sites

Three sources of information were consulted in order to compile an inventory of archaeological resources in the vicinity of the Study Area: the site records for registered archaeological sites (housed at the Ministry of Culture), published and unpublished documentary sources, and the files of the archaeological consulting firm.

In Ontario, information concerning archaeological sites is stored in the Ontario Archaeological Sites Database (O.A.S.D.), maintained by the Ministry of Culture. This database contains archaeological sites registered according to the Borden system. Under the Borden system, Canada has been divided into grid blocks based on latitude and longitude. A Borden block is approximately 13 kilometres east to west, and approximately 18.5 kilometres north to south. Each Borden block is referenced by a four-letter designator, and sites within a Borden block are numbered sequentially as they are found. The Study Area under review is located in Borden blocks AlGt, AlGu, AkGu and AkGv.

For the purpose of determining archaeological potential, and identifying archaeological sites that may be impacted by the proposed transitway undertaking, the area examined included all proposed of Highway 7 Corridor alignments between Highway 50 and York/Durham Line as shown in **Appendix J Exhibit 1**, surrounded by a 250-metre buffer. There have been 105 archaeological sites registered within the area examined. The majority of these sites, which are summarized in **Appendix J Table 1**, were documented during the course of predevelopment archaeological assessments on lands within and immediately adjacent to the Study Area. The site types comprise campsite, village, findspot, cabin, homestead, kill site, industrial complex, lithic scatter and some of the sites are of undetermined type. Although most of the sites have undetermined precontact cultural/ temporal affiliation, the remaining is affiliated with late woodland, Euro-Canadian, middle to late 19th century, early/middle/late archaic, Laurentian, late/middle Irogqoian, and Paleo-Indian.

Based on the presence of these sites within the Study Area, as well as in the presence of numerous watercourses forming parts of the Humber, Don, Rouge and Petticoat Creek drainage systems, and the intensity of historic land use within the Study Area, the subject lands have potential for the identification of historic and precontact archaeological sites in areas where archaeological potential has not been negated by intensive, recent construction disturbance. However, to prior the detailed design phase, Stage 2 archaeological field survey should be conducted in accordance with the MCL Stage 1-3 Archaeological Assessment Technical Guidelines, in order to identify any archaeological remains that may be present.

6.5 EXISTING NOISE AND VIBRATION LEVELS

This Section presents the results of the background noise and vibration monitoring within the Study Area. The detailed report, *Noise and Vibration Impact Assessment Report*, on these topics can be found in **Appendix K**.

6.5.1 Predominant Land Uses

From a noise and vibration point of view, the predominant land use within the Study Area consists of a mix of residential, commercial, industrial, institutional and park/open space land uses. For the most part, the areas adjacent/closest to Highway 7 along the entire route are characterized by industrial and commercial uses, however, there are several residential pockets abutting the Corridor. These pockets are most noticeable in the City of Vaughan between Martin Grove Road and Ansley Grove Road; in the Town of Thornhill, on Bathurst Street, between Centre Street and Highway 7; in the Town of Richmond Hill, between Bayview Avenue and Leslie Street; and several areas east of Warden Avenue, in the Town of Markham. Several office, institutional, and industrial buildings also front onto Highway 7 at various points along the Corridor.

6.5.2 Approach Used

Noise limits applicable to transit development projects are contained in provincial protocols and the Ontario Model Municipal Noise Control By-law. Local municipal noise control by-laws also contain time and place restrictions on construction activities that in turn may have implications for such undertakings.

To determine the appropriate noise requirements for this project, meetings were held with the various relevant representatives from the MOE, including the Ministry's Environmental Assessment and Approvals Branch, Central Region Office and Air and Noise Unit. On the basis of these consultations, and the review of existing protocols for other transit projects, specific protocols for noise and vibration were developed for assessing this project. These are:

- for existing/future noise, the impact were established based on the higher of either a daytime limit of 50 dBA or existing levels, and that nighttime limits be based on the higher of either 45 dBA or existing levels, determined either by traffic noise predictions and/or measurements;
- that mitigation be considered if the existing established sound levels at the closest receptor be exceeded by > 5 dBA;
- stationary noise sources be assessed in accordance with NPC-205;
- construction noise be assessed in accordance with NPC-115; and
- vibration impact be assessed in accordance with the MOEE/TTC Protocol.

Appendix K Table 3.1 summarizes the key criteria specified in the above mentioned protocols and additional details on NPC-205 and NPC-115 are included in Appendix A of that report. Information on sound level terminology is also contained in this appendix.

6.5.3 Traffic Noise Prediction Results for Existing Conditions

Table 6.5-1 shows the traffic noise prediction results for existing conditions at selected closest receptor locations along the preferred route for both daytime and night-time.

Table 6.5-1
Predicted Existing Day Time and Night-time Traffic Noise Levels

Section		Predicted Sound Level (dBA)		Closest Receptor Distance (m)
From	To	Daytime	Nighttime	
Highway 7 Alignment				
Martin Grove Road	Kipling Avenue	66	60	18.5
Pine Valley Drive	Whitmore Road	70	63	19
Centre Street.	Langstaff Road	62	55	46.5
Bayview Avenue	Leslie Street	71	64	30.5
Woodbine Avenue	Rodick Road	64	58	50
Warden Avenue	Kennedy Road	73	66	15
McCowan Road	Laidlaw Blvd.	62	56	15
Ninth Line	Markham Bypass	59	52	40
Keele Street Alignment				
Highway 7	Highway 407	62	69	28.5
Centre Street Alignment				
Bathurst Street	Dufferin Street	65	59	18
Bathurst Street Alignment				
Centre Street	Highway 7	64	57	22.5
Town Centre Boulevard South Alignment				
Town Centre Blvd. South	Main Street Unionville	51	45	147
Kennedy Road Alignment				
Main Street Unionville	Kennedy Road	58	52	21

The table shows high daytime and nighttime sound levels at receptors closest to the major roads along the corridor. The high existing noise levels reflect the high traffic volumes on these roads.

6.5.4 Sound Level Monitoring at Receptor Locations

The monitoring program consisted of at least 52 hours of noise monitoring at 13 receptors along the preferred route on the Highway 7 Corridor between September 5 and December 8, 2003, as shown on **Table 6.5-2**. The receptor locations are shown on **Appendix K Figure 4.1**. The monitoring locations were selected based on their proximity to the preferred route and their potential to be affected by lane realignment along the route.

Table 6.5-2
Summary of Receptor Locations

Receptor #	Address	Monitoring Date	Monitoring Hours
1	83 Button Road	November 14 – 17	69
2	59 Embassador Court	October 10 – 14	95
3	7651 Keele Street	November 5 – 10	118
4	104 Suger Crescent	September 5 – 9	95
5	364 Highway 7	November 5 – 10	118
6	2 Montgomery Court	September 11 – 15	86
7	73 Lichfield Road	September 11 – 13	52
8	10 Gladiator Road	September 11 – 15	86
9	6921 Highway 7	November 7 – 11	97
10	154 Thornway Avenue	October 10 –14	86
11	79 Chilmar Crescent	October 10 –14	73
12	Future Pedestrian Mall	December 5 – 8	71
13	231 Valentina Drive	November 5 – 10	122

6.5.5 Background/ambient Sound Level Monitoring Results

The background sound level monitoring program was carried out in accordance with the procedures specified in Publication NPC-103. The monitoring was scheduled to include weekdays and weekends. However, most of the monitoring was conducted on weekends to obtain conservatively low background levels.

The detailed monitoring results are included in **Appendix K-C**. The data indicate that for the most part, daytime (7 am – 11 pm) sound levels at the receptors along the Highway 7 Corridor exceeded 50 dBA. Even at night time (11 pm – 7 am), the minimum measured sound levels were generally higher than 50 dBA. The only exception to this trend is the proposed future Pedestrian Mall location where the existing sound levels are found to be closer to 50 dBA in the daytime and 45 dBA at nighttime.

The detailed monitoring results in Appendix C of the technical report show the following key trends:

- consistently high sound levels during the daytime until at least midnight;
- lowest sound levels were generally recorded between 2 am and 5 am;
- weekend sound levels were generally lower than weekday sound levels;
- sound levels were highest for receptors closest to Highway 7;
- the lowest existing sound levels were recorded in the vicinity of the proposed future Pedestrian Mall; and
- the range and distribution of sound levels at the monitoring locations indicate that the sound environment at these locations is typical of a high traffic urban area.

6.5.6 Comparison of Traffic Noise with Measured Background Noise Levels

To assess the impact of road traffic noise at the receptor locations, a comparison was made between the measured background sound levels and STAMSON predicted sound levels at the same locations, based on the AADT traffic volumes. Equivalent daytime (16 hrs) and nighttime (8 hrs) Leq sound levels were calculated for all complete days (24 hrs) of monitoring. The results are summarized in **Table 6.5-3**.

Table 6.5-3
Comparison of Measured with Predicted Traffic Noise Levels

Location	Address	Monitoring Date	Measured Equivalent Daytime (16 hr) and Nighttimes (8 hr) L_{eq} Sound Level (dBA)		Predicted Leq Sound Levels from AADT Traffic Volumes (dBA)		Closest Receptor Distance (m)
			Day	Night	Day	Night	
1	83 Button Road	Nov 14	62.5	60.1	66	60	18.5
		Nov 15	62.7	58.9			
		Nov 16	61.6	60.9			
2	59 Embassador Court	Oct 11	65.4	61.3	70	63	19
		Oct 12	63.6	60.9			
		Oct 13	63.5	61.4			
3	7651 Keele Street	Nov 6	67.9	65.3	69	62	28.5
		Nov 7	71.3	64.8			
		Nov 8	67.6	61.7			
		Nov 9	63.7	63.2			
4	104 Suger Crescent	Sep 6	59.3	54.1	62	55	46.5
		Sep 7	61.5	57.9			
		Sep 8	63.0	58.6			
5	364 Highway 7	Nov 6	60.1	57.4	71	64	30.5
		Nov 7	60.7	55.0			
		Nov 8	57.3	53.9			
		Nov 9	57.2	57.7			
6	2 Montgomery Court	Sep 12	62.3	58	64	58	50
		Sep 13	60.9	57			
		Sep 14	60.1	58.9			
7	73 Lichfield Road	Sep 12	70.8	66.4	73	66	15
		Sep 13	71.2	N/A			
8	10 Gladiator Road	Sep 12	64.8	59.5	62	56	15
		Sep 13	63.7	58.2			
		Sep 14	62.5	60.4			
9	6921 Highway 7	Nov 7	61.3	53.3	59	52	40
		Nov 8	59.4	54.0			
		Nov 9	58.1	57.4			
10	154 Thornway Avenue	Oct 11	66	62.9	65	59	18
		Oct 12	61.2	57.6			
		Oct 13	59.9	63.6			
11	79 Chilmar Crescent	Oct 11	61.8	61.3	64	57	22.5
		Oct 12	62.7	62.8			
		Oct 13	63.4	62.4			
12	Future Pedestrian Mall	Dec 6	50	45	51	45	147
		Dec 7	48	47			
		Dec 8	52	N/A			
13	231 Valentina Drive	Nov 6	55.7	51.6	58	52	21
		Nov 7	67.0	53.1			
		Nov 8	55.7	48.7			
		Nov 9	55.6	51.8			

Note: N/A- not available

The data in the table show that the predicted daytime and nighttime traffic noise levels are most often within the range of the average measured sound levels at each receptor location, indicating the strong influence of road traffic on existing sound levels. However, as noted earlier, there are other factors which impact existing sound levels including institutional, commercial and industrial buildings in close proximity to the receptors.

6.5.7 Existing Vibration Levels along Highway 7 Corridor

Background noise levels were measured as part of the detailed noise and vibration study at 13 locations along the preferred route of the Highway 7 Corridor. The same 11 locations were chosen for vibration measurements. The vibration levels were measured on the ground surface through a mounted accelerometer. The accelerometer was connected to a vibration meter, whose output drove a paper chart. The whole system was calibrated using a Bruel and Kjaer vibration calibrator. The calibrator produces a level of 10 mm/sec velocity at 160 Hz.

The vertical vibration at each of the 13 locations was collected over a 20-minute period. The period included pass-bys (at various speeds) of cars, vans, buses and trucks of various sizes. The results are shown in **Appendix L Figures 6.1** through **6.13**.

The results, shown in Figures 6.1 to 6.13 of the technical report, present a sample of the collected data. The results show that there are no perceptible vibration levels from existing traffic at the closest sensitive receptor locations along the Highway 7 Corridor. Most of the values are well below 0.1 mm/sec. This is as expected since the traffic basically consists of rubberized-tire vehicles, and the levels from such traffic are negligible unless there are some anomalies, such as an expansion joint, in the roadbed. The only vibration sensation that was detected by the transducer occurred when the equipment operator tapped adjacent to it.

6.6 AIR QUALITY

This Section presents a brief description and the results of the air dispersion modelling in order to assess the air quality within the Study Area. A detailed report, *Air Quality Impact Assessment Report*, on these topics can be found in **Appendix L**.

Air quality is a measure of the number of molecules of a chemical in a given volume of air, namely the concentration of the chemical constituent.

In order to assess the future air quality resulting from this project, a two level approach was used. The modelling methodology will be introduced in a later section, **Section 6.6.2**.

6.6.1 Existing Environmental Conditions

Data on existing environmental conditions was collected and applied in the air dispersion modelling for the Study Area. These data includes:

- Climate and Meteorological Data;
- Air Quality Standards;
- Historical and Measured Air Quality Data;
- Predicted Atmospheric/ Vehicle Emissions;
- Odours from Diesel Exhaust; and
- Greenhouse Gas Emission

6.6.1.1 Climate and Meteorological Data

The key parameters of the meteorology and climatological conditions that must be taken into account are wind, temperature and atmospheric structure.

Wind

Wind fluctuations over a very wide range of time and space scales accomplish dispersion and strongly influence other processes associated with it. There are two significant components – direction and speed.

Direction

Wind direction is reported as the direction from which the wind blows and is based on surface (10 m) observations. Over the course of a year, wind usually blows in all directions, but with varying frequencies. Certain directions occur more frequently than others. These are known as the prevailing wind directions.

Figure 6.6-1 (wind rose) presents a wind rose with the 6-year average (1996 – 2001) and 2001 data for Pearson International Airport. Wind direction in the area varies considerably over the period. The prevailing winds are from the north and the west, with winds blowing from these sectors approximately 45 percent of the time. A single year of meteorology (2001) was used for the modelling because it was the base year for the study and the same year's traffic counts were used for the emission calculations.

Speed

The concentration of dust in the air decreases with increasing wind speed, as a result of dilution and good dispersion of gases and particles throughout the atmosphere. The distribution of average wind speed at the Pearson International Airport station is presented in **Figure 6.6-1**. The average wind speed, based on the 1996-2001 period, is 4.0 m/s, with calms (i.e. wind speeds less than 1 m/s) occurring approximately 5% of the time.

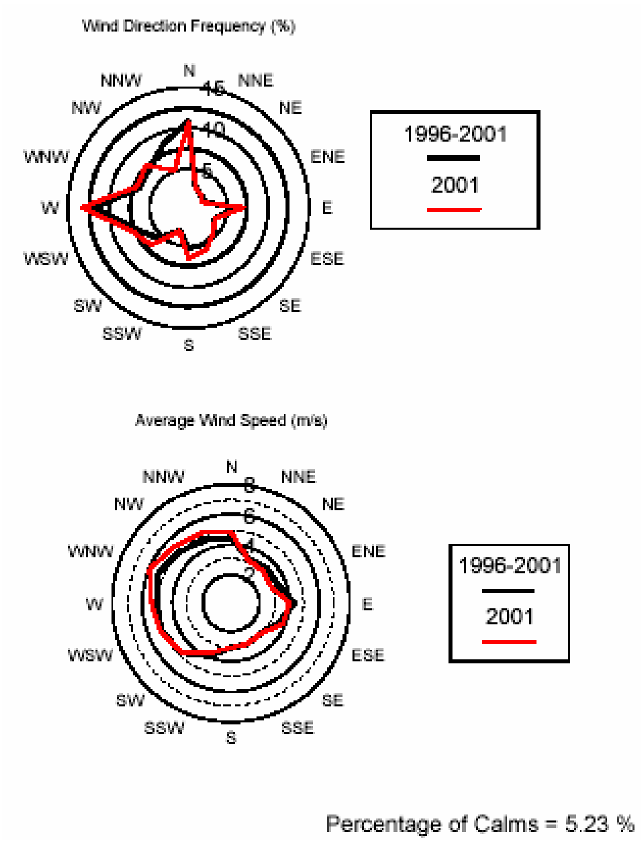


Exhibit 6.6-1
Wind Rose – Toronto Pearson International Airport 1996-2001

Temperature

There are two key temperature effects that influence air quality – temperature near the surface and temperature aloft.

Temperature near the Surface

Temperature near the surface can greatly affect the dispersion of particulate matter. When it is hot, the surface can dry out, making particulate matter available to be picked up by the wind. Cool temperatures, on the other hand, enable the surface to retain moisture longer, thereby reducing windblown dust. The project location is typical of the Southern Ontario lakes region with relatively cool spring and fall seasons, hot humid summers and cold, wet winters.

Temperature Aloft

The change in temperature vertically is the key controlling parameter in the dispersion of gases and particles.

Atmospheric stability is an inherent feature of the vertical temperature structure. It is a measure of the amount of vertical motion in the atmosphere, and hence the atmosphere's ability to mix pollutants. A stable atmosphere has little vertical motion (is less turbulent) and cannot disperse pollutants as well as a more turbulent, unstable atmosphere. A number of classification schemes have been developed for describing stability classes. The details of this classification schemes can be found in **Appendix L**, **Section 2.1.3**.

A statistical summary of the atmospheric stability using the Turner method, based on the results of the PCRAMMET Model (U.S. EPA regulatory meteorological pre-processor) is presented in **Table 6.6-1**. This table outlines the distribution of stability classes for Pearson International Airport for the 1996 to 2001 period. Stable conditions can produce higher concentrations near the ground because of reduced vertical mixing. These conditions occur approximately 30% of the time.

Table 6.6-1
Stability Class Distribution 1996-2001 in Percent for Toronto Pearson International Airport

Stability	1996	1997	1998	1999	2000	2001	Period Average
A	0.72	.73	0.65	0.31	0.36	0.34	0.52
B	4.51	4.5	4.83	4.32	3.95	4.07	4.36
C	9.57	10.26	11.35	11.54	10.47	10.43	10.60
D	54.5	55.67	51.82	53.15	58.34	58.25	55.29
E	13.49	13.23	14.51	14.53	13.66	13.67	13.85
F	17.21	15.61	16.85	16.15	13.21	13.22	15.38

Note: Class A – Least stable class
Class D – Neutral atmosphere
Class F – Most stable

Atmospheric Structure

The structure of the atmosphere is also defined by the vertical temperature change in another fundamental way – by setting a limit on the vertical dimension through which pollutants can mix. This vertical extent through which a plume of pollutants can be mixed is called the "mixing height". With a higher mixing height there is a larger volume of air available within which the pollutants can mix, producing lower concentrations.

For modelled 1-hour ground level concentrations as opposed to the annual and 24-hour average, mixing height can be very important. The use of variable mixing heights, that are as close as possible to the actual conditions, improves the ability of the model to accurately predict downwind concentrations.

Mixing height is calculated from the vertical temperature profile measured by weather balloon ascents. The data measured in Buffalo, the closest upper air station to Toronto, is representative of conditions over Toronto since mixing height is a regional parameter.

The surface values and the twice-daily upper air measurements are processed through the U.S. EPA meteorological pre-processor (PCRAMMET) to combine surface and upper air measurements into the hourly mixing heights, which are required by the model. Mixing heights calculated to be less than 10 m, were set to 10 m.

6.6.1.2 Air Quality Standards

Several measures are used to describe airborne dust impacts from roadways. Those used in this assessment are as follows:

- Total Suspended Particulate (TSP);
- Fine Particulate Matter less than 10 and 2.5 microns in diameter (PM_{10} and $PM_{2.5}$);
- Dustfall;
- Sulphur Dioxide (SO_2);
- Nitrogen Oxides (NO_x);
- Ozone (O_3); and
- Carbon Monoxide (CO).

Total Suspended Particulate (TSP)

Total Suspended Particulate (TSP), is often used to characterize air quality near a dust source. TSP is measured with a high-volume (Hi-Vol) sampler over 24 hours and consists of particles less than 44 µm in diameter. An annual average is calculated as the geometric mean of these samples measured every six days.

Under *Ontario Regulation 337*, an ambient air quality criterion is set for TSP. The ambient air quality criterion for TSP is 120 µg/m^3 averaged over 24 hours, and the annual geometric mean of the 24-hour samples is 60 µg/m3.

The air quality criteria for TSP are summarized in **Table 6.6-2**.

Table 6.6-2
Provincial Air Quality Criteria for TSP

Provincial: Ontario Ministry of the Environment		
Pollutant	Averaging Period	Ambient Air Quality Criteria
Total Suspended Particulates (TSP)	24 hours	120 µg/m^3
	1 year*	60 µg/m^3

Source: MOE (2001a)
Note: * Geometric Mean

The ambient TSP standards and criteria were set to prevent a reduction in visibility. Particles with a radius of 0.1 to 1.0 µm are most effective at reducing visibility. In a rural area where TSP levels are on the order of 30 µg/m^3, the visibility would be about 40 km. At 150 µg/m^3, a common urban concentration, the range would be reduced to about 8 km. The MOE 24-hour criterion of 120 µg/m^3 is based on a visual range of about 10 km.

The assessment of air quality focussed on health impacts (primarily driven by PM_{10} and $PM_{2.5}$) and TSP was not considered any further in the assessment.

6

Fine Particulate Matter PM10 and PM2.5

Many studies over the past few years have indicated that fine particulate matter (PM_{10} and $PM_{2.5}$), a mixture of chemically and physically diverse dusts and droplets, in the air is associated with various adverse health effects in people who already have compromised respiratory systems and suffer from asthma, chronic pneumonia and cardiovascular problems. However, the available studies have not been able to link the adverse health effects in such people to any one component of the pollution mix.

The current 24-hour regulatory limits for fine particulate matter are presented in **Table 6.6-3**.

Table 6.6-3
Air Quality Criteria for PM_{10} and $PM_{2.5}$

Provincial: Ontario Ministry of the Environment			
Pollutant	Averaging Period	Guideline Level	Ambient Air Quality Criteria
PM_{10}	24 hours	Ontario Interim	50 µg/m^3
$PM_{2.5}$	24 hours	Canada-Wide Standard	30 µg/m^3

Dustfall

In developing an Ambient Air Quality Criterion (AAQC) for dustfall of 7 g/m^2/30 days, the MOE used soiling data (e.g. surface build-up of dust) from various Ontario towns between 1951 and 1955, which indicated areas of relatively low soiling (11 to 15 g/m^2/30 days), relatively moderate soiling (17 to 24 g/m^2/30 days) and relatively heavy soiling (26 to 34 g/m2/30 days) (WHO, 1961). The air quality criteria for dustfall are summarized in **Table 6.6-4**.

Table 6.6-4
Provincial Air Quality Criteria for Dustfall

Provincial: Ontario Ministry of the Environment		
Pollutant	Averaging Period	Ambient Air Quality Criteria
Dustfall	1 month	7.0 g/m^2/30 days
	1 year$^+$	4.6 g/m^2/30 days

Source: MOE (2001a)
Note: + Geometric Mean

Criteria Air Contaminants (NOX, SO2, CO, O3)

Criteria Air Contaminants (CACs), including nitrogen oxides, sulphur oxides and carbon monoxide are common air pollutants released into the air typically by activities such as the combustion of fossil fuels.

Nitrogen dioxide (NO_2) is a reddish brown, highly reactive gas that is formed in the atmosphere through the oxidation of nitric oxide (NO). Nitrogen oxides (NO_x), the term used to describe the sum of NO, NO_2 and other oxides of nitrogen, play a major role in the formation of ozone (O_3).

Sulphur dioxide (SO_2) is a colourless gas that smells like burnt matches. It can be oxidized to sulphur trioxide, which, in the presence of water vapour, is readily transformed to sulphuric acid mist. SO_2 can be oxidized to form acid aerosols. SO_2 is a precursor to sulphates, which are one of the main components of respirable particles in the atmosphere.

Carbon monoxide (CO) is a colourless, odourless, and at high levels a poisonous gas, formed when carbon in fuel is not burned completely. It is a component of motor vehicle exhaust, which contributes about 60 percent of all CO emissions nationwide. High concentrations of CO generally occur in areas with heavy traffic congestion.

Ozone (O_3) is formed via a complex, non-linear chain of photochemical reactions involving reactive species of VOCs, NO_x and the hydroxyl radical (OH). The amount of O_3 formed depends on the strength of the sunlight, the concentrations of NO_x and the availability of OH radicals to drive the reaction mechanisms. O_3 toxicity occurs in a continuum in which higher concentrations, longer exposure duration, and greater activity levels during exposure cause greater effects. Short-term acute effects include pulmonary function changes, increased airway responsiveness and airway inflammation, and other symptoms.

A recent study shows that 21% and 58% of the SO_2 and NO_x emissions from the City of Toronto are due to transportation sources (RWDI, 2001).

The MOE AAQCs for NO_x, SO_x, CO and O_3 are shown in **Table 6.6-5**.

Table 6.6-5
MOE Ambient Air Quality Criteria for Criteria Air Contaminations

Compound	CAS No.	Ambient Air Quality Criteria (AAQC)			
		Annual (µg/m^3)	24-hour (µg/m^3)	8-hour (µg/m^3)	1-hour (µg/m^3)
Nitrogen Oxides	10102-44-0	NS	200	NS	400
Sulphur Dioxide	7446-09-5	5	275	NS	690
Carbon Monoxide	630-08-0	NS	NS	15,700	36,200
Ozone	10028-15-6	NS	NS	134*	165

Notes: NS – No Standard; * - Canada-Wide Standard

Since Ozone is largely driven by regional emissions, it has not been considered in the assessment since any impact from the small BRT increment will be hidden within the error in the larger change to the future baseline.

6.6.1.3 Historical and Measured Air Quality Data

Historical Ambient Monitoring Data

Table 6.6-6 outlines the measurement history at the MOE monitoring locations in, or near, the Study Area, and presents a summary of the parameters monitored. The table shows that historically SO_2, NO_x and CO have been well within the accepted standards, while O_3 and PM_{10} concentrations have been observed at values about 50% higher than the standard occasionally. $PM_{2.5}$ has exceeded the standard from time to time by as much as double the allowable concentration.

Table 6.6-6
Historical Air Quality Data

Pollutant	Averaging Time	Sampling Period	MOE Criteria	Location #1 – Stouffville Works Yard		Location #2 – Yonge and Hendon	
				Min.	Max.	Min.	Max.
SO_2	24-hr (µg/m^3)	1998-1999	275	ND	ND	3	45
	% of Standard		100%			1%	16%
O_3	24-hr (µg/m^3)	1998-2000	82*	17	161	19	124
	% of Standard		100%	21%	196%	23%	151%
NO_X (as NO_2)	24-hr (µg/m^3)	1998-2000	200	7	258	14	377
	% of Standard		100%	4%	129%	7%	189%
CO	1-hr (µg/m^3)	1998-1999	36,200	ND	ND	0	7,615
	% of Standard		100%			0%	21%
PM_{10}	24-hr (µg/m^3)	1998-2000	50	5	65	ND	ND
	% of Standard		100%	10%	130%		
$PM_{2.5}$	24-hr (µg/m^3)	1998-2000	30	ND	ND	4	58
	% of Standard		100%			13%	193%

Note: * Calculated equivalent 24-hour standard based on a 1-hour standard of 165.
ND = No Data

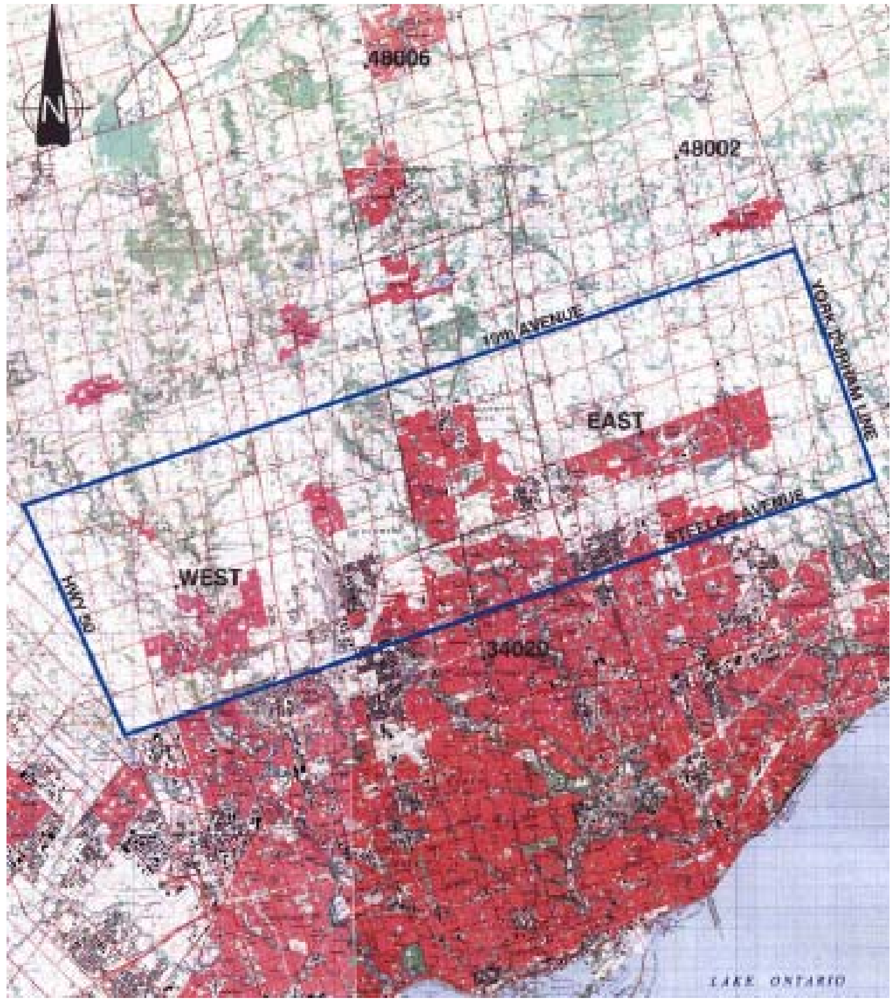


Figure 6.6-2
Monitoring Stations

Using NO_X as NO_2 is a conservative assumption but is considered acceptable.
(NO_X = NO + NO_2)

Measured Ambient Monitoring Data

Figure 6.6-2 presents the location of the existing MOE, as well as the study initiated, air quality monitoring locations. These locations were used to characterize the existing air quality in the Study Area by dividing the Study Area into four zones. These zones are defined as follows:

1. The Stouffville Works Yard Monitoring Location, where the MOE currently has an O_3 and Weather Monitoring Station (Station 48002), is representative of the area between Highway 48 and York/Durham Line;
2. The Yonge and Hendon Monitoring Location was co-located with the MOE Station (Station 34020) that measures SO_2, O_3, NO_x, CO and PM_{10}). Measurements at this station will be representative of the air quality along the Yonge Street Corridor from Highway 400 to Highway 404;
3. The #2 Aitken Circle Monitoring Location was sited near the intersection of 16th Avenue and Kennedy Road and will be representative of the air quality from Highway 404 to Highway 48; and
4. The Woodbine Centre Monitoring Location was sited in the snow removal works yard near the intersection of Highway 27 and Rexdale Boulevard. This location will be representative of the air quality between Highway 50 and Highway 400.

Table 6.6-7 presents a summary of the data from the project sampling stations in terms of average, maximum, minimum and percentage of the Ambient Air Quality Criteria (AAQC) set by the Province of Ontario. This table confirms the historical data, with SO_2 and CO well within the applicable standards. It further shows that PM can be up to three times the standard from time to time. This is further confirmed by the dustfall results that show, for the period of sampling, loadings over double the applicable standard. Daily average NO_x concentrations during the monitoring period were mostly below the standard. The daily average O_3 data was confirmed to be above the standard from time-to-time at all locations. The data also show, for the Highway 7 Corridor, that NO_x levels are equivalent to those near other corridors. These data are used as part of the model characterization of the existing and future scenarios.

Table 6.6-7
Summary of Project Air Quality Monitoring

Pollutant	Averaging Time	MOE Criteria	Location #1 – Works Yard Stouffville (48002)			Location #2 – Yonge and Hendon (34020)			Location #3 – 16th & Kennedy (EAST)			Location #4 – Woodbine Centre (WEST)		
			Max.	Min.	Avg.	Max.	Min.	Avg.	Max.	Min.	Avg.	Max.	Min.	Avg.
SO_2	24-hr (µg/m³)	275	11	7	9	6	2	4	9	4	5	4	4	4
	% of Standard	100%	4%	3%	3%	2%	1%	1%	3%	1%	2%	1%	1%	1%
	Equiv.24hr based on 30day sample(µg/m³)		14	12	13	24	23	23	18	15	16	30	29	30
	% of Standard		5%	4%	5%	9%	8%	8%	7%	5%	6%	11%	10%	11%
O_3	24-hr (µg/m³)	82*	19	10	15	17	7	11	16	3	8	35	3	16
	% of Standard	100%	24%	12%	19%	21%	9%	13%	19%	3%	10%	43%	3%	20%
	Equiv.24hr based on 30day sample(µg/m³)		294	276	286	243	213	223	243	216	228	228	218	224
	% of Standard		359%	336%	349%	297%	260%	272%	297%	263%	279%	278%	266%	273%
NO_X	24-hr (µg/m³)	200	53	49	51	150	140	145	77	18	42	107	21	62
	% of Standard	100%	26%	24%	25%	75%	70%	73%	39%	9%	21%	53%	10%	31%
	Equiv.24hr based on 30day sample(µg/m³)		74	69	72	242	216	231	157	153	155	272	0	173
	% of Standard		37%	35%	36%	121%	108%	115%	79%	76%	77%	136%	0%	87%
CO	1-hr (µg/m³)	36,200	406	406	406	813	418	447	1,626	406	424	813	406	427
	% of Standard	100%	1%	1%	1%	2%	1%	1%	4%	1%	1%	2%	1%	1%
PM_{10}	24-hr (µg/m³)	50	ND	ND	ND	ND	ND	ND	130	14	44	101	14	52
	% of Standard	100%							259%	28%	89%	202%	29%	103%
$PM_{2.5}$	24-hr (µg/m³)	30	ND	ND	ND	ND	ND	ND	58	7	27	88	15	44
	% of Standard	100%							194%	24%	89%	293%	48%	146%
Dustfall	30-hr (µg/m³)	7	ND	ND	ND	ND	ND	ND	ND	ND	16	ND	ND	11
(inorganic fraction)	% of Standard	100%									228%			164%

Table 6.6-7
Summary of Project Air Quality Monitoring

Note: * Calculated equivalent 24-hour standard based on the 1-hour average 165
ND = No Data

6.6.1.4 Predicted Atmospheric / Vehicle Emissions

Traffic Volumes

The rate of contaminant emissions from a section of road is proportional to the number and type of vehicles travelling along that road. Hourly traffic flows for Highway 7 were calculated based on the known ratios of hourly-to-peak traffic flows. The peak morning, peak afternoon and maximum 8-hour traffic volumes for the various sections of Highway 7 for the Year 2001 were provided. For the large-scale modelling approach, the annual average daily traffic (AADT) counts are used for emission calculations.

Vehicle Emissions

Tailpipe emissions from vehicles are a function of many variables. Some of the more important parameters are listed below.

- age of the vehicle (newer vehicles emit less);
- number of kilometres which the vehicle has driven;
- emission control equipment that may have been tampered with;
- type of fuel (gasoline, diesel);
- Reid Vapour Pressure (RVP) of gasoline used (adjusted seasonally);
- ambient air temperature;
- vehicle speed;
- rate of acceleration;
- time spent idling;
- type of vehicle (automobile, light truck, heavy truck, bus, etc.); and
- cold or hot start mode.

Vehicular emissions predicted are expressed in terms of mass emitted per distance travelled per vehicle and are generally estimated from emission factors in units of mass of contaminant emitted per vehicle, per distance travelled. These emission factors are a function of the length of the road section, travelling speed and vehicle registration distributions. The fleet average emission factors were used for the large-scale simulation in this assessment.

6

Table 6.6-8 summarizes the emission factors used in the base scenario year, for the average Ontario fleet travelling on streets (32.8 km/hr) and highways (66.6 km/hr).

Table 6.6-8
Tailpipe Emission Factors for Vehicles

Pollutant	Emission factor (g/km) Base year (2001)	
	Street	Highway
CO	13.12	6.25
SO_2	0.0825	0.0825
NO_X	1.537	1.569
PM_{10}	0.0744	0.0744

In addition to PM_{10} emissions from the tailpipes of vehicles, the U.S. EPA provides an emission factor (U.S.EPA 2003) to estimate the amount of dust suspended by vehicles on the road. It is a function of particle size, silt loading, weight of fleet, emission factor for 1980's vehicle fleet exhaust, break wear and tire wear, vehicle kilometres travelled (VKT) and average daily traffic (ADT). The equation of this particulate emission factor can be found in **Appendix L Section 4.1**. The calculated emission factor is 1.269 g/VKT for low ADT roads and 0.437 g/VKT for high ADT roads.

6.6.1.5 Odours from Diesel Exhaust

Odours from diesel exhaust are generally acknowledged to be associated with aldehyde constituents in the exhaust. These are largely comprised of formaldehyde, but acrolein and possibly acetaldehyde may contribute to the odour as well.

Using the fact that diesel odour is associated with formaldehyde (HCHO) and the Internal Combustion Engines Emission Calculation, the ratios between emission factors for PM_{10}, NO_x, CO, SO_2 and HCHO were determined for both gasoline and diesel engines. These ratios are:

Table 6.6-9
Ratio between Emission Factors for both Gasoline and Diesel Engines

Formaldehyde	Gasoline Engines	Diesel Engines
$HCOH/PM_{10}$	0.011997	0.0037546
$HCOH/NO_X$	0.000786	0.0002665
HCOH/CO	0.000020	0.0012365
$HCOH/SO_2$	0.014636	0.0040293

These ratios were then used to estimate the HCHO emissions based on the emissions of other pollutants. The maximum emission rate calculated was used as representative of the odorous constituents in order to model odour distribution across the Study Area.

6.6.1.6 Greenhouse Gases

CEAA has provided draft guidance on incorporating climate change considerations in an Environmental Assessment. With respect to greenhouse gases, the guidance document (CEAA, 2003) outlines a procedure for assessing whether greenhouse gas emissions associated with the project are sufficient to be addressed in greater detail within the EA, and whether greenhouse gas management plans would be required.

The preliminary scoping involves *"identifying whether the project's greenhouse gas emissions are likely to be of relatively low, medium or high volumes or intensity. If the project's emissions are likely to be of only low intensity or volume, then there may be no need to conduct further analysis."*

To determine the intensity of the project's greenhouse gas emissions, the CO_2 emissions from the vehicle fleet were estimated using the same methodology described for SO_2, NO_x and CO emissions in **Appendix L, Section 3.1**. The vehicle CO_2 emission factor, for the current conditions, is estimated to be 511.56 g/mile. The methane and nitrous oxide emissions from vehicle emissions are only a small fraction of the CO_2 emissions (<3% CO_2-equivalent) and are considered insignificant. Therefore the analysis presented here discusses only CO_2 emissions.

The estimated annual CO_2 emission for the existing scenario is estimated to be 1,906 kilotonnes.

For comparison, the estimated CO_2-equivalent emissions from the Ontario fleet for 2001 is 49,400 kilotonnes and from all sources, approximately 200,000 kilotonnes. The existing CO_2 emissions are approximately 4% of the Ontario fleet CO_2-equivalent emissions.

6.6.2 Air Dispersion Modelling Methodology

Two-level approach was used to assess the future air quality. The first level, the large-scale approach, examined concentrations of pollutants over the whole Study Area to delineate any significant patterns or "hot-spots". The second level, the small-scale approach, examined an area in more detail if sensitive receptors were found very close to the corridor that might be adversely affected.

6.6.2.1 Air Dispersion Model – Large Scale Approach

An atmospheric dispersion model is used along with at least one (1) year of historical meteorological data from a local weather station. This model is to be run twice - once for the existing conditions and a second time, using the same meteorological conditions, to assess any changes that would occur as a result of the project. In order to ensure that the worst-case impact was assessed, it was assumed that the emissions from the day, with the highest emission rate, occurred every day for the entire year modelled.

Several atmospheric dispersion models were considered for use in this air quality assessment. The description and assessment of these models can be found in **Appendix L, Sections 4.1.1.1** to **4.1.1.5**. The ISC3 dispersion model was selected for the modelling of the emissions from the regional modelling domain.

6.6.2.2 Air Dispersion Model – Small Scale Approach

Four specific areas were selected for the Highway 7 Corridor for this small scale approach modelling. They are:

- Area 1 – Islington;
- Area 2 – Jane/Keele;
- Area 3 – Kennedy Road; and
- Area 4 – Stouffville Hospital.

The results of this model are presented graphically in **Figures 6.6-3** to **6.6-6**. These Exhibits represent the predicted maximum PM_{10} concentrations in the existing base case along Highway 7 at the above mentioned areas.

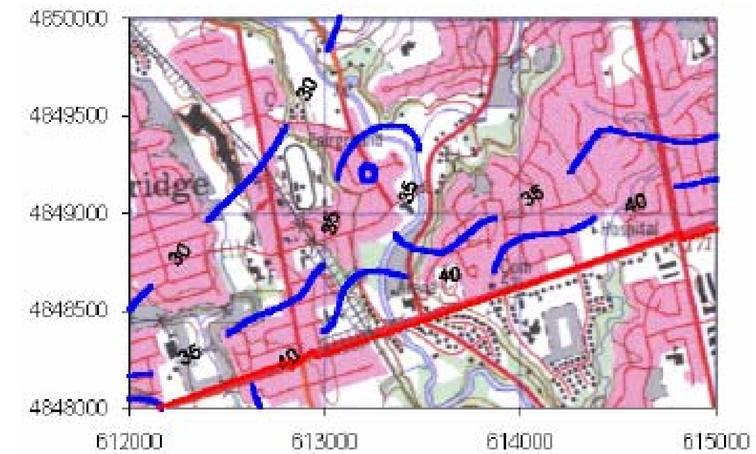


Figure 6.6-3
Predicted PM_{10} Concentrations – Maximum 24 Hours Existing Base Case – Area 1

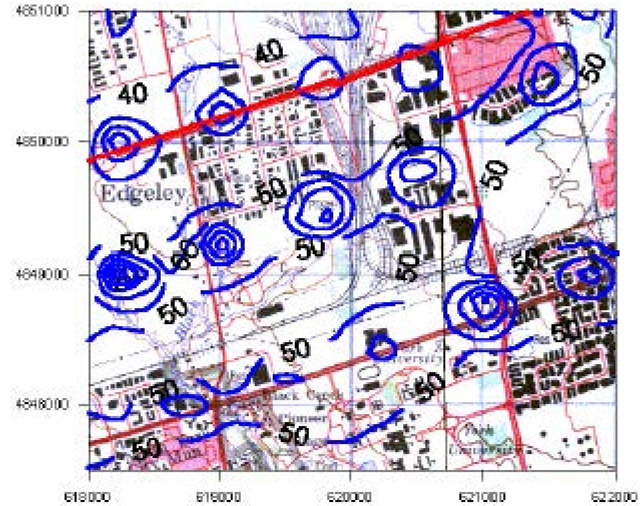


Figure 6.6-4

Predicted PM_{10} Concentrations – Maximum 24 Hours Existing Base Case – Area 2

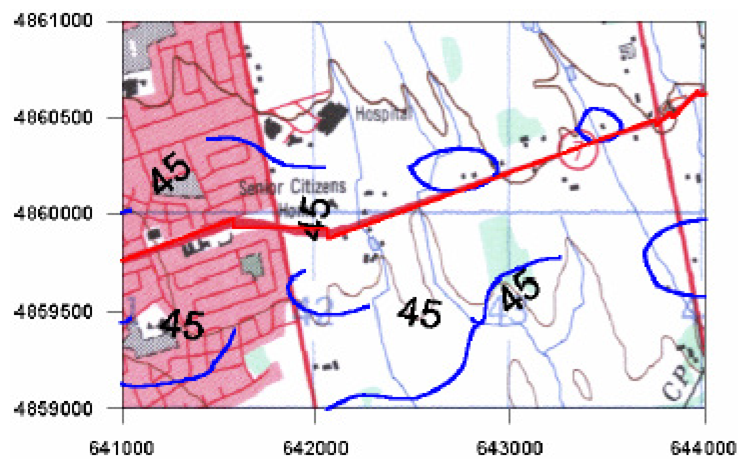


Figure 6.6-6

Predicted PM_{10} Concentrations – Maximum 24 Hours Existing Base Case – Area 4

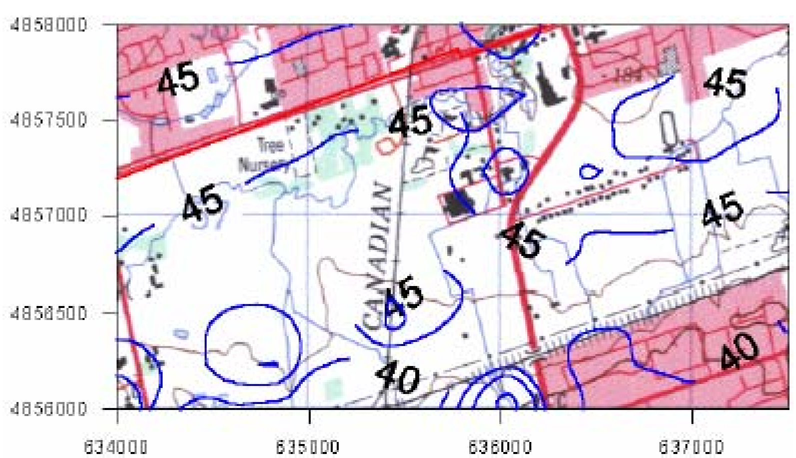


Figure 6.6-5

Predicted PM_{10} Concentrations – Maximum 24 Hours Existing Base Case – Area 3

6.6.3 Overall Assessment of Existing Air Quality

The existing air quality in the area can be described as fairly good because:

- The historical SO_2 and CO concentrations are well within all applicable standards;
- The historical data also shows the PM concentrations can be up to two times the standard from time to time. This was confirmed by project specific sampling that found values up to thrice the standard;
- Daily average NO_X concentrations, measured during the project sampling, were confirmed to be below the standards;
- Historically there have been occasional exceedances of the O_3 standard which was confirmed by the additional sampling; and
- The estimated CO_2 emissions from the Study Area are approximately 4% of the Ontario fleet CO_2-equivalent emissions.

7. PLANNING AND DESIGN PARAMETERS

7.1 RAPID TRANSIT DESIGN OBJECTIVES

Rapid transit services and infrastructure in the Highway 7 Corridor and Vaughan North-South Link Transitway will be designed to provide the essential features for its role as an important new member of the family of transit services available to the Region's communities, as defined in the Transportation Master Plan. This family is intended to comprise:

- Local services through neighbourhoods and business districts using conventional buses of various sizes;
- Rapid Transit service operating on a regional network fed by local services and inter-connected with commuter services and rapid transit in Toronto and adjacent regions; and
- Long distance inter-regional commuter service provided by GO Transit buses and trains.

The primary objectives in designing the rapid transit infrastructure and service are to achieve the following:

- A flexible, permanently integrated high-performance system with a strong customer-oriented identity;
- An integrated assembly of elements appropriate to urban environment for current and future market(s) to be served;
- High service speeds offering superior travel times competitive with those of the private automobile;
- Demonstrated service reliability providing high frequency (an average wait of 5 minutes) and a high degree of on-time performance;
- Comfort and convenience by providing a smooth ride, level boarding in a user-friendly, quality station environment, easy transfers between systems and innovative fare pre-payment and passenger information services; and
- Environmental compatibility manifested by reductions in energy use, pollution, noise and visual intrusion as well as environmentally sensitive urban design.

The key components of the ultimate Highway 7 Corridor and Vaughan North-South Link Transitway are as follows:

- An exclusive two-lane, at-grade transitway that uses the centre median of the existing Highway 7 and other routing streets rights-of-way to enable operation of surface rapid transit services (BRT or LRT) with no loss of current traffic capacity;
- High-frequency BRT service of 3-minute headway or less during peak travel periods;
- Transit signal priority to speed the movement of transit vehicles through busy intersections and limited stops (approximately 1-kilometre station spacing) to improve overall travel times;
- Attractive rapid transit stations, designed and landscaped for integration with the surrounding communities (the Transitway alignment includes high-density commercial and residential nodes, and a commercial heritage district);
- Access facilities at stations to encourage and support pedestrian and bicycle modes of transportation;
- Proof-of-payment fare policy and systems to speed passenger boarding and facilitate "smart card" technology;
- "Real-time" passenger information displays at stations and on-board vehicles;
- Intelligent Transportation Systems (ITS) technology to track vehicles and interface with transit priority measures for reliable service;
- Integrated communications to increase public awareness and overall ridership with a corresponding decrease in automobile use; and
- In the case of the Vaughan North-South Link, an extension of the Toronto Spadina Subway line from Steeles Avenue to Highway 7 in the VCC.

7.2 DESIGN CRITERIA

In the York Region network, surface rapid transit facilities will initially use BRT technology and convert to LRT technology at such time when BRT service reliability can no longer be assured or the use of LRT will result in operating cost benefits or attract greater transit oriented development.

This section outlines the basic criteria adopted for the planning and design of the main components of the facilities for each technology.

Transitway alignment geometry will influence the system riding quality, especially for standing passengers. The design aims to provide alignments which reduce sags, crests and directional changes to a minimum, consistent with reasonable economy. In developing the rapid transit alignment, consideration must be given to the following:

- Safety;
- Alignment standards;
- Sight distance and visibility;
- General appearance;
- Passenger comfort;
- Impact on at-grade Crossings;
- Intended operating and service plan;
- Adjacent roadways and railways;
- Vehicle performance;
- Impact on adjacent property;
- Underground and overhead utilities;
- Cost-effectiveness;
- Horizontal and vertical clearances;
- Type of construction; and
- Future LRT Horizontal and Vertical Alignment standards and clearances.

7.2.1 Bus Rapid Transit (BRT)

The BRT system is one in which predominantly exclusive rights-of-way with on-line stations are provided for the use of the rubber-tired vehicles delivering the service. These rapid transit vehicles can operate on and off the rapid transit right-of-way and therefore offer the opportunity to link certain feeder and line haul express services to reduce the need for passengers to transfer. In the early stages of system development, BRT services may be provided by buses operating in exclusive bus or HOV lanes in streets or even in mixed traffic.

Wherever practical, BRT station design will allow vehicles to pass other vehicles that are picking up and dropping off passengers. This means that skip stop and express services can be combined with local stopping services in the same ROW. The typical BRT operating configuration consists of a high frequency service running the full length of the corridor and stopping at each station. It provides a service not unlike that of LRT except the vehicle used is rubber tired (usually articulated for greater capacity). On top of this service various express services can be overlain and, where appropriate, services can be started or terminated off of the transitway.

Passengers access the service as they would to an LRT service by walking or cycling to the stations, transferring from feeder buses and by using park-and-ride and pick-up/drop-off facilities where provided. In addition, some trips could be made without a transfer.

BRT Design Criteria

Table 7.2-1 summarizes the principal BRT running way design criteria adopted for the development of alternative designs for transitway facilities. These criteria have been developed with possible future conversion to LRT in mind.

7

Table 7.2-1
Summary of BRT Geometric Design Criteria

CRITERIA		Preferred	Absolute
Design Speed – Transitway between stations (Generally follows the existing local traffic speeds)		90 km/h	40 km/h
Design Speed – Station and Business Dist. Areas		-	50 km/h
Design Speed - Arterial Ramps and Access Roads		-	40 km/h
Stopping Sight Distance:	90 km/h design speed 60 km/h design speed	- -	236 m 84 m
Minimum Horizontal Curve Radius, Transitway		200 m	50 m
Minimum Horizontal Curve Radius, Stations and CBD		120 m	50 m
Minimum Horizontal Curve Radius, Access Ramps		-	45 m
Minimum Turning Radii at Intersections		25 m	15 m
Maximum Transitway Superelevation (above 50 km/h)		-	7%
Maximum Superelevation at Stations		-	- 2% (fall to centre)
Minimum Tangent at end of Station Platforms		20 m	14 m
Maximum Grade of Transitway		3%	7%
Minimum Transitway Grade between Stations		0.5%	0.35%
Maximum Grade in Stations		0.5%	4%
Transitway Grade: Access Roads and Ramps		6%	10%
Minimum Grade in Stations		0.5%	0.3%
Minimum Crest Curves: (Passenger Comfort)	90 km/h design speed 60 km/h design speed	K=65 K=17	- -
Minimum Sag Curves: (Passenger Comfort)	90 km/h design speed 60 km/h design speed	K=59 K=17	- -
Transitway Lane Width		3.50 m	3.40 m
Streetscape Median		4.00 m	-
Raised Median		1.00 m	-
Rumble Strip		-	0.3 m

Note: CBD – Central Business District
K – Parabolic Vertical Curve Parameter

7.2.2 Light Rail Transit (LRT)

Light rail transit is a flexible, rail-based transit mode that can operate in a variety of urban ROW settings. Depending on the degree of segregation of the right-of-way, it is a relatively low cost form of rail technology and is usually electrically propelled, obtaining power from overhead catenary wires.

LRT can provide a broad range of passenger capacities due to its ability to use coupled vehicles. It can operate in exclusive or semi-exclusive lanes or in mixed traffic on tracks embedded in the street. The overhead power supply feature allows LRT systems to interface safely with other at-grade transportation modes and with pedestrians.

The electrically powered vehicles are virtually pollution free (a major benefit for a region with air quality concerns) although the primary power generating source may produce some pollution. Vehicles are generally bi-directional, low-floor and articulated with multiple doors on both sides. LRT has the ability to be placed into built-up urban areas and is designed to operate harmoniously with vehicular and pedestrian traffic. It is possible for light rail vehicles to share a transitway with buses operating in a BRT service as the vehicle dynamic envelope is similar to a BRT lane width. Also, LRT vehicles can be operated on existing railway tracks assuming compatible facilities and temporal separation of service from freight operations.

LRT Design Criteria

Table 7.2-2 provides a summary of the LRT geometric design criteria.

Table 7.2-2
Summary of LRT Geometric Design Criteria

CRITERIA		Preferred	Absolute
Maximum In-service Speed (Generally follows the existing local traffic speeds)		100 km/h	-
Minimum Horizontal Curves Radius:	On Running Line In Stations In Yards	250 m Tangent 50 m	100 m 800 m 35 m
Minimum Length of horizontal curves		Design Speed / 2	35 m
Minimum length of spiral curves, the greater of the following: - considering roll rate; or - considering vehicle torsion; or - considering lateral acceleration		 $8.75E_a \times V$ $400E_a$ $6.45E_a \times V$	 14 m 14 m 14 m
Minimum Length of tangent between spiral curves		100 m	25 m
Minimum Length of tangent track preceding a point of switch		15 m	10 m
Minimum Length of tangent beyond the ends of platforms		20 m	15 m
Maximum Gradient:	On running line In Stations	4.5% 0.3%	6.0% 0.5%
Minimum Grade on running lane		0.3%	0.0%
Minimum Length of vertical curves		100 m	60 m
Maximum Length of vertical curves		-	200 m
Minimum Length of constant grade between vertical curves		100 m	80 m
Maximum applied superelevation on running track		110 mm	130 mm
Maximum Unbalanced E_u:	On running line In turnouts	75 mm	100 mm 90 mm
Transitway Lane Width		3.50 m	3.40 m
Streetscape Median		4.00 m	-
Raised Median		1.00 m	-
Rumble Strip		-	0.3 m

Note: E_a – LRT superelevation
E_u – Unbalanced superelevation

7.2.3 Subway

Subway Design Criteria

The fundamental design criteria (related to both track and station requirements) employed in the development of each alternative were established based on the Toronto Transit Commission's Design Manual. A summary of these design criteria is presented in **Table 7.2-3**.

Table 7.2-3
Summary of Subway Geometric Design Criteria

Horizontal Criteria		
absolute minimum horizontal curve radius (used only with TTC approval in special circumstances)		300 m
desired minimum horizontal curve radius		600 m
minimum length of tangent section		150 m
minimum length of circular curve		23 m
minimum length of constant profile grade		150 m
Station ROW	centre platform	26 m x 150 m long
	side platform	26 m x 150 m long
tangent section ROW		26 m
tail track ROW	centre platform station	26 m x 257 m long
crossover track ROW		26 m x 172 m long[3]
Vertical Criteria		
maximum gradient of main-line track		± 3.5%
minimum gradient of main-line track (for drainage purposes)		± 0.3%
gradient through stations		± 0.3%
tunnel diameter	inside	5.2 m
	outside	5.65 m
minimum depth	top of box structure to grade	3.0 m
of cover	top of station structure to grade	3.0 m
	top of tunnel to grade	1.5-2 tunnel diameter
	top of tunnel to grade	~ 8 m

To facilitate fast and efficient operation of the subway train, the largest horizontal radii and flattest grades feasible should be employed. However, given physical constraints and/or property restrictions, these were often not feasible and/or optimal. As suggested by TTC staff, the twin box configuration and centre platform stations were assumed to provide maximum flexibility in the construction methodology (i.e. these represent the greatest requirements).

Standard subway stations were located on a tangent section (i.e. straight section) with a grade of 0.3% to facilitate drainage and ease of mobility for passengers on the platform. Typical stations were assumed to have a platform length of 150 metres; beyond this, the station right-of-way (26 metres) was extended a further 25 metres at either end to accommodate service rooms, ventilation equipment, etc. To maximize the catchment areas and integration with street bus services, subway stations were typically located in close proximity to major intersections.

At terminal stations, including interim terminal stations (i.e. stations that will act as terminal stations during the phased construction of the line) provisions for necessary tail track and crossover track were assumed to be required. Both of these were located on tangent sections with a constant grade. The "worst case" scenario has been assumed for the following requirements as some basic information has not been available. A 172 metre crossover track, located prior to the station, was assumed with a maximum grade of ±3.5% (although it is preferred to use ±0.3% to match that of the station). The tail track, located beyond the station, for the storage of disable trains whilst ensuring the continued operations of the station and both tracks required a length of 257 metres based on the following:

- 90 metres for overshoot protection beyond the end of the station;
- 150 metres for storage (6 car train); and
- 17 metres for bumping post and stopping distance.

7.2.4 Roadway

The insertion of the exclusive transitway ROW in the median of Highway 7 and other routing streets requires widening of these streets in order to maintain the existing number of traffic lanes and to meet the traffic demands. In addition, a section of Highway 7 in Markham requires widening from existing four lanes to future six lanes during the interim stage of transit implementation. To ensure the safety and driver's comfort, the design criteria of these streets is generally conformed to the Geometric Design Standards for Ontario Highways (MTO, 1994) and with reference to Geometric Design Guide for Canadian Roads (TAC, 1999) and respective municipality design guidelines currently in use.

Roadway Design Criteria

Table 7.2-4 provides a summary of the roadway geometric design criteria.

Table 7.2-4
Summary of Roadway Geometric Design Criteria

CRITERIA		Preferred	Absolute
Design Speeds (Retains existing traffic speeds)		-	50 - 90 km/h
Minimum Stopping Sight Distance:	50 km/h	-	65 m
	60 km/h	-	85 m
	70 km/h	-	110 m
	80 km/h	-	135 m
	90 km/h	-	160 m
Minimum Horizontal Curves Radius/ Spiral (A):	50 km/h	-	90 m/ 79
	60 km/h	-	130 m/ 99
	70 km/h	-	200 m/ 125
	80 km/h	-	250 m/ 149
	90 km/h	-	340 m/ 180
Maximum Deflection Angle without Curve		-	$0^{o}30'$
Superelevation		6%	-
Maximum Grade		6%	12.0%
Minimum Crest Vertical Curves (K):	50 km/h	8	-
	60 km/h	15	-
	70 km/h	25	-
	80 km/h	35	-
	90 km/h	50	-
Minimum Sag Vertical Curves (K):	50 km/h	12	-
	60 km/h	18	-
	70 km/h	25	-
	80 km/h	30	-
	90 km/h	40	-
Lane Width		3.50 m	3.40 m
Curb Lane Width		3.75m	-
Left Turn Deceleration Parallel Lane/ Taper Length:	50 km/h	20 m/ 85 m	-
	60 km/h	30 m/ 100 m	-
	70 km/h	40 m/ 115 m	-
	80 km/h	50 m/ 130 m	-
	90 km/h	60 m/ 145 m	-
Right Turn Deceleration Parallel Lane/ Taper Length:	50 km/h	20 m/ 40 m	-
	60 km/h	30 m/ 50 m	-
	70 km/h	45 m/ 60 m	-
	80 km/h	60 m/ 70 m	-
	90 km/h	70 m/ 75 m	-
Minimum Turning Radii at Intersections		18 m	15 m
Intersection Angle		-	$< 70^{o}$ ($> 110^{o}$)

Table 7.2-4
Summary of Roadway Geometric Design Criteria

Reference: Geometric Design Standards for Ontario Highways (MTO, 1994)
Geometric Design Guide for Canadian Roads (TAC, 1999)
Note: A – Spiral Parameter

7.3 SURFACE STATION DESIGN FEATURES

The stations are normally unattended and their design will stress passenger safety, convenience, comfort, low maintenance and accessibility. The station location and layout will facilitate convenient transfer between the Rapid Transit service and local service and also to any pick-up/drop-off facility, where provided. Stations will be fully accessible to persons with disabilities and configured to allow convenient access by pedestrians and cyclists. Pedestrians from local services or travelling by foot, as well as cyclists will access the station platforms at the signalized intersections where all the stations are conveniently located. Space for bike lockers will be identified adjacent to sidewalks near most stations.

Stations are normally spaced such that the majority of walk-in passengers walk less than 400 m to and from the station; however, some passengers can be expected to walk up to 600 m. This provision results in station spacing between 0.8 and 1.5 km.

The preferred station layout consists of two parallel side-loading platforms preferably offset head-to-head on either side of an intersection or mid-block pedestrian crossing as illustrated in **Figure 7.3-1**. Through major stations with high passenger volumes, the transitway is widened to four lanes with a central fenced median to allow buses to bypass and pull out around stopped buses. Where hourly one-way bus volumes are less than the maximum capacity, a reduced space station configuration is recommended as illustrated.

Passenger shelters, benches, system maps, real-time passenger information and other amenities are provided on each platform. All designs emphasize durability and minimal ongoing maintenance needs.

7.4 FARE COLLECTION

The facilities provided at the stations will be those required for a fare system based on the off-board purchase of passes and tickets. Provision for pass and ticket dispensing machines and sufficient space for totally off-board fare collection in a protected environment wherever practical is a requirement of the station design.

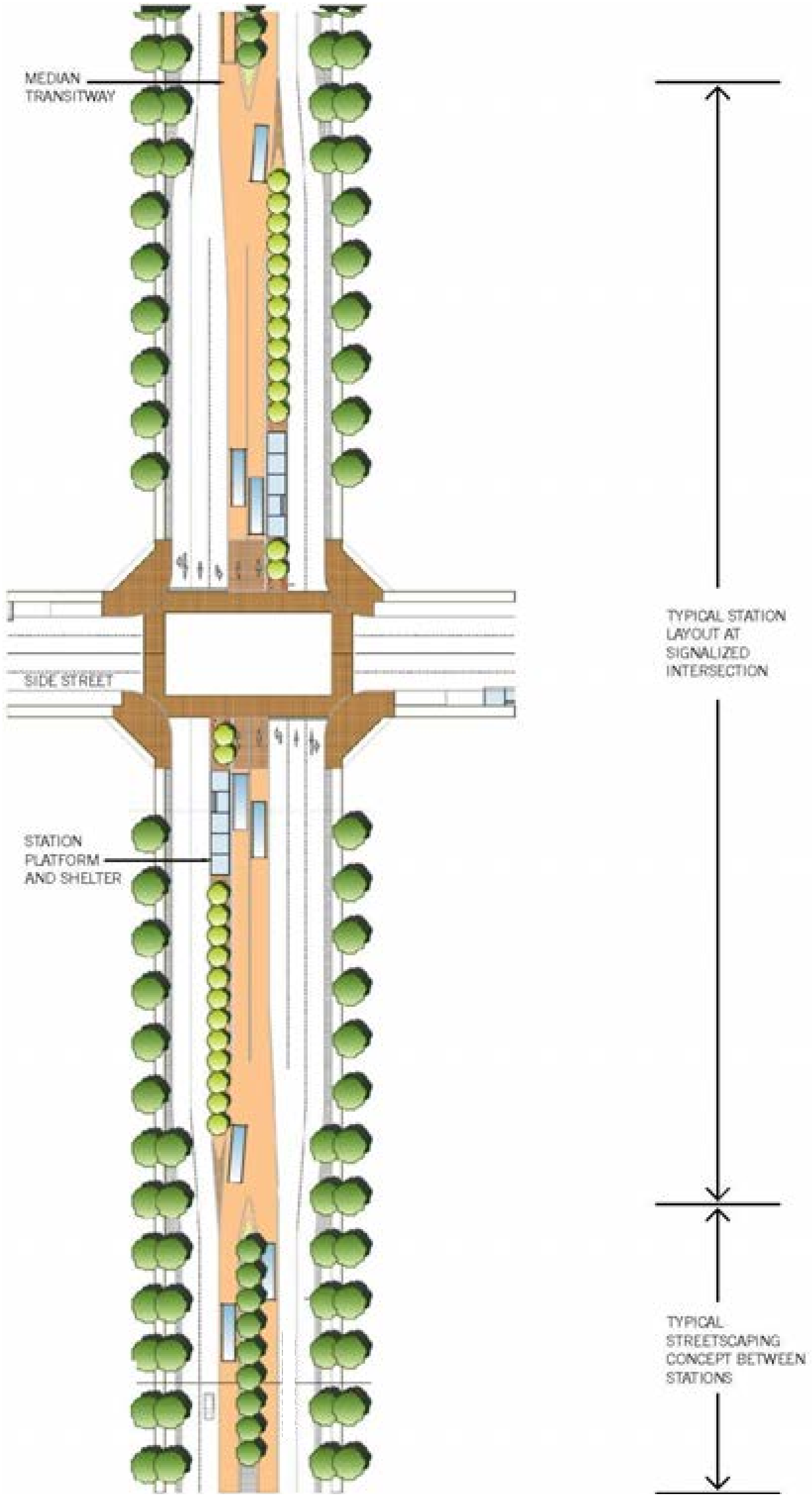


Figure 7.3-1
Typical Station Layout at street intersection

7

8. DEVELOPMENT AND SELECTION OF PREFERRED DESIGN

8.1 EVALUATION METHODOLOGY

The methodology described below was developed and used for evaluation of alignment designs for surface rapid transit technologies only. **Chapter 12** describes the methodology used to evaluate alignment design options for the ultimate subway technology application in the Vaughan North-South Link.

In order to select the Technically Preferred Alignment Design for surface rapid transit, the following methodology was adopted:

- Design Objectives for the undertaking were identified as described in **Chapter 7**;
- Each route alternative was developed to a level that allowed all benefits and effects to be determined;
- Segment route alternatives were evaluated against a set of Evaluation Objectives and Goals;
- For each primary objective, "Goals" were developed as factors considered important in choosing between alternatives;
- For each Factor, quantifiable and qualitative "Indicators" were identified;
- The Objectives, Factors and Indicators were distributed to the TAC members and specialist sub-consultants to ensure that they were appropriate and reflected the effects of the alternatives in relation to each specialist discipline;
- An evaluation methodology was developed to rank the alternatives;
- The evaluation was conducted by the project team and presented to the TAC members for their input;
- A Technically Preferred Alignment was then selected; and
- Local Area variations were also developed and evaluated as necessary to refine the Technically Preferred Alignment.

The evaluation methodology used ranked each alternative in terms of the indicators using a relative ranking between alternatives. The quantity unit was chosen to represent the responsiveness to the goal it was satisfying. Once all indicators were ranked, the combined response to each goal was then ranked for each alignment alternative.

An overall most responsive alternative was then chosen for each objective by summarizing the degree to which each of the goals and objectives were met. A general synopsis of route evaluation findings was tabulated for each objective to explain the rationale behind the selection. This included a description of the advantages and disadvantages of each alternative and its merits regarding the objective and goals.

8.2 EVALUATION OBJECTIVES, GOALS AND INDICATORS

Evaluation Objectives were derived from the Design Objectives identified in **Chapter 7**. Goals and indicators were then developed to ensure a traceable process and by choosing indicators that were quantifiable subjective evaluations.

The following table presents the Evaluation Objectives, Goals and Indicators used in the evaluation of Alignment Alternatives.

Table 8-2-1
Evaluation Objectives, Factors and Indicators

	Objectives and Goals	Typical indicators measuring route's ability to achieve goals
OBJECTIVE A: To Improve mobility by providing a fast, convenient, reliable, and efficient rapid transit service		
A1	Maximize inter-regional and local transit connectivity	Connections to inter-regional services and existing gateways
		Compatibility with local network
A2	Maintain flexibility to expand network	Potential for additional stations
		Number of stations with potential for surface expansion capability
A3	Alignment geometry that maximizes speed and ride comfort and minimizes safety risks and maintenance costs	% of route > 3% grade
		No. of running way sections > 3.5%
		No. of curves < 100 metres radius
		No. of curves > 100 metres and < 300 metres radius
A4	Increase attractiveness of rapid transit service	Projected travel time along each alternative
		Passenger volume at the peak load point
		AM Peak period boardings
		Route features with potential to reduce service reliability
A5	Station locations that maximize ridership potential of rapid transit service	Existing and future residents or residences within 500 m walking distance of station
		Existing and future employment within a 500 m walking distance of a station
A6	Maximize convenience of access to rapid transit system	No. of stations with bus transfer facilities (off-street, on-street)
		No. of stations with potential for park-and-ride facilities
		No. of stations with potential for passenger pick-up/drop-off facilities
		No. of stations with other travel modes (taxi/bikes/Wheel Trans)
		Ease of accessibility by the disabled
		Average transfer time at connection points between facilities and modes; ease of transfers
		No. of major transfers along the line
OBJECTIVE B: To protect and enhance the social environment in the corridor		

Table 8-2-1
Evaluation Objectives, Factors and Indicators

	Objectives and Goals	Typical indicators measuring route's ability to achieve goals
B1	Minimize adverse effects on and maximize benefits for communities in corridor	Potential for displacement/disruption of unique and distinctive community features
		No. of persons and residential units displaced by location
		Potential for change in interaction among community groups
		No. of land area and type of community features/services affected
		Construction effects
B2	Maintain or improve road traffic and pedestrian circulation	No. of intersections closed
		No. of intersections with restricted access
		No. of driveways closed
		No. of residential driveways with restricted access
		Potential for infiltration of neighbourhoods by diverted traffic
		Loss of residential street parking
		No. of pedestrian paths intersected or made more indirect
		No. of stations with the potential to increase traffic and parking on local streets
		No. of special (transitway left turn) signalized intersections required
		No. of signalized intersections affected - more complex, greater demands
		No. of unsignalized intersections affected
		Length of road with temporary restricted capacity or blocked during construction
B3	Maintain a high level of public safety and security in corridor	No. of locations with potential to decrease public safety
		Effect of transitway insertion on emergency vehicle circulation
B4	Minimize adverse noise and vibration effects	Sound - Minimize the number of residences impacted by operations
		Vibration - Minimize number of residences impacted by operations
		Construction - Minimize the number of residences impacted
B5	Minimize adverse effects on cultural resources	Minimize the number of built heritage features and cultural landscape displaced (loss or relocation) in the Study Area
		Minimize the number of built heritage features and cultural landscape disrupted in the Study Area
B6	Minimize disruption of community vistas and adverse effects on street and neighbourhood aesthetics	Visual impact on people living and working in and visiting the community
		Effect on viewing opportunities
OBJECTIVE C: To promote a sustainable environment by protecting and enhancing the natural environment in the corridor		
C1	Minimize adverse effects on Aquatic Ecosystems	No. of aquatic ecosystems displaced or disturbed within zone of potential facility effects

Table 8-2-1
Evaluation Objectives, Factors and Indicators

Objectives and Goals		Typical indicators measuring route's ability to achieve goals
		Type of aquatic ecosystems within zone of potential facility effects
		Significance of aquatic ecosystems within zone of potential facility effects
C2	Minimize adverse effects on Terrestrial Ecosystems	No. of terrestrial ecosystems displaced or disturbed within zone of potential facility effects
		Type of terrestrial ecosystems within zone of potential facility effects
		Significance of terrestrial ecosystems within zone of potential facility effects
C3	Improve regional air quality and minimize adverse local effects	Dispersion potential of the route
		No. of receptors in prevailing downwind direction
		Assessment of contaminant level in existing ambient air along the route
		Amount of pollutants emitted by length of route
		Amount of pollutants emitted by stops on route
C4	Minimize adverse effects on corridor hydrogeological, geological, hydrological and geomorphic conditions	Potential effects on municipal and private wells
		Recharge / discharge areas affected
		Potential effects on aquifers
		Area within floodplain
		Potential for adverse effects on surface water quality/quantity
		No. of sites with issues of potential subsurface environmental concern
		Extent of the channel re-alignment
OBJECTIVE D: To promote smart growth and economic development in the corridor		
D1	Support Regional and Municipal Planning Policies and approved urban structure	Conformity with, and support for, policies of official plans and urban structures of Region, internal and adjacent municipalities, including GTA
		Conformity with land use designations, including compatibility with existing development
D2	Provide convenient access to social and community facilities in corridor	Service to planned centres, major and minor
		Proximity to community facilities, hospitals, educational institutions, community centres, local government offices etc.
D3	Minimize adverse effects on business activities in corridor	No., land area and type of industrial uses displaced
		No., land area and type of retail, office and service commercial businesses displaced
		Potential for an increase in business activity
		No. of business entrances/exits affected by transitway insertion
		Percentage of total parking potential lost

Table 8-2-1
Evaluation Objectives, Factors and Indicators

Objectives and Goals		Typical indicators measuring route's ability to achieve goals
D4	Protect provisions for goods movement in corridor	Inventory of major truck routes, delivery and loading areas, manufacturing operations affected by transitway insertion
D5	Promote transit-oriented development	Opportunities for re-development
		Potential opportunities for development and higher order uses, at stations, termini, and along the corridor
OBJECTIVE E: To maximize the cost-effectiveness of the rapid transit system		
E1	Minimize capital cost of vehicles, facilities and systems required	Estimate of cost of capital works including: elevated, at-grade, cut and cover, tunnelled or open cut running way, stations, systems and major utility relocation works
		Influence on vehicle fleet cost
E2	Minimize cost effects of/on adjacent properties to implement facilities	Extend of residential land acquisition
		Extend of industrial land acquisition
		Extend of commercial land acquisition
		Potential for costs associated with management of contaminated soils or ground water
		Potential risk to adjacent utilities from construction operations
E3	Minimize adverse effects of alignment characteristics on operating and maintenance costs	Influence of route length on O & M costs
		Influence of alignment characteristics on O & M costs

8.3 DEVELOPMENT OF SEGMENT ALIGNMENT ALTERNATIVES

In **Chapter 5**, route alternatives were selected in each of the four segments identified within the study limits. For both Segments A and D, a route entirely on Highway 7 was the only feasible route retained, while route alternatives for Segments B and C were developed as described below:

- **In Segment B (Highway 400 to Yonge Street):** Route alternatives between Vaughan Corporate Centre (VCC) and Richmond Hill Centre at Bayview Glen in Richmond Hill, while at the same time connecting to the City of Toronto at York University; and
- **In Segment C (Yonge Street to Kennedy Road):** Alignment alternatives between Richmond Hill Centre (Bayview Glen) and the planned Markham Centre (Warden-Kennedy) in Markham.

In addition to the above primary route alternatives, local alignment variations in all segments were developed to meet local constraints and create local opportunities. These local options were not evaluated with all factors but with factors relevant to the local environment. The following sections describe all the primary route alternatives as well as local options by segment.

8.3.1 Segment A - Route Alternatives

8.3.1.1 Route Entirely on Highway 7

In **Chapter 5**, the selection of Highway 7 as the only feasible primary route alternative resulted from the evaluation of alternative technology/route combinations in Segment A as illustrated in **Figure 8.3-1**. This alignment remains in the Highway 7 right-of-way from Highway 50 to Highway 400. The alignment of this route was developed fully in order to assess its benefits and impacts in this segment as shown in **Figure 8.3-2**. This segment presents local constraints at the grade separated Canadian Pacific (CP) Mactier Subdivision crossing and on the steep grades between Kipling and Islington Avenues. Variations considered to overcome these constraints are described in the following section.

Local Variations at Woodbridge/ CP crossing/ Humber River

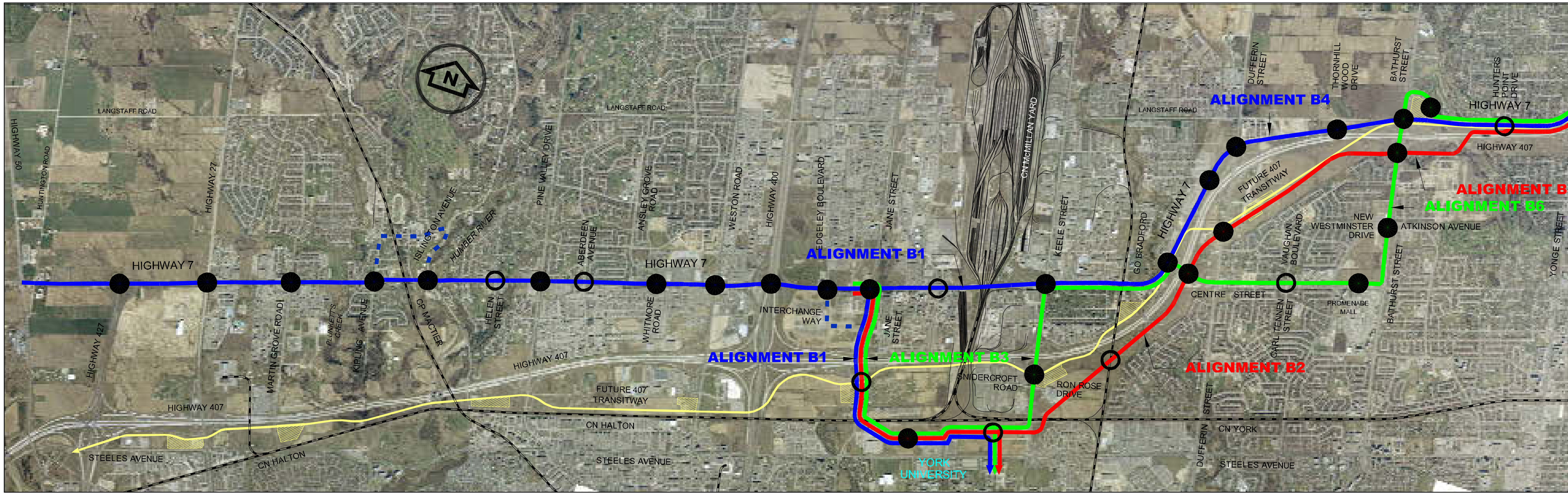
At present, the width of the CP railway overpass can only accommodate a total of four traffic lanes in both directions as the abutments were built very close to the edge of pavement. Implementing a median transitway means widening a minimum of 4.3m on each side of the roadway. This is not feasible without reconstructing the entire structure at high cost due to the topography and the need for temporary accommodation of the CP operations. Also, the steep grades on Highway 7 east of Kipling Avenue and west of Islington, 6.78% and 7.25%, respectively, exceed the maximum desirable grade for BRT and allowable grade for LRT.

A local variation diverting the transitway route through the Woodbridge community was examined as an alternative to staying on Highway 7. This diversion takes the transitway north on Kipling Avenue, east on Woodbridge Avenue and south on Islington Avenue to return to the Highway 7 route. Both options of dedicated median transitway and mixed-traffic operation on this diversion were considered.

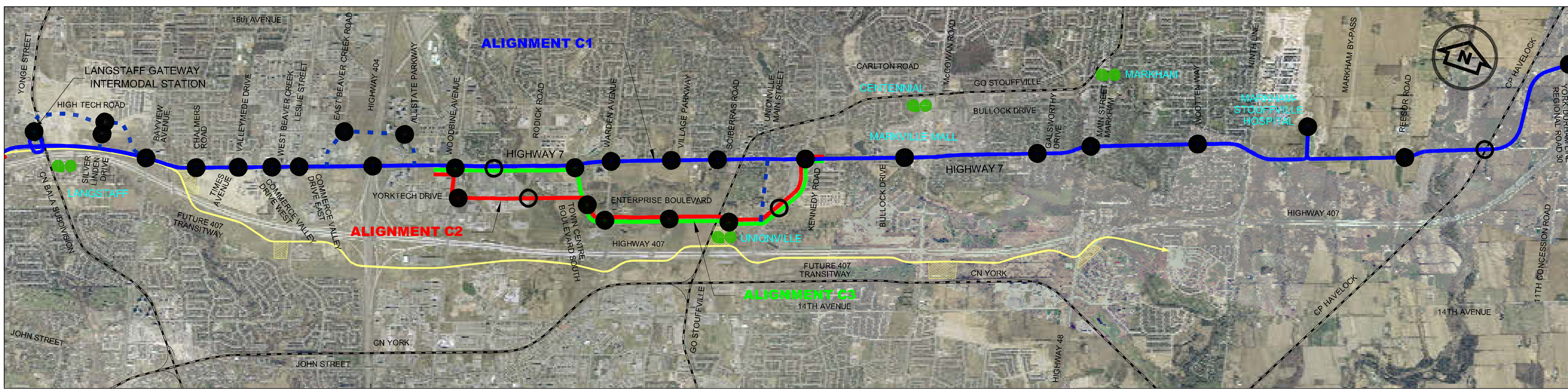
The dedicated transitway option requires widening along the fully developed Kipling, Woodbridge and Islington Avenues. Widening Kipling and Woodbridge Avenues will have significant impact on the local residences and businesses which are mostly immediately adjacent to the streets. Also, the CP Mactier Subdivision has a grade separated crossing at Woodbridge Avenue posing the same challenge as on Highway 7. Further, widening Woodbridge Avenue will have effects at the environmentally sensitive Humber River crossing.

8

METRIC



SEGMENT A — SEGMENT B WEST — SEGMENT B EAST



SEGMENT C — SEGMENT D

LEGEND:

- ● POTENTIAL STATION LOCATION
- ○ POTENTIAL FUTURE STATION LOCATION
- - - - EXISTING RAILROAD TRACKS

SCALE

PRIMARY ROUTE ALTERNATIVES EVALUATED

8.3-1

FIGURE

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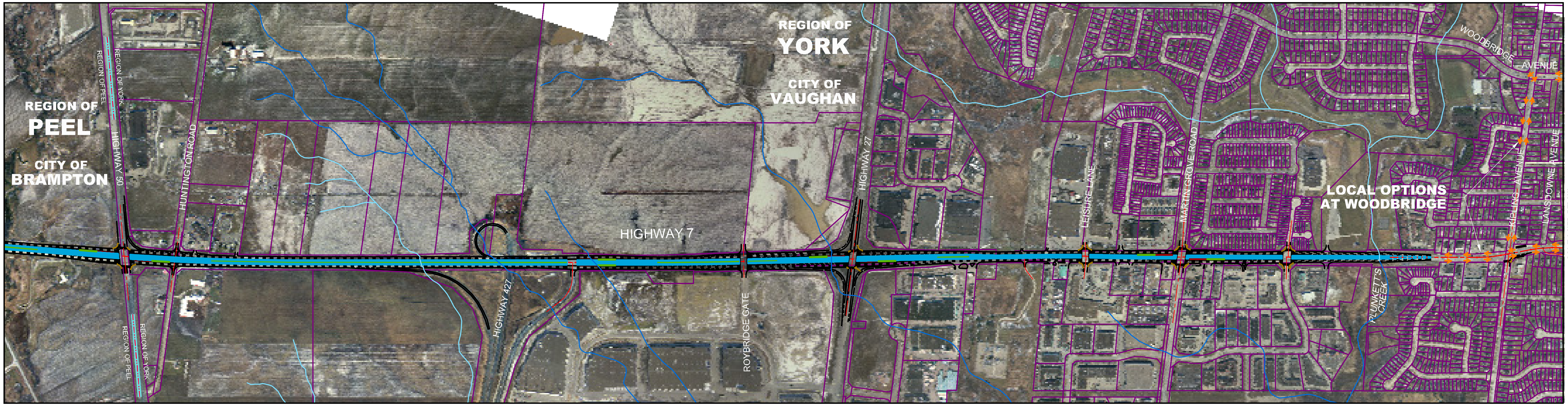
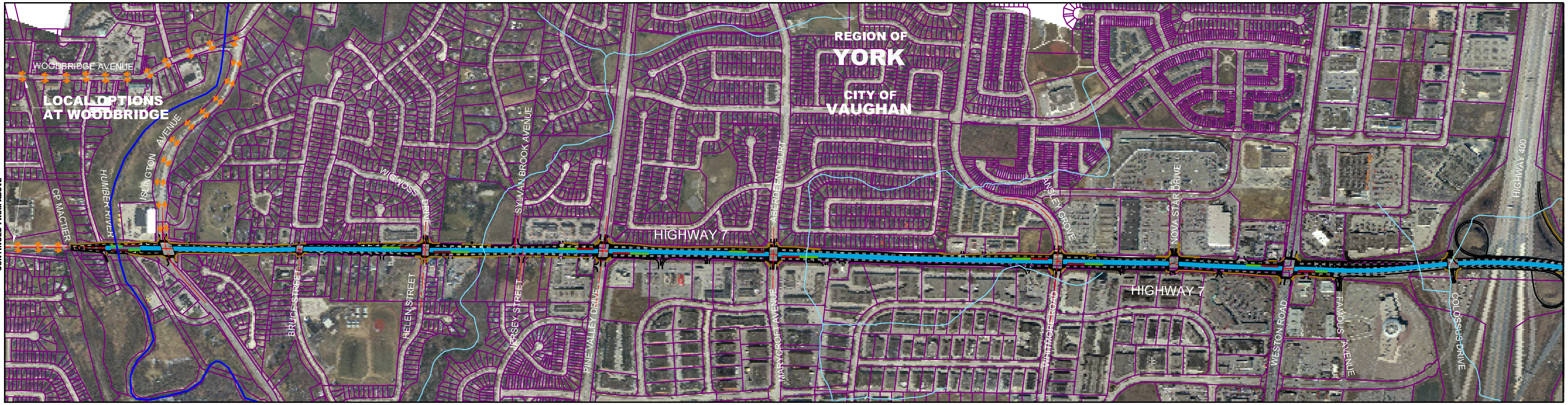


PRIMARY ROUTE ALTERNATIVE AND LOCAL OPTIONS
SEGMENT A - HIGHWAY 50 TO HIGHWAY 400



YRTP

STATIONS	PROPOSED SIDEWALK	EXISTING ROADWAYS	REGIONAL BOUNDARIES
TRANSITWAY	PROPOSED LANDSCAPE	EXISTING RIGHT OF WAY	MIXED-TRAFFIC OPERATION
PROPOSED TRAFFIC LANES	PROPOSED RIGHT OF WAY	MUNICIPAL BOUNDARIES	SCALE

HIGHWAY 7 CORRIDOR AND VAUGHAN NORTH-SOUTH LINK PUBLIC TRANSIT IMPROVEMENTS ENVIRONMENTAL ASSESSMENT

8.3-2

FIGURE

Mixed-traffic operation will require rapid transit to navigate the already narrow two-lane plus street parking Woodbridge Avenue, and the narrow two-lane Islington Avenue likely resulting in significant transit service delay and local traffic congestion. Also, the transitions between dedicated transitway and mixed-traffic at the intersections of Highway 7/Kipling Avenue and Highway 7/Islington Avenue have the potential to cause significant delay to the already optimized intersection operation.

Furthermore, regardless of the option adopted, the ridership predicted in Woodbridge is not significant enough to justify this diversion.

Therefore, remaining on Highway 7 is still considered the best option. Given that the Region intends to widen this section of Highway 7 to six lanes and that it is only 675m in length, it is recommended that rapid transit operate in mixed traffic from Kipling to Islington Avenue with priority signal measures until such time as the Region widens this section of Highway 7 when a dedicated transitway could be implemented as part of the construction.

Potential Station Locations in Segment A

Potential station locations recommended for the Highway 7 alignment in Segment A are at Highway 50, Highway 427, Highway 27, Martin Grove Road, Kipling Avenue, Islington Avenue, Wigwoss Drive/Helen Street, Pine Valley Drive, Aberdeen Avenue/Marycroft Avenue, Ansley Grove Road/Whitmore Road, Weston Road, and Highway 400.

8.3.2 Segment B West - Route Alternatives

For assessment of route alternatives, Segment B was divided into two segments, West and East, due to the complexity of the alternatives. Segment B West extends from Highway 400 to Centre Street where all western alternatives converge. Segment B East extends from Centre Street to Yonge Street and includes all eastern alternatives.

In addition to the two route alternatives retained in **Chapter 5**, a new variation was considered to promote redevelopment opportunities along Keele Street. Transitway alignment alternatives assessed in Segment B West are listed below and illustrated in **Figure 8.3-1.**

- **Primary Route Alternative B1:** Highway 7 from Highway 400 to Centre Street combined with Jane Street/ Hydro Right-of-way to York University (Vaughan North-South Link);
- **Primary Route Alternative B2:** Highway 7 from Highway 400 and Jane Street/Hydro Right-of-way to York University and then north easterly in the Hydro Right-of-way to Centre Street; and
- **Primary Route Alternative B3:** Highway 7 from Highway 400 and Jane Street/Steeles Avenue-York University-Keele Street/Keele Street and Highway 7 to Centre Street.

The following sections describe and evaluate these alignment alternatives in detail.

8.3.2.1 Primary Route Alternative B1: Highway 7 from Jane to Centre Streets and Jane Street/ Hydro Right-of-way to York University (Vaughan North-South Link)

Alternative B1, a combination of two routes, the Highway 7 route and Jane Street to Hydro Corridor to York University route, namely Vaughan North-South Link (VNSL), is illustrated in **Figures 8.3-3 and 8.3-4**. The southern portion of the VNSL leaves Jane Street, follows the Hydro right-of-way north of Steeles Avenue, enters the York transit terminal site and then crosses Steeles Avenue to reach York University southerly. This alternative was developed fully and carried forward for evaluation.

Potential Station Locations in Alternative B1

Potential station locations considered for Alternative B1 in Segment B West were at Edgeley Boulevard/ Interchange Way, Jane Street, Costa Road (future), Highway 407 (at Jane Street)(future), Planned York Region Bus Terminal, York University, Keele Street, and Centre Street.

8.3.2.2 Primary Route Alternative B2: Highway 7/ Jane Street/ Hydro Right-of-way to York University and North-easterly in Hydro Right-of-way to Centre Street

Alternative B2 includes Highway 7 to Jane Street where it follows the VNSL south to York University and then continues north easterly to Centre Street along the Hydro right-of-way adjacent to Highway 407 as illustrated in **Figure 8.3-4**. This alternative was also developed fully and carried forward for evaluation.

Potential Station Locations in Alternative B2

Potential station locations considered for Alternative B2 in Segment B West were at Edgeley Boulevard/ Interchange Way, Jane Street, Highway 407(future), Planned York Region Bus Terminal, York University, GO Bradford (future), and Centre Street.

8.3.2.3 Primary Route Alternative B3: Highway 7-Jane-Steeles-York University-Keele and Highway 7 to Centre Street

Alternative B3 includes Highway 7 to Jane Street, where it turns south to Steeles Avenue then to York University along Steeles Avenue and to Keele Street and then north to Highway 7 as illustrated in **Figure 8.3-5**. This alternative was developed fully to carry forward for evaluation.

Potential Station Locations in Alternative B3

Potential station locations considered for Alternative B3 in Segment B West were at Edgeley Boulevard/ Interchange Way, Jane Street, Highway 407(at Jane Street)(future), Planned York Region Bus Terminal, York University, Highway 407(at Keele Street)(future), Keele Street, and Centre Street.

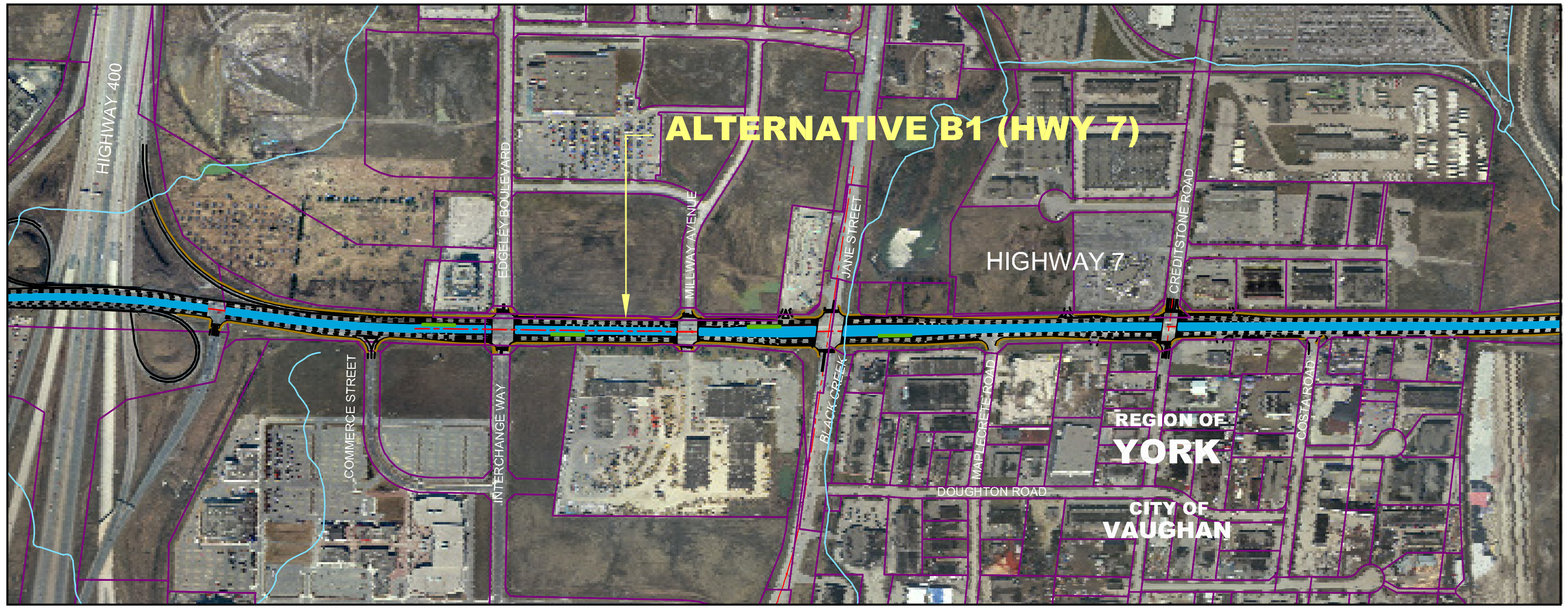
8.3.2.4 Alternatives Evaluation Findings and Recommendation

Detailed evaluations were preformed comparing Alternatives B1, B2 and B3. A synopsis of these evaluations is presented in **Table 8.3-1** following which detailed evaluations can be found in **Appendix M Tables 1** to **5**.

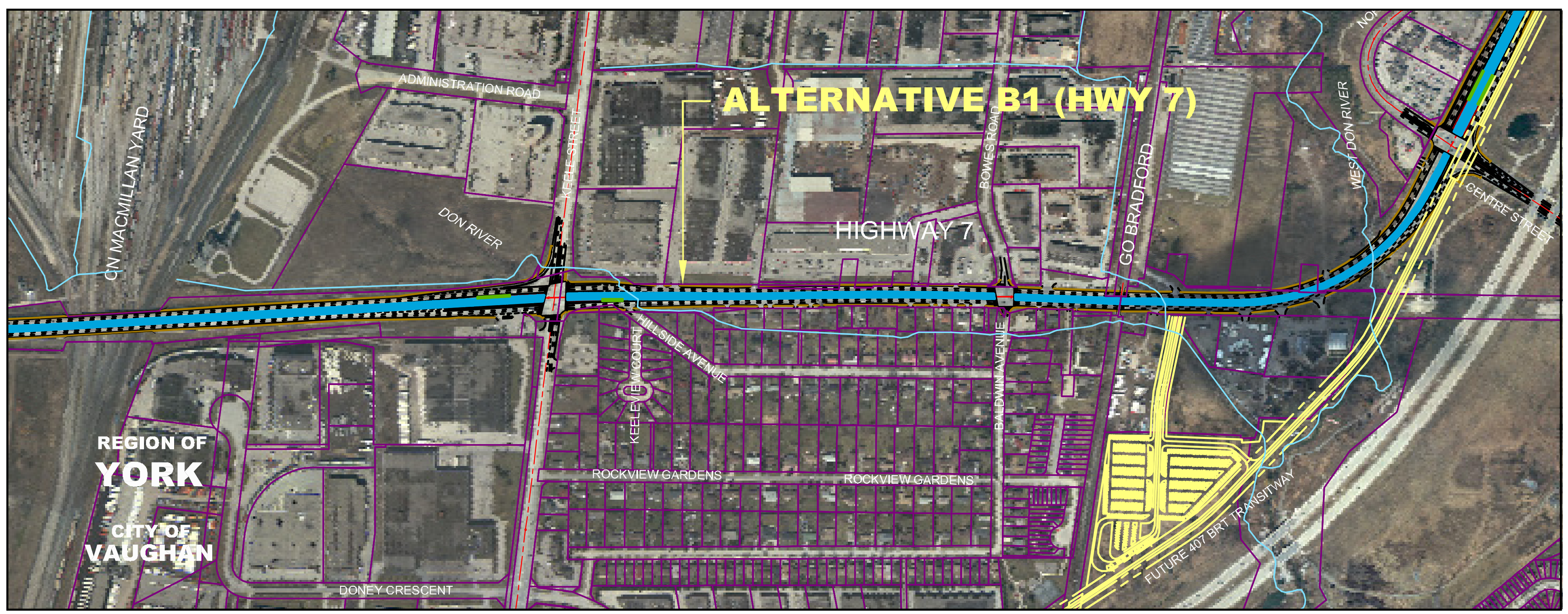
The evaluation indicated that primary route **Alternative B1**, in combination with a partially segregated rapid transit service on Keele Street between Highway 7 and Steeles Avenue, is preferred because:

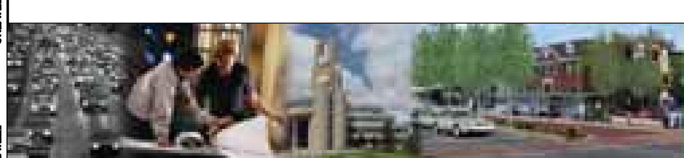
- Projections show that the combination will attract the highest ridership on east-west Highway 7 service by providing a direct link from Richmond Hill and Markham to both the Vaughan Corporate Centre and York University The latter could include access to an extension of the Spadina Subway to Steeles Avenue.
- The route conforms to the Regional Official Plan's "nodes and corridors" policy by linking Vaughan Corporate Centre to the eastern YRTP network and the TTC system as well as serving the Jane Street/Highway 7 and Keele Street/Steeles Avenue redevelopment nodes on the corridors.
- The continuation of the Region's initial Quick Start service as partially segregated rapid transit on Keele Street between Highway 7 and Steeles Avenue would offer an additional opportunity especially if Spadina Subway is extended initially to York University.
- The route combination supports Vaughan's vision for the ultimate development of land use along Avenue 7 and serves the planned major redevelopment to the south and east of the Jane Street intersection.
- A connection to the future BRT Transitway service is possible at either Jane or Keele Street interchanges.
- A connection to a future station on GO Transit's Bradford Line is feasible.

8



PRIMARY ROUTE ALTERNATIVE B1 (HIGHWAY 7 PORTION ONLY)
SEGMENT B WEST - HIGHWAY 400 TO CENTRE STREET





YRTP

STATIONS		PROPOSED SIDEWALK		EXISTING ROADWAYS		REGIONAL BOUNDARIES	REGION OF YORK / REGION OF PEEL
TRANSITWAY		PROPOSED LANDSCAPE		EXISTING RIGHT OF WAY			
PROPOSED TRAFFIC LANES		PROPOSED RIGHT OF WAY		MUNICIPAL BOUNDARIES	CITY OF VAUGHAN / TOWN OF MARKHAM	SCALE	100 80 60 40 20 0 100

HIGHWAY 7 CORRIDOR AND VAUGHAN NORTH-SOUTH LINK PUBLIC TRANSIT IMPROVEMENTS ENVIRONMENTAL ASSESSMENT

8.3-3

FIGURE

PRIMARY ROUTE ALTERNATIVES B1 (VNSL PORTION ONLY) AND B2
SEGMENT B WEST - HIGHWAY 400 TO CENTRE STREET

STATIONS		PROPOSED SIDEWALK		EXISTING ROADWAYS		REGIONAL BOUNDARIES	REGION OF YORK / REGION OF PEEL
TRANSITWAY		PROPOSED LANDSCAPE		EXISTING RIGHT OF WAY			
PROPOSED TRAFFIC LANES		PROPOSED RIGHT OF WAY		MUNICIPAL BOUNDARIES	CITY OF VAUGHAN / TOWN OF MARKHAM	SCALE	

HIGHWAY 7 CORRIDOR AND VAUGHAN NORTH-SOUTH LINK PUBLIC TRANSIT IMPROVEMENTS ENVIRONMENTAL ASSESSMENT

8.3-4

FIGURE

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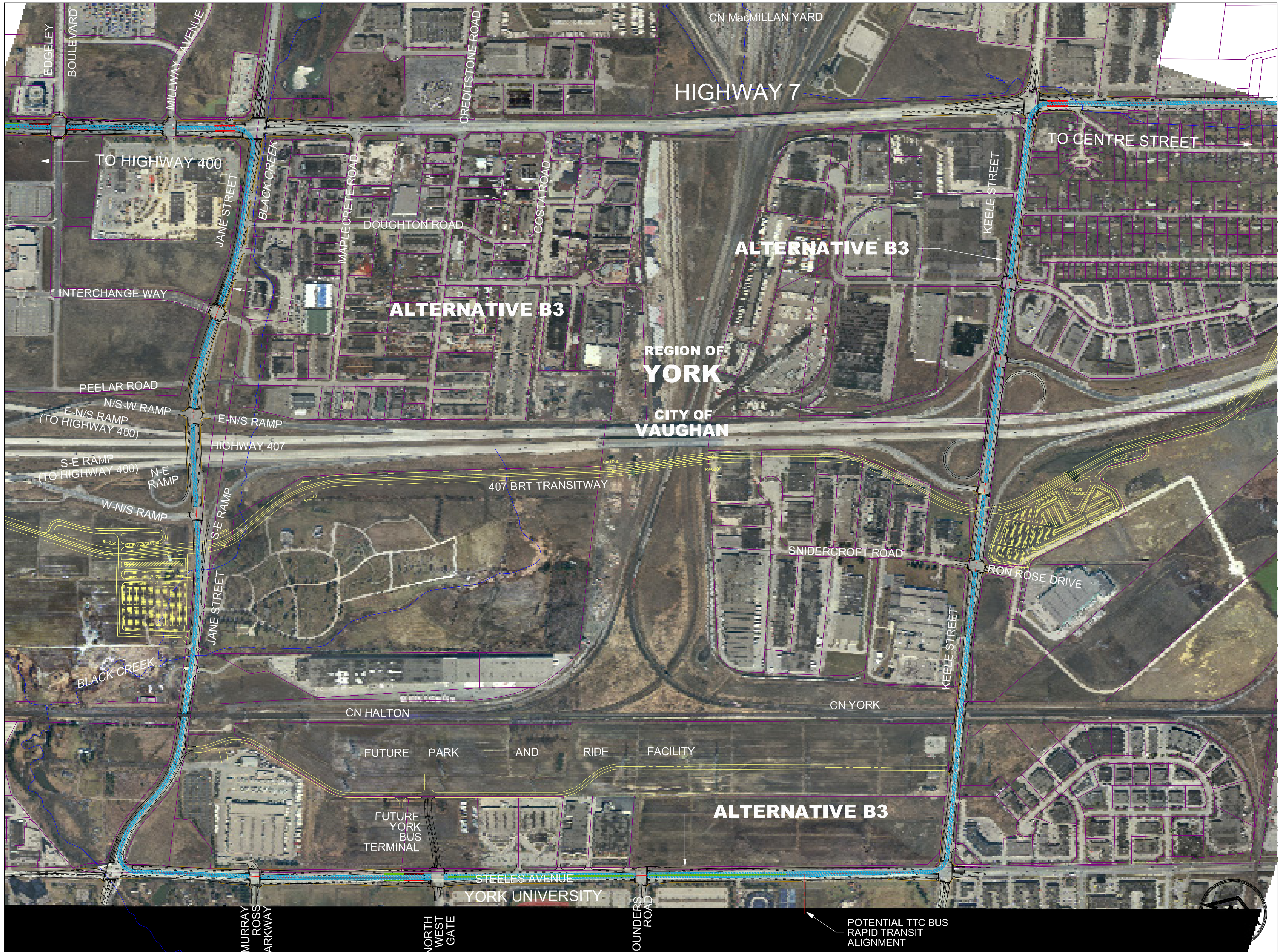
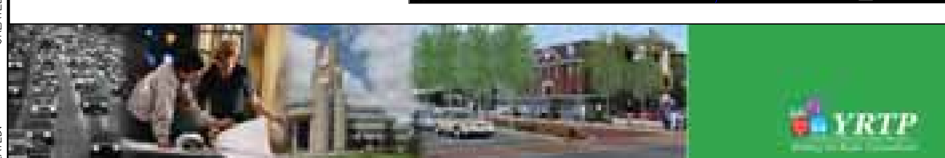
PRIMARY ROUTE ALTERNATIVE B3
SEGMENT B WEST - HIGHWAY 400 TO CENTRE STREET





STATIONS		PROPOSED SIDEWALK		EXISTING ROADWAYS		REGIONAL BOUNDARIES	REGION OF YORK / REGION OF PEEL
TRANSITWAY		PROPOSED LANDSCAPE		EXISTING RIGHT OF WAY			
PROPOSED TRAFFIC LANES		PROPOSED RIGHT OF WAY		MUNICIPAL BOUNDARIES	CITY OF VAUGHAN / TOWN OF MARKHAM	SCALE	

HIGHWAY 7 CORRIDOR AND VAUGHAN NORTH-SOUTH LINK PUBLIC TRANSIT IMPROVEMENTS ENVIRONMENTAL ASSESSMENT

8.3-5
FIGURE

DRAWING NAME: J:\Data\PM1435\PM\dwgs\HIGHWAY 7 EA PLATES\Figures\Figure 8.3-05 Alt B3.dwg
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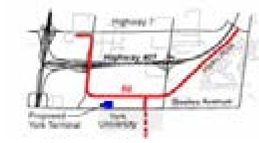
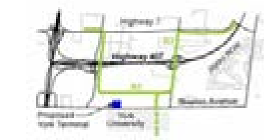
Table 8.3-1

Synopsis of Primary Route Alternative Evaluation Findings for Segment B West

Objectives and Goals	Alternative B1 Hwy 7: Jane-Centre St. and Jane St. /Hydro ROW to York U. 		Alternative B2 Jane St. /Hydro ROW to York U. & north-east in Hydro ROW - Centre St. 		Alternative B3 Jane-Steeles-York U.-Keele and Hwy 7 to Centre St. 	
IMPROVE MOBILITY						
Maximize inter-regional and local transit connectivity	◑	▪ Circuitous route to York U. for trips from the east reduces Hwy 7 service daily boardings by 7-10%. ▪ Transfer required to connect the future 407 Transitway service to Hwy 7 service origins/ destinations east of Jane St. ▪ Alignment geometry good, station access reasonable. ▪ Major road intersections may affect system reliability	◕	• Circuitous route to VCC from the east but direct route to York U. from the east maximizes Hwy 7 boardings • Connects Hwy 7 and Vaughan N-S link service directly to the future BRT Transitway service at Jane interchange. • Alignment geometry fair, some stations less accessible. • Better system reliability due to fewer road intersections	●	• Circuitous route to VCC from the east but direct route to York U. maximizes Hwy 7 boardings • Connects Hwy 7 and Vaughan N-S link service directly to the future BRT Transitway service at Jane interchange. • Alignment geometry fair, station access good • Major road intersections may affect system reliability
Maintain flexibility to expand network	●		◕		●	
Alignment geometry that maximizes speed & ride comfort & minimizes safety risks & maintenance costs	●		◕		◕	
Increase attractiveness of rapid transit service	●		◑		◕	
Station locations that maximize ridership potential of rapid transit service	◕		◑		●	
Maximize convenience of access to rapid transit system	◕		◑		●	
PROTECT AND ENHANCE SOCIAL ENVIRONMENT						
Minimize adverse effects on and maximize benefits for communities in corridor	◕	▪ Alignment largely in road ROW minimizes effects on community features ▪ Alignment largely in major road median requires more mitigation of traffic/access impact and safety concerns ▪ Adverse noise and vibration effects are minimized ▪ Median transitway will have minimal effect on vistas and no effect on cultural resources	●	▪ Will have a minor effect on public open space ▪ Alignment partially in Hydro ROW reduces traffic/access impact but intersections still result in safety concerns ▪ Adverse noise and vibration effects are minimized ▪ Median and Hydro ROW transitway will have minimal effect on vistas and no effect on cultural resources	◑	▪ Alignment in road median has minimal effect on community features ▪ Alignment entirely in road median requires most mitigation of traffic/access impact and safety concerns ▪ Noise and vibration effects likely unnoticeable at the few residential areas ▪ Median transitway will have minimal effect on vistas. Black Creek cultural resources on route
Maintain or improve road traffic and pedestrian circulation	◕		●		◑	
Maintain a high level of public safety and security in corridor	●		◕		◑	
Minimize adverse noise and vibration effects	◕		●		◕	
Minimize adverse effects on cultural resources	●		●		●	
Minimize disruption of community vistas and adverse effects on street and neighbourhood aesthetics	●		◔		◕	
PROTECT NATURAL ENVIRONMENT						
Minimize adverse effects on Aquatic Ecosystems	◔	▪ Potential for minor effects on aquatic ecosystems due to widening of the road over 7 crossings ▪ Potential for some effects on terrestrial ecosystems	◕	▪ Has the least adverse effect on aquatic ecosystems with only 3 widening of crossings ▪ Has no effects on terrestrial ecosystems ▪ Lower potential for adverse effects on hydrological and geological conditions	◔	▪ Potential for minor effects on aquatic systems due to widening of the road over 6 crossings
Minimize adverse effects on Terrestrial Ecosystems	◕		●		◕	
Minimize adverse effects on corridor hydrogeological, geological and hydrological conditions	◑		◕		◑	
PROMOTE SMART GROWTH/ ECONOMIC DEVELOPMENT						
Support Regional and Municipal Planning Policies and approved urban structure	●	▪ Conforms best with planning policies and provides good access to community facilities ▪ Provides positive effects on business activities but affects access to businesses ▪ Provides the best opportunities for transit-oriented-development around stations and along the corridor	◑	▪ Does not conform as well with planning policies and some stations are remote from community facilities ▪ Offers least interference with business activities but also minimal potential for increased business activities ▪ Provides the least opportunity for transit-oriented-development around stations and along the corridor	◕	▪ Conforms well with planning policies and provides good access to community facilities ▪ Optimized for positive effects on business activities at stations and within the corridor ▪ Provides good opportunities for transit-oriented-development and some redevelopment
Provide convenient access to social and community facilities in corridor	◕		◑		◕	
Minimize adverse effects on business activities in corridor	◑		◔		◕	
Protect provisions for goods movement in corridor	◑		◕		◑	
Promote transit-oriented development	◕		◔		◑	
MAXIMIZE COST-EFFECTIVENESS OF RAPID TRANSIT						
Minimize capital cost of vehicles, facilities and systems required	◕	▪ Capital cost +/- $170 million plus slightly higher vehicle fleet cost due longer route ▪ Minimal property cost, some Hydro easement cost ▪ 7.3 km route results in slightly higher O&M costs	●	▪ Capital cost +/- $144 million plus lowest vehicle fleet cost ▪ Hydro easement cost to be carried ▪ 6.7 km route yields lowest O&M costs	◕	▪ Capital cost +/- $165 mill. plus higher vehicle fleet cost due to longest route ▪ Minimal property cost ▪ 8.2 km route results in marginally higher O&M costs
Minimize cost effects of/on adjacent properties to implement facilities	◑		◕		●	
Minimize adverse effects of alignment characteristics on operating and maintenance costs	◑		◕		◔	
	Technically Preferred Alternative				**Rapid Transit service on Keele St., as in B3, would be added to the preferred B1 Alternative**	

LEGEND: Least Responsive ○ ◔ ◑ ◕ ● Most Responsive

NOTE: ROW – Right-Of-Way O&M – Operation and Maintenance VCC – Vaughan Corporate Centre

The above indicators were presented to the public at Open House #2. Certain indicators shown at the time have been removed from this evaluation as there was no significant difference in the response of the three alignments options in meeting the goal, particularly effects on air quality. Detailed evaluations can be found in Appendix M Tables 1 to 5.

➢ Adverse effects on the social and natural environment are either minimal or able to be mitigated.

8.3.2.5 Local Modification of the Preferred Alternative at GO Bradford Line and CN Halton Grade Separations

There are two local challenges regarding a grade separated Canadian National (CN) Newmarket Subdivision (GO Bradford) crossing at Highway 7 and a grade separated CN Halton Subdivision crossing at Jane Street. In both cases, widening of the rail structures is necessary to place a median transitway. However, in recognizing the heavy implications on the cost of widening structures and the temporary re-location of the currently running CN freights and GO rail services, widening the structures deems unjustified at the early stage of the rapid transit services. Thus, it is recommended that the rapid transit will operate in mixed traffic with priority signal measures at these locations. The short sections of the mixed traffic, 750m at GO Bradford and 350m at CN Halton, will not adversely affect the efficiency of the rapid transit services. It is also recommended that widening the structures to accommodate the median transitway be taken into consideration when the time comes to upgrade or expand the rails requiring construction at these two locations.

A local route variation at the Highway 7/Jane Street intersection is considered to promote opportunities for transit-oriented development. The following section will discuss this alignment variation in detail.

8.3.2.6 Local Option at Highway 7/ Jane Street Intersection (Vaughan Corporate Centre)

Vaughan Corporate Centre has been identified as a major developmental node in the City. In light of this, a local option using the Region's Viva 1 service routing at the Highway 7/ Jane Street intersection was considered. The aim of this option was to divert rapid transit service into the heart of the VCC to promote transit-oriented development opportunities. Instead of turning south through the Highway 7/ Jane intersection, the transitway would turn south and then east along Interchange Way to meet Jane Street where the preferred alignment would continue to York University. A station to serve this area can potentially be located near the bend of Interchange Way. This concept is illustrated in **Figure 8.3-6**. However, at the time of this investigation, the properties along Interchange Way have been developed very close to the road right-of-way offering little opportunity to implement the median transitway. Further, the existing big-box retail development in the neighbourhood will not encourage transit use as they are auto-oriented businesses. As a result, this option was eliminated.

8.3.2.7 Local Modification of Preferred Alternative in the Hydro Corridor Right-of-Way

In developing the route within the Hydro Corridor north of York University, Hydro One and two planning studies were consulted. York University was also consulted to establish the location of the preferred access to its designated bus terminal facility. The criteria set out by Hydro One for developing a roadway within the Hydro Corridor are:

➢ The minimum distance from a paved area to the footing of any hydro tower is to be 17.5 ft (5.4 m); and
➢ No roadway will be permitted between the 500 KV power lines.

Figure 8.3-6
Local Option at Highway 7/ Jane Street Intersection

The first planning study reviewed was the City of Vaughan's *Property Protection for Steeles Rapid Transit Terminal Facilities Rapid Transit Extension to York University (January 2001, Cansult Limited)* to identify property requirements for the major off-street bus terminal, major commuter parking lot(s), kiss-n-ride facilities and access roads (east-west and north-south). The other study, the City of Vaughan's *Steeles Avenue Corridor Land Use Review Jane Street to Keele Street (Urban Strategies Inc.)* investigated the requirements for a transit-oriented mixed-use precinct in the area.

The preferred transit route will use the western half of the proposed East-West access road identified by the studies before entering the terminal facility but has been modified to observe Hydro One's criteria.

8.3.3 Segment B East - Route Alternatives

In Segment B East, between Centre Street and Hunters Point Road, three primary route alternatives were carried forward from **Chapter 5** for detailed analysis. These routes, illustrated in **Figure 8.3-1**, are:

➢ **Primary Route Alternative B4:** Highway 7 between Centre and Bathurst Streets (Hunters Point Road);
➢ **Primary Route Alternative B5:** The Hydro right-of-way between Centre and Bathurst Streets (Hunters Point Road); and
➢ **Primary Route Alternative B6:** Centre and Bathurst Streets to Highway 7 and then east to Hunters Point Road.

The following sections describe the evaluation of these alignment alternatives in detail.

8.3.3.1 Primary Route Alternative B4: Highway 7 between Centre and Bathurst Streets (Hunters Point Road)

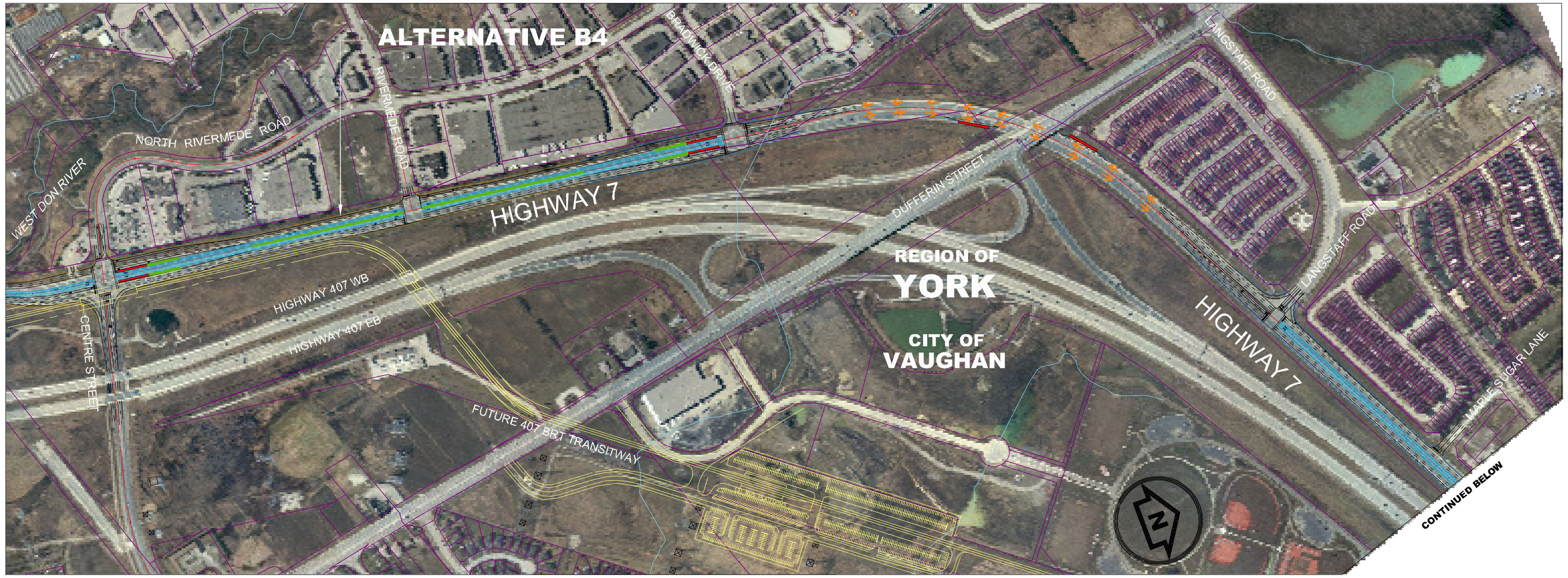
Alternative B4 is a direct route in the median along the Highway 7 right-of-way from Centre Street to the planned Richmond Hill Centre Intermodal Terminal at Yonge Street. Alternative B4 is shown on **Figure 8.3-7**.

Local constraints on the widening of Highway 7 under the grade separation structures at Dufferin and Bathurst Streets are described in the following section.

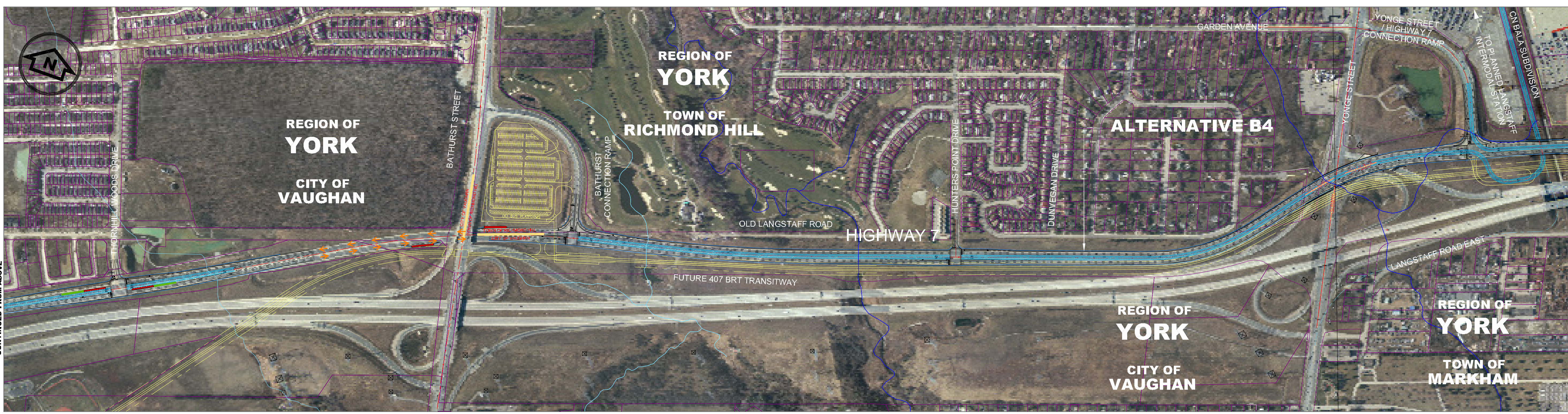
Local Options at Dufferin and Bathurst Grade Separations

The existing width of the Highway 7 right-of-way under the Dufferin Street and Bathurst Street structures cannot accommodate the widening required for a transitway. Reconstructing the bridges will be costly and require complex construction staging to divert heavy traffic elsewhere in close proximity to the Highway 407 access ramps. Two options to overcome this constraint were considered.

The first, shown in **Figure 8.3-8**, is to leave Highway 7 at Bradwick Road in Vaughan and construct a separate transitway between the rights-of-way of Highways 7 and 407 to reach Yonge Street. This 5.4 km diversion avoids the reconstruction of the existing bridges but four new structures would have to be built to cross Dufferin, Bathurst and Yonge Streets and the Yonge Street/Highway 407 N-W Ramp. This option offers uninterrupted service from Bradwick Road to Yonge Street but will be costly.



PRIMARY ROUTE ALTERNATIVE B4
SEGMENT B EAST - CENTRE STREET TO YONGE STREET



NOTE:
THE OPTION OF JOINT USE OF THE HIGHWAY 407 BUSWAY BETWEEN DUFFERIN STREET AND BAYVIEW AVENUE BEING INVESTIGATED

YRTP

STATIONS		PROPOSED SIDEWALK		EXISTING ROADWAYS		REGIONAL BOUNDARIES	REGION OF YORK / REGION OF PEEL
TRANSITWAY		PROPOSED LANDSCAPE		EXISTING RIGHT OF WAY		MIXED-TRAFFIC OPERATION	
PROPOSED TRAFFIC LANES		PROPOSED RIGHT OF WAY		MUNICIPAL BOUNDARIES	CITY OF VAUGHAN / TOWN OF MARKHAM	SCALE	100 80 60 40 20 0 100

HIGHWAY 7 CORRIDOR AND VAUGHAN NORTH-SOUTH LINK PUBLIC TRANSIT IMPROVEMENTS ENVIRONMENTAL ASSESSMENT

8.3-7
FIGURE

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Figure 8.3-8
Separate Transitway Option between Bradwick Road and Yonge Street

A second option is to operate in mixed-traffic under the Dufferin Street and Bathurst Street overpass structures. This option avoids the costly reconstruction of the existing bridges. The delay caused by the mixed traffic operation is considered minimal due to the short mixed traffic sections in combination with the existing free-flowing traffic conditions. Finally, the mixed-traffic option is recommended because it avoids either the costly reconstruction of existing bridges, or the cost of constructing four new structures in the separate transitway option. These costs cannot be justified given the low potential for loss of service reliability with the mixed-traffic option. In addition, the existing geometry of Highway 7 offers fairly good rider comfort compared to the separate transitway option that requires lower geometric standards and new elevated sections in which suitable grades for conversion to LRT will be difficult to achieve.

8

Potential Station Locations in Alternative B4

Potential station locations considered for Alternative B4 in Segment B East were at Bradwick Road, Dufferin Street, Thornhill Wood Drive, Bathurst Street and Hunters Point Drive (future).

8.3.3.2 Primary Route Alternative B5: Hydro Right-of-way between Centre Street, Bathurst Street and Hunters Point Road

Alternative B5, the extension of Alternative B2, continues northeast in the Hydro One right-of-way up to and across Bathurst Street, then crosses Highway 407 to rejoin Highway 7 near Hunters Point Road from where it continues eastward to the terminal at Yonge Street. Alternative B5 is shown in **Figure 8.3-9**.

Potential Station Locations in Alternative B5

Potential station locations considered for Alternative B5 in Segment B East were at Dufferin Street, Bathurst Street, and Hunters Point Drive (future).

8.3.3.3 Primary Route Alternative B6: Centre and Bathurst Streets to Highway 7 at Hunters Point Road

Alternative B6, shown in **Figure 8.3-10**, leaves Highway 7 at Centre Street continuing eastward in the median of Centre Street as far as Bathurst Street. At the Bathurst Street intersection, it turns north into the median of Bathurst Street which it follows to return to Highway 7. The alignment then heads east using the existing Bathurst Street Connection Ramp to reach the median of Highway 7, in which it continues another 2 km east to Yonge Street.

Potential Station Locations in Alternative B6

Potential station locations considered for Alternative B6 in Segment B East were at Dufferin Street, Vaughan Boulevard (future), Promenade Mall Entrance, Atkinson Avenue, Highway 7 (at Bathurst Street) and Hunters Point Drive (future).

8.3.3.4 Alternatives Evaluation Findings and Recommendation

Detailed evaluations were performed comparing Alternatives B4, B5 and B6. A synopsis of these detailed evaluations is presented in **Table 8.3-2** following while the detailed evaluations can be found in **Appendix M Tables 6** to **10**.

Primary route **Alternative B6** was selected as the preferred alignment in this segment because:

- It has the potential to attract ridership from existing commercial and residential land uses on both sides of the alignment, as well as future transit-oriented intensification and redevelopment at the Dufferin and Bathurst nodes on Centre Street.
- The route serves existing community facilities and a major shopping area while also providing the opportunity for urban design improvements in the rights-of-way.
- A connection to a future 407 Transitway service can be achieved at the Bathurst Street and Highway 7 intersection.
- Connections to local transit serving large residential areas north of Highway 7, such as the Carrville Community, can be made at the Bathurst Street and Dufferin Street nodes on the alignment. The local services will need to be configured as feeders to the rapid transit stations, using parts of Highway 7 where beneficial.
- Effects on the natural environment are negligible or minor and traffic management measures and improved transit vehicle technology can mitigate social environmental impacts.

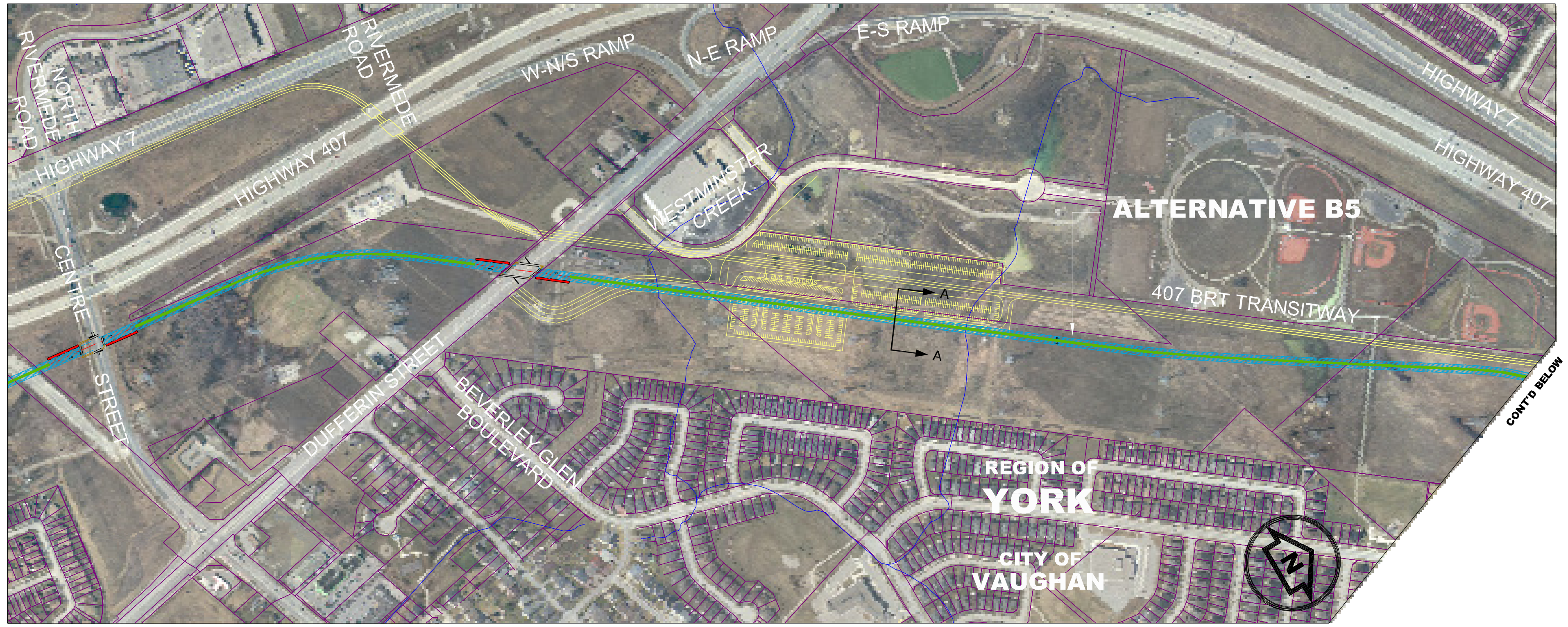
Measures to protect for future implementation of parallel express rapid transit service entirely on Highway 7 are also recommended for this section between Bathurst and Centre Streets.

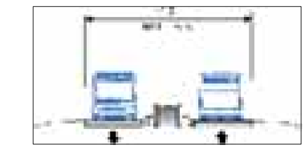
8.3.3.5 Local Options at Highway 7 and Bathurst Street

Recognizing the complications of widening the Bathurst Street bridges at the Highways 407/7 interchange with Alternative B6 as the preferred alignment, two local options were considered to minimize the impact on these structures.

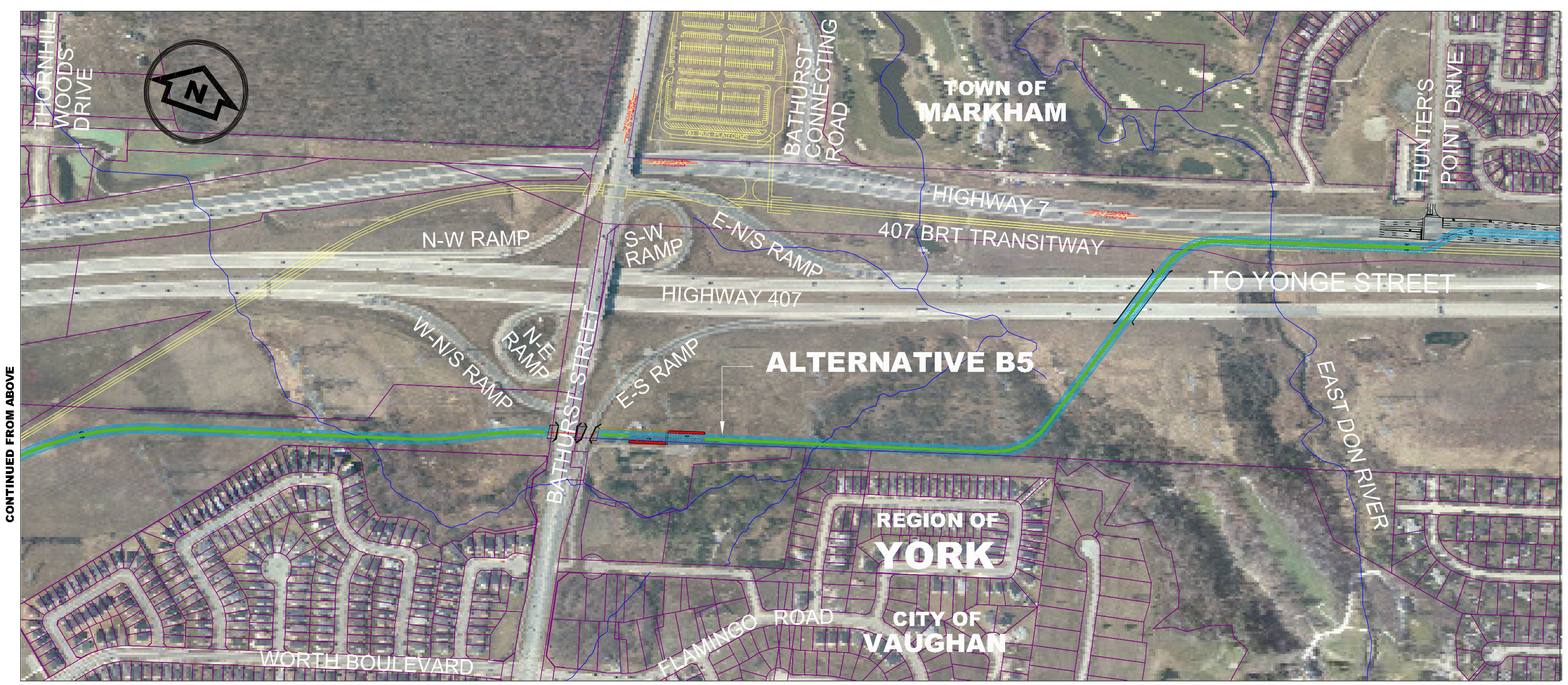
One option, shown in **Figure 8.3-11**, is to leave Bathurst Street at Flamingo Road proceeding north easterly in a separate transitway in the Hydro Corridor, crossing Highway 407, sharing a section of the future Highway 407 transitway, and then returning to Highway 7 at Hunter's Point Drive. This option avoids the Highways 407/7 Interchange structures completely but requires new structures over Highway 407 and tributary of the East Don River.

A second option is to operate rapid transit service in mixed traffic from Flamingo Road to the Bathurst Street Connection Ramp and then return to Highway 7 with a median transitway. This option avoids the widening of the Highways 407/7 Interchange structures.





PRIMARY ROUTE ALTERNATIVE B5
SEGMENT B EAST - CENTRE STREET TO YONGE STREET



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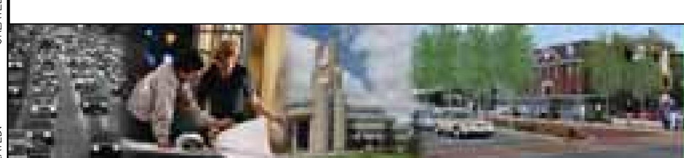


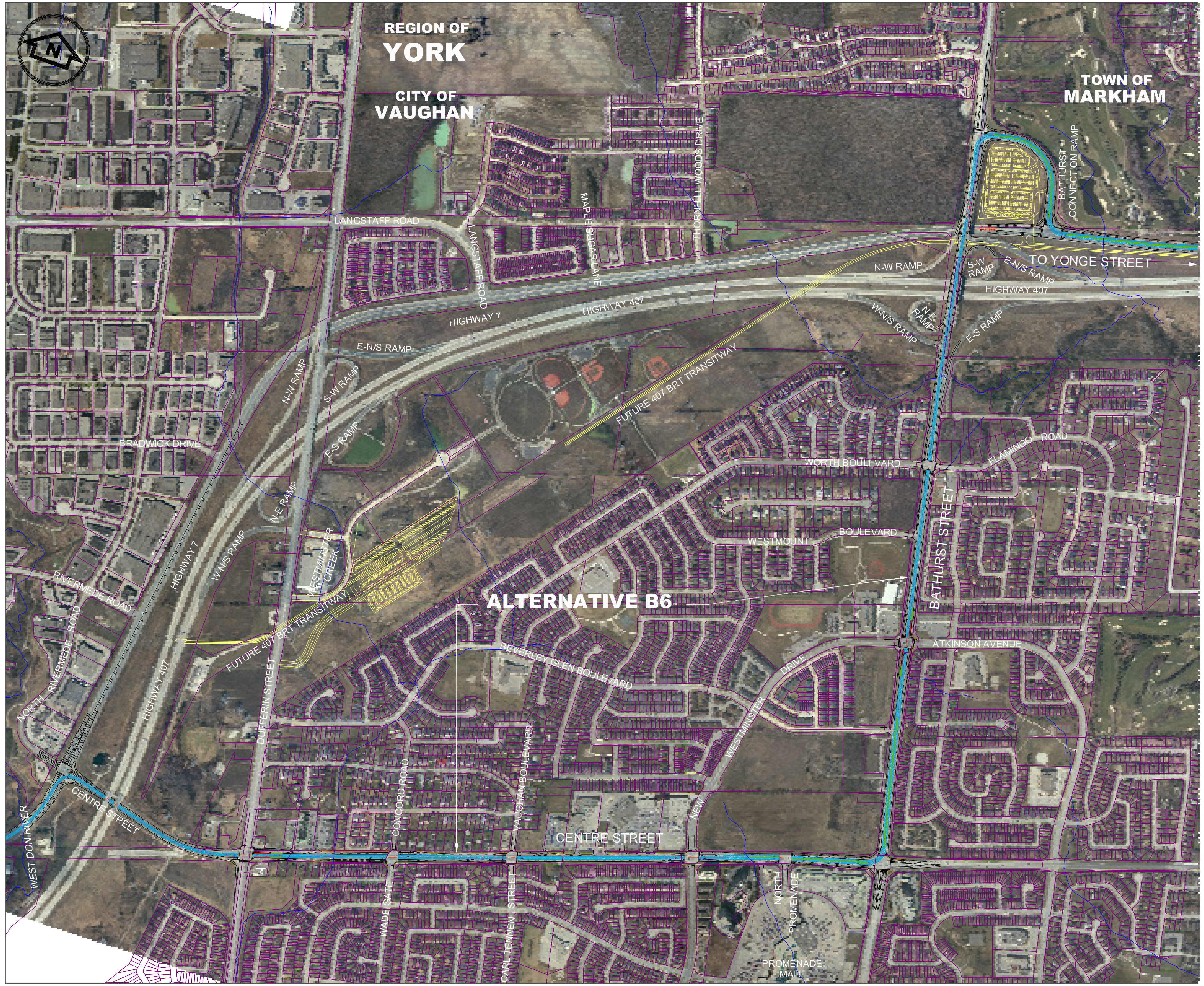
YRTP

STATIONS	PROPOSED SIDEWALK	EXISTING ROADWAYS	REGIONAL BOUNDARIES (REGION OF YORK / REGION OF PEEL)
TRANSITWAY	PROPOSED LANDSCAPE	EXISTING RIGHT OF WAY	SCALE
PROPOSED TRAFFIC LANES	PROPOSED RIGHT OF WAY	MUNICIPAL BOUNDARIES (CITY OF VAUGHAN / TOWN OF MARKHAM)	

HIGHWAY 7 CORRIDOR AND VAUGHAN NORTH-SOUTH LINK PUBLIC TRANSIT IMPROVEMENTS ENVIRONMENTAL ASSESSMENT

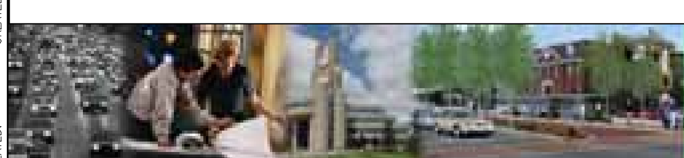
8.3-9

FIGURE



PRIMARY ROUTE ALTERNATIVE B6

SEGMENT B EAST - CENTRE STREET TO YONGE STREET



YRTP

STATIONS		PROPOSED SIDEWALK		EXISTING ROADWAYS		REGIONAL BOUNDARIES	REGION OF YORK / REGION OF PEEL
TRANSITWAY		PROPOSED LANDSCAPE		EXISTING RIGHT OF WAY			
PROPOSED TRAFFIC LANES		PROPOSED RIGHT OF WAY		MUNICIPAL BOUNDARIES	CITY OF VAUGHAN / TOWN OF MARKHAM	SCALE	

HIGHWAY 7 CORRIDOR AND VAUGHAN NORTH-SOUTH LINK PUBLIC TRANSIT IMPROVEMENTS ENVIRONMENTAL ASSESSMENT

8.3-10

FIGURE

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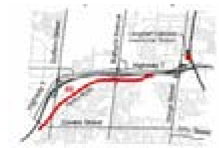
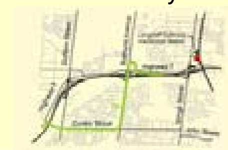
Table 8.3-2

Synopsis of Primary Route Alternative Evaluation Findings for Segment B East

Objectives and Goals	Alternative B4 Hwy 7 between Centre St. and Bathurst St. (Hunters Point Rd.) 		Alternative B5 Hydro ROW between Centre and Bathurst Sts. (Hunters Point Rd.) 		Alternative B6 Centre St. and Bathurst St. to Hwy 7 at Hunters Point Rd. 	
IMPROVE MOBILITY						
Maximize inter-regional and local transit connectivity	◕	▪ Connects to future 407 Transitway service at Bathurst and possibly Dufferin. Good alignment geometry and attracts marginally lower daily boardings than Centre-Bathurst route option. ▪ Development served by stations on north side only ▪ Limited opportunities for station access facilities	◑	▪ Future 407 Transitway connection indirect ▪ Good alignment geometry but will attract least daily boardings on Hwy 7 service ▪ Good service reliability due to separation of alignment from major road traffic ▪ Access less convenient due to remoteness from road system	●	▪ Connects to future 407 Transitway service at Bathurst ▪ Has reasonable alignment geometry and is projected to attract slightly higher daily boardings than other routes. ▪ Higher potential for loss of service reliability due to traffic interference at intersections ▪ Station access very convenient with some opportunity for station drop-off/park and ride
Maintain flexibility to expand network	◕		◑		◕	
Alignment geometry that maximizes speed & ride comfort & minimizes safety risks & maintenance costs	●		◕		◕	
Increase attractiveness of rapid transit service	◕		◑		◕	
Station locations that maximize ridership potential of rapid transit service	◕		◔		◕	
Maximize convenience of access to rapid transit system	◑		◕		●	
PROTECT AND ENHANCE SOCIAL ENVIRONMENT						
Minimize adverse effects on and maximize benefits for communities in corridor	●	▪ No effect on community interaction or community features ▪ Moderate impact of median transitway on traffic circulation/access ▪ Minimal adverse noise and vibration effects ▪ Some urban design opportunity to improve vistas and no effect on nearby cultural resources	●	▪ No effect on community interaction, minor intrusion on public open space ▪ Minimal impact of Hydro ROW transitway on traffic circulation/access ▪ Minimal adverse noise and vibration effects ▪ Minor intrusion on open space vistas and no effect on nearby cultural resources	◕	▪ Minor effect on community interaction, improves access to community features ▪ Moderate impact of median transitway on traffic circulation/access ▪ Adverse noise and vibration effects likely unnoticeable ▪ Significant urban design opportunity to improve vistas and no effect on nearby cultural resources
Maintain or improve road traffic and pedestrian circulation	◕		●		◑	
Maintain a high level of public safety and security in corridor	◕		●		◑	
Minimize adverse noise and vibration effects	●		◕		◑	
Minimize adverse effects on cultural resources	●		●		●	
Minimize disruption of community vistas and adverse effects on street and neighbourhood aesthetics	●		◕		◕	
PROTECT NATURAL ENVIRONMENT						
Minimize adverse effects on Aquatic Ecosystems	●	▪ Has least adverse effect on aquatic ecosystems ▪ Has negligible effects on terrestrial ecosystems ▪ Low potential for adverse effects on hydrological and geological conditions	◕	▪ Potential for minor effects on aquatic ecosystems ▪ Has negligible effects on terrestrial ecosystems ▪ Low potential for adverse effects on hydrological and geological conditions	◕	▪ Potential for minor effects on aquatic ecosystems ▪ Has negligible effects on terrestrial ecosystems ▪ Minor hazardous material risk
Minimize adverse effects on Terrestrial Ecosystems	●		●		●	
Minimize adverse effects on corridor hydrogeological, geological and hydrological conditions	◕		◕		◑	
PROMOTE SMART GROWTH/ ECONOMIC DEVELOPMENT						
Support Regional and Municipal Planning Policies and approved urban structure	●	▪ Conforms well with planning policies and provides good access to community facilities ▪ Provides some potential for increase in business activities ▪ Provides some opportunities for TODs around stations and along the corridor	◑	▪ Conforms least with planning policies and does not provides good access to community facilities ▪ Provides the least positive effects on business activities ▪ Provides very little opportunities for TODs and re-development along the corridor	●	▪ Conforms very well with planning policies and provides good access to community facilities ▪ Has the best potential for increase in business activity and little effects on business access ▪ Provides most opportunities for TODs and re-development around stations and along the corridor
Provide convenient access to social and community facilities in corridor	◑		◔		●	
Minimize adverse effects on business activities in corridor	●		◑		◕	
Protect provisions for goods movement in corridor	●		●		◕	
Promote transit-oriented development	◑		◔		●	
MAXIMIZE COST-EFFECTIVENESS OF RAPID TRANSIT						
Minimize capital cost of vehicles, facilities and systems required	◕	▪ Capital cost +/- $100 million ▪ Minimal property cost ▪ O&M costs marginally higher due to longer alignment	●	▪ Capital cost +/- $90 million ▪ Hydro easement cost ▪ Lowest O&M costs due to alignment being shortest.	◑	▪ Capital cost +/- $110 mill. ▪ Minimal property cost ▪ O&M costs marginally higher due to longer alignment.
Minimize cost effects of/on adjacent properties to implement facilities	●		◕		◑	
Minimize adverse effects of alignment characteristics on operating and maintenance costs	◕		●		◑	
						Technically Preferred Alternative

LEGEND: Least Responsive ○ ◔ ◑ ◕ ● Most Responsive

NOTE: TOD – Transit-oriented Development O&M – Operation and Maintenance

The above indicators were presented to the public at Open House #2. Certain indicators shown at the time have been removed from this evaluation as there was no significant difference in the response of the three alignments options in meeting the goal, particularly effects on air quality.

Detailed evaluations can be found in Appendix M Tables 6 to 10.

8

Figure 8.3-11
Separate Transitway Option at Bathurst Street/ Highway 7

Following an assessment of the merits of each, the mixed-traffic option was recommended because:

- It will offer an opportunity to interface with the future 407 Transitway at its Bathurst Street/Highway 7 station and will not cause significant travel time delay due to the short mixed-traffic section and enhanced operation with the transit priority signals. Although the separate transitway option provides riders with uninterrupted service, it bypasses the future 407 Transitway station at Bathurst Street and Highway 7.
- It will offer an opportunity for the Region to contribute to joint-use of the future Highway 407 park-and-ride facility in the Bathurst Street Connection Ramp loop.
- It will have minimal impact on the natural environment compared to the separate transitway option that crosses the valley of the East Don River tributary.
- It will be simpler to construct compared to the separate transitway option that may not permit a desirable grade for any future LRT because of the new crossing of Highway 407.
- It will have relatively low cost compared to the new structures required for the separate transitway option.

8.3.4 Segment C West – Route Alternatives

In the western half of Segment C, a single primary route alternative along Highway 7 was brought forward from the initial screening analysis. In order to confirm the single route, it was necessary to consider two sets of local alignment options in this segment. The first option occurs between Yonge Street and Bayview Avenue while the second considers methods to cross Highway 404 between Leslie Street and Woodbine Avenue. The analysis of these options is described in the following **Sections 8.3.4.1** and **8.3.4.2**.

8.3.4.1 Local Options between Yonge Street and Bayview Avenue

Recognizing the benefit of serving the residential neighbourhood north of the Richmond Hill Centre (Bayview Glen), the following local alignment variation was compared with the Highway 7 route:

- **Option C-A1:** Highway 7 right-of-way alignment between Yonge Street (planned Richmond Hill Centre Intermodal Terminal) and Bayview Avenue.
- **Option C-A2:** High Tech Road alignment starting from the planned Richmond Hill Centre Terminal and continuing north easterly across CN Rail's Bala Subdivision into the south side of High Tech Road. From this point it follows High Tech Road and then turns southeast along the existing supermarket's west boundary. Continuing eastward it passes under the Bayview Avenue/Highway 7 Connection Road and Bayview Avenue returning to the Highway 7 median. This option, shown in **Figure 8.3-12** was shown to the public at the second Public Consultation Centre in April 2003. At a later date, a variation to link High Tech Road to the Highway 7 median using Silver Linden Drive was developed.

Figure 8.3-12
Local Option C-A2: High Tech Alignment between Yonge Street and Bayview Avenue

The findings of a simplified evaluation comparing Options C-A1 and C-A2 are presented in **Table 8.3-3**.

Table 8.3-3
Evaluation of Local Options Between Yonge Street and Bayview Avenue

Objectives and Goals	Option C-A1 Highway 7 Alignment	Option C-A2 High Tech Road
IMPROVE MOBILITY		
• Inter-regional transit connectivity • System expansion flexibility • Speed, safety, ride comfort • Service quality and effectiveness • Station catchment • Convenience of access	• Alignment minimizes travel time in this segment of Hwy 7 Corridor. • More direct service for users of rapid transit service outside of this area. • Access from residential area requires transfer from feeder service	• Location of station on High Tech Road offers better catchment area. • Better accessibility for the residents of the neighbourhood north of High Tech Road. • Route is less direct with slower operating speeds
PROTECT & ENHANCE SOCIAL ENVIRONMENT		
• Effects on communities • Road traffic and pedestrian circulation • Public safety and security • Noise and vibration • Effects on cultural resources • Community vistas and street aesthetics	• No direct negative effects on residential neighbourhoods. • Minor effects on traffic and pedestrian circulation from the median location on Hwy 7.	• Potential effects on community vistas given the need for elevated transitway. • Better solution in terms of traffic and pedestrian circulation given the dedicated ROW needed. • Potential for inconvenience to residents during construction
PROTECT NATURAL ENVIRONMENT		
• Effect on aquatic ecosystems • Effect on terrestrial ecosystems • Effect on Air Quality • Effect on Hydro-geological conditions	• Minimal effect on the environment due to the median location on Hwy 7.	• Some potential for adverse environmental effects due to need for a new right-of-way for most of the distance.
PROMOTE SMART GROWTH/ ECONOMIC DEVELOPMENT		
• Regional/ Mun. Plans and Urban Structure • Access to community facilities • Effect on business activities • Goods movement • Promote transit-oriented development (TOD)	• Conforms to municipal plans and urban structure objectives. • Some potential for transit-oriented developments on lands south of Hwy407.	• Option conform partially with municipal plans and urban structure Objectives. • Limited property available for TODs on south side of High Tech road.
MAXIMIZE COST-EFFECTIVENESS OF RAPID TRANSIT		
• Effect on Capital Costs • Property required • Effect on operating and maintenance costs	• Little requirement for property acquisition since the alignment in Hwy 7 median uses existing right-of-way. • Least capital cost as works entail only street widening and one bridge widening	• Right-of-way widening needed along High Tech Road • Potential for commercial property severance. • Requires a new costly rail overpass and 2 underpasses. • Requires a higher cost elevated inter-modal station due to alignment profile.
	Technically Preferred Option	

From this evaluation, **Option C-A1** using a route along Highway 7 between Yonge Street and Bayview is preferred because:

- Overall, the technical complexities in integrating the transitway in a route along High Tech Road and the associated costs cannot be justified by the potential benefits of this alignment; and
- Local feeder service to a station on Highway 7 near Silver Linden Drive could serve the residential neighbourhood north of High Tech Road and the future development on adjacent lands to the south.

8.3.4.2 Local Alignment Options in the Highway 404 Area

Analysis of the feasibility of the route in the Highway 7 right-of-way revealed that the existing spans of the Highway 404 interchange bridges over Highway 7 could not accommodate a full median transitway without reduction of lanes or removal of sidewalks. At present, peak period traffic volumes at this interchange reach the capacity of the existing Highway 7 lanes. Since it is not feasible to reduce the number of lanes the three local alignment alternatives, illustrated in **Figure 8.3-13**, were developed and considered:

Option C-B1: Operation in Mixed Traffic on Existing Highway 7

This option assumes that new, dedicated median transit lanes would be constructed through most of the heavily-congested blocks of Highway 7 on either side of Highway 404 up to the ramp terminal intersections immediately east and west of the interchange bridges. This would leave approximately 400 metres of Highway 7 to be travelled in mixed traffic.

Given that this portion of the highway is part of one of the most heavily-congested zones along the corridor, a field survey of traffic movements and modelling of traffic behaviour with and without transit priority was carried out to assess this option's feasibility. This investigation revealed that, although the queues at the East Beaver Creek Road and Allstate Parkway signalized intersections extend into the central 400 m portion of the interchange in peak periods, vehicles in this portion are cleared within one 90 second signal cycle. Rapid transit vehicles in mixed traffic in this portion would be advanced in the same way.

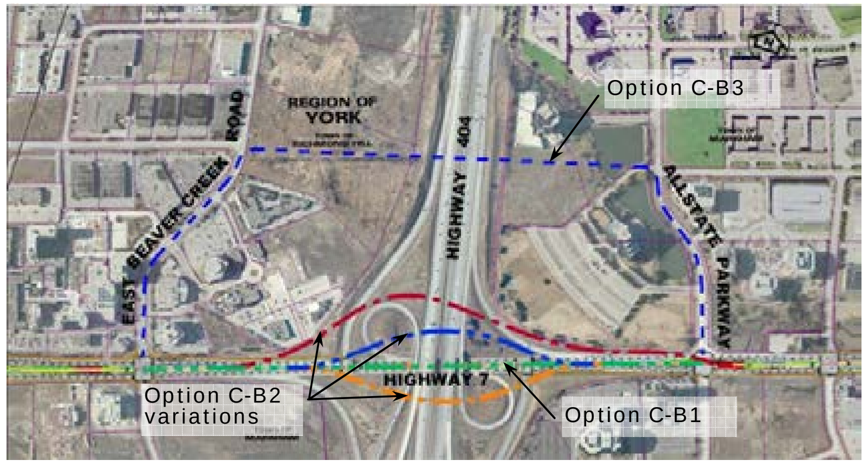


Figure 8.3-13
Local Alignment Options for Transitway on Highway 7 at Highway 404 Interchange

Option C-B2: A Segregated Alignment through the Interchange

For this option, the median transitway would remain in the Highway 7 median but be either elevated over the interchange or depressed under the existing road and ramp terminal intersections. A third variation for this option would elevate the transitway on an alignment crossing the interchange ramps and Highway 404 north or south of the existing bridges.

A further option to segregate rapid transit from traffic through the interchange would be a lengthening of the span of the existing Highway 404 bridges to achieve an opening wide enough for the two dedicated lanes to pass under the Highway 404 in the median of Highway 7.

Option C-B3: A Bypass Alignment North of the Interchange

This third option comprises a new transit-only overpass of Highway 404 at the northern limit of the interchange. The transitway alignment would have to leave the Highway 7 median and follow East Beaver Creek Drive right-of-way to the East Pearce Street intersection area where it would turn east across private land to a Highway 404 overpass which could be integrated with Markham/Richmond Hill's proposed collector road if the Town's and Region's EA recommends a compatible location for the road crossing. After crossing the highway, it would continue east across private property to the Allstate Parkway right-of-way. From this point the transitway would follow Allstate Parkway to the existing Highway 7 intersection where it would turn east and continue into Markham.

The advantages and disadvantages of each option are summarized in **Table 8.3-4**.

Table 8.3-4
Advantages and Disadvantages of Alignment Options in the Highway 404 Interchange Area

	Option C-B1 Operation in Mixed Traffic on Existing Highway 7	Option C-B2 A Segregated Alignment Through the Interchange	Option C-B3 A Bypass Alignment North of the Interchange
Advantages	• Dedicated lanes separate transit from congestion through most of the Woodbine-Leslie zone, eliminating most of the delay experienced at present in this portion of Highway 7. • Avoids widening of local road rights-of-way (East Beaver Creek and Allstate Parkway) and has no impact on access to properties as would be required by the northern bypass option. • Minimizes the number of signalized intersections on the rapid transit route (2 req'd). • Minimizes initial and potentially ultimate capital cost of rapid transit through Highway 404 interchange. • Defers decision on high capital investment until effect of new municipal overpass and proposed interchange ramp improvements is known. • Analysis of peak-period traffic movements and signal operation indicates that, with reasonable signal advance times (8 seconds), delays to transit vehicles will not exceed 1.5 minutes (a full signal cycle), with the westbound AM peak representing the worst-case scenario. • Permits full segregation of rapid transit, if required with minimal throw-away cost for initial solution.	• Dedicated lanes separate transit from congestion entirely in the Woodbine-Leslie zone. • Separates rapid transit service from all road traffic between East Beaver Creek Road and Allstate Parkway avoiding the up to 90 second delay of mixed traffic operation. • No delay during off-peak periods. • Eliminates potential for delay due to general traffic incidents within the interchange. • Minimizes travel time through the Woodbine-Leslie zone for all transit riders from/to the east.	• Separates rapid transit service from all road traffic between East Beaver Creek Road and Allstate Parkway. • Eliminates potential for delay due to general traffic incidents within the interchange but more intersections on this route raises the potential for incidents. • Offers opportunity for an additional station serving development north of the interchange.
Dis-advantages	• Rapid transit service could be further delayed by a traffic incident in the Highway 7 interchange affecting the mixed traffic section (e.g. a collision or stalled vehicle). • Requires MTO approval of changes to ramp terminal signal timing. • Municipal road improvements may not defer traffic congestion on Highway 7 significantly.	• Depending on structural solution selected, $20-$50 million capital cost to get rapid transit through Highway 404 interchange. • Requires high rapid transit capital investment prior to the effect of planned new road overpass and interchange improvements being known. • Minor visual intrusion if 2-level elevated transitway option is adopted although impact is mainly within interchange • Some disruption of traffic during construction with severity dependent on the structural solution adopted.	• Requires widening or reduction in general traffic capacity of local road rights-of-way (East Beaver Creek Road and Allstate Parkway) and dedication/acquisition of private property to reach northern location of new Highway 404 overpass. • Requires 5 at-grade signalized traffic intersections along the rapid transit route on East Beaver Creek Road, new east-west road and Allstate Parkway. • Requires resolution of property access conflicts on East Beaver Creek Road and Allstate Parkway. • Transit turning movements at Allstate Parkway and East Beaver Creek constrained to left turn phases of these Highway 7 intersections increasing delay potential. • Increases length of rapid transit route by 0.6 km

8

Table 8.3-4
Advantages and Disadvantages of Alignment Options in the Highway 404 Interchange Area

	Option C-B1 Operation in Mixed Traffic on Existing Highway 7	Option C-B2 A Segregated Alignment Through the Interchange	Option C-B3 A Bypass Alignment North of the Interchange
			over shortest route in Highway 7 median adding 2-3 minutes to travel time depending on traffic signal wait times and dwell time at additional station. • Delay would also occur during off-peak periods when not required. • Adds $20-30 million to capital cost of initial rapid transit through Highway 404 interchange depending on land cost for new right-of-way. • Requires high rapid transit capital investment prior to the effect of planned new road overpass and interchange improvements being known.
	Technically Preferred Option		

Option C-B1 is recommended as the preferred alignment for the section through the Highway 404 interchange because it:

- Is an operationally feasible and acceptable low-cost solution.
- Offers the flexibility to avoid or defer higher system capital costs until they are shown to be warranted.
- Does not preclude future implementation of a fully grade separated option if planned road improvements do not manage growth in traffic congestion by redistribution of traffic flows through the area.

In addition, approval of an optimum fully grade separated alignment through the Highway 404 interchange (Option C-B2) is being sought in the EA to be available for implementation without a separate EA in the event that reliability of mixed traffic rapid transit service cannot be assured at some point in the future.

8.3.5 Segment C East - Route Alternatives

In the eastern half of Segment C, consideration of the primary route alternatives led to three alternatives being developed for detailed analysis. These were:

- **Primary Route Alternative C1:** Highway 7 between Woodbine Avenue and Kennedy Road
- **Primary Route Alternative C2:** Woodbine Avenue Area, Yorktech Drive to Markham Centre and Kennedy Road to Highway 7
- **Primary Route Alternative C3:** Highway 7 from Woodbine Avenue to South Town Centre Boulevard and Kennedy Road to Highway 7

These alternatives, illustrated in **Figure 8.3-1**, are described in detail in **Sections 8.3.5.4** and **8.3.5.5** later in this chapter.

Prior to evaluating the overall primary route alternatives in the eastern half, it was necessary to develop and evaluate several local alignment options connecting to and within the planned Markham Centre. These included the area of South Town Centre Boulevard discussed in **Section 8.3.5.1**, GO Unionville Station in **Section 8.3.5.2**, and south Unionville in **Section 8.3.5.3**.

8.3.5.1 Local Alignment Options to Link Highway 7 to Markham Centre in the Vicinity of South Town Centre Boulevard

A transition from Highway 7 near the existing Civic Centre to the planned Markham Centre is an essential element of Primary Route Alternative C3. Several local alignment options shown in **Figure 8.3-14** were developed and evaluated. These comprised:

- **Option C3-1**: This alignment leaves the median of Highway 7 at Warden Avenue with a tunnel underneath the intersection, returning to the surface on the east side of Warden Avenue. It then turns east at Enterprise Drive towards the Markham Centre.
- **Option C3-2**: This alignment leaves the median of Highway 7 at Warden Avenue with a tunnel underneath Highway 7, returning to the surface on the west side of Warden Avenue. It then turns east, crossing Warden Avenue at Enterprise Drive, towards the Markham Centre.
- **Option C3-3**: This alignment leaves Highway 7 at Warden Avenue, continuing in the median, south to Enterprise Drive, then turns east towards the Markham Centre.
- **Option C3-4**: This alignment leaves Highway 7 at South Town Centre Boulevard, continuing in the median, south to IBM's private road network. It then leaves Town Centre Boulevard south-easterly, crossing the Rouge River Valley and Warden Avenue towards the Markham Centre.
- **Option C3-5**: This alignment leaves Highway 7 at the future south extension of Village Parkway, namely Birchmount Avenue, south to future Enterprise Drive. It then turns east towards the planned Markham Centre.

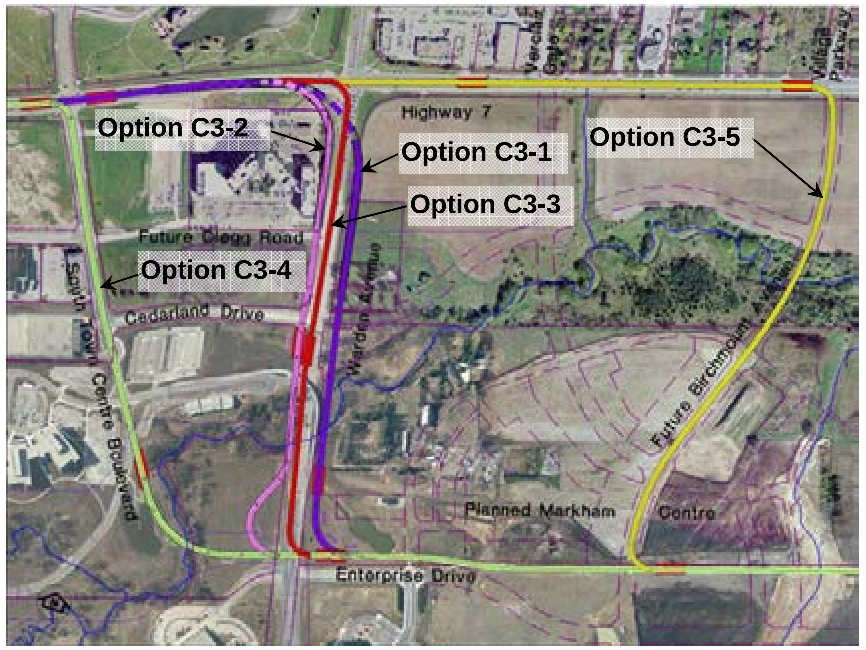


Figure 8.3-14
Local Options to Link Highway 7 to Markham Centre in the Vicinity of Town Centre Boulevard

Table 8.3-5 presents the findings of the evaluation based on the objectives and goals adopted generally for route evaluation in all segments. The evaluation shows that **Option C3-4** achieves many of the objectives sought for the transitway alignment although this option requires mitigation of adverse effects on the Rouge River crossing natural environment. The relative merits of this option are highlighted below.

- The potential to attract ridership on both the Highway 7 and Markham North-South Link services from surrounding land use is similar and high. Option C3-4 is most convenient to the existing and growing work force in this precinct.
- The alignment along South Town Centre Boulevard does not impact the Cedarland Woodlot while road widening on Warden Avenue to accommodate a transitway will affect the edge of the vegetation. There will be environmental impact at the crossing of Rouge River. However, the effects can be mitigated and must meet TRCA requirements.
- In terms of effects on traffic operations and access, Option C3-3 puts transit service reliability at greater risk due to traffic volumes at the Warden Avenue/Highway 7 intersection, but does not place any new restrictions on left-turn access to properties along the alignment. Option C3-4 on the other hand, avoids the congested Warden intersection but restricts left-turn access into adjacent properties to the signalized intersections along the route.
- Capital and property cost for this option is estimated to be the most cost-effective.

Table 8.3-5
Local Option Evaluation Findings for Options C3-1, C3-2, C3-3, C3-4 and C3-5 in Segment C

Objectives and Goals	Option C3-1 Warden: East Side Grade Separation	Option C3-2 Warden: West Side Grade Separation	Option C3-3 Warden: Median at Grade	Option C3-4 Town Centre Boulevard	Option C3-5 Birchmount Alignment
IMPROVE MOBILITY					
Station Catchment & Ridership Potential	• Alignment geometry (hor. & vert.) permits two stations: TCB/7 and on Warden south of Rouge crossing; • 1,100 units/ 91,500 m² employment (200m radius)	• Alignment geometry (hor. & vert.) permits three stations: TCB/7, south of Cedarland Dr. and Enterprise/Warden; • 2,030 units/ 105,200 m² employment (200m radius)	• Alignment geometry (hor. & vert.) permits three stations TCB/7, south of Cedarland Dr. and Enterprise/Warden; • 2,030 units/ 105,200 m2 employment (200m radius)	• Alignment geometry (hor. & vert.) permits three stations: TCB/7, IBM/TCB & Enterprise/Warden; • 1,840 units/ 127,400 m² employment (200m radius)	• Alignment geometry (hor. & vert.) permits three stations: TCB/7., Verclaire area/7 and Village/7; • 2,610 units/ 106,700 m2 employment (200m radius)
Influence on service speed, safety and ride comfort	• 2 horizontal curvatures to manoeuvre with; • Longer route (1,800 m) than TCB alignment but higher speed possible with grade separation at Warden/Hwy 7.	• 4 horizontal curvatures to manoeuvre with; • Longer route (1,900 m) than TCB alignment and curvature south of IBM entrance offsets benefit of grade separation at Warden/Hwy 7.	• 2 horizontal curvatures to manoeuvre with; • Longer route (1,800 m) than TCB alignment with service speed constrained by at-grade traffic intersections	• 2 horizontal curvatures to manoeuvre with; • Shorter route (1,500 m) but service speed constrained by at-grade traffic intersections	• 4 horizontal curvatures to manoeuvre with; • Longest route (2,200 m) with speed constrained due to curvature and residential street environment
Effect on transit service quality and reliability	• Delay potential at two intersections (TCB/7 & Clegg/Warden) with one unconventional intersection; • Hwy 7 median access grade separated.	• Delay potential at five intersections (TCB/7, Clegg/Warden, Cedarland/Warden, IBM/Warden & Enterprise/Warden) with four unconventional intersections. Hwy 7 median access grade separated.	• Delay potential at four intersections (TCB/7, Warden/7, Clegg/Warden & Enterprise/Warden) with two unconventional intersections; • Hwy 7 median access at-grade.	• Delay potential at five intersections (TCB/7, Clegg/TCB, Cedarland/TCB, IBM/TCB & Enterprise/Warden) with two unconventional intersections; • Hwy 7 median access at-grade.	• Delay potential at seven intersections (TCB/7, Warden/7, Verclair/7, Village/7, future int. on Birchmount & Birchmount/ transitway in Markham Centre) with two unconventional int.; • Hwy 7 median access at-grade
Interface with service on Markham North-South Link	• MNSL service to IBM requires more time consuming loop on Cedarland and bus only crossing of Warden.	• MNSL service to IBM requires more time consuming loop on Cedarland.	• MNSL service to IBM requires more time consuming loop on Cedarland and mixed traffic weaving on Warden.	• MNSL service can access IBM station through convenient loop on Hwy 7 transitway. • Transfer to Hwy 7 service at IBM station.	• MNSL service to IBM requires the most time consuming loop on Cedarland. • Transfer to Hwy 7 service at Birchmount / Markham Centre station.
PROTECT AND ENHANCE SOCIAL ENVIRONMENT					
Effect on street aesthetics and community vistas	• Underpass ramp on east side of Warden has negative effect on urban design and streetscaping opportunities. • Widening of Rouge crossing will require re- vegetation.	• Underpass ramp on west side of Warden has negative effect on urban design and streetscaping opportunities on hotel frontage and park zone. • Widening of Rouge crossing will require re- vegetation.	• Widening of Warden ROW limits median streetscaping; some streetscaping opportunity along Hwy 7 & in park zone. • Widening of Rouge crossing will require re-vegetation.	• Constrained Town Centre Blvd. ROW limits median streetscaping to minor island planting. • New Rouge crossing will require re-vegetation	• Some streetscaping opportunities on Hwy 7 but transitway and left turn lanes in narrow Birchmount ROW limit options
Road traffic access and pedestrian circulation	• No restriction on intersection movements. • One unconventional intersection at Clegg/Warden. • Limited access from Warden to east side properties. • Reduced opportunities for walk-in access to stations.	• No restriction on intersection movements. • Four unconventional intersections at Clegg/Warden, Cedarland/ Warden, IBM/Warden & Enterprise/Warden. • Limited access from Warden to west side properties. • Reasonable opportunity for walk-in access to stations.	• No restriction on intersection movements. • Two unconventional intersections at Warden/7 & Enterprise/Warden. • Access to adjacent properties unchanged from constraints imposed by Warden and Hwy 7 raised medians. • Reasonable opportunity for walk-in access to stations.	• No restriction on intersection movements. • Three unconventional int. at TCB/7, IBM/TCB & Enterprise/Warden. • Requires left & U-turns at intersections to access properties along Town Centre Blvd. • Good walk-in access to all stations.	• Some restriction on future movements on Birchmount intersection. • Two unconventional intersections at Village/7 & Birchmount/transitway in Markham Centre. • Requires left & U-turns at intersections to access properties along Birchmount and Hwy 7. • Reasonable walk-in access to all stations.
Community and pedestrian safety and security	• Interfaces with pedestrian crossings at 2 intersections. • Some inconvenience in accessing Enterprise/ Warden station from west.	• Interfaces with pedestrian crossings at 5 intersections. • Inconvenience in accessing Enterprise/ Warden station from west.	• Interfaces with pedestrian crossings at 4 intersections. • Inconvenience in accessing Enterprise/ Warden station from west.	• Interfaces with pedestrian crossings at 5 intersections. • Most convenience in accessing IBM/TCB station from west.	• Interfaces with pedestrian crossings at 7 intersections. • Most inconvenience in accessing station from west.
Potential for adverse Noise & Vibration Effects	• Very low due to operation near major arterial.	• Very low due to operation near major arterial.	• Very low due to operation in major arterial.	• Low due to operation in collector road with mixed use zoning	• Low due to operation in major arterial and collector road but residential zoning sensitivity on Birchmount
PROTECT NATURAL ENVIRONMENT					
Effect on aquatic ecosystems (watercourses)	• One new Rouge crossing adjacent to existing Warden Avenue crossing	• One new Rouge crossing adjacent to existing Warden Avenue crossing	• One Rouge crossing by widening existing Warden Avenue crossing	• One Rouge crossing at new location southeast of IBM. New location is not supported by TRCA, as per Valley and Stream Corridor Management Program (1994). New crossing design must accommodate meander belt and hundred year erosion limits of watercourse.	• One Rouge crossing at future Birchmount crossing. New location is not supported by TRCA, as per Valley and Stream Corridor Management Program (1994). New crossing design must accommodate meander belt and hundred year erosion limits of watercourse.
Effect on terrestrial ecosystems (Vegetation)	• Larger area effecting the Rouge Valley than TCB alignment	• Rouge Valley and Cedarland woodlot	• Rouge Valley and Cedarland woodlot	• Rouge Valley only	• Larger area on Rouge Valley at Birchmount than TCB alignment
PROMOTE SMART GROWTH/ ECONOMIC DEVELOPMENT					
Influence on Urban Form and TOD potential	• Two stations attracting transit–oriented development, one constrained by valley lands	• Three stations attracting transit-oriented development; • Alignment displaces development parcel on Warden south of Rouge River	• Three stations attracting transit-oriented development	• Three stations attracting transit – oriented development	• Three stations attracting transit – oriented development
Effect on business activities and goods movement	• Constrains development on northeast quadrant of Warden/Enterprise and affects Warden's east side retail frontage north of Rouge.	• Some potential impact on hotel parking and circulation. • Warden west side frontage displaced S. of Rouge	• Minor constraint on commercial development at Warden /Enterprise NE corner. • Median Station on Warden will require new pedestrian signal	• Left turn access to businesses restricted to signalized intersections on Town Centre Blvd. • No adverse effects on Warden.	• Left turn access to businesses restricted to signalized intersections on Hwy 7 between Town Centre Blvd. and Birchmount
MAXIMIZE COST-EFFECTIVENESS OF RAPID TRANSIT					
Effect on Capital and operating & maintenance costs	• Construction costs highest due to Hwy 7/Warden grade separation and new Rouge bridge. • Grade separation increases O&M costs	• Construction costs highest due to Hwy 7/Warden grade separation and new Rouge bridge. • Grade separation increases O&M costs	• Moderate construction costs, mainly roadworks and Rouge crossing widening at Warden. • O&M costs normal for at-grade transitway.	• Moderate construction cost, mainly roadworks and new Rouge bridge. • O&M costs normal for at-grade transitway	• High construction cost, mainly new roadworks and new Rouge bridge. • O&M costs normal for at-grade transitway
Property required	• Approx. 810 m of new transit ROW on east side of Warden.	• Approx. 860 m of new transit ROW on west side of Warden, IBM's valleyland.	• Approx. 810 m of Warden ROW widening mainly on west side.	• Approx. 940 m of TCB ROW widening, Rouge river valley land.	• Widening of Birchmount & Hwy 7 ROW for new transit lanes, approx. 1,150 m in length.
				Technically Preferred Option	

NOTE: TCB – Town Centre Boulevard MNSL – Markham North-South Link TOD – Transit-oriented Development O&M – Operation and Maintenance ROW – Right-of-Way
Distances measured from TCB to Birchmount/ Markham Centre pedestrian mall right-of-way

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Extensive consultation with developers and businesses was carried out to secure a right-of-way from Highway 7 to the planned Markham Centre. These discussions were concluded during August 2004 with IBM representatives indicating that they could not endorse a transit right-of-way across their property given that their long-term needs on the property could not be predicted with any certainty at this time. The YRTP Network Implementation Plan schedule contemplates segregated transitway construction in this segment in 2009 at the earliest.

Recognizing the current position of the affected business, this EA seeks MOE and CEAA approval of **Option C3-4** as the preferred route along South Town Centre Boulevard. Option C3-4 offers the greatest long-term benefit in support of both existing commercial and planned residential development in this local area. However when funding has been secured for this segment, its implementation will depend on whether the affected business is in a better position at that time to confirm their long-term land needs and accommodate the rapid transit right-of-way. It is proposed to consult with this business prior to commencing preliminary and detailed designs to determine whether a right-of-way and station can be integrated within their property. If provision of a new right-of-way cannot be negotiated at that time, the Region will submit an amendment to this EA to obtain approval of a widening of the Warden Avenue right-of-way along the businesses' frontage will become necessary to allow the transitway to be placed in the Warden Avenue median, as defined in Option C3-3, the next best alternative.

8

8.3.5.2 Local Options for the Markham Centre Alignment and crossing of GO Transit's Stouffville Rail Line

Development of an alignment through Markham Centre required a comparison of the two options available to traverse the proposed development between Warden Avenue and GO Transit's Stouffville Rail Line.

These options comprise either the proposed Enterprise Drive right-of-way or the parallel easement for the York Durham Sanitary Sewer the surface of which has been designated as a civic mall in the Markham Centre Secondary Plan. Both options anticipate a new crossing at the re-aligned Tributary 4 of the Upper Rouge River. In consultation with the Town of Markham staff, the study conducted an evaluation of the two alignment options and found an alignment along the civic mall easement to be the preferred for the reasons tabulated below in **Table 8.3-6**.

Table 8.3-6
Evaluation of Local Alignment Options at the Markham Centre

Planning Criteria	Enterprise Drive Option		Civic Corridor Option	
Warden Crossing				
Opportunity to grade-separate RT if required in future.	Grade separation of median Rapid Transit is feasible.	Good	Grade separation of Rapid Transit in north side ROW is feasible.	Good
Impact of at-grade RT location in ROW on Enterprise/ Warden intersection traffic.	RT operations in median conflict with left turns reducing auto green time.	Fair	RT operations in north side ROW conflict with both left and right turns reducing auto green time and potentially complicate pedestrian movements.	Poor
Ability to accommodate junction with N-S link at Warden, if required.	RT movements from N-S link to median transitway impact some intersection traffic movements.	Fair	RT movements from N-S link to north-side transitway impact all intersection traffic movements.	Fair
Effect of inserting a station at the Warden intersection.	At-grade median station location east or west of Warden offers reasonable access to walk-in passengers from all directions. (All passengers cross half width of Enterprise)	Fair	At-grade north-side station location east or west of Warden offers good access to walk-in passengers from north directions but passengers from south must cross full width of Enterprise.	Good
Effect of ROW location on RT alignment to the west of Markham Centre.	RT alignments towards northwest will require an awkward transition from Enterprise median.	Poor	RT alignments towards northwest can be achieved directly without any transition.	Very Good
Unionville GO Station interface				
Quality of inter-connection with GO Station facilities. (Ease of transfer between modes)	Grade separation of Enterprise with GO Rail will require a depressed RT station. Access to GO Rail platform level feasible by walkway on side of rail bridge.	Good	Grade separation of Enterprise with GO Rail will require a depressed RT station. Access to GO Rail platform level feasible by walkway on side of rail bridge. Entire width of Enterprise Drive must be crossed.	Fair-Good
Effect of grade-separation of RT and GO Rail Line.	Grade separation of median RT and Enterprise Dr. feasible but both should be aligned to South to improve connection to 407 service platforms.	Fair	Grade separation of north-side RT and Enterprise Dr. feasible but both should be aligned to South to improve connection to 407 service platforms.	Fair
Relationship of RT location to facilities for inter-regional 407 BRT service.	RT in median of Enterprise in current location would be very remote from more southern 407 service platform.	Fair – Good	RT on north side of Enterprise in current location would be very remote from a south side 407 service platform.	Fair
Markham Centre Stations/Stops				
Ability to accommodate stations at high demand nodes. (compatibility with proposed land use)	Enterprise median location can accommodate single central station in Markham Centre zone but reverse curves preclude two stations at third points, if required.	Fair	RT in Civic ROW can accommodate both single central and third point stations, if required.	Very Good

Table 8.3-6
Evaluation of Local Alignment Options at the Markham Centre

Planning Criteria	Enterprise Drive Option		Civic Corridor Option	
Impact of ROW widening required to accommodate station/stop facilities.	Approx 14metre widening required at station(s) will impact adjacent parcel size and, maybe, also adjacent land use.	Fair	Depending on location of trunk sewer, local widening may be required at stations.	Good
Quality of access to station by all modes. (pedestrian, auto pick-up/drop-off)	Pedestrian access fairly good but requires crossing of traffic lanes to reach median platforms. Auto pick-up/drop-off possible on Enterprise and N-S roads.	Fair	Pedestrian access very good as direct platform access is possible. Close auto pick-up/drop-off is only possible on N-S roads.	Good
Transit ROW				
Influence of ROW choice on RT performance through downtown segment. (alignment geometry)	Reverse curve geometry reduces ride comfort and service speeds. Turning movements at crossroad intersections conflict with RT operations. Generally a higher potential for traffic to impact RT operation.	Fair	Minor impact on RT geometry at west extremity if RT remains on north side of Enterprise Dr. Interface of RT operations and street traffic confined to cross-streets.	Good
Degree of ROW widening required for each location option. (exclusive of cut or fill requirements)	Minimum 10 metre widening required between stations to accommodate at-grade RT alignment potentially reducing net developable land and north-south parcel dimension.	Poor	Depending on location of trunk sewer, widening of Civic ROW unlikely to be required thus retaining net developable parcels proposed.	Good
Impact of RT/ROW choice on road traffic circulation	Median transitway will lower intersection level of service.	Fair	Minimal traffic delays as RT vehicles cross intersecting streets only. RT signal coordination with Enterprise signals required to avoid conflict with queuing traffic.	Good
Influence of ROW choice on transition opportunities	Any transitions from median to outside ROW at Centre extremities would compromise adjacent intersection operation.	Poor	Transition to median location, if essential at extremities, creates long skewed crossings compromising adjacent intersections and traffic operations.	Poor
Land Use and Other Facilities				
Effect of RT insertion on adjacent land uses	RT in median is part of general street traffic and will have limited direct effect on adjacent land use as it is separated from adjacent property lines. Access to properties adjacent to Enterprise Dr. will be restricted to right-in/right-out and rear entry from cross-streets	Fair	RT on edge of Civic ROW (to avoid trunk sewer) will require urban design sensitive to adjacent land uses. Opportunity to integrate internal station(s) with surrounding land uses. Access to properties constrained on one side of ROW only.	Good
Effect of RT location on built form	RT and road consolidation orients buildings to a single (Enterprise) frontage	Good	Separation of RT and road creates ambiguity for building frontage	Fair

Table 8.3-6
Evaluation of Local Alignment Options at the Markham Centre

Planning Criteria	Enterprise Drive Option		Civic Corridor Option	
Effect of RT location on streetscape opportunities	Wider street to accommodate RT means less street definition and comprises opportunities for median landscaping.	Fair	RT in Civic ROW allows a better street definition on Enterprise and more median landscaping opportunity.	Good
Effect of RT location on parking	Compromises ability to get off-peak, on street parking and RT restricts left turns into off-street parking facilities.	Fair	Allows off peak, on street parking on Enterprise as well as left turns into parking facilities along Enterprise.	Good
Effect of RT location on pedestrian and bike path circulation	RT in median complicates crossings of Enterprise, potentially compromising safety. Eliminates bike path from Enterprise cross-section	Fair	Enterprise pedestrian crossings will be less complex and likely safer and bike path can be accommodated in Civic ROW. RT integration increases safety challenges in planning pedestrian and cycle paths.	Good
Compatibility with other facilities in ROW	RT row conflicts with trunk sewer, Cogen and shallow street utilities at west end where Enterprise Dr. overlaps easement.	Fair	RT location in ROW can accommodate trunk sewer and Cogen maintenance access requirements.	Good
YRT Interface				
Ease of integration of feeder bus transfer facilities. (Considering all stations in Town Centre.)	Can be accommodated if feeder buses use Market St. Normal intersection crossing to access Warden Station.	Good	Can be accommodated if feeder buses use Market St. Normal intersection crossing to access Warden Station.	Good
Impact of station location on feeder bus routing or circulation pattern.	With single internal station, feeder bus routing is indirect but if two internal stations are provided, feeder bus routing can follow collector roads.	Fair	With single internal station, feeder bus routing is indirect but if two internal stations are provided, feeder bus routing can follow collector roads.	Fair
	TECHNICALLY PREFERRED OPTION			

Following the selection of the civic mall alignment, alternative alignments to grade separate the transitway from GO Transit's Stouffville Rail Line near the Unionville GO Station were identified and evaluated. A range of eight alternatives encompassing both over and underpasses located either north of the GO Station adjacent to Enterprise Drive underpass, midway between the Enterprise Drive crossing and the Highway 407 right-of-way, or thirdly south of the Markham Centre Development lands and adjacent to the future 407 Transitway easement.

An initial screening evaluation of these alternatives led to the selection of the two alignments C-C1 and C-C2 shown in **Figure 8.3-15**. These options were considered the best alignments representing either a northern route integrated with the Enterprise Drive underpass or a southern route aimed at placing the rapid transit station closer to the planned BRT station in the future 407 Transitway easement. The mid-block alignment option was eliminated because of the need to sever the large development parcel adjacent to the GO Line and Highway 407 and provide a costly elevated or underground station on the GO parking lot site.

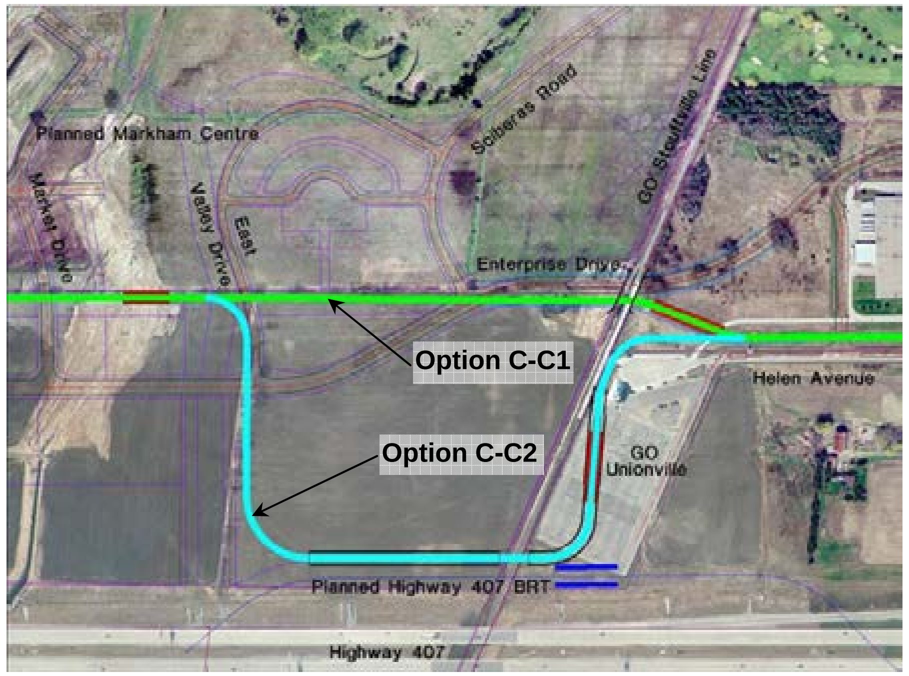

Figure 8.3-15
Local Options of Alignment in Markham Centre and GO Unionville Station

The northern and southern alignment options were then compared to select the preferred alignment for the GO Stouffville Line grade separation and the optimum station location. This station is to serve the east end of Markham Centre, as well as redevelopment east of the GO Line and provide good connectivity with GO Rail and future 407 Transitway services. The findings of this evaluation are presented in **Table 8.3-7** with the recommendation that the northern alignment, Option C-C1 be adopted allowing the transitway to be integrated with the Enterprise Drive grade underpass of the GO Line.

Table 8.3-7
Evaluation of Local Alignment Options C-C1 and C-C2 in Segment C

	Planning Criteria	Option C-C1 North of GO Station		Option C-C2 South of GO Station	
A	Unionville Station Interfaces				
1	Quality of inter-connection with GO Station facilities. (Ease of transfer between modes)	Vertical transfer to rail level required. Covered walkway to GO station required (110m±).		Vertical transfer to rail level required. Covered walkway to GO station required (70m±).	✓
2	Effect of grade-separation of RT and GO Rail line.	Integrated grade separation structure and temporary rail diversion with Enterprise.	✓	Separate tunnel under GO required. Separate temporary rail diversion or complex structure required.	
3	Relationship of RT location to facilities for future inter-regional 407 Transitway service.	Centre of closest RT platform to closest future 407 Transitway platform is 300m±.		Centre of closest RT platform to closest 407 BRT platform is 120m±.	✓
4	Impact on existing / proposed GO Rail facilities and operations	Joint impact with Enterprise during construction of grade separation.	✓	Underground station facilitates central access to future GO Rail platforms. Requires second grade separation.	
B	Transit ROW				
1	Influence of RT alignment on service speed / travel time through downtown segment. (alignment geometry)	Alignment very direct.	✓	Circuitous alignment.	
2	Impact of RT alignment on maintenance	Two minimum radius curves. Increased storm water pumping station capacity required.	✓	Five minimum radius curves. 200m± underground section requires ventilation.	✓
3	Impact of RT alignment on road traffic circulation. (at-grade crossings)	Enterprise intersection grade separated. One simple at-grade intersection.	✓	Two at-grade intersections.	
C	Land Use and Other Facilities				
1	Effect of RT routing on adjacent land uses west of GO ROW	RT profile restricts serviceability of adjacent land.	✓	RT ROW not available for development. RT forms barrier between land uses south of Enterprise.	
2	Effect of RT routing on adjacent land uses east of GO ROW	RT profile restricts serviceability of adjacent land to the north. RT limits access to Helen Ave.	✓	RT profile restricts serviceability of adjacent land to the north. RT limits access to Helen Ave.	✓
3	Effect of RT location on built form	Limited.	✓	Limits redevelopment options on GO site.	
4	Effect of RT location on streetscape / urban design opportunities	RT -Enterprise grade separation limits urban design opportunities.		RT remote from most development areas.	✓

8

Table 8.3-7
Evaluation of Local Alignment Options C-C1 and C-C2 in Segment C

	Planning Criteria	Option C-C1 North of GO Station		Option C-C2 South of GO Station	
5	Effect of RT location on parking	Restriction only if parking proposed within YDSS corridor.	✓	Temporary impact on GO parking during construction.	
6	Effect of RT location on pedestrian and bike path circulation	Retained cut west of Enterprise crossing restricts pedestrian or bike crossings.		RT remote from areas proposed for pedestrian or bike facilities.	✓
7	Potential for joint development	Station could be integrated in joint development.	✓	Potential only if GO site redeveloped.	
8	Impact on, or by, YDSS	Does not cross YDSS.	✓	Reduced cover (to 2m) at crossing north of GO station.	
D	Factors affecting Capital Cost				
1	Length of RT alignment (between common points)	820m	✓	1120m	
2	Length of underground section	None	✓	210m	
3	Length of retained cut	190m retained one side adjacent to Enterprise. 430m retained two sides.		400m retained two sides.	✓
4	Area± of rail or road grade separations	Enterprise - RT - 1,400 m2; GO - RT - 240 m2	✓	Included in item D2.	✓
5	Complexity of RT station	Simple, retained cut station	✓	Underground station and adjacent tunnel section require ventilation.	
6	Order of Magnitude Costs		✓		✓
		Technically Preferred Option			

NOTE: RT – Rapid Transit ROW – Right-Of-Way YDSS – York-Durham Sanitary Sewer

8.3.5.3 Local Alignment Options to Link the Markham Centre Alignment to Highway 7 in the Vicinity of Unionville

Two options, shown in **Figure 8.3-16**, to link the planned Markham Centre from GO Unionville Station to Highway 7 were considered.

- **Option C-D1**: Through Main Street Unionville between Helen Avenue and Highway 7. This Old Kennedy Road, now Main Street Unionville was retained after the construction of Highway 407 and relocation of Kennedy Road. It was considered as an option because of the possibility to use this corridor without having to widen the street, i.e., two of the four existing lanes on Main Street Unionville would be used for the transitway and the rest for regular traffic.
- **Option C-D2**: Along Helen Avenue and Kennedy Road between Helen Avenue and Highway 7.

Evaluation findings, presented in **Table 8.3-8** indicate that **Option C-D2,** using an alignment along Kennedy Road, is preferred for the following reasons:

- A Kennedy Road alignment offers a better location for a future station to serve existing adjacent land uses and further development.
- The potential effects on the social and natural environment (Rouge River crossings) are minor compared to the alternative alignment on Main Street.
- An alignment using Main Street Unionville is not compatible with the local community's vision of the area as an extension of the Unionville Heritage District.

Figure 8.3-16
Local Options to Link Markham Centre to Highway 7

Table 8.3-8
Evaluation of Alignment Options C-D1 and C-D2 in Segment C

Objectives and Goals	Option C-D1 Main St. Unionville between Helen Ave. and Hwy. 7	Option C-D2 Kennedy Rd. between Helen Ave. and Hwy 7
IMPROVE MOBILITY		
• Inter-regional transit connectivity • System expansion flexibility • Speed, safety, ride comfort • Service quality and effectiveness • Station catchment • Convenience of access	• Transitway will reduce existing road and parking capacity unless ROW is widened • Good alignment geometry is possible. • Future station catchment area has limited development potential due to Rouge valley. • Transit speed may have to be restricted in local street environment	• Good alignment geometry using median of Kennedy Road. • Some local right-of-way widening is needed . • Future station location offers convenient access to mixed-uses on west side of Kennedy and residential neighbourhoods on east side.
PROTECT & ENHANCE SOCIAL ENVIRONMENT		
• Effects on communities • Road traffic and pedestrian circulation • Public safety and security • Noise and vibration • Effects on cultural resources • Community vistas and street aesthetics	• Transit operations may be considered intrusive in the proposed residential neighbourhood and valley lands along the alignment.. • Main Street Unionville alignment is the southern extension of the Heritage district north of Hwy 7 and includes the heritage Esso station that may be impacted an alignment to LRT standards.	• Low potential for adverse noise effects on residential community north-east of Kennedy. • Better accessibility for residential neighbourhood north-east of Kennedy. • Transitway offers opportunity for enhancement of Kennedy Road streetscape.
PROTECT NATURAL ENVIRONMENT		
• Effect on aquatic ecosystems • Effect on terrestrial ecosystems • Effect on Air Quality • Effect on Hydro-geological conditions	• Requires two Rouge River crossings on Hwy 7 and Main Street (no effect on latter bridge if transit uses existing lanes).	• No interference with the natural environment. • Bypasses Rouge River crossings
PROMOTE SMART GROWTH/ ECONOMIC DEVELOPMENT		
• Regional/ Mun. Plans and Urban Structure • Access to community facilities • Effect on business activities • Goods movement • Promote transit-oriented development (TOD)	• Limited opportunity to support increased business activity in the area • Offers limited opportunity for TODs or future re-development	• Conforms best to planning policies and supports urban structure of area. • Provides good potential for increase in existing business activities (Hwy 7, Kennedy) • Provides some opportunities for TODs / higher order use in the southern portion
MAXIMIZE COST-EFFECTIVENESS OF RAPID TRANSIT		
• Effect on Capital Costs • Property required • Effect on operating and maintenance costs	• Less costs due to using existing lanes for the transitway (No widening necessary). • Potential for the need to widen the Rouge River crossing on Hwy 7. • Some acquisition of land needed (corner of south end of Main St)	• Some widening necessary on the length of the alignment.
		Technically Preferred Option

8.3.5.4 Primary Route Alternative C1: Highway 7 between Woodbine Avenue and Kennedy Road

Alternative C1 is a route entirely on the existing Highway 7 between Woodbine Avenue and Kennedy Road and shortlisted in **Chapter 5** to reflect the relative advantages/disadvantages of a direct east-west route passing Markham Centre along its north edge. This relationship to the planned centre is shown in **Figure 8.3-17**.

Potential Station Locations on Alternative C1

Potential station locations considered for Alternative C1 in Segment C were at Woodbine Avenue, Montgomery Court (future), Town Centre Boulevard, Warden Avenue, Village Parkway, Sciberras Road, and Kennedy Road.

8.3.5.5 Primary Route Alternative C2: Woodbine Avenue Area, Yorktech Drive to Markham Centre and Kennedy Road to Highway 7

To support the planned Markham Centre, two alternatives, C2 and C3, were developed as variations of the Highway 7-Markham Centre route recommended in **Chapter 5**.

In Alternative C2, the transitway, shown in **Figure 8.3-17**, leaves Highway 7 at Woodbine Avenue, turns south to Yorktech Drive, east to Town Centre Boulevard, south to the southern end of Town Centre Boulevard and east towards Warden Avenue, crossing the Rouge River Valley system four times in the process with all new crossings. A variation using Cochrane Drive and Lanark Road, to continue east across Woodbine Avenue into Yorktech Drive was identified to avoid congestion at the Highway 7/Woodbine intersection. This local alignment would have been evaluated further if Alternative C2 was selected as the preferred alignment.

The transitway travels through the planned Markham Centre Civic Mall and passes under the Stouffville GO Line en route to the Unionville GO Station. From the station, the alignment follows Helen Avenue to Kennedy Road where it turns north to rejoin Highway 7.

Potential Station Locations on Alternative C2

Potential station locations considered for Alternative C2 in Segment C were at Woodbine Avenue, Yorktech Drive (at Woodbine), Rodick Road (future), Town Centre Boulevard, Warden Avenue, future Street G "Market Drive", GO Unionville Station and Kennedy Road.

8.3.5.6 Primary Route Alternative C3: Highway 7 from Woodbine Avenue to South Town Centre Boulevard and Kennedy Road to Highway 7

In Alternative C3, the transitway, shown in **Figure 8.3-17**, travels in the median of Highway 7 from Woodbine Avenue to Town Centre Boulevard and turns south on Town Centre Boulevard to enter IBM's private road network where the transitway turns south-easterly crossing the Rouge River Valley and Warden Avenue. The transitway then shares the same alignment as Alternative C2 through the planned Markham Centre Civic Mall to Helen Avenue and back to Highway 7 on Kennedy Road. The alignment will cross the Rouge River Valley system three times with one being an existing crossing.

Potential Station Locations on Alternative C3

Potential station locations considered for Alternative C3 in Segment C were at Woodbine Avenue, Montgomery Court (future), Town Centre Boulevard, IBM's private road, Warden Avenue, future Street G "Market Drive", GO Unionville Station and Kennedy Road.

8.3.5.7 Evaluation of Route Alternatives

The findings of a comparative evaluation of Alternatives C1, C2 and C3 are summarized in a synopsis in **Table 8.3-9**. Detailed evaluation findings can be found in **Appendix M Tables 11** to **15**.

This evaluation of route alternatives between Woodbine Avenue and Kennedy Road has led to the selection of **Alternative C3** as the preferred alternative because:

- It provides direct service to, and through, the planned Markham Centre from both east and west.
- It provides the best linkage of the existing Markham Civic Centre facilities to the major mixed-use Markham Centre development.
- A good connection to GO Transit's Stouffville Rail service and a future 407 Transitway service can be achieved at Unionville GO Station.
- Proposed station locations will offer convenient access to both existing and future mixed-use development along most of the route.
- It offers the greatest potential for urban design improvements in the Highway 7 Corridor through a combination of arterial road and civic mall rights-of-way.
- Although, not as minimal as a Highway 7 only route, effects on the natural environment are confined to a single new crossing of a Rouge River tributary.
- Capital costs are estimated to be similar to the other alternatives and land acquisition costs are limited to approximately 0.6 km of the route.
- Traffic interface concerns on the Highway 7 and Kennedy sections can be mitigated and attenuation of noise and vibration on the civic mall is feasible if required.

Future consideration of parallel express rapid transit service entirely on Highway 7 is also recommended for this section between Town Centre Boulevard and Kennedy Road.

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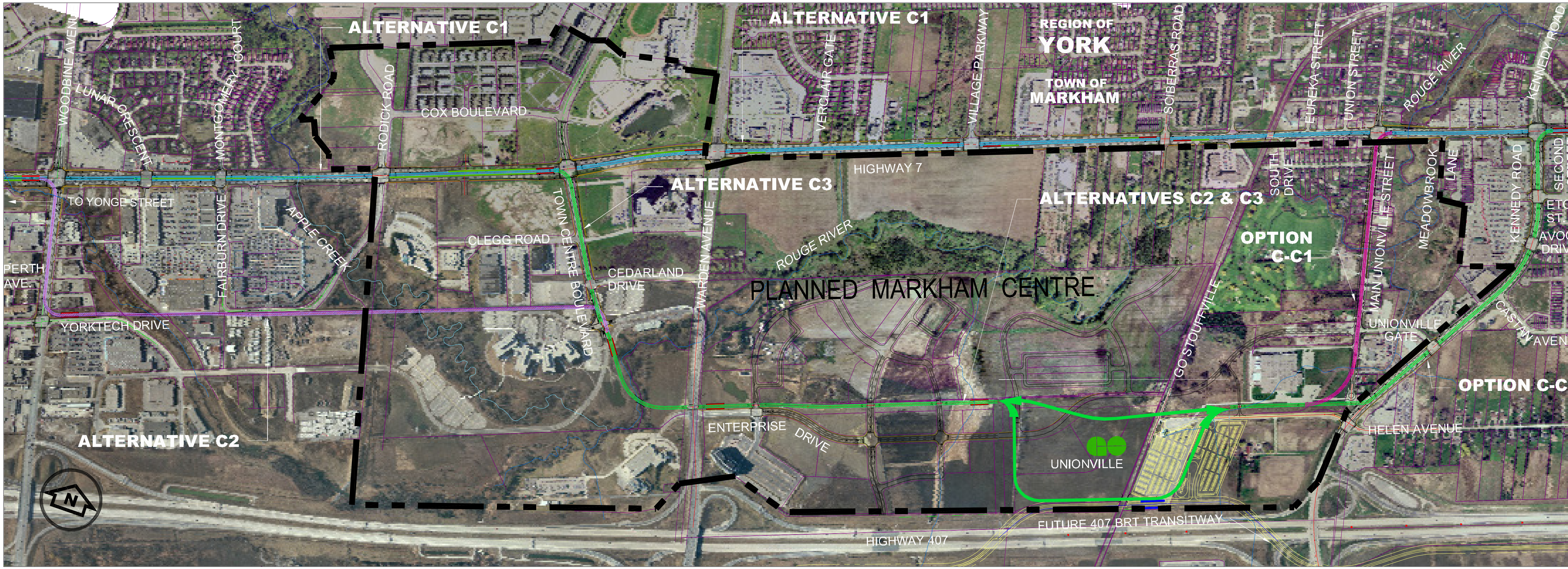
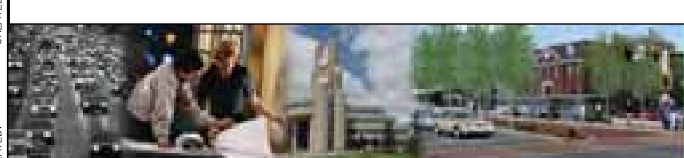


PRIMARY ROUTE ALTERNATIVES C1, C2 AND C3 AND LOCAL OPTIONS C-C1 AND C-C2

SEGMENT C - YONGE STREET TO KENNEDY ROAD



YRTP

STATIONS
TRANSITWAY
PROPOSED TRAFFIC LANES
PROPOSED SIDEWALK
PROPOSED LANDSCAPE
PROPOSED RIGHT OF WAY
EXISTING ROADWAYS
EXISTING RIGHT OF WAY
MUNICIPAL BOUNDARIES — CITY OF VAUGHAN / TOWN OF MARKHAM
REGIONAL BOUNDARIES — REGION OF YORK / REGION OF PEEL
100 80 60 40 20 0 100
SCALE

HIGHWAY 7 CORRIDOR AND VAUGHAN NORTH-SOUTH LINK PUBLIC TRANSIT IMPROVEMENTS ENVIRONMENTAL ASSESSMENT

8.3-17

FIGURE

DRAWING NAME: J:\Data\PM1435\PM\dwgs\HIGHWAY 7 EA PLATES\Figures\Figure 8.3-02-Hwy 7_8.3-03-B1_8.3-07-B4_8.3-17-C1+8.3-18_8.3-19.dwg
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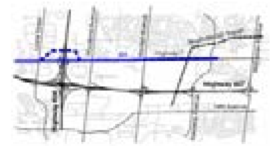
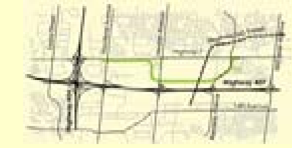
Table 8.3-9

Synopsis of Primary Route Alternative Evaluation Findings for Segment C

Objectives and Goals		Alternative C1 Hwy 7 between Woodbine Ave. and Kennedy Rd. 		Alternative C2 Woodbine Ave., Yorktech Dr. to Markham Centre & Kennedy Rd. to Hwy 7 		Alternative C3 Hwy 7 from Woodbine Ave. to S. Town Centre Blvd. to Markham Centre & Kennedy Rd. to Hwy 7 
IMPROVE MOBILITY						
Maximize inter-regional and local transit connectivity	◔	▪ Indirect service to future Markham Centre reduces daily boardings by 4-5% ▪ Has no direct connection to Stouffville GO service ▪ Good alignment geometry but Hwy 7 traffic activity could affect reliability ▪ Convenient access from residential use north of and mixed-use on Hwy 7	◑	▪ Provides direct service to future Markham Centre and direct connection to GO Stouffville rail service ▪ Fair alignment geometry on partially exclusive ROW but still requires several at-grade intersections ▪ Station catchment is mainly employment and Markham Centre mixed-use	◕	▪ Provides direct service to future Markham Centre and direct connection to GO Stouffville rail service ▪ Fair-good alignment geometry requiring several intersections and partial interface with Hwy 7 traffic activity ▪ Convenient access to mixed- uses along most of route
Maintain flexibility to expand network	◕		◑		◕	
Alignment geometry that maximizes speed & ride comfort & minimizes safety risks & maintenance costs	●		◑		◕	
Increase attractiveness of rapid transit service	◑		●		●	
Station locations that maximize ridership potential of rapid transit service	◑		◕		◕	
Maximize convenience of access to rapid transit system	◕		◔		◑	
PROTECT AND ENHANCE SOCIAL ENVIRONMENT						
Minimize adverse effects on and maximize benefits for communities in corridor	●	▪ Causes very few adverse community effects after construction ▪ Hwy 7 median location has most traffic interface with greater safety risk ▪ Alignment entirely in Hwy 7 minimizes effect of system noise and vibration and offers good urban design potential ▪ Minimal effect on community vistas	◑	▪ Some intrusion in river/ creek valleys but few other adverse community effects ▪ No Hwy 7 traffic interface but route requires most intersections ▪ Noise & vibration attenuation may be required in Markham Centre civic mall and river valleys. ▪ Urban design potential mainly in Markham Centre and Kennedy Road. ▪	◕	▪ Minor intrusion in river valley and few other adverse community effects ▪ Some Hwy 7 traffic interface and several intersections increases safety risk ▪ Noise & vibration attenuation may be required in Markham Centre civic mall ▪ Good urban design potential in Markham Centre, on Kennedy Road and Hwy 7, particularly at Civic Centre
Maintain or improve road traffic and pedestrian circulation	●		◑		◕	
Maintain a high level of public safety and security in corridor	●		◑		◕	
Minimize adverse noise and vibration effects	●		◕		◕	
Minimize adverse effects on cultural resources	◕		●		●	
Minimize disruption of community vistas and adverse effects on street and neighbourhood aesthetics	◕		◑		◕	
PROTECT NATURAL ENVIRONMENT						
Minimize adverse effects on Aquatic Ecosystems	◕	▪ Has little adverse effect on aquatic ecosystems ▪ Potential for some effects on terrestrial ecosystems due to highest numbers of ecosystems adjacent to the alignment. ▪ Highest number of potentially hazardous material sites	◔	▪ Potential for adverse effects on aquatic ecosystems due to the alignment requiring new crossings at Beaver Creek, Apple Creek, Upper Rouge River and Rouge River Tributary 4. ▪ Little adverse effect on terrestrial ecosystems ▪ Few potentially hazardous material sites	◑	▪ Potential for some effects on aquatic ecosystems due to the alignment requiring bridge widening at Beaver Creek and Apple Creek, and new crossings at Upper Rouge River and Rouge River Tributary 4. ▪ Some potential effect on terrestrial ecosystem ▪ Few potentially hazardous material sites
Minimize adverse effects on Terrestrial Ecosystems	◔		◕		◑	
Minimize adverse effects on corridor hydrogeological, geological, hydrological and geomorphic conditions	◔		◕		◕	
PROMOTE SMART GROWTH/ ECONOMIC DEVELOPMENT						
Support Regional and Municipal Planning Policies and approved urban structure	◕	▪ Conforms well with planning policies and provides acceptable access to community facilities, but by-passes Markham Centre ▪ Provides good potential for increase in existing business activities along Hwy 7 ▪ Provides opportunities for higher order uses	◑	▪ Conforms with planning policies and supports urban structure of Region ▪ Provides good access to community facilities ▪ Serves Markham Centre well, Civic Centre less convenient ▪ Provides some potential for increase in existing business activities (Kennedy, Woodbine) ▪ Provides good opportunities for TODs / higher order use	●	▪ Conforms best with planning policies and supports urban structure of Region ▪ Provides very good access to community facilities ▪ Serves both Civic Centre and Markham Centre well ▪ Provides good potential for increase in existing business activities (Hwy 7, Kennedy) ▪ Provides good opportunities for TODs / higher order use
Provide convenient access to social and community facilities in corridor	◑		◕		●	
Minimize adverse effects on business activities in corridor	◕		◑		◕	
Protect provisions for goods movement in corridor	◕		◕		◕	
Promote transit-oriented development	◑		●		◕	
MAXIMIZE COST-EFFECTIVENESS OF RAPID TRANSIT						
Minimize capital cost of vehicles, facilities and systems required	●	▪ Capital cost +/- $147 million ▪ Minor property cost ▪ Lowest vehicle and O&M costs due to alignment being shortest.	◕	▪ Capital cost +/- $154 million ▪ Property cost for 2.5km ROW ▪ Vehicle and O&M costs marginally higher due to longer alignment	◕	▪ Capital cost +/- $156 million ▪ Property cost for 0.6 km ROW ▪ Vehicle and O&M costs marginally higher due to longer alignment.
Minimize cost effects of/on adjacent properties to implement facilities	◑		◕		◕	
Minimize adverse effects of alignment characteristics on operating and maintenance costs	●		◑		◑	
						Technically Preferred Alternative

LEGEND: Least Responsive ○ ◔ ◑ ◕ ● Most Responsive

NOTE: TOD – Transit-oriented Development O&M – Operation and Maintenance ROW – Right-of-Way

The above indicators were presented to the public at Open House #2. Certain indicators shown at the time have been removed from this evaluation as there was no significant difference in the response of the three alignments options in meeting the goal, particularly effects on air quality.

Detailed evaluations can be found in Appendix M Tables 11 to 15.

8

8.3.6 Segment D - Route Alternatives

8.3.6.1 Highway 7 Only Route

For this remaining 12 km segment, the initial screening discussed in **Chapter 5** recommended Highway 7 as the most logical continuous route, illustrated in **Figure 8.3-1**, to serve major trip generators such as Markville Mall and the Markham-Stouffville Hospital. **Figures 8.3-18 and 8.3-19**, presented at the Second Public Consultation Centre, illustrates the details of the proposed transitway. A dedicated transitway in the median has been assumed for the 4 km section from Kennedy Road to Main Street Markham (Markham Road). Between Main Street Markham (the Markham Heritage Conservation District) and Wootten Way, the Elmwood and Andrews Cemeteries on both sides of Highway 7 make widening impossible. Hence a 1.3 km section of mixed traffic operation has been assumed for this section. In the 2.75 km section, from Wootten Way to Reesor Road, widening of Highway 7 for a dedicated transitway is feasible and is assumed.

In the remaining 2.25 km section from Reesor Road to the York-Durham Line, widening of Highway 7 for dedicated transit lanes is not desirable due to encroachment on property in the Locust Hill District. This area includes the Locust Hill Cemetery and has potential to be designated a Heritage District in the future. Ridership forecasts and hence service frequencies, do not warrant dedicated transit lanes until future development in this section results in traffic congestion levels affecting service reliability. Therefore, operation in mixed traffic has been assumed until such time as a dedicated transitway is warranted. The mixed traffic operation will still allow an interface with the existing Durham transit services. If development is approved east of Reesor Road in Markham and in Pickering, associated with the planned airport and the Seaton Community expansion, protection of a right-of-way wide enough to accommodate dedicated transit lanes along the remainder of Highway 7 should be pursued through the site plan approval process for adjacent development.

At the intersection of Highway 7 and Reesor Road, the Highway 7 alignment is re-aligned to avoid impact on the historical Reesor cairn located at the northeast corner. Developing the transitway, mostly in the median of Highway 7 offers good access to stations and local transit, and can support a major improvement in the urban design of the corridor in Segment D.

Assuming the urban structure of the east-west corridor through this segment is to be concentrated around Highway 7, rapid transit service entirely on the highway will best support this planning objective. Local diversions to access Markham-Stouffville Hospital and the planned, Markham East business and commercial areas are discussed below.

8.3.6.2 Local Alignment Options to Serve Markham Stouffville Hospital and Cornell Community Facilities

The study considered three local alignments, shown in **Figure 8.3-20** for accessing the Hospital and environs:

- **Option D1:** An alignment leaving Highway 7 at Ninth Line, turning north to Church Street, east to the proposed Bur Oak Drive, and south to rejoin Highway 7.
- **Option D2:** An alignment leaving Highway 7 at the Ninth Line intersection, passing through the future southern Cornell development south of the Hospital and returning to Highway 7 on Bur Oak Drive east of the Hospital.
- **Option D3:** An alignment along Highway 7 with a branch to a transit terminal up Bur Oak Drive on the eastern edge of the Hospital property.
- **Option D4:** An alignment entirely on Highway 7 with a station at the Bur Oak Drive intersection and a local service connection to the Hospital.

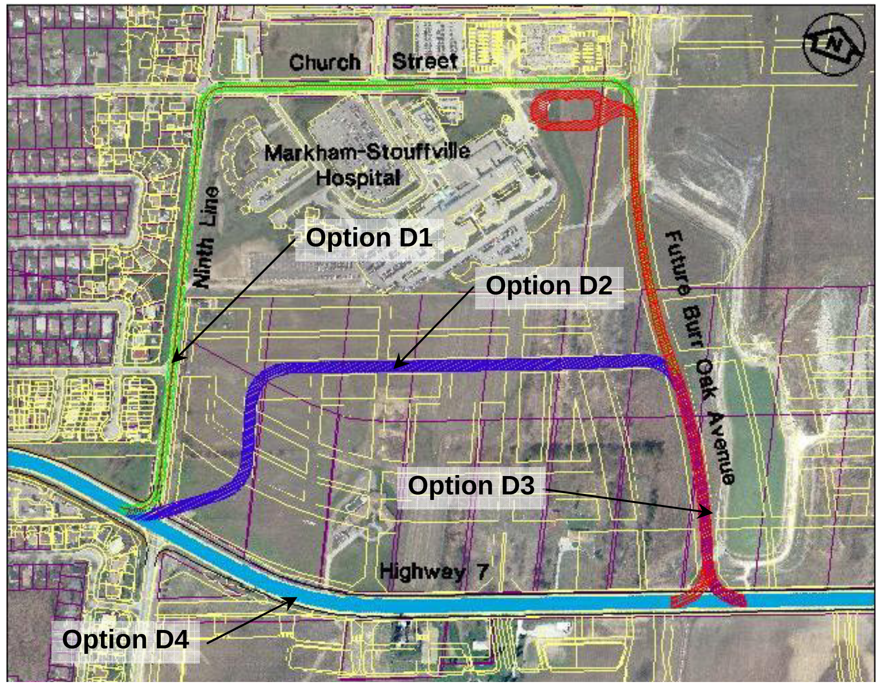


Figure 8.3-20
Local Options for Accessing the Markham-Stouffville Hospital

A comparative evaluation of the above options led to the recommendation that an alignment remaining on Highway 7 (Option D4) be adopted for the service through the Cornell/Hospital Area for the following reasons:

- Although Option D1 will serve the Hospital directly, it is a very circuitous alignment with several turns at busy intersections on Ninth Line and Church Street.
- Ridership from the Cornell Area and the Hospital can be brought to a station on Highway 7 at Ninth Line or Bur Oak Drive by high frequency local service thus avoiding the increase in travel time for through passengers caused by the longer D1 alignment.
- Option D2 requires a complicated five leg intersection at Ninth Line and widening of local roads through the proposed development south of the Hospital.

Option D4 provides the most direct route through the area and allows a station with a catchment planned to contain mostly higher density mixed-use development.

Potential Station Locations in Segment D

Potential station locations considered in Segment D were at Markville Mall, Galsworthy Drive, Main Street Markham, Wootten Way, Markham-Stouffville Hospital, Reesor Road, CP Havelock (future) and York-Durham Line.

8

CONTINUED BELOW

PRIMARY ROUTE - HIGHWAY 7 ONLY

SEGMENT D - KENNEDY ROAD TO YORK-DURHAM LINE

CONTINUED FROM ABOVE

CONTINUED ON EXHIBIT 8.4-17

YRTP

STATIONS		PROPOSED SIDEWALK		EXISTING ROADWAYS		REGIONAL BOUNDARIES	REGION OF YORK / REGION OF PEEL
TRANSITWAY		PROPOSED LANDSCAPE		EXISTING RIGHT OF WAY		MIXED-TRAFFIC OPERATION	
PROPOSED TRAFFIC LANES		PROPOSED RIGHT OF WAY		MUNICIPAL BOUNDARIES	CITY OF VAUGHAN / TOWN OF MARKHAM	100 80 60 40 20 0 100 SCALE	

HIGHWAY 7 CORRIDOR AND VAUGHAN NORTH-SOUTH LINK PUBLIC TRANSIT IMPROVEMENTS ENVIRONMENTAL ASSESSMENT

8.3-18

FIGURE

DRAWING NAME: J:\Data\PM1435\PM\dwgs\HIGHWAY 7 EA PLATES\Figures\Figure 8.3-02-Hwy 7_8.3-03-B1_8.3-07-B4_8.3-17-C1+8.3-18_8.3-19.dwg
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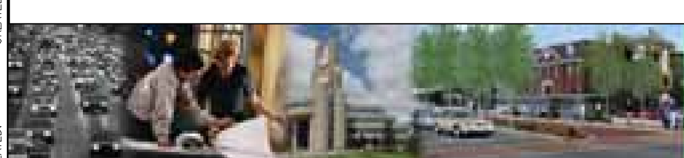
PRIMARY ROUTE - HIGHWAY 7 ONLY

SEGMENT D - KENNEDY ROAD TO YORK-DURHAM LINE



YRTP

STATIONS

TRANSITWAY

PROPOSED TRAFFIC LANES

PROPOSED SIDEWALK

PROPOSED LANDSCAPE

PROPOSED RIGHT OF WAY

EXISTING ROADWAYS

EXISTING RIGHT OF WAY

MUNICIPAL BOUNDARIES — CITY OF VAUGHAN / TOWN OF MARKHAM

REGIONAL BOUNDARIES — REGION OF YORK / REGION OF PEEL

MIXED-TRAFFIC OPERATION

SCALE

HIGHWAY 7 CORRIDOR AND VAUGHAN NORTH-SOUTH LINK PUBLIC TRANSIT IMPROVEMENTS ENVIRONMENTAL ASSESSMENT

8.3-19

FIGURE

9. THE UNDERTAKING

9.1 DESCRIPTION OF THE UNDERTAKING

The surface transitway alignment plan and profile for the entire Highway 7 Corridor and Vaughan North-South Link preferred design is shown in **Plates 9-1 to 9-84** at the end of the Chapter. The portion of the undertaking comprising the Highway 7 capacity improvements from Woodbine Avenue to Sciberras Road is shown in **Section 13.9**. The portion of the undertaking comprising the Spadina Subway Extension from Steeles Avenue to Highway 7 is described in **Section 12.5**. **Figure 9.1-1** below summarizes the overall alignment and station locations.

The following sections describe the main features of the preferred surface rapid transit design:

Two-Lane Median Transitway

For the most part, a 41 km two-lane transitway is proposed in the median of Highway 7, Jane Street, Centre Street, Bathurst Street, Town Centre Boulevard, Helen Avenue, and Kennedy Road between Highway 50 in the west and the Markham By-Pass in the east.

Mixed Traffic Sections

Due to certain local constraints, mixed traffic operation is proposed at the following locations:

- On Highway 7 from Kipling Avenue to Islington Avenue;
- On Jane Street from the existing Beechwood Cemetery entrance to 75m south of the CN Halton Subdivision Overpass;
- On the proposed new east-west collector road from Jane Street to the proposed Street C within the Hydro Corridor north of Steeles Avenue;
- On proposed Street C, the extension of North West Gate;
- On Steeles Avenue from the proposed Street C to the planned TTC BRT alignment south of Steeles Avenue into York University;
- On Keele Street between York University and Highway 7;
- On Highway 7 from Bowes Road/ Baldwin Avenue to Centre Street;
- On Bathurst Street from Worth Boulevard/Flamingo Road to the Bathurst Street Connection Ramp;
- On the entire Bathurst Street Connection Ramp;
- Westbound on Highway 7 from Hunter's Point Drive to the Bathurst Street Connection Ramp;
- Westbound on Highway 7 from the Richmond Hill Centre Intermodal Station via the Yonge Street Connection Ramp to just east of Yonge Street;
- Westbound on Highway 7 from Red Maple Road to the Richmond Hill Centre Intermodal Station via the Yonge Street Connection Ramp;
- On Highway 7 from the Bayview Connection Road to Chalmers Road;
- On Highway 7 from Highway 404 interchange N-EW Ramp to S-EW Ramp;
- On Highway 7 from Galsworthy Drive/ Grandview Boulevard to Wootten Way;
- On the proposed Bur Oak Avenue to the Markham-Stouffville Hospital Terminal in the initial phase of operations; and
- On Highway 7 from Reesor Road to York-Durham Line (Regional Road 30).

Separate Two Lane Transitway Sections

A separate two-lane transitway is proposed through Markham Centre West from Town Centre Boulevard to Helen Avenue, east of the Unionville GO Station. This transitway will utilize the planned Civic Mall sharing the easement with the York-Durham Sanitary Sewer (YDSS).

Station Locations

Stations, including appropriate amenities, are planned at 46 locations generally at arterial or major collector roads listed below:

Segment A:

1. Highway 50;
2. Highway 427;
3. Highway 27;
4. Martin Grove Road;
5. Kipling Avenue;
6. Islington Avenue;
7. Wigwoss Drive/ Helen Street (if future development warrants);
8. Pine Valley Drive;
9. Aberdeen Avenue/ Marycroft Avenue (if future development warrants);
10. Ansley Grove Road/ Witmore Road; and
11. Weston Road.

Segment B:

1. Edgeley Boulevard/ Interchange Way;

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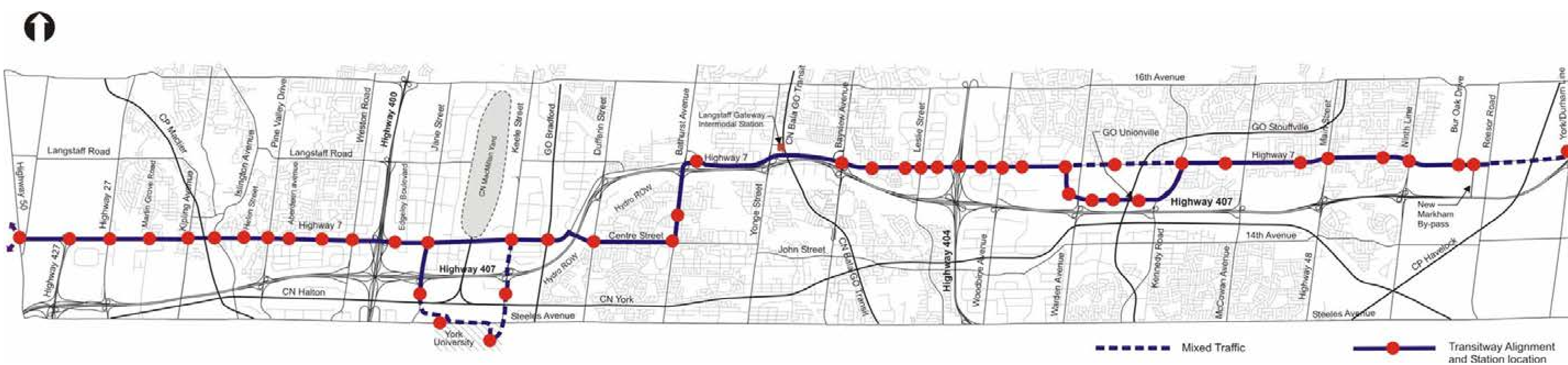

Figure 9.1-1
Summary of Preferred Alignment and Station Locations

2. Jane Street;
3. Highway 407/Jane Street (if future 407 Transitway is implemented with a station at Jane Street);
4. Highway 407/Keele Street (if future 407 Transitway is implemented with a station at Keele Street);
5. Keele Street;
6. GO Bradford (if a station for the GO Bradford line is to be implemented at Highway 7 which is beyond GO Transit 10-year plan);
7. Dufferin Street;
8. Vaughan Boulevard/Carl Tennen Street (if future development warrants);
9. North Promenade;
10. Westminster Drive/ Atkinson Avenue; and
11. Bathurst Street Connection Ramp/ Highway 7.

Segment C:

1. Bayview Avenue;
2. Chalmers Road/ South Park Road;
3. West Beaver Creek Road/ Commerce Valley Drive West;
4. Leslie Street;
5. East Beaver Creek Road/ Commerce Valley Drive East;
6. Highway 404 (if a Highway 404 BRT service is implemented with a stop at Highway 7);
7. Allstate Parkway/ East Valhalla Drive;
8. Woodbine Avenue;
9. Montgomery Court/ Fairburn Drive (if future development warrants);
10. South Town Centre Boulevard;
11. IBM Private Roadway;
12. Warden Avenue/ Enterprise Drive;
13. Future Market Drive in proposed Markham Centre West;
14. Unionville GO Station;
15. Unionville Gate Area on Kennedy Road (if future development warrants); and
16. Kennedy Road at Highway 7.

9

Segment D:

1. McCowan Road;
2. Galsworthy Drive/ Grandview Boulevard;
3. Main Street Markham;
4. Wootten Way;
5. Ninth Line (if future development warrants);
6. Proposed Markham-Stouffville Hospital YRT Terminal on the planned Bur Oak Avenue (for service in the initial phase; for service in the later phase, station at Bur Oak Avenue/Highway 7 could be introduced);
7. New Markham By-pass; and
8. York-Durham Line/ Regional Road 30 (at bus turnaround).

York Region Intermodal Terminal

A York Region Intermodal Terminal is planned on Region-owned land in the north-west quadrant of Steeles Avenues and North West Gate (Proposed Street 'C'), just north of the York University. The main function of this terminal is intermodal transfer between the Region of York and the City of Toronto services including, but not limited to, the Region's planned rapid transit, the YRT local services, GO Transit services, the TTC's planned bus rapid transit and ultimately the Spadina Subway extension to Steeles Avenue.

It will greatly benefit Toronto-bound commuters from the Region and the expanding York University community while supporting Vaughan's planned mixed-use development in the vicinity. This terminal will include an off-street bus terminal, a park and ride facility within the Hydro Corridor right-of-way and ultimately, a subway station underground.

Connectivity to Other Public Transit Systems

The planned Richmond Hill Centre (Langstaff Gateway) Intermodal Terminal located at Yonge Street and Highway 7 will allow for convenient connections between the Highway 7 and Yonge Street rapid transit services, local bus services and the park and ride lot immediately adjacent to the site as well as GO Transit's rail service. A future pedestrian bridge, in which its planning study is underway by the Region of York and GO Transit in a separate study, will facilitate these connections.

Similarly, the proposed station adjacent to GO Transit's Unionville Station will permit convenient transfers to the commuter rail system. Pedestrian access and vertical circulation facilities will be designed during the preliminary and detailed design phases to facilitate these transfers. In addition, there are potential opportunities to connect to the future 407 Transitway at various locations such as Unionville GO Station, the Richmond Hill Centre or Jane Street.

At the regional boundaries, the design of the proposed rapid transit facilities will also permit inter-connection with Peel and Durham transit services as well as sharing of the transitway, if appropriate, by these services.

9.1.1 Transitway Elements

The proposed typical cross-sections for the transitway are shown in **Figures 9.1-2 to 9.1-10**. The Highway 7 Corridor Transitway includes not only the Highway 7 itself, but also service and in some cases transitway infrastructure on Jane Street, Steeles Avenue, Keele Street, Centre Street, Bathurst Street, Town Centre Boulevard, Helen Avenue and Kennedy Road. The above-mentioned existing roadways have a range of cross-sections from two lanes to seven lanes (in both directions). The preferred design maintains their existing through lane configurations wherever necessary. All median left turning lanes are displaced by the exclusive median transitway. Where necessary, access to adjacent properties and cross-streets will be facilitated by signalized left and U-turns at regular intervals. All right turn lanes in the 6-lane cross-section will be eliminated in accordance with the Region's directive unless the specific traffic volume demand warrants their retention. In addition, at the designated locations where the transit service will be operated in mixed traffic to avoid impacting major physical features, the cross-sections of the roadway will remain unchanged.

Lane Widths: The width of existing general traffic lanes on Highway 7 Corridor generally varies from 3.5 m to 3.75 m and 4 m to 5 m for the median left-turn lane at various locations. These will be replaced by 3.5 m transit lanes, 3.5 m general-purpose traffic lanes and 3.75 m curb lanes. A 300mm wide rumble strip is proposed to delineate and provide separation between the transit and general-purpose lanes. The transit lanes and traffic lanes are proposed flush with each other to facilitate crossing of emergency vehicles, surface drainage and easier snow clearance.

In the area of Highway 7 and Highway 427, a preliminary design study of the Highway 427 extension and transitway is underway. The MTO preliminary design in this area has been incorporated in the Highway 7 transitway design from approximately 500 m west of Highway 427 to just west of Roybridge Gate. MTO's proposed 3.75 m general-purpose lanes are provided in this area. The lane widths in this area have the following dimensions:

- Traffic lanes increased from 3.5 m to 3.75 m;
- Transit lanes remains 3.5 m;
- Narrow median of 1.0 m.

Since at the time of writing this report, the Highway 427 Extension preliminary study has not been finalized, a review of the final design of Highway 427 extension, if available, is recommended during the transitway preliminary and detailed design phases.

Lane width reductions detailed under **Section 9.1.5** have also been proposed on some structures to minimize the extent of structure widening.
The City of Vaughan's *Vaughan Corporate Centre Streetscape and Open Space Master Plan Study* is currently underway. Along Highway 7, the study proposes a reduction in capacity from six lanes to four lanes in both directions and a reduction in lane width from 3.5 m to 3.3 m for the ultimate

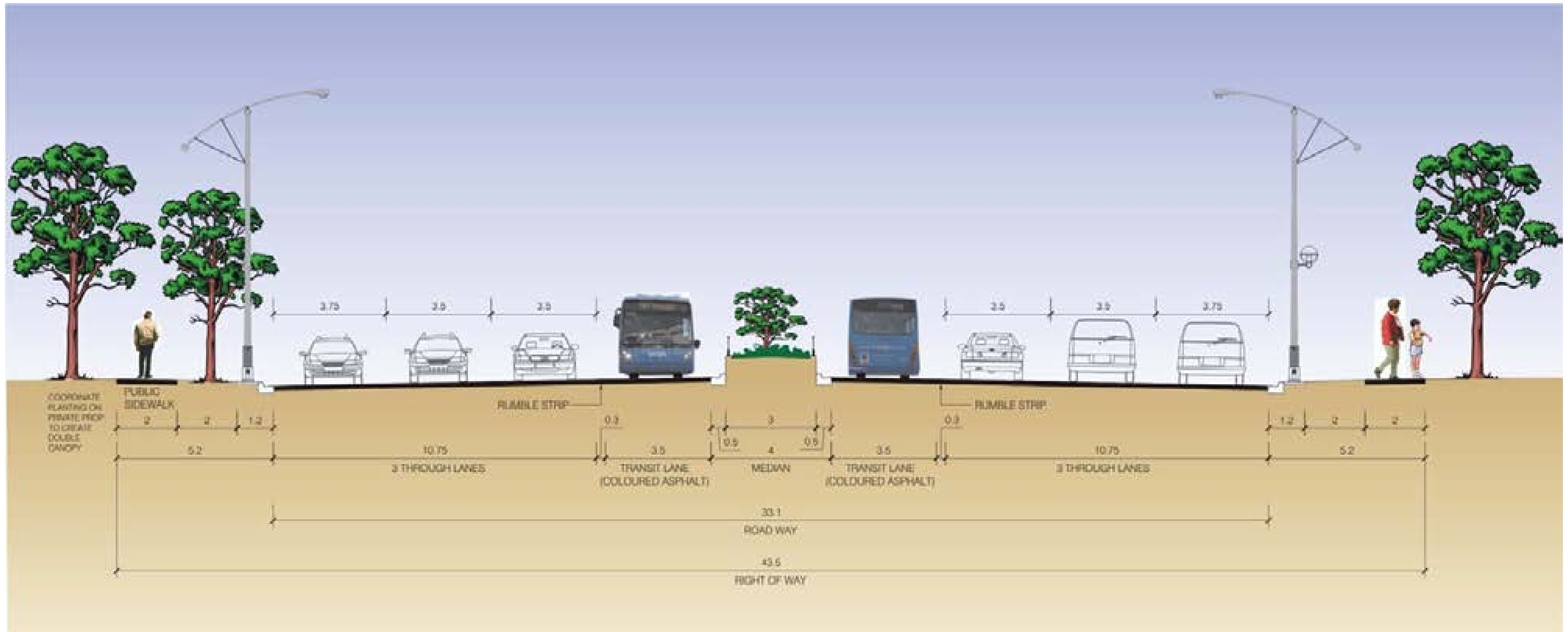

Figure 9.1-2
Typical B.R.T. Transitway Cross-section
6-lane Traffic and 4.0 m Streetscape Median

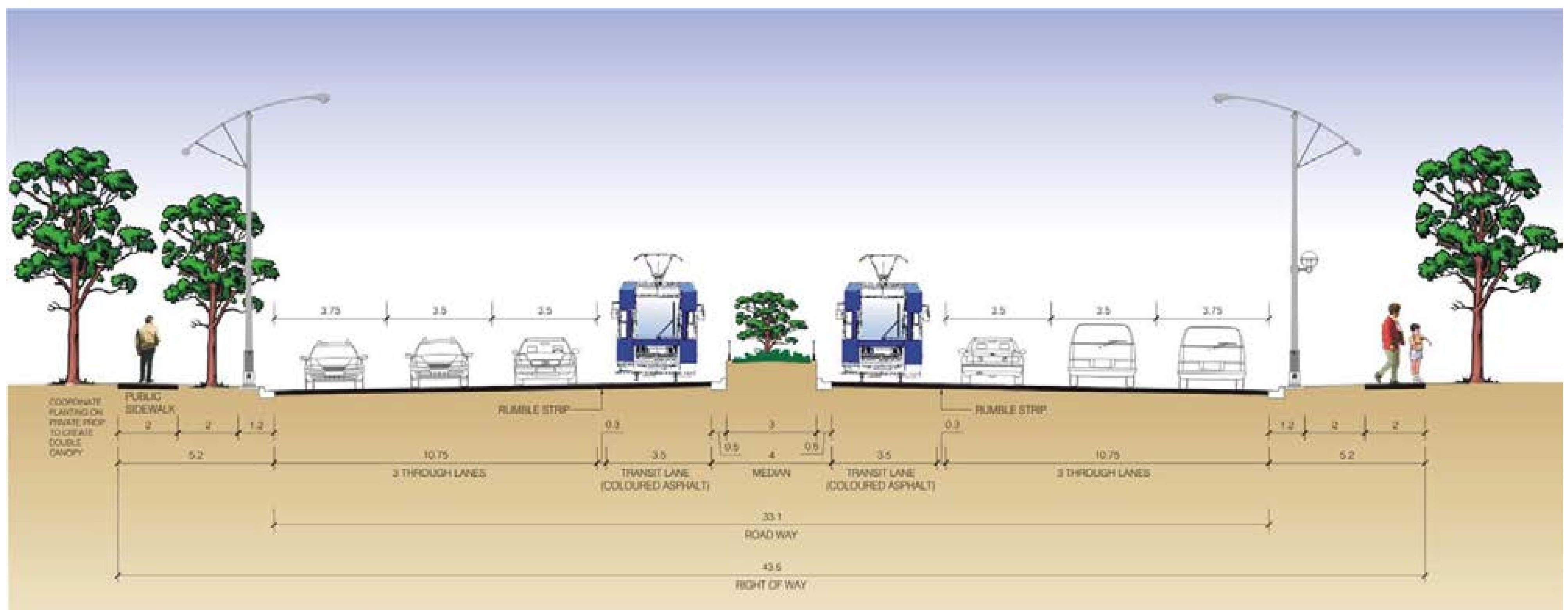

Figure 9.1-3
Typical L.R.T. Transitway Cross-section
6-lane Traffic and 4.0 m Streetscape Median

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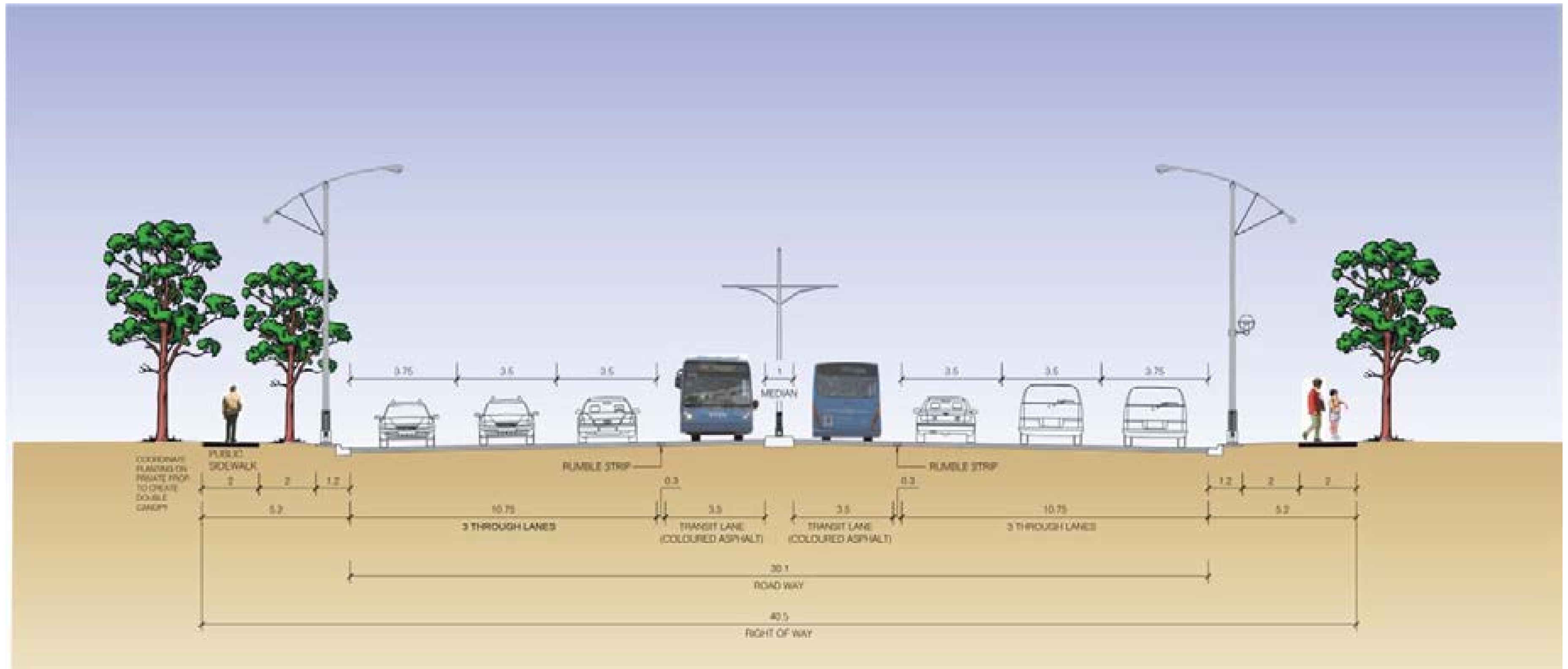

Figure 9.1-4
Typical B.R.T. Transitway Cross-section
6-lane Traffic and 1.0 m Raised Median

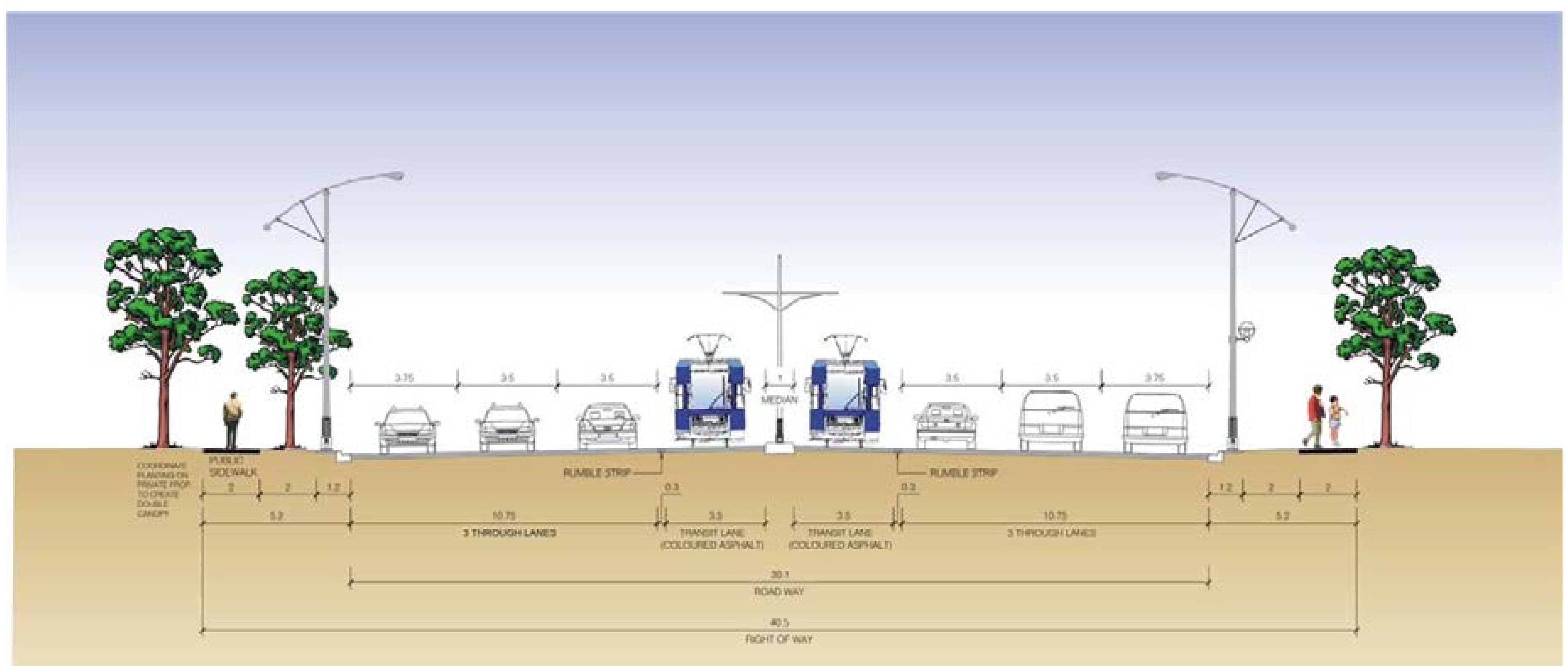

Figure 9.1-5
Typical L.R.T. Transitway Cross-section
6-lane Traffic and 1.0 m Raised Median

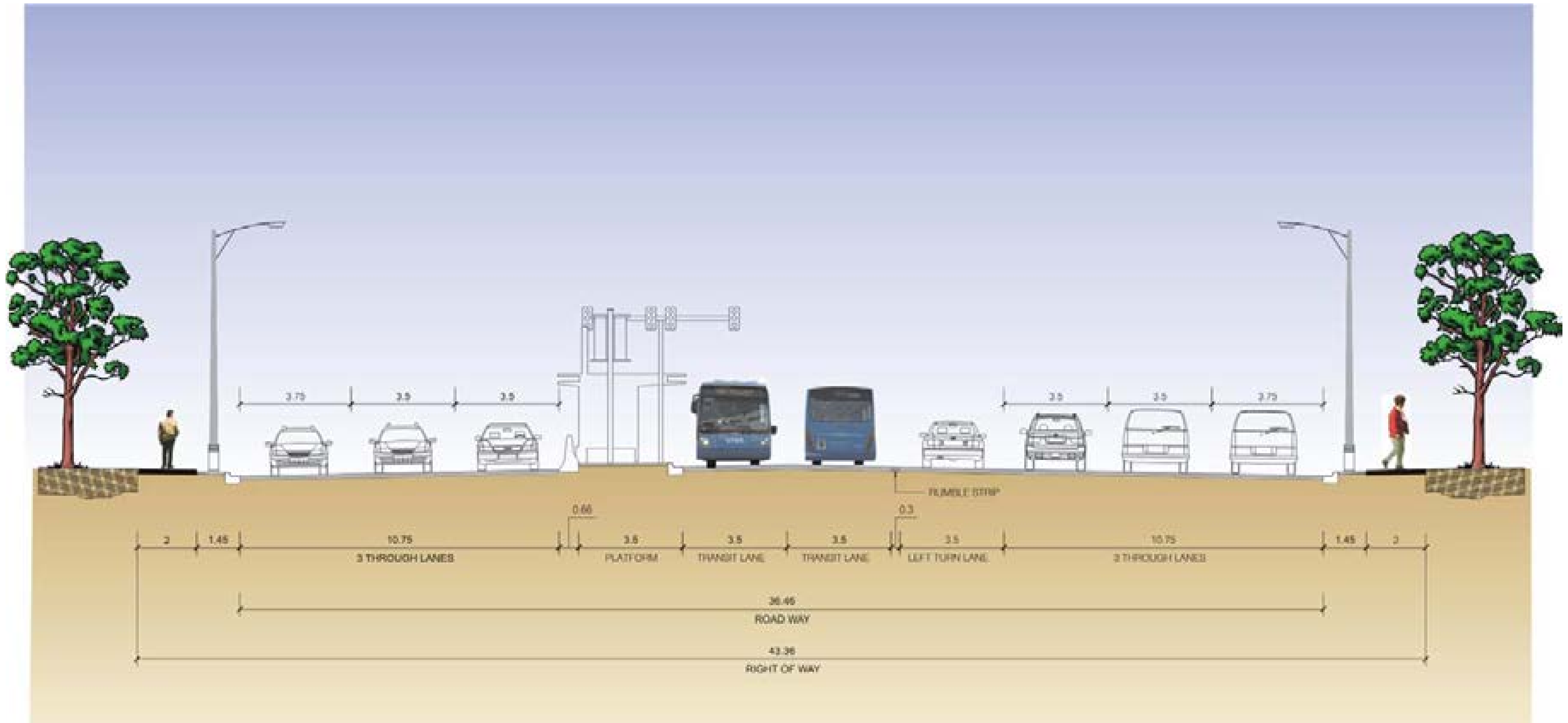

Figure 9.1-6
Typical B.R.T. Station Cross-section
6-lane Traffic with Left Turn Lane

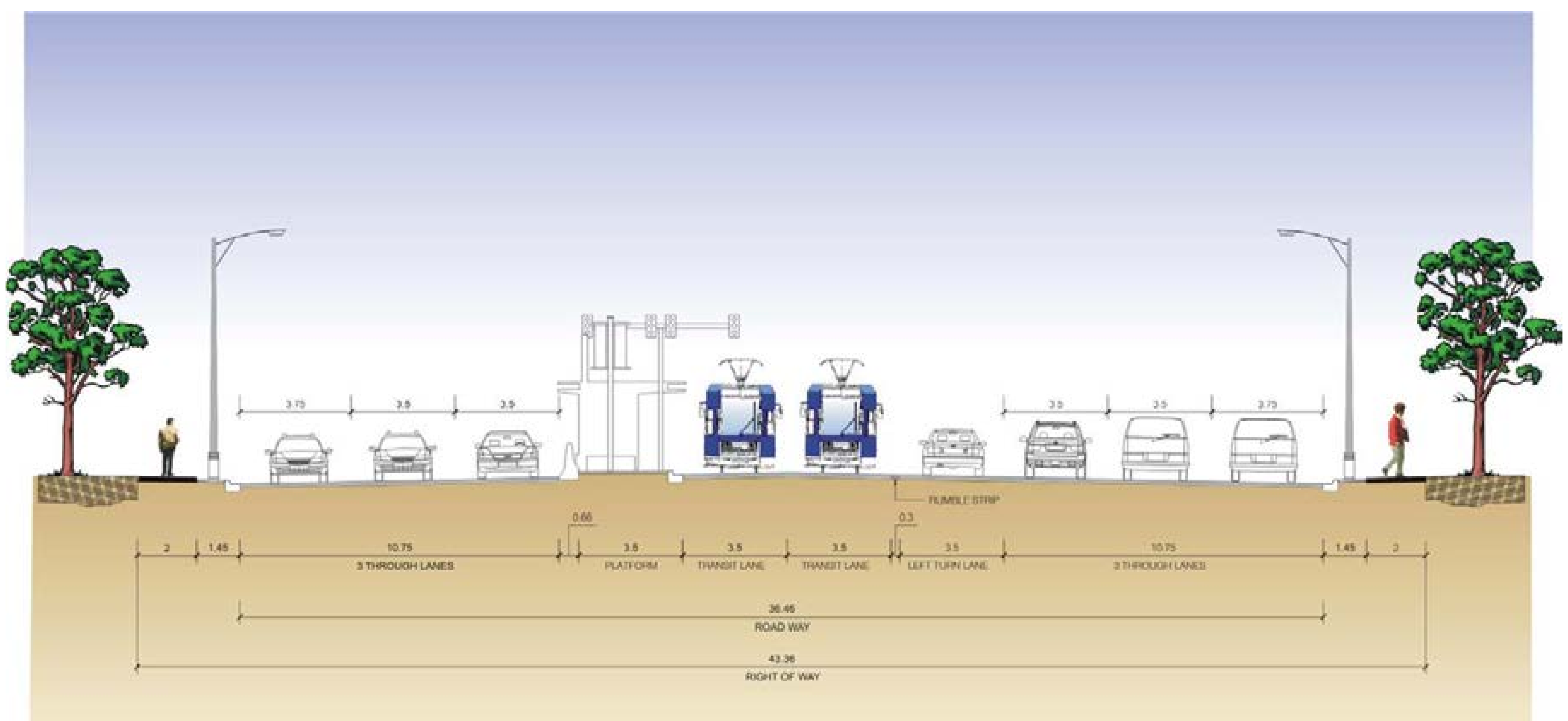

Figure 9.1-7
Typical L.R.T. Station Cross-section
6-lane Traffic with Left Turn Lane

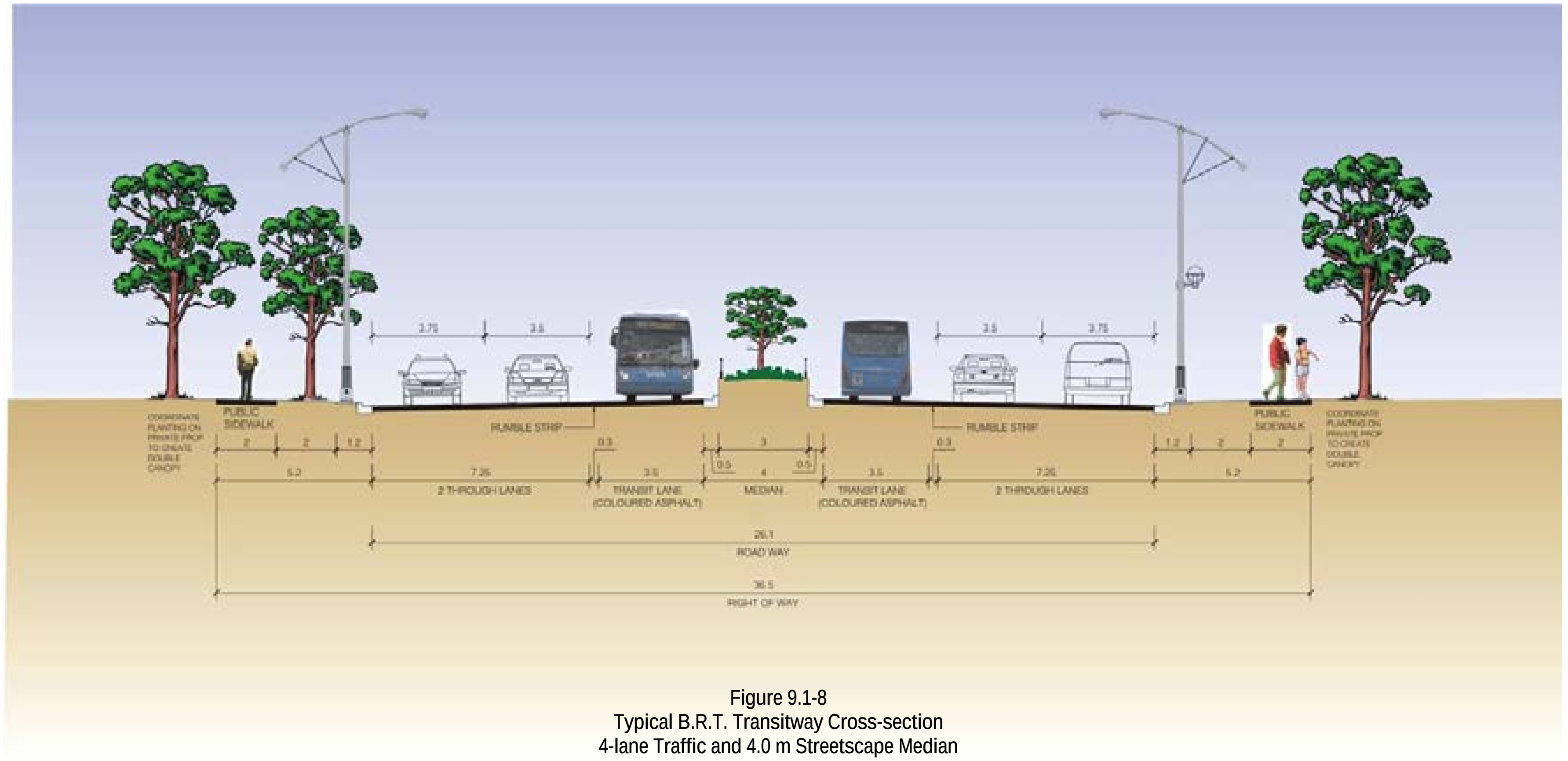

Figure 9.1-8
Typical B.R.T. Transitway Cross-section
4-lane Traffic and 4.0 m Streetscape Median

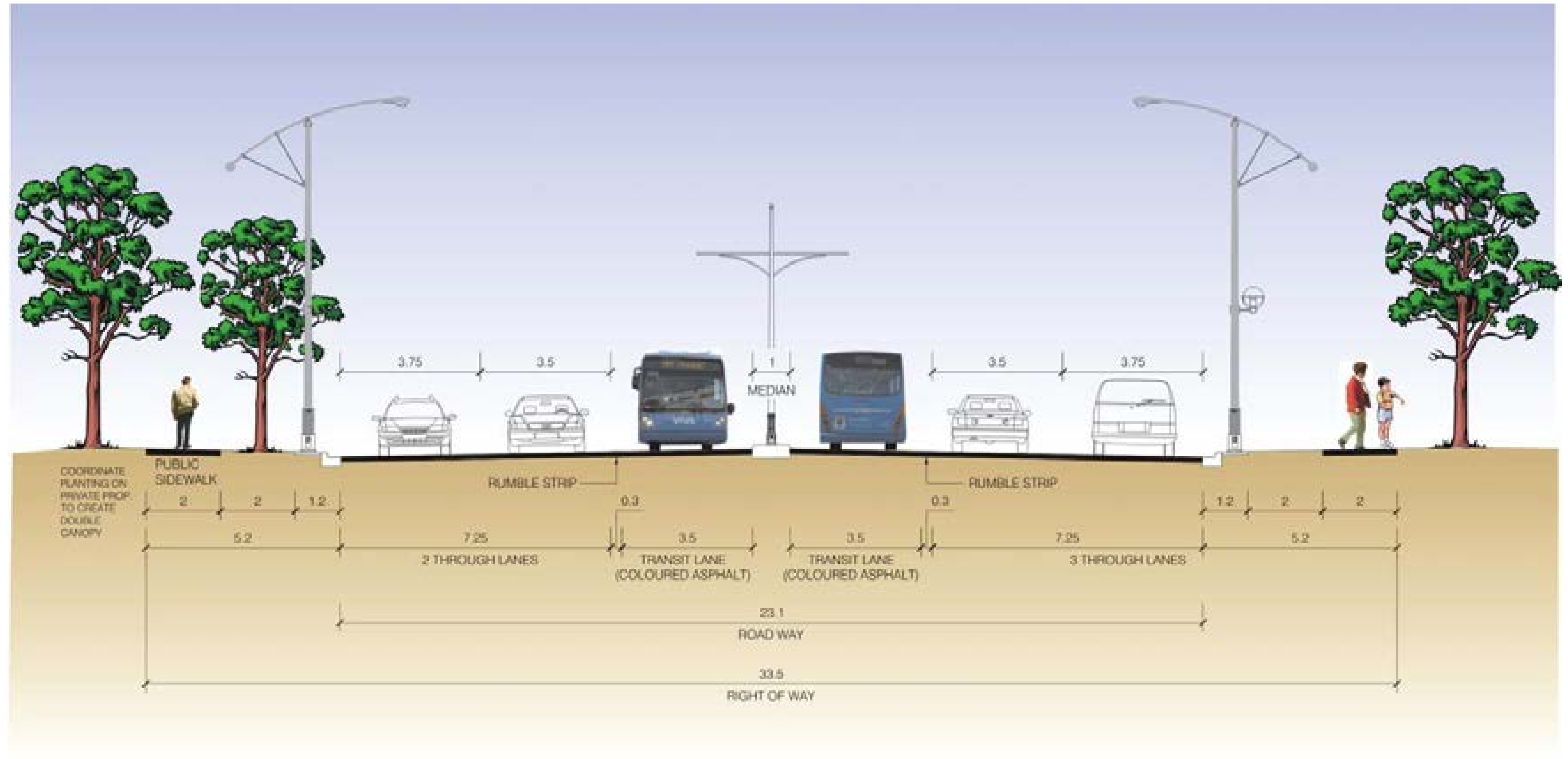

Figure 9.1-9
Typical B.R.T. Transitway Cross-section
4-lane Traffic and 1.0 m Raised Median

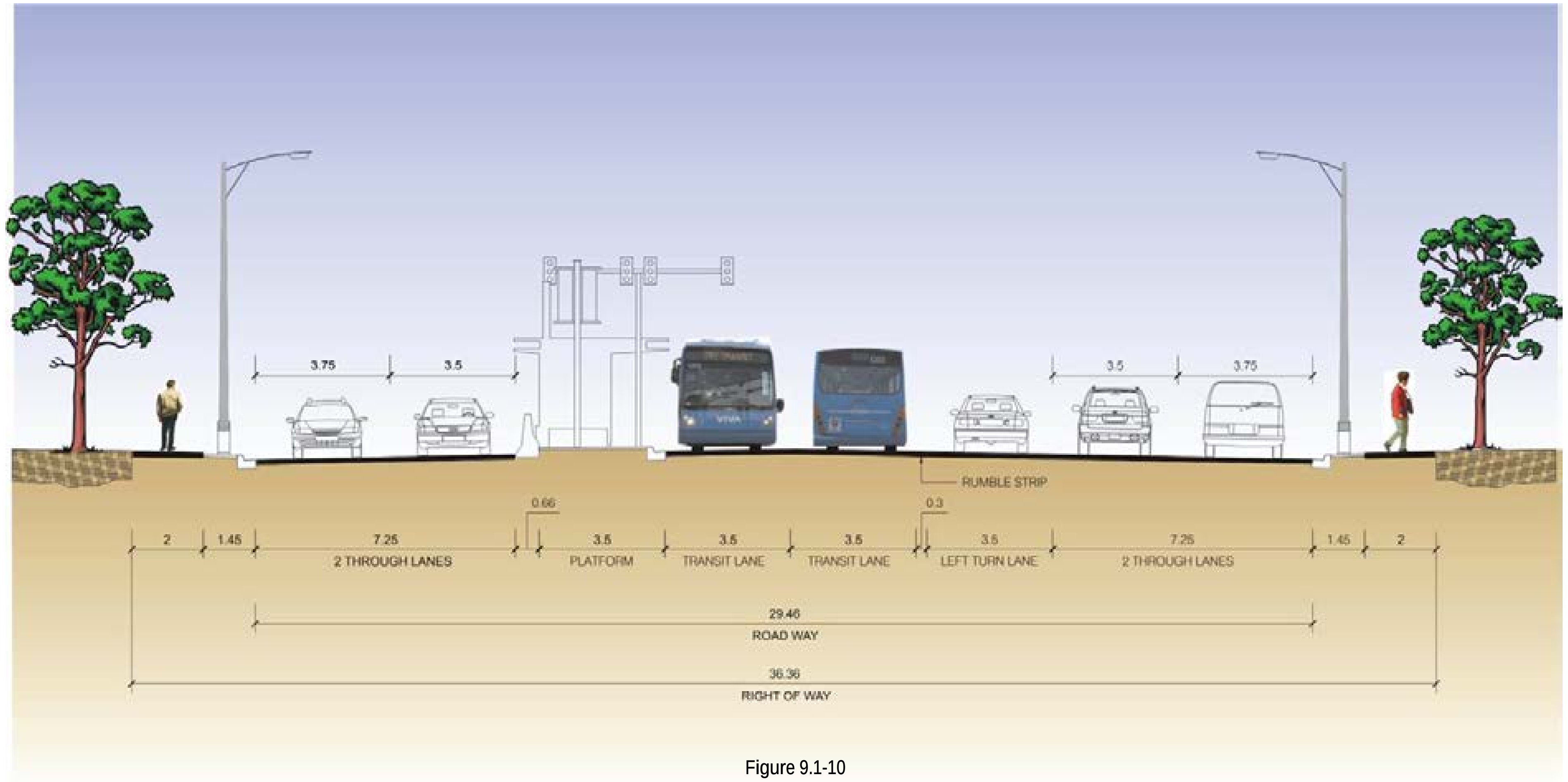

Figure 9.1-10
Typical B.R.T. Station Cross-section
4-lane Traffic with Left Turn Lane

condition, and introduction of crossing side streets. A review of the final design in the area of Vaughan Corporate Centre with York Region and City of Vaughan during the transitway preliminary and detailed design phases is recommended. If necessary, local amendments will be made to the cross-sections shown in this EA for the section within the Corporate Centre Study limits.

Streetscaping: A streetscaping plan, developed in conjunction with local municipalities, was adopted for the Highway 7 Corridor Transitway A number of workshops were held to determine the optimum plan for Highway 7 Corridor in order to create a streetscape that would be a catalyst for transit-oriented development and to attract transit ridership. The vision for the roadway was developed in consultation with technical staff from the City of Vaughan, the Town of Markham, the Town of Richmond Hill and York Region.

The following are some of the Urban Design Principles on which the current conceptual design has been based and which are recommended for future detail design:

Consistency and Coherency: To avoid a circumstantial and inconsistent look to the corridor, it is important to establish a consistent cross-section and curb line. The corridor should also communicate a legible and understandable appearance that clearly puts forward the idea of transit as the future.

Identity: The transit system should be broken down into subsystems that have their own character and sense of place that riders can identify with. Heritage districts should be designed to reflect the heritage of the specific area in question. Green Technology should be the principle on which amenities should be designed, such as solar power for everything from lighting, to ticket dispensing to heating of bus shelters. Landscaping and tree planting are identified as essential in portraying a green image.

Environment and Median: A range of climate issues can be dealt with through careful planning, e.g. trees can be planted to provide shelter from the wind and shade for pedestrians as well screening from the road for adjacent buildings. Trees also act as a solid body for air pollutants to settle on and therefore reduce negative effects in the atmosphere. The type of materials and colour in paving the transitway itself and the sidewalks, splash strips, etc. should be carefully chosen to reinforce the identity and character of the transitway that is proposed.

Median is the Message: A number of options were developed for providing a landscaping plan within the corridor. These included three main alternatives:

- a median landscape area with transit either side;
- two landscape areas either side of the transitway separating the transit from the roadway; and
- a minimal separator in the median (1 metre) with landscaping at the outer curb areas only.

In choosing between these options some fundamental requirements were established such as the need for landscaping in the public space especially in the boulevard. In addition, it was recognized that paving for transit would create additional hard asphalt areas that would result in extensive and undesirable expanses of asphalt once appended to the existing road surface. To alleviate this it was established that median landscaping was necessary.

The option with two landscape areas either side of the transitway could only accommodate a 2 m landscape width due to the constrained nature of the Highway 7 Corridor, especially as it was considered desirable. to include some landscaping in the boulevard area This width of two metres was found inadequate, as it was insufficient to allow vegetation to grow especially in the winter months where salt/spray splash would not allow it to survive.

The option of no median was considered less acceptable, as it did not meet the fundamental requirements of breaking up wide expanses of asphalt, did not result in an aesthetic look to the corridor and did not provide a mid-crossing refuge for pedestrians crossing the Highway 7 Corridor.

The preferred alternative was to have a median of at least 4 metres in width to allow tree growth. To limit salt/snow splash it was recommended that trees should be housed in raised planters. A buried irrigation system would be desirable and only select species of trees that were known to be more resistant to salt spray would be chosen. Evergreens would also be selected in certain locations to ensure that some landscaping remained in the winter months.

The above arrangement has been used successfully in many locations in a northern American environment and was arrived at in consultation with the team's landscape architects.

Although not desirable, the option of the 1 m median was also accepted at locations where the opportunities to widen the existing right-of-way are limited.

Network: The transitway is part of a complex network reflecting how people move through the community. The linkages that connect private vehicles, drop off, park-and-ride, bicycles, local transit buses, GO buses, etc., to the future transitway should be designed with an integrated approach making the experience of transitioning to transit services efficient and effortless.

Signage: A consistent approach to all types of signage, directional, proprietary advertising, etc., should be developed for the corridor to minimize visual clutter and the chronic symptom of competitive "sign wars".

Snow Plowing: The clearing, storage and removal of snow along traffic and transit lanes must be carefully planned. A generous splash and storage strip must be provided on the sidewalk side of the curb.

Emergency Response Services (ERS) Considerations: Currently, a two-way, mostly undivided roadway and occasionally continuous median left turn lane allows access into existing local streets and properties on both sides of Highway 7 and other route links. This random access is available to all vehicles including ERS vehicles such as fire trucks, emergency medical response vehicles (ambulances) and police cars. With the introduction of a raised, landscaped median between the dedicated transit lanes this access will be restricted to signalized intersections at regular intervals along the alignment.

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In order to mitigate the effect of this change in traffic operations, the transitway design assumes ERS vehicles will use the dedicated transit lanes and incorporates a crossing treatment in the raised median to permit left turn access by ERS vehicles. The design was developed in consultation with representatives of ERS groups operating in the Highway 7 Corridor through meetings and a workshop. The objective of the design was to reinstate current operations of most ERS vehicles using the existing two-way median left turn.

The proposed typical median crossing treatment is shown in **Figure 9.1-11**. The crossing consists of an inclined, minimum 3.5 m wide opening to allow an emergency vehicle to reach the opposing transit lane from which a left turn can be made either to an existing roadway/driveway or to reach the curb facing opposing traffic. Semi mountable curbs will be used at the crossings and to limit access to ERS vehicles only, regulatory signing will be provided and the appropriate by-law enforced.

Generally, the proposed spacing of these crossings is approximately 100 m

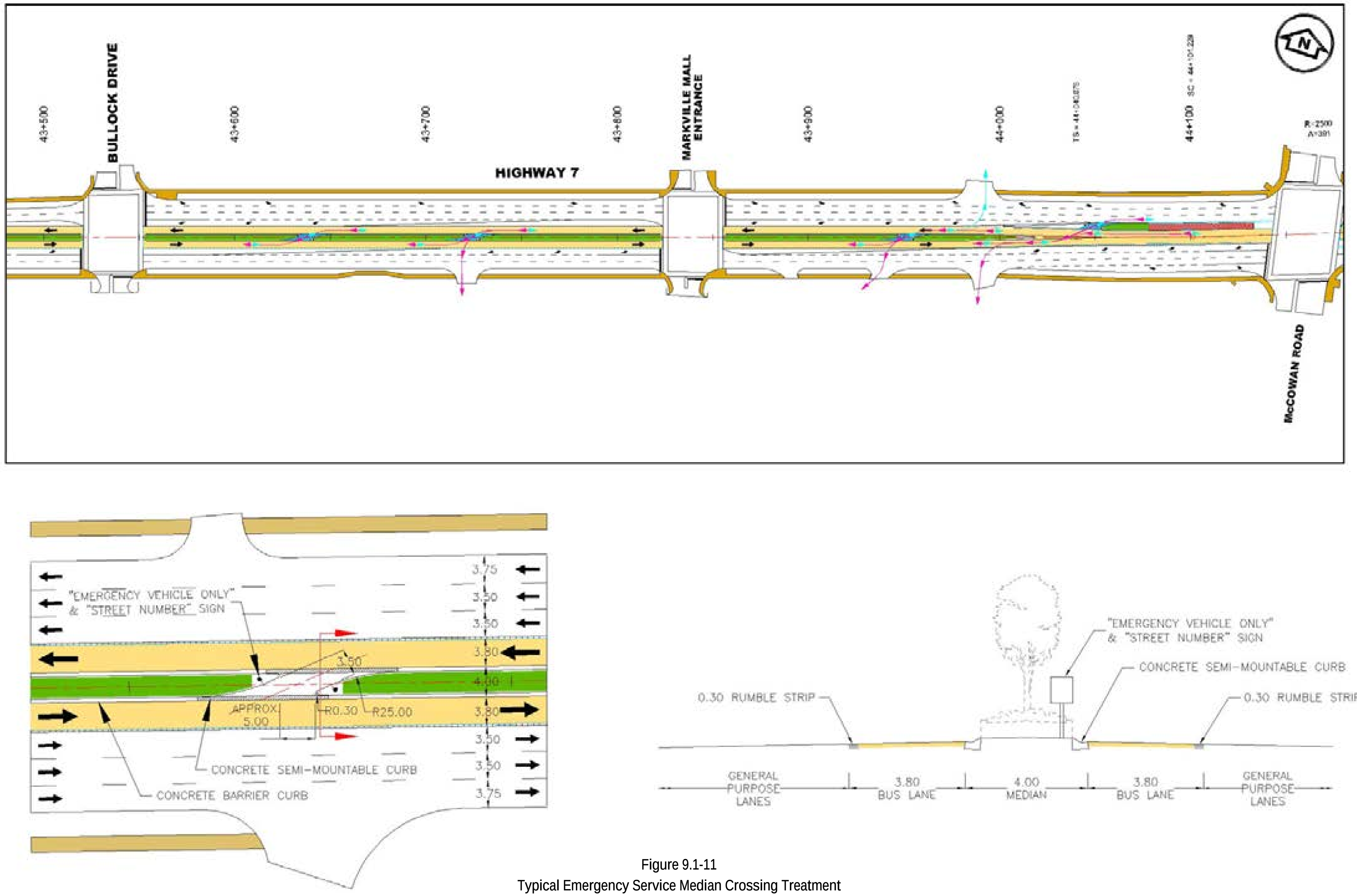

Figure 9.1-11
Typical Emergency Service Median Crossing Treatment

and they will be placed strategically to ensure effective access. **Figure 9.1-11** also shows a typical treatment of a section of the alignment between Bullock Drive and McCowan Road as an example. This diagram illustrates how ERS vehicles would use the dedicated transit lanes in-lieu of the existing two way median left turn lane, either at intersections or after a median crossing to access sideroads or driveways. When an ERS vehicle is using the transit lane in the normal direction, transit vehicles will be required to move to the right into general traffic lanes to allow ERS vehicles to pass. When a transit lane is being used in the opposing direction for a left turn manoeuvre, transit vehicles will stop, as is currently the case, to avoid the possibility of collisions between ERS and transit vehicles.

It is anticipated that a detailed crossing plan will be developed for Highway 7 Corridor from Highway 50 to Reesor Road in consultation with ERS organizations during the detail design phase to ensure that all properties and streets can be accessed safely and within current response times.

Other items: These included street lighting and public art. For street lighting it was stressed that light spillage is to be avoided and excess light reduced. Heritage or decorative lighting is to be included in the appropriate sections of the transitway corridor.

For public art, it was articulated that the design components, such as paving, light standards, benches, stations, etc. should include the provision for a rich variety of public art that will express community character throughout the corridor.

The streetscaping plan for the Highway 7 Corridor Transitway EA is shown in **Figure 9.1-12**. The plan depicts a typical design for two areas of the corridor; at an intersection in the vicinity of stations and areas located mid block between intersections.

9.1.2 Horizontal Alignment

The proposed Highway 7 route including Highway 7, Jane Street, Steeles Avenue, Keele Street, Centre Street, Bathurst Street, Town Centre Boulevard, Helen Avenue, and Kennedy Road comprises relatively straight roads with horizontal curve radii ranging from 250 metres to 7,000 metres.

For transitway design the horizontal alignment conforms to minimum LRT standards as much as the situation permits. The roadway design conforms to the existing design speeds ranging from 60 km/h to 90 km/h and is in accordance with the Geometric Design Manual for Ontario Highways.

New tangents and horizontal curves are incorporated to shift the existing alignment where necessary to minimize the impacts on properties. The horizontal alignment has been modified in this way at the following locations:

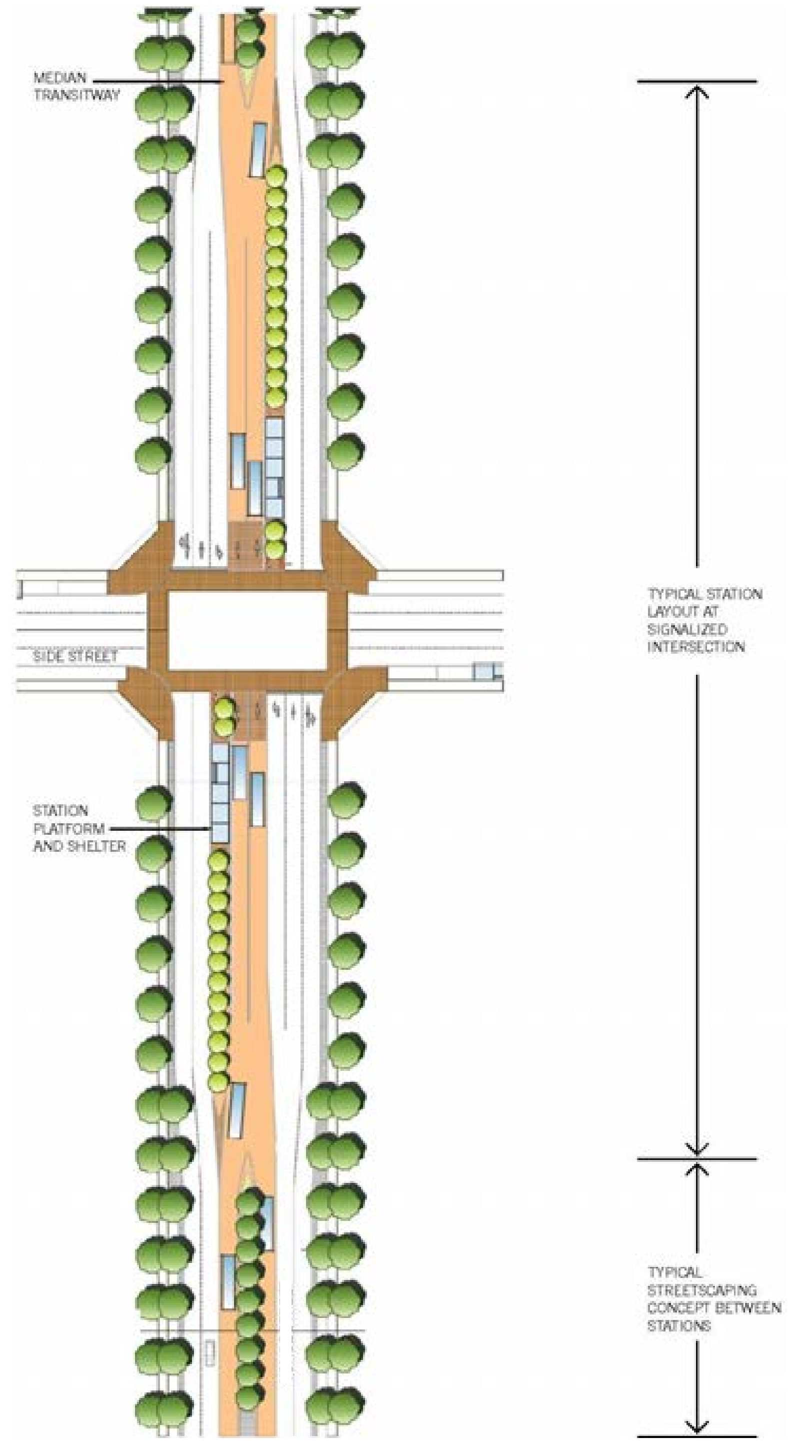

Figure 9.1-12
Streetscaping Plan for Highway 7 Transitway

- Between Highway 50 and Highway 27, the existing Highway 7 alignment would shift to the north up to 3.0 meters to incorporate the MTO's future Highway 427 extension allowing Highway 7 to be widened on the north side only.
- Immediately west of Leisure Lane, the existing Highway 7 alignment would shift to the north up to 2.3 metres to avoid encroachment on an existing building on the south side.
- Between Islington Avenue and Bruce Street, the existing Highway 7 alignment would shift to the south up to 2.8 metres to avoid encroachment on an existing retaining wall on the north side of the road.
- Between Marycroft/ Aberdeen Avenues and Nova Star Drive, the existing Highway 7 alignment would shift to the north up to 3.8 metres around Whitmore/ Ansley Grove Roads to accommodate the station platforms.
- Immediately west of Weston Road, the existing Highway 7 alignment would shift to the south up to 4.7 metres to avoid encroachment on an existing building on the north side.
- Between Allstate Parkway and Cochrane/ Frontenac Drives, the existing Highway 7 alignment would shift to the south up to 5.5 metres to avoid impacts on the Brown's Corners Church and Cemetery on the northeast corner of Highway 7 and Cochrane Drive.
- Immediately west of Town Centre Boulevard, the existing Highway 7 alignment would shift to the south up to 7.0 metres to avoid property impact on the north side.
- Between Highway 7 and the IBM private access road, the existing Town Centre Boulevard alignment would shift to the east up to 4.1 metres to avoid encroachment on an existing building on the west side.
- The existing Helen Avenue alignment would shift to the north up to 9.1 metres between the GO Unionville Station and Kennedy Road to conform with the Town of Markham's planned widening of the road, and to minimize property impacts on the south side.
- Between Bullock Drive and McCowan Road, the existing Highway 7 alignment would shift to the south up to 1.2 metres to minimize property impacts on the north side.
- Between Laidlaw Boulevard/Conservation Avenue and Thatcher's Way, the existing Highway 7 alignment would shift to the south up to 3.5 metres to avoid property impacts on the north side.
- Between Thatcher's Way and McPhillips Avenue, the existing Highway 7 alignment would shift to the north up to 1.5 metres to minimize property impacts on the south side.

In some locations, new roads are proposed to accommodate the transitway routes. Two new road alignments proposed for the Vaughan North-South Link are:

- An East-west Collector Road from Jane Street to proposed Street C (North West Gate Extension); and
- Street C (a North West Gate Extension).linking Steeles Avenue to the new east-west collector road.

As illustrated in **Figures 9-24 and 9-25**, these two new roads will allow transit vehicles to turn off Jane Street, in mixed traffic, onto the east-west collector road along the south boundary of the Hydro Corridor right-of-way north of Steeles Avenue and travel to the future York Region Intermodal Terminal. From the terminal transit vehicles would use the future Street C and Steeles Avenue in mixed traffic to reach the entrance to York University.

The East-west Collector Road consists of four 3.5-metre lanes, a 3.5-metre boulevard and a 2.0-metre sidewalk on the south side, and a 3.0 boulevard on the north side as shown in **Figure 9.1-13**. Final details of the roadway will be discussed with Hydro One and City of Vaughan during the detailed design phase.

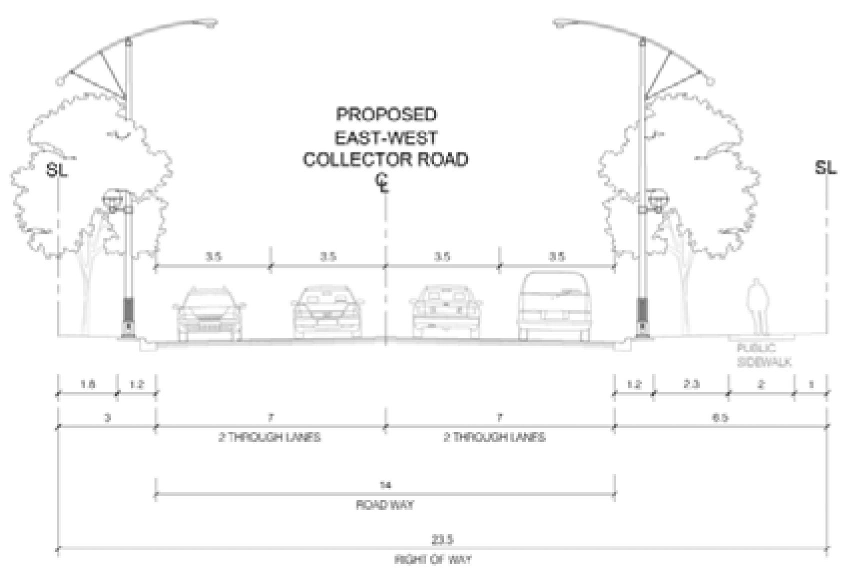

Figure 9.1-13
Typical Cross-section for Proposed East-west Collector Road

The Street C consists of a 2-metre median, four 3.5-metre lanes, a 3.25-metre boulevard and a 1.5-metre sidewalk on the east side, and a 2.0 boulevard on the west side adjacent to the future York Region Intermodal Terminal as shown in **Figure 9.1-14**. Final details of the roadway will be discussed with City of Vaughan during the detailed design phase.

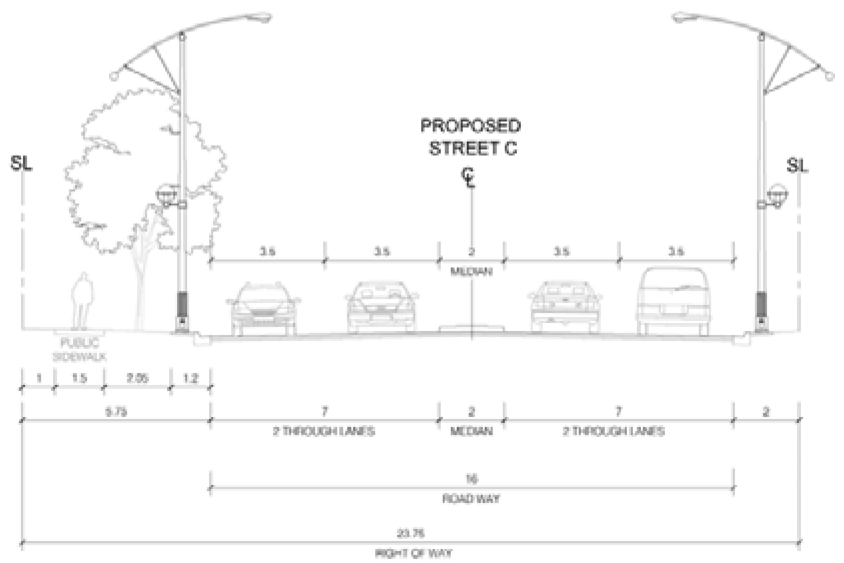

Figure 9.1-14
Typical Cross-section for Proposed Street C (North West Gate Extension)

Further, one new transit alignment is proposed in the future Markham Centre area. Connecting South Town Centre Boulevard to the future Markham Centre West and the existing GO Unionville station, this new transit-only alignment exits South Town Centre Boulevard at the south end, crosses the Rouge River Valley and Warden Avenue, follows the York-Durham Storm Sewer right-of-way, shares the new rail underpass structure with the future Enterprise Boulevard, and returns Highway 7 through the Helen Avenue and Kennedy Road rights-of-way.

9.1.3 Vertical Alignment and Pavement Widening

Vertical alignment for the Highway 7 Corridor will generally follow the profile of the existing road. In order to obtain good ride quality and the required service speeds for rapid transit, a best-fit vertical profile has been designed to achieve a smooth profile for the median transit lanes.

Additional pavement width is required to incorporate the median transit lanes and the landscaped median. The additional lanes and streetscaping will require widening of the curb lines as well as some local right-of-way widening. Pavement depths for the transit lanes may be different from those of the traffic lanes as well as the landscaped median. With the above changes necessary it is anticipated that complete reconstruction of the cross-section is required. Whenever possible, right-of-way widening or impact on commercial properties including parking has been minimized by the provision of retaining walls or other grading measures.

The proposed vertical alignment generally conforms to design speeds ranging from 60 km/hr to 90 km/hr for general-purpose traffic. Vertical alignment standards for BRT stated in **Chapter 7** are met.

At some locations the grades at stations exceed the maximum gradient standard for BRT due to the need to match existing road grades on the running ways. However, these grades are considered acceptable variations from the desirable standard and thus it is proposed to retain these grades. The foreseeable future LRT technology introduction will most likely be between Yonge Street and McCowan Road. Thus, the only grades through stations exceeding the desirable maximum LRT station gradient are 2.49% at Chalmers Road/ South Park Road eastbound platform, 2.13% at West Beaver Creek Road/ Commerce Valley Drive West westbound platform, 2.97% at East Beaver Creek Road/ Commerce Valley Drive East platforms, and 2.56% at McCowan Road platforms. Grades through stations at these locations will have to be reduced by local vertical separation from adjacent traffic lanes if and when LRT technology is introduced.

9.1.4 Intersection Design

Intersection design is in accordance with the Geometric Design Manual for Ontario Highways. An important feature of the new intersections is the provision for general-purpose traffic to negotiate U-turns at intersections. Therefore, signalized intersections have been designed to allow for trucks of size WB17 to make a U-turn with signal protection. However, it is anticipated that most heavy vehicles would adopt an alternative routing to reach destinations to avoid making U-turns. Non-signalized intersections have been designed to maintain existing turning radii. Left and right turn lanes with appropriate lengths, have been incorporated into the design based on traffic needs. Property will be acquired as part of the highway/transit improvements to provide for adequate day-lighting triangles for all the intersections.

9.1.5 Structures

Thirty-one (31) significant structures along the Highway 7 Corridor will be affected by the introduction of rapid transit running ways. Among these, six of them have Controlled Access Highway (CAH) designation. Any modifications required on these CAH structures must be reviewed and approved by the MTO during the preliminary and detailed design phases. Structures affected by the transitway are:

1. The Highway 7 bridge over the Highway 427 (CAH);

2. The Plunkett's Creek bridge at Station 13+919;
3. The Highway 7 underpass of CP Rail's Mactier Subdivision;
4. The Humber River bridge at Station 14+835;
5. The Highway 7 bridge over the Highway 400 (CAH);
6. The Highway 7 bridge over the CN McMillan Yard;
7. The Jane Street bridge structure over Peelar Road;
8. The Jane Street bridge structure over the Highway 407 (CAH);
9. The Jane Street underpass at CN Halton;
10. The Keele Street bridge structure over CN York;
11. The Keele Street bridge structure over Highway 407;
12. The Highway 7 underpass at GO Bradford;
13. The West Don River Crossing bridge structure at Station 23+950;
14. The Centre Street underpass at Highway 407 (CAH);
15. The Bathurst Street bridge structure over Highway 407;
16. The Bathurst Street bridge structure over Highway 7;
17. The Bathurst-Highway 407 N-W Ramp bridge structure over Highway 7;
18. The Little Don River Crossing concrete box culvert at Station 28+940;
19. The Highway 7 bridge structure over Yonge Street (CAH);
20. The Highway 7 bridge structure over Yonge-Highway 407 E-N/S Ramp (CAH);
21. The Highway 7 CNR bridge structure over the Bala Subdivision railway line;
22. The Highway 7 bridge structure over future Cedar Avenue;
23. The Highway 7 underpass at Bayview Avenue;
24. The Highway 7 underpass at Highway 404;
25. The Beaver Creek Crossing open bottom concrete culvert at Station 37+790;
26. The Apple Creek Crossing bridge structure at Station 38+695;
27. New Upper Rouge River Crossing bridge structure at Station 540+190;
28. New Upper Rouge River Tributary 4 Crossing structure at Station 541+424;
29. New underpass at future Enterprise Drive at Station 541+730;
30. New underpass at Go Stouffville line at Station 541+920;
31. The Lower Rouge River Crossing bridge structure at Station 43+256; and
32. The Little Rouge River Crossing bridge structure at Station 51+117;

The following is a description of how the transit lanes are proposed to cross either over or under these structures:

1) The Highway 7 bridge over Highway 427 (CAH)

The existing crossing consists of three 3.66-metre lanes of traffic, a 1.5-metre sidewalk in each direction and a 2.0-metre raised median. The proposed cross-section will include a 1.0 metre raised median, two 3.5 metre transit lanes with 0.5 metre rumble strips, six 3.75 metre general-purpose lanes, two maximum 4.75 metre speed change lanes and one 2.0 metre sidewalk on the north side. It is shown in **Figure 9.1-15**. Consequently a widening of a minimum of 10.89 metres on the north side and a maximum of 4.75 metres on south side of the bridge is required. It is recommended to co-ordinate with MTO on the Highway 427 Extension.

2) The Plunkett's Creek Bridge at Station 13+919

This newly widened crossing consists of three 3.75 metre traffic lanes, a 1.7 metre shoulder, and 2.0 metre sidewalk in each direction and a 2.0 metre raised median. The proposed design transitions the 6-lane general-purpose traffic to 4-lane immediately east of Parkfield Court/Woodstream Boulevard resulting in 4 traffic lanes on the bridge. The proposed cross-section will include a 1.0 metre raised median, two 3.5 metre transit lanes with 0.3 metre rumble strips, two 3.5 metre general-purpose lanes, two 3.75 metre curb lanes, two 2.40 metre shoulders and two 2 metre sidewalks. No additional widening of the bridge is required.

3) The Highway 7 underpass at CP Rail's Mactier Subdivision

The existing rail underpass spans two 3.5 metre lanes of traffic, a 1.5 metre shoulder and a 2.0 metre sidewalk in each direction. No modification of this bridge is proposed as the rapid transit will operate in mixed-traffic through this area.

4) The Humber River bridge at Station 14+835

The existing bridge consists of two 3.5 metre lanes of traffic, a 0.504 metre shoulder and a 1.5 metre sidewalk in each direction with one median lane of 3.0 metres. No modification of this bridge is proposed as the rapid transit will operate in mixed-traffic through this area.

5) The Highway 7 bridge over the Highway 400 (CAH)

This existing bridge consists of one 3.90 metre and two 3.75 metre general traffic lanes and a 2.0 metre sidewalk in each direction, as well as a 4 metre minimum width speed change lane and a 1.2 metre raised median. The proposed cross-section will add a 0.4 metre raised median, two reduced width 3.3 metre lanes for transit with 0.3 metre rumble strips. The outermost general-purpose lanes will be reduced to 3.5 metres wide, the rest of the general-purposed lanes to 3.4 metres, the speed change lanes to 3.75 metres (minimum) and 0.95-metre sidewalks are proposed. These reductions in lane and sidewalk width will minimize widening of the bridge as shown in **Figure 9.1-16**. Widening of 0.80 metre each side is required.

6) The Highway 7 bridge over CN Rail's McMillan Yard

This crossing consists of one 3.50 metre and two 3.75 metre lanes of traffic with a 2.0 metre raised median, a 0.5 metre shoulder and a 2.0 metre sidewalk in each direction. The proposed cross-section will include a 1.0 metre raised median, two 3.5 metre transit lanes with 0.3 metre rumble strips, four 3.5 metre general-purpose lanes, two 3.75 metre curb lanes, two 0.5 metre shoulders and two 1.5-metre sidewalks. Widening of 2.55 metres each side is required as shown in **Figure 9.1-17**.

7) The Jane Street bridge over Peelar Road

The existing bridge consists of one 3.50 metre and two 3.75 metre traffic lanes, a 1.0 metre shoulder and a 2.0 metre sidewalk in each direction along with a 5.0 metre raised median and a 3.5 metre bus bay on the west side. The proposed cross-section will include a 1.0 metre raised median, two 3.5 metre transit lanes with 0.3 metre rumble strips, four 3.5 metre general-purpose lanes, two 3.75 metre curb lanes, a 3.0 metre bus bay, and two 2 metre sidewalks. Consequently a widening of 1.43 metre on the east side is required.

8) The Jane Street bridge over Highway 407 (CAH)

This existing bridge consists of two 3.50 metre and three 3.75 metre traffic lanes in each direction, a northbound left turn lane of 3.0 metres, a southbound speed change lane of minimum 3.75 metres along with a 2.0 metre raised median, a 1.0 metre shoulder and a 1.5 metre sidewalk each side. The proposed cross-section will include a 1.0 metre raised median, two 3.5 metre transit lanes with rumble strips, a 3.5 metre northbound left turn lane, four 3.5 metre general-purpose lanes, one 3.75 metre curb lane, one 3.75-metre southbound curb lane/ speed change lane, two 0.50 metre shoulders and two 1.5 metre sidewalks. Widening of 5.35 metres on the east side and 0.25 metre on the west side is required as shown in **Figure 9.1-18**.

9) The Jane Street underpass of CN Rail's Halton Subdivision

This underpass spans two 3.5 metre lanes of traffic in each direction, a 2.0 metre median, a 1.0 metre shoulder and a 1.5 metre sidewalk on each side. It is proposed to operate rapid transit in mixed traffic through this area with a 2.0 metre raised median, a 3.4 metre southbound left turn lane, two 3.4 metre general-purpose lanes in either direction, a 0.336 metre northbound shoulder and 1.5 metre northbound sidewalk. No modification of the structure is required.

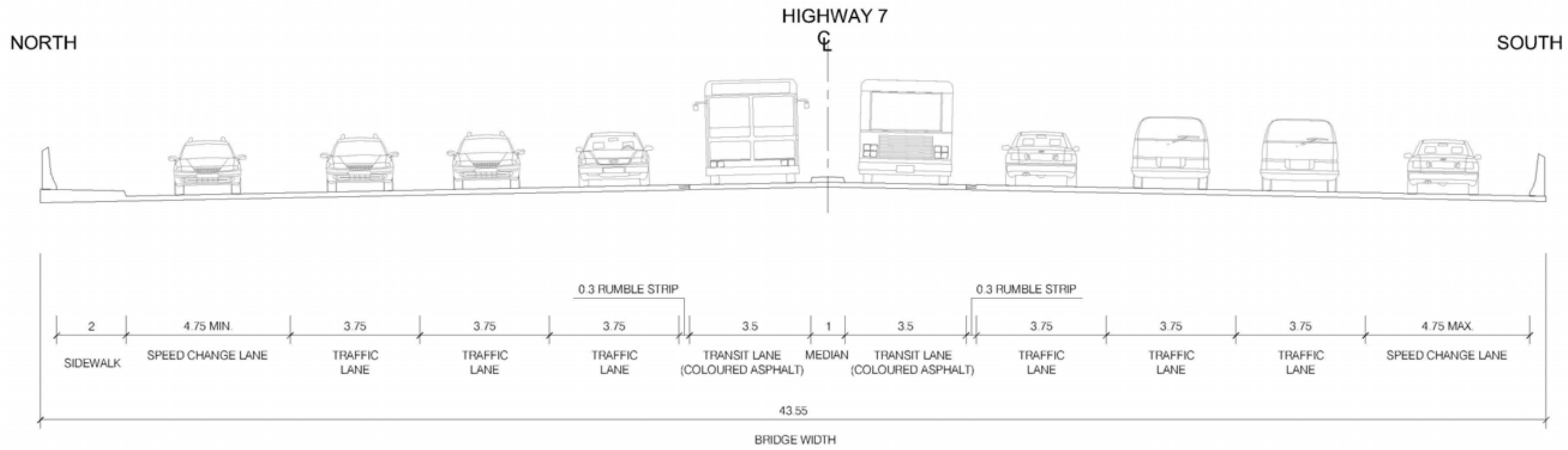

Figure 9.1-15
Highway 7 Bridge Structure over Highway 427

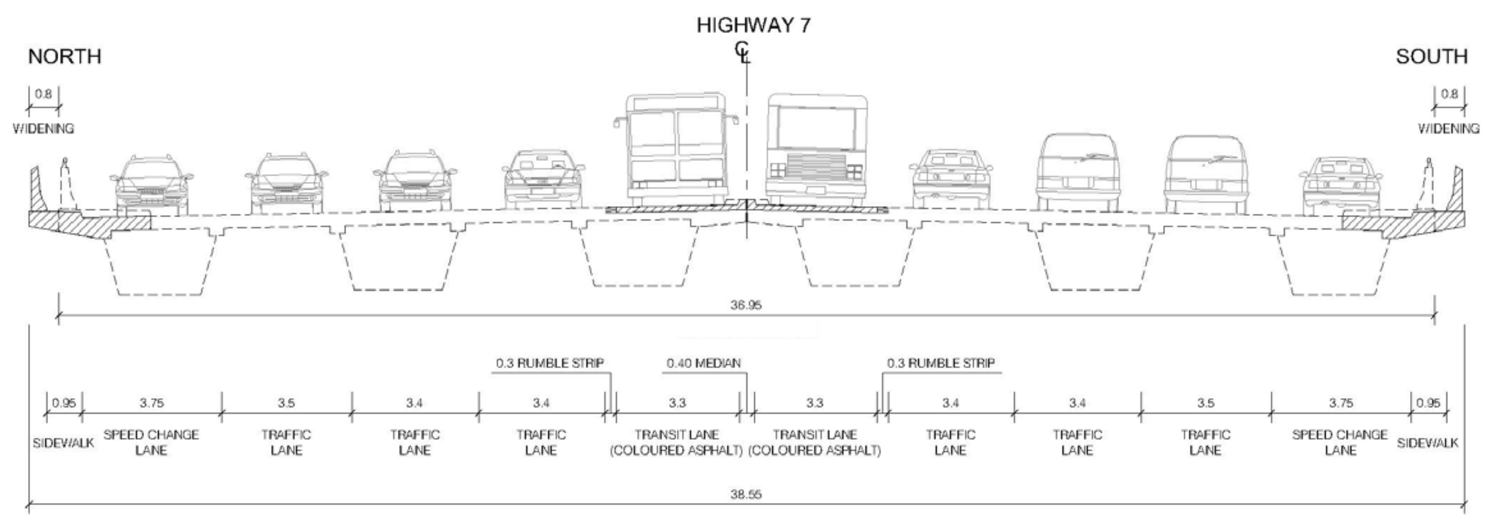

Figure 9.1-16
Highway 7 Bridge Structure over Highway 400

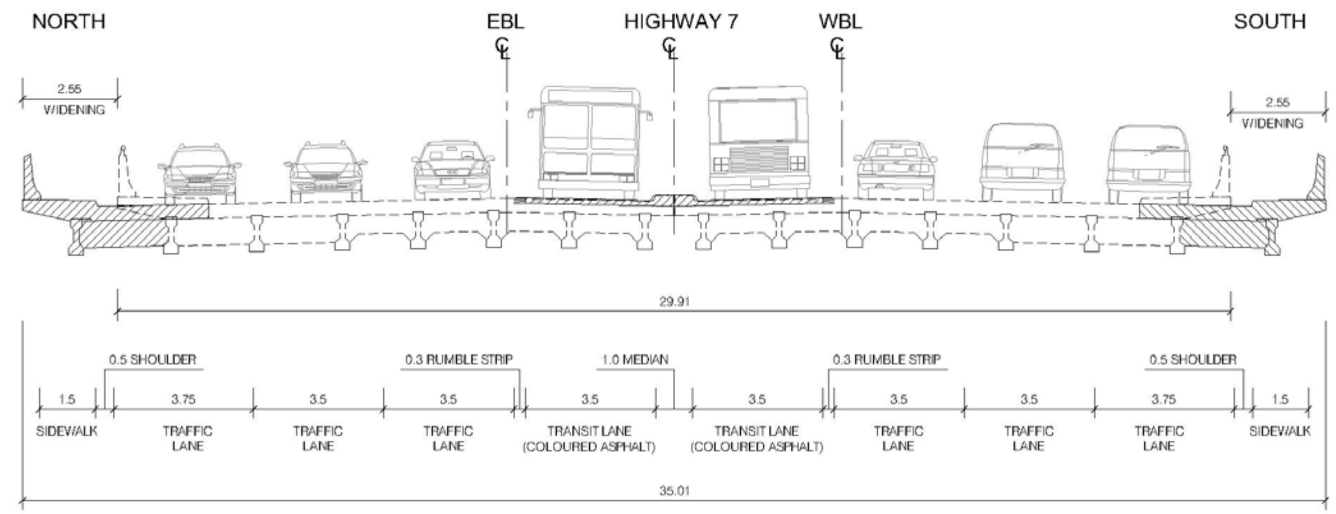

Figure 9.1-17
Highway 7 Bridge Structure over CN McMillan Yard

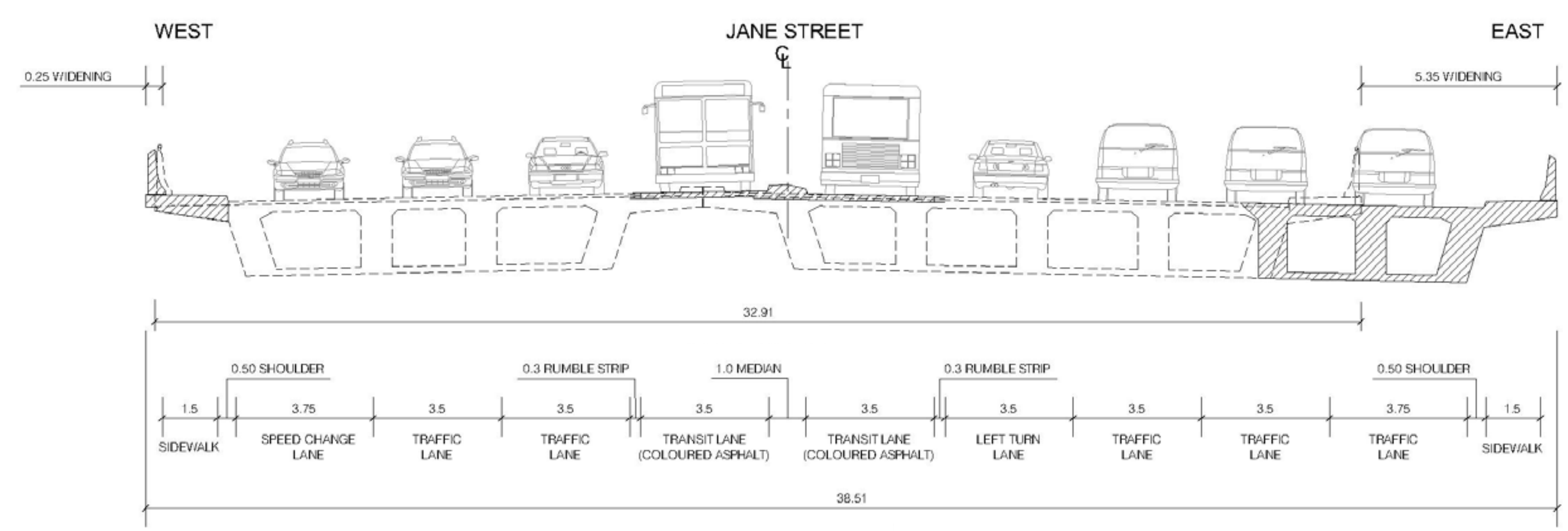

Figure 9.1-18
Jane Street Bridge Structure over Highway 407

10) & 11) The Keele Street bridges over CN Rail's York Subdivision and Highway 407

Rapid transit service on Keele Street over these bridges will operate in mixed-traffic hence no modifications to the bridges are required.

12) The Highway 7 underpass of the GO Bradford Line

Rapid transit service will operate in mixed-traffic through this underpass hence no modification of the bridge is required.

13) The West Don River bridge at Station 23+950

No modification of this bridge is required as rapid transit service on Highway 7 will operate in mixed-traffic through this area.

14) The Centre Street underpass at Highway 407 (CAH)

The existing bridge spans one 3.5 metre and one 3.75 metre traffic lane in each direction with a 5.0 metre median for structure columns, a 6.25 metre eastbound shoulder and a 9.5 metre westbound shoulder. The proposed design in this area is a dedicated westbound transit lane and mixed-traffic operation eastbound. Therefore, the cross-section will include one 3.5 metre westbound transit lane with rumble strip, one 3.5 metre westbound left turn lane, two 3.5 metre general-purpose lanes, two 3.75 metre curb lanes, a 5.0 metre median, a 3.89 metre (max. width) eastbound channelized right turn taper, and a 2.0 metre sidewalk on each side. This underpass was constructed to protect for future Highway 407 access ramps and this plan has since been put on hold indefinitely. Thus, this underpass has enough space to accommodate the rapid transit design with no lengthening of the structure required.

15) & 16) The Bathurst Street bridges over Highways 407 and 7

Rapid transit service on Bathurst Street will operate in mixed-traffic over these bridges hence no modification is required.

17) The Bathurst-Highway 407 N-W Ramp bridge over Highway 7

Rapid transit service will operate in mixed-traffic over this bridge hence no modification is required.

18) The Little Don River box culvert at Station 28+940

The existing crossing width is made up of one 3.5 metre and two 3.75 metre traffic lanes in each direction with a 5 metre raised median/eastbound left turn lane taper, and a 2.5 metre sidewalk on either side. The proposed design through this area is a dedicated rapid transit lane for the eastbound direction and mixed-traffic operation westbound. Therefore, the cross-section will include one 3.5 metre eastbound transit lane with rumble strip, a 2.28 metre raised median, a 3.5 metre eastbound left turn lane, two 3.5 metre eastbound through traffic lanes, one 3.75 metre curb lane and a 2.0 metre eastbound sidewalk. The westbound lane configuration is unchanged. A minimum widening of 3.85 metre is required on the south side depending on grading.

19) The Highway 7 bridge over Yonge Street and Highway 407 N-W Ramp (CAH)

The existing crossing consists of a 3.50 metre and a 3.75 metre traffic lane in each direction with a 2.0 metre raised median, a 3.0 metre eastbound left turn lane, and a 0.5 metre shoulder and 2.0 metre sidewalk on each side. The proposed cross-section will include a 1.0 metre raised median, two 3.5 metre transit lanes with rumble strips, a of 3.25 metre maximum width eastbound left turn lane taper, four 3.5 metre general-purpose lanes, two 3.75 metre curb lanes, a 0.9 metre westbound shoulder, a 0.5 metre eastbound shoulder, and a 1.5 metre eastbound sidewalk. A widening of 4.33 metres on the south side is required as shown in **Figure 9.1-19**.

20) The Highway 7 bridge over the Yonge- Highway 407 E-N/S Ramp (CAH)

The existing bridge carries a 3.50 metre and 3.75 metre traffic lane in each direction with a 2.0 metre raised median, a 3.0 metre eastbound left turn lane, a 0.5 metre shoulder and a 2.0-metre sidewalk on each side. The proposed cross-section will include a 1.0 metre raised median, two 3.5 metre transit lanes with the rumble strips, a 3.50 metre eastbound left turn lane, four 3.5 metre general-purpose lanes, two 3.75 metre curb lanes, a 0.95 metre westbound shoulder and a 2 metre eastbound sidewalk. A widening of 4.55 metres on the south side is required.

21) The Highway 7 bridge over the CNR Bala Subdivision and GO Richmond Hill Rail Line

The existing bridge width accommodates one 3.50 metre and two 3.75 metre traffic lanes in each direction, a 5.0 metre raised median, and a 0.75-metre shoulder and 1.75-metre sidewalk each side. The proposed design shown in **Figure 9.1-20** is a dedicated rapid transit lane for eastbound service and mixed-traffic operation for westbound. Also, an extended eastbound left turn lane is required as a result of the longer storage length predicted. In order to avoid widening the structure, reduced lane widths have been proposed for transit and general traffic lanes. With this assumption, the cross-section will include one 3.3 metre eastbound transit lane with rumble strip and 1 metre raised median, one 3.4 metre eastbound left turn lane, three 3.4 metre traffic lanes in both directions, a 0.8-metre shoulder on each side and a 2.0-metre sidewalk on the south side.

Figure 9.1-20 shows the re-distribution of the traffic lanes on the existing bridge to accommodate BRT service on Highway 7. Conversion of the rapid transit service to LRT technology will require construction of a new transit bridge adjacent to the existing on the north side as shown by the conceptual LRT alignment in **Figure 9-45**. This bridge will be approximately 10 metres wide and will have spans matching the existing bridge providing the same horizontal and vertical clearances to existing and future CN tracks as the Highway 7 bridge. The detailed design of this bridge will be submitted to CN Rail and Canadian Transportation Agency (CTA) for approval prior to implementation.

22) The Highway 7 bridge over Cedar Avenue

The existing bridge carries one 3.50 metre and two 3.75 metre general traffic lanes in each direction, a 5.0 metre raised median, and a 0.75 metre shoulder and 1.75 metre sidewalk each side. The proposed cross-section will include two 3.5 metre transit lanes with rumble strips, and four 3.5 metre general-purpose lanes, two 3.75 metre curb lanes, a 1.0 metre median, two 0.5 metre shoulders and two 2.0 metre sidewalks. A widening of 1.55 metres each side is required.

23) & 24) The Highway 7 underpasses at Bayview Avenue and Highway 404

Rapid transit will operate in mixed traffic through both of these underpasses hence no modification of the bridges will be required. However, in the future, if service reliability through the Highway 404 interchange cannot be maintained the option of extending the span of the existing interchange bridges may be pursued.

25) The Beaver Creek culvert at Station 37+790

The existing culvert crossing consists of one 3.5 metre and two 3.75 metre traffic lanes in each direction, a 4.5 metre continuation of the centre left turn lane, a maximum 2.4 metre westbound right turn taper, and a 0.5 metre shoulder and 1.5 metre sidewalk on each side. The proposed cross-section will include a 1.0 metre raised median, two 3.5 metre transit lanes with rumble strips, four 3.5 metre general-purpose lanes, two 3.75 metre curb lanes, one each of the 3.5 metre westbound and eastbound left turn lanes, a maximum of 2.2 metres for the westbound and eastbound right turn lane tapers, two 0.5 metre shoulders and two 1.5 metre sidewalks. Widening of 5.10 metres on the north side and 6.84 metres on the south side are required.

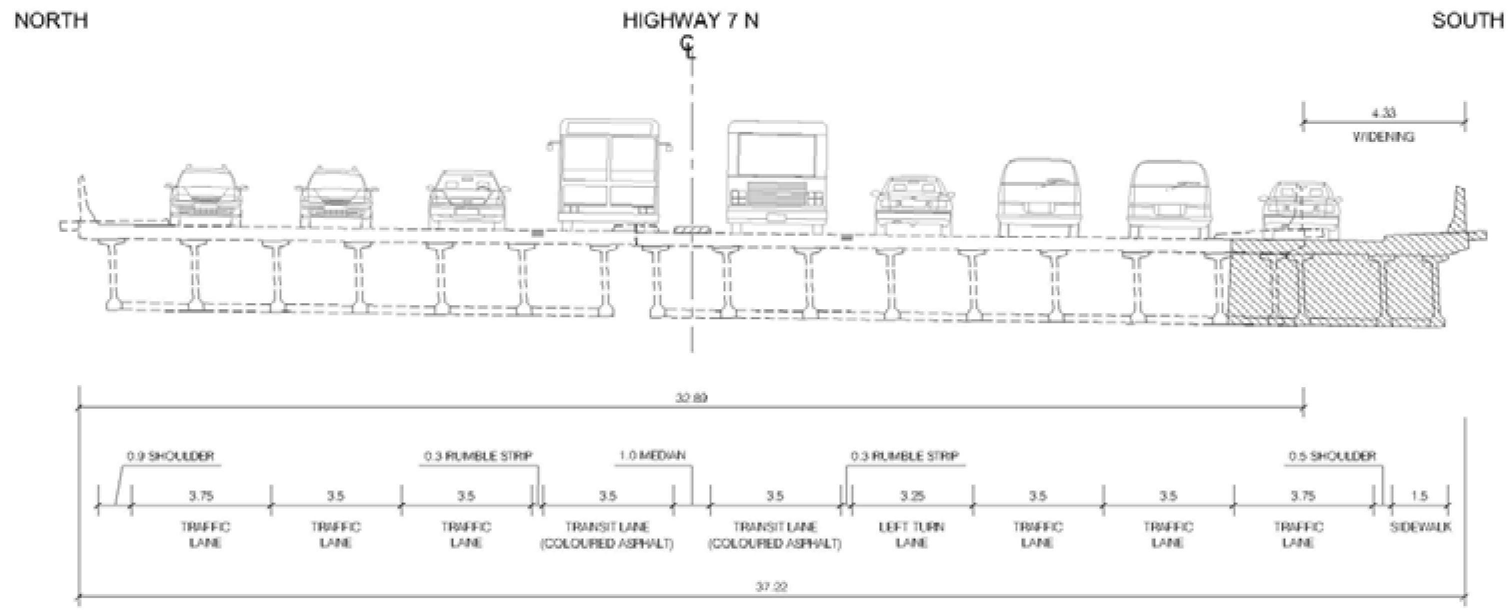

Figure 9.1-19
Highway 7 Bridge Structure over Yonge Street

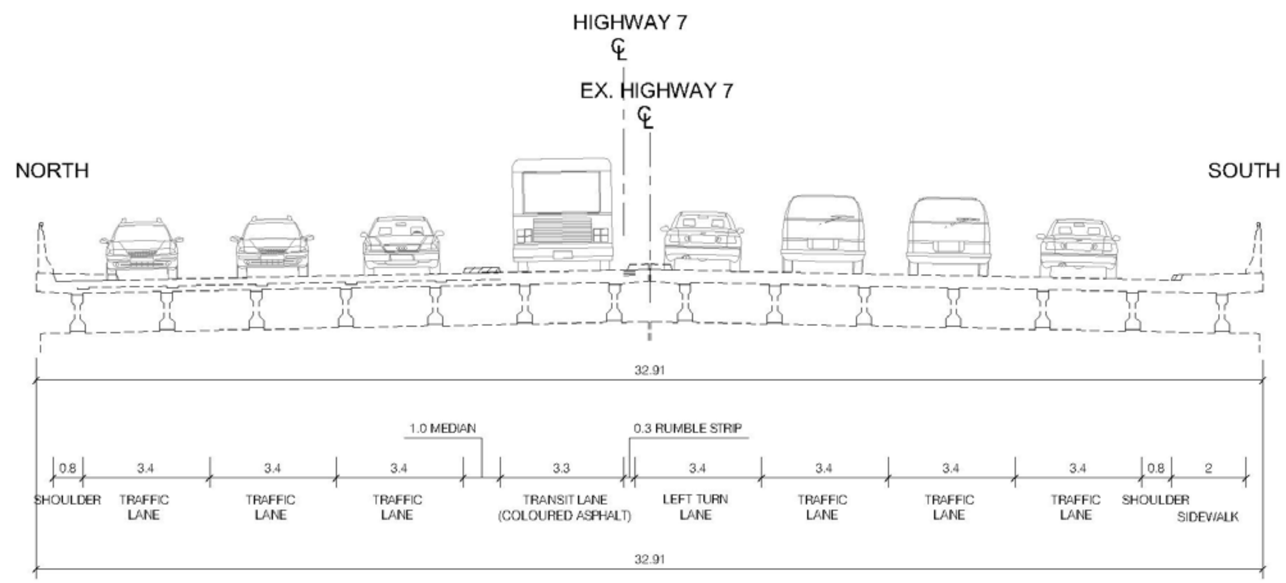

Figure 9.1-20
Highway 7 Bridge Structure over the CNR Bala Subdivision Railway Line

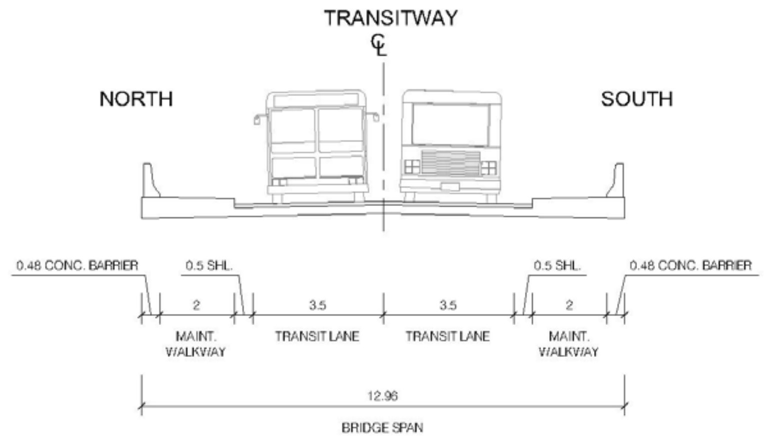

Figure 9.1-21
New Upper Rouge River Crossing Structure near IBM at Station 540+190

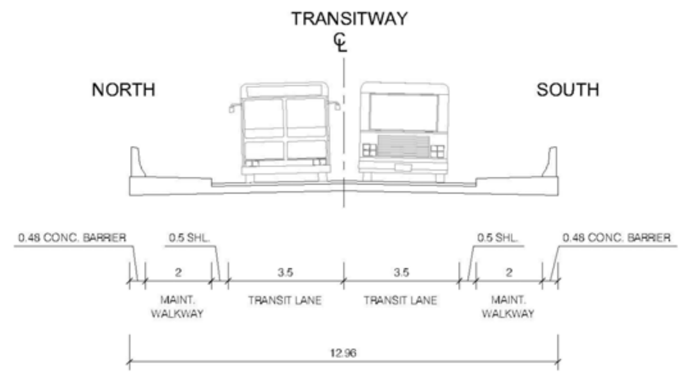

Figure 9.1-22
The Upper Rouge River Crossing Structure in Markham Centre at Station 541+424

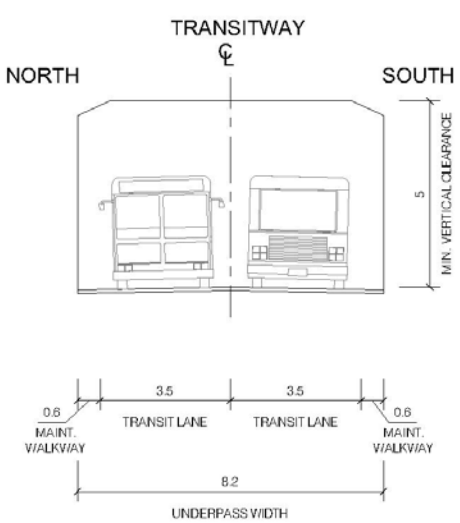

Figure 9.1-23
New Underpass at Future Enterprise Drive at Station 541+730

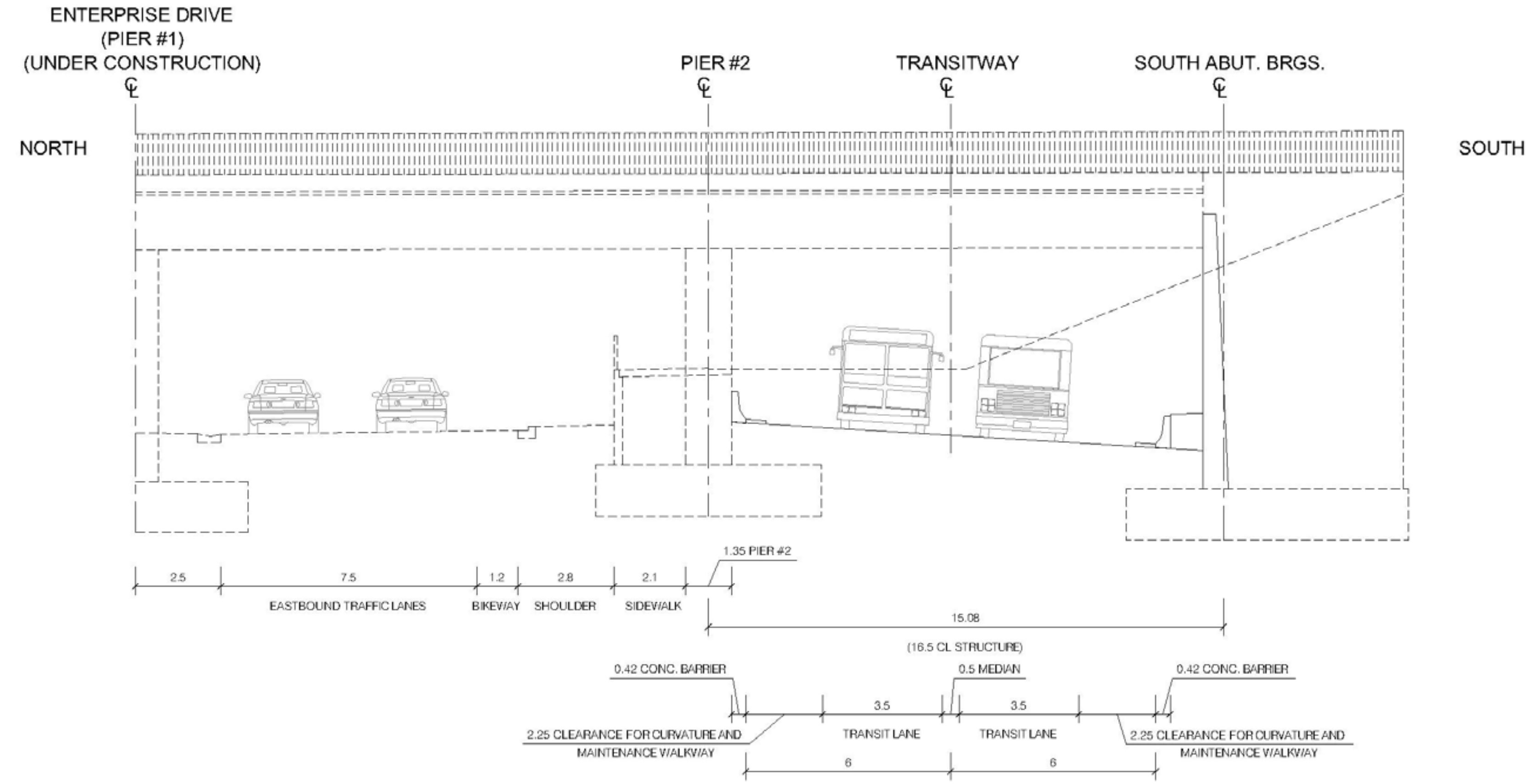

Figure 9.1-24
New Underpass at GO Stouffville Line

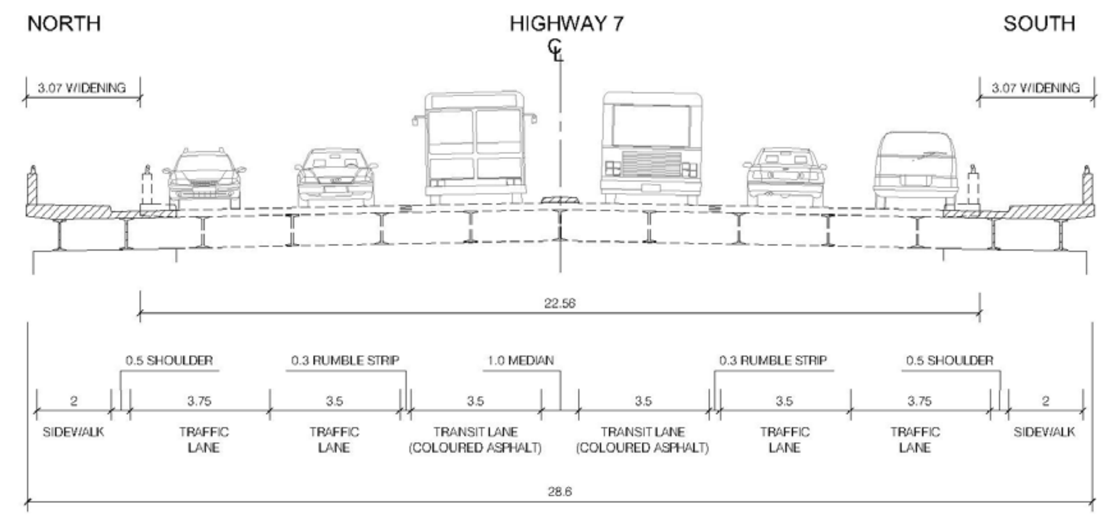

Figure 9.1-25
Highway 7 Bridge Structure at Lower Rouge River Crossing

26) The Apple Creek bridge at Station 38+695

The existing bridge carries two 3.5 metre traffic lanes in each direction, a 1.5 metre raised median, and a 0.5 metre shoulder and 2.0 metre sidewalk on each side. This bridge is to be widened from two lanes to three lanes in each direction as described in Chapter 13 of this Report. Prior to the implementation of the transitway, the roadway is to consist of an 8.6 metre temporary landscaped median, a 3.25 metre eastbound left turn lane, a maximum of 1.01 metres for the westbound left turn lane taper, four 3.50 metre general-purpose lanes, two 3.75 metre curb lanes, 0.5 metre for the eastbound shoulder, a westbound shoulder varying in width from 0.5 to 1.509 metre and two 3 metre sidewalks. To implement the transitway, the 8.6 metre temporary landscaped median will be replaced by a 1 metre raised median, two 3.5 metre transit lanes with rumble strips. There will be no additional widening for implementation of the transitway.

27) New Upper Rouge River bridge near IBM at Station 540+190

This new Rouge River crossing will consist of two 3.5-metre lanes for transit, two 0.5-metre shoulders and two 2-metre maintenance walkways as shown on **Figure 9.1-21**. A meander belt analysis will be carried out and a 100-year erosion limit will be determined during the preliminary and detailed design phases to determine the sizing of the bridge span.

28) New Upper Rouge River Tributary 4 crossing structure at Station 541+424

This new Rouge River Tributary 4 crossing will consist of two 3.5-metre lanes for transit, two 0.5-metre shoulders and two 2-metre maintenance walkways as shown in **Figure 9.1-22**. The type of structure will be determined during the detailed design.

29) New underpass of future Enterprise Drive at Station 541+730

The proposed underpass is shown in **Figure 9.1-23**. It consists of two 3.5 metre lanes for transit and a 0.6 metre maintenance walkway in each direction is proposed. The total width of this underpass is 8.2 metres.

30) New underpass at GO Stouffville line at Station 541+925

The rapid transit will be located south of future Enterprise Drive sharing the new underpass together. This new structure will be constructed first as part of the future Enterprise Drive construction. It is protected for the implementation of rapid transit. The rapid transit part of the underpass consists of a 0.5 metre median, two 3.5 metre transit lanes, two 1.65 metre shoulders and two 0.6 metre maintenance walkways as shown in **Figure 9.1-24**.

31) The Lower Rouge River crossing bridge structure at Station 43+256

This current crossing consists of two lanes of traffic in each direction of 3.66 metres in width, a 2.44-metre raised median, and a 2.41-metre shoulder either side. The proposed cross-section will include a 1.0-metre raised median, two 3.5-metre transit lanes with the rumble strips, four 3.5-metre general purposed lanes, two 3.75-metre curb lanes, 0.5 metre for shoulders, and 2.0 metres for the sidewalks. A widening of 3.07 metres on the either side is required as shown on **Figure 9.1-25**.

32) The Little Rouge Creek crossing bridge structure at Station 51+117

This current crossing consists of one 3.66-metre lane of traffic in each direction, and a 0.91-metre shoulder and a 1.52-metre sidewalk either side. The proposed design through this area is to be a mix-traffic operation. Therefore, existing structure remains untouched.

In the event that grade separated option C-B2 through the Highway 404 Interchange becomes necessary, the MTO will be consulted during the design process of this grade separated option during the preliminary and detailed design phases.

9.1.6 Modifications to Existing Interchanges

There are eight (8) interchange ramps that will require re-alignment to MTO highway design standards in order to accommodate the widening of intersecting roadways. The details of the re-alignments will be developed for MTO approval during the preliminary and detailed design phrases. These are the following:

1. Highway 427 W-S Ramp;
2. Highway 427 E-S Ramp;
3. Highway 400 E-S Ramp;
4. Highway 400 W-N Ramp;
5. Highway 407-Yonge Street S-W Ramp;
6. Highway 404 W-S Ramp;
7. Highway 404 E-N Ramp; and
8. Highway 407-Jane Street S-E Ramp.

9.1.7 Stations

Station conceptual designs were developed based on the criteria outlined in **Chapter 7**. The objective was to develop a typical or prototype station that incorporates a set of common elements that would create a clear identity and allow for ease of installation and maintenance.

The prototype station includes:

- Consideration of the station precinct and the connections to the local community as part of the station development;
- Far-side stops, with the end of the passenger platform located as close to the pedestrian crosswalk as possible;
- Distinctive, modular shelters to provide weather protection and contribute to the visual identity of the system;
- Provision for amenities including fare collection equipment, signage, system maps and real-time passenger information.

Opportunities to incorporate art to enhance the image of the system and to incorporate elements of the historic nature of the station areas or the corridor will be introduced.

The station precinct includes the station site itself and consideration of how pedestrians access the transit service from the local neighbourhood. This includes the sidewalk system, crosswalks and signage and wayfinding systems. The identity of the system and the access to the system are clearly defined by the various prototype elements. The stations are conveniently located at the signalized intersection where pedestrians and cyclists can easily access the station through the intersection.

Far-side stations allow vehicles to pass through signalized intersections before stopping at the platform, minimizing lost time at signals and minimizing vehicle-pedestrian interfaces. This also places the vehicle beyond the crosswalk so that passengers leaving the station do not interfere with the vehicle's departure.

The prototype staggered station layout, illustrated in **Figure 9.1-9**, will be used at approximately half of the station locations listed at the beginning of this chapter. The exceptions where platforms are not staggered but face each other are:

- Highway 427 – west side platforms next to future Highway 427 transitway;
- Kipling Avenue – east curb-side platforms due to mixed traffic operation;
- Islington Avenue – west curb-side platforms due to mixed traffic operation;
- Jane Street - west side platforms due to transit diversion;
- Keele Street - east side platforms due to transit diversion;
- Dufferin Street - east side platforms due to physical constraint;

- North Promenade - east side platforms due to the entrance to the York Region Transit Terminal;
- Bathurst Street Connection Ramp/ Highway 7 – westbound curb-side platform due to mixed traffic operation and eastbound median platform;
- Bayview Avenue - east curb-side platforms due to mixed traffic operation;
- Allstate Parkway/ East Valhalla Drive - east side platforms due to protection for potential transit diversion;
- Town Centre Boulevard – west side platforms;
- IBM Entrance – south side platforms;
- Warden Avenue – east side platforms;
- Future Market Drive (Markham Centre) – east side platform;
- Unionville GO Station – east side platforms;
- Galsworthy Drive/ Grandview Boulevard – west side platforms due to mixed traffic operation;
- Wootten Way - east side platforms due to mixed traffic operation;
- Reesor Road - west side platforms due to mixed traffic operation;

Modular shelter design allows for a consistent image to be created through a design that is responsive to the level of passenger usage. The platform area is a consistent size across the system, designed to allow for two LRT vehicles to be stopped at any given time. The shelter is sized based on anticipated station loads and can be expanded as the system grows.

Fare collection equipment, signage and system maps and information will be presented in a similar manner at each station. This predictability of information and placement will enhance the passenger's experience.

In many newer transit systems art is incorporated in the stations through stand-alone or integrated art. This provides an opportunity to enhance the public's perception of the system and increases the level of safety and security. This art can reflect the current or historical context of the station or community. In many cases the art at several stations is linked into a common theme to provide variation yet allow for a complete story to be told. Integrated art has become the more common method as stand-alone art generally requires more space and is seen as distinct from the station whereas integrated art joins the function of the station with the aesthetic.

9.1.8 Park and Ride Facilities

Although integration with YRT local services as feeders is a primary objective, the Region's rapid transit plan includes a commitment to undertake a parking need assessment and management study to perform an operational review on feeder services, to determine the requirements for parking spaces and how these required parking spaces will be provided and implemented. The installation of parking facilities, wherever practical, cost-effective and primarily in the general areas noted earlier in this Chapter, will encourage access to the system by private cars. During the study, local municipalities and, where opportunities exist, private property owners will be consulted to identify potential locations for park-and-ride facilities. The allocation of parking spots may be feasible at regional centres and business locations to allow for the integration of the transit system. Options to be investigated could include vacant land owned by municipalities, shared use of municipal parking lots or garages, sharing of commercial parking lots and joint development in the vicinity of key transitway stations. Park-and-ride facilities will be implemented in accordance with the study recommendations respecting site planning and EA regulatory requirements. Any new separate facilities will be subject to the requirements of a Class or Individual EA as appropriate. The Region will not assume that parking spaces will be available on GO Transit-owned lands at GO Stations. There are 500 spots being provided in the Hydro Corridor north of Steeles Avenue and east of Jane Street.

9.2 SERVICE PLAN FOR SURFACE RAPID TRANSIT

9.2.1 Near-Term Service Design

Initially, the service design for the Highway 7 Corridor is expected to be generally the same as that for the Viva 1 phase, scheduled to begin operation in fall of 2005. This is described as follows:

- **Routing (Highway 7 Route)** – essentially staying on the corridor, as defined in this report, except all services routing to and from York University; peak routing from Cornell to Martin Grove during peak periods and from Cornell to York University in off-peak times;

- **Routing (Markham and Vaughan North-South Routes and Yonge-Markham Route)** – overlaying various parts of the Highway 7 route, from York University to Martin Grove (Vaughan), from Warden to Cornell (Markham) and from Langstaff to Markham Centre (Yonge-Markham), and then continuing to Toronto subway terminals (Downsview for Vaughan, Don Mills for Markham and Finch for Yonge-Markham); during off-peak times, the Markham N-S route would terminate at Unionville GO and the Yonge-Markham route would not operate, in order to not duplicate other routes during low-demand times;

- **Stop Policy** – stopping at all stations, as defined in this report (i.e. no express or semi-express operation or other stop variation);

- **Vehicle Allocation** – 12-metre standard vehicles, but transitioning to 18-metre articulated vehicles as ridership grows and articulated vehicles are added to the Rapid Transit fleet to meet overall growth requirements;

- **Span of Service** – 7 days per week and approximately 18 hours per day (6:00 am to 12:00 midnight, with slightly later early morning starts Saturdays and Sundays), the same as for the Viva 1 phase, although service could operate later in the evening as ridership builds, say to 1:00 or 2:00 am, the same as the local service now provided by YRT;

- **Service Frequencies (weekday peak periods)** – a minimum 10-minute service on each route (Highway 7, Vaughan N-S, Markham N-S and Yonge-Markham) during weekday peak periods, with integrated schedules where routes overlap to provide a combined 5-minute service (6 vehicles per hour in each direction on individual routes and 12 vehicles per hour in each direction where routes overlap).

- **Service Frequencies (off-peak times)** – a 15-minute service on all routes with no route overlaps, as noted in the routing descriptions above.

9.2.2 Longer-Term Service Design Concepts

Once the initial Viva 1 service is implemented, ridership is expected to grow considerably over the next 15 years. Ridership modeling has produced forecasts for 2006 (i.e. the Viva 1 phase) and 2021. The 2021 peak-hour peak-direction link volume forecasts at key locations on the corridor and the north-south connectors are shown in **Table 9.2-1**.

Table 9.2-1
2021 Peak-hour Peak-Direction Link Volume Forecasts at Key Locations

Link	Viva 1	Full-Build
Highway 7 – Hwy 400 to York U.	800	1500
Vaughan N-S – Steeles to York U.	1000	2200
Highway 7 – York U. to Yonge	700	1600
Highway 7 – Woodbine to Kennedy	2200	2600
Markham N-S – Markham Ctr. to Hwy 407	2100	3000
Highway 7 – Kennedy to Ninth Line	1300	2400

Unlike the Yonge Street Corridor, where volumes are much greater in the southern part of the corridor than anywhere else in the network (6800 per hour in the peak direction) and much lower further north, the volumes for the various links of Highway 7 and the north-south connectors are within a similar order of magnitude. This suggests that no individual links would be expected to dominate to the extent that they would need overlaid or

9

duplicated services (like those in Viva 1). It further suggests a service design concept that would tend to balance service levels among the various links.

The fact that the Highway 7 and the north-south corridors meet at two points even further suggests the need for a service design that is flexible enough to maintain that balance of service levels and offer multiple trip connection or interline opportunities. Thus, in both Markham and Vaughan, there would be opportunities and desirabilities to offer routings that could follow any combination of links, namely:

- Vaughan – Woodbridge to Yonge (Highway 7 route);
- Vaughan – Woodbridge to Downsview (Vaughan N-S);
- Vaughan – Yonge (Thornhill/Promenade) to Downsview (not included in Viva 1);
- Markham – Cornell to Yonge (Highway 7 route);
- Markham – Cornell to Don Mills (Markham N-S);
- Markham – Yonge (Beaver Creek/Woodbine) to Don Mills (not included in Viva 1).

The two routing combinations noted above that are not included in Viva 1 would offer significant new direct trip opportunities for some key markets. The Yonge-York U.-Downsview routing in Vaughan would provide a Downsview subway link to the Thornhill and Promenade area and would provide additional capacity for the peak demands between York University and the Yonge Street Corridor (and much of the south-central part of the Region). The Yonge-Markham Centre-Don Mills routing in Vaughan would provide an additional subway link to the Beaver Creek and Woodbine employment areas and would add capacity to Don Mills station without over servicing the portion of the Highway 7 Corridor east of Markham Centre.

9

Allowances in the route alignments and intersection alignments where rapid transit routes meet should then be designed to accommodate any of the above routing combinations. In the case of Vaughan, one approach might be to keep a Highway 7 service (Woodbridge to Yonge) on Highway 7 (bypassing York University) to provide a quicker east-west link, while having the two Downsview-oriented services meeting the demand needs of both York University and the Downsview subway link. The specific service designs for any of these routes would be done in the future once ridership patterns have further developed and demand has grown sufficiently to justify the new route combinations while maintaining high frequency "rapid-transit" service levels.

9.2.3 Longer-Term Service Levels

The 2021 ridership forecasts in the above table indicate that the required individual link frequencies could be as high as 90 seconds to two minutes during peak hours in the busiest parts of the corridor. This assumes the longer-term use of articulated buses on all corridors, which is supported by these ridership figures.

By using a more flexible routing approach, such as that described above, most or all links on Highway 7 and the two north-south connectors would have two overlaid services during peak periods. This would mean that individual route frequencies during peak periods would be as high as 3 to 4 minutes. These frequencies are very much of a "rapid transit" quality and yet are not so high that they would result in inefficiencies or operational difficulties. Thus, within the 2021 time frame and using the multi-route approach, there would not likely be a need to put in place more complex operational policies, such as express services or trips with varying stop policies.

9.2.4 Other Possible Complementary Services

Notwithstanding the above service concepts, there could be benefit in considering some complementary peak express services much like those now operated by YRT that serve residential neighbourhoods in Unionville, Markham and Cornell and connect these areas quickly to the Finch subway station. These would not have to be part of the rapid transit service, however, since rapid transit, as currently designed, requires equipment for on-street fare collection and other services. Keeping the express services as separate, complementary YRT services would maintain their flexibility to circulate through residential neighbourhoods and expand as necessary.

For these types of services to be able to use the rapid transit alignment, there would need to be space for vehicles to pass at stations, where express buses would not be stopping.

A further service design concept that could be considered would be to add rapid transit branches towards the outer ends of the routes. Examples might include a branch to the north on Main Street Markham or to the north on Islington or Weston in Vaughan, any of which would require further investigation. Such branches, of course, would require rapid transit stops/stations with appropriate shelter and fare payment facilities. If such branches were to be considered, they would work better towards the outer ends of the routes since branching will reduce service frequencies on individual branches, which would not be desirable on the busier inner portions of individual routes. Even if peak demands were to be high enough for such an approach, off-peak frequencies would be much less and branches could risk frequencies dropping below what would be desirable for rapid transit.

9.3 ULTIMATE CONVERSION OF VAUGHAN NORTH-SOUTH LINK TO SUBWAY TECHNOLOGY

In Chapter 5 the benefits of ultimately converting surface rapid transit in the Vaughan North-South Link to subway technology were discussed. Chapter 12 evaluates the alternative methods of achieving the conversion by an extension of the Spadina Subway into York Region and describes the components of the subway extension that form part of the undertaking for this EA.

9.4 PROJECT ACTIVITIES

There are three distinct phases to the project: **Pre-construction; Construction; and Operation.** The activities associated with each of these phases are presented below:

Pre-construction Phase: This phase includes the completion of preliminary and detailed engineering and streetscape designs and preparation of contract drawings and specifications. This phase also involves obtaining all necessary permits, as well as approvals from regulatory agencies.

Construction Phase: This phase involves all activities related to construction such as: removals, grading, excavation, filling, construction and replanting for the entire construction period.

Operation Phase: This phase begins with the first day of transitioning operation, and covers the general operational activities such as maintenance and monitoring, on an as required basis.

9.4.1 Pre-construction Phase

This stage includes completion of preliminary and detailed engineering and streetscape designs and preparation of contract drawings and specifications. Issues to be addressed and resolved during preliminary design include but are not limited to:

- Potential funding sources for construction of the project;
- Property acquisition;
- Phasing requirements for infrastructure design;
- Construction staging of the design;
- Resolution of transit arrangement for the section at IBM, Markham;
- Obtaining MTO approvals for interchange modifications;
- Landscaping materials;
- Heritage element design;

- Utility relocation strategy and design;
- Street lighting design, frequency and location;
- Street furniture;
- Public art;
- Storage & Maintenance Facility design;
- Vehicle types and operational plans;
- Amenities for stations and their design;
- Traffic signal design;
- Coordination with local transit routes and transfer strategies;
- Fare collection strategies;
- Sewer design and watermain design and;
- Pavement design for running ways and roadways.

Other pre-construction activities include:

- Site surveying as required;
- Obtaining approvals for construction access and working areas;
- Geotechnical investigations including drilling of boreholes to determine existing soil and groundwater conditions;
- Archaeological and waste contamination investigations;
- Advance utility relocation or burying contracts; and
- Coordination with other projects in the vicinity of the corridor.

9.4.2 Construction Activities

Physical construction activities will include:

- Installation of traffic accommodation measures as required by staging plan;
- Clearing and grubbing of trees and vegetation within the grading limits for construction of the project;
- Stripping and topsoil within the grading limits;
- Excavation of road surface including sidewalks and medians;
- Trenching and installing new below grade infrastructure and burying overhead services;
- Removing existing asphalt and disposing at approved facility;
- Removing redundant structures and disposing of debris;
- Preparing road bed including cutting and filling and lying granular;
- Potentially salvaging existing granular/asphalt for reuse;
- Pouring concrete for curb, barriers, retaining walls, planters and sidewalks;
- Constructing buildings in the Storage and Maintenance Facility;
- Fabricating and erecting station elements including amenities;
- Laying granular and application of hot mix asphalt;
- Installing lighting, heritage lighting and traffic signals;
- Final grading and topsoil application;
- Asphalt line painting; and
- Installing landscaping features such as sod, shrubs, trees, paving stones irrigation systems, station amenities and street furniture.

Throughout the construction stage, various associated activities, which can have potentially adverse environmental effects will need to be mitigated, as outlined in **Section 10.4**.

9.4.3 Operation Phase

Once construction is complete, monitoring of the Highway 7 Transitway will be initiated. This will include:

- Monitoring traffic and transit ridership volumes to determine the potential for future modifications;
- Accidents to analyze safety conditions;
- Traffic signals timing; and
- Landscape health.

Routine maintenance activities include:

- Spring sweeping of road, sidewalk and boulevards;
- Snow and ice removal in the winter;
- Landscape maintenance including grass cutting, shrub and tree pruning in the summer; and
- Replacement of any landscaped material.

9.5 PROJECT STAGING

There will be opportunities to stage project activities during the construction phase. Staging the project will be beneficial in maintaining the best possible level of service during construction, including maintaining accesses to all properties as well as maintaining city/town and utility services such as water, sewer and hydro. This will include staging of activities in terms of activities across the corridor (cross-section staging), or sections/portions along the corridor (component staging).

Although specific plans to stage the project will not be determined until the detailed design phase, it is useful to present staging opportunities in general terms in this environmental assessment study so that potential effects can be assessed.

Because of the generous platform width required for the new project, staging of construction should be easy and should have the ability to maintain pedestrian and road traffic as currently existing during construction. The basic strategy would be:

- Construct the additional widening on one side of the roadway to its required width;
- Shift existing traffic to the side where new widening has been constructed. If necessary a temporary surface over the landscape median/station areas may have to be constructed;
- Operate traffic to one side. Set up temporary signals to align with new traffic lanes at signalized intersections;
- Construct remainder of the roadway while maintaining access to existing properties by staged construction;
- Finalize construction and open to traffic to its final configuration.

9.6 DESIGN ATTRIBUTES AND BUILT-IN MITIGATION

For this project, "built-in mitigation" is defined as actions and design features incorporated in the pre-construction, construction and operational phases, that have the specific objectives of lessening the significance or severity of environmental effects which may be caused by the project.

The Highway 7 Transitway will be designed and implemented with the benefit of planning, road and transit design engineering, landscaping design, and environmental best management practices. Regard shall be given to the legislation, policies, regulations, guidelines, and best management practices of the day. Where possible, mitigation measures will be prescribed in the construction contracts and specifications. Examples of practices that should be employed, based on current standards, are described below. These will be applied and refined during the pre-construction, construction and operational phases of the project.

Construction and Traffic Management Plan

A Construction and Traffic Management Plan will be developed to manage the road's transportation function for all travel modes including equipment and material deliverables at various times during the construction period. The objective will be to maintain clear pedestrian safe routes and to maintain existing traffic as close as possible to its current conditions. The plan will also outline the road signage program.

Emergency Response Plan

The preparation of an Emergency Response Plan to be used by the contractor, is included to allow full emergency services access during the construction period, such that anytime there is a method to access all residential, commercial and other land uses in the event of an emergency. Additionally, the emergency response plan should include provisions for providing temporary services to end users in the event of a construction related service outage or other service disruption. A spills response and reporting plan will be prepared and adhered to by the contractor. Spills or discharges of pollutants or contaminants will be reported immediately. Clean up shall be initiated quickly to ensure protection of the environment.

Management of Contaminated Materials

Studies will be completed to confirm the potential for the project to interact with contaminated soil or groundwater. Where the potential is confirmed, a plan to remediate the environment to the applicable standards will be prepared. The Ministry of Environment and Construction Manager would be notified immediately upon discovery of any contaminated material encountered within the construction area. If contaminated materials or contaminated groundwater are encountered within the construction limits, these are to be removed and disposed off in accordance with all applicable Acts and regulations. Treatment and discharge of contaminated groundwater are also to be in accordance with applicable legislation and regulations.

Construction Waste Management Plan

During construction there will be some excess materials that must be disposed off the site of the project. These could include concrete rubble, asphalt, earth and road right-of-way appurtenances such as signs and lighting and utility poles. During the detailed design stage a waste management plan will be developed to ensure that surplus material is recycled wherever practical and to describe the methods to be used by the Contractor for disposal of all other surplus material in accordance with provincial or local municipal practices and guidelines.

Geotechnical Investigations

Geotechnical investigations will be required to confirm groundwater and subsurface conditions and potential impacts that will need to be considered in the detailed design of the project.

Archaeological Assessment and Monitoring

Based on the existing conditions, there were areas identified as having archaeological potential. Accordingly, it is recommended that a Stage 2 Archaeological Assessment be conducted by a licensed archaeologist, prior to construction. During actual construction, it may be necessary to monitor deep excavations, by a licensed archaeologist. The results of the Stage 2 assessment should be used to determine this level of monitoring. If during the course of construction, archaeological resources are discovered, the site should be protected from further disturbance until a licensed archaeologist has completed and any necessary mitigation has been completed.

Stormwater Management Plan

A Stormwater Management Plan will be prepared, in accordance with the MOE's *Storm Water Management Planning and Design Manual (2003) and Guidelines for Evaluating Construction Activities Impacting on Water Resources,* in detail to identify the rate and volume of anticipated storm water runoff and the means to accommodate it, and to identify the means of achieving MOE guidelines for water quality of storm water runoff. This includes the identification, in the detailed design phase, of the overall storm water management system requirements, methods of detention and filtration, and any control mechanisms necessary to achieve runoff quantity and quality targets. This plan, when prepared during the detailed design phase, will take into account the opportunity that exists to use specific locations within the identified right-of-way as retention areas to assist in the objective to improve stormwater runoff quality to further off-site (i.e., outside the right-of-way) treatment. This plan will also outline monitoring & maintenance commitments for SWM facilities constructed as part of this Undertaking.

To meet the basic criteria of providing water quality treatment for the increase in impervious area, storm water management needs to be provided for approximately 12% of the right-of-way. The storm water management facilities to be included as part of the proposed transitway will be developed during the detail design phase.

The Highway 7 Corridor is mostly urbanized and there are generally limited opportunities to provide storm water management for the Highway 7/transitway runoff. In addition, only a small section of the overall corridor currently outlets to a storm water management facility. The existing roadway runoff has a greater impact on the downstream watercourse than the potential increase in runoff due to the proposed transitway. Storm water management should therefore be developed as part of an initiative to provide treatment on a watershed basis rather than trying to manage the incremental change resulting from the proposed transitway. This type of initiative would be separated from the current EA for the Highway 7 Corridor and Vaughan North-South Public Transit Improvements.

The storm water management options to be considered during detail design of the transitway are identified by locations in **Appendix G**.

Erosion and Sediment Control Plan

During the detailed design phase, a detailed plan will be prepared by the Contractor to manage the flow of sediment into storm sewers. This plan will be based on best management practices including the Guideline of Erosion and Sediment Control at Urban Construction sites. Provision for inspection of erosion and sedimentation control measures during construction will be identified in permit approvals. Catchbasin filters and straw bales in roadside ditches will be used to control erosion and sedimentation during construction. Sediment fences will be used where construction is adjacent to watercourse crossings.

Landscape Plan

A detailed Landscape Plan will be prepared to guide the species selection, location and planting details for all proposed plantings and other streetscaping elements within the corridor. The plan will be prepared by a professional landscape architect with experience in plantings along arterial roadways.

Lighting Treatment Plan

A lighting treatment plan in accordance with local and regional municipal standards will be prepared during the pre-construction phase. The lighting treatment plan will include lighting fixtures and illumination along the various sections of the corridor. A lighting audit of the preferred lighting design plan will be conducted to ensure clear sight lines and appropriate illumination.

Public Communications Plan

The requirement for a Public Communications Plan stems from the need to keep the public informed about the work in progress and the end result of the construction activity. Residents and other stakeholders must be aware of scheduled road closings and other disruptions to normal service ahead of time in order that their activities can be planned with minimum disruption. The Public Communications Plan should detail how to communicate the information to the public, what information should be disseminated, and at what project stages the communications should take place.

10. ASSESSMENT OF THE UNDERTAKING

10.1 ASSESSMENT METHODOLOGY

An impact analysis was undertaken to identify the potential effects, both positive and negative of the pre-construction, construction and operational activities required for project implementation. In the case of negative effects, mitigation opportunities and methods were also identified. The evaluation criteria and indicators established during the alternatives evaluation process were used as the basis for assessing the effects of the preferred design on the social, physical and natural environments. The effects analysis involved applying the following steps:

Step 1: Identify and analyze activities where the project, as described in **Chapter 9**, may interact with the existing environmental conditions described in **Chapter 6**.

Step 2: Acknowledge predetermined project activities that act as built-in positive attributes and/or propose mitigation measures that can be implemented during construction or operation of the undertaking, as outlined in **Section 9.4**.

Step 3: Identify the residual environmental effects, if any.

Step 4: Identify opportunities for further mitigation of residual effects, if possible/practical, including monitoring.

Step 5: Determine the significance of the residual environmental effects, after further mitigation. The potential effects of project implementation were described based on their level of significance.

Step 6: Recommend monitoring activities during the construction or operation of the undertaking.

Professional experience, analysis, simulation and judgement formed the basis for identifying environmental effects and mitigation measures. The analysis was based primarily on comparing the existing environment condition with the anticipated future environment, prior to, during, and after construction. The prediction of effects considered:

- The interaction between a project activity and the valued environmental components;
- The effects of the project activities on the environmental values; and
- The combined effects of multiple activities and/or multiple effects.

Within this context, consideration was given to:

- The magnitude, spatial extent, and duration of effects;
- The proportion of a population or community affected;
- Direct or indirect effects;
- The degree to which the effect responds to mitigation.

In this assessment, "residual" environmental effects are defined as changes to the environment caused by the project, and vice versa, when compared to existing conditions and taking into account all built-in mitigation measures. Potential residual environmental effects were assessed as to their significance, including spatial and temporal considerations, and were categorized according to the following definitions:

"Positive effect" means an effect that will contribute to the well-being or health of a valued environmental component.

"Negligible" means an effect that may exhibit one or more of the following characteristics:

- nearly-zero or hardly discernible effect; or
- affecting a population or a specific group of individuals at a localized area and/or over a short period in such a way that the effect is similar to random small changes but would have no measurable effect on the population as a whole.

"Insignificant" means an effect that may exhibit one or more of the following characteristics:

- not widespread;
- temporary or short-term duration (i.e., only during construction phase);
- recurring effect lasting for short periods of time during or after project implementation;
- affecting a specific group of individuals in a population or community at a localized area or over a short period, but not affecting the integrity of the population or community; or
- not permanent, so that after the stimulus (i.e., project activity) is removed, the integrity of the environmental component would be resumed.

"Moderately Significant" means an effect that may exhibit one or more of the following characteristics:

- not widespread with mostly local effects;
- requires further investigation;
- permanent reduction in species diversity or population of a species, but not in sufficient magnitude to cause a decline in abundance and/or change in distribution beyond which natural reproduction or immigration would not return that population, or any species dependent on it, to its former level within several generations; and
- could be alleviated with additional detailed design.

"Significant" means an effect that may exhibit one or more of the following characteristics:

- widespread;
- permanent transcendence or contravention of legislation, standards, or environmental guidelines or objectives;
- permanent reduction in species diversity or population of a species in sufficient magnitude to cause a decline in abundance and/or change in distribution beyond which natural reproduction or immigration would not return that population, or any species dependent on it, to its former level within several generations (including the consequences of a short-term construction effect);
- permanent loss of critical/productive habitat; and
- permanent alteration to community characteristics or services, established land use patterns, which is severe and undesirable to the community as a whole.

The definitions of significance were adopted for use in this assessment because many of the impacts cannot be quantified in absolute terms, although changes and trends can be predicted. The definitions provide guidance and were intended to minimize personal bias. This is important because the analyses are sometimes based on professional judgement and limited information.

Once the potential effects were predicted, additional mitigation measures were identified. Often these mitigation measures were sufficient to reduce potential negative effects to an insignificant or negligible status.

Monitoring is important to verify the accuracy of predicting effects. Monitoring measures were recommended to determine what effects would actually occur with project implementation, and may result in the modification of mitigation measures to improve their effectiveness. Identified monitoring measures included inspection, surveillance and compliance monitoring.

10.2 ASSESSMENT RESULTS

An environmental effect requires consideration of all project activities and their interaction with the environment. Pre-construction, construction and operational activities were assessed. **Section 10.4** describes these project activities for the surface rapid transit components of the undertaking and their interaction with the environment and location, the potential effects, mitigation measures, residual effects and their significance, and monitoring recommendations. Project stages are coded as follows:

P – Pre-construction
C – Construction
O – Operation

A similar assessment of the above effects for the ultimate phase of the Vaughan North-South Link, subway technology, is presented in **Chapter 12**.

10.3 PROJECT-RELATED EFFECTS AND MITIGATION

The evaluation of project-related effects was performed using the primary Rapid Transit Plan objectives and related goals developed for the evaluation of alternatives in selecting the preferred alignment. These objectives are:

- To improve mobility by providing a fast, convenient, reliable and efficient rapid transit service
- To protect and enhance the social environment in the corridor
- To protect and enhance the natural environment in the corridor
- To promote smart growth and economic development in the corridor

Goals defined by professionals on the study team are subsets of these objectives and refer to an environmental value or criterion. The effect of the proposed undertaking in terms of each environmental value was rated using a qualitative scale ranging from a positive or beneficial effect through negligible to a potentially significant negative effect as described in the above methodology.

10.4 ANALYSIS OF ENVIRONMENTAL EFFECTS AND MITIGATION

10.4.1 OBJECTIVE A: To improve mobility by providing a fast, convenient, reliable and efficient rapid transit service

The analysis relative to Objective A is tabulated in **Table 10.4-1**. Generally, the undertaking has the ability to improve mobility within the region and provide good connectivity with inter-regional transit services. It features connections between the City of Toronto via York University and via the Richmond Hill Centre Intermodal Station at Yonge Street. It connects to GO Transit's Richmond Hill Line at the Langstaff GO Station, their Stouffville Line at Unionville GO Station, and potentially their Bradford Line as GO finalizes new station locations for this service. The undertaking is also capable of connecting to future 400 series highway rapid transit services. From this point of view, the proposed transitway will have an overall positive effect on transit ridership and accessibility in the region. The planned alignment characteristics and geometry will provide a fast, convenient and reliable service in most respects. Although grades at some stations exceed LRT standards, the BRT technology proposed for initial implementation will be accommodated in every case. The recommended mitigation, to provide for future LRT technology when needed, will be local modifications to the running way and station platform configuration at the stations where standards are not met. Stations are located in areas with high residential density, high employment numbers or a mixture of the two to capitalize on the effectiveness of implementing the improved public transit system. The strategic locations of stations generally achieve the goal of increasing the attractiveness of the rapid transit service and make a positive contribution towards maximizing ridership. In order for all members of society to have access to the system, all stations, shelters and the transit system itself will be accessible for the mobility impaired by providing ramps, elevators, etc. Attractiveness of the rapid transit service is implicit in the design of the Undertaking, however, achieving the desired transit speed may affect the capacity for general traffic movements at certain intersections. In this respect, the effect on traffic may be moderately significant.

Table 10.4-1
Effects and Mitigation for Mobility

GOAL	Environmental Value/ Criterion	Environmental Issues/Concerns	Project Phase[1]			Location	Potential Environment Effects	Proposed Mitigation Measures			Level of Significance after Mitigation	Monitoring and Recommendation
			P	C	O			Built-In Positive Attributes and/or Mitigations	Potential Residual Effects	Further Mitigation		
OBJECTIVE A: To improve mobility by providing a fast, convenient, reliable and efficient rapid transit service												
A1	Maximize Inter-regional and local transit connectivity	Connections to inter-regional services and future gateways	✓		✓	Highway 7 & Highway 50	Opportunity to connect to a Brampton Rapid Transit Initiative "AcceleRide" to improve the inter-regional transit network.	Highway 7 transitway will provide a direct connection from western York Region to the Region of Peel. It also provides a direct connection from York University to the Region of Peel.	Increased potential for infill development around the regional boundary.	None	Positive effect	Monitor the ridership and the performance of the connection to the Region of Peel.
		Connections to inter-regional services and future gateways	✓		✓	At 400 series highways, e.g. Highways 427, 400, 404 & 407	Opportunity to connect to MTO's future rapid transit services on the 400 series highways to improve the inter-regional transit network.	Highway 7 transitway will provide additional stations for transfers.	Increased potential for infill development around these transfer points.	None	Positive effect	Monitor the ridership and the needs to provide additional stations as warranted by the future rapid transit services.
		Connections to inter-regional services and future gateways	✓		✓	York University	Opportunity to connect to the City of Toronto and improve ridership on these transit services.	Vaughan North-South Link will provide a direct connection to the York University and to the future TTC rapid transit connecting the Toronto system prior the implementation of subway extension.	Increased potential for infill development around this transfer point.	None	Positive effect	Monitor the ridership and the performance of the connection to Toronto.
		Connections to inter-regional services and future gateways	✓		✓	Proposed Richmond Hill Centre Intermodal Station	Better connection to GO Stations and future provincial inter-regional 407 Transitway station will improve ridership on all transit services	Highway 7 transitway will provide a direct connection to GO Rail's Richmond Hill Line at the proposed Richmond Hill Centre Intermodal Station. It will also have a connection to York's Yonge Street transitway and the future provincial transit corridor along Highway 407.	Increased potential for infill development around Richmond Hill Centre Intermodal Station	None	Positive effect	Monitor ridership and the performance of the connection to GO Langstaff Station
		Connections to inter-regional services and future gateways	✓		✓	Unionville GO Station	Connection to Unionville GO Station will improve York's transit network.	A pedestrian walkway will be provided to transfer the transitway passengers to the Unionville GO Station. This will provide a fast and reliable service from the future Markham Centre to the City of Toronto or northern York Region via the GO Rail's Stouffville Line.	Increased potential for infill development around this transfer point.	None	Positive effect	Monitor the ridership and the performance of the connection to Unionville GO Station.
		Compatibility with proposed local network	✓		✓	Entire Corridor	Inconvenient transfer between local transit and Highway 7 Rapid Transit may discourage transit ridership.	Stations generally located on north-south local transit routes ensuring convenient transfers between services. Integrated fare system proposed.	Project may change the configuration of local transit.	Local services configured as grid where practical, to provide both community coverage and feeder roles	Positive effect	Regular review of effectiveness of local service plans.

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Table 10.4-1
Effects and Mitigation for Mobility

GOAL	Environmental Value/ Criterion	Environmental Issues/Concerns	Project Phase[1]			Location	Potential Environment Effects	Proposed Mitigation Measures			Level of Significance after Mitigation	Monitoring and Recommendation
			P	C	O			Built-In Positive Attributes and/or Mitigations	Potential Residual Effects	Further Mitigation		
OBJECTIVE A: To improve mobility by providing a fast, convenient, reliable and efficient rapid transit service												
A2	Maximizes speed and ride comfort and minimizes safety risks and maintenance costs with an optimized alignment geometry.	Grade at station in excess of LRT standard of max. 1.0%.	✓		✓	Eastbound platform on Highway 7 at Chalmers Rd./ South Park Rd.	Running way grade at platforms is 2.49%. LRT should have the minimum climbing grade after stopping to load/unload passengers.	Grade through station will have to be modified locally resulting in a vertical separation from adjacent traffic lanes if LRT technology is introduced.	Minor retaining walls through station.	Incorporate safety barriers where required.	Significant	
		Grade at station in excess of LRT standard of max. 1.0%.	✓		✓	Westbound platform on Highway 7 at West Beaver Creek Rd./ Commerce Valley Dr. W	Running way grade at platforms is 2.13%. LRT should have the minimum climbing grade after stopping to load/unload passengers.	Grade through station will have to be modified locally resulting in a vertical separation from adjacent traffic lanes if LRT technology is introduced.	Minor retaining walls through station.	Incorporate safety barriers where required.	Significant	
		Grade at station in excess of LRT standard of max. 1.0%.	✓		✓	Both platforms on Highway 7 at East Beaver Creek Rd./ Commerce Valley Dr. E	Running way grade at platforms is 2.97%. LRT should have the minimum climbing grade after stopping to load/unload passengers.	Grade through station cannot be modified due to the close proximity of the next intersection.	Station grade exceeding desirable LRT maximum will remain.	None practical	Significant – LRT operation speed reduced.	Speed impact will be analysed during LRT system design.
		Grade at station in excess of LRT standard of max. 1.0%.	✓		✓	Both platforms on Highway 7 at McCowan Road	Running way grade at platforms is 2.56%. LRT should have the minimum climbing grade after stopping to load/unload passengers.	Grade through station will have to be modified locally resulting in a vertical separation from adjacent traffic lanes if LRT technology is introduced.	Minor retaining walls through station.	Incorporate safety barriers where required.	Significant	
A3	Maximize operational efficiency of maintenance and storage facility	N/A - Maintenance & storage facility included in Yonge St. Corridor EA Undertaking.				N/A	N/A	N/A	N/A	N/A	N/A	N/A
A4	Increase attractiveness of rapid transit service	Travel time and service reliability	✓		✓	Entire Corridor	Adjustments to signal timing to achieve progression and minimize delay to rapid transit.	Micro-simulation of rapid transit operation and general traffic movements during detailed design will be used to optimize signal timing. Transit speed will be increased to maximum achievable with reasonable intersection operation.	Delay to transit or intersecting traffic may be unacceptable. May affect intersection capacity for general traffic movements.	Modification of inter-section signal timing.	Moderately significant	Pursue an on-going intersection performance monitoring program
A5	Locate stations to maximize ridership potential and convenience of access for all users	Residents/Employees within walking distance of station locations. Accessibility of stations/transit system.			✓	Entire Corridor	Stations at locations with automobile-oriented land use could discourage rapid transit use.	Station locations selected to serve supportive land use. Facilities designed with weather protection, direct barrier-free access and attractive streetscapes within surrounding residential neighbourhoods.	Continued dependence on automobile if land use objectives not achieved	Greater emphasis on supportive land use	Positive effect	Regular review of land use and new or infill development potential during detailed design phases for transitway and stations.

Notes:

P – Pre construction, C – Construction, O – Operation

10.4.2 OBJECTIVE B: To protect and enhance the social environment in the corridor

Overall, the various goals set to protect and enhance the social environment are largely achieved. The assessment in terms of the related environmental values indicates that most adverse effects are generally mitigated by the built-in attributes of the design and benefits for the communities within the corridor can be maximized. The assessment for Objective B is tabulated in **Table 10.4-2**.

In particular, the undertaking will very likely improve community cohesion as well as access to municipal and community facilities within the corridor. In general, overall intersection capacity for vehicular traffic in the Study Area will be reduced due to the required operational changes and the effects of traffic using modified access to adjacent properties. Offsetting somewhat is an anticipated reduction in vehicular demand over time. As a result, the intersections in the Study Area can continue to serve a high volume of vehicular traffic, the needs of a broad range of pedestrians and adjacent businesses with the implementation of the rapid transit. While some improvements to road traffic and pedestrian circulation safety are anticipated, the removal of random left turn access inherent in the adoption of a median location for the transitway requires road users to modify their travel patterns. This transitway configuration, although preferable to curb-side options, will restrict left turn access to regularly spaced signalized intersections for vehicles and widen the roadway for pedestrians. In both cases, these effects are significantly mitigated by permitting U-turns at the signalized intersections for general traffic and by the introduction of a centre median refuge to allow for a two-stage pedestrian crossing where necessary. Ultimately, the implementation of a median transitway will increase the person carrying capacity along the corridor.

Preserving and improving public safety and security in the corridor was an important consideration in the development of the design concept. Again, several features of the median transitway design were able to, not only allow frequent access across the median for Emergency Response Vehicles, but also provide pedestrians with a safer environment.

In addition, noise and vibration studies at representative sensitive receptors have demonstrated that the combined effect of median transitway operation and general traffic on the widened Highway 7 Corridor roadways will not result in a noticeable increase in noise or vibration levels for residents, except that in the future Markham Centre area the BRT and LRT are predicted to exceed the background noise levels that can be mitigated with the use of noise control features.

Station shelters should be consistent in design throughout YRTP corridors. In Heritage Conservation Districts consideration to enhance design with traditional motifs may be considered. This may include the etching of glass with the name of the HCD district or alternate light for individual station platforms.

A Stage 1 Archaeological Assessment, conducted during the study, indicated the absence of archaeological sites within the project impact area. As is usually the case, a Stage 2 archaeological study will be conducted during the construction phase for the transitway.

Finally, the introduction of a transitway, even in a highly developed urban context, has the potential to worsen the visual aesthetics of the road. In consultation with the municipalities and the public, a concerted effort was made to establish landscaping and streetscaping principles to be followed in transitway insertion design for the entire corridor, offering the potential for a significantly enhanced street environment.

Table 10.4-2
Effects and Mitigation for Social Environment

GOAL	Environmental Value/ Criterion	Environmental Issues/Concerns	Project Phase[1]			Location	Potential Environment Effects	Proposed Mitigation Measures			Level of Significance after Mitigation	Monitoring and Recommendation
			P	C	O			Built-In Positive Attributes and/or Mitigations	Potential Residual Effects	Further Mitigation		
OBJECTIVE B: To protect and enhance the social environment in the corridor												
B1	Minimize adverse effects on and maximize benefits for communities in corridor	Potential displacement of community features		✓	✓	Entire Corridor	Potential displacement or loss of unique features.	Avoid known distinct community features to minimize impact; incorporate landscaping and furniture into streetscape to enhance corridor and community environment.	None expected	None expected	Negligible	Future community consultation
		Effect on community cohesion			✓	Entire corridor	Highway 7 may be perceived as a 'highway-like road, which in turn with the introduction of transit service vehicles, could create an unfriendly environment for pedestrians.	Design transitway to facilitate safe pedestrian road crossings with median refuge. Improved streetscaping in order to create a friendlier pedestrian environment.	During initial operation, vehicle/pedestrian incidents may occur due to the introduction of new traffic facilities and patterns.	Emphasis on education programs, signage, and stricter enforcement.	Negligible	Continue to monitor traffic behaviour and causes of incidents involving pedestrians.
		Community facility utilization			✓	Entire corridor	Improved transit access could increase demand on facilities and services within the corridor.	Municipality can expand services and facilities through the increased development charge revenue.	Community facility expansion could impact stable existing communities.	Include mitigation measures in community facility expansion.	Positive effect	Monitoring of registration levels at the various facilities.

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Table 10.4-2
Effects and Mitigation for Social Environment

GOAL	Environmental Value/ Criterion	Environmental Issues/Concerns	Project Phase[1] P	C	O	Location	Potential Environment Effects	Proposed Mitigation Measures: Built-In Positive Attributes and/or Mitigations	Potential Residual Effects	Further Mitigation	Level of Significance after Mitigation	Monitoring and Recommendation
OBJECTIVE B: To protect and enhance the social environment in the corridor												
B2	Maintain or improve road traffic and pedestrian circulation	Reduction in main street intersection capacities due to rapid transit operations			✓	Highway 50	Implementation of rapid transit reduces the intersection capacity after future growth.	A dedicated WB transit phase of 10s and a WB transit left turn have been introduced.	Under 2021 considerations, EBL, WBT & SBT will operate at capacity in the AM peak hour, and; EBL, WBT, NBT & SBL will operate at capacity in the PM peak hour. The impact of the RT system on the intersection will be negligible as the transit vehicle will operate in conjunction with the WBL.	Under 2021 considerations, the addition of a WB protected left turn phase should be considered.	Significant	Monitoring required for WB protected left turn phase.
					✓	New Mid-block Road	Under 2021 considerations, EBL, EBT & WBT will operate at capacity in the AM peak hour. The SBL will operate at capacity in the PM peak hour.	Pedestrian split phasing should be considered in detailed design phase.	None expected	None required.	Significant	Monitoring required for pedestrian split phasing.
					✓	Hwy 427 N-E/W Off-Ramp	Under 2021 considerations, WBT will approach capacity in AM peak hour, and; no capacity constraints are expected in the PM peak hour.	None required.	None expected	None required.	Insignificant	None required.
					✓	Hwy 427 S-E/W Off-Ramp	Transit vehicles will experience delay due to heavy ramp traffic volumes.	Cycle length has been increased from 90 seconds to 120 seconds to accommodate the heavy volumes on the off ramp.	The ramp movements require more green time to maintain acceptable operating conditions.	Transit signal priority could be considered during the detailed design phase.	Moderately Significant	Monitoring required for active transit signal priority.
					✓	Roybridge Road/ Vaughan Valley Boulevard	Implementation of RT reduces the intersection capacity.	N-S main phase has been increased to accommodate pedestrian crossing time.	The time for E-W main street movements will be reduced. WBT movements will operate at or near capacity.	Future pedestrian volumes should be monitored over time to determine the opportunity to provide a 2-stage crossing for pedestrians & thus allocate additional green time to the E-W main phase.	Moderately Significant	Monitoring required for 2-stage crossing.
					✓	Highway 27	Implementation of RT reduces the intersection capacity.	N-S green time has been increased to accommodate the minimum pedestrian crossing time.	WBL will operate at capacity in the AM peak hour. This capacity issue currently exists today.	None required	Moderately Significant	None required
						Kipling Avenue	Requirement for transit to transition to mixed-traffic complicates the intersection operation.	A ten second transit advance phase will be provided to facilitate the access/ egress of the transit vehicle to/from the transit lanes. WBR is permitted during the transit advance phase.	The additional transit phase will operate at capacity. WBT, SBT, EBL & EBT will operate at capacity or approach capacity in AM/ PM peak hour.	Split phasing should be considered to allocate additional green time to the E-W phase as the N-S phase will operate at a minimum split of 38s. Alternatively, implementation of exclusive lanes in the SB approach for example an exclusive left, through & right turn lane should be considered.	Moderately Significant	Monitoring required for implementation of split phasing or exclusive lanes in the SB approach.

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Table 10.4-2
Effects and Mitigation for Social Environment

GOAL	Environmental Value/ Criterion	Environmental Issues/Concerns	Project Phase[1] P	C	O	Location	Potential Environment Effects	Proposed Mitigation Measures: Built-In Positive Attributes and/or Mitigations	Potential Residual Effects	Further Mitigation	Level of Significance after Mitigation	Monitoring and Recommendation
OBJECTIVE B: To protect and enhance the social environment in the corridor												
B2 cont'd	Maintain or improve road traffic and pedestrian circulation (cont'd)	Reduction in main street intersection capacities due to rapid transit operations (cont'd)			✓	Islington Avenue	Requirement for transit to transition to mixed-traffic complicates the intersection operation.	A ten second transit advance phase will be provided to facilitate the access/ egress of the transit vehicle to/from the transit lanes. EBR is permitted during the transit advance phase.	EBT, WBT, NBL & SBL will operate at capacity in AM/PM peak hour. Surrounding lands prevent road network improvements.	Pedestrian split phasing should be considered on the N-S phase to generate additional green time for the E-W movements. Improvements are not possible due to land/ grade constraints or would not improve operating conditions due to excessively high volumes. Minor remedial measures are not possible such as dual left turn lanes or signal modifications.	Significant	Monitoring required for implementation of split phasing or exclusive lanes in the SB approach. When the time comes to widen this section of the Highway 7 to 6 lanes, dual left turn lanes should be considered.
					✓	Pine Valley Drive	Implementation of RT reduces the intersection capacity.	N-S pedestrian crossing times have been increased. Protected-only EBL & WBL have been introduced. Due to property constraints, duel left turn lanes cannot be provided.	The number of permissive left turns will be limited due to the heavy E-W through volumes. WBL, EBL & NBL will approach capacity or operate at capacity during peak hours.	Review property impact during Preliminary Design Phase to assess the opportunities to provide a dual left turn lanes.	Moderately Significant	Review property impact during Preliminary Design Phase.
					✓	Weston Road	Under 2021 considerations, the intersection is expected to operate at capacity during both peak hours.	None required.	Intersection will continue to operate at capacity.	None required.	Significant	None required.
					✓	Famous Avenue	Under 2021 considerations, WB will approach capacity during both AM and PM peak hours.	None required.	Intersection will continue to operate at capacity.	None required.	Significant	None required.
					✓	Highway 400 S-EW off-ramp	Under 2021 considerations, NB dual left will approach capacity in the AM peak hour, and; no capacity constraints are expected during the PM peak hour.	None required.	Intersection will continue to operate at capacity.	None required.	Significant	None required.
					✓	Highway 400 Interchange	As the area generates a significant amount of traffic, the interchange will operate at capacity conditions between Weston Road to Jane Street during the peak period.	None required initially. However, monitoring for active signal priority is required to confirm if active signal priority is necessary in the future.	None expected	None required.	Moderately Significant	Monitoring for active signal priority required
					✓	Interchange Way	EBL, WBT & SBR will approach capacity or operate at capacity. Dual EBL could not be incorporated due to property constraints.	None required.	Intersection will continue to operate at capacity.	Review property impact during Preliminary Design Phase to assess the opportunity for dual eastbound left turn lanes.	Moderately Significant	Review property impact during Preliminary Design Phase

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Table 10.4-2
Effects and Mitigation for Social Environment

GOAL	Environmental Value/ Criterion	Environmental Issues/Concerns	Project Phase[1] P	C	O	Location	Potential Environment Effects	Proposed Mitigation Measures: Built-In Positive Attributes and/or Mitigations	Potential Residual Effects	Further Mitigation	Level of Significance after Mitigation	Monitoring and Recommendation
OBJECTIVE B: To protect and enhance the social environment in the corridor												
B2 cont'd	Maintain or improve road traffic and pedestrian circulation (cont'd)	Reduction in main street intersection capacities due to rapid transit operations (cont'd)			✓	Jane Street	Some transit vehicles are required to turn south to reach the York University.	A ten second transit phase will be provided to facilitate the movements. The NB exclusive right turn lane will be permitted during the transit phase. Review opportunities for road network improvements to improve left turn lane capacity issues.	The intersection of Highway 7 and Jane Street will operate at capacity during both peak periods. The protected left turn restrictions resulting from the RT system will result in the eastbound and westbound left turns operating at capacity.	Split phasing should be considered during the detailed design phase to provide a minimum split for the N-S pedestrian movement. Review opportunities for road network improvements to improve left turn lane capacity issues.	Moderately Significant	Monitoring required for implementation of split phasing. Review opportunities for road network improvements to improve left turn lane capacity issues.
					✓	Interchange Way (Jane Street)	East approach is operating as a shared left-through and shared through-right. Heavy left turn volumes suggest an exclusive or dual westbound left turn lane is required.	Monitor east approach for widening	Intersection will continue to operate at capacity.	None expected	Moderately Significant	Recommend further intersection analysis during Preliminary Design Phase to determine if exclusive WB left turn widening is warranted.
					✓	Proposed East-West Road (Jane Street)	Under 2021 Considerations, SBL will operate at capacity and NBT will approach capacity during the AM peak hour. The opposing WBR will approach capacity during the PM peak hour.	Traffic volume should be monitored to determine if a SB dual left turn lane will be required to facility the heavy volume during the morning period.	Intersection will continue to operate at capacity.	None expected	Moderately Significant	Monitoring required for SB dual left turn lane.
					✓	Northwest Gate (Steeles Avenue)	Under 2021 Considerations, the intersection will operate at capacity during the AM peak hour.	None required.	Intersection will continue to operate at capacity.	None expected	Moderately Significant	None required.
					✓	Keele Street	Transit vehicles are required to turn onto Highway 7.	A ten second transit phase will be provided to facilitate the movements. The WB general traffic will be permitted during the transit phase.	Both peak periods show the left turn movements operating at capacity.	Additional green time to the critical movements should be considered in the detailed design phase; or road network improvements should be considered in the preliminary design phase.	Moderately Significant	Review opportunities to provide additional capacity for the left turn movements during detailed design phase/preliminary design phase.
					✓	Creditstone Road	WBT, NBL & EBT will operate at capacity in the PM peak hour.	None required.	Intersection will continue to operate at capacity.	A 2-stage pedestrian crossing should be considered during the detailed design stage.	Significant	None required.
					✓	Bowes Road/ Baldwin Avenue	Requirement for transit to transition to mixed-traffic complicates the intersection operation.	A ten second transit phase will be provided.	The intersection is expected to operate at good level-of-service with the RT system.	None expected	Positive effect	None required.
					✓	Centre Street/ North Rivermede	Requirement for transit to transition to mixed-traffic complicates the intersection operation.	EB transit vehicle will utilize the existing channelized right turn lane and diverge into the transitway downstream of the intersection to avoid delay.	The intersection will operate at a satisfactory LOS. NBT & EBT will approach capacity. Minimal delays or queues are expected between the two transitional intersections.	None expected	Insignificant	None required.

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Table 10.4-2
Effects and Mitigation for Social Environment

GOAL	Environmental Value/ Criterion	Environmental Issues/Concerns	Project Phase[1]			Location	Potential Environment Effects	Proposed Mitigation Measures			Level of Significance after Mitigation	Monitoring and Recommendation
			P	C	O			Built-In Positive Attributes and/or Mitigations	Potential Residual Effects	Further Mitigation		
OBJECTIVE B: To protect and enhance the social environment in the corridor												
B2 Cont'd	Maintain or improve road traffic and pedestrian circulation (cont'd)	Reduction in main street intersection capacities due to rapid transit operations (cont'd)			✓	Centre/ Bathurst Streets	Transit vehicles are required to negotiate an EBL or SBR in the dedicated transit ROW.	EBL/SBR for transit, & EBL/EBT for general traffic has been permitted during a 10-second transit phase. All the left turn lanes operate under protected-permissive phases as the transit phase operate under an exclusive phase.	EBL, NBL & SBT will approach capacity in the PM peak hour.	None expected	Moderately Significant	None required.
					✓	Worth Boulevard/Flamingo Road (Bathurst Street)	Requirement for transit to transition to mixed-traffic complicates the intersection operation.	A ten second transit phase will be provided. SBT will be permitted during this transit phase.	NBT will operate at capacity and SBT will approach capacity. Addition green time is required in the N-S direction.	Split phasing should be considered during the detailed design stage.	Significant	Monitoring required for split phasing.
					✓	Bathurst Street Connection Road	Requirement for transit to transition to mixed-traffic complicates the intersection operation.	Three SB left turn lanes will be provided: one for an exclusive SB transit left turn lane; two for SB general left turn traffic. A dual EB left turn lane will be provided.	No capacity constraints.	None expected	Positive effect	None required.
					✓	Hunter's Point Drive	Requirement for transit to transition to mixed-traffic complicates the intersection operation.	A ten second transit phase will be provided. EBT will be permitted during this transit phase.	No capacity constraints.	None expected	Positive effect	None required.
					✓	Yonge Street Connection Road	Accessing the Richmond Hill Centre Intermodal Station complicates the intersection operation.	WB & SB right transit movements will operate in mixed traffic utilizing the existing channelized right turn lanes. EB & SB left transit movements will remain in the dedicated transit lanes. EB left transit & general traffic movements will operate together. Similarly, SB left transit & general traffic movements will operate together. Signal priority will likely be implemented to detect buses in the transitway & activate the appropriate phases to avoid long delays & prevent the buses from doubling up.				
					✓	Red Maple Road	Requirement of mixed-traffic transition complicates the intersection operation. Under 2021 Considerations, volumes from Bayview Glen Development show the eastbound left to operate at capacity during the PM peak hour.	An advance EB through phase will be implemented into the signal timing to permit the WB transit vehicle to transition to mixed traffic. The EB left will operate as protected only.	The intersection will operate at an acceptable LOS during the AM peak hour with the WB through approaching capacity. The WBT will operate at capacity in the PM peak hour.	None expected	Moderately Significant	Review potential to provide a dual eastbound left turn lane during the Preliminary & Detailed Design Phases.
					✓	Silver Linden Drive	EBL and WBT will operate at capacity or approach capacity in the PM peak hour.	None required.	Intersection will continue to operate at capacity.	None required.	Moderately Significant	None required.
					✓	Bayview Avenue Connection Ramp	Requirement for transit to transition to mixed-traffic complicates the intersection operation.	A ten second transit phase will be provided.	EBT will approach capacity in the AM peak hour.	The implementation of a dual EB left turn and/or split phasing for pedestrians should be considered during detailed design phase.	Moderately Significant	Evaluate option of implementing a dual eastbound left turn lane and/or review opportunity to provide split phasing for pedestrian.
					✓	South Park Drive/Chalmers Road	Requirement for transit to transition to mixed-traffic complicates the intersection operation.	A ten second transit phase will be provided.	E-W phase will operate at capacity during the PM peak hour. The EBL & WBT will operate a capacity.	Pedestrian split phasing should be considered.	Moderately Significant	Monitoring required for pedestrian split phasing.

Table 10.4-2
Effects and Mitigation for Social Environment

GOAL	Environmental Value/ Criterion	Environmental Issues/Concerns	Project Phase[1] P	C	O	Location	Potential Environment Effects	Proposed Mitigation Measures: Built-In Positive Attributes and/or Mitigations	Potential Residual Effects	Further Mitigation	Level of Significance after Mitigation	Monitoring and Recommendation
OBJECTIVE B: To protect and enhance the social environment in the corridor												
B2 cont'd	Maintain or improve road traffic and pedestrian circulation (cont'd)	Reduction in main street intersection capacities due to rapid transit operations (cont'd)			✓	Leslie Street	WBL, SBL, EBL, EBT & NBL will operate at capacity or approach capacity in the AM & PM peak hours. The N-S movements will require a minimum split of 49 s to serve pedestrian crossing times. Long-term conditions expect high vehicular volumes in all approaches. Additional road improvements are insignificant due to high traffic demands from Highway 404 and surrounding future development.	Improvements are not possible due to land/ grade constraints or would not improve operating conditions due to excessively high volumes. Minor remedial measures are not possible such as dual left turn lanes or signal modifications.	Intersection will continue to operate at capacity.	Opportunities to reduce the minimum N-S split, such as a 2-stage pedestrian crossing, should be pursued as other critical phases require the additional green time.	Moderately Significant	None required.
					✓	East Beaver Creek/ Commerce Valley Drive East	EBL & WBL will operate at capacity due to the protected-only phases. The reduction in east-west capacity is mainly attributed to the additional north-south green time required to accommodate pedestrians. Heavy volumes and proximity to the Highway 404 interchange result in capacity conditions with minimal improvement from minor remedial measures.	Improvements are not possible due to land/ grade constraints or would not improve operating conditions due to excessively high volumes. Minor remedial measures are not possible such as dual left turn lanes or signal modifications.	Intersection will continue to operate at capacity.	None expected	Significant	A two-stage pedestrian crossing should be considered at the Commerce Valley Drive intersection to reduce side street green time demands.
					✓	Highway 404 N-E/W Ramp	Requirement for transit to transition to mixed-traffic complicates the intersection operation.	The WB transit vehicles will be given a green indication in conjunction with the WB traffic. A ten second EB transit phase will be provided. The WBT will be permitted during this phase. Upstream & stop bar detection of the transit vehicle will be provided to allow the controller with advance warning and confirmation that a transit vehicle requires the advance transit phase.	Overall peak hour operations are not impacted. Transit delay between the two transition intersections is expected.	Should the resultant delays to transit vehicles be considered excessive, transit vehicle priority could be employed at both the transition intersections to advance the traffic signal display in anticipation of the arrival of the transit vehicle.	Moderately Significant	Review the need to provide transit vehicle priority.
					✓	Highway 404 Interchange	Heavy volumes on off-ramps and through Highway 7 Corridor suggest major mitigative measures will be required in future.	Major mitigative measures should be considered in future.	Congestion within the interchange will remain.	None required.	Significant	Monitor queuing on off-ramps and on Highway 7 to assess need for improvements. Monitoring required for active signal priority.
					✓	Highway 404 S-E/W Ramp	Requirement for transit to transition to mixed-traffic complicates the intersection operation.	The EB transit vehicles will be given a green indication in conjunction with the EB traffic. A ten second WB transit phase will be provided. The EBT will be permitted during this phase. Upstream & stop bar detection of the transit vehicle will be provided to allow the controller with advance warning and confirmation that a transit vehicle requires the advance transit phase.	Overall peak hour operations are not impacted. Transit delay between the two transition intersections is expected.	Should the resultant delays to transit vehicles be considered excessive, transit vehicle priority could be employed at both the transition intersections to advance the traffic signal display in anticipation of the arrival of the transit vehicle.	Moderately Significant	Review the need to provide transit vehicle priority.

Table 10.4-2
Effects and Mitigation for Social Environment

GOAL	Environmental Value/ Criterion	Environmental Issues/Concerns	Project Phase[1]			Location	Potential Environment Effects	Proposed Mitigation Measures			Level of Significance after Mitigation	Monitoring and Recommendation
			P	C	O			Built-In Positive Attributes and/or Mitigations	Potential Residual Effects	Further Mitigation		
OBJECTIVE B: To protect and enhance the social environment in the corridor												
B2 cont'd	Maintain or improve road traffic and pedestrian circulation (cont'd)	Reduction in main street intersection capacities due to rapid transit operations (cont'd)			✓	Allstate Parkway/East Valhalla	EBL, WBT & SBR will operate at or above capacity in the AM & PM peak hours due to heavy volumes generated from the high-density office area and future Seneca College. An extended advance phase is required, which impacts the E-W available green time in the AM peak hour.	Extended EB advance phase should be considered. The implementation of a channelized SB right turn lane should be examined as well as a dual EB left turn lane during the detailed design stage.	Intersection will continue to operate at capacity.	None required.	Moderately Significant	Review potential to provide a channelized right turn lane in the southbound direction and a dual eastbound left turn lane.
					✓	Town Centre Boulevard (Town Centre Blvd. Alignment)	Transit vehicles are required to negotiate an EBR or NBL in the dedicated transit ROW.	EBR/NBL for transit, & WBT for general traffic has been permitted during a dedicated 10-second transit phase. The WBL will operate as protected-only in order to prohibit WBL vehicles from operating with the WBT volumes during the transit phase.	EBT will operate at capacity in the PM peak hour.	None required.	Significant	None required.
					✓	Clegg Road	WBT, SBL, EBL & NBL will approach capacity in AM/PM peak hour.	None required.	Intersection will continue to operate at capacity.	None required.	Significant	None required.
					✓	Helen Avenue/ future North-South Connection Road	Transit vehicles are required to enter/exit the dedicated median transitway lanes.	An exclusive transit only phase will be provided.	Under 2021 Considerations, EBL & SBL will approach capacity in the AM/PM peak hour.	None required.	Significant	None required.
					✓	Helen Avenue (Kennedy Road)	Transit vehicles are required to negotiate an EBL or SBR in the dedicated transit ROW. Under 2021 Considerations, heavy volumes generated from Markham Centre West and GO Unionville Station will result in capacity constraints on NBL, SBT & WBL during AM/PM peak hour.	A transit phase of 10 s has been incorporated into the signal timings to operate in conjunction with the EBL & EBT movements. Under 2021 Considerations, a dual northbound left and channelized right turn should be considered.	Intersection will continue to operate at capacity.	None required.	Significant	Follow-up monitoring during full buildout conditions to examine the possibility of implementing a dual northbound left and channelized eastbound right turn lane.
					✓	Avoca Drive(Kennedy Road)	Implementation of RT will reduce the intersection capacity. The proposed Markham Centre West developments at this intersection show heavy north-south volumes on Kennedy Road. WBL, NBL & EBL will approach capacity in AM/PM peak hour.	NBL & SBL will operate as protected left phases. Io reduce the northbound advance phase, improvements such as implementing a dual northbound left turn lane should be considered in the detailed design phase.	Intersection will continue to operate at capacity.	None required	Significant	Follow-up monitoring to assess capacity issues during the PM peak hour with NB/SB through movements and the NB left.
					✓	Kennedy Road	Transit vehicles are required to negotiate a NBR or WBL in the dedicated transit ROW.	A transit phase of 10 s has been incorporated into the signal timings to operate in conjunction with the WBT movements.	None expected.	A 2-stage pedestrian crossing should be considered during detailed design phase to meet the minimum split requirements in both directions.	Moderately significant	A 2-stage pedestrian crossing should be considered during detailed design phase.
					✓	Bullock Drive/ Commercial Access	EBL will operate at capacity as a protected left turn phase in PM peak hour.	None required	Intersection will continue to operate at capacity.	None required	Moderately significant	None required

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Table 10.4-2
Effects and Mitigation for Social Environment

GOAL	Environmental Value/ Criterion	Environmental Issues/Concerns	Project Phase[1] P	C	O	Location	Potential Environment Effects	Proposed Mitigation Measures: Built-In Positive Attributes and/or Mitigations	Potential Residual Effects	Further Mitigation	Level of Significance after Mitigation	Monitoring and Recommendation
OBJECTIVE B: To protect and enhance the social environment in the corridor												
B2 Cont'd	Maintain or improve road traffic and pedestrian circulation (cont'd)	Reduction in main street intersection capacities due to rapid transit operations (cont'd)			✓	McCowan Road	WBL & NBL will operate above capacity.	None required initially. Based on future operations, improvements to the westbound left and northbound left may be required to improve operations at the intersections during the AM peak hour. To improve operating conditions, a two-stage pedestrian crossing should be investigated in both directions during the detailed design stage.	Intersection will continue to operate at capacity.	None required	Significant	Investigated the need to provide a two-stage pedestrian crossing in both directions during the detailed design stage. Review special needs for the westbound left and northbound left during the AM peak hour.
					✓	Grandview Boulevard/ Galsworthy Drive	Requirement for transit to transition to mixed-traffic complicates the intersection operation.	A ten second transit phase will be provided.	The intersection is expected to operate at an acceptable LOS.	None required	Positive Effect	None required.
					✓	Main Street Markham	E-W main phase is reduced significantly due to the pedestrian crossing time requirements to cross Highway 7.	WBL will operate at capacity in the AM peak hour and WBL & NBL will approach capacity in the PM peak hour.	Intersection will continue to operate at capacity.	None required	Significant	None required
					✓	Wooten Way	Requirement for transit to transition to mixed-traffic complicates the intersection operation.	A ten second transit phase will be provided.	The intersection is expected to operate at an acceptable LOS.	None required	Positive Effect	None required.
					✓	Ninth Line	Under 2021 considerations, EBL, SBT, NBL, NBT & WBT will approach capacity or operate at capacity in the AM/PM peak hour.	None required	Intersection will continue to operate at capacity.	None required	Significant	None required
					✓	Bur Oak Avenue	Requirement for transit to transition to mixed-traffic complicates the intersection operation in the initial phase.	EBL transit and general traffic will operate together. Similarly, SB transit and general traffic will operate together. WBR transit vehicles will operate in conjunction with the SB phase.	The intersection is expected to operate without any capacity constraints.	None required	Positive Effect	None required.
					✓	Future Markham By-Pass Extension	Under 2021 considerations, SBL will operate at capacity in the AM/PM peak hours.	Exclusive right turn lanes in all approaches should be considered in detailed design phase.	Intersection will continue to operate at capacity.	None required	Significant	Monitoring required for Exclusive right turn lanes.
					✓	Reesor Road	Requirement for transit to transition to mixed-traffic complicates the intersection operation.	A ten second transit phase will be provided for EB transit vehicle in conjunction with the WB through general traffic.	The intersection will not be significantly impacted.	None required	Insignificant	None required.
		Need to divert from main street at various locations, as required for the preferred alignment.			✓	▪ TTC BRT Entrance/ Steeles Ave. ▪ IBM Entrance/ Town Centre Blvd.	New traffic signal will be required to facilitate a safe transit movement among the general traffic.	New traffic signal is introduced.	None expected.	None Expected	Insignificant	None required.
		Potential conflict at transition points between mixed-traffic operations and median transitway operations			✓	▪ Proposed signalized Beechwood Cemetery Entrance SB	Rapid transit may have to wait for opportunity to merge with the general through traffic resulting in service delay. New traffic signal will be required to facilitate a safe transit movement among the general traffic.	New traffic signal is introduced to accommodate transit movements. Also, this new intersection provides a better access for the cemetery.	None expected.	None Expected	Positive	None required.

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Table 10.4-2
Effects and Mitigation for Social Environment

GOAL	Environmental Value/ Criterion	Environmental Issues/Concerns	Project Phase[1]			Location	Potential Environment Effects	Proposed Mitigation Measures			Level of Significance after Mitigation	Monitoring and Recommendation
			P	C	O			Built-In Positive Attributes and/or Mitigations	Potential Residual Effects	Further Mitigation		
OBJECTIVE B: To protect and enhance the social environment in the corridor												
B2 Cont'd	Maintain or improve road traffic and pedestrian circulation (cont'd)	Critical left turn storage lengths			✓	Westbound dual left at Famous Avenue	High left turn volumes at this cinema's only access will deteriorate the intersection operation.	The dual left turn storage lengths have been maximized.	Due to the constraint of the intersection spacing (306 m), the maximized left turn storage lengths still cannot provide the required capacity. The left turn vehicles may spill out onto the adjacent through lane blocking the through traffic.	None Expected	Moderately Significant	None
					✓	Eastbound and Westbound at Millway Avenue	High left turn volumes resulted from future Vaughan Corporate Centre development will deteriorate the intersection operation.	The left turn storage lengths have been maximized.	Due to the constraint of the intersection spacing (260 m in EB; 172 m in WB) and platform locations, the maximized left turn storage lengths still cannot provide the required capacity. The left turn vehicles may spill out onto the adjacent through lane blocking the through traffic.	None Expected	Moderately Significant	None
					✓	Eastbound and Westbound left at Chalmers Road/ South Park Drive	High left turn volumes resulted from the business park will deteriorate the intersection operation.	The left turn storage lengths have been maximized.	Due to the constraint of the intersection spacing (220m in WB), the maximized left turn storage lengths still cannot provide the required capacity. The left turn vehicles may spill out onto the adjacent through lane blocking the through traffic.	None Expected	Moderately Significant	None
					✓	Westbound left at Saddlecreek Drive	High left turn volumes resulted from new development will deteriorate the intersection operation.	The left turn storage lengths have been maximized.	Due to the constraint of the intersection spacing (250 m), the maximized left turn storage lengths still cannot provide the required capacity. The left turn vehicles may spill out onto the adjacent through lane blocking the through traffic.	None Expected	Moderately Significant	None
					✓	Eastbound and Westbound left at Times Avenue/ Valleymede Drive	High left turn volumes resulted from the business park will deteriorate the intersection operation.	The left turn storage lengths have been maximized.	Due to the constraint of the intersection spacing (250 m in EB; 405 m in WB) and the platform location, the maximized left turn storage lengths still cannot provide the required capacity. The left turn vehicles may spill out onto the adjacent through lane blocking the through traffic.	None Expected	Moderately Significant	None

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Table 10.4-2
Effects and Mitigation for Social Environment

GOAL	Environmental Value/ Criterion	Environmental Issues/Concerns	Project Phase[1]			Location	Potential Environment Effects	Proposed Mitigation Measures			Level of Significance after Mitigation	Monitoring and Recommendation
			P	C	O			Built-In Positive Attributes and/or Mitigations	Potential Residual Effects	Further Mitigation		
OBJECTIVE B: To protect and enhance the social environment in the corridor												
B2 Cont'd	Maintain or improve road traffic and pedestrian circulation (cont'd)	Critical left turn storage lengths (cont'd)			✓	Northbound left on Jane Street at Highway 407 north ramp	High left turn volumes accessing the Highway 407 will deteriorate the intersection operation.	The left turn storage length has been maximized.	Due to the constraint of the intersection spacing (230 m), the maximized left turn storage lengths still cannot provide the required capacity. The left turn vehicles may spill out onto the adjacent through lane blocking the through traffic.	None Expected	Moderately Significant	None
					✓	Eastbound and Northbound left at Kennedy Road and Helen Avenue	High left turn volumes accessing the GO Unionville Station will deteriorate the intersection operation.	The eastbound left turn storage length has been maximized and the northbound left turn storage length remains as existing.	Due to the constraint of the intersection spacing (245 m in EB), the maximized left turn storage lengths still cannot provide the required capacity. The left turn vehicles may spill out onto the adjacent through lane blocking the through traffic.	None Expected	Moderately Significant	None
		Widening or construction of new structures resulting in major temporary disruption to highway or railway traffic during construction		✓		▪ Hwy 427 ▪ CP Mactier ▪ Hwy 400 ▪ McMillian Yard ▪ Hwy 407/ Jane St. ▪ CN Halton ▪ CN Bradford ▪ Hwy 407/ Bathurst St. ▪ Yonge St. ▪ CN Bala ▪ Future Cedar Ave. ▪ Bayview Ave. ▪ Hwy 404 ▪ CP Havelock	Construction staging at busy highway interchanges, such as at Hwy 404, could cause additional delay to general traffic. Temporary relocation of railway lines could cause delay to railway traffic.	Mitigation in the form of traffic accommodation plans and temporary works will be developed for all structures where disruption is unavoidable. Mixed traffic operation is introduced in the area of CP Mactier, CN Halton, CN Bradford, Hwy 407/ Bathurst St., Bayview Ave., CN Bala, Hwy 404 and CP Havelock to avoid widening of structures. Lane reduction is used at Hwy 400 to minimize the widening of the structure. The widening of the rest of the structures is considered unavoidable.	Reduction in transit and general traffic operation speed. Some delays likely during construction period.	None	Moderately significant	Monitor traffic operation to confirm whether dedicated transit lanes are required in the future.
		Access to minor side streets and properties along the Highway 7 Corridor transit routes	✓	✓	✓	Entire Corridor	Median transitway will eliminate random left turns into minor side streets and properties thereby requiring an alternative access route	In many cases, alternative access can be obtained to a site via another site access or an adjacent roadway with signalized access to Highway 7. The travel patterns for the major traffic generators will be changed. U-turns provided at major intersections for safe manoeuvres into side streets and to properties. Random permissive left turns eliminated thus increasing safety. Develop traffic management plans for construction.	Conflict with U-turns and Right may decrease safety.	None necessary	Moderately significant	Monitor traffic and prohibit Right Turns On Red movements from the side street at these locations if necessary

Table 10.4-2
Effects and Mitigation for Social Environment

GOAL	Environmental Value/ Criterion	Environmental Issues/Concerns	Project Phase[1] P	C	O	Location	Potential Environment Effects	Proposed Mitigation Measures: Built-In Positive Attributes and/or Mitigations	Potential Residual Effects	Further Mitigation	Level of Significance after Mitigation	Monitoring and Recommendation
OBJECTIVE B: To protect and enhance the social environment in the corridor												
B2 Cont'd	Maintain or improve road traffic and pedestrian circulation (cont'd)	U-turn movements and the corresponding side street right-turn-on-red (RTOR) movements			✓	▪ Highway 7/ Helen St.; ▪ Highway 7/ Town Centre Blvd.; ▪ Town Centre Blvd/ Cedarland Dr.; ▪ Kennedy Rd./ Avoca Dr.; ▪ Highway 7/ Robinson St./ St. Patrick School Entrance; ▪ Highway 7/ Grandview/ Galsworthy Dr.; ▪ Highway 7/ McCowan Rd.; ▪ Highway 7/ Laidlaw Blvd./ Conservation; ▪ Highway 7/ Wooten Way; ▪ Highway 7/ Ninth Line	The permitted U-turn movements at these locations may cause conflicts with RTOR movements.	Follow-up monitoring should be undertaken to review the interaction between the U-turn movement and any opposing cross-street RTOR movement. A RTOR prohibition may need to be enacted to reduce conflicts at these intersections.	None Expected	None Expected	Moderately Significant	Further monitoring should be undertaken to ensure the conflicts been reduced.
		Potential for Traffic Infiltration			✓	▪ Monsheen Drive Neighbourhood; ▪ Willis Rd./ Chancellor Dr.; ▪ Westminster Dr.; ▪ Beverley Glen Blvd; ▪ South Park Dr./ Commerce Valley Dr. E & W; ▪ Kennedy Rd. from Avoca Dr. to Swansea Rd.	In many neighbourhoods, traffic infiltration has already been occurring to circumvent Highway 7. With future constraints placed on Highway 7, it may prove more beneficial for traffic to utilize these local roadways.	Future traffic volumes through these neighbourhoods should be monitored before and after the implementation of the preferred transitway alternative to determine if additional measures are required to reduce traffic infiltration.	Infiltration may still require mitigation	Measures to reduce traffic infiltration could be implemented.	Insignificant	None

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Table 10.4-2
Effects and Mitigation for Social Environment

GOAL	Environmental Value/ Criterion	Environmental Issues/Concerns	Project Phase[1] P	C	O	Location	Potential Environment Effects	Proposed Mitigation Measures: Built-In Positive Attributes and/or Mitigations	Potential Residual Effects	Further Mitigation	Level of Significance after Mitigation	Monitoring and Recommendation
OBJECTIVE B: To protect and enhance the social environment in the corridor												
B2 Cont'd	Maintain or improve road traffic and pedestrian circulation (cont'd)	Pedestrian Crossings			✓	▪ Vaughan Valley Blvd./ Roybridge Gate; ▪ Hwy 427; ▪ Jane St./ Hwy 7; ▪ Creditstone Rd.; ▪ Keele St.; ▪ Islington Ave.; ▪ Aberdeen Ave./ Marycroft Ave.; ▪ Worth Blvd./ Flamingo Rd./ Bathurst St.; ▪ South Park/ Chalmers Rd.; ▪ Leslie St.; ▪ Commerce Valley Dr. E./ E. Beaver Creek; ▪ Town Centre Blvd./ Hwy 7; ▪ Kennedy Rd./ Avoca Dr. ▪ Kennedy Rd./ Hwy 7; ▪ McCowan Rd.	Due to the width of the main street at intersection, pedestrians may not be able to cross the intersection in one signal phase based on the standard pedestrian crossing times of 7 seconds.	Transitway median facilities generally provide a pedestrian refuge at mid-crossing.	These intersections may require two-stage crossing in the future to accommodate heavy main street traffic.	The decision to implement these special provisions should be deferred until post-operation conditions are monitored and the need is identified	Moderately Significant	Monitoring is required to determine if the implementation of two-stage is a necessity.
B3	Maintain a high level of public safety and security in corridor	Access for emergency vehicles	✓	✓	✓	Highway 7, Jane Street, Town Centre Boulevard, Kennedy Road, future Burr Oak Avenue	Incorporation of median and construction will have adverse effects on Emergency Response Services (ERS) access and time	Provided U-Turns at intersections. Meet with emergency representatives. Median breaks to be provided to allow access to Emergency Response Vehicles only.	Some risk may remain as access type will change after implementation of mitigation	Address during detail design in conjunction with ERS	Insignificant	Obtain feedback from ERS
B4	Minimize adverse noise and vibration effects	Noise effect for BRT and LRT due to widening of Highway 7 Corridor			✓	Entire corridor in proximity of residential uses	Combined effect of median transitway operation and general traffic on the widened Highway 7 Corridor roadways may result in increased noise levels for residents.	Modeling of future traffic activities indicated that expected noise increases in all, but one road segment, will not exceed the 5dB threshold at which mitigation measures are required. BRT and LRT sound level increases are expected to be marginal to none. However, at the future Markham Centre location, the BRT and LRT are predicted to exceed the background noise levels by as much as 8 dBA.	Transitway noise above likely background levels in Civic Mall at future Markham Centre location.	Depending on lower floor building uses, may require noise screening along transitway and/or noise control features in residential design along Civic Mall segment in Markham Centre area.	Insignificant	Undertake confirmation monitoring to verify compliance once the transitway is fully operational. In the event that the future noise level warrants mitigation, appropriate noise reduction measures will be put in place.
		Vibration effect for BRT and LRT due to widening of Highway 7 Corridor			✓	Entire corridor in proximity of residential uses	Combined effect of median transitway operation and general traffic on the widened Highway 7 Corridor roadways may result in increased vibration levels for residents.	Modeling of future traffic activities indicated that expected vibration increases will not exceed the protocol limit of 0.1 mm/sec for LRT. BRT vibration levels are expected to be negligible.	None expected	None necessary	Negligible	Undertake confirmation monitoring to verify compliance once the transitway is fully operational.
B5	Minimize adverse effects on cultural resources	Displacement of Built Heritage Features (BHF)	✓	✓	✓	Brown's Corners United Church (Markham)	Widened roadway could displace some of the cemetery's graves, unless alignment is modified.	Alignment is shifted up to 5.5 m to the south	Displacement of cemetery property is completely avoided.	None required	Negligible	None required.
		Displacement of Cultural Landscape Units (CLU)	✓	✓	✓	None Expected	None Expected	None required	None expected	None necessary	Positive	None required

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Table 10.4-2
Effects and Mitigation for Social Environment

GOAL	Environmental Value/ Criterion	Environmental Issues/Concerns	Project Phase[1]			Location	Potential Environment Effects	Proposed Mitigation Measures			Level of Significance after Mitigation	Monitoring and Recommendation
			P	C	O			Built-In Positive Attributes and/or Mitigations	Potential Residual Effects	Further Mitigation		
OBJECTIVE B: To protect and enhance the social environment in the corridor												
B5 cont'd	Minimize adverse effects on cultural resources (cont'd)	Disruption of Built Heritage Features (BHF)		✓		Residences in Vaughan: ▪ 5298 Hwy 7 (#2 CLU); ▪ 5263 Hwy 7 (#2 CLU); ▪ 1423, 1445, 1453 & 1139 Centre Street (1453 may have been demolished since survey)(#8 BHF;	The potential introduction of rapid transit operation may cause changes in visual, audible and atmospheric environment around the cultural heritage features.	None required – transitway will be integrated with existing streetscape and road traffic operations.	None expected	None necessary	Insignificant	None required
						Residences in Markham: ▪ 4592 Hwy 7; ▪ 5429 Hwy 7 (#10 BHF); ▪ 6881 Hwy 7 (#12 BHF); ▪ 7170 Hwy 7 (#13 BHF); ▪ 7265 Hwy 7 (#14 BHF); ▪ 7482 Hwy 7 (#15 BHF).	The potential introduction of rapid transit operation may cause changes in visual, audible and atmospheric environment around the cultural heritage features.	None required – transitway will be integrated with existing streetscape and road traffic operations.	None expected	None necessary	Insignificant	None required
				✓		Brown's Corners United Church (Markham)	The potential introduction of rapid transit operation may cause changes in visual, audible and atmospheric environment around the cultural heritage features.	None required – transitway will be integrated with existing streetscape and road traffic operations.	None expected	None necessary	Insignificant	None required
		Disruption of Built Heritage Features (BHF) (cont'd)		✓		Sabiston house (Markham) - 5110 Hwy 7 in shopping plaza (Markham) (#9 BHF)	The potential introduction of rapid transit operation may cause changes in visual, audible and atmospheric environment around the cultural heritage features.	None required – transitway will be integrated with existing streetscape and road traffic operations.	None expected	None necessary	Insignificant	None required
				✓		Individual designated building within Markham HCD now Tim Hortons (#11 BHF)	The potential introduction of rapid transit operation may cause changes in visual, audible and atmospheric environment around the cultural heritage features.	None required – transitway will be integrated with existing streetscape and road traffic operations.	None expected	None necessary	Insignificant	None required
				✓		Historic Plaque: Reesor Cairn (Markham)(#16 BHF)	The potential introduction of rapid transit operation may cause changes in visual, audible and atmospheric environment around the cultural heritage features.	None required – transitway will be integrated with existing streetscape and road traffic operations.	None expected	None necessary	Insignificant	None required
		Disruption of Cultural Landscape Units (CLU)		✓		Farm complex in Vaughan: ▪ 6701 Hwy 7 (#1 CLU)	There is potential encroachment through widening to the CLU.	None required – transitway will be integrated with existing streetscape and road traffic operations.	None expected	None necessary	Insignificant	None required

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Table 10.4-2
Effects and Mitigation for Social Environment

GOAL	Environmental Value/ Criterion	Environmental Issues/Concerns	Project Phase[1]			Location	Potential Environment Effects	Proposed Mitigation Measures			Level of Significance after Mitigation	Monitoring and Recommendation
			P	C	O			Built-In Positive Attributes and/or Mitigations	Potential Residual Effects	Further Mitigation		
OBJECTIVE B: To protect and enhance the social environment in the corridor												
B5 cont'd	Minimize adverse effects on cultural resources (cont'd)	Disruption of Cultural Landscape Units (CLU) (cont'd)		✓		Residences in Vaughan: ▪ 4976, 4908, 4902 & 4855 Hwy 7 (#2 CLU)	The potential introduction of rapid transit operation may cause changes in visual, audible and atmospheric environment to the cultural heritage features in the Cultural Landscape – former centre of settlement. (Brownsville)	None required – transitway will be integrated with existing streetscape and road traffic operations.	None expected	None necessary	Insignificant	None required
				✓		Residences in Vaughan: ▪ 2060, 2063, 1985 & 1929 Hwy 7 (#3 – #6 BHF) ▪ Southeast of Hwy 7 & GO Bradford (no street address)(#7 BHF) GO Bradford railway overpass	The potential introduction of rapid transit operation may cause changes in visual, audible and atmospheric environment around the cultural heritage features.	None required – transitway will be integrated with existing streetscape and road traffic operations.	None expected	None necessary	Insignificant	None required
				✓		Farm complex in Vaughan: ▪ Stong Farm in York U. – 3105 Steeles Avenue (#6 CLU)	The potential introduction of rapid transit operation may cause changes in visual, audible and atmospheric environment to the cultural landscape feature	Complete photo documentation of site context prior to construction.	None expected	None necessary	Insignificant	None required
				✓		Farm complex in Markham: ▪ 7996 Helen Avenue (#6 CLU)	The potential introduction of rapid transit operation may cause changes in visual, audible and atmospheric environment to the cultural landscape feature	Complete photo documentation of site context prior to construction.	None expected	None necessary	Insignificant	None required
				✓		Brown's Corners United Church Cemetery (Markham) (#8 CLU)	The potential introduction of rapid transit operation may cause changes in visual, audible and atmospheric environment to the cultural landscape feature	None required – transitway will be integrated with existing streetscape and road traffic operations.	None expected	None necessary	Insignificant	None required
				✓		Centre of settlement: ▪ Markham Village Heritage Conser-vation District designated under Part V OHA (#11 CLU)	The potential introduction of rapid transit operation may cause changes in visual, audible and atmospheric environment to the cultural landscape feature	None required – transitway will be integrated with existing streetscape and road traffic operations.	None expected	None necessary	Insignificant	None required
				✓		Elmwood Cemetery (Markham)	The potential introduction of rapid transit operation may cause changes in visual, audible and atmospheric environment to the cultural landscape feature	Transitway will operate in mixed traffic to avoid widening adjacent to the cemetery.	None expected	None necessary	Insignificant	None required
				✓		St. Andrews Cemetery (Markham)	The potential introduction of rapid transit operation may cause changes in visual, audible and atmospheric environment to the cultural landscape feature	Transitway will operate in mixed traffic to avoid widening adjacent to the cemetery.	None expected	None necessary	Insignificant	None required

Table 10.4-2
Effects and Mitigation for Social Environment

GOAL	Environmental Value/ Criterion	Environmental Issues/Concerns	Project Phase[1]			Location	Potential Environment Effects	Proposed Mitigation Measures			Level of Significance after Mitigation	Monitoring and Recommendation
			P	C	O			Built-In Positive Attributes and/or Mitigations	Potential Residual Effects	Further Mitigation		
OBJECTIVE B: To protect and enhance the social environment in the corridor												
B5 cont'd	Minimize adverse effects on cultural resources (cont'd)	Disruption of Cultural Landscape Units (CLU) (cont'd)		✓		Farm complex in Markham: ▪ 6937 Hwy 7 (#12 CLU) ▪ 7323 Hwy. 7 (Likely demolished)(#13 CLU)	The potential introduction of rapid transit operation may cause changes in visual, audible and atmospheric environment to the cultural landscape feature	None required – transitway will be integrated with existing streetscape and road traffic operations.	None expected	None necessary	Insignificant	None required
				✓		Locust Hill – historical centre of settlement (#15 CLU)	The potential introduction of rapid transit operation may cause changes in visual, audible and atmospheric environment to the cultural landscape feature	Transitway development will not extend eastward beyond Reesor Road. Any rapid transit through Locust Hill to Pickering will operate in mixed traffic.	None expected	None necessary	Insignificant	None required
				✓		At grade historic railway corridor: ▪ CP Havelock rail line (#16 CLU)	The potential introduction of rapid transit operation may cause changes in visual, audible and atmospheric environment to the cultural landscape feature	Transitway development will not extend eastward beyond Reesor Road. Any rapid transit through Locust Hill to Pickering will operate in mixed traffic.	None expected	None necessary	Insignificant	None required
				✓		Roadscape: ▪ Reesor Road landscape north side. (#14 CLU)	The potential introduction of rapid transit operation may cause changes in visual, audible and atmospheric environment to the cultural landscape feature	None required – transitway will be integrated with existing streetscape and road traffic operations.	None expected	None necessary	Insignificant	None required
		Possible impacts to areas with potential for identification of archaeological sites	✓			Entire Corridor	There is potential for identification of archaeological sites within the project impact area.	▪ Stage 1 Archaeological Assessment has been conducted. ▪ Stage 2 Archaeological Assessment will be performed in detailed design: field survey in accordance with Ministry of Culture Stage 1-3 Archaeological Assessment Technical Guidelines to identify any sites that may be present within the proposed impact area. ▪ If areas of further archaeological concern are identified during Stage 2 assessment, such areas must be avoided until any additional work required by the Ministry of Culture has been completed. Mitigation options, including avoidance, protection, or salvage excavation must be determined on a site-by-site basis. ▪ If no potentially significant archaeological sites are identified during Stage 2, it will be recommended to the Ministry of Culture that the areas assessed be considered free of further archaeological concern.	▪ Archaeological sites may be identified during the course of Stage 2 Archaeological Assessment. ▪ In the event that deeply buried archaeological remains are encountered during construction activities, the office of the Regulatory and Operations Group, Ministry of Culture should be notified immediately. ▪ In the event that human remains are encountered during construction, both the Ministry of Culture and the Registrar or Deputy Registrar of the Cemeteries Regulation Unit, Ministry of Consumer and Commercial Relations should be notified immediately.	Needs for further mitigation, possibly including Stage 3 Archaeological Assessment (test excavation) and Stage 4 Archaeological Assessment (further mitigative work, including mitigative excavation), must be determined following Stage 2 Archaeological Assessment, if archaeological resources are identified during survey.	Negligible for stage 1 Archaeological Assessment	No requirement for monitoring has been identified as a result of Stage 1 Archaeological Assessment. Monitoring may be required, depending on the result of Stage 2 Archaeological Assessment.
B6	Minimize disruption of community vistas and adverse effects on street and neighbourhood aesthetics	Visual Effects	✓		✓	Entire Corridor	Introduction of transit may reduce visual aesthetics of road	Introduction of a comprehensive landscaping and streetscaping plan for the corridor.	Narrow sections of ROW where property cannot be acquired may limit incorporation of streetscaping		Significant	Monitor redevelopment and acquire property through redevelopment applications

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Table 10.4-2
Effects and Mitigation for Social Environment

GOAL	Environmental Value/ Criterion	Environmental Issues/Concerns	Project Phase[1]			Location	Potential Environment Effects	Proposed Mitigation Measures			Level of Significance after Mitigation	Monitoring and Recommendation
			P	C	O			Built-In Positive Attributes and/or Mitigations	Potential Residual Effects	Further Mitigation		
OBJECTIVE B: To protect and enhance the social environment in the corridor												
		Visual Effects	✓		✓	Hwy 404 interchange	If necessary in the future, achieving a dedicated transitway through the interchange by adopting an elevated solution, could have an adverse effect on vistas in the area.	Initially, the option of lengthening the span of the existing interchange bridges will be analyzed and only if found impractical under traffic operations, will an elevated solution be developed. This design can be made visually acceptable given the surrounding highway interchange environment and the remoteness of adjacent land uses from which vistas may be degraded.	The overall height of the interchange works would be increased to that of the neighbouring Highway 407 interchange.	None	Insignificant if span lengthening is adopted. Moderately significant if elevated design is required.	Monitor the level of traffic congestion affecting the reliability of the preferred mixed traffic operation to assess the effectiveness of the planned new Hwy 404 road overpass north of the interchange.
B6 Cont'd	Minimize disruption of community vistas and adverse effects on street and neighbourhood aesthetics (cont'd)	Landscaping	✓		✓	Entire Corridor	Landscaping species may not survive in winter months	Choose appropriate species for both winter and other months to maintain greenery throughout corridor. Place landscaping in planters and incorporate buried irrigation systems.	Species may still not survive	Change species, irrigation patterns, etc	Insignificant	Monitor health of landscaping continuously
		Encroachment on sites of existing buildings		✓	✓	Immediately west of Leisure Lane, south side	Modification of alignment is required to avoid the south building	Alignment shifted up to 2.3 m to the north	South building setback restored; internal parking required rearranging.	None	Insignificant	None Required
		Encroachment on sites of existing retaining walls		✓	✓	Between Islington Ave. and Bruce Street, north side	Relocation of existing retaining walls holding up residential properties would be required with the existing alignment.	Alignment shifted up to 2.8 m to the south	North retaining walls remain intact.	None	Negligible	None Required
		Encroachment on sites of existing property		✓	✓	In the proximity of Whitmore/ Ansley Grove Roads	Additional road width required accommodate station platforms would result in property encroachment solely on the south side.	Alignment shifted up to 3.8 m to the north	Property impact on both sides becomes similar.	None	Insignificant	None Required
		Encroachment on sites of existing buildings		✓	✓	Northwest of Weston Rd. & Hwy 7	Additional road width required accommodate station platforms would result in removal of NW building. Modification of alignment is required.	Alignment shifted up to 4.7 m to the south	Encroachment to the NW building is avoided.	None	Negligible	None Required
		Encroachment on sites of existing property		✓	✓	Northwest of Town Centre Boulevard & Hwy 7	The NW is being developed and the future buildings will be constructed very close to the existing north ROW such that property negotiation is not feasible. Modification of alignment is required.	Alignment shifted up to 7.0 m to the south. Agreement has been made with the developer that they will grade YRTP's proposed sidewalk at the limit of ROW.	Property impact on the north side is avoided.	None	Insignificant	None Required
		Encroachment on sites of existing building		✓	✓	Southwest of Clegg Rd. & Town Centre Boulevard	Encroachment to the existing SW building would be required.	Alignment shifted up to 4.1 m to the east.	Encroachment to the SW building is avoided.	None	Negligible	None Required
		Encroachment on sites of existing property		✓	✓	Between Bullock Dr. and McCowan Rd., north side	North property would be subjected to greater property impact than the south.	Alignment shifted up to 1.2 m to the south.	Property impact on the north side is minimized.	None	Moderately significant	None Required
		Encroachment on sites of existing property		✓	✓	Northeast of Robinson Street/ Jolyn Road and Hwy 7	Encroachment to existing fenced residential property would be required.	Alignment shifted up to 3.5 m to the south and retaining walls along the limit of north ROW are introduced.	Property impact on the north side is avoided.	None	Insignificant	None Required
		Encroachment on sites of existing buildings		✓	✓	Galsworth Dr./ Grandview Blvd., south side	Encroachment on sites of existing buildings would be required.	Alignment shifted up to 1.5 m to the north.	Encroachment of new boulevard on sites of existing buildings is minimized.	None	Moderately significant	None Required

Notes:
P – Pre construction, C – Construction, O – Operation

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10.4.3 OBJECTIVE C: To protect and enhance the natural environment in the corridor

The protection and enhancement of the natural environment within the corridor has been entirely achieved. By definition, the undertaking along the Highway 7 and local arterial rights-of-way is set in a highly developed urban environment, where natural features have mostly been disturbed by previous development. Nevertheless, there are watercourses crossing Highway 7 within the Humber, Don, Rouge and Petticoat Creek watersheds. Similarly, nearby urban green spaces still exist and must be protected. In terms of all valued environmental components to be considered, effects on aquatic and terrestrial ecosystems are either negligible or insignificant when built-in mitigation measures are implemented or construction and operation methods required for sensitive areas are respected. The widening of existing bridges, lengthening of existing culverts or installation of new bridges and culverts along the transitway will incorporate mitigation measures where required to preserve or enhance the aquatic habitat.

Future air quality, except for PM, is expected to be better than current air quality mainly due to improvements in engine technology and fuels but there will be a minor contribution from the diversion of trips to rapid transit. The forecast increase in PM10 from 2001 to 2021 can be attributed to the increase in fugitive emissions from traffic due to population and employment growth built into the traffic forecasting model. As noted in **Appendix L**, future 2021 air quality was forecasted both with and without the proposed rapid transit alternative. In the case of all pollutants assessed (PM_{10}, $PM_{2.5}$, NO_x, SO_2, CO), implementation of rapid transit is expected to have a small net positive effect in 2021 (refer to Tables 3.2, 3.3 and 3.4 in **Appendix L**). Greenhouse gas emission (CO_2) is also forecasted to be reduced due to the energy efficiency of the overall vehicle fleet plus the implementation of an improved public transit alternative. (Refer to Section 3.2 of **Appendix L**).

The assessment in terms of Objective C is tabulated in **Table 10.4-3**.

Table 10.4-3
Effects and Mitigation for Natural Environment

GOAL	Environmental Value/ Criterion	Environmental Issues/Concerns	Project Phase[1] P	C	O	Location	Potential Environment Effects	Proposed Mitigation Measures: Built-In Positive Attributes and/or Mitigations	Potential Residual Effects	Further Mitigation	Level of Significance after Mitigation	Monitoring and Recommendation
OBJECTIVE C: To protect and enhance the natural environment in the corridor												
C1	Minimize adverse effects on Aquatic Ecosystems	Fuel spills, due to accidents during construction refuelling and accidents during operation, entering the watercourses		✓	✓	Entire Corridor	Fish kills due to chemical spills resulting in short term population decline.	▪ No refuelling within 10 m of a watercourse. ▪ Emergency Response Plan.	▪ Short term population decline. ▪ Some contaminants within storm-water system.	None practical	Insignificant	None required
		Sediment laden stormwater entering watercourses during construction		✓		Entire Corridor	Fish kills and loss of aquatic habitat resulting in short term population decline.	▪ Construction fencing at work areas near watercourses limiting area of disturbance. ▪ Erosion and Sedimentation Control Plan.	Short term population decline.	None practical	Insignificant	None required
		Sediment laden stormwater entering watercourses during operation			✓	Entire Corridor	Loss of aquatic habitat resulting in population decline.	▪ Stormwater management facilities such as grassed swales, oil and grit separators, stormwater ponds. ▪ Detailed Storm Water Management Plan will be prepared during the detailed design stage.	Short term population decline.	Clean-out facilities as required.	Insignificant	Monitor sediment accumulation in stormwater management facilities.
		Loss of site-specific habitat.		✓		All watercourses within entire corridor.	Potential loss of fish habitat as a result of new culverts/bridges, culvert/bridge extensions and/or culvert/bridge replacements or repairs.	▪ Design transitway cross-sections to avoid modifications at culverts/bridges. ▪ Span meander belt or 100-year erosion limit of the watercourse. ▪ Avoid in-water work to the extent possible. ▪ Minimize the area of in-water alteration to the extent possible. ▪ Follow in-water construction timing restriction. ▪ Perform all in-water work in the dry using a temporary flow bypass system.	A harmful alteration of fish habitat will likely result from culvert modifications at approximately 25 culverts that convey watercourses that support fish habitat.	Negotiations with regulatory agencies during detail design. Compensate for the harmful alteration of fish habitat.	Insignificant	On-site environmental inspection during in-water work. Post-construction monitoring of fish habitat compensation measures.

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Table 10.4-3
Effects and Mitigation for Natural Environment

GOAL	Environmental Value/ Criterion	Environmental Issues/Concerns	Project Phase[1] P	C	O	Location	Potential Environment Effects	Proposed Mitigation Measures: Built-In Positive Attributes and/or Mitigations	Potential Residual Effects	Further Mitigation	Level of Significance after Mitigation	Monitoring and Recommendation
OBJECTIVE C: To protect and enhance the natural environment in the corridor												
C1 cont'd	Minimize adverse effects on Aquatic Ecosystems (cont'd)	Fish mortality		✓		All watercourses within entire corridor.	Fish may be injured or killed by dewatering.	▪ Design transitway cross-sections to avoid modifications at culverts/bridges. ▪ Avoid in-water work to the extent possible. ▪ Perform all in-water work in the dry using a temporary flow bypass system. ▪ Capture fish trapped during dewatering of the work zone and safely release upstream. ▪ Prohibit the entry of heavy equipment into the watercourse.	None expected.	None	Negligible	On-site environmental inspection during in-water work.
		Barriers to fish movement.		✓	✓	All watercourses within entire corridor.	Culvert/bridge extension, repair or replacement may create a barrier to fish movement.	▪ Use open footing culverts or countersink closed culverts a minimum of 20% of culvert diameter. ▪ Span the watercourse, meander belt or floodplain with new structures where warranted by site conditions.	Culvert extensions will be designed to avoid the creation of a barrier to fish movement.	Negotiations with regulatory agencies during detail design.	Negligible	On-site environmental inspection during in-water work.
		Baseflow alterations		✓	✓	All watercourses within entire corridor.	New impervious surfaces can lead to changes in the frequency, magnitude and duration of flows.	▪ Reduce the area of impervious surfaces to the extent possible. ▪ Use stormwater management practices that encourage infiltration and recharge of groundwater.	None expected.	None	Negligible	▪ Post-construction inspection of stormwater management facilities to evaluate their effectiveness. ▪ On-going maintenance as required.
		Increased temperature		✓	✓	All watercourses within entire corridor	Clearing of riparian vegetation and stormwater management practices can impact temperature regimes.	▪ Minimize the area of stream bank alteration to the extent possible. ▪ Use stormwater management practices that encourage infiltration and recharge of groundwater.	Shading provided by culvert/bridge offsets shading lost through removal of riparian vegetation.	Restore riparian areas disturbed during construction with native vegetation.	Negligible	▪ Post-construction inspection of stormwater management facilities to evaluate their effectiveness. ▪ On-going maintenance as required. ▪ Post-construction inspection of riparian plantings to confirm survival.
		Disturbance to rare, threatened or endangered species		✓	✓	All watersheds within entire corridor.	▪ Humber River watershed known to support redside dace, American brook lamprey, and central stoneroller. ▪ Don River watershed known to support redside dace and American brook lamprey. ▪ Rouge River watershed known to support redside dace, American brook lamprey, and central stoneroller.	▪ Design transitway cross-sections to avoid modifications at culverts/bridges. ▪ Mixed traffic operation has been introduced at the Humber River, West Don River, East Don River and Little Rouge Creek bridges to avoid widening and disturbance to rare, threatened and endangered species. ▪ Avoid in-water work to the extent possible. ▪ Perform all in-water work in the dry using a temporary flow bypass system. ▪ Capture fish trapped during dewatering of the work zone and safely release upstream. ▪ Prohibit the entry of heavy equipment into the watercourse.	None expected.	None required.	Negligible	None required.

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Table 10.4-3
Effects and Mitigation for Natural Environment

GOAL	Environmental Value/ Criterion	Environmental Issues/Concerns	Project Phase[1] P	C	O	Location	Potential Environment Effects	Proposed Mitigation Measures: Built-In Positive Attributes and/or Mitigations	Potential Residual Effects	Further Mitigation	Level of Significance after Mitigation	Monitoring and Recommendation
OBJECTIVE C: To protect and enhance the natural environment in the corridor												
C2	Minimize adverse effects on Terrestrial Ecosystems	Loss of wildlife habitat and ecological functions		✓	✓	Entire corridor.	Construction of the transitway and associated facilities may result in the removal of vegetation and ecological functions it supports.	▪ Minimize the area of vegetation removals to the extent possible. ▪ Minimize grade changes to the extent possible. ▪ Use close cut clearing and trimming to minimize the number of trees to be removed. ▪ Delineate work zones using construction fencing/tree protection barrier. ▪ Protect trees within the clear zone using guiderail, curbs, etc. to prevent removal.	None expected.	Restore natural areas disturbed using construction with native vegetation, where feasible. Replace ornamental vegetation as part of landscaping.	Negligible	None required.
		Wildlife mortality		✓	✓	Entire corridor.	Removal of wildlife habitat may result in wildlife mortality.	▪ Perform vegetation removals outside of wildlife breeding seasons (typically April 1 to July 31). ▪ Perform culvert/bridge extension, repair and replacement outside of wildlife breeding season.	None expected.	None required.	Negligible	None required.
		Barriers to wildlife movement and wildlife/vehicle conflicts		✓	✓	Entire corridor	▪ Culvert/bridge extension, repair or replacement may create a barrier to wildlife movement. ▪ Increase in width of Highway 7 to accommodate transitway and associated facilities may create an additional impediment to wildlife movement and increase the potential for wildlife/vehicle conflicts. ▪ New crossings at Upper Rouge River & Rouge River Tributary 4 may create a barrier to wildlife movement.	Maintain or enhance riparian corridors and terrestrial wildlife passage under new/ realigned bridges. New or modified culverts and bridges will be investigated during preliminary and detail design to identify opportunities to promote wildlife passage. Methods to enhance wildlife passage such as increasing vertical and horizontal clearances, drift fence, dry benches, etc. will be taken into consideration.	Transitway represents an incremental increase in road width compared to existing barrier created by Highway 7. Required culvert extensions will not impede wildlife passage under Highway 7.	Use of existing culverts/bridges maintains wildlife passage under transitway and does not offer opportunities to enhance wildlife passage.	Insignificant at new/ realigned bridges with appropriate mitigations	None required.
		Wildlife/vehicle conflicts			✓	Entire corridor.	Increase in width of Highway 7 to accommodate transitway and associated facilities may increase the potential for wildlife/vehicle conflicts.	▪ Span bridges across the meander belt. ▪ Use oversized culverts to promote wildlife passage under the road. ▪ Stagger culvert inverts to create wet and dry culverts.	Transitway represents an incremental increase in road width compared to existing hazard to wildlife created by Highway 7.	None required.	Insignificant	None required.
		Disturbance to rare, threatened, or endangered wildlife		✓	✓	Entire corridor.	Three rare species were identified within the study area: rough-legged hawk (non-breeding migrant/vagrant, extremely rare breeding occurrence by MNR); northern shrike (non-breeding migrant/vagrant, very rare to uncommon breeding occurrence by MNR); and, milk snake ('special concern' by COSEWIC, and 'rare to uncommon' by MNR)	▪ Prevent the harassment of eastern milk snake if encountered during construction. ▪ Perform vegetation removals outside of wildlife breeding seasons (typically April 1 to July 31). ▪ Perform culvert/bridge extension, repair and replacement outside of wildlife breeding season.	None expected.	None required.	Negligible	None required.

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Table 10.4-3
Effects and Mitigation for Natural Environment

GOAL	Environmental Value/ Criterion	Environmental Issues/Concerns	Project Phase[1]			Location	Potential Environment Effects	Proposed Mitigation Measures			Level of Significance after Mitigation	Monitoring and Recommendation
			P	C	O			Built-In Positive Attributes and/or Mitigations	Potential Residual Effects	Further Mitigation		
OBJECTIVE C: To protect and enhance the natural environment in the corridor												
C2 Cont'd	Minimize adverse effects on Terrestrial Ecosystems (cont'd)	Disturbance to vegetation through edge effects, drainage modifications and road salt		✓	✓	Entire corridor.	▪ Clearing of new forest edges may result in sunscald, windthrow, and invasion of exotic species. ▪ Ditching, grading and other drainage modifications may alter local soil moisture regimes. ▪ Road salt may result in vegetation mortality and die back.	▪ Minimize the area of vegetation removals to the extent possible. ▪ Minimize the grade changes and cut/fill requirements to the extent possible. ▪ Use close cut clearing and trimming to minimize encroachment on remaining vegetation. ▪ Delineate work zones using construction fencing/ tree protection barrier. ▪ Manage the application of road salt to the extent possible. ▪ TRCA guidelines for Forest Edge Management Plans & Post-Construction Restoration will be followed. ▪ All valley lands disturbed will require restoration with native herbaceous & woody species.	▪ Vegetation communities within the study area are primarily cultural in origin and have been impacted by Highway 7. ▪ The transitway represents an incremental encroachment into these already disturbed communities.	Landscape treatments.	Insignificant	None required.
		Disturbance to rare, threatened or endangered flora		✓		Entire Corridor.	▪ Twenty-two regionally rare or uncommon species are located within the study limits including: Black Walnut, Common Evening Primrose, Cut-leaved Toothwort, Groundnut ▪ Hitchcock's Sedge, Michigan Lily, Ninebark, ▪ Purple-stemmed Angelica, Red Cedar, Red Pine, Red-sheathed Bulrush, Sandbar Willow ▪ Shining Willow, Showy Tick-trefoil, Spike-rush ▪ Spotted Water Hemlock, Spring-beauty, Stickseed, Tall Beggar-ticks, Three-square ▪ Turtlehead, and Virginia Wild-rye.	▪ Minimize the area of vegetation removals to the extent possible. ▪ Minimize grade changes to the extent possible. ▪ Use close cut clearing and trimming to minimize the number of trees to be removed. ▪ Delineate work zones using construction fencing/ tree protection barrier. ▪ Protect trees within the clear zone using guiderail, curbs, etc. to prevent removal. ▪ Transplant rare species to safe areas prior to construction.	Trees may be removed by the transitway and its associated facilities.	None required.	Insignificant	Monitor clearing activities to ensure that minimum work zones are used to avoid any unnecessary tree removal.
C3	Improve regional air quality and minimize adverse local effects	Degradation of existing local and regional air quality when compared to MOE standards			✓	York Region	Situation expected to be unchanged or marginally better than 2001	The fleet average emissions will drop significantly due to technological improvements balancing the increase in traffic volumes. The BRT will divert commuters from individual highly polluting sources (single passenger automobiles)	Forecast improvement in all pollutants assessed (PM_{10}, NO_X, SO_2, CO) when comparing 2021 forecasts with and without the proposed Rapid Transit (see Tables 4.3 & 4.4 of Appendix L, 3.6% decrease in PM_{10} & CO, 4.4% in SO_2)	None required	Positive Effect	None recommended
		Increase in emissions of Greenhouse Gases (GhG)			✓	York Region	Fewer GhGs are expected to be emitted	Compared to the status quo (no additional transit) there will be far less GhGs emitted per commuting person	Reduction per capita emissions of GhGs (overall annual reduction of 54 kilotonnes of CO_2 forecast in 2021)	None required	Positive Effect	None recommended
		Degradation of air quality during construction		✓		Highway 7 Corridor	Some dust is expected during the construction period.	The law requires that all possible pollutant emission mitigation steps possible be taken during construction activities	Some PM emissions locally.	None required.	Negligible	Regular inspection of site dust and construction vehicle exhaust emissions during construction in compliance with MOE's standards and municipal by-laws.

Table 10.4-3
Effects and Mitigation for Natural Environment

GOAL	Environmental Value/ Criterion	Environmental Issues/Concerns	Project Phase[1]			Location	Potential Environment Effects	Proposed Mitigation Measures			Level of Significance after Mitigation	Monitoring and Recommendation
			P	C	O			Built-In Positive Attributes and/or Mitigations	Potential Residual Effects	Further Mitigation		
OBJECTIVE C: To protect and enhance the natural environment in the corridor												
C4	Minimize adverse effects on corridor hydro-geological, geological, hydrological and geomorphic conditions	Water quality in shallow groundwater that can affect quality in surface watercourses			✓	Areas located hydraulically down gradient of transit alignment, where receiving surface watercourses are present.	Transitways will require de-icing salt and also will accumulate various chemical substances that can impact water quality of runoff. Impacted runoff that infiltrates can increase concentrations in shallow groundwater. Potential to affect shallow groundwater that discharges to surface watercourses.	Dilution and other natural processes will attenuate elevated parameters in groundwater.	▪ Potential effects to water quality of surface water courses. ▪ Groundwater quality effects are anticipated to be detectable.	Reduce application of road salt, where possible. Curbs and gutters to convey impacted runoff away from permeable soil areas.	Moderately Significant	None required. Water quality effects are anticipated to remain acceptable.
		Water quality in shallow groundwater that can affect quality in water supply wells			✓	Areas located hydraulically down gradient of transit alignment, where shallow dug wells in active use are present.	Transitways will require de-icing salt and also will accumulate various chemical substances that can impact water quality of runoff. Impacted runoff that infiltrates can increase concentrations in shallow groundwater. Potential to affect shallow groundwater that is extracted by down gradient supply wells.	Dilution and other natural processes will attenuate elevated parameters in groundwater.	▪ Potential effects to groundwater quality used as drinking water. ▪ Groundwater quality effects in water wells may be detectable.	Reduce application of road salt, where possible. Curbs and gutters to convey impacted runoff away from permeable soil areas.	Moderately Significant	None required. Water quality effects are anticipated to remain acceptable within Ontario Drinking Water Standards. Well inspection will be performed during the detailed design phase to confirm the relationship of the widened roadway to existing active water well will not have an adverse affect on water quality. If it does or domestic well use is confirmed, a contingency plan will be developed.
		Baseflow in surface water courses		✓	✓	Recharge areas within proposed alignment, particularly in areas of Newmarket Till and sand textured glacial lake deposits.	Increase of pavement area decreases the pervious area that existed prior to construction, resulting in proportionally decreased recharge to shallow groundwater.	N/A	▪ Decreases in recharge can decrease baseflow in surface water course(s). ▪ Reduced baseflow in surface watercourses.	Construction of pervious surfaces where practical, including grassed areas and permeable pavements.	Negligible	None required. The degree of impact is anticipated to be undetectable.
		Increased pavement; decreased infiltration			✓	Entire corridor	Minor increase in quantity of surface runoff. Minor decrease in quantity of groundwater.	Storm water management facilities such as grassed swales and storm water ponds.	▪ Minor increase in peak streamflows. ▪ Minor decrease in groundwater.	None practical	Negligible	None required
		Changes in flood levels from the widening of existing bridges and culverts			✓	Beaver Creek crossing at Sta 37+790	HEC-RAS model provided by TRCA was used to assess changes in flood level due to widening the existing culvert by 10 m.	No increase in Regional storm or return period flood levels upstream of the crossing. See Appendix G for results of the analysis.	N/A	N/A	Negligible	None required.
					✓	Rouge River (Apple Creek) crossing at Sta 38+695	HEC-RAS model provided by TRCA was used to assess changes in flood level due to widening the existing bridge by 18 m.	Regional storm flood level upstream of the bridge would increase by up to 50 mm. No increase in return period flood levels upstream of the crossing. See Appendix G for results of the analysis.	Minor increase in Regional storm flood level. Widening will not adversely impact upstream water levels.	N/A	Negligible	None required.
					✓	Rouge River crossing at Sta 43+256	HEC-RAS model provided by TRCA was used to assess changes in flood level due to widening the existing bridge by 8 m.	No increase in Regional storm flood levels. Return period flood levels upstream of the crossing would increase by up to 30 mm. See Appendix G for results of the analysis.	Minor increase in return period flood levels. Widening will not adversely impact upstream water levels.	N/A	Negligible	None required.
		Changes in flood levels from the construction of a new bridge.			✓	Proposed Rouge River crossing at Sta 540+190	HEC-RAS model provided by TRCA was used to assess changes in flood level due to a proposed bridge with a width of 10 m and a span of 30 m.	Regional storm flood level upstream of the bridge would increase by up to 20 mm. The 100 year return period flood level would increase by 110 mm just upstream of the crossing The increase for the 25 and 2 year events would be 50 mm and 0 mm respectively. See Appendix G for results of the analysis.	Minor increase in Regional storm flood level. Increase in 100 year flood level. The 100 year flood level is over 2 m below the Regional storm flood. No change in existing regulatory floodline or developable area.	N/A	Negligible. The 100 year flood level is contained within the Regional storm flood plain and the increase is not significant.	None required.

Notes: P – Pre construction, C – Construction, O – Operation

10.4.4 OBJECTIVE D: To promote smart growth and economic development in the corridor

One of the main purposes of the Rapid Transit System is to support the smart growth policies of the Provincial and Regional Governments and simultaneously encourage economic development. From this perspective, the Highway 7 Transitway strongly supports Regional and Municipal planning policies, such as the Centres and Corridors urban form. In many respects, the undertaking will contribute to the intensification of underutilized sites within the corridor and encourage transit-oriented development at infill locations and vacant land along the routes. At the same time, several built-in design characteristics are aimed at reducing the potential for adverse effects on business or access to residential neighbourhoods and community facilities.

The transit system will support the overall objective of the Region's Planning Policies to ensure that form follows function. The transit system must contribute to a sustainable environment by improving access to new and existing development leading to increased business and economic activity along the corridor. Through this increase in business activity, infill locations and vacant land is more likely to be developed, maximizing the desired concentration of development within municipal zoning controls and leading to a more viable alternative of rapid transit in York Region. The assessment in terms of Objective D is tabulated in **Table 10.4-4**.

Table 10.4-4

Effects and Mitigation for Smart Growth and Economic Development

GOAL	Environmental Value/ Criterion	Environmental Issues/Concerns	Project Phase[1]			Location	Potential Environment Effects	Proposed Mitigation Measures			Level of Significance after Mitigation	Monitoring and Recommendation
			P	C	O			Built-In Positive Attributes and/or Mitigations	Potential Residual Effects	Further Mitigation		
OBJECTIVE D: To promote smart growth and economic development in the corridor												
D1	Support Regional and Municipal Planning Policies and approved urban structure	Need for pedestrian-friendly streets and walkways for access to stations		✓	✓	Entire corridor	Streetscape will create a more pedestrian-friendly atmosphere.	▪ Signalized pedestrian crosswalks will be provided at all station locations and an appropriate number of intersections; Pedestrian safety will be considered in the design of station precincts and road signage will be highly visible to both pedestrians and automobiles.	Potential for jaywalking in vicinity of stations, which could lead to increased in number of vehicle/pedestrian incidents.	Platform edge treatment will discourage illegal access	Negligible	Monitor traffic accidents involving pedestrians to establish whether cause is transit related.
		Locating higher density and transit-oriented development where it can be served by transitway			✓	New and redevelop-ment/infill locations	Current landowners could object to implementation of existing land use pattern changes along transit corridor.	▪ Regional/Municipal land use controls and approval processes to encourage transit-oriented development or re-development in support of OP objectives.	Redevelopment pressure on surrounding areas	Apply Municipal Site Plan approval process	Insignificant	Monitor re-development activity to control overall increase in development density
		Reflection of historical districts through urban design and built form.			✓	Main Street Markham	Station aesthetics may not be compatible with the character of heritage districts along the corridor.	▪ In the area of Main Street, the rapid transit is discontinued with rapid transit operating in mixed traffic. ▪ Incorporate station designs and features that reflect the surrounding historical districts where further redevelopment is limited through consultation with community and heritage groups.	Historical district is generally north of Highway 7.	Apply Municipal Site plan approval process	Insignificant	Municipalities to monitor nature of re-development in sensitive districts
D2	Provide convenient access to social and community facilities in corridor	Potential barrier effects during construction and operation		✓	✓	Entire corridor	Transitway could be perceived as a barrier in access to future community centres, hospital(s), malls, parks, etc.	▪ Construction Traffic and Pedestrian Management Plan will avoid wherever possible, barriers to entrances/exits to large attractors along Highway 7. ▪ Transitway median design will recognize pedestrian access requirements, particularly in proximity to community facilities.	Alternative access routes to facilities may affect adjacent properties	Mark detours and alternative access points clearly	Insignificant	Monitor congestion levels during construction and traffic patterns during operations.
D3	Minimize adverse effects on business activities in corridor	The potential for an increase in business activity.	✓	✓	✓	Entire corridor	Increased pedestrian traffic via the implementation of a rapid transit system will increased the potential for business activity.	▪ A higher density of development on underutilized sites, infill locations and on vacant land should increase the market for some business activity.	Increase in vehicular traffic; increase in workforce/ population.	Encourage intensification meeting urban form objectives.	Insignificant and positive	Monitor building applications/ permits, economic influences (employment rate, etc.)
		The potential for a decrease in business activity.		✓	✓	Entire corridor	Modification of road access could lead to displacement and/or business loss.	▪ Implement procedures to address requests of affected businesses; Incorporate design solutions and construction methods to minimize number of businesses affected.	Decrease in traffic; decrease in workforce/population	Encourage alternative compatible development	Moderately significant	Cooperative response to business loss concerns addressed to municipalities.

Table 10.4-4
Effects and Mitigation for Smart Growth and Economic Development

GOAL	Environmental Value/ Criterion	Environmental Issues/Concerns	Project Phase[1] P	C	O	Location	Potential Environment Effects	Proposed Mitigation Measures: Built-In Positive Attributes and/or Mitigations	Potential Residual Effects	Further Mitigation	Level of Significance after Mitigation	Monitoring and Recommendation
OBJECTIVE D: To promote smart growth and economic development in the corridor												
D4	Protect provisions for goods movement in corridor	Ease of Truck Movement			✓	Entire Corridor	Median transitway will restrict truck movement in corridor	▪ Provided U-turns at major intersections to allow for truck access to side streets and properties. Traffic analysis at intersections indicated sufficient capacity for trucks using U-turns.	In areas of 4-lane cross-section, intersections with no station or landscaping in median do not allow sufficient turning width for WB 17(articulated trucks).	Traffic signs prohibit large truck at these intersections (see next entries). Designate truck routes.	Insignificant	Monitor and widen Highway 7 with right turn tapers at side streets to allow for movement
				✓		Entire Corridor	Construction may limit access for trucks	▪ Traffic management plan to ensure truck access at all times	May not be possible in some areas	Designate alternative truck routes	Negligible	None required
		Truck U-turn Movement Prohibited			✓	Westbound at Kipling Ave. intersection	The effect is not anticipated to be critical because: ▪ the gas station at the SE corner also has an access on Kipling Ave.; ▪ there is no other commercial property on the south side between Kipling Ave. and Islington Ave.	None required.	None expected.	None required.	Insignificant	Monitor and widen Highway 7 with right turn tapers at side streets to allow for movement, or widen Highway 7 from 4 lanes to 6 lanes.
					✓	Eastbound at Kipling Ave. intersection	There is a need for trucks to access to the many commercial properties on the north side between Kipling Ave. and Parkfield Crt/ Woodstream Blvd. The next U-turn permitted intersection, i.e. Islington Ave. is approximately 600m away and trucks will have to travel additional 120m to access these north side properties.	Truck U-turn Movement at this intersection cannot be prohibited.	Trucks making U-turn will have to negotiate with the EB through traffic as they will need to move out of the left-turn lane in order to make the U-turn.	Traffic signs required to warn EB through traffic of the truck U-turn movements.	Moderately significant	Monitor the truck u-turn operation to confirm if this operation will impede EB through traffic operation severely. Widen Highway 7 with right turn tapers at side streets to allow for movement, or widen Highway 7 from 4 lanes to 6 lanes.
					✓	Westbound at Bruce St. intersection	The effect is not anticipated to be critical because: ▪ the commercial property on the SE corner has no access on Highway 7; ▪ there is no other commercial properties on the south side between Bruce St. and Helen St./ Wigwoss Dr.; and ▪ the next U-turn permitted intersection is only approximately 400m away at Islington Ave.	None required.	None expected.	None required.	Insignificant	Monitor and widen Highway 7 with right turn tapers at side streets to allow for movement, or widen Highway 7 from 4 lanes to 6 lanes.
		Truck U-turn Movement Prohibited (cont'd)			✓	Westbound at Swansea Rd. intersection	The effect is not anticipated to be critical because: ▪ the commercial property opposite Bullock Dr. can be accessed at the signalized Bullock intersection; ▪ there is no other commercial properties on the south side between Swansea Rd. and Bullock Dr.; and ▪ the next U-turn permitted intersection is only approximately 450m away at Kennedy Rd.	None required.	None expected.	None required.	Insignificant	Monitor and widen Highway 7 with right turn tapers at side streets to allow for movement, or widen Highway 7 from 4 lanes to 6 lanes.

Notes:
P – Pre construction, C – Construction, O – Operation

10

10.5 ENVIRONMENTAL EFFECTS ASSESSED FOR CEAA REQUIREMENTS

10.5.1 Cumulative Effects

Cumulative environmental effects are defined as, *"… the effects on the environment caused by an action in combination with other past, present and future human actions"* (CEAA, 1999). They occur when two or more project-related environmental effects, or two or more independent projects, combine to produce a different effect. The effects may be positive or negative, and may have regional as well as site-specific implications. They can be assessed on the basis of their spatial and temporal boundaries.

10.5.1.1 Spatial Cumulative Effects

Spatial cumulative effects may be experienced by:

- crowding of more than one project or activity within a single space;
- compounding of effects from a localized activity with other activities or conditions over a broader (i.e., regional) area;
- indirect consequence of an activity's effect on a seemingly unrelated activity of condition; and
- fragmenting the value of a larger environmental component by small incremental changes (i.e., nibbling).

The facilities planned for the Highway 7 Corridor transitway have been sited in locations and designed in configurations such that there will be no spatial cumulative effects during the construction and operation of the rapid transit service.

During project implementation, staging of the construction of elements of the Undertaking will ensure that temporary construction disruption does not present a risk of reaching an unacceptable level of adverse effect on community and business access and mobility. Traffic accommodation, noise and dust control measures will be planned and designed to mitigate the overall level of construction activity at any one time and location. Monitoring programs will be followed to verify that the level of construction activity is not accumulating to a level with potential for adverse effects on the social and natural environment.

Similarly, operation of the rapid transit service in the Highway 7 Corridor simultaneously with the proposed service in the Yonge Street Corridor will not produce any adverse cumulative effects. The services will use separate transitways and the size and configuration of the intermodal terminal at Richmond Hill Centre will accommodate both services. The commercial land uses surrounding the station are not sensitive to the noise levels projected for the combined operations in the future. If re-development of the lands around the facility takes place in the future, it will very likely remain commercial due to the proximity of the Hydro right-of-way and the role of the area as a transportation hub.

10.5.1.2 Temporal Cumulative Effects

Temporal cumulative effects may be experienced by:

- accumulation of repetitive yet insignificant effects, reaching a significant level (i.e., crossing a threshold) over a long period of time.

10.5.2 Timelags Whereby the Effects of Short-term Activities are not Experienced until the Future

The one potential temporal cumulative effect has been identified and discussed in **Chapter 5** under the evolution of technologies on the proposed rapid transit network. This relates to the potential loss of BRT service reliability in heavily congested portions of the route. As indicated, this future condition may require extension of the TTC subway system in the case of the Vaughan North-South Link or the introduction of an LRT based service on these portions in York Region. The growth in transit ridership and its effect on the frequency of BRT vehicles required in this portion of the corridor will be monitored during the first 10 years of operation of the system.

10.5.3 Effects of a Project Malfunction or Accident

Rapid transit service will be operated mostly on dedicated lanes within the Highway 7 Corridor road rights-of-way. All transit vehicle movements will be subject to the *Ontario Highway Traffic Act* and general traffic will only be permitted to cross the dedicated lanes at signalized intersections. These measures will reduce the probability of a system malfunction due to collisions with other vehicles. In the event such as a collision occurs, rapid transit vehicle operators will be able to obtain instant assistance from the transit control centre. If required, the centre will request emergency response services that will be able to reach the site of the incident using the general traffic lanes and, when necessary, the median crossings for emergency vehicles provided at regular intervals along the routes. This will permit management of any environmental hazards at incidents by the appropriate emergency service.

The maintenance and storage of rapid transit vehicles will be carried out at the Region's maintenance facility proposed in the Langstaff industrial area of Markham. The effects of a project malfunction of accident at this facility have been described in the Yonge Street Corridor Public Transit Improvements Environmental Assessment.

10.5.4 Effects of the Environment on the Undertaking

All infrastructure required for the Undertaking will be designed to function satisfactorily and safely in the range of environmental conditions stipulated in the applicable Ontario design codes and standards. Since the infrastructure and systems anticipated comprise typical road and rail transit facilities, proven in service in the transportation industry in Canadian urban environments, no adverse effects of normal environmental conditions are expected.

The service will be operated mostly in existing road rights-of-way where drainage systems and snow or ice clearing measures will mitigate the effects of severe weather conditions on operations in both summer and winter. Where exclusive rights-of-way are used for rapid transit, the Region will provide all necessary transitway maintenance services to enable safe operation in all normal weather conditions. In the event that extreme conditions (e.g. blizzards or hurricanes), make rapid transit operation unsafe, services will be halted and reinstated under direction from the Region's Transit System Control Centre.

10.5.5 Full Life-cycle Effects

The assessment described in **Chapter 10** considers the potential environmental effects during both construction and operation of the undertaking. In accordance with the requirements of the CEAA, the effects during the remaining phase of the project life-cycle, the Decommissioning phase are discussed below.

York Region's rapid transit service is planned as a permanent public service with facilities designed for a service life of 30 – 50 years. Consequently, most of the infrastructure will be maintained or replaced to support the service for the foreseeable future. The only instance where a component may be decommissioned would be if the Region decided to replace all or part of the Maintenance Centre with another facility at another site. If this were to occur, the Region would decommission the facility in accordance with all requirements of the relevant.

11. IMPLEMENTATION PROCESS

11.1 CONTEXT

Chapter 1 of this report has described the Regional Municipality of York's commitment to put in place a comprehensive network of rapid transit services linking the four designated regional centres. The Plan has as its focus, the early provision of a viable alternative to increasing automobile dependence for mobility in the Region.

The Highway 7 Corridor and Vaughan North-South Link Transitway undertaking, described in **Chapter 9**, is the primary east-west corridor and secondary north-south corridor, respectively, in York Region's proposed four-corridor Rapid Transit Plan. In addition, travel demand modelling has indicated that rapid transit service on the Highway 7 Corridor will attract some of the highest transit ridership on the network. Consequently, the Region's plans for the evolution of the network place a high priority on early implementation of facilities and service in this corridor.

This Environmental Assessment Study constitutes the first step in the implementation process which will include all the traditional phases of preliminary and detailed design, construction, testing and commissioning of systems and installations and finally operation of rapid transit service.

11.2 PROJECT IMPLEMENTATION PLAN

In support of the Environmental Assessment studies, the preferred transitway design has been developed to a Functional Planning level of detail including both horizontal and vertical alignment of the preferred transitway alternative. Also, preferred locations for the at-grade stations have been identified and conceptual layouts for insertion of prototypical station facilities developed at each station site.

11.2.1 The Design Phase

The infrastructure planning undertaken during the study is considered adequate to identify the effects of implementation and operation of the undertaking and establish whether any mitigation is needed and what form it should take. Following approval of the EA by both provincial and federal agencies, further preliminary design and subsequently, detailed design will constitute the first stage of the Region's implementation plan.

Selection of bus rapid transit (BRT) as the preferred initial technology allows the facilities to be constructed and the service to be operated in stages along the length of the corridor. The timing and extent of each stage implemented and operated will depend on the availability of funding and the period required for construction of each stage.

Once these factors have been determined, a work plan to carry out the detailed design will be developed. This plan must recognize that the Region has decided to implement rapid transit featured services with new buses in mixed traffic in the corridors prior to and during construction of the dedicated lanes. Consequently, the Maintenance and Storage Facility (MSF) at Langstaff will be the first component to be designed for early approval and construction as soon as land acquisition is complete.

It is likely that the design phase for transitway infrastructure will be completed sequentially in three segments along the route, each timed to allow sufficient time for post-EA approvals prior to the scheduled start of construction in each segment. Besides the MOE and CEAA approvals of the EA itself, examples of these approvals are:

- Municipal Building Permits, mainly for the Maintenance Facility;
- TRCA permits;
- Federal DFO authorization;
- If required, EPA approvals for waste disposal at the MSF;
- Permits under the Lakes and Rivers Improvement Act for alternations to the watercourses and/or stream crossings; and
- Any Ontario MNR approvals.

11.2.2 The Construction Phase

11.2.2.1 <u>The Surface Transitway and Stations</u>

Implementation of the transitway by segment was introduced in the discussion on design approach above. Assuming continuity in the availability of funding for construction, it is anticipated that construction of the transitway and associated station facilities will commence in year 2008 in the segment between Yonge Street and Markham Centre. Work in this 9 km segment will continue through the 2009 and 2010 construction seasons.

Prior to commencing construction in the Highway 7 Corridor right-of-way, a comprehensive, detailed Traffic Management Plan will be prepared in consultation with regional and local municipal traffic operations staff, emergency services personnel and owners of businesses generating major traffic movements. The plan will include

- traffic signal modifications to control left and U-turns;
- distribution of available roadway width for traffic lane diversions;
- sequencing of shifts of construction and traffic between sides of Highway 7 and other routes;
- measures to preserve vehicle and pedestrian access to adjacent properties;
- measures to maintain access for emergency vehicles;
- locations and details of signage and barriers; and
- methods to permit transit operations during construction.

Within each of the segments discussed above, road-widening works, to develop the median right-of-way for transit, will be staged to minimize the temporary disruption due to traffic lane diversions and narrowing.

11.2.2.2 <u>Vaughan North-South Link Ultimate Subway Extension Phase</u>

The timing of construction of the extension of the Spadina Subway into York Region will depend on decisions on the timing and extent of the project to expand the system in Toronto between Downsview Station and Steeles Avenue Station. If subway expansion into York Region can be funded as part of this project, the construction along the Vaughan North-South Link would be integrated with the schedule for the overall expansion project. In the event that the Toronto project is terminated at Steeles Avenue, the timing of the VNSL subway segment will be predicated on availability of funding and the need to support Vaughan's regional centre development growth.

11.3 ENVIRONMENTAL COMMITMENTS

The purpose of this section is to outline commitments made by York Region to undertake environmental mitigation measures to ensure compliance with the requirements of the government agencies responsible for the review of this Environmental Assessment. Refer to **Table 11.3-1**.

Table 11.3-1
Summary of Environmental Concerns and Commitments

Environmental Issue/ Concern/ Effect			Environmental Commitments		
I.D. #	Details	Potentially Interested Group/ Agency	I.D.#	Details	Comments
1	Fisheries and Aquatic Habitat	EC, MNR, DFO, MOE, TRCA	1.1	All culverts/ bridge modifications regarding potential Harmful Alterations, Disruption or Destruction of fish habitat, compensation under the Fisheries Act and identification of additional watercourses during the detailed design phase will be reviewed and approved by TRCA to ensure the compliance to their requirements.	Appendix D (NSR)
			1.2	For the proposed crossing at Rouge River between Town Centre Boulevard and	Appendix D

11

Table 11.3-1
Summary of Environmental Concerns and Commitments

Environmental Issue/ Concern/ Effect			Environmental Commitments		
I.D. #	Details	Potentially Interested Group/ Agency	I.D.#	Details	Comments
				Warden Avenue, a meander belt analysis will be carried out and a 100-year erosion limit will be determined during the preliminary & detailed design phases to meet TRCA's approval in determining the sizing of the bridge span.	
			1.3	Discussion with TRCA will be carried out during the detail design phase to determine if a HADD will occur at new water crossing; and if so, to secure a Fisheries Act authorization.	Appendix D
			1.4	Any proposed in-stream work and site-specific mitigation measures will be carried out as outlined in Table 8 of the Natural Science Report (Appendix D).	Appendix D
2	Wildlife Habitat	MNR, TRCA, DOE, EC	N/A	N/A	N/A
3	Vegetation and Wetlands	MNR, MOE, TRCA, DOE, EC	3.1	Edge Management Plan and Tree Preservation Plans will be prepared during the detailed design to mitigate impacts to adjacent natural features, as well as the preparation of detailed compensation and restoration plans to strive to provide for a net improvement to existing condition. TRCA guidelines for Forest Edge Management Plans and Post-Construction Restoration will be followed.	Appendix D (NSR)
4	Groundwater Resources	MOE, TRCA	4.1	In the event the shallow or upward groundwater movement becomes an issue due to the construction of subway during the detailed design stage, TRCA's hydrogeologist will be consulted.	Chapter 12
			4.2	For wells that remain in use, if any, a well inspection will be conducted prior to construction to establish baseline conditions and to confirm the relationship of the widened roadway to existing active water well will not have an adverse affect on water quality. If it does, a contingency plan will be developed. In the event that wells are required to be closed, closure will proceed in accordance with O.Reg.903 of the Ontario Water Resource Act. If the widened roadway has adverse effects on the active well on water quality, a contingency plan will be developed.	Appendix D
			4.3	For subway extension, a subsurface investigation will be conducted during preliminary and detail design to identify groundwater and soil conditions. Impact assessment and mitigation measures will be performed at that time to address any issues related to groundwater quality and quantity	Appendix D
5	Surface Water Resources	MOE, MNR, DOE, TRCA	5.1	A detailed Storm Water Management Plan (SWMP) will be developed in accordance with the MOE's *Stormwater Management Planning and Design Manual (2003)* and *Guidelines for Evaluating Construction Activities Impacting on Water Resources*. This SWMP will outline monitoring & maintenance commitments for SWM facilities constructed as part of this undertaking.	Section 9.5, Appendices D & G
			5.2	Water quality controls up to the MOE water quality guideline of Enhanced Level (80% total suspended solids removal) will be required for areas where an increase in impervious surface is observed.	Appendices D & G
			5.3	An Erosion and Sediment Control Plan will be developed to manage the flow of sediment into storm sewers and watercourses and to monitor erosion and sedimentation control measures during construction.	Section 9.5
6	Air Quality & Energy	MOE, EC	N/A	N/A	N/A
7	Contaminated Soil	MOE	7.1	In the event contaminated sites are identified after construction activities begin, a contingency plan will be prepared to outline the steps that will be taken to ensure that contaminant release will be minimized and appropriate clean-up will occur. The site clean-up procedure of the plan is subject to the *MOE's Brownfield's* legislation and the *Record of Site Condition Regulation* (O.Reg. 153/04)	Appendix F
		Heath Canada	7.2	Health Canada's Federal Contaminated Site Risk Assessment in Canada will be obtained.	
8	Noise and Vibration	MOE	N/A	N/A	N/A
9	Effects on Businesses and Other Land Uses	MOE	9.1	A parking need assessment and management study to be performed.	Section 9.1.8
10	Archaeological Resources	MTCR, Municipal Agencies, Municipal Heritage Planners, LACAC, TRCA	10.1	Findings of future archaeological assessment will be forwarded to the Ministry of Culture.	Appendix J
11	Subway Extension	City of Toronto, TTC	11.1	City of Toronto/ TTC will be consulted for the EA Amendment for the VNSL subway extension.	Chapter 12
12	Agriculture	MAF	12.1	A policy to protect agricultural lands during construction will be developed during the detailed design phase.	
13	Others	MTO	13.1	MTO will be consulted and their approval will be sought in any medications to the CAH bridges, and the grade separated option (C-B2) through Hwy 404 Interchange when required.	Section 9.1.5
			13.2	The Highway 427 Extension Preliminary Study will be obtained during detailed design once they are finalized. MTO will be consulted in the design of Highway 7 structure over Highway 427.	Section 9.1.5
		Public	13.3	Public concerns/ complaints will be address through public consultation centres during detailed design phase. As well, public relation stuff will address complaints regarding construction and operations of the transitway. The received concerns/ complaints will be circulated to appropriate department for action.	
		Markham, CPAC	13.4	During the preliminary and detailed design phases, the Cycling and Pedestrian Advisory Committee (CPAC) will be consulted regarding the cyclist and pedestrian treatments.	Section 13.9.4

11.4 MONITORING

The purpose of this section is to outline commitments made by York Region to monitor the project activities to ensure compliance with the requirements of the government agencies responsible for the review of this EA.

11.4.1 Construction Monitoring

During the construction of the transitway, the Region will carry out monitoring activities in accordance with a comprehensive **Monitoring Program** to be finalized during the detailed design phase. The plan will set out the purpose, method and frequency of all monitoring activities and provide the framework for recording and documenting their results.

The outline of the plan, shown in **Table 11.4-1**, documents York Region's commitment to measure the effects of transitway construction activities on the elements of the environment listed.

Table 11.4-1
Construction Monitoring

Environment Element	Purpose of Monitoring	Monitoring Method	Monitoring Frequency
Noise generated by construction activities	To ensure noise levels comply with Municipal by-laws	Site measurements of levels produced by representative equipment/activities	At time of introduction of equipment/ activities producing significant noise level with potential to disturb sensitive areas.
Effect of construction activities on air quality(dust, odour,)	To confirm that local air quality is not being adversely affected by construction activity	Regular inspections of site dust control measures and of construction vehicle exhaust emissions	Monthly during construction seasons.
Condition of heritage homes adjacent to transitway alignment	To determine if any damage/deterioration is due to construction activity	Pre-construction inspection to obtain baseline condition and monitoring during nearby construction	As required by construction schedule for work adjacent to heritage features.
Effect of construction on water quality and quantity in watercourses	To confirm that water quality is not being adversely affected by construction activity	Monitor sediment accumulation after rain events during construction to ensure that the proposed mitigation measures in the Erosion and Sediment Control Plan have been satisfied.	After first significant rain event
Effect of construction on boulevard trees	To ensure the survival of boulevard trees	Inspection of protective measures and monitoring of work methods near trees	Prior to commencement of work and bi-weekly during work activities.

Environmental protection measures will be stipulated in all appropriate construction specifications that will form the contractual basis for carrying out the works. The **Monitoring Program** will include procedures for implementation of mitigation of any adverse effects identified as well as contingency measures to respond to unexpected adverse impacts. In addition, the plan will set out the responsibilities of inspection staff assigned to carry out the monitoring program described above. The staff will report to an independent Environmental Compliance Manager who will have overall responsibility for execution of the **Monitoring Program**.

11.4.2 Operations Monitoring

The **Monitoring Program**, described above, will also include a methodology and associated procedures to continue the necessary monitoring during revenue operations to confirm compliance with the commitments documented in the EA Report. The Program will include regular monitoring activities as well as the procedure to be adopted in the event that adverse effects are identified between regular inspections. Monitoring activities during rapid transit operations are shown in **Table 11.4-2**.

Table 11.4-2
Monitoring Activities During Rapid Transit Operations

Environment Element	Purpose of Monitoring	Monitoring Method	Monitoring Frequency
Noise generated by operation and maintenance activities	To ensure noise levels comply with Municipal by-laws	Pass-by and idling measurements of levels produced by representative vehicles /activities	Initially after revenue service is introduced and in response to concerns or after any major increase in service frequency.
Effect of rapid transit operations on local air quality (pollutants, odour,)	To confirm that local air quality is not being adversely affected by transit vehicle activity at terminals/facilities	Regular inspections of measures and of transit vehicle exhaust emissions	Initially after facilities are placed into service and at five-year interval during vehicle life.
Condition of heritage homes adjacent to transitway alignment	To determine if any damage/deterioration is due to vibrations produced by transit vehicles	Post-construction inspection to obtain baseline condition and monitoring during pass-by operations	Initially after revenue service is introduced and in response to concerns or after any major increase in service frequency.
Traffic Operation	To confirm that the traffic operation is not adversely affected.	Post-construction traffic study	Initially after revenue service is introduced and at a regular interval afterward.
Effect of snow and ice removal on water quality in corridor watercourses	To confirm that water quality is not being adversely affected by transitway and vehicle maintenance activities	Monitor sediment accumulation in storm water management facilities.	During major storm events up to five times per year
Effect of operations and maintenance on boulevard trees	To ensure the survival of boulevard trees	Inspection of protective measures and monitoring of work methods near trees	Annually

11.4.3 Vehicle Conversion from BRT to LRT

The **Monitoring Program** will involve a methodology for reviewing the timing for conversion in vehicle technology from BRT to LRT. Ridership will be monitored between 2007 and 2011, and by 2012 a major review of the YRTP project will be undertaken to determine if the underlying assumptions about growth (population, employment and other activities) in York Region have taken place. This review will determine if the ridership response to the YRTP service has also met expectations. The traffic operations within the Corridor and at intersections will be reviewed to determine the level of service (LOS). The advantages of technology conversion to LRT technology will be assessed before making a final decision on the timing of LRT implementation (improvement in overall traffic operations, travel time savings, impact to overall ridership, service reliability etc.).

During the monitoring, consultation with the City of Toronto and TTC staff will take place in relation to capacity and technology requirements and service integration. In addition, the consultations will review the TTC subway extension priorities at that time to establish if, and when an extension of the Yonge or Spadina Subway to Highway 7 will be forthcoming. A report will be presented to Regional Council in open session, following the printing of newspaper notices advising the public of the proposed technology transfer from BRT to LRT.

11.5 MODIFYING THE PREFERRED DESIGN

In discussing the process to change the preferred design, it is important to distinguish between minor and major changes. A major design change would require completion of an amendment to this EA, while a minor change would not. For either kind of change, it is the responsibility of the Regional Municipality of York, as proponent, to ensure that all possible concerns of the public and affected agencies are addressed.

Minor design changes may be defined as those which do not appreciably change the expected net impacts associated with the project. For example, a design change in lighting treatment and landscaping as well as minor changes to median width, vehicle lane widths, design speed of roadway curbs and underground infrastructure to be renewed. Such changes could likely be dealt with during the design phase and would remain the responsibility of York Region to ensure that all relevant issues are addressed.

Due to unforeseen circumstances, it may not be feasible to implement the project as described in this EA report. Accordingly, any significant modification to the project or change in the environmental setting for the project which occurs after the filing of this EA shall be reviewed by York Region and an addendum to the EA shall be prepared.

11.6 AMENDMENT TO COMPLETE VAUGHAN NORTH-SOUTH LINK PREFERRED SUBWAY DESIGN

Chapter 12 identifies the need to defer development of a complete preferred design for the Spadina Subway Extension for the portion of the Vaughan North-South Link tying into the Toronto/TTC EA preferred design in the Steeles Avenue area until that EA is approved. York Region proposes to carry out this work at a future date and seek MOE approval of the preferred design of the portion not included in this EA by submitting an amendment report after appropriate stakeholder consultation. The work can only be performed when MOE approval of the preferred designs for the related Toronto/TTC Subway Extension EA and the planned 407 Transitway EA has been obtained. It will include the tasks summarized in **Chapter 12**.

12. VAUGHAN N-S LINK ULTIMATE CONVERSION TO SUBWAY TECHNOLOGY

12.1 BACKGROUND

12.1.1 Regional Context

The study's Terms of Reference included an assessment of a potential extension of the TTC's Spadina Subway from the York Region boundary north of York University to Vaughan's planned Corporate Centre at Highways 400 and 7 in response to both a request by the City of Vaughan and the Region's Centres and Corridors Strategy initiatives.

The Regional Centres and Corridors Strategy is a multi-faceted program of policy, financial tools, infrastructure and supportive programs. The objective of the strategy is to facilitate the development of both the Regional Centres and Corridors with more intensive development supporting transit ridership and with a mix of higher-density uses creating a more vibrant, city-type environment. The Vaughan Corporate Centre (VCC) is the western Regional Centre which is intended to focus on higher order development needed as the Region increases the emphasis on the growth priority of city-building within the urban boundary.

The Regional Official Plan Amendment 43 was approved on January 5, 2005 to further enhance the Regional Centre policies to promote mix-use intensification supported by rapid transit with high quality urban design in the Vaughan Corporate Centre. The overall purpose of ROPA 43 is to advance the city-building model of development based on a network of Regional Centres and Regional Corridors, served by rapid transit. The long-term sustainability of York Region's urban structure requires a diverse, mixed-use development form that is compact, transit-supportive, pedestrian-friendly and well-designed. City-building is a vital part of achieving the Region's Urban Structure through:

- Managing rapid growth;
- Providing housing for a diversifying population;
- Keeping the economy strong – providing for business and workforce;
- Supportive and efficient infrastructure;
- Providing human services;
- Quality of life; and
- Need long term sustainability.

Regional initiatives including Vision 2026, Transportation Master Plan, York Region Rapid Transit Plan (YRTP), and the "York Region Centres + Corridors Strategy: "Making it Happen!" have all reaffirmed the need for and benefits of more compact and concentrated development patterns as a means of supporting infrastructure investment and improving the overall quality of our communities.

A focus on centres and corridors also forms the basis for growth management across the entire GTA region, as endorsed by Regional Planning Commissioners of Ontario – GTA Caucus in their December 2003 report, "Centres & Corridors – Growth Management in the GTA." This growth management model is further reinforced by the release of the Provincial Draft Growth Plan for the greater Golden Horseshoe which defines the VCC as an "Urban Growth Centre" intended to become one of the primary areas for growth with transit supportive densities. The Draft Growth Plan calls for a compact, "inward" pattern of growth supported by transit as an alternative to continued auto-oriented "outward" growth.

12.1.2 Local Context

The objective of the City of Vaughan is to ensure the link between the VCC and the existing and planning rapid transit facilities established through the broader Regional policies and the local Official Plan is confirmed and protected for, and if necessary refined. Vaughan has actively been pursuing the realization of the VCC and its linkage to the broader framework through:

- The adoption of OPA 500 – Vaughan Corporate Centre Secondary Plan
- The ongoing Vaughan's Highway 7 Futures Study - Defining intensification opportunities along the Regional Corridor
- The ongoing Vaughan Corporate Centre Streetscape and Open Space Master Plan Study – to update and enhance OPA 500
- Current consideration of higher density development applications in response to these planning initiatives

All of these planning initiatives are supportive of the broader Regional goals for city-building via a centres and corridors urban structure.

Reflecting the Regional Official Plan policies, the City of Vaughan Official Plan Amendment 529 protects for a rapid transit alignment between the Vaughan Corporate Centre and the City of Toronto. The alignment shown in OPA 529 is based on the Higher Order Transit Corridor Protection Study – Vaughan Corporate Centre, which was completed in 2001. It is the basis for the alignment under consideration in this Environmental Assessment.

The Higher Order Transit Corridor Protection Study was informed by the TTC's concurrent Rapid Transit Expansion Study – August 2001, which was considered by the Commission on August 29, 2001. The study recommended that the Spadina Subway Extension to Steeles Avenue be adopted as one of its two priorities for rapid transit expansion, should funding come available. The Commission adopted this recommendation. The conceptual alignment for the Spadina subway extension that was carried forward for future evaluation in the Rapid Transit Expansion Study is consistent with the alignment adopted in OPA 529.

OPA N0. 529 identifies and incorporates the alignment into the City of Vaughan Official Plan and its policies allow for the application of Section 41(7)(d) of the Planning Act, which permits the municipality to require conveyance of public transit rights of way, at the time of site plan approval proved that the rights of was are shown or described in an official plan. The Ontario Municipal Board approved OPA 529 on July 11, 2001. The York Region Official Plan Amendment 43 reflects this alignment as a Regional Rapid Transit Corridor.

12.1.3 Updating of Background Studies

Ridership forecasting for the analysis of transit technology options for York Region's rapid transit network assumed that the Spadina Subway would be extended to York University before 2021. This analysis, described in **Chapter 5**, also indicated that bus rapid transit would be appropriate as the initial technology for the Vaughan North-South Link between York University and the VCC during the study planning period to 2021.

Notwithstanding this conclusion, there is a high probability that the Toronto subway system will serve York University on the regional boundary during the planning period. Given the University's proximity to a major regional node, Vaughan's planned Corporate Centre on Highway 7, consideration of the short subway extension along the Vaughan North-South Link as the ultimate technology is a logical component of the Highway 7 Corridor Public Transit Improvements undertaking. When the regional centre develops as a primary node along the Highway 7 route, the maximum transportation benefits and efficiencies will be achieved by linking subway technology to surface rapid transit at this node. Consequently, this Chapter describes and updates the recommendations of the *Higher Order Transit Corridor Protection Study – Vaughan Corporate Centre to York University*[1] carried out for the City in 2000-2001. This study assessed and compared a range of alignments for possible future subway extensions to provide the basis for selection of a preferred alignment for which right-of-way could be protected.

Subsequent to this study, the City undertook a Property Protection Study for Steeles Rapid Transit Terminal Facilities to establish the property requirements for the preferred arrangement of facilities to support an initial subway terminal on Steeles Avenue north of York University. On the basis of this study's recommendations, York Region acquired property on the

12

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[1] *Higher Order Transit Corridor Protection Study – Vaughan Corporate Centre to York University.* Prepared by Cansult Limited in association with Tranplan Associates, January 2001.

north side of Steeles Avenue opposite the Northwest Gate entrance to the University campus. This site and associated rights-of-way for new east-west road access from Jane and Keele Streets and north-south access from Steeles Avenue will provide for a bus terminal.

12.2 RELATIONSHIP TO THE TTC'S SPADINA SUBWAY EXTENSION ENVIRONMENTAL ASSESSMENT

In October 2004, the TTC initiated an Individual Environmental Assessment for an extension of the Spadina Subway from Downsview Station to Steeles Avenue via York University. While the study area for this EA extends across the Regional boundary and up to the planned VCC, the study's Terms of Reference limits the assessment of subway alignment alternatives to the corridor between the existing Downsview Subway Station and the York Region transit terminal site north of the University on Steeles Avenue.

The TTC expects to complete their EA by the end of 2005 and obtain approval of the recommendations during 2006. At the time of completion of the Region's Highway 7 and Vaughan North-South Link EA, the on-going TTC study had identified a preferred route (Route 1 in their study) and a series of alignment alternatives for the subway extension up to the area of the Steeles Avenue terminal site. These alternatives were presented to the public in May 2005 as candidate alignments for evaluation in subsequent phases of the EA study.

These alignments approach the site from either an east-west orientation along the north boundary of the campus or a diagonal southeast to northwest direction across the station terminal site. Alignment alternatives for an extension of the subway into Vaughan will have to be compatible with any of these candidate alignments from the south.

12.3 IDENTIFICATION OF ALTERNATIVE ROUTES – YORK UNIVERSITY TO VCC

12.3.1 Vaughan Corporate Centre Station Location

The previous VCC study (*Vaughan Corporate Centre Transportation/Transit Planning and Functional Design Study*) identified three alternative alignments north of Highway 407 within which the higher order transit service could be provided, as illustrated in **Figure 12.3-1** (the scope of the study was limited by the VCC area and thus did not address alignments south of Highway 407). The three alignments were: Jane Street alignment, Edgeley Boulevard alignment and Millway Avenue alignment (recognizing that as part of the VCC road plan, Millway Avenue will be extended southerly from its current terminus at Highway 7). An assessment of each alternative was conducted based on elements pertaining to design, services and operation, environmental impacts, land use, implementation and cost.

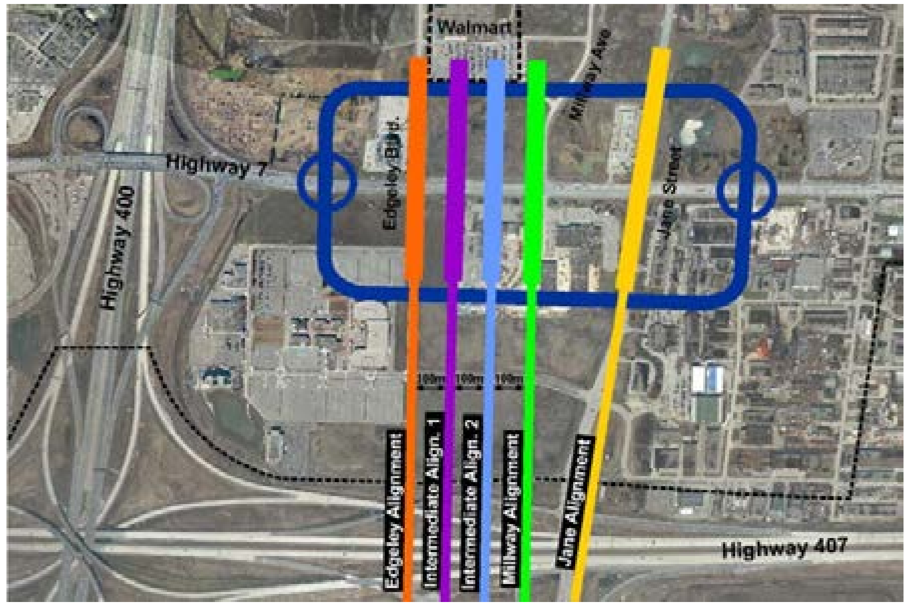

Figure 12.3-1
Vaughan Corporate Centre Station Location Alternatives

This assessment of alternatives identified the Millway alignment as the preferred alignment. Its merits include flexibility of transit technologies and excellent coverage of the VCC node. This option terminates centrally in the node at the signalized intersection of Millway Avenue and Highway 7, the intersection that has the greatest potential to accommodate transit priority signalization for at-grade transit service. It allows for acceptable inter-connection of transit service going to and from the west along Highway 7 connecting to north-south transit service and elevated, underground, and at-grade elevations can be acceptably integrated within the Millway Avenue right-of-way. Overall, Millway Avenue provided the greatest amount of flexibility to accommodate a rapid transit service that could be progressively upgraded from buses operating at-grade in exclusive lanes and with signal priority to fully grade-separated subway technology.

Following the selection of the preferred route to York University, the alignment through the VCC was revisited at the request of the adjacent landowners who were seeking to minimize the land impacts associated with the future Millway extension and the rapid transit service. The landowners' preference was to limit the southerly extension of Millway Avenue thereby allowing the development parcel to remain, intact (it would otherwise be bisected by Millway Avenue). As such, additional alternative alignments through the Corporate Centre were considered. These alignments are listed below and illustrated in **Figure 12.3-1**.

- Millway Avenue (corresponding to the future roadway extension);
- 100 metres west of Millway Avenue (corresponding to a future local road);
- 100 metres east of Edgeley Boulevard (corresponding to a future local road); and
- Edgeley Boulevard.

The alternatives were evaluated in the context of the VCC and the future 407 Transitway. Only the horizontal alignments were evaluated as the vertical alignments were considered comparable at that stage. In particular, each alignment was assessed with respect to the following:

- service to the VCC, future 407 Transitway and Highway 407 commuter parking lot;
- impacts on existing and future developments;
- integration with the planned Highway 7 transit mall;
- feasibility of a northerly extension beyond the Corporate Centre;
- short-term implementation;
- length of crossing required at Highway 407; and
- the effect on the overall route length.

The results of this evaluation are summarized below.

Service to the VCC

Within the Vaughan Corporate Centre, the VCC node is to be developed as a high density area, accommodating approximately 40% of the office employment positions (7275 out of 17,740) and 100% of the residential population (5000 residents). As such, the level of service that each alternative provides to the Corporate Centre was based on the extent to which the node area is located within the 500 metre catchment area of the VCC station (the most likely users will be those within the 300 metre catchment area). It was noted that although significant development outside of the node will also fall within the 500 metre catchment area, this development was expected to be more of the big-box and/or industrial nature and thus not necessarily highly oriented towards transit use.

Overall, the Millway Avenue alignment was expected to provide the greatest level of service as 100% of the node was located within 500 metres of the station. As the alignment is shifted to the west, the extent to which the node area was located within the 500 metre is reduced. The Edgeley Boulevard alignment contains only approximately 70% of the node within its catchment area.

Service to the Future 407 Transitway and Commuter Parking

With respect to the service level provided to the future 407 Transitway, all four alignments provided comparable levels given that the transitway station and the subway station will likely be integrated, regardless of location. However, with respect to service to the commuter parking, the alignments to the west are favoured in that they would provide for a greater number of parking stalls within the station catchment area (Jane Street limits parking availability east of the station).

Impacts on Existing and Future Developments

Both the Millway Avenue alignment and the alignment 100 metres west of Millway Avenue impacted the existing Toromont property, as indicated in **Figure 12.3-1**. However, this land use does not conform with the envisioned development of the VCC (and the node area in particular) and thus its redevelopment is foreseen (the question of when remains unanswered). No impacts to existing development would occur with either the Edgeley Boulevard alignment or the alignment 100 metres west of Edgeley; the former coincided with an existing road right-of-way whereas the latter bisects undeveloped parcels.

With respect to future VCC developments, the Edgeley Boulevard alignment did not have any impacts, as the alignment in its entirety, including the provision for station tail track north of Avenue Seven, was located within the existing road right-of-way (which extends southerly to Peelar Road/Highway 407). The only impacts associated with the Millway Avenue alignment were related to the provision for the tail track given the skewed alignment of Millway north of Highway 7. However, should Millway Avenue not be fully extended to the south, additional impacts would result. Both of the remaining alignments impacted the development parcels between the ring road and Peelar Road (the future road rights-of-way terminate at the ring road) in addition to some impacts to the WalMart site to accommodate the tail track (see **Figure 12.3-1**).

Integration with Highway 7 Transit Mall

Again, the Millway alignment offered the best opportunity to integrate services with those planned for the Highway 7 transit mall given its central location within the node area and the corresponding signalized intersection. The Edgeley Boulevard alignment also provided a good opportunity given that the transit mall would be accessible through the signalized intersection at Edgeley Boulevard. With the intermediate alignments, additional signalized intersections would be required on Highway 7 to allow the integration of transit services. These additional signals are undesirable given the resulting impacts to the operations of the transit mall (by increasing the number of intersections, both delays and travel times are increased and level of service is decreased). In addition, the resulting signal spacing would not comply with Regional standards (minimum spacing of 250 metres whereas only 100 and 200 metres would be provided).

Feasibility of Northerly Extension beyond VCC

Through the VCC, a northerly extension of the alignment would be most readily accommodated at Edgeley Boulevard as the alignment would simply follow the right-of-way. However, Edgeley Boulevard currently terminates south of Rutherford Road and thus an extension beyond this point would have further ramifications. The two intermediate alignments would both likely be extended via Edgeley Boulevard (given their proximity) and in doing so would be subject to the potential impacts noted above in addition to further impacting the current WalMart development. The Millway alignment would be best suited to follow Jane Street given its proximity and northerly limits (Highway 9 in Newmarket). However, in doing so, there could be some impacts to future VCC development as the alignment is reconfigured to Jane Street.

Short-Term Implementation

In the short-term, both the Edgeley Boulevard and the alignment 100 metres east of Edgeley could be readily implemented (the latter would require the acquisition of some vacant lands south of Interchange Way/ring road). The remaining two alignments required the availability of the Toromont lands.

Length of Highway 407 Crossing and Overall Route

The lengths of crossing at Highway 407 were comparable, ranging from approximately 270 metres (Edgeley alignment) to 315 metres (Millway alignment). Overall, the alternatives west of Millway Avenue increased the route length by distances of approximately 100 metres, 200 metres and 300 metres respectively. At an approximate construction cost of $100 million per kilometre, these increases translate to $10, $20 and $30 million respectively. Property acquisition costs were considered site specific and thus could not be gauged at that time.

Preferred Alignment

To best serve the VCC, the Millway alignment was preferred given its central location, increased potential for surface transit integration with the Highway 7 transit mall and the potential for interim development of a Millway busway. Although this alignment depended upon the acquisition of a portion of the property occupied by Toromont, this shortcoming was not considered serious since other short-term alternatives are available for transit improvements (i.e. the recommended exclusive bus lanes on Jane Street). Furthermore, the Corporate Centre will not develop as envisaged without the redevelopment of the Toromont lands and, because of the site's large size, it is questionable whether sufficient transit demand would exist for an exclusive right-of-way without redevelopment of this site.

Although the Edgeley Boulevard alignment was more favourable in the short-term, (the land is available and there will be minimal impacts), the overall quality of access to rapid transit provided to the Corporate Centre in the long-term would not be as great. This could have further ramifications to the long-term VCC development potential in that significant transit services are required to support the ultimate development levels.

12.3.2 Routes linking Vaughan Corporate Centre to York University

The Higher Order Transit Corridor Protection Study identified the following existing rights-of-way as opportunities for a rapid transit route to the planned VCC, (the use of public rights-of-way rather than private rights-of-way is preferred to minimize property acquisition costs and to expedite implementation):

East-West Rights-of-way:

- Steeles Avenue
- Steeles Hydro Corridor
- Highway 407
- Future 407 Transitway
- Highway 7

North-South Rights-of-way:

- Edgeley Boulevard (north of Highway 407)
- Millway Avenue (north of Highway 407)
- Jane Street
- CN McMillan Rail yard
- Keele Street

The combination of the various east-west and north-south rights-of-way resulted in the development of the following alternatives:

- Route A — Steeles Avenue/Jane Street/Millway Avenue
- Route B — Steeles Hydro Corridor/Jane Street/Millway Avenue
- Route C-1 — Rail Yard/Highway 407/Millway Avenue
- Route C-2 — Rail Yard/Highway 407/Edgeley Boulevard
- Route D — Rail Yard/Highway 7
- Route E-1 — Keele Street/Highway 407/Millway Avenue
- Route E-2 — Keele Street/Highway 407/Edgeley Boulevard
- Route F — Keele Street/Highway 7

The above alternatives are illustrated in **Figure 12-2** and described briefly below. Common to all alternatives was the assumption that the existing

12

Spadina subway will be extended to York University using the preferred route recommended in the TTC's Yonge-*Spadina Subway Loop Environmental Assessment Report* and that the University Station would be the point of origin for the extension into Vaughan where the point of destination will be the VCC node.

12.3.2.1 Route A

From York University, Route A extended north to Steeles Avenue turning west into the arterial road right-of-way to a point approximately 400 metres east of Jane Street where it deviated to continue in a northerly direction. The route was then located adjacent to Jane Street as it crossed the CN York Subdivision and Highway 407 and continued into the VCC node via the future Millway Avenue south of Highway 7.

12.3.2.2 Route B

Route B was similar to Route A except the east-west portion was contained within the existing Hydro Corridor approximately 200 metres north of Steeles Avenue while the alignment into the Corporate Centre node remained unchanged.

12.3.2.3 Route C

Route C extended northerly from the York University station site towards Highway 407, crossing the Hydro Corridor and the existing CN rail leads en route. It was then located parallel to and south of Highway 407, primarily within the future 407 Transitway corridor, to Jane Street where again a change to the north-south direction was required for the alignment into the Corporate Centre node. Two slight deviations were developed as a result of geometric constraints in the vicinity of Jane Street. The first, Route C-1, aligned with Edgeley Boulevard, whereas the second, Route C-2, aligned with Millway Avenue.

12.3.2.4 Route D

Route D was similar to Route C from York University to Highway 407. Beyond Highway 407, it remained along the west edge of the CN rail property to Highway 7. The approach to the Corporate Centre node was then achieved in the east-west direction via Highway 7.

12

12.3.2.5 Route E

Route E extended northeasterly from the university toward Highway 407 via the Keele Street right-of-way. It subsequently followed the alignment of Highway 407 in the east-west direction to Jane Street and then on to the Corporate Centre node. As with Route C, two slight variations (Route E-1 and E-2) were developed to accommodate the change of direction and use of Edgeley Boulevard versus Millway Avenue.

12.3.2.6 Corridor F

Route F was primarily located within the Keele Street and Highway 7 rights-of-way and thus closely followed their alignments from the university to the Corporate Centre node. As with Route D, it approached the Corporate Centre node via Highway 7 from the east, as opposed to the south.

12.3.3 Evaluation of Alternative Routes

The above alternative subway routes were evaluated against the comprehensive set of criteria, consisting of factors and sub-factors presented in **Table 12.3-1**. The evaluation was general in nature for the purposes of assessing the broad effects and benefits of the various functionally different route alternatives and to present arguments justifying the selection of the preferred route.

Table 12.3-1 Evaluation Criteria

Factor	Sub-factors
Transportation Design	1. Horizontal alignment ▪ maximum design speed ▪ minimum design speed ▪ number of curves ▪ total curve length ▪ substandard curves (radius < 350 metres) ▪ percent of corridor on curves ▪ quality of alignment 2. Vertical alignment
Transportation Service	1. Connection to future 407 Transitway at Jane Street/Keele Street/other locations. 2. Service to the Vaughan Corporate Centre. 3. Overall accessibility and station location at the VCC/York Transit Terminal/intermediate stations. 4. Travel time 5. Commuter parking opportunities 6. Possible extension of service beyond the Corporate Centre 7. Integration with street bus service at the VCC/York University/intermediate stations.
Social Environment	1. Impacts to existing residents 2. Displacement of jobs/homes/businesses 3. Noise and vibration 4. Impacts to the Beechwood Cemetery

Table 12.3-1 Evaluation Criteria

Factor	Sub-factors
Natural Environment	1. Loss of natural environment ▪ Aquatic ecosystems ▪ Terrestrial ecosystems ▪ Air quality ▪ Hydrogeological, geological and hydrological conditions 2. Restriction of access to conservation and recreation lands
Land Use	1. Potential for development at stations at the VCC/York Transit terminal/intermediate stations. 2. Impacts on development plans
Implementation	1. Use of railway lands 2. Use of hydro lands 3. Possibility of expropriation of private lands
Cost	1. Length of corridor 2. Length of curves 3. Number of structures 4. Number of stations 5. Portion of corridor buried and/or elevated 6. Impacts on existing buildings

12.3.3.1 Summary of Evaluation

Based on the criteria tabulated above, the Study recommended that both **Routes A and B** be considered further given their commonality and proximity (in fact, they can be considered route options within the same overall corridor). Not only did they both provide the most direct link between the VCC and the Spadina subway (via York University), but they also provided a high level of service to the future 407 Transitway and the associated commuter parking facility. In addition, they would both serve future adjacent developments well and have good potential for further expansion in a northerly direction beyond the Corporate Centre (possibly to serve Canada's Wonderland, the Vaughan Mills Centre, the community of Maple and the future Urban Village 1).

The key rationale in selecting Routes A and B is itemized below; with instances where alternative routes were evaluated as being better or equal to routes A and B noted.

<u>Transportation Design</u>

- shortest and most direct link between the Corporate Centre and York University;
- least number of curves, none of which are substantial or substandard; and
- shortest segment on curvilinear alignment.

<u>Transportation Services</u>

- The proposed station at Jane Street/future 407 Transitway would

provide an excellent opportunity for integration of services (rapid transit with future 407 Transitway) and good commuter parking and kiss-and-ride opportunities.
- Route A provided the most optimal station spacing (the stations are approximately equally spaced and well located in areas that are either developed or developable).
- Both had good potential for a northerly extension beyond the Vaughan Corporate Centre to serve Paramount Canada's Wonderland, the Vaughan Mills Centre, the community of Maple and the future Urban Village 1.
- Route F was comparable to both A and B from this perspective, although an extension beyond the Corporate Centre would likely be towards the west.

<u>Social Environment</u>
- no residential areas are affected as the routes avoid such areas;
- minimal displacement of jobs and businesses;
- no impacts on the cemetery; and
- overall, the impacts of Route C-1 and D on the social environment are comparable.

<u>Natural Environment</u>
- Routes A and B had the potential to impact Black Creek; from the perspective of natural environment, the other alternatives are preferable

<u>Land Use</u>
- There was good potential for development at all four stations (Route A is slightly better given the more optimal station spacing).
- The station on Steeles Avenue was expected to promote further intensification of the adjacent land uses, including those lands within the university campus.
- There would be minimal impacts on future development plans at the VCC, York University and at the intermediate station locations.
- Route F was comparable from this perspective.

<u>Implementation</u>
- For Route A, railway and hydro lands are not required; a large percentage of the corridor would be in public ownership.
- Also with Route A, there is only a minimal possibility of expropriation of private property.
- Route B is not as favourable as approximately 40% would be located in the Hydro Corridor, the use of which would be subject to operational requirements of Hydro One (such an arrangement involving a 500 KV line is unprecedented in Ontario) and approval by the landowners, the Ontario Realty Board.

<u>Cost</u>
- Routes A and B represented the shortest routes with the fewest curves and structures; as such the related construction and maintenance costs were expected to be lower than the longer, more curvilinear routes.
- Route B offered the potential for an at-grade section within the Hydro Corridor, thereby reducing costs further.
- Route D was considered comparable from a cost perspective (although it was somewhat longer and had more curves, it too had the potential for an at-grade section).

12.4 FUTURE SUBWAY ELEMENTS OF THE UNDERTAKING: YORK TRANSIT TERMINAL TO VCC

Having established that the most appropriate routes for a rapid transit service connecting the VCC to York University were Routes A and B, the Study then developed specific alignments along each route. The alignment alternatives had to satisfy a range of criteria including operational efficiency, convenient station access points, future extension opportunities and minimal impacts on existing and future developments in addition to the social and natural environments. Design criteria used were presented in Chapter 7 and a description of the routes and evaluation criteria follows.

Routes A and B are primarily located within public rights-of-way currently being used for either roadway (i.e. Steeles Avenue) or hydro services (i.e. Hydro Corridor north of Steeles Avenue), or will be used in the future for the same (i.e. Millway Avenue and future 407 Transitway). As such, the opportunities for an at-grade rapid transit alignment are limited. Also, the proposed extension to York University is being planned as below-grade, further limiting at-grade opportunities.

12.4.1 Analysis of Alternative Alignments

A total of five alignment alternatives were assessed in the Higher Order Transit Corridor Protection Study. As shown in **Figure 12.4-1**, Alignments A-1 and A-2 were located along Steeles Avenue/Jane Street/Millway Avenue, (i.e. along Route A) whereas Alignments B-1, B-2 and B-3 were located along the north edge of Steeles Hydro Corridor/Jane Street/Millway Avenue (i.e. along Route B).

The sections of Alignments B-1, B-2 and B-3 within the Hydro Corridor were developed recognizing the existing hydro towers and transmission lines; one 230 kV line (closest to Steeles Avenue) and two 500 kV lines currently exist. As instructed by Hydro One at the time of the study, the rapid transit alternatives cannot be located directly under the transmission lines (except in crossing the corridor) regardless of whether the facility is at-grade or in tunnel, and as such the alignment followed the north boundary of the Hydro Corridor. Although a fourth transmission line (230 kV) is planned along the north boundary, both it and the rapid transit route could be accommodated provided the former is buried as opposed to elevated by towers, and off-set from the rapid transit alignment. Discussions with Hydro One indicated that 230 kV underground cable is a proven technology currently employed by Hydro One and thus would have applications in this instance.

Immediately north of the Hydro Corridor is a second utility corridor that houses a high-pressure gas main and sewer lines. These locations were noted on the respective figures and avoided, where possible, by the alternative routes. It was recognized that while a crossing of the utility corridor will be required; this could be accomplished provided that the rapid transit alignment maintains a sufficient vertical clearance.

12.4.1.1 <u>Alignments A-1 and A-2</u>

From the university, Alignments A-1 and A-2 curved under Steeles Avenue approximately 800 metres east of Jane Street at the Region's terminal site and then proceeds to Jane Street, where, via a 360 metre curve, it turned north towards Highway 407 where a 60 metre long, 2000 metre radius curve was provided to connect with Millway Avenue and its ultimate destination at the intersection of Avenue Seven and Millway Avenue. As this represented the terminal station, sufficient geometrics were provided for both tail track and crossover track. As illustrated, alignment A-2 was identical to Alignment A-1 apart from its origin, which coincided with the station location as identified in the *Yonge-Spadina Subway Loop EA*. The alignment geometrics and remaining station locations were otherwise identical.

12

In addition to the proposed stations on Steeles Avenue at York Region's terminal and the VCC, one additional intermediate station was identified to serve the future Jane Street/407 Transitway/commuter parking facility. As the construction of this facility will likely occur in stages, the station on Steeles Avenue was located not only to maximize the catchment area but also to serve as an interim terminal facility. Hence, sufficient geometrics for tail track and crossover track (as indicated in **Figure 12.4-1**) were considered.

These alignments would be located entirely below ground and hence possible constraints introduced by the existing developments (within York University and the VCC), utilities (gas main and 900 mm diameter sanitary sewer) and the crossing of Highway 407 and future transitway can be circumvented.

12.4.1.2 Alignments B-1 and B-2

Alignment B-1 originated from the 1993 TTC EA study's westerly York University alignment and proceeds north, crossing under Steeles Avenue at the York transit terminal site, to the existing Hydro Corridor (see **Figure 12.4-1**). Alignment B-2 was identical to A-1 except that it originated at the 1993 EA approved station further east. Both alignments then turned to the west, surfacing and continuing at-grade along the south boundary of the Hydro Corridor for approximately 750 metres. As per the instruction of Ontario Hydro, the crossing of the existing transmission lines was below-grade. Approximately 450 metres east of Jane Street, the alignment will return to below-grade and proceed to the future 407 Transitway station. This station was common to all alignments and the remainder of the alignment to the VCC remained unchanged. To minimize land use impacts and the length of crossing required through the Hydro Corridor, horizontal curves of 320 metres were adopted in both instances. Although larger radii could promote higher speeds (and hence shorter travel times), the proximity of the curves to adjacent stations minimized the increase in travel times introduced by the curves. Therefore, the impacts of reduced curve radii were not significant.

Given the use of the Hydro Corridor, the range of locations for a successful intermediate station were somewhat limited; the proposed location was immediately south of Steeles Avenue to serve development along Steeles Avenue while taking advantage of potential commuter parking within the Hydro Corridor. As it would likely be an intermediate terminal station during staged construction, trail track and crossover facilities would be required. Given its proximity to the curve, the tail track would be required outside of the curve and thus would be used on a temporary basis only (resulting in inflated construction costs with only limited use).

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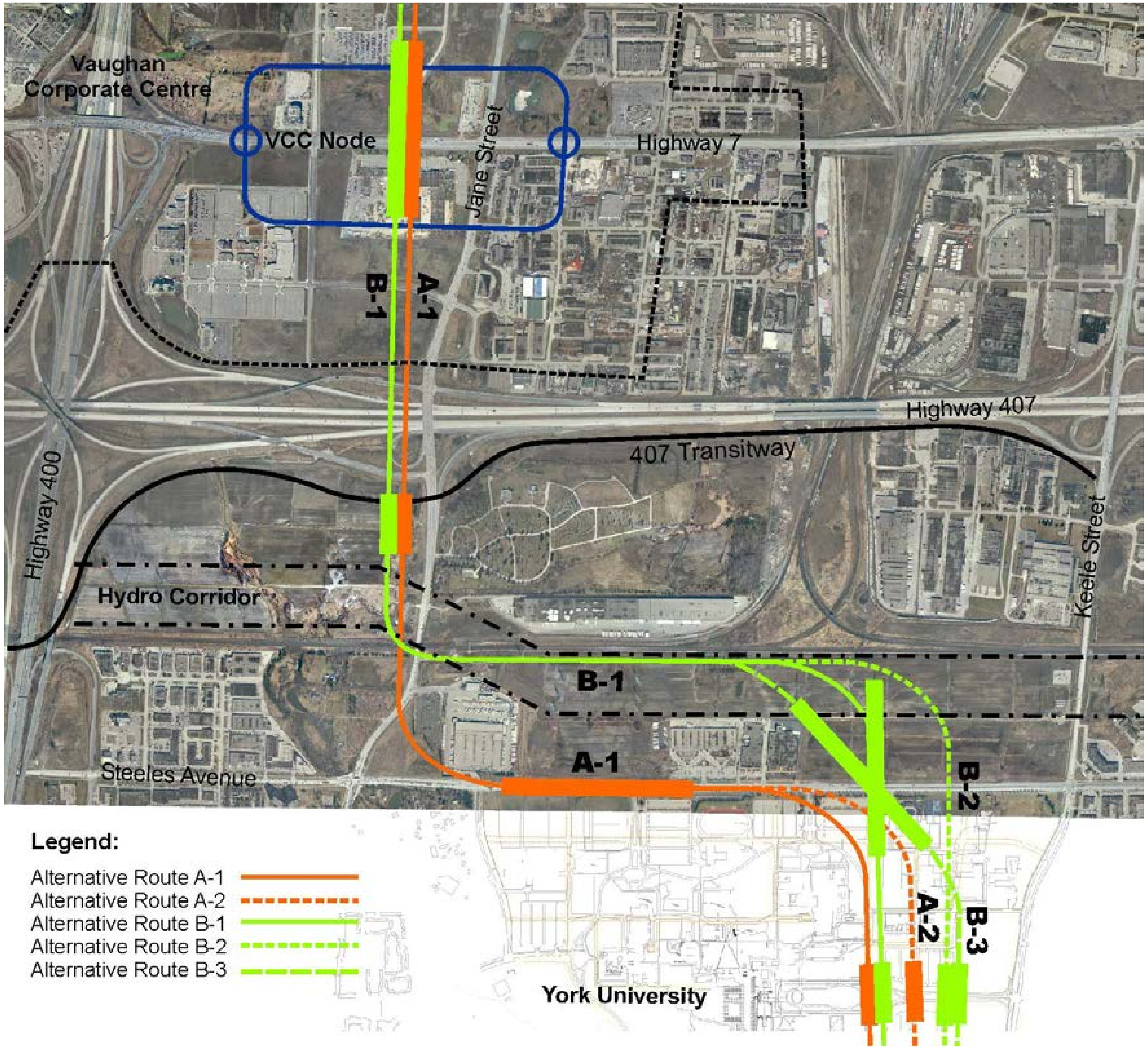


Figure 12.4-1
Alignment Alternatives between VCC and York University

12.4.1.3 Alignment B-3

The fifth alternative, B-3 built on both Alignments B-1 and B-2 in that it provided for a station at Steeles Avenue while minimizing the resulting impacts and eliminating any duplication of track. Originating at the EA approved university station, it continued northerly crossing the Hydro Corridor on an approximate 45-degree angle. The crossing itself was on a tangent section thereby accommodating the requirements for a terminal station (again, it was assumed that this interim station would serve as an intermediate end point during staged construction). The corresponding distance from the university station to the Steeles Avenue station was approximately 850 metres. The remaining alignment through the Hydro Corridor and onto the Corporate Centre was identical to the previous two routes. Overall, approximately 550 metres of this alignment would be at-grade.

12.4.2 Evaluation of Alternative Alignments

The evaluation of the alternatives was conducted in two stages. The first stage evaluated the individual alternatives within each of the two corridors (i.e. Route A: Steeles Avenue/Jane Street/Millway Avenue and Route B: Hydro Corridor/Jane Street/Millway Avenue) and identified the single preferred route within each. The second stage evaluated the preferred alternative within Route A as compared to that in Route B.

The alternative alignments were evaluated based on criteria pertaining to transportation design, transportation service, social environment, natural environment, land use, implementation and costs (refer to **Table 12.4-2**). As part of a consistent approach, this set of criteria is similar to that used in the evaluation of the alternative rapid transit routes. However, the different scope, alternatives and levels of detail involved at each of the different stages of the analysis and evaluation required using the criteria in a slightly different manner for each. In addition, many of the sub-factors are not differentiable across the route alternatives and thus do not have any consequence in the evaluations. As such, the evaluation was based only on the key criteria as highlighted in **Table 12.4-2**.

Table 12.4-2 Evaluation Criteria

Factor	Sub-factors
Transportation Design	1. Horizontal alignment ▪ minimum & maximum design speed ▪ number of curves & total curve length ▪ substandard curves (radius < 320 metres) ▪ percent of corridor on curves ▪ quality of alignment 2. Vertical alignment 3. Potential to relocate station at York University
Transportation Services	1. Connection to future 407 Transitway ▪ quality of alignment ▪ Jane Street & Transitway ▪ Keele Street & Transitway ▪ other 2. Service to the Vaughan Corporate Centre 3. **Overall accessibility and station location** ▪ station at VCC ▪ **station at York University** ▪ intermediate station to serve future 407 Transitway ▪ **intermediate station to serve Steeles Avenue** 4. Travel time 5. **Commuter parking opportunities** 6. Possible extension of service beyond the Corporate Centre 7. Integration with street bus service ▪ at VCC ▪ at York University
Social Environment	1. Impacts to existing residents 2. Displacement of jobs/homes/businesses 3. Noise and vibration 4. Impacts to the Beechwood Cemetery
Natural Environment	1. Loss of/disruption to the natural environment 2. Restriction of access to conservation and recreation lands
Land Use	1. **Potential for development at stations** ▪ at VCC ▪ **at York University** ▪ at future 407 Transitway ▪ **at other intermediate stations** 2. Impacts on development plans
Implementation	1. Use of railway lands 2. **Use of hydro lands** 3. **Possibility of expropriation of private lands**
Cost	1. **Length of alignment (measured from York Transit Terminal Station to VCC station)** 2. **"Throw-away" track** 3. Length of curves 4. Number of structures 5. Number of stations 6. **Portion of route at-grade** 7. **Impacts on existing buildings**

Subfactors shown **bold** indicate key criteria to be considered in the evaluation of the alternative routes

12.4.2.1 Stage 1 Evaluation

The Stage 1 evaluation assessed the various alternatives within the two identified travel routes to identify a preferred alignment within each, based on the key criteria previously presented. Given the commonality between alignments on Route A and Route B, a number of the evaluation criteria did not yield significantly different results.

Route A (Alignments A-1 and A-2)

As the only difference between Alignments A-1 and A-2 was their point of origin within York University and approach to Steeles Avenue, the evaluation focussed on the corresponding route segments. Beyond Steeles Avenue, the routes were identical and thus a corresponding analysis would not have yielded any further distinction at this stage. Also, given that the current update of the TTC's Spadina Subway Extension EA is revisiting alignments and station locations in the University, it is not necessary to present the details of the comparison between Alignments A-1 and A-2 made in the City of Vaughan's Study.

It suffices to record that Alignment A-1 was the preferred Route A alignment given that it better served the university (a primary travel origin/destination and purpose of the station), had less impact on existing and future university development, and was estimated to be less costly.

Route B (Alignment B-1 vs B-2 vs B-3)

Route B alignments differed only in the location of the York University station, the location of the Steeles Avenue station and the approach alignment to the Hydro Corridor. As such, the evaluation only addressed these differences. The points of origin at the university were the same as adopted by Alignments A-1 and A-2, and thus the evaluation as it pertained to this station remained unchanged (Alignments A-1 and B-1 adopted the westerly York University station whereas A-2, B-2 and B-3 adopted the easterly station).

Transportation Services

As was the case for A-1, Alignment B-1 provided better accessibility to the university campus (i.e. more of the campus would be within an acceptable walking distance of 500 metres) as compared to Alignments B-2 and B-3. With respect to the Steeles Avenue station, B-2 will provide better accessibility (although both B-1 and B-3 will also provide good accessibility) as they were closest to the major intersection of Steeles Avenue and Keele Street and contained a greater amount of undeveloped land within the station's 500 metre catchment area.

Commuter parking facilities were proposed within the Hydro Corridor north of Steeles Avenue in proximity to the corresponding stations (i.e. within 750-1000 metre walking distance). Given the proximity of the Hydro Corridor routes and the station at Steeles Avenue, comparable parking facilities, in terms of both size and accessibility, were foreseen.

Land Use

Potential for development adjacent to the York University station did not differ significantly for the three routes. However, the potential for development at the Steeles Avenue station was expected to differ between routes despite their close proximity. Alignment B-2 had the highest potential for development at the Steeles Avenue station as it contained the greatest amount of currently undeveloped land within the 500-metre catchment area. Some lands north of Steeles Avenue within the 500 metre catchment areas for the B-1 and B-3 stations are currently developed as industrial uses and thus would not foster transit ridership. South of Steeles Avenue, the B-3 alignment and Steeles Avenue station location would provide a slightly better potential for redevelopment of the York University lands given the University's desire to redevelop the north precinct.

In the long term, the City of Vaughan envisions a complete redevelopment along the north side of Steeles Avenue coupled with a redevelopment of the university's north precinct south of Steeles Avenue, with a focus on the ensuing subway station location. As such, the benefits of one station location over another become somewhat diminished in the long term (i.e. irregardless of where the station is located, the level of development is expected to be comparable).

Despite the improved service to the large (approximately 200 metres x 850 metres) developable parcel located in the northwest corner of Steeles Avenue and Keele Street, the B-2 alignment was located prominently in the centre of it and thus, from a developer's perspective, may not be as appealing given the resulting limitations on development. Although both B-1 and B-3 also bisected the same property, they both provided a higher level of flexibility for development given the relatively large parcel that remains (600 metres x 200 metres). In addition, there is an inherent potential for high-density development at the corner of the Steeles Avenue and Keele Street given the high visibility and auto accessibility resulting from frontage on two key arterial roadways. As such, a more westerly subway alignment (eg. B-1 or B-3) would improve accessibility to the remaining mid-block parcels (while not impacting the corner parcels) and further promote high-density development.

12

With respect to impacts on existing development and future development plans, Alignment B-1 had the fewest impacts. Through the university campus, B-1 would be located within the right-of-way of a future road extending to Steeles Avenue (unlike B-2 and B-3 that will impact existing campus buildings and future university development). A simple perpendicular crossing of the vacant lands north of Steeles Avenue minimized impacts on future development - the corresponding easement could be used as a local access road to the development sites and commuter parking.

Implementation

Again, as with the Route A alignments, there was no significant differences with respect to implementation of the three routes for the segments within the university campus and Hydro Corridor. Alignment B-2 has the longest section within the Hydro Corridor and therefore the highest potential of conflicts with existing transmission towers. However, it was expected that any such conflicts could be relatively easily resolved through minor modifications to the horizontal and vertical alignment.

Cost

Of the three Route B alignments, B-3 was the shortest (5320 metres) followed by B-1 and B-2 (5630 and 5850 metres respectively) as measured from the centre of the Keele/Finch station to the terminating point in the Vaughan Corporate Centre. Included in the lengths for both B-1 and B-2 was a 260-metre section of tail track that would be required at the Steeles Avenue station should construction of the subway be staged and the Steeles Avenue station is an interim terminal station (refer to Figure 12.4-1). Upon further extension of the subway to the Vaughan Corporate Centre, the need for the tail track would be diminished although it could still be used for storage of trains and for short-turning trains. In essence, the tail track would be constructed for short-term use only and therefore represents an additional cost that would not otherwise be incurred if the construction was not staged or if Alignment B-3 was selected.

The primary benefit for locating the rapid transit alignment within the Hydro Corridor was the ability to provide a segment of the alignment at-grade or within a cut section and thereby reduce the overall cost of construction. Based on the alignments illustrated and assuming that the crossings of the hydro transmission lines (particularly the 500kV lines) must be accomplished below grade, Alignment B-1 provided for an approximate 750 metre at-grade section, B-2 a 1000 metre at-grade section and B-3 a 550 metre section resulting in potential savings of $27.5 to $50 million dollars to the cost of the overall project.

Similar to Alignment A-2, additional costs would be incurred by B-2 and B-3 associated with mitigating measures to reduce the impacts to existing development. There was the possible need to relocate and/or demolish 2-3 buildings (or tunnel under them) with both B-2 and B-3 while B-1 had no impacts on existing buildings.

Preferred Alignment

The preferred alignment was found to be **Alignment B-1** as it better served the university, had less impact on existing university development and less impact on future proposed development (both north and south of Steeles Avenue). Although the development potential north of Steeles Avenue may be slightly higher for B-2 as there is more undeveloped land in close proximity to the Steeles Avenue station, B-1 provided for greater flexibility in the development of these lands. Even though both alignments bisected the parcel, B-1 resulted in more favourable parcel sizes from a developer's perspective.

Alignment B-3 was the least preferred given its skewed alignment and significant impacts on future development north of Steeles Avenue. Although it was shorter in overall length, the increased potential for at-grade sections with both B-1 and B-2 partially offsets this benefit. Alignments B-1 and/or B-2 were deemed equal to or better than B-3 for all of the key criteria investigated.

12.4.2.2 Stage 2 Evaluation

The Stage 2 evaluation compared the preferred alignments within the two Routes (Alignments A-1 and B-1) and identified a single preferred route to connect the Vaughan Corporate Centre to York University with intermediate stations to serve Steeles Avenue and the future 407 Transitway. South of Highway 407, Alignment A-1 differed considerably from B-1 and thus the evaluation was based on the full range of criteria detailed in Table 12-x, as opposed to select sub-factors. The results of the evaluation are summarized below.

Transportation Design

There was no appreciable difference between Alignments A-1 and B-1 from a design perspective, apart from the fact that a section of B-1 (approximately 500-750m) would be located at-grade within the Hydro Corridor. The horizontal and vertical alignments of both could be accommodated equally well with acceptable geometry.

Transportation Services

Given the common station locations, both alignments provided equal levels of service to the stations located at the University, future 407 Transitway and the Vaughan Corporate Centre. With respect to the station located at Steeles Avenue, A-1 provided an improved level of service in that the station spacing was more optimal. With B-1 the 1750 metre spacing resulted in a significant level of development along Steeles Avenue (including future University development and the Black Creek Pioneer Village) well beyond the 500-metre catchment area (the farthest distance would be approximately 1000 metres).

Both alignments offered the opportunity for commuter parking within the Hydro Corridor. Given the configuration of the proposed Steeles Avenue station along B-1 (i.e. north-south), the overall walking distance from the parking area to the station was slightly less than that resulting from A-1. However, under each alignment, the majority of the Hydro Corridor parking would be within the 500-metre catchment area and thus the expected walking distance was acceptable.

With respect to integration with surface transit, both alignments offered comparable services at their common stations. Integration with the Steeles Avenue bus services were also considered comparable in that both provided opportunities for additional surface facilities (e.g. bus terminals, kiss-and-ride, etc.).

Social Environment

Few impacts to the social environment were expected given that there are no local residents within the immediate areas and no displacement of existing jobs/homes/businesses expected. The noise and vibration impacts of Alignment A-1 were judged to be somewhat greater than B-1 given its alignment underneath Steeles Avenue and the proximity of development on both sides of Steeles Avenue. Under Alignment B-1, this section would be within the Hydro Corridor and thus removed from the development activity along Steeles Avenue.

Natural Environment

Overall, there would be no loss of natural lands under either alignment. If the alignment were not underground (100% with Alignment A-1), it would be located within the Hydro Corridor, which is not considered a natural area. Despite Alignment A-1 being underground, it still had the potential to impact the Toronto Region Conservation Authority (TRCA) Lands located west of Jane Street adjacent to the existing CN rail line, as does B-1 (although a shorter section of its alignment passed through (under) TRCA lands).

Land Use

Again, Alignments A-1 and B-1 differed only with respect to the section extending from York University to the future 407 Transitway station. At the Steeles Avenue station, there was undeveloped lands in close proximity to either station location; for alignment A-1, the vacant parcel is approximately 450 metres by 200 metres whereas for B-1 the parcel is 850 metres by 200 metres. Both of these parcels could be developed in a manner to further support the development of the subway extension. The remaining lands within the respective catchment areas were seen as primarily limited to industrial or university uses; the former of which was not very conducive to the on-going development of a subway service. However, for both routes, it was envisioned that re-development along Steeles Avenue would likely occur in light of the future subway and that the development would be focused on the station location. As such, in the long term, there would be little difference between the alignments in that both offered the opportunity for further development. Alignment A-1 was considered to have a slight advantage in that the station would be more centrally located along Steeles Avenue and configured parallel to it as opposed to perpendicular.

With respect to impacts on future development plans, Alignment A-1 would have some impacts on development within the university campus (along the section that would not be within the road ROW) and some impacts on the parcels at the intersection of Jane Street and Steeles Avenue. B-1 would not impact university development in that it would be located completely within a road ROW but it would impact development immediately north, in the Steeles-Keele Investments Inc. property given the need for an easement.

Implementation

In constructing Alignment A-1, below ground easements would be required through a portion of York University (along the section that would not otherwise be located within a future road right-of-way), through the UPS site (under their existing parking lot) and through Phase 2 of the Columbarium site at the north-east corner of Jane Street and Steeles Avenue (under a proposed parking lot). Alignment B-1 would require an easement north of Steeles Avenue through the vacant development parcel (Steeles-Keele Investments Inc. property). In accordance with TTC requirements, the easements (23 metres) must be free and clear of all obstructions; buildings and structures must be set back and no structure of any depth could be constructed within the easement. Surface uses such as roads, sidewalks, shallow utilities, surface parking and landscaping would be permitted above the alignment.

Approximately 30% (1750 metres) of Alignment B-1 would be located within the Hydro Corridor (both underground and at-grade) and thus could potentially be impacted by the transmission lines (one 230 kV line and two 500 kV lines) and the transmission towers (relocation of towers was not considered feasible given the high costs). Although Hydro One stated that a subway alignment within the Hydro Corridor may be feasible, a significant amount of additional studies would be required to fully investigate potential impacts and necessary mitigating measures. In addition, it was noted that as Hydro One is only the registered easement holder and not the owner of the lands within the Hydro Corridor, additional agreements with the landowner (Ontario Realty) would be required.

Both alignments would also require access to the Hydro Corridor parking facilities and an adequate area for supporting facilities (e.g. bus terminal, kiss-and-ride, etc.).

Cost

The overall length of Alignment A-1 (extending from the 1993 EA Study's Keele/Finch station to the VCC station) is approximately 5320 metres - 320 metres shorter than Alignment B-1. At an approximate construction cost of $100 million per kilometre, this translates to a saving of $32 million. Alignment B-1 will also incorporate a short section of tail track (260 metres) at the Steeles Avenue station that would not be necessary upon fully extending the line to the VCC (this assumes the construction is staged and the Steeles station serves as an interim terminal). As such, the costs incurred to construct this section of "throw-away" track ($26 million) would only yield short-term benefits.

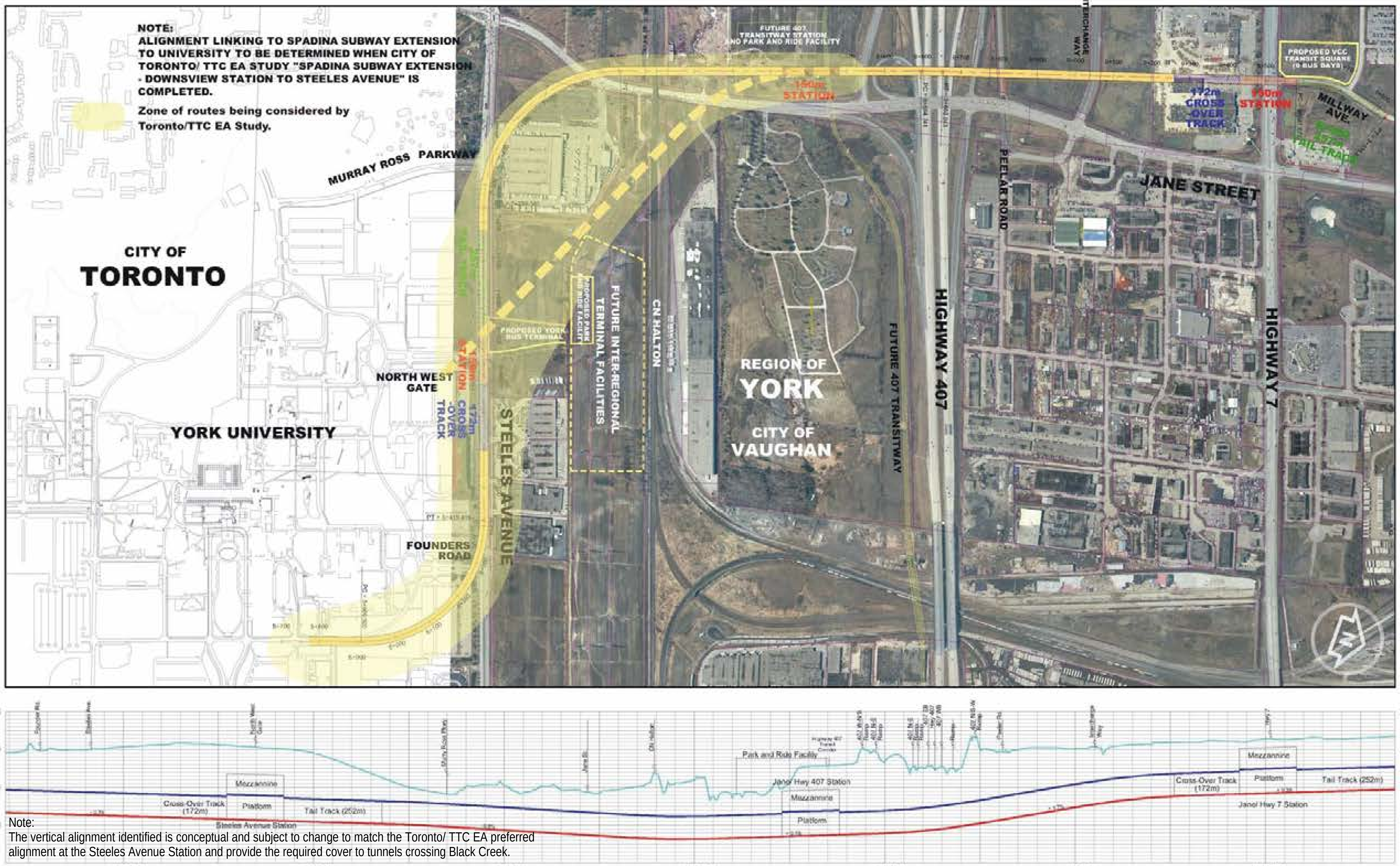
The purpose of investigating the use of the Hydro Corridor for B-1 was to minimize construction costs (at-grade construction being approximately half the cost of tunneling - $50 million per kilometre). As such, the at-grade section would result in a saving of approximately $30 million based on an at-grade length of 600 metres. Additional costs would be incurred in using the Hydro Corridor given the need to then bury the planned 230 kV transmission line. Estimates from Ontario Hydro indicate that this would cost approximately $1 million per kilometre per circuit. Additional costs would also be incurred in the construction of the tunnel portals. Otherwise, there were no other significant differences from a cost perspective.

Preferred Alignment

Based on the evaluation and the summaries provided above **Alignment A-1** is recommended for a subway extension extending from York University to the Vaughan Corporate Centre.

Although Alignment B-1 was preferred from the perspective of impacts to the natural and social environments (slightly better than A-1 in both cases), Alignment A-1 provided an increased level of service and was preferred from an implementation perspective. Given the importance of the latter two elements and the significant differences between the two options in the respective comparisons, Alignment A-1 was considered to be the preferred route.

METRIC



YRTP

SCALES

PREFERRED ALIGNMENT FOR SPADINA SUBWAY EXTENSION

12-4
FIGURE

12.5 SUBWAY FACILITIES INCLUDED IN THE UNDERTAKING

The scope of the *Higher Order Transit Corridor Protection Study*, described above, did not allow for the detailed station planning necessary to define property requirements for ancillary rapid transit terminal station facilities. Consequently, the City of Vaughan carried out a separate *Property Protection Study* in 2001 to identify the property requirements to support the Steeles Avenue Station location recommended for the preferred subway alignment A-1.

Following an analysis of the available alternatives, this study identified the preferred configuration and property requirements for facilities at the proposed interim terminal station. These facilities comprised the following components:

- The rapid transit station itself located below grade within the Steeles Avenue right of way and centred on the North West Gate intersection;
- A commuter parking lot with approximately 3,000 spaces located in the Hydro Corridor portion of the Parkway Belt north of Steeles Avenue;
- An off-street transit terminal with capacity for 19 bus bays on the northwest corner of the Steeles Avenue and North West gate intersection;
- A passenger pick-up and drop-off facility on the southeast corner of Steeles Avenue and North West Gate; and
- Two new municipal roads to provide access to the above facilities as well as to support higher intensity, transit-oriented development.

Based on the conclusions of both City of Vaughan studies, Vaughan Council adopted *OPA 529* which defined the location and width of the transit right-of-way and station locations. This amendment was subsequently approved by York Region and the Regional Council authorized the acquisition of the properties required for the transit terminal and associated access roads off Steeles Avenue and Jane Street in 2002. Most of the land required for the transit terminal has been acquired by the Region and acquisition of the remaining parcels including those required for the east-west access road is in progress.

Consequently, the site has been identified by the TTC as the end point of their routes and alignments to be studied in their on-going EA for the extension of the Spadina Subway. At the time of completion of this Highway 7 Corridor EA the TTC/City of Toronto EA study had not yet identified the preferred alignment for the subway south of this end-point. Hence it is not possible to confirm that the preferred subway alignment A-1 selected in the City of Vaughan studies and shown in **Figure 12-4** will be compatible with the alignment south of Steeles Avenue selected through the TTC/City of Toronto EA.

Planning to date by the TTC's study has identified three potential alignments on which the subway could reach the Region's terminal site. The TTC work to date indicates that the preferred horizontal and vertical alignment of the Toronto subway extension will fall within the shaded zone shown on **Figure 12-4** between Highway 407 and Steeles Avenue.

Therefore this EA is seeking approval of the underground Alignment A-1 with the option of amending, where necessary, the portion south of Highway 407 to tie into the approved TTC station and tail track alignment at the York Region transit terminal site. The proposed amendment will include:

- analysis and evaluation of tunnel horizontal and vertical alignment options through the approximately 800m tie-in zone,
- identification of a preferred location for the future 407 Transitway station on the subway alignment and integration of surface facilities associated with this station based on the approved design from an EA for the 407 Transitway.
- assessment of the effects of construction of the above works and operation of subway service on the surrounding environment and description of proposed mitigation and monitoring measures..
- finalization of the preferred functional design for the Highway 7 terminal station and associated surface facilities including relocation of the surface rapid transit station on Highway 7 at Jane Street, and
- assessment of the effects of construction and operation of Highway 7 station facilities on the surrounding environment.

The Region proposes to carry out the additional studies and submit the amendment report at a future date and when preferred designs for the inter-related works have received EA approval.

In addition to the recommendation and assessment of a preferred subway alignment at the Region's transit terminal site, the TTC/City of Toronto EA will be developing and evaluating alternative locations and configurations for ancillary inter-regional transit terminal facilities serving the initial subway terminus at Steeles Avenue. These facilities, which are not part of the undertaking for the York Region's EA, will include:

- Bus terminal(s) for use by York Region, Viva, GO Transit and TTC bus services. These bus terminal facilities will use, in part, the lands immediately north of North West Gate acquired by Vaughan for a future bus terminal;
- a passenger pick-up and drop-off facility; and
- a commuter parking lot to be located in the Hydro Corridor north of Steeles Avenue.

The above facilities will be included in the works constituting the TTC/City of Toronto EA undertaking and consequently are excluded from this undertaking.

In summary, this York Region EA undertaking includes the following components of the ultimate phase of rapid transit in the Vaughan North-South Link, subway technology by extension of the TTC subway system to Highway 7:

- the alignment for subway right-of-way from the northern limit of the tail track at the Highway 7 Station to the north end of the interim terminal tail track at the Steeles West Station (defined by the TTC/City of Toronto EA).
- Stations at Highway 7 and Highway 407.
- Development of transit terminal facilities on York Region's site at the northwest corner of Steeles Avenue and North West Gate/Street 'C', in a facility of the type shown conceptually in **Chapter 9**, **Figure 9-25**.
- An initial phase of the proposed park-and-ride lot within the Hydro Corridor north of Steeles Avenue (500parking spots).
- Transit terminal facility at the northwest corner of Highway 7 and Millway Avenue.

12.6 ASSESSMENT OF THE PREFERRED SUBWAY DESIGN

12.6.1 Assessment Methodology

An impact analysis was undertaken to identify and mitigate the potential effects, both positive and negative of the pre-construction, construction and operational activities required for project implementation. Generally, the evaluation criteria and indicators established during the alternatives evaluation process for the undertaking's surface rapid transit components were used as the basis for assessing the environmental effects of the preferred design.

- As in the previous assessment professional experience, analysis, simulation and judgement formed the basis for identifying environmental effects and mitigation measures. The analysis was based primarily on comparing the existing environment condition with

12

the anticipated future environment, prior to, during, and after construction.

12.6.2 Project Related Effects and Mitigation

Using the methodology described in **Chapter 10**, the evaluation of project-related effects was performed using the primary Rapid Transit Plan objectives and related goals developed for the evaluation of alternatives in selecting the preferred alignment. These objectives are:

- To improve mobility by providing a fast, convenient, reliable and efficient rapid transit service
- To protect and enhance the social environment in the corridor
- To protect and enhance the natural environment in the corridor
- To promote smart growth and economic development in the corridor

Goals defined by professionals in the study team are subsets of these objectives and refer to an environmental value or criterion. The effect of the proposed undertaking in terms of each environmental value was rated using a qualitative scale ranging from a positive or beneficial effect through negligible to a potentially significant negative effect as described in the above methodology.

12.6.3 Assessment Results

An environmental effect requires consideration of all project activities and their interaction with the environment. Pre-construction, construction and operational activities were assessed. **Section 12.6.4** describes these project activities for the surface rapid transit components of the undertaking and their interaction with the environment and location, the potential effects, mitigation measures, residual effects and their significance, and monitoring recommendations. Project stages are coded as follows:

P – Pre-construction
C – Construction
O – Operation

12.6.4 Analysis of Environmental Effects and Mitigation

12.6.4.1 OBJECTIVE A: To improve mobility by providing a fast, convenient, reliable and efficient rapid transit service

The analysis for Objective A is tabulated in **Table** 12.6-1. Generally, a subway extension from York University, the ultimate form of the undertaking for the Vaughan N-S Link, has the ability to significantly improve mobility within the western portion of the corridor and provide good connectivity with all intra-regional transit services. It provides connections to the City of Toronto subway network via York University and is also capable of connecting to future Highway 407 rapid transit services near Jane Street. From this point of view, the subway technology will have an overall positive effect on transit ridership in the region. The planned alignment characteristics and geometry will provide a fast, convenient and reliable service in all respects. Station locations will support medium-long term development in the Vaughan Corporate Centre and York University area where high residential density, high employment numbers or a mixture of the two will capitalize on the effectiveness of implementing a subway system extension. The strategic locations of stations generally achieve the goal of increasing the attractiveness of the rapid transit service and make a positive contribution to maximizing ridership. In order for all members of society to have access to the system, all stations, ancillary facilities and the transit system itself will be accessible for the mobility impaired providing ramps, elevators, etc. Attractiveness of the rapid transit service is implicit in the design of this ultimate phase of the undertaking, by achieving the desired transit speed and providing a key link between a planned major Regional Centre and the future expanded GTA transit network.

Table 12.6-1
Effects and Mitigation for Improved Mobility

GOAL	Environmental Value/ Criterion	Project Activity/ Issue	Project Phase[1]			Location	Assessment of Effect on the Environment	Built-In Positive Attributes and/or Mitigations	Potential Residual Effects	Further Mitigation	Level of Significance after Mitigation	Monitoring and Recommendation
			P	C	O							
OBJECTIVE A: To improve mobility by providing a fast, convenient, reliable and efficient rapid transit service												
A1	Maximize Inter-regional and local transit connectivity	Connections to inter-regional services and future gateways	✓		✓	Highway 407 crossing	Opportunity to connect to MTO's future rapid transit plans on the 407 highway to improve the inter-regional transit network.	Vaughan N-S Link subway will include a station for transfers from a future 407 inter-regional service to the subway.	Some potential for infill commercial development around this transfer point.	Development approvals must recognize proximity to Black Creek	Positive effect	Monitor the ridership and land use to size park-and-ride facility as warranted by the Provincial future rapid transit plans.
		Connections to inter-regional services and future gateways	✓		✓	York University	Opportunity to connect to the City of Toronto and improve ridership on these transit services.	Vaughan North-South Link will provide a direct connection to the York University and to the TTC rapid transit system via the Spadina subway extension.	High potential for infill mixed-use development around this transfer point.	None	Positive effect	Monitor the ridership and the performance of the connection to Toronto.
		Compatibility with proposed local network	✓		✓	Entire Corridor	Inconvenient transfer between local transit and Highway 7 Rapid Transit may discourage growth in transit ridership.	Steeles Avenue and Hwy 7 Stations will be served by local YRT and TTC transit routes ensuring convenient transfers between services. Integrated fare system proposed.	Project will require a change to the configuration of local transit.	Local services configured as grid where practical, to provide both community coverage and feeder roles	Positive effect	Regular review of effectiveness of local service plans.
A2	Maximize speed and ride comfort and minimize safety risks and maintenance costs	Alignment geometry	✓		✓	Entire Corridor	Minimum geometric standards would limit service speed, increase travel time and reduce ride comfort and system safety.	Alignment for subway extension includes only one curve and with greater than minimum radius avoiding speed restriction, reduced ride comfort, increased safety risks and maintenance costs.	Improved travel time will attract ridership.	None	Positive effect	None required.
A5	Locate stations to maximize ridership potential and convenience of access for all users	Residents/Employees within walking distance of station locations. Accessibility of stations/transit system.			✓	Entire Corridor	Stations at locations with automobile-oriented land use could discourage rapid transit use.	Station locations will serve supportive land use. Facilities and access can be designed with weather protection, direct barrier-free access and attractive streetscapes within surrounding mixed-use neighbourhoods.	Continued dependence on automobile if land use objectives not achieved	Greater emphasis on supportive land use particularly in VCC.	Positive effect	Regular review of land use and new or infill development potential during detailed design phases for subway extension.

Notes:
P – Pre construction, C – Construction, O – Operation

12

12.6.4.2 OBJECTIVE B: To protect and enhance the social environment in the corridor

Overall, the various goals set to protect and enhance the social environment can be achieved. The assessment, in terms of the related environmental values, indicates that most adverse effects are generally mitigated by the built-in attributes of the design and benefits for the existing and future communities served by the route can be maximized. The assessment for Objective B is tabulated in **Table 12.6-2**.

In particular, the subway phase of the undertaking will improve community mobility, in particular, access to commercial and community facilities planned for each end of the extension, the VCC and York University and environs. In general, overall intersection capacity for vehicular traffic in the station areas will be maintained due to the planned road system changes to accommodate traffic accessing station park-and-ride facilities. Also, a reduction in north-south vehicular demand is anticipated when the subway extension is placed into service. As a result, the intersections in the station areas can continue to serve a high volume of vehicular traffic, the needs of a broad range of pedestrians, and adjacent businesses with the implementation of rapid transit in subway form.

Preserving and improving public safety and security along the route was an important consideration in development of the design concept. While fulfilling its role as a major transit interchange node in VCC, the features of the Highway 7 station precinct design will create a pedestrian-friendly environment as planned in the recently-completed VCC Streetscaping Study. It will not only allow frequent access across the median transitway for Emergency Response Vehicles, but also provide pedestrians with a safer environment. In addition, noise and vibration studies at representative sensitive receptors have demonstrated that the use of the TTC's standard floating slab track support system will mitigate any noticeable increase in noise or vibration levels for residents of future developments that may be implemented along the route.

A Stage 1 Archaeological Assessment, conducted during the study, indicated the absence of archaeological sites within the project impact area. As is usually the case, a Stage 2 archaeological study will be conducted during the construction phase for the subway extension. Finally, the conversion to a subway, even in a highly developed urban context, will have no effect on the visual aesthetics of the route. In consultation with the municipalities and the public, a concerted effort will be made to incorporate landscaping and streetscaping principles developed for the VCC in station area design in the Avenue 7 right-of-way, offering the potential for a significantly enhanced street environment at a major transit interchange node.

Table 12.6-2
Effects and Mitigation for Social Environment

GOAL	Environmental Value/ Criterion	Project Activity/ Issue	Project Phase[1]			Location	Assessment of Effect on the Environment	Built-In Positive Attributes and/or Mitigations	Potential Residual Effects	Further Mitigation	Level of Significance after Mitigation	Monitoring and Recommendation
			P	C	O							
OBJECTIVE B: To protect and enhance the social environment in the corridor												
B1	Minimize adverse effects on, and maximize benefits for, communities in corridor	Potential displacement of community features.		✓	✓	Entire route	Potential displacement or loss of unique features.	Avoids known distinct community features to minimize impact; incorporate landscaping and furniture into streetscape to enhance corridor and community environment.	None expected	None expected	Negligible	Future municipality and VCC community consultation
		Effect on community cohesion			✓	Entire route	Subway extension may be perceived as a north-south barrier between communities on each side of the route	Underground alignment design will facilitate convenient, safe vehicle and pedestrian crossings. Improved streetscaping at stations will create a friendlier pedestrian environment.	During initial operation, vehicle/pedestrian incidents may occur due to the introduction of new station support facilities.	Emphasis on information programs, effective signage, and traffic by-law enforcement.	Negligible	Monitor traffic behaviour and cause of incidents involving pedestrians in station areas at VCC and Steeles Ave.
		Community facility utilization			✓	VCC area	Improved transit access could increase demand on facilities and services within the VCC.	Municipality can expand services and facilities through the increased development charge revenue.	None expected	None expected	Positive effect	Monitoring of activity levels at the various facilities.
B2	Maintain or improve road traffic and pedestrian circulation	Reduction in overall intersection capacity			✓	Entire route	The overall intersection capacity for vehicular traffic in the station areas could be reduced due to the required operational changes and access related traffic redistribution.	The implementation of improved rapid transit will reduce the general vehicular demands on the corridor. Improved road infrastructure at VCC and the Steeles Avenue node will make traffic operation acceptable.	None expected	None expected	Insignificant	Continue to monitor intersections to confirm assumptions.
					✓	Proposed East-West Road (Jane Street)	Under 2021 considerations, SBL will operate at capacity and NBT will approach capacity during the AM peak hour. The opposing WBR will approach capacity during the PM peak hour.	Traffic volume will be monitored to determine if a SB dual left turn lane to access park-and-ride will be required to facilitate the heavy volume during the morning period.	Intersection will continue to operate at capacity.	None expected	Moderately Significant	Monitoring required for SB dual left turn lane.

Table 12.6-2

Effects and Mitigation for Social Environment

GOAL	Environmental Value/ Criterion	Project Activity/ Issue	Project Phase[1]			Location	Assessment of Effect on the Environment	Built-In Positive Attributes and/or Mitigations	Potential Residual Effects	Further Mitigation	Level of Significance after Mitigation	Monitoring and Recommendation
			P	C	O							
OBJECTIVE B: To protect and enhance the social environment in the corridor												
					✓	Northwest Gate (Steeles Avenue)	Under 2021 Considerations, the intersection will operate at capacity during the AM peak hour.	None required.	Intersection will continue to operate at capacity.	None expected	Moderately Significant	None required.
		Pedestrian Crossings			✓	Jane St./ Hwy 7;	Due to the width of the main street at intersection, pedestrians may not be able to cross the intersection in one signal phasing based on the standard pedestrian crossing times of 7 seconds.	These intersections may require two-stage crossing in the future to accommodate heavy main street traffic. The decision to implement these special provisions should be deferred until post-operation conditions are monitored and the need is identified.	None Expected	None Expected	Moderately Significant	Monitoring is required to determine if the implementation of two-stage is a necessity.
B3	Maintain a high level of public safety and security in corridor	Access for emergency vehicles	✓	✓	✓	Highway 7, Jane Street,	Incorporation of median and construction activity could have adverse effects on Emergency Response Services (ERS) access and time	U-Turns permitted at intersections. Consultation with emergency response representatives resulted in median breaks being provided to allow access to Emergency Response Vehicles only.	Some risk may remain as access procedure will change after implementation of mitigation	Address during detail design in conjunction with ERS	Insignificant	Obtain feedback from ERS
B4	Minimize adverse noise and vibration effects	Noise effects due to construction and operation of subway extension from Steeles Avenue station to Highway 7			✓	Portions of route where alignment is in the proximity of future residential land uses	Subway operations and general traffic on the widened Highway 7 corridor roadways may result in increased noise levels for residents.	Ambient noise level increase due to future subway operations will not exceed the 5dB threshold with TTC floating slab track support system. Sound level increases in future adjacent developments can be limited to acceptable levels by conditions during site plan approvals.	None expected	None necessary	Insignificant	Undertake confirmation monitoring to verify compliance once the subway extension is fully operational.
		Vibration effects due to construction and operation of subway extension			✓	Portions of route where alignment is in the proximity of future residential land uses	Subway operations may result in increased vibration levels for residents.	Modeling of future subway operations indicates that expected vibration increases will not exceed the protocol limit of 0.1 mm/sec.	None expected	None necessary	Negligible	Undertake confirmation monitoring to verify compliance once the subway extension is fully operational.
B5	Minimize adverse effects on cultural resources	Disruption of Built Heritage Features (BHF)		✓			The potential introduction of rapid transit operation may cause changes in visual, audible and atmospheric environment around built heritage features.	None required – Subway facilities will be integrated with existing streetscape and VCC road network.	None expected	None necessary	Insignificant	None required
B5	Minimize adverse effects on cultural resources	Disruption of Cultural Landscape Units (CLU)		✓			The potential introduction of rapid transit operation may cause changes in visual, audible and atmospheric environment to the cultural heritage features in the Cultural Landscape.	None required – Subway will be integrated with existing streetscape and road traffic operations.	None expected	None necessary	Insignificant	None required
B6	Minimize disruption of community vistas and adverse effects on street and neighbourhood aesthetics	Visual Effects	✓		✓	VCC Station precinct	Introduction of surface transit facilities serving the VCC station may reduce visual aesthetics of Avenue 7.	Transit intermodal facilities will be developed in consultation with Vaughan Municipality as part of the introduction of a comprehensive landscaping and streetscaping plan for the VCC and station precinct.	None expected	None necessary	Insignificant	Monitor VCC planning and development applications and acquire property for facilities and streetscape enhancement through redevelopment applications
		Landscaping	✓		✓	Station precincts	Landscaping species may not survive in winter months.	Choose appropriate species for both winter and other months to maintain greenery throughout corridor. Place landscaping in planters and incorporate buried irrigation systems.	Species may still not survive	Change species', irrigation patterns, etc.	Insignificant	Monitor health of landscaping continuously
		Encroachment on sites of existing buildings		✓	✓		Subway alignment is required to avoid the south building.	Alignment		None	Insignificant	None Required

Notes:

P – Pre construction, C – Construction, O – Operation

12

12.6.4.3 OBJECTIVE C: To protect and enhance the natural environment in the corridor

The limited natural environment along the subway extension route of the can be protected and enhanced in a small way. Most of the preferred subway extension alignment is set in a developed urban environment where natural features have already been disturbed by previous development. Nevertheless, within the Don watershed, the Black Creek watercourse crosses Highway 7 east of the proposed subway terminal station at Millway Avenue and the proposed subway alignment south of Highway 407. At the Highway 7 crossing, the subway tunnel, station and surface works will be remote from the watercourse and outside the floodplain while at the crossing south of Highway 407 the tunnel profile can be designed to allow the subway to pass under the creek leaving the station and associated surface works as the components with potential to effect the watercourse and related vegetation.

As noted in **Section 12.5**, the precise location of the alignment south of Highway 407 through the Black Creek floodplain cannot be established until the preferred alignment for the subway across Steeles Avenue is identified and approved in the City of Toronto/TTC EA Study. The options under consideration in this study comprise the north-south alignment (Alignment A1) possible with a 90 degree curve from an east-west orientation of the Steeles Avenue Station or an alignment curving northward from a diagonal station orientation at Steeles Avenue. The former allows an interchange station either south or north of the Highway 407 rapid transit right-of-way while the latter's curvature restricts the station location to the north side of the right-of-way. Consequently, if the diagonal Steeles Station is selected by the Toronto/TTC study, all underground Highway 407 station works would be constructed under the Highway 407 ramps without directly impacting the Black Creek meander belt. On the other hand, to get the benefits of a more southerly station possible with Alignment A1, approximately 50 metres o the north-south portion of Black Creek would have to be realigned eastward towards Jane Street. While the northern station option eliminates the need for the creek realignment, it requires that all access to the station be at the north edge, instead of being distributed from two points in the station park-and-ride area.

The discussion of options above indicates that the extent of effects on the Black Creek watercourse cannot be identified and mitigation measures developed until after the Toronto/TTC's Spadina Subway Extension EA is approved in 2006 when further study of the connection to the preferred alignment in Toronto and an addendum to this EA Report is completed. This addendum will include a recommendation for the subway alignment between Highway 407 and the approved Steeles Avenue Station tail track as well as an update of the environmental effects of the recommended alignment in the form of analysis documentation and additions to **Table 12.6-3**.

In terms of all other environmental components to be considered, effects on aquatic and terrestrial ecosystems are either negligible or insignificant when built-in mitigation measures are implemented or sensitive construction and operation methods are respected. The lengthening of existing culverts or installation of new culverts along the subway extension will incorporate mitigation measures where required to preserve or enhance the aquatic habitat. Future air quality, except for PM, is expected to be better than currant air quality mainly due to improvements in engine technology and fuels but also with some contribution from the diversion of trips to rapid transit. While PM levels can be expected to increase as traffic increases, rapid transit will slow the rate of increase. Green house gas emissions will be reduced due to the energy efficiency of an improved public transit alternative.

The assessment for Objective C is tabulated in **Table 12.6-3**

Table 12.6-3
Effects and Mitigation for Natural Environment

GOAL	Environmental Value/ Criterion	Project Activity/ Issue	Project Phase[1]			Location	Assessment of Effect on the Environment	Built-In Positive Attributes and/or Mitigations	Potential Residual Effects	Further Mitigation	Level of Significance after Mitigation	Monitoring and Recommendation
			P	C	O							
OBJECTIVE C: To protect and enhance the natural environment in the corridor												
C1	Minimize adverse effects on Aquatic Ecosystems	Fuel spills entering the watercourses, due to accidents during construction refuelling and accidents at bus terminals during operation.		✓	✓	Entire Route	Fish kills due to chemical spills resulting in short term population decline.	▪ No refuelling within 10 m of a watercourse. ▪ Emergency Response Plan.	▪ Short term population decline. ▪ Some contaminants within storm-water system.	None practical	Insignificant	None required
		Sediment laden stormwater entering watercourses during construction		✓		Entire Route	Fish kills and loss of aquatic habitat resulting in short term population decline.	▪ Construction fencing at work areas near watercourses limiting area of disturbance. ▪ Erosion and Sedimentation Control Plan.	Short term population decline.	None practical	Insignificant	None required
		Sediment laden stormwater entering watercourses during operation			✓	Entire Route	Loss of aquatic habitat resulting in population decline.	▪ Stormwater management facilities such as grassed swales, oil and grit separators, stormwater ponds.	Short term population decline.	Clean-out facilities as required.	Insignificant	Monitor sediment accumulation in stormwater management facilities.

12

Table 12.6-3
Effects and Mitigation for Natural Environment

GOAL	Environmental Value/ Criterion	Project Activity/ Issue	Project Phase[1]			Location	Assessment of Effect on the Environment	Built-In Positive Attributes and/or Mitigations	Potential Residual Effects	Further Mitigation	Level of Significance after Mitigation	Monitoring and Recommendation
			P	C	O							
OBJECTIVE C: To protect and enhance the natural environment in the corridor												
C1 Cont'd	Minimize adverse effects on Aquatic Ecosystems (cont'd)	Loss of site-specific habitat.		✓		Black Creek and tributary watercourses within route.	Potential loss of fish habitat as a result of watercourse realignment, new culverts/bridges, culvert/bridge extensions and/or culvert/bridge replacements or repairs.	▪ Design subway works to avoid modifications at culverts/bridges. ▪ Span the watercourse, meander belt or floodplain with new structures where warranted by site conditions. ▪ Avoid in-water work to the extent possible. ▪ Minimize the area of in-water alteration to the extent possible. ▪ Follow in-water construction timing restriction. ▪ Perform all in-water work in the dry using a temporary flow bypass system.	An improvement to fish habitat may result from channel modifications at Black Creek watercourses that support fish habitat.	Consultations with regulatory agencies during detail design to confirm no harmful alteration of fish habitat.	Insignificant	On-site environmental inspection during in-water work. Post-construction monitoring of fish habitat recovery measures.
		Fish mortality		✓		Black Creek and tributary watercourses within route.	Fish may be injured or killed by dewatering.	▪ Design subway works to avoid modification of water quantity and quality in watercourses. ▪ Avoid in-water work to the extent possible. ▪ Perform all in-water work in the dry using a temporary flow bypass system. ▪ Capture fish trapped during dewatering of the work zone and safely release upstream. ▪ Prohibit the entry of heavy equipment into the watercourse.	None expected.	None	Negligible	On-site environmental inspection during in-water work.
		Barriers to fish movement.		✓	✓	Black Creek and tributary watercourses within route.	Subway and station works may create a barrier to fish movement.	▪ Use open footing culverts or countersink closed culverts a minimum of 20% of culvert diameter. ▪ Span the watercourse, meander belt or floodplain with new structures where warranted by site conditions.	New bridges or culverts and culvert modifications will be designed to avoid the creation of a barrier to fish movement.	Negotiations with regulatory agencies during detail design.	Negligible	On-site environmental inspection during in-water work.
		Baseflow alterations		✓	✓	Black Creek and tributary watercourses within route.	New impervious surfaces at stations can lead to changes in the frequency, magnitude and duration of flows.	▪ Reduce the area of impervious surfaces to the extent possible. ▪ Use stormwater management practices that encourage infiltration and recharge of groundwater.	None expected.	None	Negligible	▪ Post-construction inspection of stormwater management facilities to evaluate their effectiveness. ▪ On-going maintenance as required.
		Increased temperature		✓	✓	Black Creek and tributary watercourses within route.	Clearing of riparian vegetation and stormwater management practices can impact temperature regimes.	▪ Minimize the area of stream bank alteration to the extent possible. ▪ Use stormwater management practices that encourage infiltration and recharge of groundwater.	Shading provided by culvert/bridge offsets shading lost through removal of riparian vegetation.	Restore riparian areas disturbed during construction with native vegetation.	Negligible	▪ Post-construction inspection of stormwater management facilities to evaluate their effectiveness. ▪ On-going maintenance as required. ▪ Post-construction inspection of riparian plantings to confirm survival.
		Disturbance to rare, threatened or endangered species		✓	✓	Black Creek and tributary watercourses within route.	▪ Don River watershed known to support redside dace and American brook lamprey.	▪ Design subway works to avoid modifications at culverts/bridges. ▪ Avoid in-water work to the extent possible. ▪ Perform all in-water work in the dry using a temporary flow bypass system. ▪ Capture fish trapped during dewatering of the work zone and safely release upstream. ▪ Prohibit the entry of heavy equipment into the watercourse.	None expected.	None required.	Negligible	None required.

12

Table 12.6-3
Effects and Mitigation for Natural Environment

GOAL	Environmental Value/ Criterion	Project Activity/ Issue	Project Phase[1]			Location	Assessment of Effect on the Environment	Built-In Positive Attributes and/or Mitigations	Potential Residual Effects	Further Mitigation	Level of Significance after Mitigation	Monitoring and Recommendation
			P	C	O							
OBJECTIVE C: To protect and enhance the natural environment in the corridor												
C2	Minimize adverse effects on Terrestrial Ecosystems	Loss of wildlife habitat		✓	✓	Black Creek and tributary watercourses within route.	Construction of the subway and station facilities may result in the removal of vegetation and the wildlife habitat it supports.	▪ Minimize the area of vegetation removals to the extent possible. ▪ Minimize grade changes to the extent possible. ▪ Use close cut clearing and trimming to minimize the number of trees to be removed. ▪ Delineate work zones using construction fencing/tree protection barrier. ▪ Protect trees within the clear zone using guiderail, curbs, etc. to prevent removal.	None expected.	Restore natural areas disturbed using construction with native vegetation, where feasible.	Negligible	None required.
		Wildlife mortality		✓	✓	Black Creek and tributary watercourses within route.	Removal of wildlife habitat may result in wildlife mortality.	▪ Perform vegetation removals outside of wildlife breeding seasons (typically April 1 to July 31). ▪ Perform any channel realignment and culvert/bridge extension, repair and replacement outside of wildlife breeding season.	None expected.	None required.	Negligible	None required.
		Barriers to wildlife movement and wildlife/vehicle conflicts		✓	✓	Black Creek and tributary watercourses within route.	▪ Channel realignment or culvert/bridge extension, repair or replacement may create a barrier to wildlife movement. ▪ Insertion of subway station surface facilities may create an additional impediment to wildlife movement and increase the potential for wildlife/vehicle conflicts.	Enhance wildlife passage around facilities, where feasible through culvert/bridge modifications and re-vegetation along boundaries.	Design of new bridges or culvert extensions to provide access to station facilities will not impede wildlife passage.	None required	Negligible	None required.
		Disturbance to rare, threatened, or endangered wildlife		✓	✓	Entire route.	Three rare species were identified within the Hwy. 7 corridor study area: rough-legged hawk (non-breeding migrant/vagrant, extremely rare breeding occurrence by MNR); northern shrike (non-breeding migrant/vagrant, very rare to uncommon breeding occurrence by MNR); and, milk snake ('special concern' by COSEWIC, and 'rare to uncommon' by MNR)	▪ Prevent the harassment of eastern milk snake if encountered during construction. ▪ Perform vegetation removals outside of wildlife breeding seasons (typically April 1 to July 31). ▪ Perform culvert/bridge extension, repair and replacement outside of wildlife breeding season.	None expected.	None required.	Negligible	None required.
		Disturbance to vegetation through edge effects, drainage modifications and road salt		✓	✓	Station surface facilities.	▪ Clearing of new forest edges may result in sunscald, windthrow, and invasion of exotic species. ▪ Ditching, grading and other drainage modifications may alter local soil moisture regimes. ▪ Road salt may result in vegetation mortality and die back.	▪ Minimize the area of vegetation removals to the extent possible. ▪ Minimize the grade changes and cut/fill requirements to the extent possible. ▪ Use close cut clearing and trimming to minimize encroachment on remaining vegetation. ▪ Delineate work zones using construction fencing/ tree protection barrier. ▪ Manage the application of road salt to the extent possible.	▪ Vegetation communities within the study area are primarily cultural in origin and have been impacted by Highways 7 and 407. ▪ Subway stations represent a minor incremental encroachment into these already disturbed communities.	Re-vegetation along watercourses and landscape treatments.	Insignificant	None required.

12

Table 12.6-3
Effects and Mitigation for Natural Environment

GOAL	Environmental Value/ Criterion	Project Activity/ Issue	Project Phase[1]			Location	Assessment of Effect on the Environment	Built-In Positive Attributes and/or Mitigations	Potential Residual Effects	Further Mitigation	Level of Significance after Mitigation	Monitoring and Recommendation
			P	C	O							
OBJECTIVE C: To protect and enhance the natural environment in the corridor												
C2 cont'd	Minimize adverse effects on Terrestrial Ecosystems (cont'd)	Disturbance to rare, threatened or endangered flora		✓		Entire Route.	▪ Some regionally rare or uncommon species may be located within the subway route limits.	▪ Minimize the area of vegetation removals to the extent possible. ▪ Minimize grade changes to the extent possible. ▪ Use close cut clearing and trimming to minimize the number of trees to be removed. ▪ Delineate work zones using construction fencing/ tree protection barrier. ▪ Protect trees within the clear zone using guiderail, curbs, etc. to prevent removal. ▪ Transplant rare species to safe areas prior to construction.	Trees may be removed by the construction of the subway and its associated facilities.	None required.	Insignificant	Monitor clearing activities to ensure that minimum work zones are used to avoid any unnecessary tree removal.
C3	Improve regional air quality and minimize adverse local effects	Degradation of existing local and regional air quality when compared to MOE standards			✓	VCC, Hwy 407 and Steeles Avenue Station areas	Situation expected to be unchanged or marginally better than 2001	The fleet average emissions will drop significantly due to technological improvements balancing the increase in traffic volumes. The subway extension will divert commuters from individual highly polluting sources (single passenger automobiles).	Improvement of about 4% in all pollutants except PM. Subway availability will slow the rate of increase of PM.	None required	Positive Effect	None recommended
		Increase in emissions of Greenhouse Gases (GhG)			✓	Entire route	GhGs emitted may not be improved	Compared to the status quo (no rapid transit) there will be far less GhGs emitted per commuting person.	Net decrease in CO_2-equivalent emissions of 4-5 kilotonnes	None required	Positive Effect	None recommended
		Degradation of air quality during construction		✓		Entire route	Some dust may be created during the construction period.	The law requires that all possible pollutant emission mitigation steps possible be taken during construction activities.	Some PM emissions locally.	None required.	Negligible	None recommended
C4	Minimize adverse effects on corridor hydro-geological, geological and hydrological conditions	Water quality in shallow groundwater that can affect quality in surface watercourses			✓	Areas located hydraulically down gradient of transit alignment, where receiving surface watercourses are present.	Subway park-and-ride lots and bus loops will require de-icing salt and also will accumulate various chemical substances that can impact water quality of runoff. Impacted runoff that infiltrates can increase concentrations in shallow groundwater. Potential to affect shallow groundwater that discharges to surface watercourses.	Dilution and other natural processes will attenuate elevated parameters in groundwater.	▪ Potential effects to water quality of surface water courses. ▪ Groundwater quality effects are anticipated to be detectable.	Reduce application of road salt, where possible. Curbs and gutters to convey impacted runoff away from permeable soil areas.	Moderately Significant	None required. Water quality effects are anticipated to remain acceptable.
		Baseflow in surface water courses		✓	✓	Recharge areas within proposed alignment, particularly in areas of Newmarket Till and sand textured glacial lake deposits.	Increase of paved area at stations decreases the pervious area that existed prior to construction, resulting in proportionally decreased recharge to shallow groundwater.	N/A	▪ Decreases in recharge can decrease baseflow in surface water course(s). ▪ Reduced baseflow in surface watercourses.	Construction of pervious surfaces where practical, including grassed areas and permeable pavements.	Negligible	None required. The degree of impact is anticipated to be undetectable.
		Increased pavement; decreased infiltration			✓	Stations along route	Minor increase in quantity of surface runoff. Minor decrease in quantity of groundwater.	Storm water management facilities such as grassed swales and storm water ponds.	▪ Minor increase in peak streamflows. ▪ Minor decrease in groundwater.	None practical	Negligible	None required

Table 12.6-3
Effects and Mitigation for Natural Environment

GOAL	Environmental Value/ Criterion	Project Activity/ Issue	Project Phase[1] P	C	O	Location	Assessment of Effect on the Environment	Built-In Positive Attributes and/or Mitigations	Potential Residual Effects	Further Mitigation	Level of Significance after Mitigation	Monitoring and Recommendation
OBJECTIVE C: To protect and enhance the natural environment in the corridor												
C4 Cont'd	Minimize adverse effects on corridor hydro-geological, geological and hydrological conditions (Cont'd)	Groundwater resources and aquifers		✓		Black Creek crossing	Construction of subway tunnels and the planned Hwy 407 station could affect groundwater resources if significant dewatering is required.	The extent of dewatering and any aquifer depressurization to permit tunnel and station construction will be minimized by the use of earth pressure balancing tunnel boring equipment in areas where groundwater resources could be affected. Local dewatering and recharge will likely be required around the station which must be constructed by the cut-and-cover method. Measures to mitigate any potential effects will be identified during the amendment to this EA covering the connection of the subway at Hwy 407 to the approved alignment for the Toronto/TTC Spadina Subway Extension to York University.	▪ None anticipated. ▪ (Detailed analysis of construction methods during the EA Amendment will confirm the likelihood of residual effects and identify any further mitigation required.)	None anticipated	Insignificant	An on-going program to monitor groundwater and creek flow conditions will be conducted during construction

Notes:
P – Pre construction, C – Construction, O – Operation

12

12.6.5 OBJECTIVE D: To promote smart growth and economic development in the corridor

One of the main purposes of the Rapid Transit System is to support the smart growth policies in the Region and simultaneously encourage economic development. From this perspective, the conversion of the Vaughan N-S link to subway technology strongly supports Regional and Municipal planning policies, such as the Centres and Corridors urban form. In many respects, the undertaking will contribute to the intensification of underutilized sites along and encourage transit-oriented development at infill locations and vacant land along the corridor. At the same time, several built-in design characteristics are aimed at reducing the potential for adverse effects on business or access to social and community facilities.

The transit system should support the overall structure of the Region's Planning Policies to ensure that form follows function. The transit system must create a sustainable environment that will increase development leading to increased business activity along the corridor. Through the increase in business activity, infill locations and vacant land could be developed, maximizing the density of development and leading to a more viable alternative of rapid transit in York Region. The assessment for Objective D is tabulated in **Table 12.6-4**.

Table 12.6-4
Effects and Mitigation for Smart Growth and Economic Development

GOAL	Environmental Value/ Criterion	Project Activity/ Issue	Project Phase[1]			Location	Assessment of Effect on the Environment	Built-In Positive Attributes and/or Mitigations	Potential Residual Effects	Further Mitigation	Level of Significance after Mitigation	Monitoring and Recommendation
			P	C	O							
OBJECTIVE D: To promote smart growth and economic development in the corridor												
D1	Support Regional and Municipal Planning Policies and approved urban structure	Need for pedestrian-friendly streets and walkways for access to stations		✓	✓	VCC and Steeles Ave. Stations	Pedestrian access to the proposed subway stations could be degraded by increased vehicular traffic generated by development around the planned stations.	▪ The VCC Streetscaping Study recomendations and York Region's streetscaping policies applied to the Steeles Avenue precinct will create a pedestrian-friendly station environment. ▪ Signalized pedestrian crosswalks will be provided at all station locations and an appropriate number of intersections; Pedestrian safety will be considered in the design of station precincts and road signage will be highly visible to both pedestrians and automobiles.	Potential for jaywalking in vicinity of stations, which could lead to increased in number of vehicle/pedestrian incidents.	Streetscaping treatment will discourage illegal access by defining pedestrian paths to signalized intersections	Negligible	Monitor traffic accidents involving pedestrians to establish whether cause is transit related.
		Locating higher density and transit-oriented development where it can be served by transitway			✓	New and redevelop-ment/infill locations	Current landowners could object to implementation of changes to existing land use pattern around subway stations.	▪ Regional/Municipal land use controls and approval processes to encourage transit-oriented development or re-development in support of OP objectives.	Redevelopment pressure on surrounding areas	Apply Municipal Site Plan approval process	Insignificant	Monitor re-development activity to control overall increase in development density
D2	Provide convenient access to social and community facilities in corridor	Potential barrier effects during construction and operation		✓	✓	VCC and York University station precincts	Subway construction works could be perceived as a barrier in access to future community centres, hospital(s), malls, parks, etc.	▪ Construction Traffic and Pedestrian Management Plan will avoid wherever possible, barriers to entrances/exits to large attractors along Highway 7.	Alternative access routes to facilities may affect adjacent properties	Mark detours and alternative access points clearly	Insignificant	Monitor congestion levels during construction and traffic patterns during operations.
D3	Minimize adverse effects on business activities in corridor	The potential for an increase in business activity.	✓	✓	✓	Entire route	Increased pedestrian traffic via the implementation of a rapid transit system will increase the potential for business activity.	▪ A higher density of development on underutilized sites, infill locations and on vacant land should increase the market for some business activity.	Increase in vehicular traffic; increase in workforce/ population.	Encourage intensification meeting urban form objectives.	Insignificant and positive	Monitor building applications/ permits, economic influences (employment rate, etc.)
		The potential for a decrease in business activity.		✓	✓	Entire route	Modification of road access could lead to displacement and/or business loss.	▪ Implement procedures to address requests of affected businesses; incorporate design solutions and construction methods to minimize number of businesses affected.	Decrease in traffic; decrease in workforce/population	Encourage alternative compatible development	Moderately significant	Cooperative response to business loss concerns addressed to municipalities.
D4	Protect provisions for goods movement in corridor	Ease of Truck Movement			✓	Entire route	Median transitway will restrict truck movement in corridor	▪ Provided U-turns at major intersections to allow for truck access to side streets and properties. Traffic analysis at intersections indicated sufficient capacity for trucks using U-turns.	In areas of 4-lane cross-section, intersections with no station or landscaping in median do not allow sufficient turning width for WB 17(articulated trucks).	Traffic signs prohibit large truck at these intersections (see next entries). Designate truck routes.	Insignificant	Monitor and widen Highway 7 with right turn tapers at side streets to allow for movement
				✓		Entire route	Construction may limit access for trucks	▪ Traffic management plan to ensure truck access at all times	May not be possible in some areas	Designate alternative truck routes	Negligible	None required

Notes:
P – Pre construction, C – Construction, O – Operation

13. HIGHWAY 7 CAPACITY IMPROVEMENTS: WOODBINE AVENUE TO SCIBERRAS ROAD

13.1 BACKGROUND

In addition to the Public Transit Improvement initiative studied in this Environmental Assessment (EA), the *2002 York Region Transportation Master Plan* identified future road network capacity needs in the Highway 7 Corridor to improve the capacity and operational and physical characteristics of arterial roads. The Region's 2004 Ten-Year Road Construction Program scheduled the implementation of improvements to Highway 7 between Woodbine Avenue and Sciberras Road for the Year 2007. Also, the Town of Markham Council has passed a resolution requesting the Region to advance the execution of the widening of this section of Highway 7 from 2007 to 2005/2006.

The Highway 7 Corridor Public Transit Improvements assessed in the earlier chapters of this report comprise the implementation of a dedicated transitway on the portion of this section of arterial road west of Town Centre Boulevard. This chapter documents the assessment of the related road improvements between Woodbine Avenue and Sciberras Road. Integration with the future transitway and the necessary response to traffic and land development growth arising from the Town of Markham's future plans for the area has been considered.

In 2001, a Municipal Class EA study was initiated for the widening of Highway 7 between Woodbine Avenue and Sciberras Road. Later that year, when it became evident that a Public Transit Improvement Program should be investigated, the Class EA was suspended in order to avoid conflict between the two EA processes.

Two years later, the Region re-activated the assessment of the Highway 7 Road Widening as a component of the Highway 7 Corridor and Vaughan North-South Link (VNSL) Public Transit Improvements EA. This approach was considered desirable since the road widening and transitway insertion are interdependent with each having a significant influence on the other.

13.2 ENVIRONMENTAL ASSESSMENT PROCESS

In cases where a Class EA and an Individual EA (IEA) have been combined, the Class EA process requires that the more rigorous of the two EA processes be applied to complete the single study.

In this particular case, the Highway 7 Corridor and VNSL Public Transit Improvement study has been conducted under the more comprehensive requirements of an IEA Schedule.

13.3 STUDY PHASES

Being part of an expanded IEA Study, this assessment of the widening of Highway 7 between Woodbine Avenue and Sciberras Road followed the planning process described below:

Phase 1: Identifying the study objective, need and justification of the undertaking.

Phase 2: Evaluating alternative transportation solutions to the problem identified in Phase 1.

Phase 3: Identifying and evaluating design alternatives to carry out the preferred solution, considering social and environmental effects, the Regional and local municipal land use plans for this section of Highway 7, property impact and cost-effectiveness.

Phase 4: Documenting (in this chapter) a summary of the process and findings of the above phases.

13.4 STUDY ORGANIZATION AND APPROACH

Meetings with representatives from York Region's Transportation and Works Department were held at key points throughout the study to review the study progress, develop the public consultation strategy, assess data collected, discuss the evaluation of planning and design alternatives, provide general guidance to the study and resolve issues.

Consultation with the Town of Markham and other external agencies was also maintained through the course of the study to obtain information regarding future land use and transportation plans for the area affected, as well as technical input and comments on the study recommendations.

Public involvement, an essential component of the road widening portion of the EA Study, comprised open-house format Public Consultation Centres (PCCs). In PCC #3 of the transit study, the widening of Highway 7 was addressed. In addition, after selecting the preferred alternative, a separate PCC was held to present the whole process of the widening study.

13.5 NEED AND JUSTIFICATION

Currently, Highway 7 is a six-lane roadway west of Woodbine Avenue reducing to four lanes from Woodbine Avenue eastward. In response to the dramatic growth in recent years and future committed development, especially Markham Centre West, the Region has planned the implementation of road improvements. In addition, a necessary capacity increase in the sector between Woodbine Avenue and Sciberras Road identified in the *2004 Ten-Year Capital Works Program* confirms the recommendations of the *Region's Transportation Master Plan*.

13.5.1 Traffic Analysis

This Section develops the traffic component of the need and justification for widening Highway 7 from Montgomery Court/Fairburn Drive to Sciberras Road by assessing the resulting traffic operating conditions. The analysis objective was to determine improvements required to support the future population and employment growth along on Highway 7 in the vicinity of Warden Avenue that has been identified as a high growth area with the development of Markham Centre West as part of the regional centre designated in the *Region's Official Plan*.

As noted above, the six-lane cross-section currently narrows to four lanes approximately 230 metres east of the Fairburn Drive/Montgomery Court intersection and continues easterly through Markham.

13.5.1.1 Study Process

Using the YRTP demand forecasting model described in **Chapter 4**, the 2011 and 2021 future traffic conditions were established. For the need and justification analysis, South Town Centre Boulevard was considered. The following transportation related studies were referenced in completing the analysis.

- *Stringbridge Traffic Study*, December 2004.
- *Highway 7/ Warden Avenue Mixed-Use Development Traffic Study*, May 2004.
- *Markham Centre West Master Plan Transportation Study*, December 14, 2001.

Recent count data for this section of Highway 7 was obtained from regional turning movement counts and recent transportation studies. The counts were obtained in 2002 and 2003 and are included in the *Transportation Assessment* (**Appendix C**).

13.5.1.2 Future Screenline Volume and Capacity

The 2011 and 2021 future conditions were analysed based on a screenline using the York Region model. The 2021 conditions represent full build-out conditions after implementation of the York Region Transit system. The 2011 conditions are based on the planned development indicated in the Markham Centre West Study without the implementation of the York Region's planned rapid transit system.

The screenline analysis was conducted to determine the operation of the east-west roadways based on the existing lane configuration. Exhibit 8-9 and Exhibit 8-10 of **Appendix C** summarize the results of the screenline analysis for the 2011 and 2021 future conditions.

The 2011 screenline analysis shows that the current 4-lane cross-section will be insufficient to accommodate the projected 2011 traffic demand. The analysis predicts that without the rapid transit system and with the Markham Centre West development, east of Woodbine Avenue and west of Unionville Main Street both westbound lane capacities will be deficient by one lane. The total screenline 2011 volume to capacity (v/c) ratio will exceed capacity at 107% east of Woodbine Avenue and 101% west of Unionville Main Street.

With the rapid transit system, the 2021 forecasts illustrate that the existing lane configuration in the westbound direction is insufficient to accommodate the future volumes of 8,730 vehicles east of Woodbine Avenue and 9,480 vehicles west of Main Street Unionville. The screenline east of Woodbine Avenue is deficient by one lane in the westbound direction at a volume to capacity ratio of 109%. The screenline west of Main Street Unionville is expected to operate at a volume to capacity ratio of 118% and requires two additional westbound lanes in order to improve operations.

The above findings indicate that a shortfall of road capacity between Woodbine Avenue and Main Street Unionville will exist in this portion of the corridor. It is also evident that implementation of the rapid transit alone will not alleviate the need to increase road capacity in the east-west direction.

13.5.1.3 Collision History

1999 to 2003 collision data reports were obtained from York Region for the intersections as well as the roadway links between the intersections to identify any potential safety concerns within this section of Highway 7. Within the entire section, a total of 456 collisions occurred; of which 1(0.2%) collision was fatal, 66(14.5%) were injury related and 389(85.3%) involved property damage only. The number of collisions that occurred at intersections and road links within the five-year period by class is summarized in **Appendix C**.

13

13.5.1.4 Existing Intersection Operations

The existing operations at the signalized intersections on Highway 7 between Montgomery Court and Sciberras Road are summarized in **Appendix C - Section 3.5.2** and are based on existing lane configuration and signal timings. Sciberras Road currently operates as an unsignalized intersection and therefore has not been included in the analysis of the existing conditions. From a review of the existing traffic analysis, the following can be concluded with regard to traffic operations on Highway 7 between Montgomery Court and Sciberras Road:

- The northbound left on Fairburn Drive/Montgomery Court is operating at capacity during the PM peak hour;
- The northbound left on Town Centre Boulevard is approaching capacity during the AM peak hour. During the PM peak hour the northbound left at Town Centre Boulevard operates at capacity;
- The westbound left and southbound through movements at Warden Avenue are approaching capacity during the AM peak hour. The eastbound through, northbound through and southbound left are approaching capacity at Warden Avenue during the PM peak hour; and
- No capacity constraints were noted at Rodick Road, Verclair Gate and Village Parkway during the AM and PM peak hours.

Although the overall level of service of this section of the Highway 7 Corridor is satisfactory with current traffic volumes on the present four-lane cross-section, it is expected to worsen with the future traffic forecast for the area.

13.5.2 Identification of the Needs and Justification

The need and justification for road improvements in this segment of road as one of the priorities within the *Ten-Year Capital Program* stems from the following:

- As the development currently in progress or already committed and awaiting final approval by the Town of Markham takes place, traffic congestion will exceed permissible levels at peak hours as indicated in **Section 13.8.2 Analysis of Future Traffic Conditions**.
- York Region's *Transportation Master Plan* recommends the widening of this section of Highway 7 as one of its priorities.
- The future Transitway recommended for the median of Highway 7 will require widening of the road west of Town Centre Boulevard (or Warden Avenue).
- By virtue of its role as the main arterial through Unionville Central District, the Town of Markham intents to provide an urban image and operation to this stretch of Highway 7.
- Future development and the Transitway will generate pedestrian circulation resulting in the need of pedestrian facilities such as sidewalks.

The reasons described above justify increasing the capacity of the road as well as other operational and physical improvements such as the inclusion of pedestrian and cyclist facilities on Highway 7 between Woodbine Avenue and Sciberras Road.

The main objectives of the proposed improvements are to:

- alleviate traffic congestion on this sector of Highway 7;
- serve the traffic needs of existing and approved adjacent developments;
- support the York Region and Town of Markham *Official Plan* policies;
- provide additional east-west traffic capacity to accommodate long term growth; and
- simultaneously make provision for the future installation of rapid transit infrastructure in an integrated manner while increasing the capacity for general traffic and improving pedestrian circulation along the right-of-way.

13.6 EXISTING CONDITIONS

Chapter 6 of this Report identifies the existing transportation, natural, social, cultural, noise and air quality environments of the Highway 7 Corridor by segment, including this stretch between Woodbine Avenue and Sciberras Road.

This section complements the information included in **Chapter 6** by describing conditions more specific to this sector of the road and in areas where the existing conditions may be affected by the proposed road widening.

13.6.1 Roadway General Characteristics

This segment of Highway 7 is 3 km long; the six-lane cross-section west of Woodbine Avenue is reduced to four lanes at the intersection with Montgomery Court, maintaining that capacity from that intersection going east. The four through lanes are typically separated by a fifth centre left turning lane and all signalized intersections include exclusive right and left turn lanes. At present, the road has a rural cross-section (open ditch drainage and no sidewalks). There are five signalized intersections at Rodick Road, Town Centre Boulevard, Warden Avenue, Verclair Gate and Village Parkway.

A number of residential and office developments are currently under construction or in various stages of approval by the Town of Markham. The Town's future plans for road expansion in the area include new intersections along this stretch of Highway 7 as described below:

- Cross-intersection between Rodick Road and Town Centre Boulevard, with future road (Circa Boulevard) connecting Cox Boulevard on the north side of Highway 7 with Clegg Road on the south.
- T-intersection between Town Centre Boulevard and Warden Avenue, with future road (Street "C") to serve as access to the Liberty Development and the Hilton Suits Hotel.
- Current T-intersection with Verclair Gate will become a cross-intersection when Verclair Gate is extended to the south.
- Current T-intersection with Village Parkway will become a cross-intersection when Village Parkway is extended to the south to connect with Birchmount Road.
- Cross-intersection between Village Parkway and Sciberras Road (Street "B"), with future road connecting Ferrah Street and the future Riverside Drive.
- Current T-intersection with Sciberras Road will become a cross-intersection when Sciberras Road is extended to the south.

13.6.2 Surface Drainage

Drainage along this section of Highway 7 is mostly provided by roadside ditches. There are a number of catchbasins and short sections of storm sewers at the intersections. The storm sewers outlet either to the ditch or to the municipal storm sewer systems at the intersecting roads.

The highway runoff outlets at a number of locations. The runoff from the west study limit (Montgomery Court/Fairburn Drive) flows eastward and discharges to the Rouge River (Apple Creek) crossing located between Montgomery Court and Rodick Road. Similarly, there is a high point in the road located west of Town Centre Boulevard and drainage westward from this high point also discharges to the Rouge River (Apple Creek) crossing.

The section of Highway 7 from the high point west of Town Centre Boulevard eastward to Warden Avenue drains to a ditch that flows south and east along the boundary of the hotel property and outlets to the Rouge River crossing at Warden Avenue.

The ditches along Highway 7 from Warden Avenue to the east study boundary continue to flow in an eastward direction with two outlets. One is a large swale (Flask Ditch) about 400 m east of Warden Avenue that flows southward to the Rouge River. The other is the Highway 7 ditches that continue to flow eastward beyond the Study Area to another crossing of the Rouge River.

13.6.3 Pavement Condition

The existing pavement structure, summarized in **Table 13.6-1**, is based on a field investigation performed in August, 2003.

Table 13.6-1
Existing Pavement Structure

Layer	Range (mm)	Average (mm)
Montgomery Court to Town Centre Boulevard		
Asphalt	150 – 220	185
Granular Base & Sub Base	580 – 1050	815
Fill	600 – 800	700
Town Centre Boulevard to Sciberras Road		
Asphalt	120 – 200	160
Granular Base & Sub Base	480 – 760	620
Fill	700 – 2100	1400

A visual inspection indicated that the pavement is in a generally acceptable to good condition, except for a very few moderate transverse cracks near major intersections. The asphalt concrete pavement has recently been resealed in different portions of this section of Highway 7.

13.6.4 Utilities

The major utilities, identified through direct contact with their respective companies, in this section of Highway 7 are the following:

Sanitary

- A 675 mm sewer between Rodick Road and Verclair Gate on the north side; and
- A future trunk sewer between Village Parkway and Sciberras Road on the north side (currently in the detailed design stage).

Gas

- A 150 mm main along the south side, between Montgomery Court and Village Parkway, crossing Highway 7 at the intersection of Village Parkway and continuing to the east along the north side; and
- Various mains crossing at Rodick Road, Town Centre Boulevard, Verclair Gate and Village Parkway.

Bell

- An underground line along the south side from Montgomery Court to Sciberras Road; and
- An underground line along the north side from Town Centre Boulevard to Sciberras Road.

Hydro

- Primary overhead lines along the north side from Montgomery Court to Sciberras Road;
- An underground line on the south side of the road, between Montgomery Court and Apple Creek;
- An underground line along the south side at Town Centre Boulevard and crossing Highway 7 on the east side of the intersection; and
- An underground line from Warden Avenue to Verclair Gate along the north side of the road.

Watermain

- A 500 mm diameter main along the south side between Montgomery Court and Sciberras Road.

Cable TV

- An overhead TV cable (CATV) from Montgomery Court to the future Circa Boulevard, and from Town Centre Boulevard to Sciberras Road along the north side. A second overhead TV cable crosses Highway 7 at the intersection of Warden Avenue.
- An underground CATV cable from the future Circa Boulevard to Town Centre Boulevard along the south side and also across Highway 7 at Montgomery Court, the future Circa Boulevard, and Town Centre Boulevard.
- An overhead fibre optic structure (FOTS) along the north side between Apple Creek and the future Circa Boulevard, and across Highway 7 from the west side to the east side of Warden Avenue;
- An underground FOTS crossing Highway 7 at Rodick Road;
- An overhead (Futureway) FCI broadband line on the north side from Montgomery Court to Sciberras Road; and
- An underground FCI broadband line crossing the highway at Town Centre Boulevard.

13.6.5 Structures

Between Montgomery Court and Rodick Road, a single 25 m span, concrete slab on prestressed, precast concrete girder bridge with steel pile foundations spans Apple Creek, a branch of the Rouge River. This structure is in fair condition with curbs and concrete parapet walls with twin steel tube railings on both sides. No record of any rehabilitation exists.

13.6.6 Illumination

The existing illumination of Highway 7, between Montgomery Court Road and Sciberras Road consists of the following:

- **North Side:** 400 W high pressure sodium luminaries with 2.4m elliptical brackets installed on the hydro poles.
- **South Side:** 400 W high pressure sodium luminaries installed on base mounted aluminium poles. The lengths of elliptical bracket arms vary between 1.8m and 2.4m long. There are two sectional steel poles at the Warden Avenue intersection, one on each of the eastbound and westbound approaches to the intersection.

All luminaires are flat glass and have integral photoelectric cells for individual control. At intersections, illumination is installed jointly with traffic signals on sectional steel poles. Power supply is obtained from the overhead hydro line along the north side.

13.6.7 Land Use

The frontage of this section of Highway 7 is comprised primarily of commercial land uses with some local residential and a large tract of agricultural land on the south side, east of Warden Avenue.

Major areas of recent and future development include the Hilton Suites Hotel Expansion, IBM Phase 1 & 2, Liberty Development, Tridel, ORC Office and YMCA, Stringbridge, Tenstone, South Unionville and Motorola. First Markham Place shopping centre located east of Fairburn Drive, the Anthony Roman Civic Centre and Markham Theatre northeast of Town Centre Boulevard and Highway 7 and the Markham Town Square on the northeast corner of the Warden Avenue intersection are examples of more mature major developments. **Figure 13.6-1** illustrates the land use along the corridor.

13.7 EVALUATION OF ALTERNATIVES TO THE UNDERTAKING

Consistent with the requirements of the Environmental Assessment Act, the proponent for a particular public undertaking must not only examine alternative methods of carrying out the undertaking, but must also examine transportation alternatives to the undertaking itself. This latter requirement will also confirm that there is reasonable and adequate justification to proceed with the project and that its need is clearly demonstrated. In this context, the following planning alternatives were considered and analysed:

- Do-Nothing
- Limit Development
- Increase Vehicle Occupancy (Transportation System Management)
- Improve Public Transit Service
- Improve the capacity of Highway 7
- Improve other roadways

As can be observed, the planning alternatives listed above range from the status quo (do-nothing) to an increase in the capacity of either the public transit or road system or both. Each alternative is discussed briefly below.

13.7.1 Do-Nothing

In relation to this undertaking, a “do-nothing” option implies continuation of the status quo in terms of transportation capacity for the portion of Highway 7, between Montgomery Court and Sciberras Road.

Considerable urban growth (residential, commercial and industrial) during the last decade or so in the Markham and Unionville areas, has demanded plans for road network expansion, improvements to the existing arterial roadways in the area and consideration of implementation of rapid transit systems due to the increasing traffic congestion and decline in road safety.

Highway 7 being the main (only continuous) east – west arterial in the area will not have the capacity to handle predicted traffic volumes when all land development, either underway or in the process of approval, takes place. Neighbourhood road network expansion, already approved by the Town of Markham will increase Highway 7 traffic volumes when implemented, thus increasing traffic delays over longer periods of time, as well as the potential for accidents, particularly the types of accidents associated with congestion.

While a “do-nothing” scenario avoids the short-term negative impacts usually associated with road/infrastructure improvements and the corresponding expenditure of public funds, it represents a “no-response” option. Clearly, the justification for most public undertakings must be rationalized on the basis that the benefits arising from the undertaking must outweigh the negative implications of alternative courses of action, including the alternative to not carry out any action.

Conclusion: Taking into account the significant negative consequences of a “do-nothing” scenario, this course of action cannot be considered a reasonable or acceptable option. In support of the approved Official Plan urban structure recommendations, some proactive measures must be considered to improve traffic capacity and vehicular and pedestrian safety on this segment of Highway 7.

13.7.2 Limit Development

Along this portion of Highway 7 important developments are either, under construction, approved, or awaiting approval. The most important and highest traffic generator of all will be the proposed Markham Regional Centre, (immediately south of the Study Area) which will consist of approximately 260 acres and is expected to house a population of 25,000 and generate close to 40,000 jobs. These plans for higher density land development have been identified in the Region and Town of Markham Official Plans and constitute a key element of the Region’s Centres and Corridors urban form strategy. Consequently limiting development in this area just to mitigate traffic congestion along Highway 7 and intersecting roads would be contrary to the approved municipal urban structure plan.

Conclusion: This course of action does not represent a feasible and realistic measure due to the advanced status of committed and planned private and public development plans. It is also important to recognize that many of the road users constitute “through traffic” only, Highway 7 being the main east-west arterial in the Region.

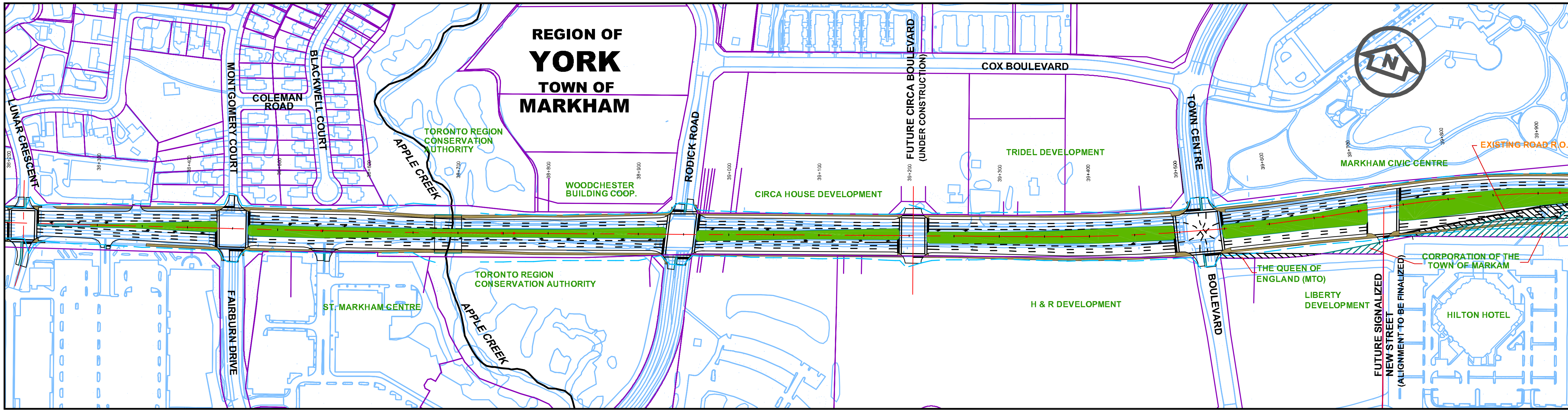
13.7.3 Increase Vehicle Occupancy (Transportation System Management)

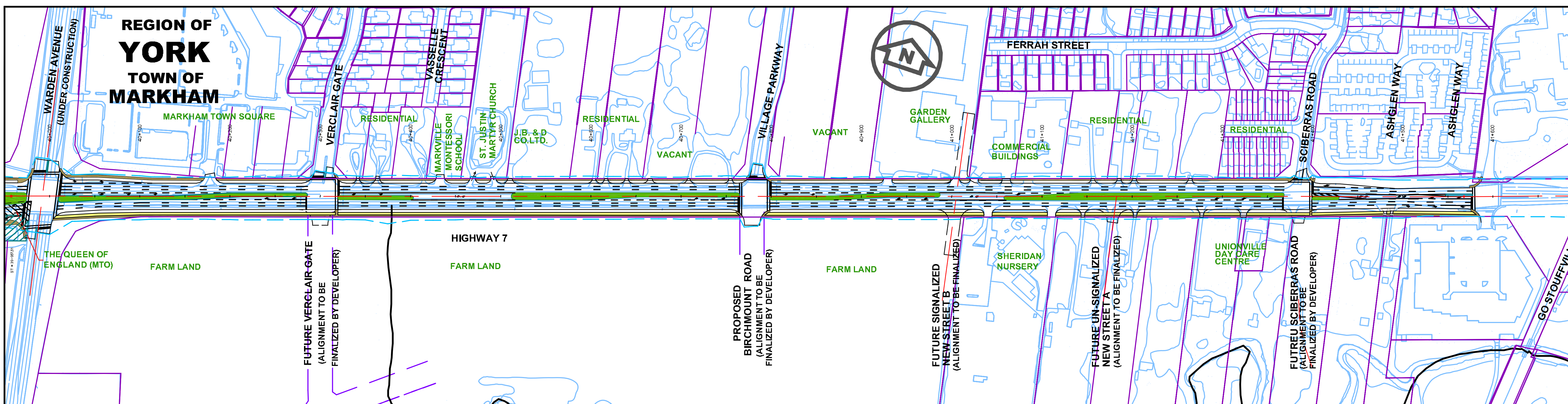
There are a number of potential techniques to reduce the number of vehicles using regional roads such as Highway 7. Along this section, the encouragement of car and van pooling and express buses could be considered.

Under this alternative, the through traffic volumes may be slightly lower, but no significant reduction of the overall traffic volumes would be realized. Traffic increases due to existing and future adjacent developments will have an offsetting effect, increasing traffic delays over longer periods of time, as well as the potential for accidents, particularly the types associated with congestion. Vehicle occupancy increases (as a transportation strategy) would also be complicated to initiate and enforce.

Conclusion: This alternative would only have a marginal positive effect on the available capacity and safety deficiencies. Over time, it may also have a negative effect on future development. As such, this alternative would not satisfy the long term needs of the transportation, economic and social environments.

METRIC





DRAWING NAME: J:\Data\PM1435\PM\dwgs\HWY 7 Widening EA\Alignment\Hwy 7 Widening - Alt 1 - wide median & raised median with bike path (wider median bw tcb to warden).dwg
MODIFIED: Mar 04, 2005 - 1:47pm
CREATED:
CREATED:

NOT TO SCALE

Legend			
PROPOSED TRAFFIC LANES	PROPOSED SIDEWALK	PROPERTY LINE	
PROPOSED GRADING LINE	PROPOSED LANDSCAPE	WATERCOURSES	

LAND USE ALONG THE HIGHWAY 7 WIDENING CORRIDOR

FIGURE 13.6-1

13.7.4 Improvements to Public Transit Service

As predicted in the analysis and recommendations made in the Markham Centre West Master Plan and the evaluation and definition of transit corridors in the York Region Transportation Master Plan, the traffic modelling for this segment of Highway 7 indicates that there will be improvements when rapid transit service is implemented.

Conclusion: The introduction of rapid transit service along Highway 7, integrated with other transit systems serving the area, will contribute to a reduction in traffic volumes along Highway 7 and surrounding streets. As well, it would provide additional direct access to Markham Centre making this alternative a strong contributor to the solution of the problem.

13.7.5 Improvements to Highway 7 Capacity

This alternative entails the widening of Highway 7 from the existing four through lanes and centre left turn lane to six through lanes and a centre left turn lane. Also, Highway 7 would be converted from a rural arterial cross-section to an urban cross-section with boulevards and the appropriate pedestrian facilities. This is in line with the Town of Markham's plans to eventually convert Highway 7 into an arterial with urban characteristics.

The increased capacity would significantly improve traffic operations and safety on Highway 7, however, temporary disruption and inconvenience during construction, along with some construction activity in sensitive streams, will need to be minimized by including efficient staging plans and protective measures in the widening design.

Conclusion: Widening of Highway 7 increases capacity and can make a significant contribution to traffic operations and safety between Montgomery Court and Sciberras Road. This option also supports municipal urban design and development objectives.

13.7.6 Improvements to Other Roadways

In this segment of the Corridor, Highway 7 represents the only continuous east-west arterial south of Unionville, separating the planned Markham Centre from the residential district. Consequently widening/improvements to other parallel roadways in the area does not represent a feasible alternative solution to increasing traffic congestion on Highway 7.

Considering the north–south road system, the Region and Town of Markham has plans to expand the network in the area as follows:

- Widen Warden Avenue
- Extend Verclair Gate southward to Enterprise Drive
- Extend Village Parkway southward to connect with Birchmount Road
- Extend Sciberras Road to the south to Enterprise Drive
- Develop a north – south road between Rodick Road and Town Centre Boulevard connecting Cox Boulevard and Clegg Road
- Develop a north – south road from Highway 7 to the Clegg Road extension just west of the Hilton Hotel Complex
- Develop a north - south road from Highway 7 to Farrah Drive between Village Parkway and Sciberras Road

Conclusion: The Town considers the north–south road network expansion necessary to provide adequate accessibility to Markham Centre and adjacent new developments. However, the new crossings will have some negative effect on the operation of intersections along this segment of Highway 7 and the absence of a continuous parallel east-west route makes this alternative ineffective in addressing the road system capacity problem. The north-south road improvements in combination with improved traffic signal operations on a widened Highway 7 would contribute to solving the growing congestion problem.

13.7.7 Evaluation of Alternatives to the Undertaking

Table 13.7-1 summarizes the evaluation of the transportation solutions considered as alternatives to the Highway 7 widening, the undertaking, in this study.

Table 13.7-1
Evaluation of Alternative Transportation Solutions

Evaluation Factors and Criteria	Alternative Transportation Solutions					
	Do-Nothing	Limit Development	Increase Vehicle Occupancy	Improvements to Public Transit Service	Improvements to Highway 7 Capacity	Improvements to Other Roadways
Effect on Transportation System - Capacity - Traffic operations	System capacity shortfall will continue to increase. Traffic operations will further deteriorate causing longer congestion-related delays	Existing capacity shortfall will continue with deteriorating operations due to traffic from the already approved future develop-ment along Highway 7 and Markham Centre.	This alternative alone would not have a significant effect on traffic volumes; traffic operations on Highway 7 would continue to deteriorate.	This alternative alone will not overcome capacity shortfall in regional centre zone. Higher transit mode share will contribute to improved traffic operations on Highway 7.	Widening Hwy 7 will reduce capacity shortfall and improve traffic operations. Promotes a balanced system when combined with transit improvements.	Improvements to other roads may benefit the overall traffic operation in the area but influence on Hwy 7 capacity would be minor.
- System safety	Higher potential for accidents as congestion and neighbourhood infiltration grows.	Existing accident potential would still increase due to development already approved.	Reduction in accident potential would be minimal as congestion increases.	Accident potential could be reduced to some extent due to increased system capacity.	Accident potential will be reduced by less congestion and infiltration.	Some increased accident potential due to higher traffic volume on other roads.
Effect on Socio-economic Environment - Community/ neighbour-hoods - Cultural/ heritage features	Increasing Hwy 7 congestion will encourage infiltration and degrade access to community facilities.	Encourages incompatible development in other communities. Does not reduce existing impacts.	TDM and HOV measures alone will not mitigate potential adverse community effects such as traffic noise.	Improved transit alone will only defer adverse community effects; some improved access to facilities.	Capacity increase will reduce neigh-bourhood traffic infiltration. Improves access to community facilities.	Capacity increase mainly in N-S direction; some improvement in community access but limited effect on potential for infiltration.
- Noise intrusion - Land use and development	Transportation system will not support committed development.	Contrary to O.P. Centres and Corridors objectives.	Solution will have moderate benefits for committed development.	Supports O.P. Centres and Corridors urban form / land use.	Supports O.P Centres and Corridors urban form / land use.	Limited support for O.P Centres and Corridors urban form.
Effect on Natural Environment - Aquatic habitat - Terrestrial - Air Quality	No impact on natural features but congestion will continue to degrade air quality.	No impact on natural features. No improvement in existing air quality.	No impact on natural features. Minimal improvement in air quality.	Minor impact at water crossings. Small contribution to improved air quality.	Minor impact at water crossings. Moderate air quality improvement.	Potential impact on features on other roadways. Minor air quality improvement.
Cost-effectiveness - Capital Costs	Requires least capital investment	Reduced development revenue to fund improved infrastructure	Low capital requirement but not a complete solution.	Significant capital investment req'd to achieve increased transit mode share.	Moderately significant capital cost for widening and streetscaping improvements.	Moderately significant capital cost for other road widenings.
Maintenance Cost	Increased costs as traffic volume increases road deterioration.	Increased costs as traffic volume increases road deterioration.	Minimal reduction in costs for road maintenance.	Increased costs due to more extensive road infrastructure.	Increased costs due to more extensive road infrastructure.	Increased costs due to more extensive road infrastructure.
Summary	This Alternative would not address the needs to reduce current and future traffic congestions.	Alternative does not support Region's and Town's Official Plan objectives for the corridor. Future development in the area including Markham Centre has already been approved by the Town.	Alternative would only have a marginal effect (if any) on the identified capacity deficiencies and congestion related accidents. It would be difficult to enforce.	Proposed Rapid Transit service through Markham Centre will increase the transit share of future trips but the remaining auto use traffic will still exceed the existing road capacity.	Increasing the road capacity will have a significant positive impact on traffic congestion. Sidewalks, landscaped medians and boulevards with bicycle paths will enhance street-scape and achieve a more pedestrian friendly environment.	Other parallel toll free main or collector roads are too distant and discontinuous to represent a real benefit to Hwy 7.
Conclusion					Preferred Transportation Solution	

Table 13.7-1
Evaluation of Alternative Transportation Solutions

From **Section 13.5** and the evaluation of transportation alternatives described above, the traffic demand generated by the continuing developments in the Study Area and the implementation of Markham Centre West regional node will only be properly addressed by increasing the capacity of Highway 7. This is best achieved by a combination of widening the cross-section and the implementation of a dedicated transitway along Highway 7. Service on the latter must also be closely integrated with that of other transit systems serving the area.

This alternative fits within the ongoing municipal infrastructure improvement program to respond to significant growth in the corridor, as well as the Region's commitment to provide an enhanced roadway system based on existing and future transportation demands.

13.8 ALTERNATIVE METHODS OF CARRYING OUT THE UNDERTAKING (DESIGN ALTERNATIVES)

This section describes the process followed to identify, analyse and evaluate the alternative methods of carrying out the undertaking (preliminary design alternatives). In addition to the technical activities, there was continuous consultation/involvement with the external agencies, and participation of interest groups and general public. This process contributed to the building of consensus on design issues among the study participants.

13.8.1 Design Requirements

In developing the design alternatives presented in this Chapter, the following design requirements were considered:

- urban treatment of the cross-section
- the proposed rapid transit system
- the road network expansion plan
- intersection treatment
- bicycle ways and pedestrian circulation
- access to adjacent properties

Each of these requirements is discussed briefly below.

13.8.1.1 Urban Treatment of the Cross-section

As part of their road network improvement policies, York Region plans to urbanize the image of Highway 7. This policy also coincides with the urban design plans of the Town of Markham. Consequently the proposed cross-section for this segment of Highway 7 includes curb and gutter, concrete sidewalks, landscaped medians and boulevards and a storm sewer system with catch-basins and sub-drains.

13.8.1.2 The Proposed Rapid Transit System

As indicated in earlier chapters, the preferred alignment of the transitway follows the centre line of Highway 7 as far east as South Town Centre Boulevard where it turns south to reach the future Markham Centre West. Consequently, the cross-section in the portion from Montgomery Court to either one of the two southward routes must incorporate a raised median wide enough to ultimately accommodate the future transitway, its stations and other facilities.

13.8.1.3 Road Network Expansion Plans

Section 13.6.1 described the Town of Markham's road expansion plans in the Study Area. These include future intersections along this stretch of Highway 7, all of which have been considered in the design of alignment alternatives evaluated in this chapter. Provision for future left turns when applicable was addressed specifically.

13.8.1.4 Intersection Treatment

The designs respected the Region's policy for arterial roads with more than two through lanes per direction which recommends the elimination of additional right turn lanes, unless traffic volumes for that movement are high enough to justify an exclusive right turn lane to avoid significant delay to through traffic. All signalized intersection designs provide left turn lanes on Highway 7.

13.8.1.5 Bicycle Ways and Pedestrian Circulation

The Town of Markham has a plan to introduce bicycle paths or dedicated lanes in various sectors of the municipality. In the case of the Study Area, the plan includes a bicycle way along Cox Boulevard and through the parkland of the Civic Centre to the intersection of Warden Avenue and Highway 7. The Town also anticipates developing a bicycle way from the intersection of Sciberras Road with Highway 7, southward to the Markham Centre along the future Sciberras Road extension. In order to connect these bicycle ways, the Town requested consideration of a bicycle way along Highway 7, between Warden Avenue and Sciberras Road.

In addition, sidewalks are required on both sides of the Highway 7 as a key element of the urban cross-section.

13.8.1.6 Access to Adjacent Properties

In design alternatives introducing a raised median, an alternative means of access to existing and future residential and commercial properties is required. Permitting 'U' turns at specific intersections and/or introducing openings in the median are options to be considered.

13.8.2 Analysis of Future Traffic Conditions

Future traffic conditions have been analysed for both the 2011 and 2021 horizon year. It was assumed that the future road network as well as the future development indicated in the *Markham Centre West Master Plan Transportation Study* will be mostly implemented by 2011 supported by implementation of all proposed rapid transit services by 2021.

13.8.2.1 Cross-section Alternatives

In analyzing the effect of future traffic volumes predicted from the Markham Centre West Study on the operations of Highway 7, two roadway alternatives were considered as follows:

- A four lane (existing) cross-section with left turn lanes; and
- A six lane cross-section with left turn lanes.

13.8.2.2 Future Traffic Operations

The operational analysis of intersections shows that the overall level of service improves in the six-lane scenario. However, the improvement is more noticeable when the operation of the critical movements is compared. From these results, it is evident that widening Highway 7 to a six-lane cross-section within the selected planning horizons is required to carry the future traffic volumes generated by the Markham Centre development. The future developments are expected to be mostly built-out by 2011 and therefore it is recommended that the widening of Highway 7 be completed soon thereafter in order to support the proposed development. The complete operational analysis is included in **Appendix C**.

By widening the cross-section to six through lanes with the wide median necessary for the future transitway in the west segment or landscaping in the east section as requested by the Town of Markham, longer pedestrian phase times will be necessary. This reduces "green time" for the critical moves and may impact the overall operation of the intersection depending on the vehicular demand on Highway 7 in comparison to the crossing street.

As far as road safety is concerned, the intersection of Rodick Road and Highway 7 has been identified as requiring improvements due to a relatively high PSI rating of 6.04 based on collisions recorded from 1999 to 2003. It is recommended that this intersection as well as the whole segment be closely monitored as volumes increase from the Markham Centre West development. Implementation of the rapid transit system will likely reduce severe collisions, such as head-on or angle collisions resulting from left turning traffic conflicting with opposing through volumes on Highway 7 as the left turns will operate with protected signal phasing. In addition, the increase in traffic volume from adjacent developments will likely reduce the operating speeds which may also reduce the number of collisions.

From the screenline and intersection capacity analysis, it can be concluded that Highway 7 will require widening to six lanes within the 2011-planning horizon. Specifically, critical movements at intersections were improved with the six lane cross-section as additional “green time” was available for the heavier movements. While the widening did not have a significant impact on the overall level of service at intersections, vehicular delays and queuing were decreased.

Overall, the analysis showed that the expected traffic volumes generated in the immediate and surrounding areas would be substantial requiring significant road improvements such as the widening of Highway 7 from four lanes to six lanes from Montgomery Court/Fairburn Road to Sciberras Road within the 2011-planning horizon.

13.8.3 Evaluation of Design Alternatives

The future operational and physical plans of the Region and the Town of Markham for Highway 7, including the transitway and the road network expansion within the Study Area were considered to identify and evaluate design and implementation alternatives for widening the road. The evaluation was divided in two sections, the west section where the future transitway is planned for the median, and the east section where no transitway is planned.

13.8.3.1 West Section: Montgomery Court to Town Centre Boulevard (future rapid transit right-of-way)

As noted earlier in this chapter, the preferred alternative for the rapid transit system follows Highway 7 as far east as South Town Centre Boulevard, where it diverts to the south to access the future Markham Centre. Three design alternatives were considered for this section. The cross-sectional widening options (**Figures 13.8-1 to 13.8-3**) and their main features are described below. Their evaluation is summarized in **Table 13.8-1**.

Alternative 1: Widening without considering future transitway in the interim stage

This alternative widens the road from four through lanes and a paved fifth lane in the centre, to six through lanes with a seventh paved lane in the centre, without considering future implementation of the transitway in the interim stage. This option would allow the widening within the existing right of way avoiding the need to acquire private property.

However, when the transitway is implemented, the necessary property to accommodate the ultimate cross-section would have to be acquired, and the complete roadway would have to be reconstructed, including relocating sub-drains, catch-basins, overhead utilities, pavement, etc.

In the short term, the initial capital cost would be less than in the other alternatives, but over the long term this cost would easily surpass the other alternatives due to the total reconstruction of the road when rapid transit infrastructure is built.

York Region, the Town of Markham, and the public, all expressed their opposition to this alternative.

Alternative 2: Allowing space for future transitway in a widened median

This alternative incorporates six through lanes, left turn lanes at the signalized intersections with a wide landscaped median along the strip where the future rapid transit system is proposed.

Construction easements or land acquisition will be required in some segments of the road to accommodate the widened right of way.

The future transitway will be built within the wide median, consequently, at that stage, it will not be necessary to reconstruct the roadway, catch-basins, sub-drains, boulevards and sidewalks or relocate utilities, since all these elements would be built initially in their ultimate locations.

Until such time as the transitway is built, the road will incorporate a landscaped median satisfying the intention of the Region and Town of Markham's planners to provide an enhanced image for Highway 7.

Alternative 3: Allowing space for future transitway in widened boulevards

This alternative comprises six through lanes, left turn lanes at signalized intersections and a paved seventh lane. Wide boulevards are provided to eventually accommodate the transitway in the centre of the road by widening the outside edges of pavement as necessary to reinstate the traffic lanes.

In terms of property impact in the short term, this alternative offers more flexibility than Alternative 2 since segments of road could be built with the same criteria as Alternative 1 where acquisition negotiation with private owners becomes lengthy. Then, when the transitway is built, the additional property could be acquired and those segments of road reconstructed as in Alternative 1. In the other segments, when the transitway is built in the centre, reconstruction of the road including catch-basins and sub-drains would be required.

Table 13.8-1
Evaluation of Widening Alternatives
Montgomery Court to Town Centre Boulevard

Evaluation Criteria	Alternative 1	Alternative 2	Alternative 3
Social environmental effects	Building the widening for an interim stage and then reconstructing most of the road when the transitway is built, would significantly increase disruption of traffic and inconvenience to the public and property owners.	This Alternative would cause the least disturbance for the public when the transitway is built; At the interim stage, a landscaped median would be provided along the transitway right of way.	Causes somewhat less disruption during construction of the transitway than in Alternative 1, but still results in significant disturbance.
Impact on property	For the interim stage there is no need for private property acquisition or temporary easements, however, when the transitway is implemented, property will have to be acquired to accommodate the ultimate cross-section.	All property and easements required for the ultimate cross-section will have to be acquired at the outset.	As in Alternative 2, the required property would be acquired at the outset, however, there is some flexibility to acquire the land later if negotiations with specific owners are delaying the process.
Impact on utilities	Hydro line and lighting poles will have to be relocated twice; for the interim stage and then again when the transitway is built.	Only one relocation of the Hydro line and lighting poles will be required.	Only one relocation of the Hydro line and lighting poles will be required.
Road reconstruction	When the transitway is built, most of the roadway will have to be reconstructed.	The transitway will be built within the median placed in the interim stage, leaving the rest of the cross-section intact.	Significant road reconstruction would take place for the ultimate stage (implementation of the transitway).
Construction cost	- highest	- lowest	- medium
Conclusion		Preferred Alternative	

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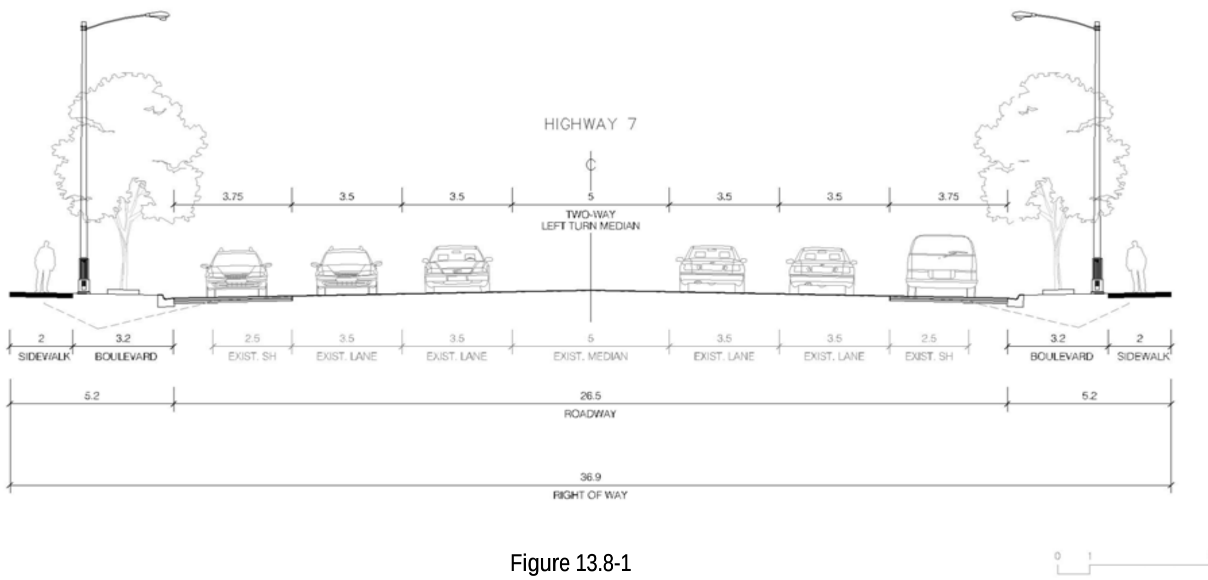

Figure 13.8-1
West Section: Montgomery Court to Town Centre Boulevard
Alternative 1: Paved 7th Lane

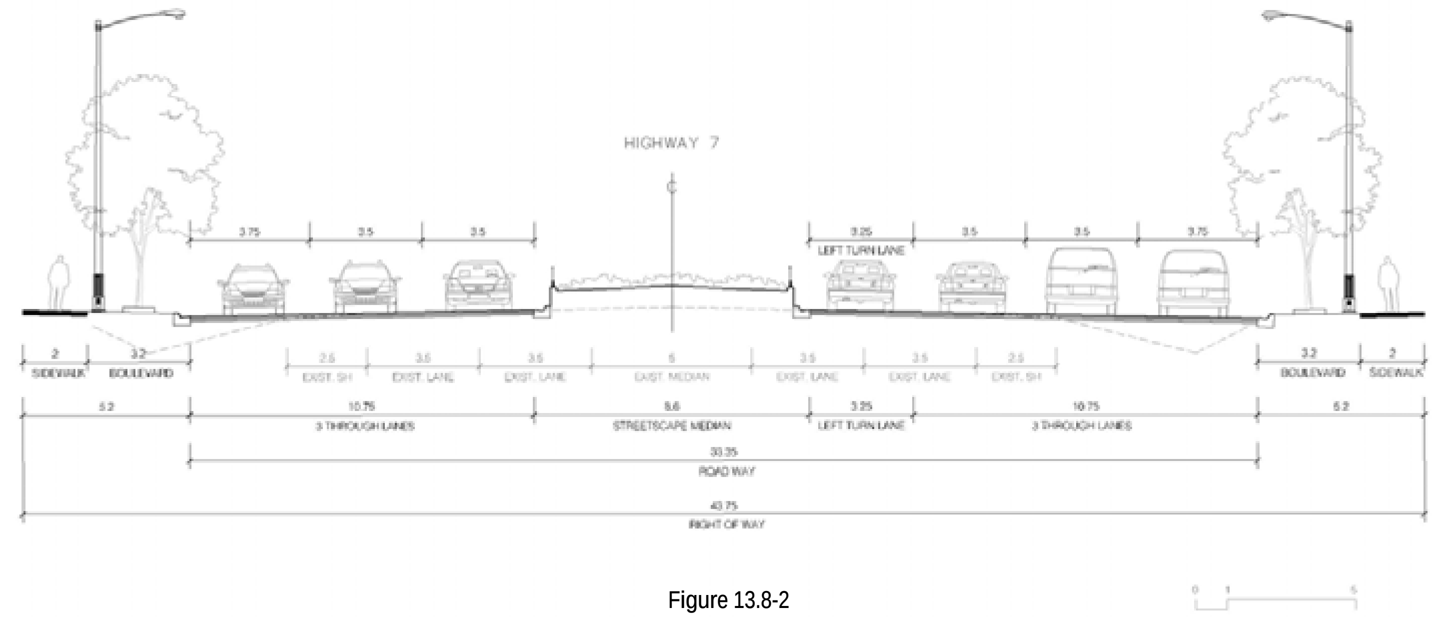

Figure 13.8-2
West Section: Montgomery Court to Town Centre Boulevard
Alternative 2: Wide Streetscape Median

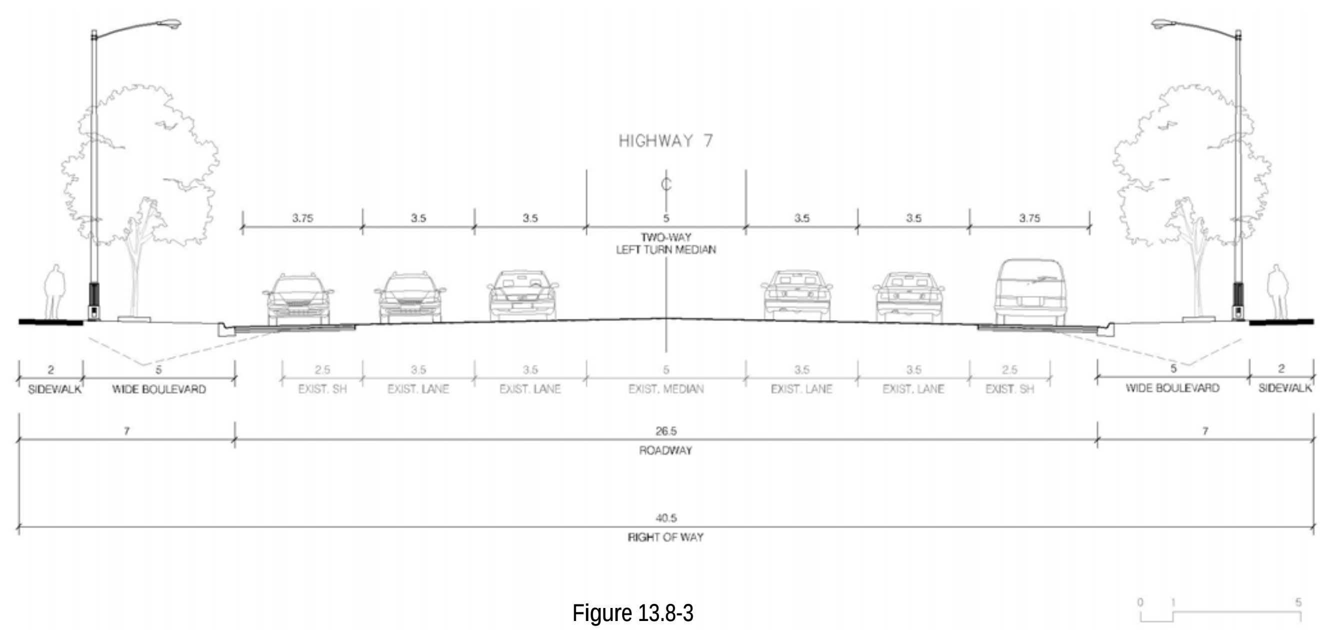

Figure 13.8-3
West Section: Montgomery Court to Town Centre Boulevard
Alternative 3: Wide Boulevard

Conclusion:

The evaluation summarized in **Table 13.8-1** indicates that **Alternative 2** ranks consistently higher than the other two alternatives and consequently, was selected as the preferred Alternative due mainly to the following advantages:

- By building the road cross-section to its ultimate stage, the overall capital cost of the widening works will be substantially less than in the other two alternatives since it would require only minimum road reconstruction when rapid transit is implemented; and
- Reconstructing the road when the transitway is built, as is required with Alternatives 1 and 3, would have a negative effect on the public and property owners due to the inconvenience caused during construction (traffic delays, noise, utility relocation, sidewalks relocation, etc.).

13.8.3.2 East Section: Town Centre Boulevard to Sciberras Road

This section encompasses the portion of Highway 7 north of the future Markham Centre development. The Town of Markham's plans for this section of Highway 7, as indicated in the Markham Centre West Master Plan Study (2000) as well as the Highway 7 Streetscape Study (1998), include wide landscaped medians and boulevards to provide a more urbanized cross-section to the road. In addition, the Town requested a study of the possibility of providing a bicycle path along Highway 7, between the intersections with Warden Avenue and Sciberras Road. This request was based on the Region's policy of supporting bicycle facilities on Regional roads where appropriate (York Region Official Plan, Transportation Master Plan Final Report),

From Town Centre Boulevard to Sciberras Road two design options were evaluated, which are:

- A raised, landscaped wide median; and
- A reversible seventh lane for left turns between traffic directions.

The main features of the cross-sectional widening options are shown in **Figures 13.8-4 to 13.8-6** and described below. The evaluation of their advantages and disadvantages is summarized in **Table 13.8-2**.

Alternative 1: Raised Landscaped Median

In line with the Region and Town of Markham's plans to "urbanize" the image of Highway 7 by providing streetscaping elements where possible, this alternative includes a raised landscaped median varying in width from 4.45 m to over 20 m in front of the Civic Centre, depending on the available ROW.

Raising the median creates a barrier between the through lanes of both directions, restricting the direct access to commercial and residential land use on each side of the road between Verclair Gate and Sciberras Road. In order to overcome this restriction, the median will be interrupted in front of properties generating the most left-turning traffic such as St. Justin Martyr Catholic Church and the Markham Montessori School between Verclair Gate and Village Parkway; and the Sheridan and Garden Valley Nurseries between Village Parkway and Sciberras Road. Also, 'U' turns will be permitted during protected left turn signal phases at Verclair Gate, Village Parkway and Sciberras Road to provide access from both directions for the limited number of residences along this section.

The back edge of the sidewalks will coincide with the property lines and encroachment for grading will be negotiated with the owners as temporary easements or as acquisition.

Alternative 2: Reversible Seventh Lane for Left Turns between Traffic Directions

This alternative entails widening the road from four to six through lanes, leaving the existing traffic operation of Highway 7 basically unchanged, by permitting direct access to properties each side from a 5 m wide Seventh lane. This arrangement requires less ROW than Alternative 1.

Although this alternative facilitates direct access to residences and businesses along the road, it is not supported by the Town of Markham since it is contrary to their intended 'urbanized' image of Highway 7.

Table 13.8-2
Evaluation of Widening Alternatives
Town Centre Boulevard to Sciberras Road

Evaluation Criteria	Alternative 1 Raised Streetscape Median	Alternative 2 7th paved lane as median
Social-Environmental Impact	Landscaping will provide an urban image and enhance the widened road's appearance, supporting the Town's plans to change the characteristics of Highway 7.	The 7-lane uninterrupted cross-section would not provide the desired urban image.
Impact on Property	Slope grading will affect private property, requiring temporary easements or minor land acquisition.	Narrower cross-section minimizes impact on property.
Traffic Operation	Access to the few residences on each side will be modified to permissible 'U' turns at three intersections during dedicated signal phases.	Direct access to adjacent properties would remain the same as the existing mostly continuous left-turn lane.
Impact on Utilities	Moderate impact	Moderate impact
Capital Cost	Higher due to median treatment and land requirements.	Lower for construction and property.
Conclusion	Preferred Alternative	

Conclusion:

Despite its higher initial cost, **Alternative 1** was selected as the preferred Alternative because it supports the Town of Markham's and York Region's objective of an enhanced streetscape with full urban characteristics for this section of Highway 7, since it will function as the gateway to Unionville and communities to the east as well as the northern perimeter of the planned regional centre. It must also support new mixed-use developments either in construction and/or awaiting approval.

13.8.3.3 Traffic Recommendations for the Design Selected Alternative

To decrease the minimum split requirements for the north-south main phase with the implementation of the rapid transit lanes, the wide landscaped median and potential widening of Highway 7 to six lanes, it is also suggested that pedestrian split phasing be considered at the following intersections to permit additional "green time" to be allocated to the east-west phase as well as ensuring pedestrian safety.

The 3 m wide cycling path along the south side of Highway 7 between Warden Avenue and Sciberras Road as well as the sidewalks proposed on both sides of Highway 7 are expected to support the expected pedestrian cycling demand. In addition, it is recommended that all new intersections be equipped with pedestrian signal heads.

13.9 DESCRIPTION OF THE SELECTED PRELIMINARY DESIGN

The technically preferred design concept identified during the evaluation of alternatives was further refined to form the recommended preliminary design alternative. The following sections describe the main features of this design for the widening of Highway 7 between Montgomery Court and Sciberras Road.

13.9.1 Design Criteria

The design criteria corresponds to the York Region standards for the 70 km/h design speed (60 km/h posted speed) selected by the Region for this section of Highway 7. These are summarized in **Section 7.2.4** of this report. York Region authorized a reduced taper length of 60 metres for left turns at all signalized intersections.

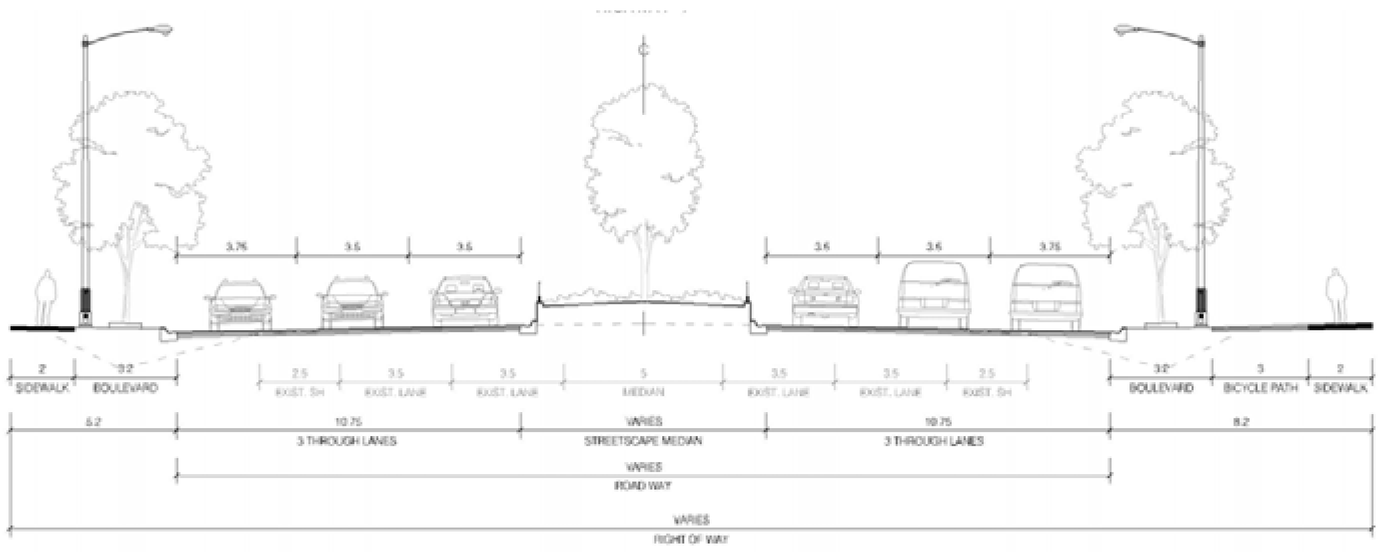

Figure 13.8-4
East Section: Town Centre Boulevard to Warden Avenue
Raised Median with Bicycle Path

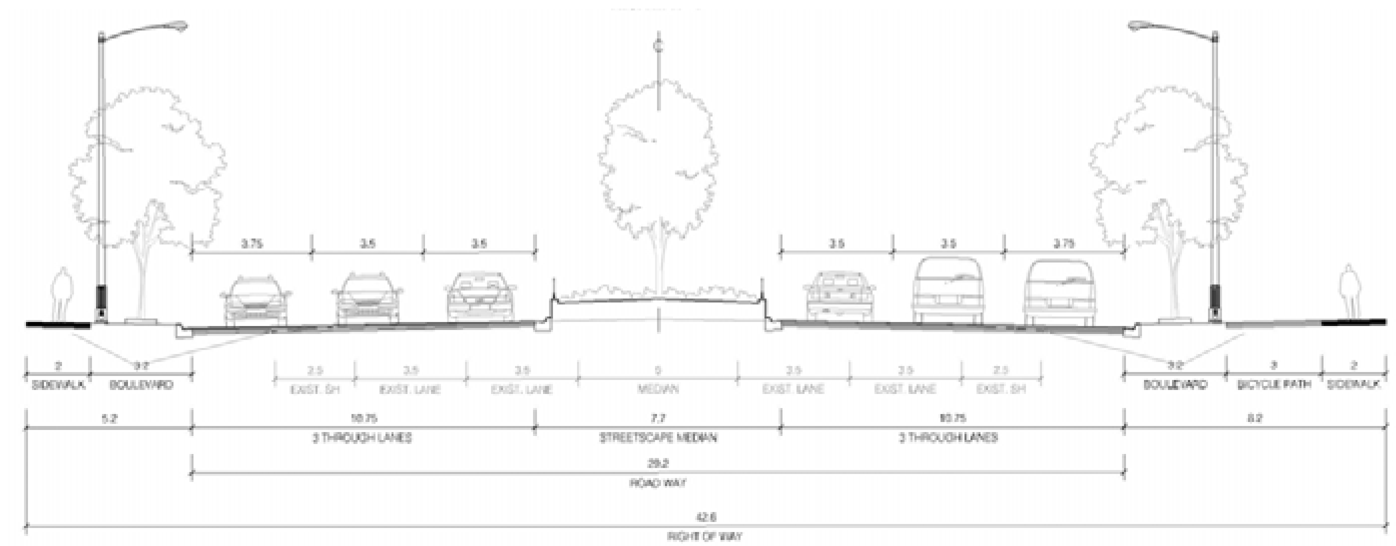

Figure 13.8-5
East Section: Warden Avenue to Sciberras Road
Alternative 1: Raised Median with Bicycle Path

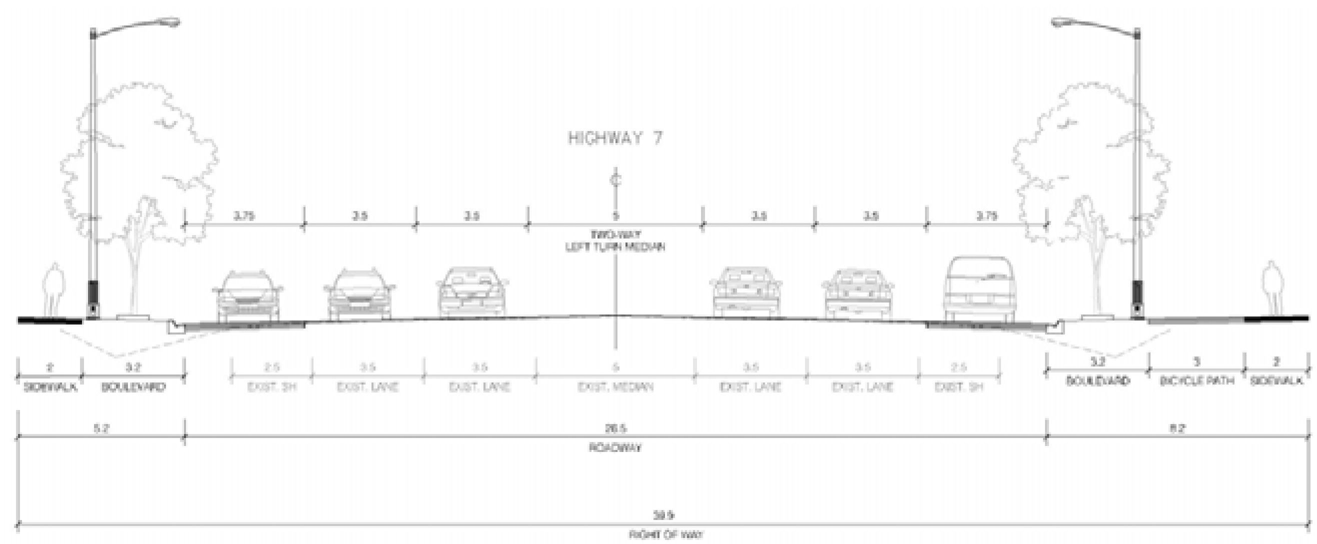

Figure 13.8-6
East Section: Warden Avenue to Sciberras Road
Alternative 2: Paved 7th Lane with Bicycle Path

13

13.9.2 Roadway Alignment

The horizontal alignment of the widening incorporates the characteristics described below:

- Montgomery Court to Rodick Road – Proposed centre line basically following existing centre line; landscaped median varying in width from 8.6 m to 12 m (dependent on the ROW requirements of the future transitway).
- Rodick Road to Town Centre Boulevard – Alignment governed by north property line which coincides with outside edge of proposed sidewalk; landscaped median varying in width from 8.6 m to 15.4 m. (dependent on the ROW requirements of the future transitway).
- Town Centre Boulevard to Warden Avenue - Proposed centre line basically following existing centre line; generous landscaped median varying from 11.2 to 23 m in width.
- Warden Avenue to Verclair Gate - Proposed centre line basically following existing centre line; 4. 45 m. wide landscaped median as well as back to back left turns.
- Verclair Gate to Sciberras Road – Alignment governed by property lines which coincide with both outside edges of the proposed sidewalks, maximizing the use of the available right of way; landscaped median varying in width from 4.45 to 7.7 m.

The preliminary vertical alignment along the whole section matches as closely as possible to the existing roadway profile. Plan and profile drawings are included in **Figures 13.9-1 to 13.9-5**.

13.9.3 Intersections

The preliminary design of the existing and future intersections along this stretch of Highway 7 incorporates the following:

- Rodick Road – Left turn lanes in both directions provided on Highway 7; right turn lanes eliminated.
- Future Circa Boulevard - Left turn lanes in both directions provided on Highway 7; no right turn lanes proposed.
- Town Centre Boulevard - Left turn lanes in both directions provided on Highway 7; right turn lanes eliminated.
- Future Street "C" – (T intersection to the south); east–south left turn lane provided; no west–south right turn lane included.
- Warden Avenue – Left and right turn lanes in both directions provided on Highway 7,
- Verclair Gate - Left turn lanes in both directions provided on Highway 7; provision for a future south extension of Verclair Gate included; westbound "U" turn permitted on left turn signal phase.
- Village Parkway/future Birchmount Extension - Left turn lanes in both directions provided on Highway 7; provision for a future south extension known as Birchmount Rd. Extension included; no right turn lanes included; "U" turns permitted on left turn signal phase.
- Future Street "B" – The Town of Markham has not yet determined when this future crossing street will be built; at this time, the Highway 7 widening preliminary design provides only an opening in the landscaped median which will serve as access to the nurseries from Highway 7 in the interim stage.
- Future Street "A" - The Town of Markham has not yet established an exact location or schedule for building the future street, consequently this preliminary design indicates only an approximate location of this right in – right out future intersection.
- Sciberras Road - Left turn lanes in both directions provided on Highway 7; provision for a future south extension of Sciberras Road is included; eastbound "U"-turn permitted on left turn signal phase.

The storage length of the left turn lanes recommended in the *Transportation Assessment* (**Appendix C**) was respected except at intersections too close to others (existing or future). The exceptions included Rodick Road westbound reduced from 70 to 67 metres; Warden Avenue eastbound reduced from 100 to 80 metres and the future south Village Parkway westbound reduced from 70 to 50 metres.

13.9.4 Bicycle Path

As requested by the Town, the preliminary design includes a 3 m wide bicycle path located between the boulevard and sidewalk from Warden Avenue to Sciberras Road on the south side. This bicycle path will include the standard traffic signage and signals as well as circulation criteria. Design specifics will be defined during the detailed design stage. It is anticipated that information and regulatory signs will be required to assure safety of users of the path, especially at the intersections and side entrances and exits.

13.9.5 Drainage

Highway 7 will be an urban cross-section with a storm sewer drainage system. The minor system flow will be conveyed by the storm sewer and the major/overland flow will be conveyed by the roadway. The proposed drainage and storm sewer outlets are summarized on a section by section basis.

Montgomery Court/Fairburn Drive to Apple Creek – Sta. 38+450 to Sta. 38+695

The highway slopes from west to east and the storm sewer will outlet to a grassed swale prior to discharging to Apple Creek (Rouge River). The overland flow will continue to flow eastward across the bridge and will contribute to the low point located approximately 180 m east of the river.

The existing highway has a paved area of approximately 0.46 ha. The proposed widening will increase the paved area by 0.35 ha. Water quality treatment for the increased pavement area can be provided by a grassed swale along the north side of the highway and west of Apple Creek.

Apple Creek to 200 m west of Town Centre Boulevard – Sta. 38+695 to Sta. 39+330

Highway runoff between Apple Creek and the high point located 200 m west of Town Centre Boulevard will flow to a low point located at Sta. 38+880 – approximately 180 m east of Apple Creek. The existing highway has a paved area of approximately 1.2 ha. The proposed widening will increase the paved area by 0.9 ha.

There is an existing storm water facility on the north side of Highway 7 and east of Apple Creek. The facility was retrofitted in 1997 as a wetland to provide water quality treatment and erosion control for a 42.5 ha area located north of Highway 7 and bounded on the west by Apple Creek and on the east by Town Centre Boulevard. While the wetland was not originally constructed to accept runoff from Highway 7, a review of the design report (*Stormwater Management Pond Retrofit, Civic Centre District, OPA 21, Town of Markham – Schaeffer & Associates, April 1997*) indicates that the water quality portion of the facility is 8% larger than required for the existing drainage area. The existing facility has sufficient capacity to provide water quality treatment for the increase in paved area for this section of Highway 7. A storm sewer will need to be constructed from the Highway 7 low point to the inlet portion of the pond.

The overland flow from the low point currently discharges southward from the road to a short tributary of Apple Creek. To allow for future development of the property to the south it is proposed that the storm sewer from the low point to the pond be oversized to provide a piped outlet for the overland flow.

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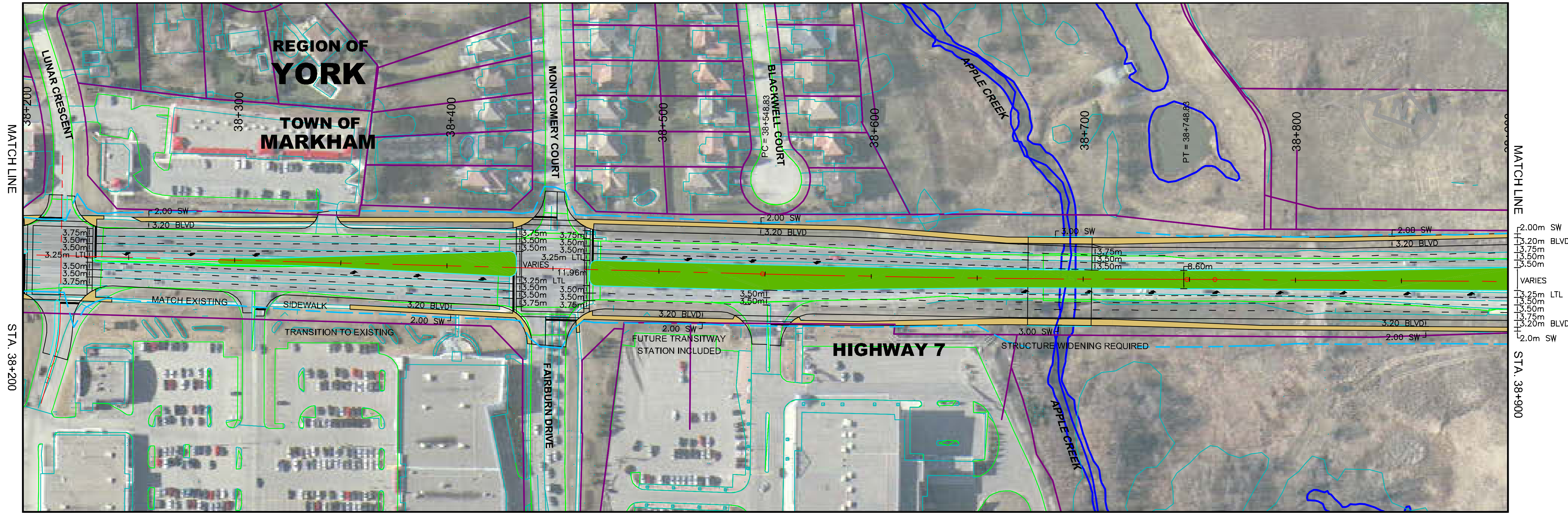

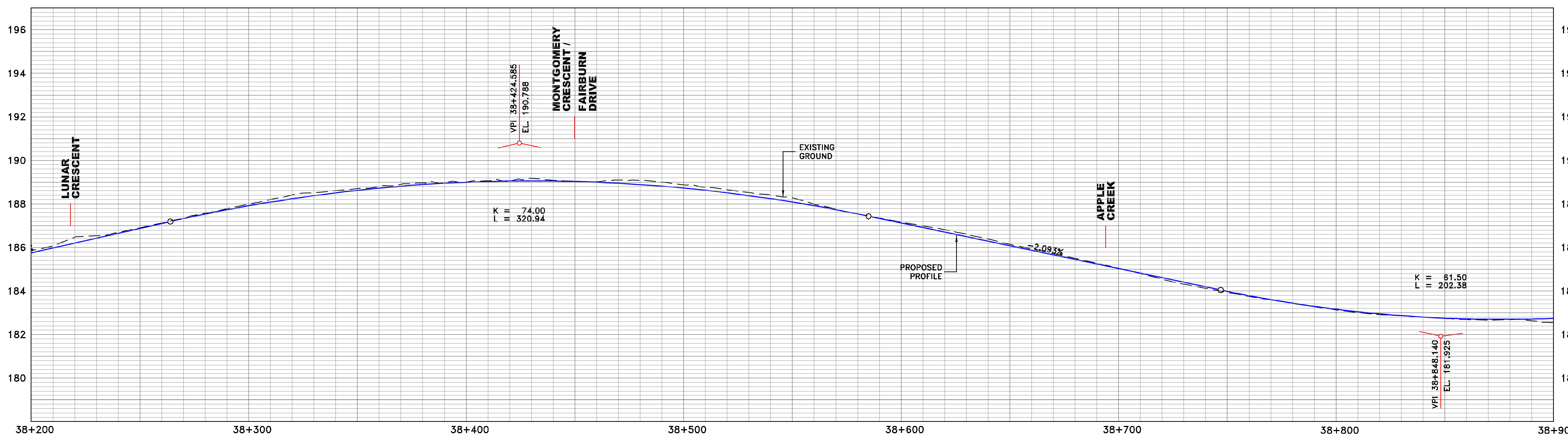

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Vertical: 1m 0 2m

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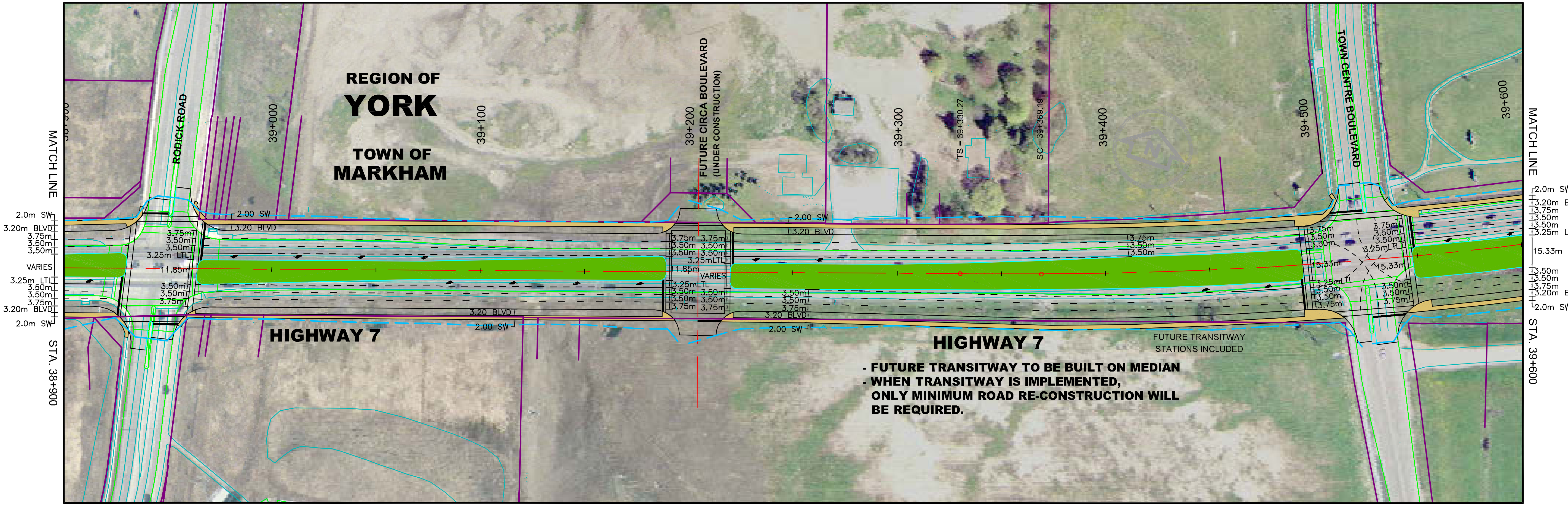
PROPOSED GRADING LINE	PROPOSED LANDSCAPE	WATERCOURSES	

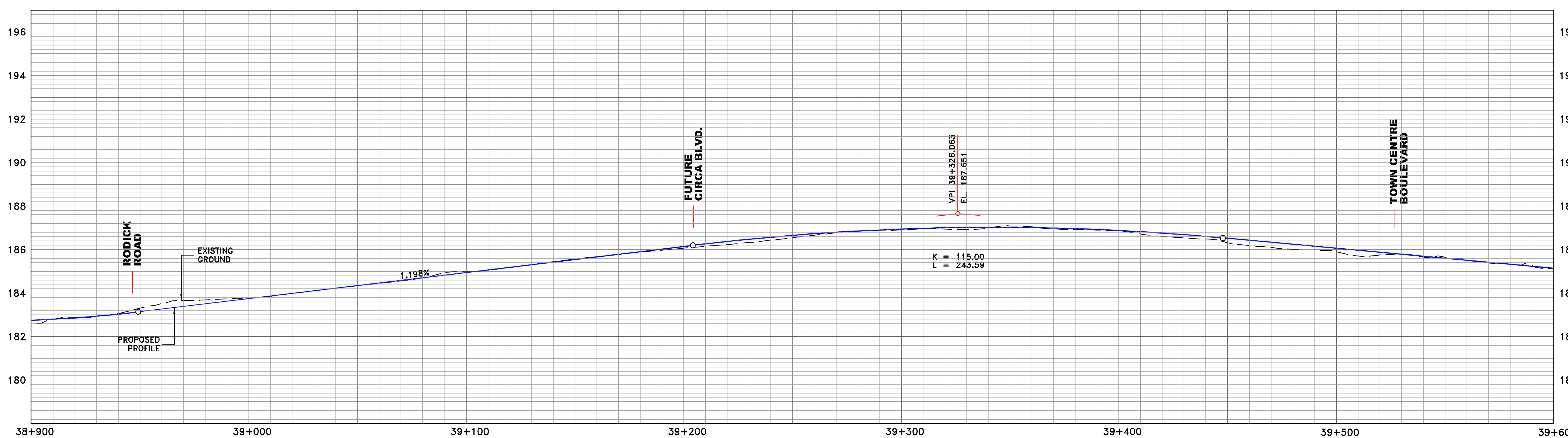
PREFERRED ALIGNMENT FOR THE HIGHWAY 7 ROAD WIDENING

13.9-1

FIGURE

METRIC





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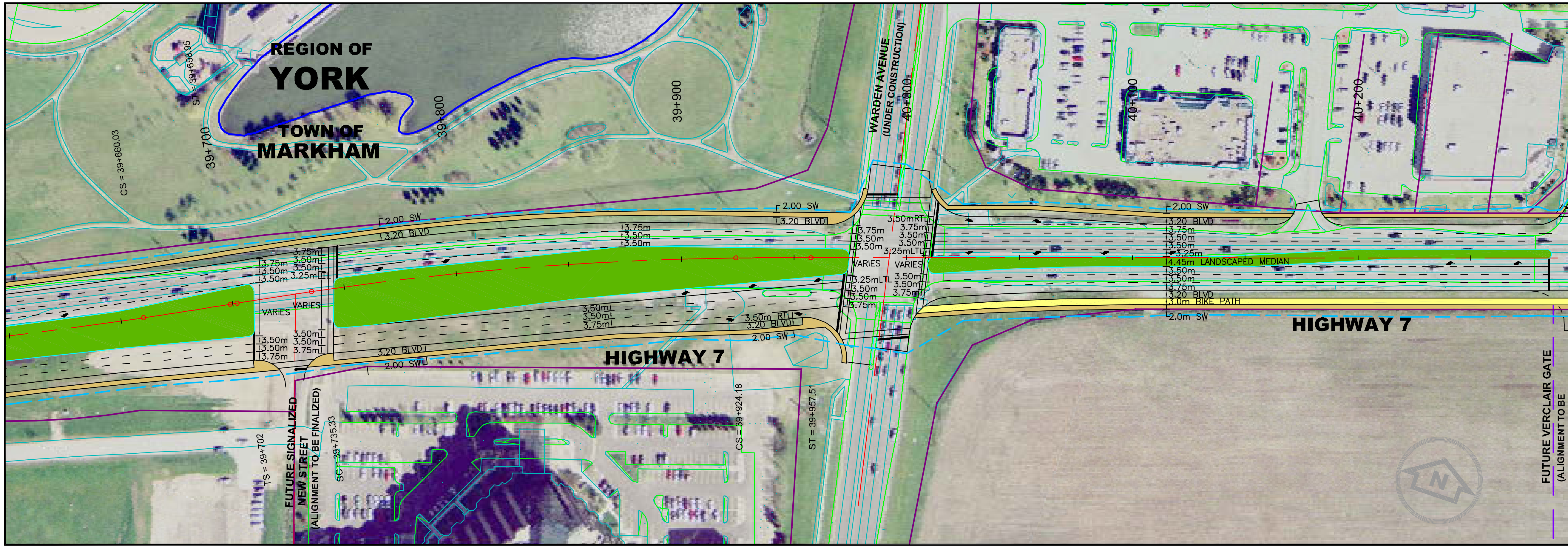
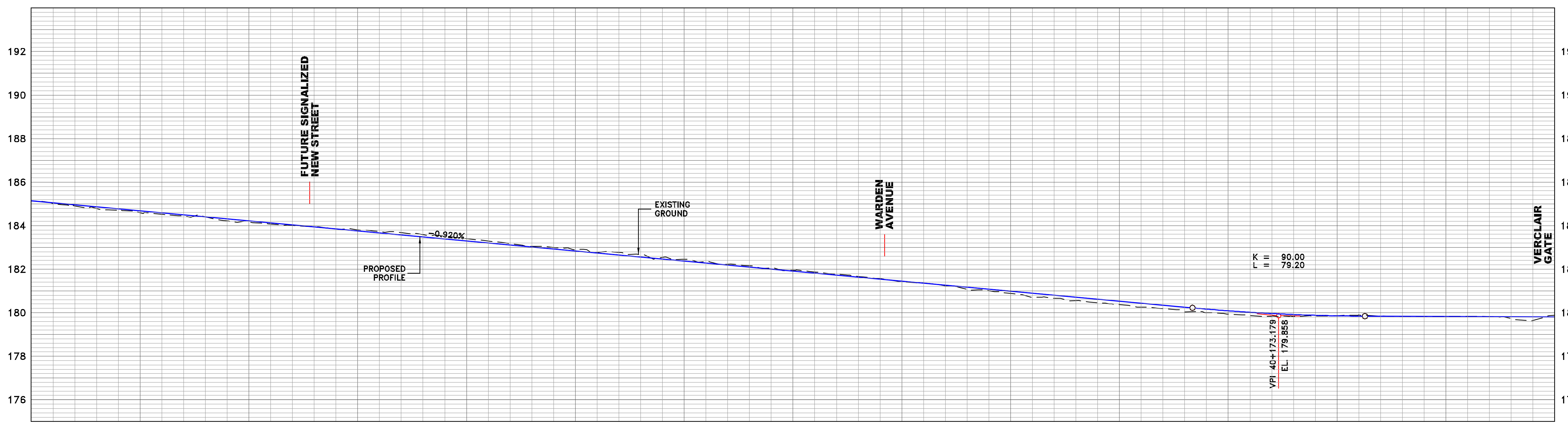
PROPOSED TRAFFIC LANES	PROPOSED SIDEWALK	PROPERTY LINE	
PROPOSED GRADING LINE	PROPOSED LANDSCAPE	WATERCOURSES	

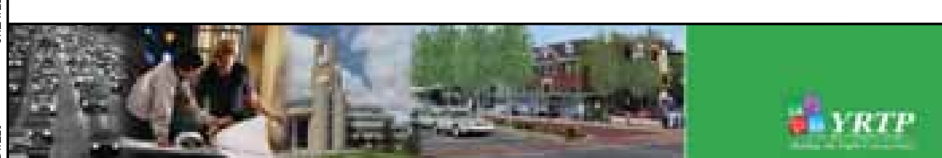
PREFERRED ALIGNMENT FOR THE HIGHWAY 7 ROAD WIDENING

FIGURE 13.9-2

METRIC







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Vertical	1m 0 2m

PROPOSED TRAFFIC LANES	PROPOSED SIDEWALK	PROPERTY LINE	
PROPOSED GRADING LINE	PROPOSED LANDSCAPE	WATERCOURSES	

PREFERRED ALIGNMENT FOR THE HIGHWAY 7 ROAD WIDENING

FIGURE 13.9-3

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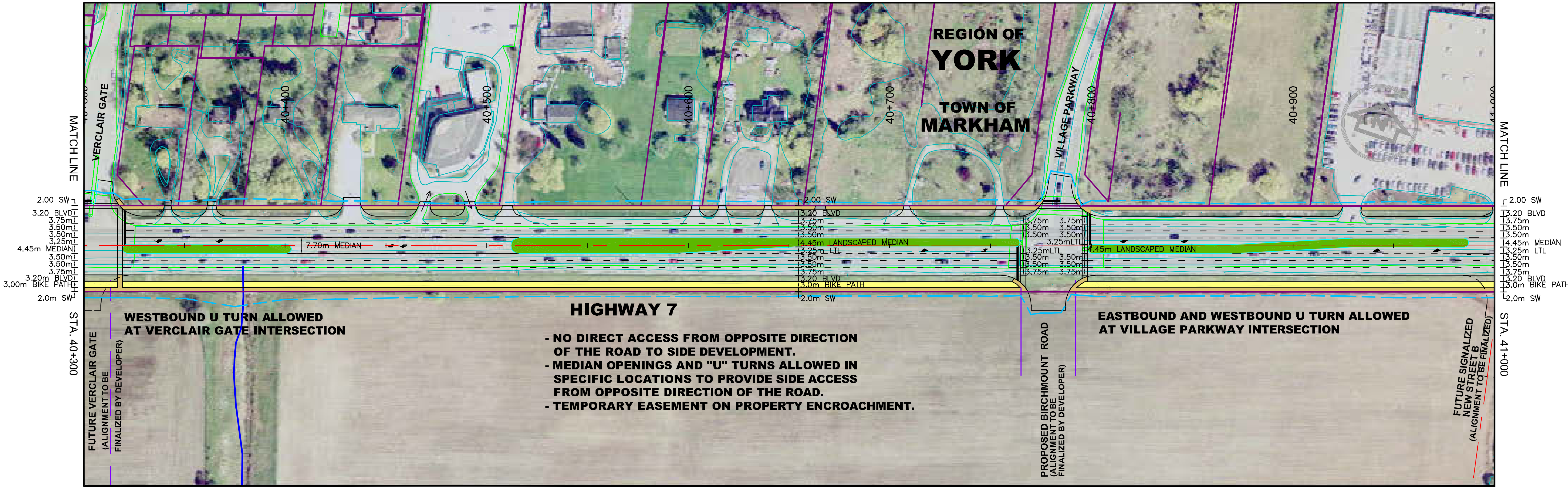

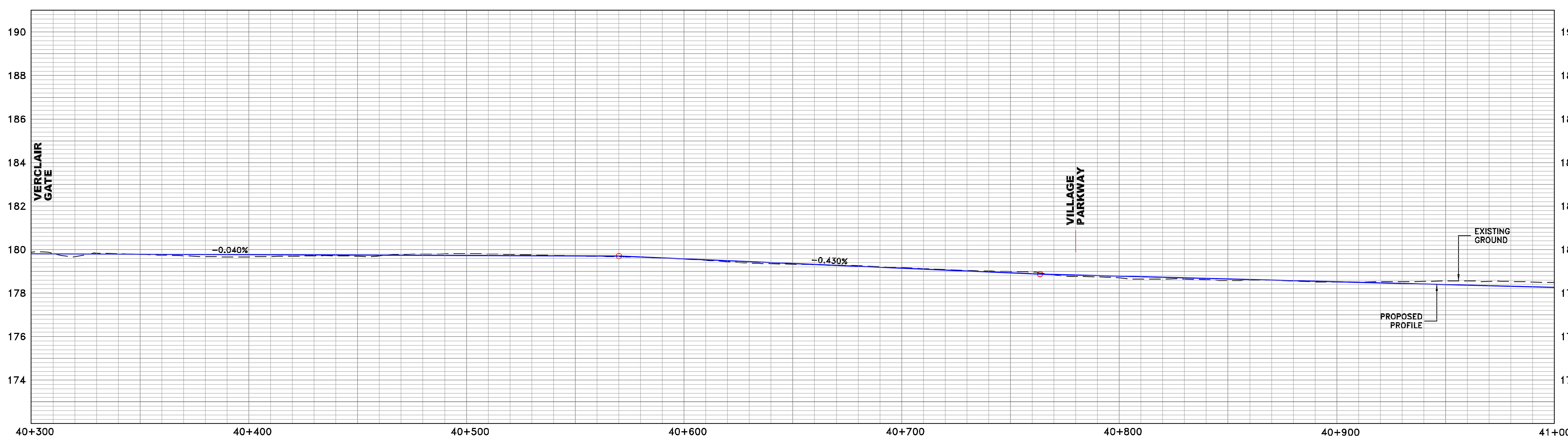

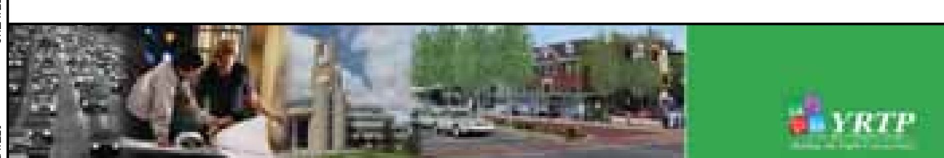

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PROPOSED GRADING LINE	PROPOSED LANDSCAPE
PROPERTY LINE	WATERCOURSES

PREFERRED ALIGNMENT FOR THE HIGHWAY 7 ROAD WIDENING

FIGURE 13.9-4

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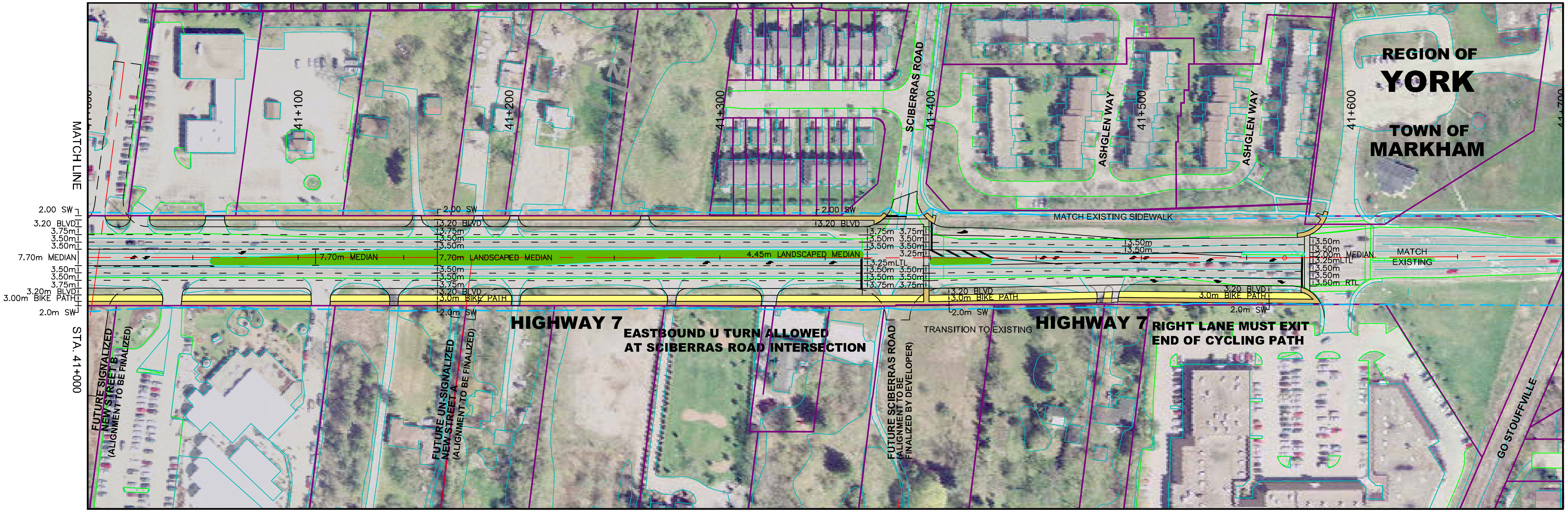

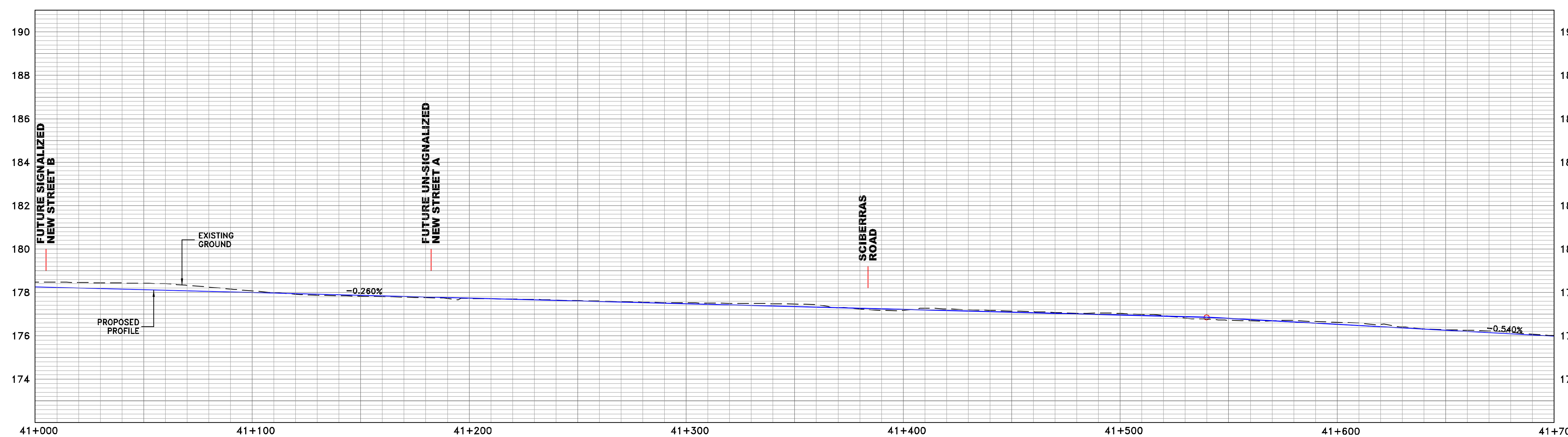

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PROPOSED TRAFFIC LANES	PROPOSED SIDEWALK	PROPERTY LINE	
PROPOSED GRADING LINE	PROPOSED LANDSCAPE	WATERCOURSES	

PREFERRED ALIGNMENT FOR THE HIGHWAY 7 ROAD WIDENING

FIGURE 13.9-5

200 m west of Town Centre Boulevard to Warden Avenue – Sta. 39+330 to Sta. 39+990

From the high point located west of Town Centre Boulevard, Highway 7 slopes eastward to Warden Avenue and beyond. The existing highway has a paved area of approximately 1.2 ha. The proposed widening will increase the paved area by 0.9 ha.

This section of Highway 7 was originally part of a 40 ha area in the 1994 Markham Centre Study that was bounded on the north by Highway 7, on the west by Rodick Road, on the south by the Rouge River and on the east by Warden Avenue. A storm sewer outlet for the north portion of this area - Clegg Road/ Cedarland Drive – has been installed with a direct discharge (no storm water management facility) to the Rouge River west of Warden Avenue. The future runoff from Highway 7 was not included in the design of the Clegg Road/ Cedarland Drive storm sewer.

There is an existing trunk sewer on Warden Avenue that flows southward and discharges to the Rouge River. There are indications that this trunk has enough capacity, which will have to be verified during detail design. The Highway 7 sewer will outlet into this existing Warden Avenue trunk sewer. There is limited space available to provide storm water quality control for this section of Highway 7 and the runoff from Highway 7 is only a small portion of the overall flow in the Warden Avenue trunk sewer. Storm water management for the Warden Avenue trunk sewer is beyond the scope of this study.

Overland flow will flow eastward on Highway 7 and then southward on Warden Avenue and will outlet to the Rouge River. Overland flow from a short section of Town Centre Boulevard north of Highway 7 will also be conveyed by Highway 7 when it is constructed as an urban cross-section.

Warden Avenue to Sciberras Road – Sta. 39+990 to Sta. 41+385

The existing highway has a paved area of approximately 2.7 ha. The proposed widening will increase the paved area by 2.0 ha.

The section of Highway 7 east of Warden Avenue is included in a current study – *Highway 7 Corridor Stormwater Management Facilities, Class Environmental Assessment* – being undertaken for the Town of Markham. The Study Area is bounded on the west by Warden Avenue, on the south by the Rouge River and on the east by Sciberras Drive, and includes all of the land south of Highway 7 as well as some areas north of Highway 7. The draft study report indicates that water quality control will be provided by two storm water management facilities located on the north edge of the Rouge River. The exact location of the ponds has not been finalized.

The storm sewers for this section of Highway 7 will connect to the trunk sewers within the development to the south and will outlet to the above noted storm water management facilities. These ponds will provide water quality treatment for the storm runoff prior to discharging to the Rouge River.

Overland flow from Highway 7 will follow the street pattern in the proposed development south of the highway and will discharge to the Rouge River.

The timing for the development of the area south of Highway 7 and the construction of the proposed ponds as well as the associated storm sewers is uncertain. If the proposed ponds or the future development are not implemented prior to the widening of Highway 7, interim or temporary solutions for storm sewer outlets and storm water management will need to be determined during the detail design phase of the Highway 7 widening.

Possible options to be considered during detail design are as follows:

- From Warden Avenue to Village Parkway – outlet the Highway 7 storm sewer and overland flow to the existing Flask Drain which flows south to the Rouge River. The Flask Drain is an existing outlet for storm runoff and would provide some water quality treatment.

- From Village Parkway to Sciberras Road – outlet to a storm sewer constructed within the proposed right-of-way for future Street "B". Street "B" is to be located along the western property boundary of Sheridan Nurseries and has been the subject of negotiations between the Town of Markham and both Lonsmount Construction Limited and Sheridan Nurseries, owners of the properties where this future street is planned to be located.

- The Street "B" storm sewer is included in the draft *Highway 7 Corridor Stormwater Management Facilities, Class Environmental Assessment* report and would need to be constructed with sufficient capacity for the both the Highway 7 runoff and the future surrounding development. Interim storm water management for the Highway 7 runoff could be provided by discharging the Highway 7 sewer to a grassed swale along the south side of Highway 7 approximately 60 m to 100 m upstream of the Street "B" sewer or by constructing a temporary storm water management facility at the downstream end of Street "B" prior to discharging to the Rouge River.

13.9.6 Pavement

A pavement design for bus bays and queue jump lanes was carried out for the Region's Phase 1 Rapid Transit Project based on bore hole information and predicted traffic loads. This preliminary pavement design for Highway 7 is based on this design. During detailed design a review of these recommendations will be conducted incorporating the findings of detailed soil investigations and traffic load analysis. The design was carried out in accordance with the AASHTO method using the following parameters:

- Number of standard, 80 kN axle loads over the Initial Performance Period – 122 articulated buses per day
- Desired Initial Serviceability Index – 4.5
- Terminal Serviceability Index – 2.5
- Allowable Total Loss in Serviceability – 2.0
- Reliability Level – 95%
- Overall Standard Deviation 0.44
- Subgrade Type – Silty Sand
- Roadbed Resiliency Modulus – Mr = 30,000 kN/m2
- Performance Period – 12 years
- Growth Rate – 3% (assumed)

Based on the information obtained in the field and predicted traffic the recommended preliminary pavement design for the widening, consists of the following:

- 140 mm Asphalt Concrete
- 150 – 200 mm Granular A base
- 450 – 500 mm Granular B Type II sub-base

Any maintenance or rehabilitation of the existing pavement should be addressed during the detailed design phase since maintenance work is currently being performed on the roadway. The recommended typical preliminary pavement design section is shown in **Figure 13.9-6**.

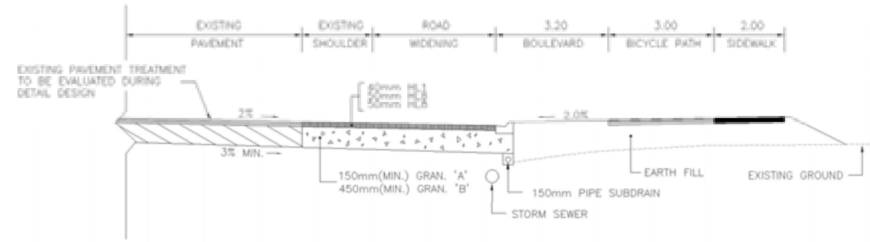


Figure 13.9-6
Preliminary Pavement Design

13.9.7 Apple Creek Bridge

Highway 7 crosses Apple Creek (a tributary of the Rouge River) approximately 250 m west of Rodick Road. The existing bridge will have to be widened to accommodate the future roadway cross-section which includes the future transitway ROW and the taper for the east to north left turn lane. This translates into a widening of 8.59 metres to the north and 10.83 metres to the south.

Hydraulics

The existing HEC-RAS model was modified to include the widening of the Highway 7 bridge from a current 21.6 m to a proposed width of 39.6 m. (In the model coding the current and proposed widths are recorded as 22 m. and 40 m respectively). The spacing between the upstream and downstream cross-sections was adjusted to accommodate the widening.

The data file with the revised bridge and the results of the hydraulic analysis are included in **Appendix G** of this Report as well as in the document sent to TRCA requesting the approval in principle for the bridge widening. **Appendix G** also includes the corresponding TRCA's approval in principle for the bridge widening.

The conclusions of the analysis indicate that with the proposed widening, the water level during the regional storm will rise 50 mm immediately upstream of the bridge. The water level will reduce to 30 mm at 175 m of the bridge and to 10 mm at 400 m upstream. Consequently, the existing bridge can be widened to a width of 40 m without causing adverse impact to the upstream flood levels. There is no change in the return period – 2 year to 100 year – flood levels with the proposed bridge.

Structure

The bridge will be widened by extending the substructure and superstructure in a configuration similar to the existing structure. Wingwalls, parapet walls and railings will be removed and reconstructed to the proposed widened alignment including a sidewalk on each side. The existing deck drains will be relocated or eliminated if the grades permit. The hydraulics of the widened structure should be reviewed to ensure that the reduced soffit height, due to the extended crossfall, is accommodated.

Based on the existing condition of the parapets and wingwalls, consideration should be given to conducting a deck condition survey on this structure prior to widening. If the deck condition warrants rehabilitation, the existing and new structures should be reconstructed to incorporate semi-integral abutments, thereby enhancing the durability of the existing and new portions of the widened structure.

13.9.8 Illumination

Highway 7 is classified as arterial urban and is under the jurisdiction of York Region. It is a six-lane cross-section between Montgomery Court and Town Centre Boulevard, and a four-lane cross-section from Town Centre Boulevard to Sciberras Road. The York Region illumination Design Criteria for urban roads is shown in **Table 13.9-1 (Illuminance) and Table 13.9-2 (Luminance)**.

Table 13.9-1
Illuminance Design Criteria for Urban Roads

	Average (lux)	Uniformity		Glare
		Avg./Min.	Max./Min	
Roadway	12-17 Eav	3:1	6:1	0.28 Lv Max (cd/m^2)
Intersections	17-22 Eav	3:1	6:1	0.28 Lv Max (cd/m^2)

Table 13.9-2
Luminance Design Criteria for Urban Roads

	Average (cd/m^2)	Uniformity		Glare
		Avg./Min.	Max./Min	
Roadway	0.8 to 1.2 Lav	3:1	5:1	20 to 30 Lv/Lav (%)
Intersections	1.2 to 1.4 Lav	3:1	4.5:1	20 to 25 Lv/Lav (%)

The hardware to be used will be in accordance with the Town of Markham current standards.

In order to accommodate the widening of Highway 7, the illumination design will be based on the following:

- on both sides of the road, preferably in a staggered arrangement;
- on the south side, the type of poles, brackets and luminaires should be in accordance with the Town of Markham current standards. In view of the proximity to the Buttonville airport, as well as the David Dunlap Observatory in Richmond Hill, luminaires should have flat glass lenses, and pole heights should not exceed the allowable heights within the approach surface to the airport's runway;
- on the north side, the luminaires will be installed on the relocated hydro poles. Coordination with Markham Hydro Authority is necessary to achieve spacing of the hydro poles suitable for the illumination levels and uniformity requirements;
- at intersections, the illumination should be integrated with the traffic signals in accordance with the requirements of York Region;
- an embedded duct for the lighting circuit should be provided on the south side of the Apple Creek bridge, which will be widened to accommodate the new road cross-section; and
- depending on the construction staging, temporary illumination may be required in order to achieve continuous night-time illumination throughout construction. The existing illumination will be affected by the relocation of the hydro line on the north side, where luminaires are present and the power supply is obtained, as well as the relocation of the lighting poles on the south side.

13.9.9 Utility Relocation

The proposed Highway 7 widening will require relocation of the overhead hydro line along the north side of the road, between Montgomery Court and Sciberras Road. The lines are to be relocated along the proposed boulevards, ideally at 2.50 metres from the back of the curb lines with the exception of three poles in front of the Tridel Development between the intersections of Rodick Road and Town Centre Boulevard. These three poles will be relocated at a shorter offset from the curb line as shown in **Figure 13.9-7**. This exception was made in order to respect the 5 metre minimum clearance from the power line to any structure (in this case the balconies of the already approved Tridel condominium buildings) as required by Hydro One.

In addition to the Hydro line relocation, the overhead TV cable from Montgomery Court to Sciberras Road, and the overhead fibre optic structure from Apple Creek to future Circa Boulevard and at the intersection of Warden Avenue are also to be relocated along the proposed boulevards.

13.9.10 Property Requirements

As indicated in other sections of this Chapter, the widening of this section of Highway 7 from four to six through lanes requires additional ROW in order to include a wide median and bicycle path. York Region's Official Plan indicates a maximum width of 45 metres on Highway 7 unless additional width is required for cuts, fills, extra lanes at intersections, high-occupancy vehicle (HOV) lanes, bicycle paths, sidewalks and landscaping where appropriate. The proposed design follows the Official Plan right-of-way provisions.

In most segments where private property is affected by the design, only the grading slopes encroach into private property. In a few of these cases new developments are in the process of approval and temporary easements and/or set back negotiations will be carried out by the Region and the Town. In cases where established commercial or residential property is affected, the Region will negotiate the acquisition of the required right-of-way widening. It is important to note that the lots along Highway 7 are very large and deep, and the strips of land to be acquired are far from the actual buildings representing an insignificant percentage of the total lot areas.

Property impact is shown on the plans in this report as well as in **Table O-1 (Appendix O)**.

13.9.11 Construction Staging

It is essential to maintain two through traffic lanes and left turn lanes at the signalized intersections at all times. In order to do so, the following general staging strategy is recommended for the construction:

Stage 1

- Pave existing granular shoulder on the north side of Highway 7;
- Reduce the centre left turn lane with from 5.5 m to 4 m in order to gain one traffic lane on the north side (i.e. paved shoulder + 1.5 m from centre left turn lane);
- Shift existing four-lane traffic to the north side; and
- Construct the widening on the south side of Highway 7.

Stage 2

- Shift the four-lane traffic to the south side; and
- Construct the widening on the north side.

Stage 3

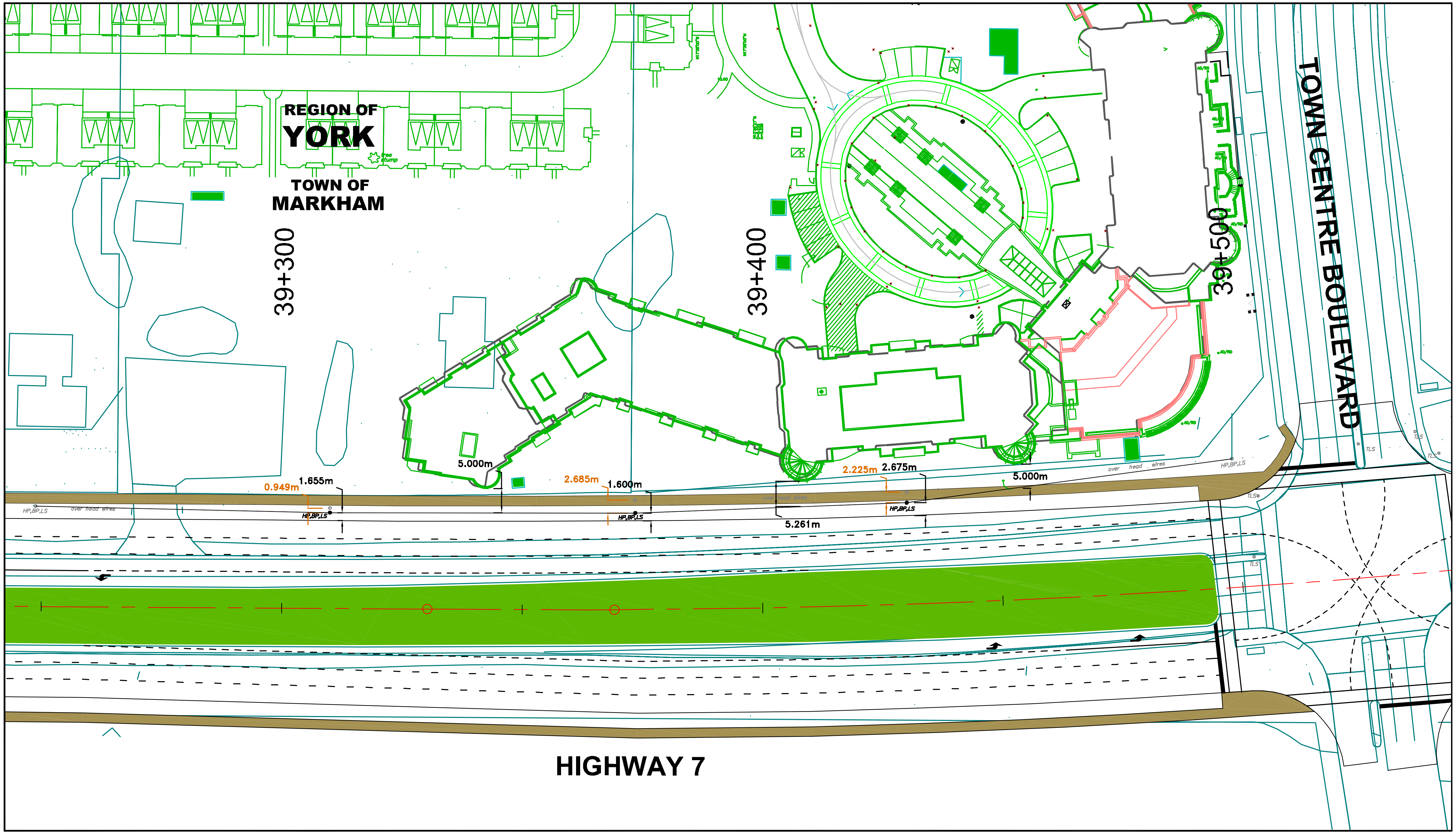
- Reduce traffic lane width to accommodate construction of the landscaped median;
- Shift traffic to its ultimate lane configuration, i.e. six lanes
- Construct landscaped median; and
- Reinstate lane width to the proposed width.

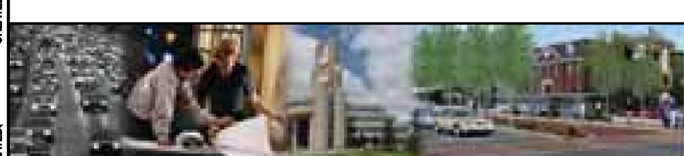
The construction staging of the drainage system will depend on the final location of the various elements proposed. This is to be defined at the detailed design phase.

Utility relocation should be done during the construction of the correspondent boulevard in the staging plan outlined above.

Measures such as night shifts and weekend work along with incentives to the contractors for finishing the work ahead of schedule are recommended to speed up the process and reduce inconvenience to the public.

METRIC





NOT TO SCALE

PROPOSED TRAFFIC LANES		PROPOSED SIDEWALK		PROPERTY LINE	
EXISTING HYDRO LINE		RELOCATED HYDRO LINE		PROPOSED LANDSCAPE	

HIGHWAY 7 CORRIDOR WIDENING - HYDRO POLE RELOCATION

13.9-7

FIGURE

DRAWING NAME: J:\Data\PM1435\PM\dwgs\HWY 7 Widening EA\Utilities\report\hydro pole relocated in Tridel area.dwg
CREATED: CREATED MODIFIED: Apr 04, 2005 - 12:01pm MODTIME

14. PUBLIC AND AGENCY INVOLVEMENT

There are five features that are key to the successful planning under the Environmental Assessment Act. The five features that are described in the "Interim Guidelines on Environmental Assessment Planning and Approval, Ministry of Environment, 1989" are:

- Consultation with affected parties;
- Consideration of reasonable alternatives;
- Consideration of all aspects of the environment (i.e., natural, social, economic, cultural and technical);
- Systematic evaluation of net environmental effects; and
- Clear and complete documentation of the planning process.

The consultation process developed for this study contributes to the achievement of each of these key features. As such an extensive public involvement program was followed during the EA. The study was organized so that interested parties were:

- Informed throughout the study by the use of various communication channels and techniques;
- Involved throughout the study period and as well notified of appropriate milestones;
- Provided access to current information in an efficient manner;
- Provided sufficient time to respond to question and data request; and
- Encouraged to participate in an issue identification and resolution process.

The program ensured that concerns and issues were brought forward early and addressed appropriately in the course of the study. In addition, ***Public Consultation Centres*** were organized on several occasions for the general public to review and comment on the findings and progress of the study. These were advertised in local newspapers and mail-drop notices. A mailing list, carried over from the ToR preparation, was also maintained and updated during the course of the study.

When appropriate, meetings with specific interest groups were held to deal with localized issues and many formal meetings and presentations were organized with various stakeholders within the Study Area. As well, information regarding the status of the EA Study was available on the Region's website throughout the study.

Since the preparation of the ToR, most of the Technical Advisory Committee (TAC) members have continued their involvement in the EA, although some members have decided not to participate since the limits of the EA Study was set outside of their jurisdiction. Others, even though representing agencies that were outside the reduced study limits, remained on the TAC as York Region still intends to introduce transit priority measures north of the current study limits (i.e., From 19th Avenue to Davis Drive in Newmarket) within their jurisdiction.

Participating technical agencies have continued to be involved during the EA Study and were actively involved in scoping the issues, developing and assessing alternative alignments, and developing mitigating measures for unavoidable impacts. Consultation with agencies was held through formal TAC meetings, site visits, workshops and correspondence.

The public, including the general public, communities, interest groups and property owners (residential/business/other) were offered several opportunities to review the study findings and provide input.

The public had four formal opportunities to participate in the EA Study through Public Consultation Centres (PCCs). In addition, representatives of key interest groups, community associations, business areas and heritage groups have been consulted through workshops, meetings and correspondence.

Technical Advisory Committee and Technical Agencies

A Technical Advisory Committee was organized to facilitate the line of communication between the Project Team and relevant agencies, thereby ensuring a seamless integration of Rapid Transit into the Region. TAC representatives were given the opportunity at all critical milestones to express any concerns their agencies may have with regards to the project. In addition, member's input was sought at various stages throughout the study and their suggestions and comments integrated into the scope of work. Given the nature of the study, the location of the Study Area, the range of issues and the potential for a high level of community interest and concern, the TAC was comprised of senior staff from the following agencies:

- York Region (including York Region Transit);
- Town of Markham;
- Town of Richmond Hill;
- City of Vaughan;
- City of Toronto;
- TTC;
- GO Transit;
- Ministry of Natural Resources (MNR);
- Ministry of Transportation (MTO);
- Toronto Regional Conservation Authority (TRCA); and
- Ministry of Culture.

The Environmental Assessment and Approvals Branch (EAAB) of the Ministry of the Environment (MOE) was asked to participate on the TAC but indicated that it was not their usual policy to participate in TAC meetings. Consequently, separate meetings were held with the MOE - EAAB to keep them informed of the study status and request comments. Meetings with MOE were also held to obtain input on noise and air quality protocols and methodologies.

Also, contact was initially established with CEAA to present the overall York Region Transit study on a program wide basis and to describe the three corridors through which implementation of the transit strategy was going to be undertaken. At this meeting a review of the application of the Federal Environmental Assessment procedures, and requirements and procedures for the screening procedures of "Triggers" under the Canadian Environmental Assessment Act was conducted. Finally CEAA was contacted at the final stages of the preparation of the EA to plan for the review of the Report.

During the EA phase, the TAC met on seven occasions. Three of these meetings were held immediately prior to Public Consultation Centres to present to TAC members the material for the upcoming PCCs and obtain their feedback. The four other meetings were held to:

- inform the TAC of the evaluation methodology of the alternatives and seek input from them;
- present the preferred alternative and summarize the rational for preferring the Highway 7 route; and
- review the draft EA Report and obtain final feedback on the Report prior to submission to MOE.

14

Copies of the Minutes of the Meetings can be found in **Appendix N**.

Technical Agencies

Key technical agencies were asked to provide input through participation on the TAC. In addition, those technical agencies with a potential interest in the study, including provincial, municipal, and federal agencies, were contacted at key points during the study and requested to provide technical input and to comment on the study findings.

The technical agencies that were contacted included the following (those shown with an asterisk (*) were also on the TAC):

❖ Ministry of Environment Environmental Assessment and Approval Branch Central Region	❖ Ministry of Natural Resources Aurora District* South Central Region ❖ Ministry of the Solicitor General - OPP
❖ Ministry of Culture Heritage Operations Regional Services Branch	❖ Ministry of Transportation Urban Planning Office Transportation Planning Branch
❖ Ministry of Education York Region District School Board York Region Separate School Board CSD Centre Sud-Ouest CBD Catholique Centre Sud	❖ Ontario Realty Corporation ❖ York Regional Fire Coordinator ❖ York Region Police Chief ❖ CN North America ❖ GO Transit*
❖ Ministry of Health	❖ Rouge Park
❖ York Regional Health Unit	❖ Environment Canada
❖ Ministry of Municipal Affairs and Housing Office of the Greater Toronto Area Central Municipal services Office	❖ Canadian Environmental Assessment Agency – Ontario Region

The Government Review Team (GRT) for the EA was given an opportunity to provide comments on the Draft EA report. A summary of these comments and the responses to each are included in **Appendix Q**.

14.1 PUBLIC INVOLVEMENT PROGRAM

For the purpose of the Highway 7 EA, the public included the general public, community groups, interest groups and property owners. Input from the public was obtained in a variety of ways including:

Public Notices – Several public notices were published to introduce the study to the public, to invite interested members of the public to be placed on the mailing list and to provide any preliminary comments. Notices were placed in local newspapers, including the *Markham Economist & Sun,* the *Vaughan Citizen*, and the *Richmond Hill Liberal*, before each *Public Consultation Centre* (the local newspapers cover all households in the Study Area and are a standard avenue for the Region to publish notices and information about these types of project). In addition, for the third PCC, announcements and information material were mailed and delivered to interest groups and community associations to all addresses along the proposed rapid transit corridor.

Public Consultation Centres (PCCs) – PCCs were held at four key stages during the study, including a final PCC after approval of the revised unscoped EA Terms of Reference. At each point, PCCs were held in three locations that provided geographic coverage along the 45 km Highway 7 rapid transit corridor. A fourth PCC location was held during the third and fourth rounds of consultation to accommodate local interest groups.

Project Website – The dedicated York Region Rapid Transit Website (www.yorkinmotion.com and subsequently www.vivayork.com) provided ongoing opportunity for the public to acquire information about the project, contact the Region and the Consortium team, and provide comments.

Region's Website – During the length of the study, current and updated information about the project was available on the Region's website (http://www.region.york.on.ca/Services/Transit/default+Public+Transit.htm). The Website included information on all aspects of the three ongoing Rapid Transit EAs in the Region, as well as information pertaining to other related rapid transit initiatives.

14.1.1 Public Consultation Centres

Public Consultation Centres were an important feedback instrument throughout the study duration. Using the format of an Open House, they allowed the public to keep up-to-date on the proposed design alternatives and recommendations for each main phase of the Project. During each PCC, the public was invited to review a detailed series of display boards, ask questions to team members and provide written and verbal comments. The full Public Consultation Centre reports are presented in **Appendix N**. The main highlights of each round of Meetings were as follows:

❖ First round of Public Consultation Centres

The purpose of the first PCC was to familiarize the public with the YRTP program, to provide the public with an opportunity to review and provide input regarding the collection of background data and to summarize the findings of the previously completed Need and Justification Study. This study included the analysis and evaluation of alternative transportation solutions. In addition to other information, the three routes identified in the ToR were displayed and the public was asked to provide feedback on the relative opportunities/challenges that each of these routes would present as well as any specific concerns or preferences. The first round of Public Consultation Centres was held in three locations:

Where	When?
Markville Mall, Town of Markham	Thursday, February 6, 2003 (2:30 pm to 8:30 pm)
Hillcrest Mall, Town of Richmond Hill	Friday, February 7, 2003 (2:30 pm to 8:30 pm)
Woodbridge Community Centre, City of Vaughan	Wednesday, February 12, 2003 (2:30 pm to 8:30 pm)

It should be noted that the second location at the Hillcrest Mall was a joint PCC with the Yonge Street EA presenting its second PCC material.

The material on display consisted of presentation boards, YRTP information banners, a continuous slide presentation and project-specific fact sheets. Upon arrival, attendees were asked to sign a visitor "sign-in" sheet. Examples of the material presented are included in **Appendix N**.

A total of forty-four (44) people signed the visitor's "sign-in" sheet at the February 6th PCC. Since the PCC was held in a shopping mall environment, it was more difficult to control the signing process. By actual count a total of 178 people reviewed some of the information available at the PCC. Of this total, 25% signed in and reviewed most of the information available, 66% reviewed most of the information available but did not sign in, and 34% reviewed the banner information located at the entry to the display area and the slide show which was visible from the entry to the display area but did not enter the display area or sign in.

A total of eight-four (84) people signed the "sign-in" sheet at the February 7th PCC. This was a joint presentation with the second PCC for the Yonge Street EA that attracted significant pass-by interest. It is conservatively estimated that there may have been at least 200 people who viewed some or all the display and pick-up hand-out material but did not sign in.

A total of seven (7) people signed the "sign-in" sheet at the February 12th Open House. Since there are no enclosed shopping malls in the Woodbridge area with areas for displays such as this, there was virtually no pass-by interest. As a result, those who came were all interested in learning more about the project.

A "Comment Sheet" box was available at all three venues for participants to submit their comments on the project and on the presentation material. In addition to numerous verbal comments, eighteen (18) written comment sheets were completed and submitted (see **Appendix N**). The overall response to the material presented at the PCC appeared to be very supportive with the majority of participants supporting Rapid Transit along Highway 7 and in the Region. The most common comments/concerns expressed verbally by the participants at the first PCC were:

- Support for a Rapid Transit system along Highway 7;
- The opinion that reduced travelling times, passenger comfort, proximity to origin or destination, fare affordability and general safety were the most important factors to a successful RT system; and
- Concern that the approval and implementation will be delayed.

Second round of Public Consultation Centres

The purpose of the second PCC was to review and provide input regarding the comparative assessment of the alternatives, the determination of the preferred undertaking, potential environmental effects, and proposed mitigating measures, and to obtain feedback on specific concerns or preferences. The second round of Public Consultation Centres was held:

Where	When?
Hillcrest Mall, Town of Richmond Hill	Thursday, April 24, 2003 (3:00 pm to 8:00 pm)
Chancellor Community Centre, Vaughan	Friday, April 25, 2003 (3:00 pm to 8:00 pm)
Markville Mall, Town of Markham	Saturday, April 26, 2003 (3:00 pm to 8:00 pm)

The material on display consisted of presentation boards, YRTP information banners, a continuous slide presentation and project-specific fact sheets. Upon arrival, attendees were asked to sign a visitor "sign-in" sheet. Examples of the material presented are included in **Appendix N**.

A total of forty-three (43) people signed the visitor's "sign-in" sheet at the April 24th PCC, seventeen (17) people signed at the April 25th PCC and a total of sixty-four (64) people signed at the April 26th PCC. Based on previous documented experience at these or similar venues for this project, the total attendance at the three locations may have been in excess of 400.

A "Comment Sheet" box was available at all venues for participants to submit their comments on the project and on the presentation material. In addition to verbal comments, eight (8) written comment sheets were completed and submitted in the "Comment Sheet" box at the venue on Thursday, another three (3) comment sheets were submitted at Friday's session and eight (8) comments were submitted on the Saturday session. The overall response to the material presented at the PCC appeared to be very supportive with the majority of participants supporting Rapid Transit along Highway 7 and in the Region in general.

The most frequent comments/concerns expressed by the participants at the second PCC were:

- The confirmation of a general support for a Rapid Transit system along Highway 7;
- The confirmation from the first PCC that fast travelling speeds, passenger comfort, overall convenience, fare affordability and general safety were the most important factors to a successful RT system; and
- Suggestions that more parking (Park-and-Ride facilities) should be provided around main intersections in the vicinity of the transitway stations.

Third round of Public Consultation Centres

The purpose of this third PCC was to present to the public the preferred route for a median transitway and describe its main characteristics as the recommended undertaking. The third round of Public Consultation Centres was held:

Where	When?
Hillcrest Mall, Town of Richmond Hill	Thursday, September 18, 2003 (3:00 pm to 8:00 pm)
Markville Mall, Town of Markham	Friday, September 19, 2003 (3:00 pm to 8:00 pm)
The Promenade, Thornhill	Saturday, September 20 , 2003 (3:00 pm to 8:00 pm)
Rosemount Community Centre	Tuesday, September 23, 2003 (6:00 pm to 9:00 pm)

The material on display consisted of presentation boards, YRTP information banners, a continuous slide presentation and project-specific fact sheets explaining the reasons for retaining the Highway 7 alignment and a general description of the transitway. The Region of York also used the opportunity offered by this PCC to present a series of Planning Policy boards that were in support of transit related development within the corridor. Upon arrival, attendees were asked to sign a visitor "sign-in" sheet. **Appendix N** contains the record of the material presented.

A total of 176 people signed the "sign-in" sheet at all four PCCs. Given the "mall" type of environment for three of the four meetings, it was difficult to insure that all the visitors would sign in. However, based on the number of information sheets that were taken by the public, it is estimated that in excess of 400 visitors actually consulted the exhibits on those days. A total of forty-seven (47) people signed the visitor's "sign-in" sheet at Thursday's meeting, six-five (65) signed-in at Friday's PCC, fifty-three (53) signed-in at Saturday's meeting and eleven (11) on the Tuesday evening meeting.

As it was the case during the first two rounds of PCCs, a "Comment Sheet" box was available at all four venues for participants to submit their comments on the project. In addition to verbal comments, twenty-seven (27) written comment sheets were completed and submitted. The questionnaire, asked four questions to the public. The most frequent comments/concerns expressed by the participants at this third round of Public Consultation Centres were:

- The retained main option along Highway 7 and the recommended route alternatives along the corridor were supported by a majority of the participants;
- Because this third round of PCCs dealt with a more specific alignment for the transitway, several landowners or area residents were concerned with potential land acquisition on their property or of the property where their building is located; and
- Several area residents expressed concerns that the transitway would increase local traffic within and along the Highway 7 Corridor.

Final round of Public Consultation Centres

A final series of PCCs was convened after the July 2004 approval of the revised ToR for the EA study. These PCCs, held on the dates below provided an opportunity for the public to review the findings of all steps in the EA process including an overview of the findings of the analysis of both alternatives to the undertaking (alternative transportation solutions) and alternative methods of carrying out the undertaking (routes and technologies). It should be noted that it was a joint PCC with the Yonge Street EA. The fourth location was held to focus on a community that may be affected by the Highway 7 Road Widening component of the EA.

Where	When?
Promenade Mall, City of Vaughan	Thursday, Sept 9, 2004 (from 3:00 pm to 9:00 pm)
Hillcrest Mall, Town of Richmond Hill	Saturday, Sept 11, 2004 (from 12:30 pm to 6:00 pm)
Markville Mall, Town of Markham	Friday, Sept. 17, 2004 (from 3:00 pm to 9:00 pm)
Markham Civic Centre, Town of Markham (to focus on the community that may be affected by the Highway 7 Road Widening component)	Thursday, October 28, 2004 (from 4:00pm to 9:00pm)

Again, the material on display consisted of presentation boards, YRTP information banners, a continuous slide presentation and project-specific fact sheets explaining the components of the Highway 7 as well as Yonge Street transitway designs and the environmental benefits of rapid transit service. In addition, copies of the detailed transitway alignment plan and profile drawings shown in **Chapter 9** were available for review by attendees.

Attendance at these PCCs exceeded 200, with 110 participants signing-in. Attendees included both those who were familiar with the project from previous PCCs and members of the public who were unaware of the project proposals. Some of the former attended to confirm that mitigation

14

discussed at prior meetings was being incorporated in the recommended design. Representative comments made by attendees included the following:

- Rapid transit in the form of a Yonge Subway extension or light rail service to Richmond Hill should be pursued;
- Reduce volume of traffic on roads by providing a fast, frequent service with convenient stations;
- Consider visual impact of transit facilities on the streetscape, respect natural features, minimize impacts and avoid a "barrier effect" between adjacent communities;
- Include attractive public spaces to encourage pedestrians and transit use;
- Provide convenient links to other existing transit services and routes such as GO Rail;
- Rapid transit is a good idea and much needed;
- Consider placing transit in the curb lanes with far side stops to make access safer and more convenient for pedestrians;
- The present frequency of GO service does not warrant a diversion from Highway 7 to the Unionville GO Station;
- Benchmark the top 10 European cities with similar demographics and climate to optimize the York Region package; and
- Concerns that the widening component should have been extended to Kennedy Road addressing the railway level-crossing with an underpass.

❖ **Record of Public Consultation Centres**

The record of the Public Consultation Centres described above is included in **Appendix N** and contains copies of comments received from the general public and examples of responses by the Region.

14.1.2 Facts Sheets

Over twenty (20) different Facts Sheets were prepared as part of he YRTP's larger communications program. The Facts Sheets presented information on a wide range of topics including specific information about the Consortium, the proposed technologies, as well as more general information relating to the environmental, transportation and economic benefits of the Plan. The facts sheets produced during the project covered topics such as follows:

- What is Rapid Transit?;
- What is York Region's Rapid Transit Plan?;
- Bring Rapid Transit to York Region: A Three-Phase Approach;
- Sustainability and Smart Growth;
- Mobility and Connectivity;
- Industry and Economy;
- Technology and Innovation;
- Integrated Family of Services Increases Convenience of Public Transit;
- Rapid Transit Corridors will Link Four Urban Centres within York Region;
- The Environmental Assessment Process;
- York Region's Rapid Transit Plan Technical Advisory Committee;
- York Region and York Consortium;
- Rapid Transit is Key to Smart Growth;
- Transportation Benefits of York Region's Rapid Transit Plan;
- Environmental Benefits of York Region's Rapid Transit Plan;
- Financial and Economic Benefits of York Region's Rapid Transit Plan;
- Innovation and Technology Benefits of York Region's Rapid Transit Plan;
- York Region is the Fastest Growing Municipality in the Greater Toronto Area;
- Transportation Gridlock Threatens Quality of Life;
- York Region's Rapid Transit Plan Improves Inter-Regional Connections;
- Measuring the Effectiveness of York Region's Rapid Transit Plan; and
- Quick Start will Speed Implementation of York Region's Rapid Transit Plan.

Other specific Facts Sheets, tailored to each of the Public Consultation Centres, were also produced during the length of the study.

14.1.3 York Rapid Transit Program Website

A comprehensive Website was created for the purpose of informing the public on the project progress. This Website, www.yorkinmotion.com has now been replaced by the www.vivayork.com site which contains a link to a summary of the material presented on the original site. Under the general heading of *Creating Transit for Tomorrow…Today*, the original site offered an extensive list of topics to consult under a number of headings, including:

- An explanation of the ***Quick Start Project*** which will introduce new service improvements, roadways modifications, stations, vehicles and amenities that work together to bring rapid transit to York Region in the short term.

- A description of the ***Improvements*** that will be brought about by the transitway project through an explanation of the *Planning and Environmental Assessment process*, the *Family of services* that will be offered, the *Proposed routes*, the *Expected benefits* and the *Timing* for implementation of the various components of the project.

- A general section introducing the basic ***Planning*** considerations and documents supporting the Rapid Transit Program in York Region. Among those, a brief presentation of the Smart Growth approach with relevant links to the Ontario Smart Growth website, a section introducing and linking to the York Region's Transportation Master Plan and current information pertaining to the EA processes for the proposed three main rapid transit corridors (Highway 7 and Vaughan North-South Link Transitway EA Study Markham North-South Link Transitway EA Study, Yonge Street Transitway EA Study).

- A section on all ***Engineering*** considerations including preliminary design, detailed design and construction general schedules. This section was designed to be easily accessible to the general public.

- An important section on ***Getting Involved*** inviting the public and community/interest groups to regularly consult *Public meeting notices*, *request presentations* or *book a speaker* in the context of the project.

- A general description of the ***Public-Private Partnership*** that was developed to create the *York Consortium*.

- A ***What's News*** section providing links and excerpts of recent headlines and Press releases pertaining to the project.

- A ***Library*** of Planning reports and other relevant documentation that could assist the public in better understanding the project and assessing its effect on the community.

- A ***Talk to us*** link provided visitors to the site a method to offer comments, request information and add their names to a master mailing list.

14.2 STAKEHOLDER CONSULTATION

First Nations Consultation

The Ontario Secretariat for Aboriginal Affairs (OSAA) received a copy of the Draft EA as part of the Government Review Team for this study. Following a review of the Draft EA, OSAA noted that there does not appear to be any land claims in the vicinity of the project. In addition, OSAA noted that the EA may be of interest to the Mississaugas of the New Credit First Nation and recommended that contact be made with them.

OSAA recommended that contact be made with organizations that represent a number of First Nations to inquire whether there are any First Nations who may be interested in the project and wish to provide comments. The two organizations identified by OSAA are the Association of Iroquois and Allied Indians, and the Anishinabek Region/Union of Ontario Indians. The Association of Iroquois Indians recommended contacting the Six Nations of the Grand River. The First Nations that encompass the southeast region within the Anishinabek Region/Union of Ontario Indians were contacted to see if they have a potential interest in the study. These First Nations include Alderville First Nation, Beausoleil First Nation, Algonquins of Pikwakanagan First Nation, Chippewas of Georgina Island First Nation, Curve Lake First Nation, Mississauga's of Scugog Island First Nation and Moose Deer Point First Nation.

OSAA also suggested that Indian and Northern Affairs Canada (INAC) be contacted since the Government of Canada sometimes receives claims that Ontario does not. Three different branches of INAC were contacted, namely the Comprehensive Claims, Specific Claims and Litigation Management and Resolution Branches. Study Area maps were provided for review and information on any First Nations that may have an interest in the EA was requested.

The Comprehensive Claims Branch of INAC noted that there are currently no comprehensive claims within the Study Area.

The Specific Claims Branch of INAC noted that the Study Area is located within the area delineated by the Toronto Purchase specific claim which involves the Mississaugas of the New Credit First Nation.

The Litigation Management and Resolution Branch of INAC noted a case involving the 1923 Williams Treaties which is currently in litigation. The First Nations involved as part of these Treaties and that may have an interest in the EA are the following: Alderville First Nation, Beausoleil First Nation, Chippewas of Georgina Island First Nations, Mississaugas of Scugog Island First Nation, Chippewas of Mnjikaning First Nation, Hiawatha First Nation and Curve Lake First Nation. Some of the First Nations that fall within the 1923 William Treaties are part of the Anishinabek Region/Union of Ontario Indians organization.

The First Nations listed above have been contacted to determine their interest in this EA, if any. The status of this contact is listed in **Table 14.2-1**.

Table 14.2-1
First Nations Contacted

First Nation	Response to Contact
1. Mississaugas of the New Credit First Nation	Would like to receive a copy of the EA.
2. Curve Lake First Nation	Do not require a copy of the EA. A notice of submission will be sent.
3. Alderville First Nation	Would like to receive a copy of the EA.
4. Beausoleil First Nation	Would like to receive a copy of the EA.
5. Chippewas of Georgina Island First Nation	Do not require a copy of the EA. A notice of submission will be sent.
6. Mississauga's of Scugog Island First Nation	Would like to receive a copy of the EA.
7. Hiawatha First Nation	Do not require a copy of the EA. A notice of submission will be sent.
8. Six Nations of the Grand River	Would like to receive a copy of the EA.
9. Algonquins of Pikwakanagan First Nation	Do not require a copy of the EA. A notice of submission will be sent.
10. Chippewas of Mnjikaning (Rama) First Nation	Response not available. A notice of submission will be sent.
11. Moose Deer Point First Nation	Response not available. A notice of submission will be sent.

Other Stakeholder Consultations

During the course of the EA, the study team consulted with several owners of property, either developed or in the process of being developed, along the routes under study. These consultations took the form of meetings, exchange of draft options analysis material and attendance at presentations. Examples of project locations where these consultations were conducted included:

- The link between Highway 7 and Markham Town Centre involving assessment of alignments on either Warden Avenue or South Town Centre Boulevard and the IBM property.
- The alignment along Centre Street in Vaughan for consideration of access to adjacent commercial property.
- Bathurst Street and Centre Street to provide intersection requirements to developers of adjacent vacant land.
- The alignment along Highway 7 between Rodick Road and Warden Avenue for discussion of right-of-way requirements and access locations with developers of adjacent property.
- Markham East for consideration of alignment options and right-of-way requirements in Cornell.
- Markham Town Centre for evaluation of alignment options and right-of-way requirements across the GO Stouffville Line and through the planned Town Centre development.
- Jane Street in front of the Beechwood Cemetery to address cemetery access issues.
- Highway 7 at Highway 404 to identify effects of transitway options on the proposed Seneca College campus.

General Presentations

The Region's general communications program included making presentations to a wide variety of stakeholders, opinion makers and community groups. While the EA Study was not usually the focus of these presentations, it was included as a key element of the overall rapid transit initiative in most of the presentations. Among the groups that received a presentation during the EA consultation period were:

- Local Boards of Trade;
- Canadian Urban Transit Association;
- Federal GTA Caucus;
- GO Transit;
- Toronto Strategic Transportation Planning Committee;
- Regional Council and all 3 local municipal Councils;
- Transportation committees of local municipalities
- Study teams for concurrent land use and streetscaping studies in Vaughan (Steeles Avenue and VCC) and Markham (Highway 7)
- MPs and MPPs;
- MP Town Hall meeting;
- Major land owners and developers;
- Large employers in the corridor;
- York University representatives;
- Markham-Stouffville Hospital representatives; and
- The Cornell community.

14.3 MUNICIPAL APPROVALS

At important decision points in the study, formal presentations were made to the Steering Committee and Regional Council to summarize the assessment of alternatives, the recommended designs and major recommendations of the study, including the final submission of this report. These presentations were also made to councils and committees of the City of Vaughan, the Town of Markham and Town of Richmond Hill.