

5. ALTERNATIVE METHODS OF IMPROVING PUBLIC TRANSIT

The previous chapter examined the potential transit demand for a rapid transit network, reflecting the direction of the York Region Transportation Master Plan. The analysis indicates that implementation of rapid transit service with the associated infrastructure will constitute an effective form of public transit improvement in the Markham North-South Link Corridor, and that ridership levels would justify dedicated rapid transit facilities in the longer term.

The purpose of this chapter is to examine alternative methods of improving public transit, including rapid transit, but also a broader range of measures that would serve to improve the attractiveness of transit in the corridor.

The analysis of alternative methods includes the following:

- Service Quality Alternatives
- Alternative Technologies
- Alternative Routings/Corridors
- Alternative Physical Infrastructure

5.1 TRANSIT RIDERSHIP PATTERNS

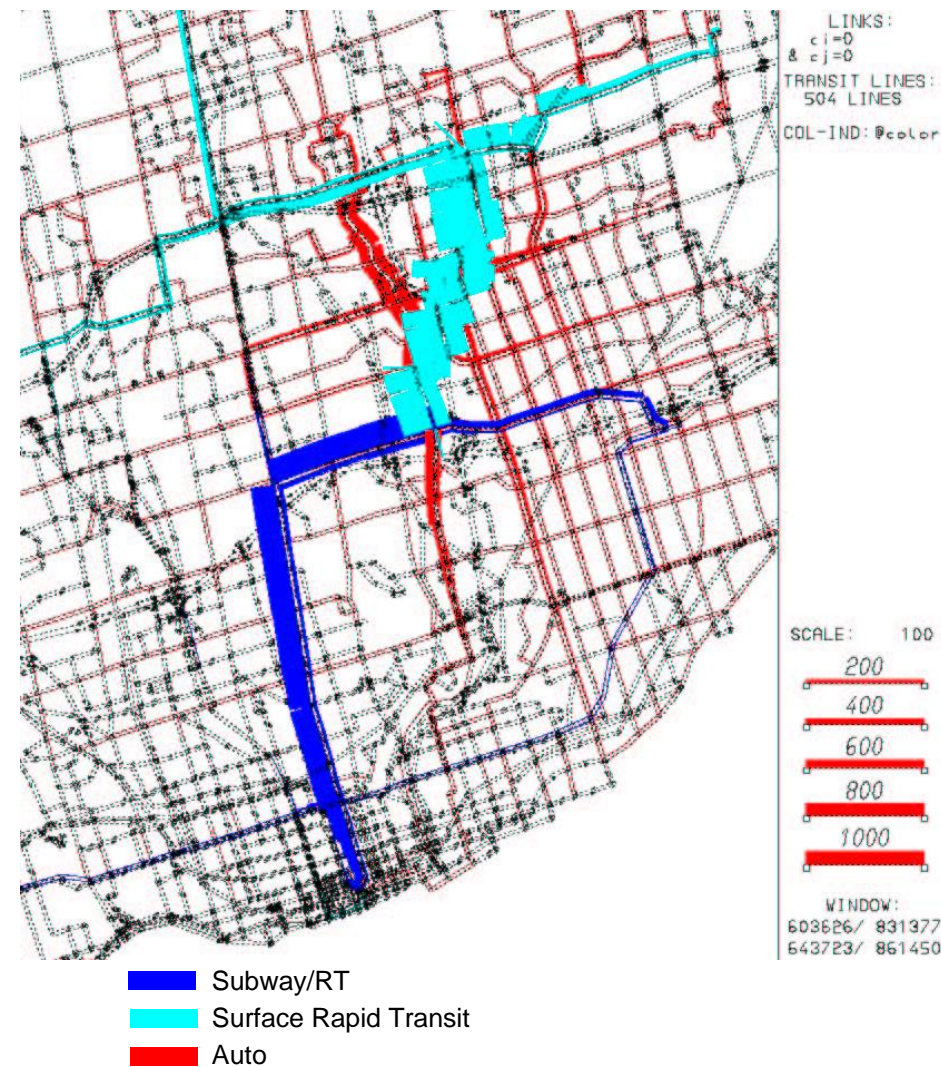
Transit travel patterns and transit system usage depend on a number of factors including the origin and destinations of people travelling to/from and within the corridor, transit services levels, convenience of connections and the characteristics of competing transit services.

In order to help develop and screen alternative methods for improving public transit, an analysis of the travel patterns of potential users of improved public transit systems was undertaken. This involved looking at future transit trips crossing the Steeles Avenue Screenline (between Don Mills Road and how they would use different transit services. Figure 5-1 provides a plot of the origin-destination patterns of transit passengers crossing the north of Steeles Avenue screenline (in either direction) for a network that includes rapid transit services in the VIVA Phase 1 (Warden Avenue) Corridor and transit priority services in the Don Mills/Leslie Street corridor. As shown, these services would attract a significant number of trips from throughout the VIVA network. A proportion of trips crossing the screenline in the southbound direction would continue to the Yonge Subway line, but clearly there is a high number of trips that start or end in the corridor.

One of the things that has become clear during this EA study, is that the Markham Link Corridor Improvements should not be just about finding the quickest way from Markham Centre to the Sheppard Subway. Improvements should also recognize that the corridor itself is a major destination. In fact, over 80% of Markham's employment is currently located in the broader study area.

A final conclusion from this analysis is that even with rapid transit in the VIVA Phase 1 corridor, there is still a strong demand for transit in the Don Mills/Leslie Street corridor. Again, this a direct result of the significant employment that is located in the Highway 404/Highway 7 Commercial Node.

Figure 5-1
Origin Destination Patterns for Transit Trips Crossing the North of Steeles Avenue Screenline
AM Peak Period Transit Trips (Excluding GO Transit)



5.2 METHODOLOGY USED TO SCREEN AND EVALUATE ALTERNATIVE METHODS

The types of alternative methods of improving public transit vary significantly, as do the range of potential environmental effects. Accordingly, criteria used for evaluating alternative methods were tailored to each type of method being assessed.

Criteria for evaluating the alternatives build on the initial criteria presented in Section 5.7.3 of the Terms of Reference. These initial criteria have been structured similar to the four objectives introduced in Chapter 3, with the addition of a fifth category reflecting cost-effectiveness and the inclusion of Smart Growth as a consideration. The five objectives are:

- Protect and Enhance Social Environment
- Protect and Enhance Natural Environment
- Promote Smart Growth and Economic Development
- Provide an Effective Transportation Service
- Maximize Cost-Effectiveness

Specific goals were then identified to allow a comparison of the advantages and disadvantages of each alternative method relating to the each category. Specific criteria/goals for each type of alternative method are discussed in the respective sections to follow. Wherever possible, quantitative criteria have been used.

5.3 SERVICE QUALITY ALTERNATIVES

5.3.1 Increasing the Frequency and Coverage of Services

Transit services in the study area are largely comprised of extensions of TTC services in the City of Toronto to serve selected employment nodes in York Region. YRT services in the study area are essentially act as neighbourhood circulator services or connections to the Sheppard Subway, in the case of the Leslie Street Services. Frequencies on most of these services are greater than 15 minutes, meaning that people experience long waits for what may only be a short trip. Another limitation of the existing transit services is that many services operate with very limited frequencies in the evening and on weekends.

The VIVA Phase 1 implemented in Fall 2005 has improved the attractiveness of transit in the study area by providing high quality, high frequency service throughout the day, evenings and weekends. However, an additional method of improving transit service quality would be to increase the frequencies and hours of operation of existing transit services, in combination with some route –restructuring to provide more

direct linkages between major residential areas (e.g. Markham Centre, Unionville, Cornell) and employment zones within the study area. As new road connections are made (e.g. Rodick Road, Birchmount Road), transit services could be introduced on these routes to improve service coverage.

The major drawback of this option is that simply increasing the frequency and coverage of services may not be enough to make people switch to transit, since buses would still be impacted by traffic congestion. As a result, this option is not considered to be an acceptable stand alone option for improving public transit. However, service improvements would complement other transit improvements.

5.3.2 Introducing Smaller Circulator Shuttles

Several communities are looking at introducing smaller buses that circulate through residential or employment areas. Essentially, these services are designed to move people from local areas to regional transit services or commuter rail services. They may also be combined with accessible transit services. These services could serve to significantly increase the coverage of transit services in many of the low-density employment areas that exist in the study area. One of the reasons why these services are not utilized more is that the costs of providing the services are similar to regular transit services because labour costs are essentially the same. The next York Region Transit 5-year service plan will feature a section on shuttle services.



5.3.3 Improved Transit Stops

Facilities for transit riders in the study area are limited. Most stops do not have weather protected waiting areas and many streets do not have sidewalks, or sidewalks are discontinuous. Many development sites are also designed for automobiles and as a result getting to and from transit stops is neither convenient or safe.



Therefore, one method for improving service quality would be to improve transit facilities, focusing on adding shelters and improving pedestrian connections to and from transit stops.

5.3.4 Improving Transit Priority

There are various methods of improving transit priority including:

- Transit actuated signals;
- Constructing queue jump lanes;
- Implementing turn restrictions to improve traffic flow;
- Implementing no parking or no stopping zones in congested areas.

Implementation of turn restrictions or no-stopping zones is not generally applicable to the transit corridors in the study area as most services operate on major arterials where parking is not permitted and turn restrictions would not be feasible.

Application of signal priority along bus routes with the goal of improving progression for buses over a number of signals may improve travel times slightly; however, the overall gains are relatively small. At many locations in the study area, simply providing signal priority at intersections for buses would not be effective without dedicated lanes to allow buses to by-pass queues upstream of the intersection. Such lanes are referred to as Queue Jump Lanes.



The implementation of Queue Jump Lanes is a key feature of the VIVA Phase 1 rapid transit service. However, in many cases these lanes could require additional right-of-way and therefore cannot be implemented without a proper environmental assessment. The construction of Queue Jump lanes, would be an effective method of improving transit service quality and is considered later in this EA.

5.3.5 Screening of Alternative Service Quality Improvements

Alternative methods of improving service quality were analysed and evaluated to determine which alternatives should be carried forward for more detailed analysis.

Criteria for evaluating the alternatives build on the initial criteria presented in Section 5.7.3 of the Terms of Reference. These have been translated into individual goals responding to each of the five main objectives. The following goals were chosen to assess each service quality alternative:

Protect and Enhance Social Environment:

- Improve accessibility to jobs for residents and employees

- Minimize effects on adjacent communities
- Minimize effects on safety and security
- Enhance acceptance of transit

Protect and Enhance Natural Environment:

- Enhance Natural Environment

Promote Smart Growth and Economic Development:

- Consistency with York Region Transportation Master Plan Objectives
- Impact on land use objectives

Provide an Effective Transportation Service:

- Improve transit user comfort
- Improve transit speed and travel times
- Improve transit service reliability
- Enhance continuity of transit services\

Maximize Cost-Effectiveness:

- Minimize operating costs
- Minimize capital costs

In general, the evaluation is based on qualitative assessments of each goal.

Table 5-1 summarizes the results of the screening process. Essentially, all of the service quality improvements will likely be implemented to varying degrees over time. In particular, VIVA Phase1 service implemented in Fall 2005 includes signal priority and enhanced transit stops/shelters. This service also includes other service quality improvements such as electronic fare payment and enhanced transit vehicles, which are key elements of Bus Rapid Transit as discussed in the next section.

Elements that would form part of the preferred undertaking, which includes the implementation of bus rapid transit, include improved transit stops and transit signal priority. Each of these is assessed in more detail on a location specific basis as part of the selection of the preferred design in Chapter 8.

In summary, the assessment resulted in the following transit service quality alternatives being carried forward for more detailed assessment: as part of the preferred design:

- Transit Priority
- Improved station stops

Increased frequencies and circulator buses are valid methods of improving public transit, but do not require further investigation under EA.

Table 5-1
Screening of Alternatives to Improve Service Quality

Objectives and Goals	Increases in Frequency and Coverage	Circulator Shuttles	Improved Transit Stops	Transit Signal Priority
PROTECT AND ENHANCE SOCIAL ENVIRONMENT				
Improve accessibility to jobs for residents and employees	● + Increased coverage provides more access to jobs; increased frequency makes transit more usable for residents	● + Provides more direct transit service to major employers	○ + Improved transit stops can be integrated with other pedestrian/streetscape initiatives, including improved sidewalks.	● + Reduces delays for transit riders
Minimize effects on adjacent communities	○ + Improves access to transit - May result in more buses within neighbourhoods	● + Improves access to transit + Reduces presence of large buses in neighbourhoods	○ + Improves overall aesthetics of community	○ ~ Minimal effects
Minimize effects on safety and security	○ + Reduces time spent waiting at shelters and therefore exposure to perceived security threats.	● + Minimizes walking distance to transit and therefore exposure to perceived safety/security threats	● + Shelters can be designed to enhance safety and security	○ ~ Minimal or uncertain impact on safety
Enhance acceptance of transit	○ + Increased frequency increases attractiveness of transit. - May result in some buses having few passengers, which the public views negatively.	● + Provides more "personalized" service	○ + Shelters can be designed be attractive and inviting	● + Positive impact if transit riders can see that they are getting an advantage over cars
PROTECT AND ENHANCE NATURAL ENVIRONMENT				
Enhance Natural Environment	○ + encourages shift from private autos to transit resulting in reduced air emissions	● + encourages shift from private autos to transit resulting in reduced air emissions	○ ~ Minimal impact on natural environment	○ ~ Minimal impact on natural environment
PROMOTE SMART GROWTH AND ECONOMIC DEVELOPMENT				
Consistency with York Region Transportation Master Plan Objectives	● + York TMP assumes improved transit in multiple corridors	○ ~ Not mentioned specifically in TMP	○ + Consistent with Rapid Transit concept described in TMP	● + Consistent with Rapid Transit approach described in TMP
Impact on land use objectives	● + Supports more compact mixed use development	○ + Can be integrated with new development	● + New development can be integrated with transit stops maximizing potential for transit use	○ + Improves capacity of transit and therefore development levels
PROVIDE AN EFFECTIVE TRANSPORTATION SERVICE				
Improve transit user comfort	○ + Reduces vehicle occupancy providing more room for passengers	○ + Reduces walking times to trunk routes, a key benefit in inclement weather.	● + Attractive stations with weather protection can significantly improve user comfort	○ ~ Minimal impacts on user comfort
Improve transit speed and travel times	○ + Reduces wait times	○ + Reduces walk times	○ ~ Minimal impact on transit speeds or times	● + potential to reduce bus times, particularly if implemented in conjunction with queue jump lanes
Improve transit service reliability	● + Reduces uncertainty of arrival time	○ + Shuttles generally operate on fixed schedules _ Need to be coordinated with regular transit services to avoid unnecessary wait times	○ + Stations can include real-time bus time updates, improving perceived reliability	○ + Improved schedule adherence
Enhance continuity of transit services	● + Generally higher frequencies and greater coverage results in more seamless transit travel	○ + Improves connections from main routes to employment areas - May require additional transfer	○ ~ Minimal impact on continuity	○ ~ Minimal impact on continuity
MAXIMIZE COST-EFFECTIVENESS				
Minimize operating costs	○ - Operating costs will increase; subsidy per passenger may increase if ridership increase is lower than service increase	○ - labour costs are high in proportion to bus capacity + vehicle are more efficient to operate	○ - increased maintenance costs for shelters	● + reduces bus travel times resulting in more cost-efficient service
Minimize capital costs	○ - requires significant number of new buses	○ - high capital costs to purchase buses + Circulator buses may off-set need to purchase regular buses	○ - enhanced shelters are more expensive than basic transit stop + overall capital requirements are low	● + may reduce number of buses required to provide service - capital costs to provide equipment, construct queue jump lanes (where required)
OVERALL ASSESSMENT	<ul style="list-style-type: none"> Provides the greatest potential for increasing transit ridership Increases capital and operating costs Will be integral part of public transit improvements solution <p>FURTHER INVESTIGATION NOT REQUIRED AS PART OF EA</p>	<ul style="list-style-type: none"> Provides the most potential benefit for accessibility to employment Relies on availability of frequent and reliable transit on regular routes Increases capital and operating costs <p>FURTHER INVESTIGATION NOT REQUIRED AS PART OF EA</p>	<ul style="list-style-type: none"> Overall costs are relatively low Has potential to improve overall image of public transit while enhancing safety and security <p>CARRIED FORWARD FOR MORE DETAILED INVESTIGATION AS PART OF PREFERRED DESIGN</p>	<ul style="list-style-type: none"> High return on investment due to more efficient transit times Minimal impacts on environment <p>CARRIED FORWARD FOR MORE DETAILED INVESTIGATION AS PART OF PREFERRED DESIGN</p>

LEGEND: Least Responsive ○ ● ● ● Most Responsive

5.4 ALTERNATIVE TRANSIT TECHNOLOGIES

5.4.1 Transit Technologies Considered

Both York Region's Transportation Master Plan and the analysis and evaluation of alternative transportation solutions carried out during this EA have indicated implementation of surface rapid transit service with the associated infrastructure will constitute an effective form of public transit improvement in the Markham North South Link Corridor.

As identified in the Terms of Reference, a comprehensive range of technologies was initially examined as part of the EA including:

- **Conventional Bus:** Conventional buses would be an integral part of any enhanced transit system, either serving to feed a rapid transit system or as an integral part of a bus-based system.
- **Bus Rapid Transit (BRT)** - Bus Rapid Transit is a flexible form of rapid transit that combines transit stations, vehicles, services, running way, and ITS elements into an integrated system.
- **Light Rail Transit (LRT)** - Light Rail Transit (LRT) is a flexible transportation mode that can operate in a variety of settings. LRT is a relatively low cost form of rail technology, usually obtaining electric power from overhead wires.
- **Diesel Multiple Units (DMU)** - This technology is a modern form of a diesel-powered rail car. DMU's are self-propelled and distinguished from current commuter rail equipment with each vehicle motorized rather than pushed or pulled by a heavy diesel engine. This type of technology would operate on conventional rail tracks, for example the GO Stouffville Line.
- **Automated Guideway Transit (AGT)** – this technology uses fully automated driverless trains, with fully grade-separated operations, typically on an elevated guideway.



- **Heavy Rail:** - this technology would consist of high capacity rail cars operating in trains of two or more cars on fixed rails in separate rights-of-way (ROW). This concept is used to serve very high volume corridors with capacities requirements in the order of 30,000 to 50,000 peak hour passengers per direction.



The selection of a transit technology should utilize information on the specific situation produced by an objective Environmental Assessment. The general consensus of transit professionals is that there is no specific demand volume at which there is always a single, preferred surface rapid transit mode because of the importance of relative costs, benefits and impacts in decision making. Two ridership level thresholds do, however, have important impacts on development of alternatives and mode selection:

- It is difficult to justify providing an exclusive lane for rapid transit if expected ridership is not higher than the number of people who would use the same road space in general traffic, i.e. 800-1,000 persons per hour on an arterial road lane or 2200-2400 per hour on a freeway lane;
- Above a certain demand level (7,000-10,000 persons per hour per direction), measures permitting BRT express service, partially grade separated rail transit (i.e., LRT) or fully grade separated rail transit (i.e. subway) is required to sustain reliable, high speed service.

Ridership forecasts developed for a representative rapid transit alignment in the Markham Link Corridor indicate a potential demand of between 2,500 and 3,500 persons per hour in the peak direction.

5.4.2 Screening of Transit Technologies

Table 5-2 provides a summary of the screening of transit technologies with a rationale for the selection of the preferred technologies provided below. Similar to the approach used for assessing service quality alternatives, the screening of technologies involved a comparison of the responsiveness of each alternative to the five primary objectives, as measured through the identification of goals. The goals, or criteria, were generally drawn from Section 5.7.3 of the Term of Reference, with the exception that some additional criteria were added.

5.4.2.1 Conventional Bus

Conventional buses will continue to be used on regular transit routes throughout York Region and the City of Toronto. Conventional buses could

also be used in providing transit service in transit priority corridors, such as Don Mills Road/Leslie Street in York Region and Victoria Park Avenue in the City of Toronto.

Conventional buses have little impact on the natural environment, assuming no new right-of-ways are constructed. Conventional buses are also economical on a cost per vehicle basis.

Conventional buses are carried forward to be considered as part of the overall plan to improve public transit services in the Markham Link corridor. However, as a technology for Bus Rapid Transit in VIVA corridors, conventional buses less desirable than other more enhanced transit vehicles.

5.4.2.2 Bus-Rapid Transit (BRT)

Bus-rapid transit, if implemented with significant priority, if not separate running ways, is consistent with the Region's vision for rapid transit. BRT has been selected as the preferred technology for both the Highway 7 Transitway and Yonge Street Transitway, while providing for the ability to change to LRT or Subway as demand increases. Depending on the alignment and cross-section elements, BRT could have impacts on the natural environment, as highlighted in Section 5.4 on Physical Infrastructure Alternatives. Similarly, more detailed assessments are needed to consider noise impacts in sensitive areas. In terms of costs, BRT is generally considered to be very cost efficient, although costs would vary depending on the extent of the existing road infrastructure that is used for the BRT running way. Overall BRT is a promising alternative and is carried forward for more detailed evaluation as part of the preferred design.

5.4.2.3 Light Rail Transit (LRT)

Light Rail Transit would be capable of providing the speeds, comfort levels and image that would be expected of a rapid transit system. It would be consistent with the Region's vision for rapid transit. As with BRT, the impacts of LRT on the natural environment would depend on the specific alignment and cross-section treatments. In terms of cost efficiency, LRT is generally more expensive than BRT, both in the cost of running ways and vehicle costs.

Based on the ridership estimates presented in the previous chapter, the capacity of a typical LRT system is 5-10 times higher than the predicted demand in this corridor. However, some experts argue that people are more likely to use rail vehicles than buses, and this is one reason for considering LRT.

A significant factor in considering LRT in the Markham North South Corridor is network continuity. Rapid transit services in the Markham Corridor are proposed to be fully integrated with other VIVA corridors. For example, a rapid transit vehicle could start in Markham, travel across Highway 7 and continue south on the Markham North South Link, without requiring a transfer. This would not be possible if LRT was chosen for the Markham corridor as LRT is not proposed for the easterly portion of the Highway 7 corridor for the foreseeable future.

The implementation of LRT is further complicated by the fact that transit corridors in the City of Toronto will be evolving over the next 20 years with the possibilities for BRT service on Don Mills, the extension of the Sheppard Subway and a possible higher order transit system in the Finch Hydro corridor in the longer term. Investing in LRT in the Markham Link corridor north of Steeles Avenue would not be appropriate unless it was determined that an LRT corridor would be available south of Steeles Avenue.

While LRT may not be feasible in the short term, it is prudent to protect for LRT in the longer term as a surface rapid transit mode. Many cities in the United States, for example, have developed LRT lines as a means of significantly enhancing the attractiveness of public transit while avoiding the high capital costs of heavy rail transit (i.e. subways). Accordingly, LRT is carried forward for more detailed assessment as part of the preferred design for surface rapid transit.

5.4.2.4 Diesel Multiple Unit (DMU)

DMU technology is only feasible where there is an available rail corridor. It would be possible to operate DMU's on the GO Stouffville rail corridor; however, this corridor is already well served by conventional commuter rail. There would be significant challenges to overcome in overlaying DMU technology with existing GO trains, and GO does not have any current or future plans to introduce this type of technology. This option is not considered to be feasible for providing a link between Markham Centre and the Sheppard Subway.

5.4.2.5 Automated Guideway Transit

The key feature of automated guideway transit is it is fully grade-separated, typically on an elevated guideway. Consequently, the impacts of this technology on noise and visual intrusion are greater than surface modes. The capital costs for automated guideway transit are generally greater than BRT or LRT technologies.

This technology is not being considered in any of the other YRTP corridors or City of Toronto corridors and would therefore present challenges with respect to system integration. It is not carried forward for further evaluation.

5.4.2.6 Heavy Rail (Subway)

Given the anticipated demand for rapid transit in the corridor, it would be difficult to justify the high capacity and high costs of heavy rail. Heavy rail would only make sense if it was part of an extension of the Sheppard Subway line, which if extended, would be extended to Scarborough City Centre. Heavy rail could also have impacts on the natural environment due to the extensive construction activities that would occur. For all of these reasons, heavy rail is not carried forward to further evaluation.

5.4.3 Description of Preferred Technologies

The preferred technology for the Markham N-S Corridor is Bus Rapid Transit or, in the longer term, Light Rail Transit (LRT). These technologies are similar in most of their characteristics, with the exception of vehicles and running ways. The following is a description of BRT and LRT as surface rapid transit modes.

Transitway: BRT and LRT can operate mixed in with general traffic, and/or exclusive lanes, and/or segregated transitways. The operating speed, capacity and reliability increases with the degree of segregation from general traffic and grade separation.



Vehicle Technology: BRT may use either conventional buses or specialized rubber-tired BRT vehicles. Available propulsion options range from conventional diesel to clean diesel and CNG to turbine-electric hybrids and all-electric trolleys. Low-floor, multiple wide-door designs and optional guidance into stations speeds boarding and alighting thus reducing station dwell time. Vehicle lengths range from 12.2 metres (single unit) to 18 metres 25.5 metre(s) bi-articulated units are also used in some systems. Typical passenger capacities are 60 (single unit) to over 110 (bi-articulated unit) standing and seated passengers per vehicle.

LRT vehicles range from all-electric to diesel propelled, high and low-floor car designs. Lengths vary from 14 metres (single unit) to 45 metres (bi-articulated unit). Typical passenger capacities are approximately 75 (single unit) to as high as 200 (bi-articulated unit) standing and seated passengers per car. Vehicles can be coupled to form up to 3 or 4 car trains depending on vehicle length and demand. Direct, no-step station platform to vehicle

boarding and alighting through multiple wide doors, often on both sides of cars, can be provided.

System Capacity: Segregated BRT service with station bypass lanes is capable of handling over 12,000 persons per peak hour per direction, depending on the degree of segregation from other traffic and grade separation. The busiest BRT segment in North America, in downtown Ottawa, carries approximately 10,000 passengers per hour in the peak direction during the single peak hour. The practical capacity without overtaking capability at stations is in the 8,000 passenger per hour range.

LRT systems are capable of carrying up to 18,000 persons per peak hour per direction, depending on the degree of segregation from other traffic and grade separation. Approximately, 10,000 people per hour (peak hour, peak direction) use the busiest light rail segments in North America in downtown Calgary and on the Green Line in downtown Boston.



Intelligent Transportation Systems: Contemporary BRT systems usually incorporate an Intelligent Transportation System (ITS) with an automatic vehicle location module that supports transit signal priority at intersections and real-time passenger information at stations, on-board and at home. LRT systems have a signal system to control train operations, provide data and voice communications and enhance safety and security. Contemporary LRT systems also have ITS capabilities to provide transit signal priority at intersections and real-time passenger information at stations, on-board and at home.

Stops or Stations: These generally comprise platforms varying in length from 15-55 m with shelters and passenger amenities. They are generally designed to be accessible by the disabled and may also include support facilities such as park and ride lots or passenger pick-up and drop-off areas. Station spacing is approximately 0.5 -1 km in built-up portions of corridors increasing to 2 km in lower density areas.

Table 5-2
Preliminary Screening of Transit Technologies

Objectives and Goals	Conventional Bus	Bus Rapid Transit	Light Rail Transit	Automated Guideway	Heavy Rail	Diesel Multiple Unit
PROTECT AND ENHANCE SOCIAL ENVIRONMENT						
Minimize effects on adjacent communities	☉ - some noise impacts when operating within residential areas + Impacts are similar to existing situation	☉ + effects generally confined to BRT corridor	☉ + effects generally confined to LRT corridor	☉ - Elevated guideway may be visually intrusive and may have noise impacts	☉ + Effects are minimal if below grade	☉ + Existing rail corridor is largely industrial uses, therefore impacts are minimal
Enhance acceptance of transit	☉ - no change from status quo	☉ + can be marketed as distinct service; vehicles are more attractive than conventional buses	☉ + can be marketed as distinct service; vehicles are more attractive than conventional buses	☉ + grade separation provides more direct competition to cars	☉ + grade separation provides more direct competition to cars	☉ + could be marketed as distinct service
PROTECT AND ENHANCE NATURAL ENVIRONMENT						
Enhance Natural Environment	☉ - impacts similar to current situation	☉ + reduces auto emissions by increasing transit use	☉ + reduces auto emissions by increasing transit use; produces minimal local emissions	☉ + reduces auto emissions by increasing transit use; produces minimal local emissions	☉ + reduces auto emissions by increasing transit use; produces minimal local emissions	☉ + utilizes existing rail corridors - increases diesel emissions
PROMOTE SMART GROWTH AND ECONOMIC DEVELOPMENT						
Consistency with York Region Transportation Master Plan Objectives	☉ + consistent with need to expand transit in multiple corridors	☉ + consistent with proposed implementation of rapid transit	☉ + consistent with proposed implementation of rapid transit + Also investigated by Town of Markham for Hydro corridor	○ - not explicitly considered in TMP	☉ - TMP discusses heavy rail for Yonge Street, but not other corridors	○ - not explicitly considered in TMP
Impact on land use objectives	☉ - no significant positive impact	☉ + provides service levels consistent with promoting more compact development; creates permanent corridor to attract investment	☉ + provides service levels consistent with promoting more compact development; creates permanent corridor to attract investment	☉ + can be integrated with development - may sterilize some lands	☉ + provides service levels consistent with promoting more compact development; creates permanent corridor to attract investment	○ - difficult to structure land use around rail corridor; not suitable for residential development
PROVIDE AN EFFECTIVE TRANSPORTATION SERVICE						
Improve transit user comfort	☉ + acceptable user comfort	☉ + vehicles are design for more comfort	☉ + vehicles are quiet and comfortable	☉ + vehicles are quiet and comfortable	☉ + provides maximum user comfort	☉ + vehicles are quiet and comfortable
Improve transit speed and travel times	○ - impact depends on degree of separation from regular traffic	☉ + consistent with surface rapid transit concept	☉ + consistent with surface rapid transit concept	☉ + allows for maximum speeds due to grade separation	☉ + allows for maximum speeds due to grade separation	☉ + improved times for trips following corridor
Improve transit service reliability	☉ - no positive impact	☉ + dedicated lanes improve reliability; can be combined with real-time transit info	☉ + dedicated lanes improve reliability; can be combined with real-time transit info	☉ + automated technology ensures schedule adherence	☉ + technology ensures schedule adherence	☉ - may be impacted by other rail vehicles; requires dedicated track to ensure reliability
Enhance continuity of transit services	☉ + fully compatible with existing transit technologies	☉ + services can be interlined to provide seamless travel	○ - would require transfer to/from bus if LRT not provided on Highway 7 and in City of Toronto	○ - would require transfer to/from bus	☉ - only feasible if heavy rail is extended from existing subway	○ - requires transfer to/from buses + connection already established at Kennedy Station on Scarborough RT
MAXIMIZE COST-EFFECTIVENESS						
Minimize operating costs	☉ - may require more vehicles to provide same capacity as higher order modes	☉ + higher capacity vehicles may reduce fleet requirements	☉ - requires separate maintenance capability + larger capacity vehicles reduce fleet requirements	○	○	○
Minimize capital costs	☉ - capital costs are limited to vehicle purchases	☉ - vehicles are more expensive than conventional buses	☉ - LRT vehicles are more expensive than conventional buses; requires construction of LRT tracks	○ - high capital costs due to elevated/grade separated transitway	○ - requires tunneling or elevated transitway	○ - likely requires separate track + can use existing GO Rail stations
OVERALL ASSESSMENT	☑ • Will be integral part of public transit improvements solution CARRIED FORWARD FOR MORE DETAILED INVESTIGATION	☑ • Has potential to significantly improve public transit with minimal or positive impacts to social and natural environments CARRIED FORWARD FOR MORE DETAILED INVESTIGATION	☑ • Has potential to significantly improve public transit with minimal or positive impacts to social and natural environments CARRIED FORWARD FOR MORE DETAILED INVESTIGATION	• Would represent a significant departure from current directions in York Region and City of Toronto NOT CARRIED FORWARD	• Cannot be justified given current travel demand in corridor NOT CARRIED FORWARD	• Numerous constraints are imposed by having to follow existing rail corridor. NOT CARRIED FORWARD

LEGEND: Least Responsive ○ ☉ ☉ ☉ ☉ Most Responsive

Off Board Fare Collection: Prepaid fares are required to reduce dwell times at stations and for passenger convenience. Options include fare gates and fare-paid, segregated platforms in stations and proof of payment systems using passes, smart cards or tickets.

Capital Costs: Total costs, including transitways, stations, ITS, vehicles, fare collection system, etc. range from \$0.6m – \$3.0m per two-way km for on-street BRT in mixed traffic using existing lanes to \$15m - \$30m for a partially segregated transitway with mostly at-grade intersections. Costs can increase to \$60m+ per km for fully segregated, grade-separated segments. Implementation costs depend on the volumes to be carried, system complexity, the degree of segregation from general traffic and the type and degree of grade separation (e.g., at grade, in subway or elevated).

Total costs for LRT including stations, ITS, vehicles, fare collection system, etc. range from \$5M per km for single track diesel lines using former rail rights-of-way to \$40M per double track km for partially segregated at-grade, electrified lines with mostly at-grade intersections. Fully segregated, grade separated electrified transitways can cost up to \$100m per double track km. Implementation costs depend on volumes to be carried, system complexity, degree of segregation from general traffic and the degree and type of grade separation (e.g., at grade, underground or elevated).

5.5 TRANSIT CORRIDOR ALTERNATIVES

The approach used to develop and evaluate alternative locations for the undertaking i.e. routing alternatives follows a two-staged approach. The first stage involved an examination of all potential routes in the study area and screening out those that are not likely to satisfy the overall objective of improving public transit, or have fatal flaws. The second stage involves looking at each of the short listed routes in more detail using quantitative criteria. The process and results are described in the following sections.

5.5.1 Initial Screening of Transit Corridors

The York Region Transportation Master Plan considered a number of options for providing a connection between Markham Centre and the Sheppard Subway but did not conduct a detailed screening of potential options.

At the outset of the current EA, all possible routes/corridors that could be considered for public transit improvements, while fulfilling the goal of providing a link between Markham Centre and the Sheppard subway, or its extensions, were identified. These are illustrated in Figure 5-2.

An initial screening process was applied to these routes to eliminate routes that were clearly not suitable for facilitating improved transit, or were less acceptable in terms of social, economic or natural environment impacts. A key factor in selecting routes for further consideration was their potential to significantly improve transit ridership to/from and within the study area.

Routing alternatives were evaluated using a qualitative approach. The assessment of each route at this stage draws on the preliminary description of existing conditions in Chapter 2. Each route was compared in terms of its ability to satisfy the five main objectives. For each objective, a number of indicators were identified, drawing on the list of potential environmental effects described in Section 5.5 of the Terms of Reference. Not all indicators are discussed or quantified for each route, as the intent at this stage is to simply eliminate routes that do not meet the basic criteria for more detailed assessment. It is also noted that at this stage in the evaluation, the exact configuration of rapid transit on any of these routes was not detailed. In general, it was assumed that any roads north of Steeles Avenue would be widened to accommodate the rapid transit in dedicated lanes. Where roads are planned to be widened, and could potentially be used for rapid transit, this is noted. For routes south of Steeles Avenue, it was assumed that widening would occur only if undertaken by the City of Toronto. It is generally policy of the City of Toronto not to widen roads for the sole purpose of adding road capacity.

It is also noted that this initial screening examines routes within the City of Toronto. As noted in Section 5.5.2, York Region does not have authority to construct new facilities in the City of Toronto. As a result, the evaluation of routes in the City of Toronto is primarily to help establish which corridors best meet the objective of providing a connection to the Sheppard Subway.

Figure 5-2
Potential Routes for Public Transit Improvements

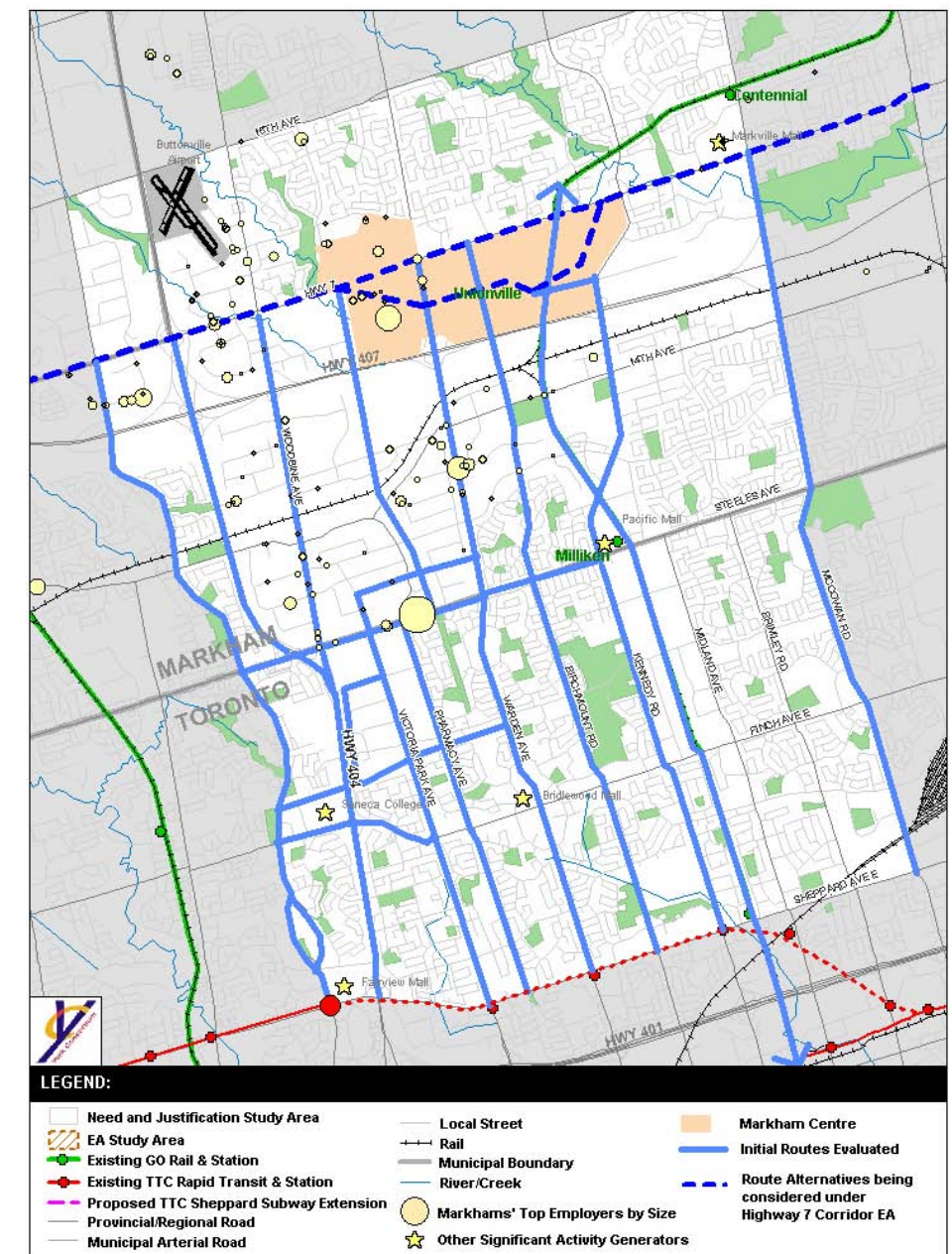


Table 5-3 provides a summary of the initial screening of each alternative route. The table is broken down by the three categories of routes, north of Steeles Avenue, South of Steeles Avenue and East-West routes.

Table 5-3a

Screening of Rapid Transit Routing Alternatives – North-South Alternatives Routes North of Steeles Avenue

Objectives and Goals	Route Segment								
	Leslie Street/Don Mills	Highway 404	Woodbine	Rodick	Warden	Birchmount	Kennedy	Stouffville GO Line	McCowan
PROTECT AND ENHANCE SOCIAL ENVIRONMENT <ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> potential impacts on residential areas S. of 407 	<ul style="list-style-type: none"> minimal community impacts 	<ul style="list-style-type: none"> potential disruption/displacement of properties 	<ul style="list-style-type: none"> the current R.O.W width would not permit four traffic lanes plus 2 rapid transit lanes; significant impacts on adjacent properties would occur with road widening. 	<ul style="list-style-type: none"> few impacts due to proximity of adjacent uses need to avoid impacts on cemetery south of Denison 	<ul style="list-style-type: none"> potential property impacts south of 14th Av 	<ul style="list-style-type: none"> potential noise impacts on adjacent residences potential disruption/displacement of properties 	<ul style="list-style-type: none"> small section of residential south of 14th Ave would be impacted 	<ul style="list-style-type: none"> potential noise impacts on adjacent residences potential disruption/displacement of properties
	☐	●	☐	☐	☐	☐	☐	☐	●
PROTECT NATURAL ENVIRONMENT <ul style="list-style-type: none"> Potential to utilize existing corridors Minimize impact on Wetlands and Watercourses 	<ul style="list-style-type: none"> Rapid transit could be developed as part of planned widening. 	<ul style="list-style-type: none"> minimal impacts if existing R.O.W is used 	<ul style="list-style-type: none"> minimal impacts as corridor is already developed 	<ul style="list-style-type: none"> would involve new water crossings may impact regional storm floodplain and valley corridor of the Rouge River 	<ul style="list-style-type: none"> Rapid transit could be developed as part of planned widening. 	<ul style="list-style-type: none"> impacts due to road widening 	<ul style="list-style-type: none"> Rapid transit could be developed as part of planned widening. 	<ul style="list-style-type: none"> limited impacts as this is existing corridor 	<ul style="list-style-type: none"> Rapid transit could be developed as part of planned widening.
	☐	☐	☐	☐	☐	☐	☐	☐	☐
PROMOTE SMART GROWTH/ECONOMIC DEVELOPMENT <ul style="list-style-type: none"> Maximize access to planned growth and intensification areas, including Markham Centre Potential to stimulate more transit-oriented development Consistency with Official Plan objectives 	<ul style="list-style-type: none"> Does not serve Markham Centre directly much of the corridor between Steeles Avenue and Highway 407 is already developed with low density uses 	<ul style="list-style-type: none"> does not serve Markham Centre would not stimulate TOD 	<ul style="list-style-type: none"> potentially serves Markham Centre provides access to high number of employers 	<ul style="list-style-type: none"> provides reasonable access to Markham Centre much of the corridor consists of low density employment uses and significant land use intensification is not planned for 	<ul style="list-style-type: none"> serves Markham Centre directly several remaining land parcels exist for transit-supportive development 	<ul style="list-style-type: none"> serves Markham Centre - some potential to influence land use 	<ul style="list-style-type: none"> serves Markham Centre limited potential to influence land uses 	<ul style="list-style-type: none"> limited potential to increase densities outside of station areas 	<ul style="list-style-type: none"> does not serve Markham Centre limited potential to influence land uses
	☐	☐	☐	○	●	☐	☐	☐	☐
PROVIDE AN EFFECTIVE TRANSPORTATION SERVICE <ul style="list-style-type: none"> Maximize ridership potential and relationship to existing and future travel patterns Maximize connectivity to existing and future transit Serves employment nodes Serves major residential areas Maximize access to inter-modal terminals Consistency with York Region Transportation Master Plan 	<ul style="list-style-type: none"> does not serve largest employers (IBM, American Express), but serves major commercial node (Highway 404/7) consistent with Toronto Official Plan routes 	<ul style="list-style-type: none"> not identified in York TMP or MTPS suitable for longer distance trips only 	<ul style="list-style-type: none"> does not serve Unionville GO not consistent with York TMP, MTPS 	<ul style="list-style-type: none"> identified in York TMP and MTPS serves IBM and Rodick Road employment lands could not be implemented until crossing of CN York Subdivision is completed (currently planned for 2007/08) 	<ul style="list-style-type: none"> serves IBM, Amex and other major employers does not connect with Toronto O.P. routes south of Steeles Avenue 	<ul style="list-style-type: none"> misses most of employment area south of 407 does not connect to Toronto O.P. routes 	<ul style="list-style-type: none"> good connections to Unionville GO and Markham Centre does not serve major employers 	<ul style="list-style-type: none"> good connections to Unionville GO and Markham Centre does not serve major employers 	<ul style="list-style-type: none"> not consistent with York TMP, MTPS, Toronto O.P. does not serve major employment areas
	☐	☐	☐	☐	☐	●	☐	☐	☐

5

Objectives and Goals	Route Segment								
	Leslie Street/Don Mills	Highway 404	Woodbine	Rodick	Warden	Birchmount	Kennedy	Stouffville GO Line	McCowan
MAXIMIZE COST-EFFECTIVENESS OF RAPID TRANSIT ▪ Minimize property impacts and acquisition ▪ Minimize impact on structures	▪ costs similar to other arterial routes	▪ potentially high construction costs	▪ potentially high property acquisition costs	▪ high capital cost for road widening, property acquisition	▪ potential cost savings due to planned widening	▪ would require modified structure at Hwy 407	▪ potentially high property acquisition costs	▪ costs could be high if RT cannot be accommodated in existing ROW	▪ potentially high property acquisition costs
	◐	◑	◑	◑	◑	◑	◑	◑	◑
OVERALL ASSESSMENT	CARRIED FORWARD FOR MORE DETIALED INVESTIGATION	Does not meet objectives for rapid transit service	CARRIED FORWARD FOR MORE DETIALED INVESTIGATION	Significant conflicts with corridor's primary function of hydro transmission	CARRIED FORWARD FOR MORE DETIALED INVESTIGATION	Local residential nature of corridor not suitable for rapid transit	Misses major employment areas	Significant duplication with GO Rail Service; not compatible with GO Transit's objectives for corridor	Does not meet objectives of connecting Markham Centre with Sheppard Subway

LEGEND: Least Responsive ◐ ◑ ◒ ◓ ◔ Most Responsive

O.P. – Official Plan, HOV – High Occupancy Vehicle, TMP – Transportation Master Plan, MTPS – Markham Transportation Planning Study, RT – Rapid Transit, TOD – Transit-Oriented Development

Table 5-3b
 Screening of Rapid Transit Routing Alternatives – North-South Alternatives Routes South of Steeles Avenue

Objectives and Goals	Route Segment							
	Leslie Street/Don Mills	Highway 404/Gordon Baker	Victoria Park	Warden	Birchmount	Kennedy	Stouffville GO Line	McCowan
PROTECT AND ENHANCE SOCIAL ENVIRONMENT • Minimize adverse noise and vibration effects (proximity to sensitive receivers) • Minimize adverse effects on cultural resources • Minimize disruption of community vistas and adverse effects on street and neighbourhood aesthetics	• potential impacts on residential areas S. of 407	• least community impacts	• potential disruption/displacement of properties	• potential impacts on adjacent residential	• significant impacts on adjacent residential	• significant impacts on adjacent residential	• potential impacts on adjacent residential, industrial	• significant impacts on adjacent residential
	◑	◔	◑	◑	◑	◑	◑	◑
PROTECT NATURAL ENVIRONMENT • Potential to utilize existing corridors • Minimize impact on Wetlands and Watercourses	• limited impacts as corridor is fully developed	• limited impacts as corridor is fully developed	• limited impacts as corridor is fully developed	• limited impacts as corridor is fully developed	• limited impacts as corridor is fully developed	• limited impacts as corridor is fully developed	• limited impacts as corridor is fully developed	• limited impacts as corridor is fully developed
	◑	◑	◑	◑	◑	◑	◑	◑

Objectives and Goals	Route Segment							
	Leslie Street/Don Mills	Highway 404/Gordon Baker	Victoria Park	Warden	Birchmount	Kennedy	Stouffville GO Line	McCowan
PROMOTE SMART GROWTH/ECONOMIC DEVELOPMENT <ul style="list-style-type: none"> Maximize access to planned growth and intensification areas, including Markham Centre Potential to stimulate more transit-oriented development Consistency with Official Plan objectives 	<ul style="list-style-type: none"> potential to enhance Don Mills Area 	<ul style="list-style-type: none"> serves Gordon Baker Business Park - moderate potential to influence land uses 	<ul style="list-style-type: none"> provides moderate potential for intensification 	<ul style="list-style-type: none"> stable residential difficult to change 	<ul style="list-style-type: none"> stable residential difficult to change 	<ul style="list-style-type: none"> stable residential difficult to change 	<ul style="list-style-type: none"> moderate potential to influence Kennedy Rd industrial area 	<ul style="list-style-type: none"> stable residential difficult to change
	●	●	◐	◑	◑	◑	◐	◑
PROVIDE AN EFFECTIVE TRANSPORTATION SERVICE <ul style="list-style-type: none"> Maximize ridership potential and relationship to existing and future travel patterns Maximize connectivity to existing and future transit Serves employment nodes Serves major residential areas Maximize access to inter-modal terminals Consistency with York Region Transportation Master Plan 	<ul style="list-style-type: none"> potential to utilize exiting HOV corridor consistent with Toronto O.P. routes 	<ul style="list-style-type: none"> potential for integration with Don Valley Corridor study alternatives reasonably direct access to Sheppard Subway 	<ul style="list-style-type: none"> does not serve Unionville GO not consistent with York TMP, MTPS Identified as transit priority corridor in Toronto O.P. 	<ul style="list-style-type: none"> does not serve major employers - not identified in Toronto O.P. Attractiveness may change if Sheppard Subway is extended 	<ul style="list-style-type: none"> does not serve major employers - not identified in Toronto O.P. 	<ul style="list-style-type: none"> does not serve major employers not identified in Toronto O.P. difficult to connect to Sheppard Subway if it is not extended 	<ul style="list-style-type: none"> does not serve major employers corridor already served by GO difficult to connect to existing Sheppard Subway if it is not extended 	<ul style="list-style-type: none"> does not serve major employers difficult to connect to Sheppard Subway if it is not extended
	●	●	●	◐	◑	◐	◑	◐
MAXIMIZE COST-EFFECTIVENESS OF RAPID TRANSIT <ul style="list-style-type: none"> Minimize property impacts and acquisition Minimize impact on structures 	<ul style="list-style-type: none"> costs similar to other arterial routes 	<ul style="list-style-type: none"> potentially high construction costs 	<ul style="list-style-type: none"> potentially high property acquisition costs 	<ul style="list-style-type: none"> potentially high property acquisition costs 	<ul style="list-style-type: none"> cost of road widening 	<ul style="list-style-type: none"> potentially high property acquisition costs 	<ul style="list-style-type: none"> costs could be high if RT cannot be accommodated in existing ROW 	<ul style="list-style-type: none"> potentially high property acquisition costs
	◐	◑	◑	◑	◑	◑	◑	◑
OVERALL ASSESSMENT	CARRIED FORWARD FOR MORE DETIALED INVESTIGATION	CARRIED FORWARD FOR MORE DETIALED INVESTIGATION	CARRIED FORWARD FOR MORE DETIALED INVESTIGATION	Lack of Toronto O.P designation combined with potential residential impacts is a challenge	Local residential nature of corridor not suitable for rapid transit	Misses major employment areas	Significant duplication with GO Rail Service; not compatible with GO Transit's objectives for corridor	Does not meet objectives of connecting Markham Centre with Sheppard Subway

LEGEND: Least Responsive ○ ◐ ◑ ◒ ◓ Most Responsive

O.P. – Official Plan, HOV – High Occupancy Vehicle, TMP – Transportation Master Plan, MTPS – Markham Transportation Planning Study, RT – Rapid Transit, TOD – Transit-Oriented Development

Table 5-3c
Screening of Rapid Transit Routing Alternatives – East-West Alternatives Routes South of Steeles Avenue

Objectives and Goals	Route Segment				
	Highway 7*	Steeles Avenue	Denison St	Finch Hydro Corridor	Finch Avenue
PROTECT AND ENHANCE SOCIAL ENVIRONMENT <ul style="list-style-type: none"> Minimize adverse noise and vibration effects (proximity to sensitive receivers) Minimize adverse effects on cultural resources Minimize disruption of community vistas and adverse effects on street and neighbourhood aesthetics 	<ul style="list-style-type: none"> adjacent land uses are set back from corridor 	<ul style="list-style-type: none"> houses on south side of street limit potential to widen for transit 	primarily commercial/industrial uses <ul style="list-style-type: none"> most business have parking abutting roadway 	displacement of informal uses, informal greenspace <ul style="list-style-type: none"> potential for visual intrusion 	<ul style="list-style-type: none"> potential for community impacts, traffic infiltration
	☐	●	☐	☐	☐
PROTECT NATURAL ENVIRONMENT <ul style="list-style-type: none"> Potential to utilize existing corridors Minimize impact on Wetlands and Watercourses 	<ul style="list-style-type: none"> limited impacts as corridor is fully developed 	<ul style="list-style-type: none"> limited impacts as corridor is fully developed 	<ul style="list-style-type: none"> limited impacts as corridor is fully developed 	<ul style="list-style-type: none"> limited impacts as corridor is fully developed 	<ul style="list-style-type: none"> limited impacts as corridor is fully developed
	☐	☐	☐	☐	☐
PROMOTE SMART GROWTH/ECONOMIC DEVELOPMENT <ul style="list-style-type: none"> Maximize access to planned growth and intensification areas, including Markham Centre Potential to stimulate more transit-oriented development Consistency with Official Plan objectives 	<ul style="list-style-type: none"> significant opportunities for intensifying land uses 	<ul style="list-style-type: none"> corridor is largely built-out and difficult to influence City of Toronto does not have plans for rapid transit on Steeles Avenue 	<ul style="list-style-type: none"> may be opportunities for intensifying some properties, but employment lands are essentially stable 	<ul style="list-style-type: none"> provides moderate potential for intensification 	<ul style="list-style-type: none"> stable residential difficult to change
	☐	☐	☐	☐	☐
PROVIDE AN EFFECTIVE TRANSPORTATION SERVICE <ul style="list-style-type: none"> Maximize ridership potential and relationship to existing and future travel patterns Maximize connectivity to existing and future transit Serves employment nodes Serves major residential areas Maximize access to inter-modal terminals Consistency with York Region Transportation Master Plan 	<ul style="list-style-type: none"> consistent with Region's rapid transit strategy 	<ul style="list-style-type: none"> serves major employment areas difficult to introduce into existing R.O.W. due to traffic congestion 	<ul style="list-style-type: none"> serves major concentration of employment, provides access for employees 	<ul style="list-style-type: none"> potentially increases walking distances for riders consistent with Toronto O.P. 	<ul style="list-style-type: none"> provides direct access to Seneca consistent with Toronto O.P. (transit priority route only)
	☐	☐	☐	☐	☐
MAXIMIZE COST-EFFECTIVENESS OF RAPID TRANSIT <ul style="list-style-type: none"> Minimize property impacts and acquisition Minimize impact on structures 	<ul style="list-style-type: none"> costs similar to other arterial routes 	<ul style="list-style-type: none"> potentially high construction costs 	<ul style="list-style-type: none"> R.O.W. is relatively narrow, may require widening 	<ul style="list-style-type: none"> leasing costs could be high high capital cost for new structures 	<ul style="list-style-type: none"> potentially high property acquisition costs
	☐	☐	☐	☐	☐
OVERALL ASSESSMENT	Not suitable for North-South Service; will be part of integrated Region-wide service	Significant challenges with adjacent properties; road configuration at Woodbine/404; would require coordination with City of Toronto	CARRIED FORWARD FOR MORE DETAILED INVESTIGATION	Ideally should be developed as part of longer service in hydro-corridor; would need to be developed with City of Toronto	May provide interim connector to Seneca College; any physical improvements would need to be developed with City of Toronto

* Highway 7 is subject to a separate EA process. It is being evaluated here in terms of its ability to form part of the north-south service.

LEGEND: Least Responsive ☐ ☐ ☐ ☐ ● Most Responsive

O.P. – Official Plan, HOV – High Occupancy Vehicle, TMP – Transportation Master Plan, MTPS – Markham Transportation Planning Study, RT – Rapid Transit, TOD – Transit-Oriented Development

One route that has been considered in previous studies, but was not assessed in detail in this EA is the north-south Hydro corridor running west of Warden Avenue. Since previous studies were completed, Ontario Power Generation has indicated their intention to construct new transmission lines in this corridor north of 14th Avenue. They also indicated that the likelihood of granting use of this corridor for rapid transit is very low, given the already constrained width of this corridor. One of the reasons for this is that OPG requires access for maintenance of the transmission towers. In addition to hydro facilities, Enbridge Gas is planning to construct a new north-south gas line in the hydro corridor, further limiting its use for rapid transit. For all of these reasons, this route was eliminated from further consideration.

Routes considered and routes carried forward are illustrated on Figure 5-3. Based on the evaluation, the following corridors have the potential to facilitate improved public transit service.

- A corridor extending from Don Mills Subway Station to the Highway 404/Highway 7 Business Park Area, with connections to east-west transit services;
- A corridor extending from Woodbine Avenue and Highway 7 to the Sheppard Subway, with east-west connections at the north and south ends;
- A corridor extending from Markham Centre (Highway 7/Warden) to the Sheppard Subway via Warden Avenue and Victoria Park Avenue;

5.5.2 Routing Options in the City of Toronto

As discussed in Section 2.7.2 and illustrated on Figure 2-9, there are several corridors in the City of Toronto that have been identified for rapid transit or priority transit. These corridors will be developed over the next 20-30 years, and may evolve if the Sheppard Subway is extended to Victoria Park or eventually to Scarborough Civic Centre.

As part of this EA, each of these potential corridors in the City of Toronto were assessed in terms of their suitability for providing improved public transit, and more specifically a link to the Sheppard Subway. In selecting a preferred corridor, several factors were considered:

- Unless there is a single GTA Transit Authority, it is likely that closed door operating policies will remain in effect for York Region Transit services in the City of Toronto. In this case, the best routing option is one that provides the fastest connection to Don Mills Station, while providing service to major employment destinations in the City of Toronto (to drop passengers off in the southbound direction and pick them up in the northbound direction). The VIVA Phase 1 route has been designed with these factors in mind.
- In the longer term, it would be desirable to integrate York Region rapid transit services with rapid transit corridors in the City of Toronto. For

example, York Region services could access the Finch Hydro corridor via Victoria Park or Warden Avenue, travel eastward to Don Mills Road and then southbound to Don Mills Station.

Since York Region has no authority to construct infrastructure in the City of Toronto, and the City of Toronto is not a co-proponent in this EA, it is not appropriate to identify ultimate alignments and designs for rapid transit services in the City of Toronto. The preferred strategy is therefore to utilize the VIVA Phase 1 alignment and stops until future rapid transit corridors south of Steeles Avenue are more fully defined and developed. At such time, the alignment for the North-South Rapid transit service would be reviewed and adjusted if appropriate.

As discussed in Section 5.6, decisions on the timing of infrastructure south of Steeles Avenue may also affect the timing of investments in York Region.

5.5.3 Detailed Assessment of Preferred Corridors

Based on the screening of potential corridors in Section 5.4.1, three potential corridors have been identified for more detailed analyses as shown on Figure 5-3.

These corridors should be considered as representative alternatives only. For example, the Woodbine Corridor could utilize Gordon Baker Road, Highway 404 or potentially Victoria Park Avenue south of Steeles Avenue. The Warden Avenue Corridor could also utilize different alignments to get east to Victoria Park Avenue, including Denison Street or Esna Park Drive.

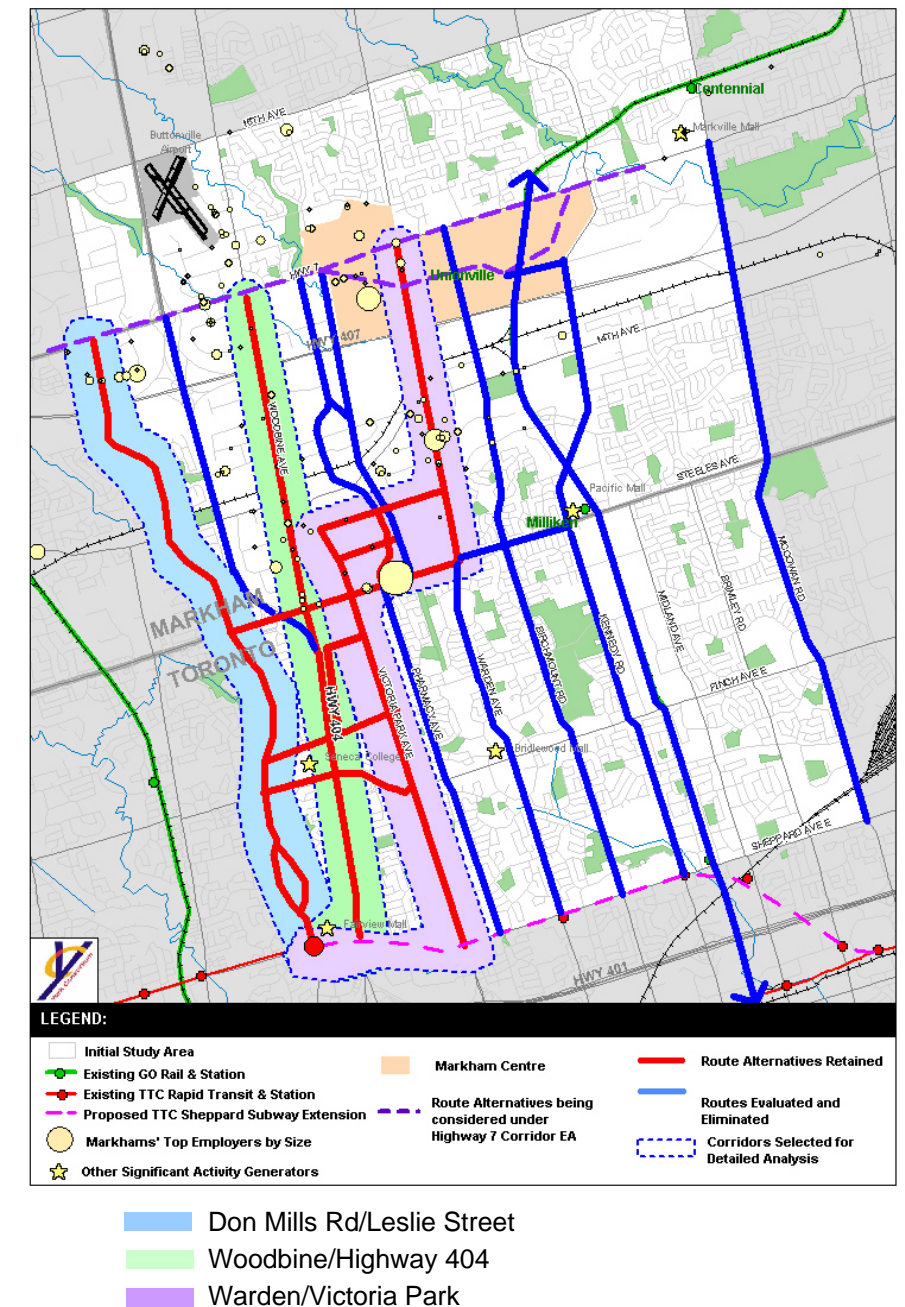
In the following sections, each corridor is discussed in terms of the following:

- Accessibility Impacts
- Impacts on Natural Environment
- Land Use Impacts
- Transit Ridership Potential
- Compatibility with other planned transportation improvements
- Costs

Based on the review of existing conditions, these are considered to be the categories where routing options may differ significantly, and hence, detailed discussion is warranted. The evaluation of also considered impacts on other criteria such as cultural resources, and discussion is provided in Table 5-7.

The results of the assessment are then used to evaluate each corridor according to specific objectives and goals as described in Section 5.5.4.

Figure 5-3
Short Listed Transitway Corridor Options



5.5.3.1 Accessibility Impacts

Potential transit improvements should be located so as to maximize access to existing and future population and employment. Figure 5-4 provides an overview of existing (2001) urban densities in the study corridor while Figure 5-5 illustrates projected future urban densities. As shown, urban densities are relatively uniform throughout the study area. Higher densities

are present in the Sheppard Subway/Consumers Road area, the Beaver Creek area and, in the future, the Markham Centre area.

In addition to absolute population and employment, it is desirable to connect major employment nodes with transit. These include major employers or educational institutions where there is a potential to implement on-site TDM programs to encourage transit usage, or in the case of post-secondary institutions, there is an inherent potential for transit usage. These nodes are highlighted on Figure 5-6.

Figure 5-7 summarizes the population and employment that would be within 500 m and 1000m of each representative alignment. As shown, the Don Mills/Leslie Corridor has the highest density of population along its length, but the lowest density of employment (mainly concentrated at the north end of the line). Between 2001 and 2021, employment in the Warden corridor (<1000 m) is expected to grow by 26% while population is expected to grow by 12%. In the longer term, the Warden corridor would contain the highest number of residents and jobs.

Figure 5-8 presents a breakdown of population and employment by corridor, distinguishing between the north and south study areas. In 2001, the Don Mills/Leslie corridor had the highest concentration of employment north of Steeles Avenue. However, this will be exceeded by the Warden corridor by 2021. Overall, the Warden Avenue corridor has the highest combined concentration of population and employment. In the southern part of the study area, population is fairly evenly distributed by corridor with Victoria Park having the highest combined population and employment within 1000 m.

5.5.3.2 Impacts on Natural Environment

None of the short-listed corridors would cross or impact any ESA's, provincially significant wetlands or Life Sciences Sites, which are located at the Unionville Marsh Area (See Figure 2-3 shown previously). Similarly, all of the routes pass through primarily urbanized areas, and therefore the impacts on habitat communities are similar for all routes. One area where the routes may differ in terms of environmental impacts is in the number of watercourses crossed. Accordingly, Table 5-4 provides a summary of the number of watercourses along each corridor.

Figure 5-4
Gross Urban Density (2001)

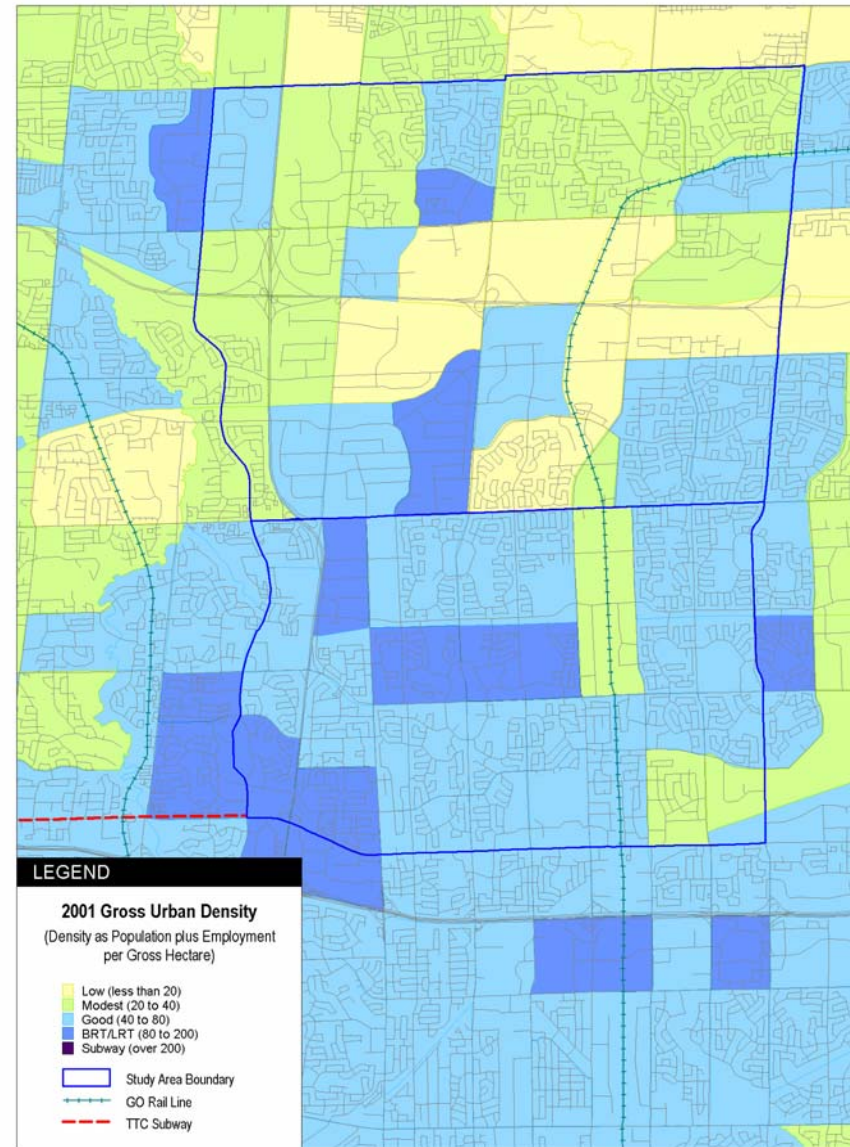


Figure 5-5
Gross Urban Density (2021)

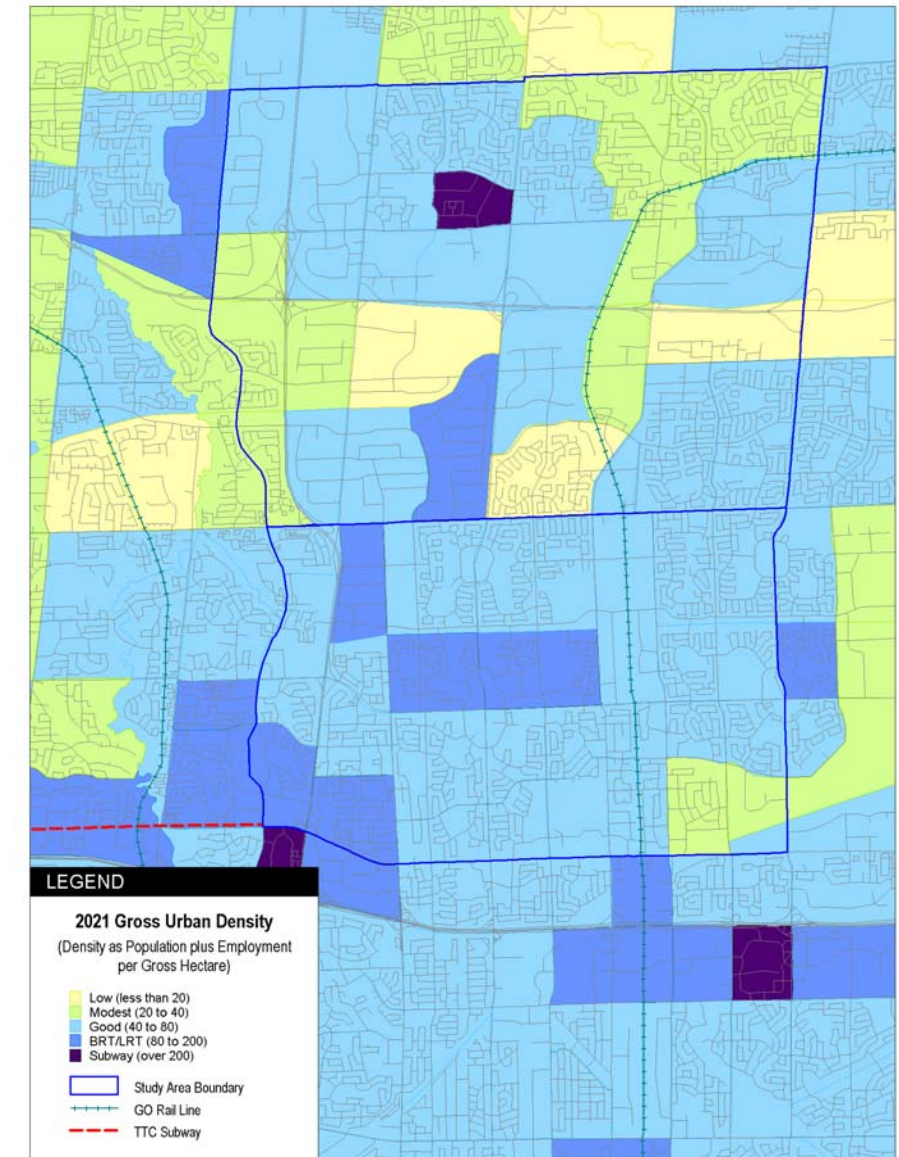


Table 5-4
Number of Watercourse by Corridor

	Don Mills/Leslie	Woodbine	Warden
Cold Water	-	-	-
Cool Water	-	Beaver Creek	Rouge River
Warm Water	German Mills Creek	German Mills Creek	-

Figure 5-6
Significant Employment Nodes

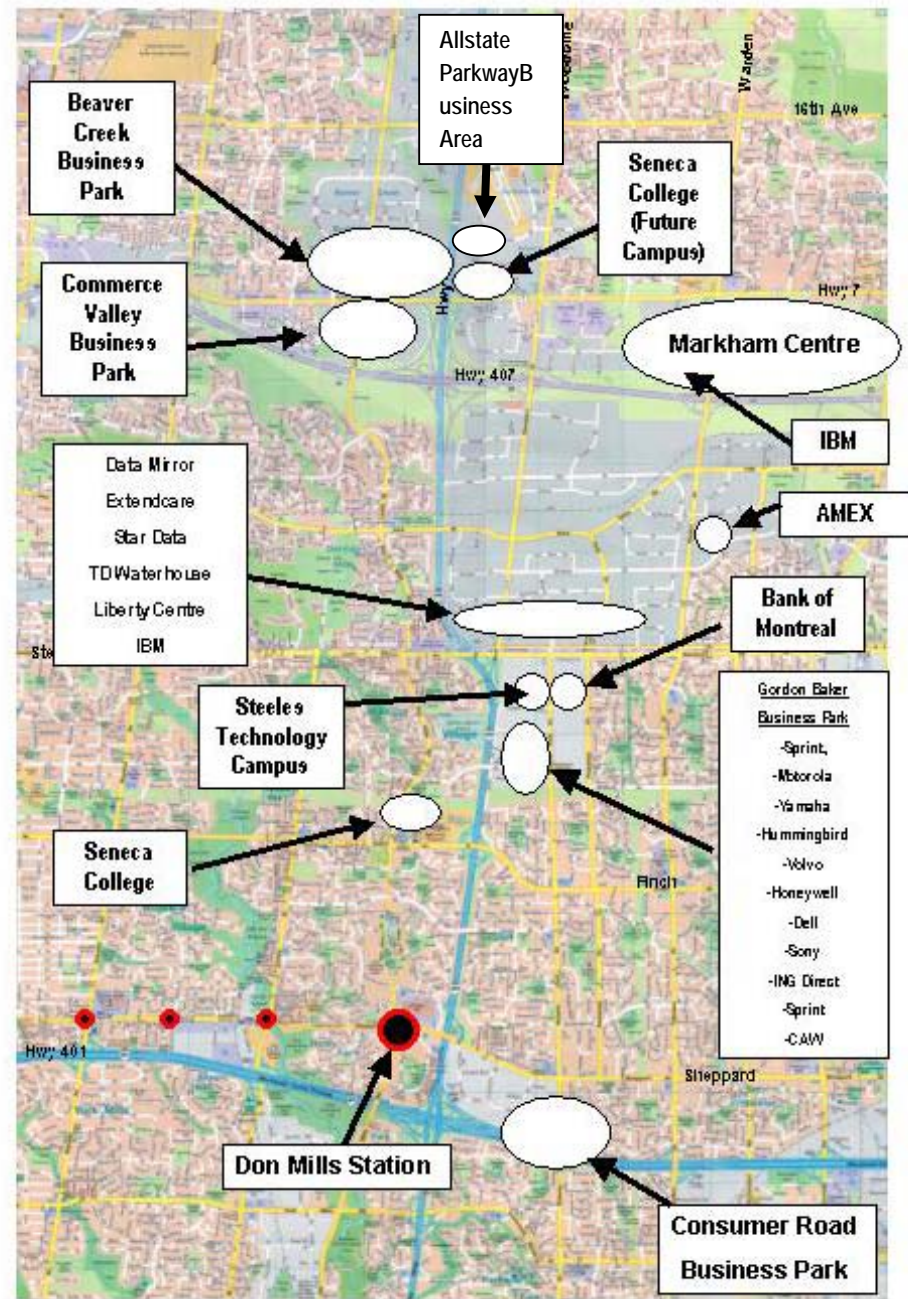
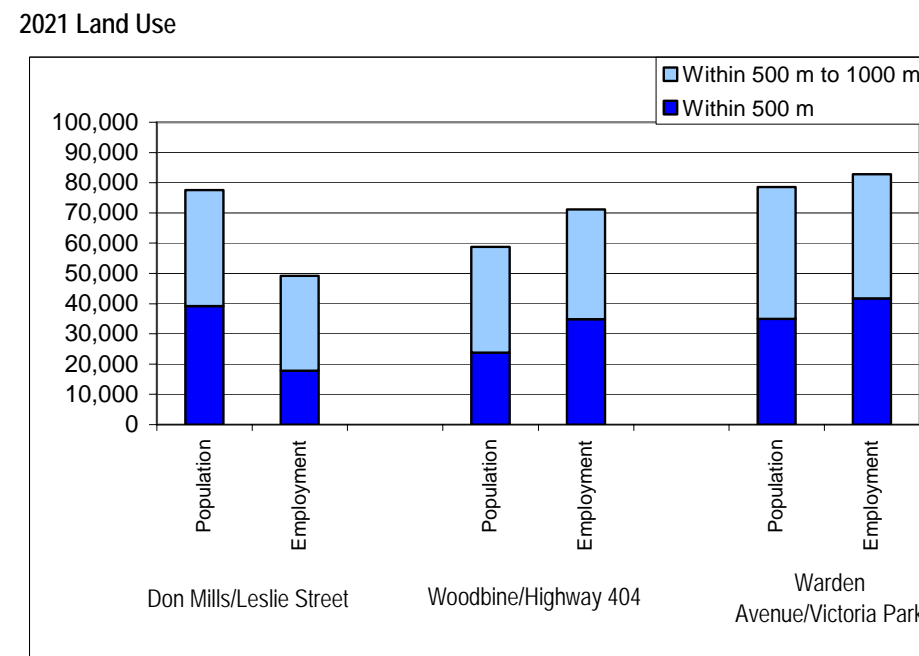
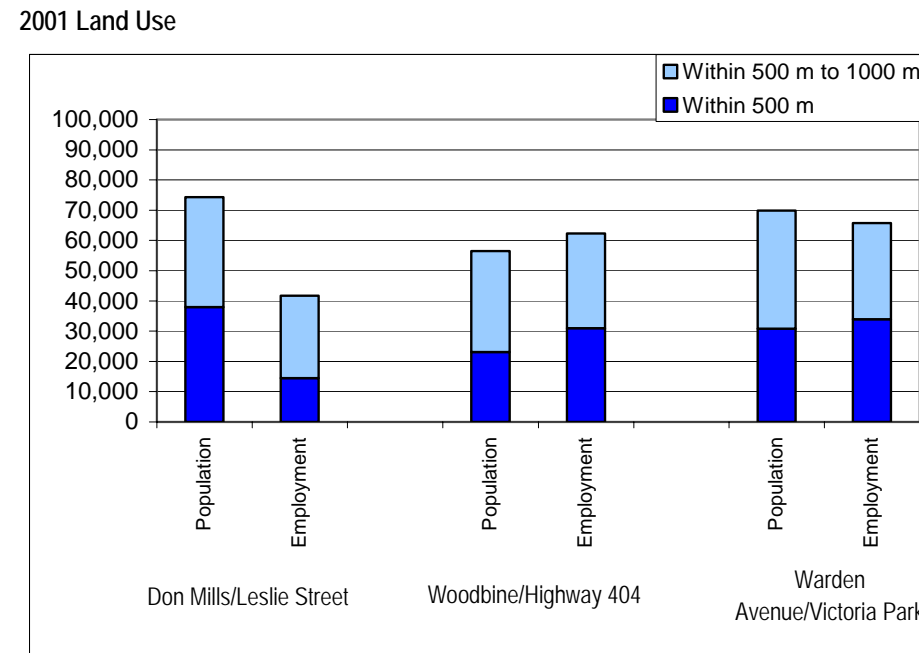
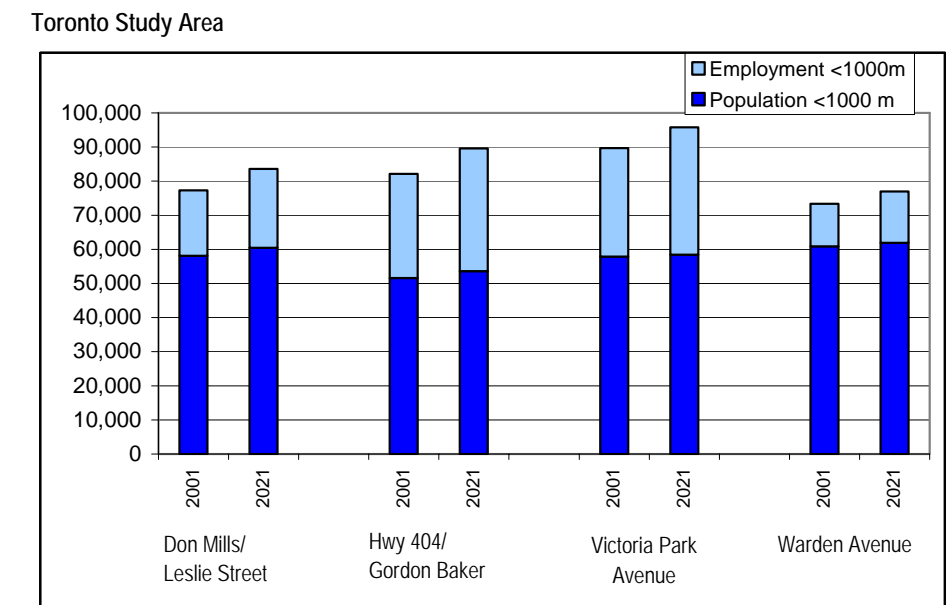
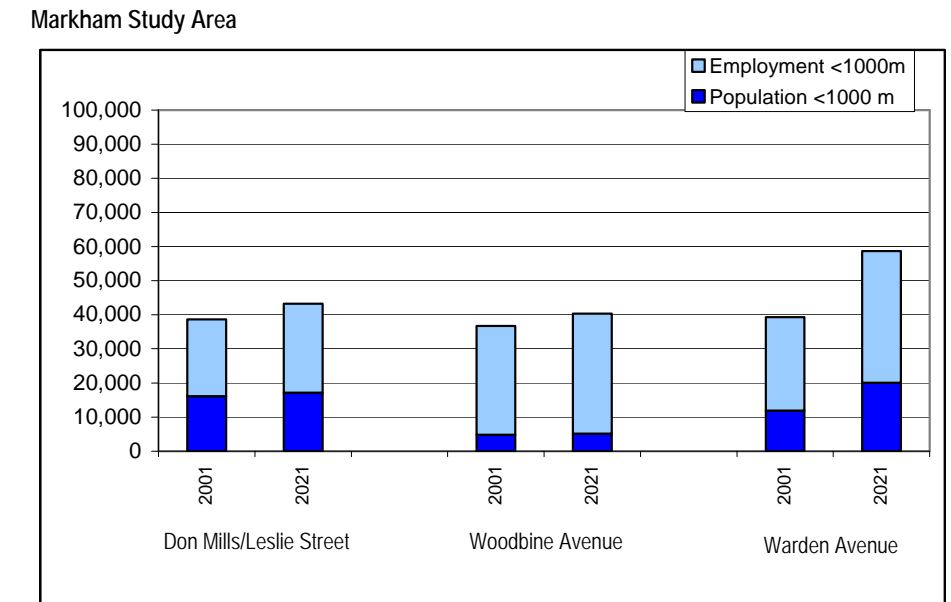


Figure 5-7
Population and Employment in Proximity to Transit Corridors
(Markham and Toronto Study Areas)



Note: See Figure 5-3 for location of corridors

Figure 5-8
Population and Employment in Proximity to Transit Corridors (2021)
(North and South Study Areas)



Note: See Figure 5-3 for location of corridors

5.5.3.3 Land Use Impacts

The potential for transit to influence land use is a key planning goal of both York Region and City of Toronto. Ideally, a new rapid transit line should be located so as to maximize development potential. Figures 2-2 and Figure 5-6 shown previously provided an indication of the general land use in the study corridors. The following observations can be made on each of the potential transit corridors:

- **Don Mills/Leslie Corridor** – includes large portions of lower density residential development north and south of Steeles Avenue, which is not expected to change in the next 20 years. Some potential for intensifying employment development exists in the Commerce Valley Drive area.
- **Woodbine/404** – Lands north of Steeles Avenue are largely commercial and are not planned for significant residential development. Opportunities to intensify employment development exist, specifically in the area just south of Highway 407.
- **Warden Avenue** –In addition to Markham Centre, there are opportunities to develop or redevelop major blocks of land for more transit-supportive uses.

5.5.3.4 Ridership Potential

For each of the three general corridors, the York Region Travel Demand Forecasting Model (described previously in Chapter 4) was used to estimate the number of transit riders that would use each line. In each case, the transit lines were coded as full bus rapid transit lines with equal speed and headway characteristics. Lines were also connected to the Highway 7 transitway in the north and the Sheppard Subway in the south. Actual line routings differs slightly from those shown on Figure 5-3; in order to equally compare corridors, lines were routed to the Sheppard Subway at Don Mills in the south portion of the study area. Ridership statistics for each line are summarized in Table 5-4.

Consistent with the population and employment accessibility measures quantified in the previous section, an alignment starting in the Warden and Highway 7 area has the greatest total ridership potential as a single rapid transit line. Peak point volumes would be slightly higher for a Don Mills alignment, but this volume occurs just north of Steeles Avenue and tapers off significantly further north. Compared to the Warden and Don Mills alignments, a Woodbine Avenue alignment does not perform as well, primarily because it does not provide direct service to either the Highway 404/7 commercial node or Markham Centre.

Table 5-5
Peak Period Ridership for Selected Lines in 2021

Parameter		Leslie/Don Mills	Woodbine/Gordon Baker/Finch/Don Mills	Warden Avenue/Gordon Baker/Finch/Don Mills (Quick Start Alignment)
Line Length		8.2 km	9.0 km	13.0 km
Maximum Load	SB	3,500	1,000	3,000
	NB	2,100	1,000	1,600
Total Boardings		4,424	1,804	4,671
Boardings per kilometre		539	200	359

Assumptions:

- 1) All lines terminate at Highway 7, with transfer to Hwy 7 transitway
- 2) All lines coded at 2 minute headway
- 3) Closed door policy in City of Toronto

5.5.3.5 Compatibility with Other Improvements

Potential transit improvements that have an impact on the selection of a corridor for north-south transit include the following:

- Through the Don Valley Corridor Transportation Master Plan, the City of Toronto has identified Don Mills Road as a potential corridor for Bus Rapid Transit. Victoria Park has been identified as a priority transit corridor.
- GO Transit is planning to introduce bus rapid transit in the Highway 407 corridor and potentially the Highway 404 corridor. It is expected that the Highway 404 service would include a stop at Don Mills Station on the Sheppard Subway.

Table 5-5 provides a discussion of the compatibility of each of the three corridors with other planned improvements.

5.5.3.6 Costs

Capital costs are dependant on the length of alignment, amount of property required and number of structures that need to be modified. The latter two cost factors are in turn dependent on the configuration of the surface rapid transit system and the degree of separation from other traffic. For example, providing for a median transitway by widening an existing roadway would be considerably more expensive than designating an existing lane for transit. These alternative methods, and their relative cost implications are discussed in Section 5.6.

A major distinction between the three alternative routes is that Woodbine Avenue is already a six lane facility, whereas Leslie Street and Warden

Avenue are 4/5 lane facilities. All corridors are of similar width: 37-39 m R.O.W. Therefore, if lane widening is required, it will be more expensive to widen Woodbine Avenue to property acquisition costs.

Table 5-6
Compatibility of Alternative Corridors with other Improvements

	Don Mills/Leslie	Woodbine	Warden Avenue
Proposed BRT in Don Mills corridor to Steeles Avenue	Extension of improved transit north of Steeles would be highly compatible	Woodbine corridor could be connected to Don Mills south of Steeles	Warden corridor could be connected to Don Mills south of Steeles
Proposed Transit Priority corridor in Victoria Park to Steeles Avenue	Services on Don Mills may overlap with Victoria Park	Woodbine corridor could be connected to Victoria Park south of Steeles	Warden corridor could be connected to Victoria Park south of Steeles
Proposed Highway 407 GO BRT	Connection at Leslie/Highway 407 is possible	Connection at Woodbine/Highway 407 is possible	Services could be integrated at Unionville Station
Potential Highway 404 GO BRT	Services follow similar alignment, but serve different markets	Services follow similar alignment, but serve different markets	Corridors are generally distinct

5.5.4 Summary and Evaluation of Route Alternatives

The preceding quantitative and qualitative analyses were used to inform an overall evaluation of each routing alternative. The evaluation follows the approach of other alternative methods in that it is structured around five objectives, for which a number of specific goals are identified. These objectives, goals and the resulting assessment of alternatives are summarized in Table 5-6.

Table 5-7
Evaluation of Routing Alternatives

Objectives and Goals	Don Mills/Leslie Street	Woodbine Avenue/Highway 404	Warden Avenue/Victoria Park Avenue
PROTECT AND ENHANCE SOCIAL ENVIRONMENT			
Minimize adverse noise and vibration effects (proximity to sensitive receivers)	○ - single family homes abut corridor from Finch to Highway 407	● + corridor is largely commercial and employment uses - some residential south of Steeles Avenue	● - Residential uses exist south of Denison Street and along Victoria Park Avenue + Facilities already have transit services
Minimize adverse effects on cultural resources	● - one cemetery located north of Finch Avenue	● + corridor is largely commercial and employment uses	○ - 2 cemeteries along route
Minimize disruption of community vistas and adverse effects on street and neighbourhood aesthetics	○ - corridor includes wide boulevards and is well treed	● - widening for transit would result in very wide corridor with minimal streetscaping opportunities	● + R.O.W. south of 14 th Avenue can accommodate additional lanes; north of 14 th Avenue there are very few adjacent properties
PROTECT NATURAL ENVIRONMENT			
Potential to utilize existing corridors	● + Already a built-up route	● + Already a built-up route	● + Already a built-up route
Minimize impact on Wetlands and Watercourses	● - 1 watercourse north of Steeles Avenue + does not involve new crossing	● - 2 watercourses north of Steeles Avenue + does not involve new crossing	● - 1 watercourse north of Steeles Avenue + does not involve new crossing
PROMOTE SMART GROWTH/ECONOMIC DEVELOPMENT			
Maximize access to planned growth and intensification areas, including Markham Centre	● - Does not connect with Markham Centre directly + Serves 7/404 employment node	○ - Does not connect with Markham Centre directly; no growth nodes are identified for corridor	● - Provides most direct connection to Markham Centre
Potential to stimulate more transit-oriented development	○ - Majority of corridor is primarily single family homes + Improves access to Highway 7/404 employment node	○ - corridor is largely commercial and employment uses, which are relatively stable and not identified for change in Official Plans	● + Can support growth of Markham Centre + Pockets of vacant land exist to intensify development - part of corridor is taken up by Highway 407 lanes
Consistency with Official Plan objectives	● - Not identified specifically in York O.P. + Don Mills South of Steeles Avenue is identified as Higher Order Transit corridor	○ - Highway 404 is not identified as a major growth corridor; although it is being developed for employment uses	● + Warden Avenue connects to the regional growth node of Markham Centre + Victoria Park Avenue South of Steeles Avenue is identified as Priority Transit corridor in the Toronto O.P.
PROVIDE AN EFFECTIVE TRANSPORTATION SERVICE			
Maximize ridership potential and relationship to existing and future travel patterns	● + highest boardings per kilometre and highest maximum ridership of three routes	○ - highest boardings per kilometre and highest maximum ridership of three routes	● + similar ridership as Don Mills/Leslie, but higher proximity to population and employment in longer term
Maximize connectivity to existing and future transit	○ + connects into planned City of Toronto Don Mills Higher Order Transit facility;	○ - does not connect with City of Toronto higher order transit corridor; less desirable location of connection with Highway 7 transitway	● - less direct connection to existing terminus of Sheppard Subway + connects with Highway 7 Transitway and Highway 407 Transitway at Markham Centre, a major transit node
Serves employment nodes	○ - Limited employment between Highway 407 and Finch Avenue + Serves 7/404 employment node and Seneca College (Newnham)	○ + Serves Allstate Parkway Business park and future Seneca College Campus	● + Served Markham Centre, IBM, Amex and other major employment nodes
Serves major residential areas	● - primarily low density residential uses North of Steeles Avenue + residential densities increase south of Finch Avenue	○ - majority of the corridor is non-residential or low density residential	○ - majority of corridor is non-residential or low density residential + large concentration of apartments exists on Warden south of Steeles Avenue
Maximize access to intermodal terminals	○ - Does not connect to GO Rail station + direct north-south connection to Don Mills Station	○ - no direct connection to GO rail stations + connects to potential future Highway 407 Transitway station	● + can be easily connected to Unionville GO station via Enterprise Drive; connects to potential future Highway 407 Transitway station
Consistency with York Region Transportation Master Plan	○ + identified as part of priority transit network	○ + identified as part of priority transit network	● + identified as potential rapid transit corridor
MAXIMIZE COST-EFFECTIVENESS OF RAPID TRANSIT			
Minimize property impacts and acquisition	○ + R.O.W. north of Steeles Avenue can accommodate widening	○ + R.O.W. north of Steeles Avenue is already built out to 6 lanes and cannot be widened without acquiring property	● + R.O.W. north of Steeles Avenue can accommodate widening
Minimize impact on structures	○ - three structures (German Mills Creek, Hwy 407 and CN)	○ - three structures (Beaver Creek, Hwy 407 and CN); may be impacts on Highway 404 structures	○ - two structures (Highway 407 and CN)
OVERALL ASSESSMENT	●	○	● TECHNICALLY PREFERRED ROUTE

LEGEND: Least Responsive ○ ● ● ● Most Responsive

O.P. – Official Plan, HOV – High Occupancy Vehicle, TMP – Transportation Master Plan, RT – Rapid Transit

Based on the above analyses, it can be concluded that both the Warden Avenue Corridor north of Steeles Avenue and the Don Mills/Leslie Corridor have strong potential for public transit improvements. A corridor following Woodbine Avenue is less desirable since it does not provide direct access for either Markham Centre or the Highway 404/7 (Beaver Creek and Commerce Valley) commercial node. There is also less potential for Woodbine Avenue to be developed for more intensive transit oriented land use.

In the longer term, Warden Avenue would have a greater potential to support a rapid transit system since it contains a high concentration of employment activities throughout the full length of the route. While the Don Mills/Leslie Street corridor contains significant concentrations of employment at each end of the corridor, a significant portion of the corridor contains low density residential uses.

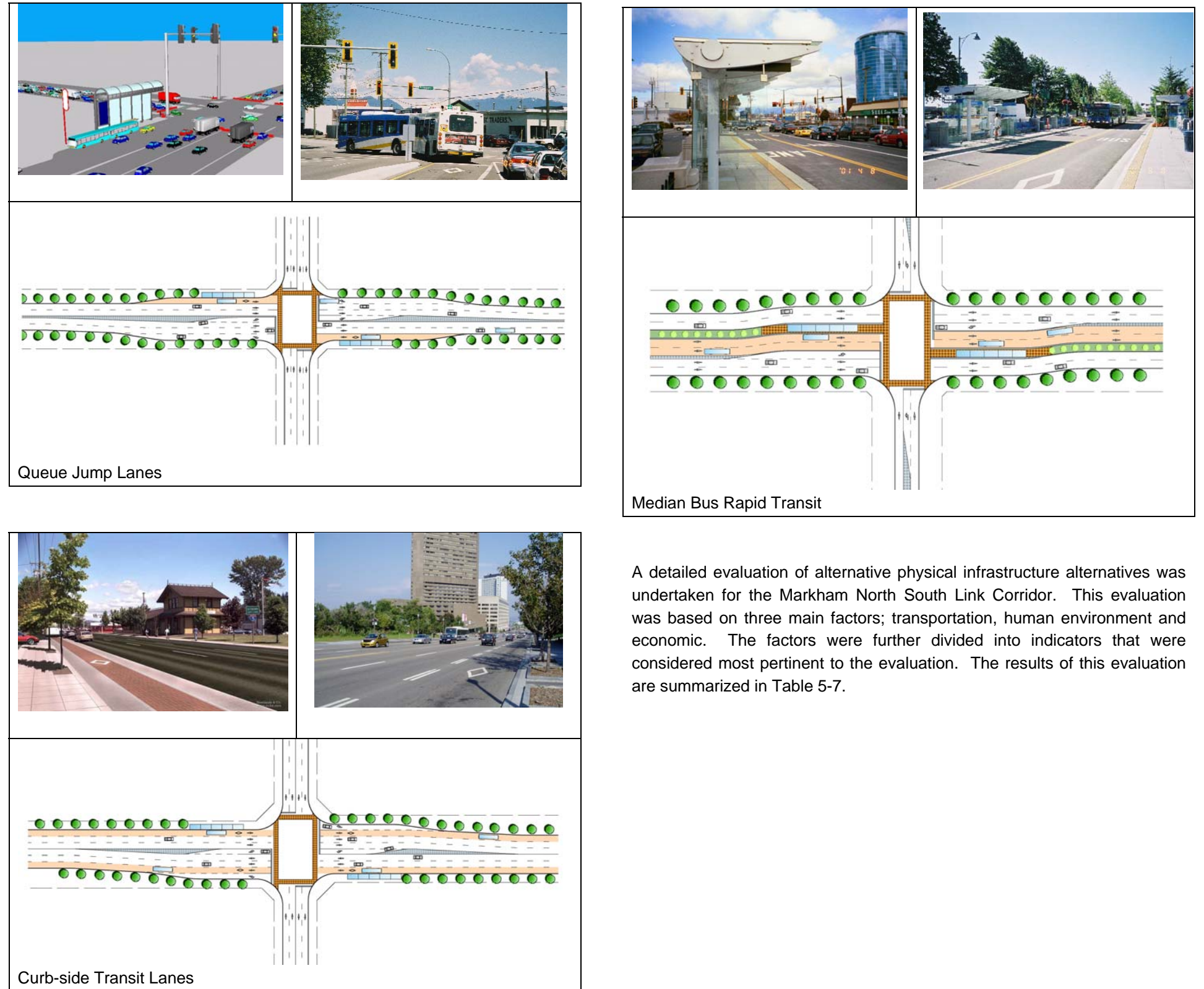
5.6 ALTERNATIVE PHYSICAL INFRASTRUCTURE IMPROVEMENTS

Given the diversity of conditions in the Markham North-South Corridors, combined with the fact that the analysis of travel patterns indicates that public transit improvements should be considered in more than one corridor, it is appropriate to examine a range of physical infrastructure alternatives. Physical infrastructure alternatives essentially consist of alternatives for locating rapid transit, or enhanced transit, within the road R.O.W. and include the following:

- Queue jump lanes, which provide priority for transit vehicles at intersections or other bottle-necks;
- separate curbside lanes that are fully dedicated for buses, or operate as combined transit/HOV lanes;
- an exclusive two way median in the centre of the roadway with northbound and southbound vehicular traffic either side of the transitway,

A description of the above alternatives is shown in Figure 5-9.

Figure 5-9
Alternative Physical Infrastructure Options



A detailed evaluation of alternative physical infrastructure alternatives was undertaken for the Markham North South Link Corridor. This evaluation was based on three main factors; transportation, human environment and economic. The factors were further divided into indicators that were considered most pertinent to the evaluation. The results of this evaluation are summarized in Table 5-7.

Table 5-8
Evaluation of Alternative Physical Infrastructure Alternatives

FACTOR & INDICATOR	ALTERNATIVE			EXPLANATION OF EVALUATION/SCREENING
	Median Transitway	Curb Side Transit lanes	Queue Jump Lanes	
Transit Service Reliability	●	○	○	<ul style="list-style-type: none"> In a median transitway the left turn centre lane will be eliminated and left turns will be prohibited mid block. Transit will have no interference from vehicular traffic except at intersections resulting in a reliable service especially if transit is given priority at signals. A two-way curb transitway will have interference only on one side of the roadway from vehicles entering driveways. Queue jump lanes will provide modest priority at intersections only.
Impact on Traffic Operations	○	●	○	<ul style="list-style-type: none"> A median transitway will force all turning traffic to U-turns or intersections. This will decrease the capacity at intersections. The effect of mixed traffic with transit vehicles in the roadway and at signals for a curb side transitway will result in more conflicts than that compared with a median transitway. Queue jump lanes will reduce the interference between buses and regular traffic.
Overall Safety of Options	●	○	○	<ul style="list-style-type: none"> A median transitway is considered the safest as it has the least number of conflicts with road traffic. Some conflicts still remain though at intersections with left turning vehicles. A curb transitway will be least safe due as transit vehicles will overlap with right turn traffic at intersections.
Vehicle Access to Adjacent Properties	○	●	●	<ul style="list-style-type: none"> Although the median option will prohibit left turn lane access to adjacent lands, the provision of U-turns, either dedicated or at intersections, will provide a balanced access to adjacent land use. A curb transitway will permit the most convenient access to adjacent lands except for interference from transit vehicles on the curb side. Queue jump lanes will afford full access to adjacent properties.
HUMAN ENVIRONMENT				
Noise & Vibration Impacts	●	○	○	<ul style="list-style-type: none"> A median transitway will be furthest from adjacent buildings and therefore have least impact on them. A two-way curb transitway or queue jump lanes will be closest to adjacent buildings on one side and will have worst vibration and noise impacts in areas where transit buses are passing each other.
Convenience & Comfort to Passengers Accessing Transit Facilities	○	●	●	<ul style="list-style-type: none"> Curb-side transit is more familiar to passengers normally using transit. Curb side platforms can be wider and feel safer as they are away from transit and road vehicles Passengers will feel more uneasy especially in areas where platforms are located in the median and where there will be traffic on both sides of a platform such as in the case of a median transitway.
Streetscape Improvement Opportunities	●	○	●	<ul style="list-style-type: none"> A median transitway will allow better opportunity for a more uniform streetscaping arrangement. It will allow a separate transitway more of a distinct character.

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FACTOR & INDICATOR	ALTERNATIVE			EXPLANATION OF EVALUATION/SCREENING
	Median Transitway	Curb Side Transit lanes	Queue Jump Lanes	
TRANSPORTATION				<ul style="list-style-type: none"> A curb transitway or mixed traffic transit will have little opportunity for streetscaping enhancements.
Economic Environment				
Capital & Operating Costs	○	●	●	<ul style="list-style-type: none"> A median transitway will have the highest capital costs due to having the widest cross section especially in platform areas. A curb transitway will have opportunities for combining platform construction with adjacent sidewalks. Queue jump lanes will have the lowest capital costs.
Land Acquisition Costs	○	●	●	<ul style="list-style-type: none"> Land acquisition costs ranking will be similar to that of construction cost rankings due to the effect of cross sectional impacts.
OVERALL	●	○	○	<ul style="list-style-type: none"> Any alternative could be used for the preferred undertaking depending on location. However, median transitway provides the best level of transit service.

QUALITY RATING:

- Most Preferred ● ○ ○ Least Preferred

The result of the evaluation indicated that a median transitway was generally preferred for the following reasons:

- It had the best transportation service quality;
- It was deemed the safest as it had the least number of conflict points at intersections;
- It provided good opportunity to mitigate the impact of local traffic and property access issues; and
- It was also considered more desirable as it allowed for better streetscaping opportunities.

However, the choice of physical infrastructure depends on local conditions including:

- Available R.O.W. width
- Number of driveways and type of traffic using the driveways (e.g. cars or heavy trucks); and,
- Potential for routing changes (i.e. in the southern portion of the study area routings may be modified if the Sheppard Subway is extended).

Therefore, all three alternatives are carried forward for more detailed assessment as part of the preferred design. However, the preferred technology for the ultimate rapid transit network is a median transitway.

5.7 STRATEGY FOR IMPROVING PUBLIC TRANSIT IN THE MARKHAM NORTH-SOUTH CORRIDOR

Rapid transit modes and technologies can evolve in a particular corridor over time. As growth occurs and development patterns change, increases in transit demand may justify or even mandate more expensive and complex technologies over time. For example, rapid transit development in a corridor may begin with a conventional BRT service operating in mixed traffic with dedicated transit lanes along specific segments. Over time, as ridership increases, partially segregated transitways, station by-passes, larger, more complex vehicles, upgraded intelligent transportation systems and other technologies can be added. Eventually the point may be reached when ridership levels are high enough that partially segregated LRT or even fully segregated heavy-rail transit could become warranted.

There are several factors that suggest a staged approach to the implementation of rapid transit in the Markham North-South corridor is appropriate:

- Existing transit ridership in the corridor is relatively modest compared to other corridors such as Yonge Street. Existing transit volumes would not justify immediate implementation of a full rapid transit system (e.g. dedicated right-of-ways).
- Some parts of the corridor required to support rapid transit have not yet fully developed, the most important of which is Markham Centre. There is a need to develop the rapid transit system to reflect the pace of development for Markham Centre.
- Forecasts for the VIVA Phase 1 service indicate that transit ridership in the short term could be handled by a bus-based system using existing right-of-ways combined with transit priority measures.
- The timing of potential transit or road improvements resulting from the Don Valley Corridor Transportation Master Plan is not known at this time.
- The timing of potential extensions of the Sheppard Subway as well as other higher order transit services identified in the City of Toronto Official Plan are uncertain.
- Funding constraints may not permit the development of a full rapid transit system in the short term.

Furthermore, due to the nature of demand patterns in the corridor, and the fact that there are multiple employment nodes that would benefit from improved transit service, it is appropriate to implement public transit improvements in more than one corridor.

Figure 5-10 provides an overview of the proposed method of improving public transit service in the Markham N-S Link Corridor.

The first stage of the evolution of rapid transit corridor is the implementation of a higher frequency, limited stop service utilizing modern buses to establish a transit connection between Markham Centre and the Sheppard Subway. This is referred to as the VIVA Phase 1 service, which has been in operation since Fall 2005.

At such time when demand warrants, the next step for the preferred corridor would be to construct median transit lanes on Warden Avenue from Enterprise Drive to Denison Street. In the longer term, these median transit lanes could be extended south to connect with a future higher order transit service in Toronto such as the Finch Hydro corridor or an extension of the Sheppard Subway.

Although not part of the preferred undertaking, an important enhancement to public transit in the study area would be the implementation of transit priority improvements on Don Mills/Leslie Street north of Steeles Avenue to allow for expedited transit services between Don Mills Station and the Highway 404/7 commercial node. These services would connect to the planned Don Mills Higher Order Transit corridor south of Steeles Avenue and be integrated with future initiatives in that corridor. Transit priority measures would also be implemented on other roadways as identified in the York Region Transportation Master Plan. The City of Toronto has initiated an EA to examine transit needs for Don Mills south of Sheppard.

Based on the evaluation of technologies presented previously, the initial technology will be Bus Rapid Transit (BRT). This technology provides sufficient capacity to handle the projected transit ridership demands while allowing for flexibility of routing over time as the corridor develops and future rapid transit alternatives are established in the City of Toronto. Bus Rapid Transit also allows for seamless travel from other rapid transit corridors in York Region and can be implemented in a phased manner.

In the longer term, Light Rail Transit (LRT) could also perform the function of providing surface rapid transit. LRT has similar operating characteristics and physical requirements as BRT, but generally provides for higher capacities. In order to maintain flexibility for evolving needs, and potential future opportunities in the corridor over the longer term, LRT technologies were carried forward as an alternative method of improving public transit. The decision to convert to LRT technology as defined in this EA would be subject to Regional Council Approval during an open session. The introduction of LRT in the York Region portion of the corridor would be predicated on the availability of LRT facilities connecting to the Sheppard Subway. The development of LRT in the City of Toronto would require a separate study and approvals process.

Implementation of the VIVA Phase 1 services do not require an Environmental Assessment as no major infrastructure will be required. The

scope and nature of transit priority measures on Don Mills Road/Leslie Street will be determined through other process. Specifically, York Region will be undertaking a Class Environmental Assessment for a proposed Leslie Street widening as identified in the Transportation Master Plan. It is recommended that this Class EA consider, as an alternative solution, transit priority measures. Similarly, the City of Toronto will be advancing planning for the Don Mills corridor. It is important that York Region and the City of Toronto work together in this regard.

In the remainder of this EA, alternative design concepts are developed and evaluated for a surface rapid transit facility in the Warden Avenue corridor, including connecting facilities to existing and potential future rapid transit networks in the City of Toronto.

Figure 5-10
Preferred Alternative Method of Improving Public Transit in the Markham N-S Corridor and Relation to Other Corridors

