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Introduction

1.0 Introduction

The existing Spadina Subway is the westerly portion of the continuous Yonge-University-Spadina Subway and runs northerly from Bloor Street. The Spadina Subway, from St. George Station to Wilson Station, was opened on January 27, 1978. Subsequently, a 2-km extension from Wilson Station to Downsview Station opened on March 31, 1996. Concurrent with the last extension, the Toronto Transit Commission planned an additional extension from Downsview Station to York University (see Figure 1-1). The supporting "Yonge-Spadina Subway Loop Environmental Assessment", as discussed below, was filed with the Ministry of the Environment and subsequently approved in 1994.

The City of Toronto and the Toronto Transit Commission (TTC) ("the Proponents") have prepared this Individual Environmental Assessment (EA), which updates and enhances the 1994 Approved Undertaking for the extension of the Spadina Subway from Downsview Station to York University. This new EA considers alternative alignments and station locations for the extension of the Spadina Subway from Downsview Station through York University to a terminal station at Steeles Avenue. Therefore, the Undertaking is a 6.2 km, four-station extension of the Spadina Subway from Downsview Station to Steeles Avenue via York University.

This Individual EA includes the following, in accordance with Subsection 6.1(2) of the Ontario ***Environmental Assessment Act*** (January 1, 1997):

1) The purpose;
2) A description of the rationale for the proposed Undertaking, alternative methods for and alternatives to the proposed Undertaking;
3) A description of the environment to be affected, the effects and actions needed to mitigate the effects;
4) An evaluation of the advantages and disadvantages to the environment; and
5) A description of the consultation conducted during the preparation of this EA.

The Terms of Reference for this EA was filed and approved in accordance with the ***Environmental Assessment Act***. The Terms of Reference provided a framework for the preparation of this EA and will be used as a benchmark for the subsequent review of the EA by MOE.

1.1. Background and Context

1.1.1. Approved Yonge-Spadina Loop Environmental Assessment (1994)

The Yonge-Spadina Subway Loop EA was identified as part of a comprehensive plan (known as Let's Move) for eight rapid transit projects, which was initiated in the early 1990's.

TTC and the former Metropolitan Toronto completed an EA for the Yonge-Spadina Loop Environmental Assessment (hereinafter referred to as the 1994 EA). The 1994 EA established the need and justification for transportation improvements in northwest Toronto. The study determined that extending and connecting the north ends of the Yonge and Spadina Subway to Steeles Avenue and connecting the two subways across Steeles Avenue was the preferred alternative. This recommendation was based on an analysis of several alternatives, including "doing nothing", roadway improvements, alternative technologies and modifications to the existing subway system. The 1994 EA determined that the need for the "loop" along Steeles Avenue was a longer-term requirement and therefore TTC only sought approval for the extension of the Spadina Subway from Downsview Station to York University only.

In 1994, upon review of the TTC/Metro Toronto Environmental Assessment Report, the Minister of the Environment and Energy authorized the Notice to Proceed with the Undertaking.

Design and construction of the approved extension of the Spadina Subway to York University (i.e. the Approved Undertaking) did not proceed due to lack of funding.

1.1.2. Need and Justification for a New EA Study

During the twelve years since the 1994 EA study was conducted, several important policy changes, planning initiatives, transit improvement projects, land development decisions and property acquisition activities have occurred. These changes in the land use and transportation-planning context have raised questions about the alignment and station locations recommended in the 1994 EA. These key changes are listed below and are illustrated in Figure 1-2:

1) The Rapid Transit Expansion Study, August 2001 (RTES), for the Toronto Transit Commission examined the need and priorities of expanding the rapid transit system to meet the growing employment and residential population within the Greater Toronto Area. RTES identified the Spadina – York University Rapid Transit corridor as one of two short-listed subway extension projects (along with the Sheppard Subway Extension). RTES also concluded that a future subway "loop" along Steeles Avenue is no longer needed and that alternatively a "radial" extension via York University to a terminal station at Steeles Avenue is preferred.
2) The City of Toronto and York Region Official Plans support "Higher Order Transit Corridor" services to York University and the new Vaughan Corporate Centre (Highway 7 and Jane Street) respectively. Both Plans call for improved transit reliability and capacity in the short term and subway expansion in the long term. Specifically, the new City of Toronto Official Plan (currently subject of appeals to OMB, with exception of the transportation policies which were approved by OMB Order on January 25, 2006) includes a Higher Order Transit Corridor following the route proposed in the Rapid Transit Expansion Study.
3) Special planning studies, Secondary Plans and Official Plan Amendments support transit-supportive development (at Allen/Sheppard, along Keele Street, within the Downsview area and the York University lands) and protect for a future subway.
4) The Downsview lands (south of Sheppard Avenue West and east of Keele Street) have changed from a Canadian Forces Base to Parc Downsview Park (to consist of parkland, a future technology park and housing). As a result, there will be more people on the site who need better public transit access.

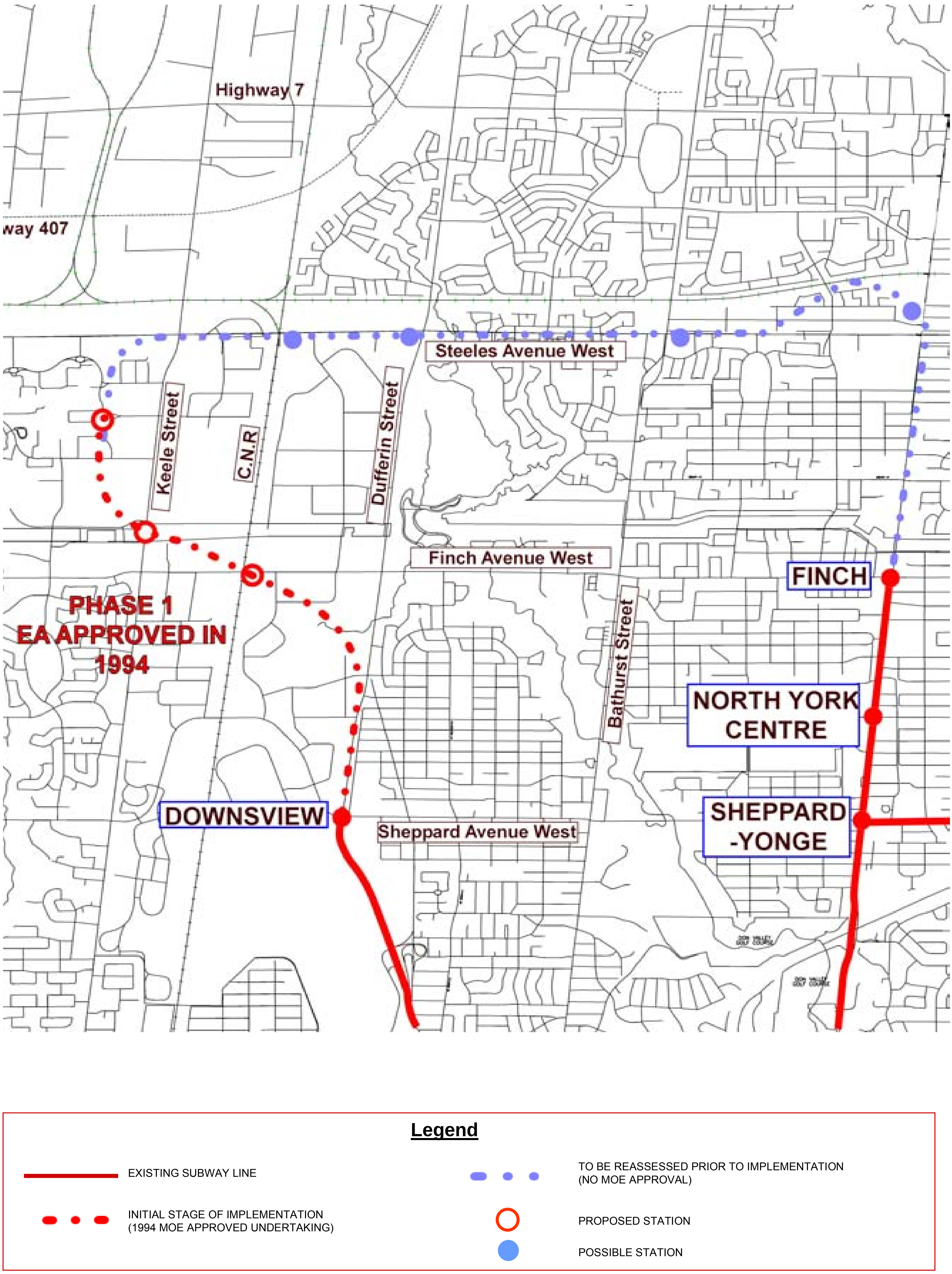

Figure 1-1: 1994 EA-Approved Alignment

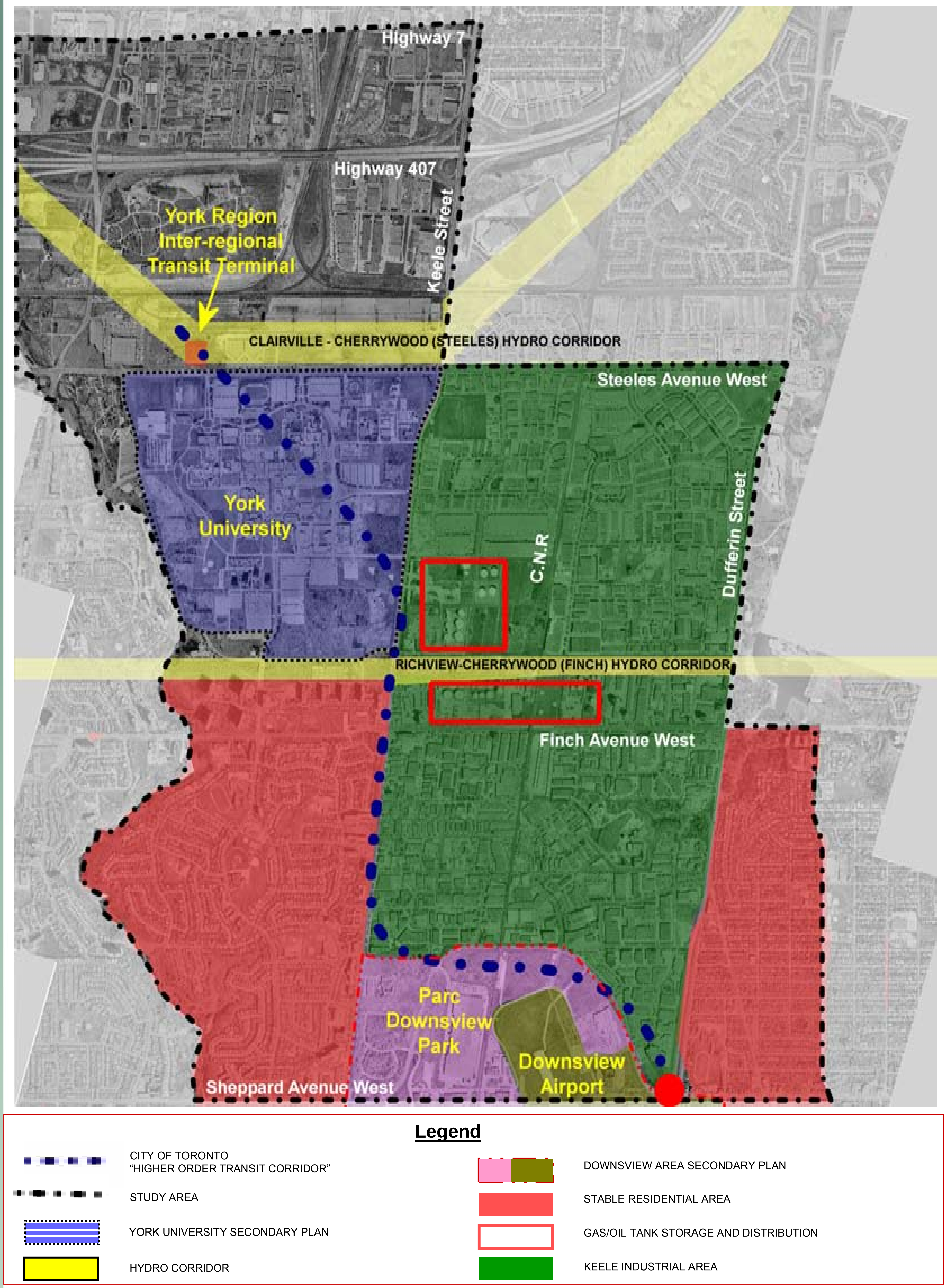

Figure 1-2: Key Changes in Study Area

5) As a result of the RTES initiative, York University's new buildings protect for an alternative subway alignment, which is more central within the campus than the 1994 EA alignment.
6) York Region has acquired property for a proposed inter-regional transit terminal at Steeles Avenue, between Jane Street and Keele Street. Additional lands are to be protected for new roads, a proposed inter-regional transit terminal and commuter parking to the north and east of the Jane Street / Steeles Avenue intersections as outlined in York Region's "Highway 7 Corridor and Vaughan North-South Link Public Transit Improvements EA".

Therefore, there is a need to develop and analyze alternative alignment and station locations (i.e. alternative methods of carrying out the Undertaking) for the subway extension. Also, a terminal station (with surface commuter facilities) at Steeles Avenue was not a part of the 1994 Undertaking.

Although the 1994 Approval of the Undertaking remains, its amending formula does not accommodate:

1) The consideration of alternative subway alignments and station locations,
2) A station at Steeles Avenue, and
3) The foregoing, in the context that the Subway would ultimately extend radially into York Region instead of a loop along Steeles Avenue to Yonge Street as proposed in the "Highway 7 Corridor and Vaughan North-South Link Public Transit Improvements EA" by York Region.

1.1.3. Spadina Subway Extension – Downsview Station to Steeles Avenue EA Terms of Reference

In accordance with the Ontario Environmental Assessment (EA) Act (January 1, 1997), the City of Toronto and the Toronto Transit Commission prepared, the June 2004 "Spadina Subway Extension – Downsview Station to Steeles Avenue Environmental Assessment Terms of Reference" (hereinafter referred to as ToR). The ToR provides a framework for the preparation and subsequent review and decision of this EA.

The ToR outlined the work plan to be followed and the environmental and technical factors to be considered in preparing this EA. To provide the public and stakeholders and opportunity to comment on the proposed ToR, Public Consultation Centres were held on April 20 and 22, 2004.

On September 13, 2004, the Minister of the Environment approved the Spadina Subway Extension – Downsview Station to Steeles Avenue Environmental Assessment Terms of Reference.

1.2. Study Purpose and Objectives

The purpose of this EA is to develop and analyze alternative alignments and station locations for an extension of the Spadina Subway from Downsview Station to a terminal station at Steeles Avenue. The EA Study also determines environmental impacts and mitigating measures.

The 1994 EA defined the purpose of the Undertaking as follows:

1) "To improve the level of trans service and the utilization of the present Yonge-University-Spadina (Y-U-S) Subway;
2) To increase the transit mode split for all trips, including cross-boundary trips between York Region and Metropolitan Toronto, by improving accessibility to rapid transit services and by improving the integration of services provided by the TTC, GO Transit and other transit operators;
3) To support existing and proposed Official Plan objectives, including residential intensification within the existing urban envelope and improved transit service to designated centres (such as North York Centre) and other major employment areas and to other major travel generators;
4) To minimize negative social and natural environmental impacts; and
5) To provide service at reasonable costs."[1]

In response to the changes discussed in section 1.1.3, the ToR for this EA updated and enhanced the purpose of the Undertaking from the 1994 EA to be as follows (see Figure 1-3):

1) Provide subway service to the Keele/Finch area, York University and a new inter-regional transit gateway and commuter parking facility at Steeles Avenue;
2) Provide improved connections between the TTC subway system and GO Transit, York Region Transit and other inter-regional transit services;
3) Support local population and employment growth up to 2031, in accordance with the land use and transportation policies of the City of Toronto, the City of Vaughan and York Region Official Plans;
4) Minimize any negative environmental impacts; and
5) Achieve reasonable capital and operating costs.

The Undertaking includes the construction, operation and maintenance of underground subway tunnels from Downsview Station to Steeles Avenue, with subway stations (and related surface commuter facilities) located:

1) At an interchange with the GO Transit Bradford Rail Line,
2) In the vicinity of Keele Street and Finch Avenue,
3) On the York University campus, and
4) At Steeles Avenue (between Keele and Jane Streets).

The alignment at Steeles West Station shall also protect for the long-term extension of the Spadina Subway to Vaughan Corporate Centre.

[1] 1994 EA, Page E-7.

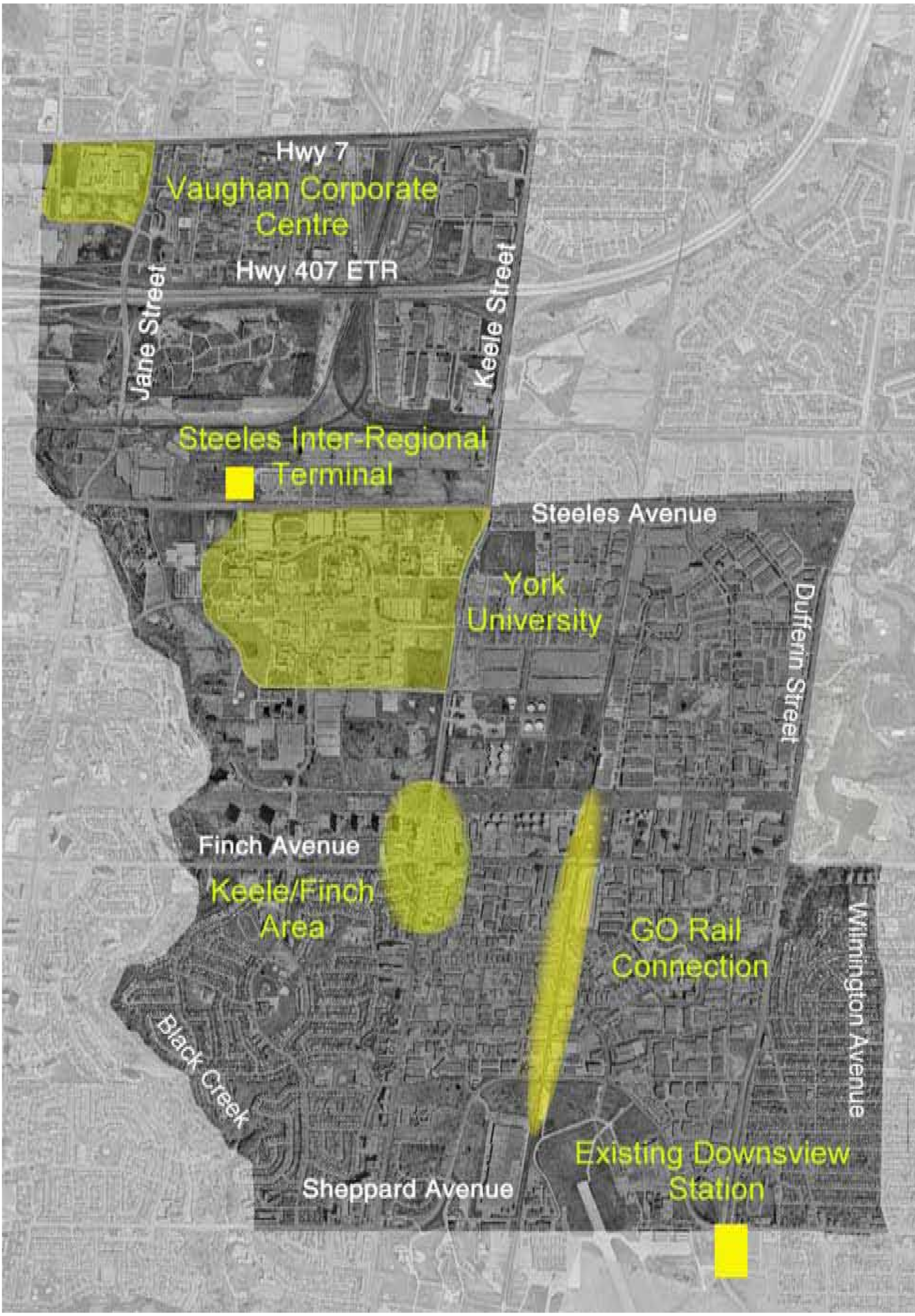

Figure 1-3: Study Area and Project Objectives

1.3. Project Organization

1.3.1. Study Team

A consulting team under the supervision of the TTC and the City of Toronto Staff undertook the study. TTC and City staff were directly responsible for:

1) Public and agency consultation;
2) Travel demand forecasting; and
3) Feeder bus route restructuring concepts.

The consultant team members and their roles in the project are described below:

1) URS Canada Inc. – overall project management, existing transportation planning, transportation systems, surface water, air quality, utilities and pipelines, future transportation demands, and EMI;
2) LGL Limited - natural heritage, environmental effects, mitigation;
3) Golder Associates Limited - geology/subsurface stratigraphy, hydrogeology;
4) Planning Partnership - socio-economic environment and existing and planned land use;
5) Archaeological Services Inc. - archaeology and cultural heritage;
6) Johnston Donald Associates – property; and
7) SS Wilson Associates - noise and vibration.

1.3.2. Technical Advisory Committee

A Technical Advisory Committee (TAC) was formed to provide overall direction to this EA and to ensure that key agencies are involved in the development of the EA. The TAC provided necessary background information to the Project Team as requested, acted as the communication linkage to their respective agencies and provided advice and guidance. The TAC included representatives for the following key stakeholder agencies:

1) Toronto Transit Commission
2) GO Transit
3) City of Toronto – City Planning Division and Transportation Services Division
4) City of Vaughan
5) Ontario Ministry of Transportation
6) Parc Downsview Park
7) Toronto and Region Conservation Authority
8) Canadian Environmental Assessment Agency
9) York Region
10) York Region Transit
11) York University

1.3.3. Other Stakeholder Agencies

Other stakeholder agencies included representatives from Provincial and Federal ministries and other agencies with an interest in the EA. Many of these representatives will be responsible for carrying out a “Government Review” of the Environmental Assessment once it is submitted to the Minister of the Environment. The EA Study findings were reviewed with these agencies at key decision points.

Environmental Assessment Process

2.0 Environmental Assessment Process

This section describes the Environmental Assessment (EA) process followed for this Study including Stage One: the Terms of Reference and Stage Two: the EA. This EA was completed in three phases (Phase One – Routes and General Station Locations, Phase Two – Alignment and Conceptual Stations, and Phase Three – Detailed Assessment of the Effects of the Undertaking)

This section also documents the steps taken in accordance with the ***Canadian Environmental Assessment Act.***

2.1. Ontario Environmental Assessment Act Requirements

The purpose of the ***Environmental Assessment Act*** of Ontario is to ensure that the environment is properly protected, conserved and wisely managed through good planning and an informed decision-making process. The EA process (Figure 2-1) involves the evaluation of the possible environmental impacts of an undertaking through the preparation of two documents: a Terms of Reference and an EA Study.

2.1.1. Terms of Reference

In accordance with Section 6 of the Ontario ***Environmental Assessment Act***, TTC and the City of Toronto prepared a Terms of Reference (ToR) for the Spadina Subway Extension Individual EA in spring of 2004. The ToR focused on the environmentally significant issues of the Undertaking and provided a framework and benchmark to guide the Study Team and focus the EA process and subsequent EA approval.

A draft ToR was presented to the general public and stakeholders at two open houses in locations within the Study Area. As detailed in section 3.0, public comments gathered from these two consultation centres were then incorporated into the finalized ToR, which was submitted to the Ministry of Environment in June 2004.

The Ministry of Environment approved the ToR for the Spadina Subway Extension on September 13, 2004. With the approval of the ToR, this EA commenced Fall 2004. Table 2-1 provides a listing of the Terms of Reference commitments and provides a reference the relevant section(s) within this EA.

2.1.2. Environmental Assessment Report

As specified in subsection 6.1 (2) of the Ontario ***Environmental Assessment Act*** and the ToR, this EA Report for the Spadina Subway Extension includes the following:

1) A description of the purpose of the Undertaking (section 1.0);
2) A description of and a statement of the rationale for,
   i) The Undertaking (section 4.10),
   ii) The alternative methods of carrying out the Undertaking (section 6.0), and
   iii) The alternative(s) to the Undertaking (section 5.0);
3) A description of:
   i) The environment that will be affected or that might reasonably be expected to be affected, directly or indirectly (section 4.0),
   ii) The effects that will be caused or that might reasonably be expected to be caused to the environment (section 8.0),
   iii) The actions necessary or that may reasonably be expected to be necessary to prevent, change, mitigate or remedy the effects upon or the effects that might reasonably be expected upon the environment by the Undertaking (section 8.0),
   iv) The alternative methods of carrying out the Undertaking and the alternatives to the Undertaking (sections 6.0 and 5.0 respectively);
4) An evaluation of the advantages and disadvantages to the environment of the Undertaking (section 8.0), the alternative methods of carrying out the Undertaking (section 6.0) and the alternatives to the Undertaking (section 5.0); and
5) A description of any consultation about the Undertaking by the proponent and the results of the consultation (section 3.0).

The EA process began with a comprehensive inventory and assessment of the existing and future conditions within the Study Area. The inventory focused on transportation, natural and cultural heritage, social and economic issues within the Study Area and the findings are documented in section 4.0 of this report. The Study Team also reviewed previous studies and EA reports conducted within the Study Area with the aim of updating baseline conditions identified in the 1994 EA as well as identifying the changes that occurred subsequent to that time. Using the inventory of existing and future conditions, the Study Team confirmed the boundaries of the Study Area for this EA.

As discussed in greater detail in section 6.0, alternative methods of carrying out the Undertaking consisted of two phases: Phase One – Routes and General Station Locations; and, Phase Two – Alignments and Station Concepts. A two-phase approach to alternative methods of carrying out the Undertaking was considered reasonable, practical and in step with the ToR and consistent with standard environmental assessment practices.

The rationale for the two-phase approach was based on the fact that the number of potential permutations and combinations of the Undertaking was neither manageable nor feasible under a one-phase selection process. A one-phase selection process may result in a situation whereby alternative methods with high potential may be excluded without an appropriate level of analysis.

In contrast, this two phase approach for developing and analyzing alternative methods of carrying out the Undertaking provided a logical, traceable, efficient and thorough method to ensure that all reasonable alternative methods were taken into consideration in selecting the preferred subway extension. The level of detail used to assess site characteristics increased from Phase One to Phase Two as the area under investigation was reduced. In addition, the two-phase selection process provided an opportunity to assess the potential of a considerable number of alternative methods, while at the same time ensuring that no alternative with high potential would be excluded without an appropriate level of analysis.

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Table 2-1: Addressing the Terms of Reference Commitments

Page #	ToR Commitments	Section of this EA
3, 12	Develop and analyze alternative alignment and station locations.	section 6.2.1, 6.2.2, 6.3.1, 6.3.2
6	Conduct an inventory of transportation, natural, social and economic environment conditions.	section 4.0
6	Review preliminary study area to encompass the area that would be potentially affected.	section 4.1
7	Consult with federal authorities to determine where Canadian Environmental Assessment Act applies.	section 2.2
9	Study changes to the 1994 EA to extend the Spadina Subway from Downsview Station to York University.	section 5.4
9	Include a summary of further analysis on the need for the “Loop”.	Section 5.0
9	Include full documentation of previous studies.	section 4.4.5
10	Bring forward for analysis GO-TTC Interchange at Finch Avenue including full documentation for the justification for further analysis.	Section 6.0
10	Bring forward for analysis GO-TTC Interchange at Sheppard Avenue including full documentation for the justification for further analysis.	section 4.3.2.2
10	Develop additional alignments based on technical design criteria, TTC standard practices, costs and construction methods.	
10	Review and customize guidelines (technical design criteria, TTC standard practices).	section 6.1.3
10	Review alignments with public and stakeholders.	section 3.1
10	Develop Design Criteria.	section 6.1.3
11	Develop a base case travel demand forecast.	section 4.6.1
11	Develop travel demand forecasts for each alternative alignment.	section 4.6.2
12	Recommend preferred alignment.	section 6.2.3
12	Conduct detailed Environmental Impact Assessment for the Preferred Alignment; including a description of the environment, potential effects, mitigation measures, and advantages and disadvantages to the environment.	section 8.0
13	Identify mitigation measures for each negative environmental impact.	section 8.0
13	Determine net effects after mitigation.	section 8.0
13	Develop a list of permits and approvals required by authorities having jurisdiction.	section 9.0
14	Evaluate the overall advantages and disadvantages to the environment.	section 8.4
14	Develop a monitoring strategy and monitoring schedule including proposed mitigation measures.	section 8.0
14	Propose a process for MOE review/approval of changes to the Undertaking.	section 9.0
14	Prepare EA Report in accordance with the Ontario EA Act requirements.	ESR
16	Advertise to approximately 40,000 homes, businesses and institutions in the Study Area.	section 3.8
Table 3	Conduct inventory of existing transit routes, operating characteristics, peak hour headways and passenger demand for TTC, York Region Transit and GO Transit.	section 4.3
Table 3	Determine planned long-term changes in routes, service levels and demand.	Appendix Q
Table 3	Conduct inventory of Yonge-University-Spadina subway train storage and maintenance facilities.	Appendix Q
Table 3	Identify planned road and transit projects in the Study Area.	section 4.3.4.3, ____
Table 3	Conduct inventory of existing road network, existing and planned number of lanes, and existing and future traffic volumes.	section 4.3.4, 4.3.4.2, 4.6
Table 3	Identify socio-economic characteristics of existing communities within the Study Area.	section 4.5.1
Table 3	Conduct measurements of baseline noise levels in the primary study area.	section 4.5.5
Table 3	Identify any noise and vibration sensitive receptors.	Appendix __
Table 3	Update inventory of historical/ architectural features in the Study Area.	section 4.5.4
Table 3	Update inventory of archaeological sites.	section 4.5.3
Table 3	Update inventory of community facilities including schools, places of worship, parks, arenas, and libraries.	section 4.5.1.1
Table 3	Determine existing and emerging development patterns within the Study Area.	section 4.5.2, 4.5.6.2
Table 3	Conduct a detailed descriptive analysis of local land use policies and development patterns within the Study Area.	section 4.5
Table 3	Development patterns to be broadly characterized into Stable Areas and Areas with Development Potential.	section 4.5.6
Table 3	Conduct inventory of major utilities within the Study Area.	section 4.5.8

Table 2-1 (Continued): Addressing the Terms of Reference Commitments

Page #	ToR Commitments	section of this EA
Table 3	Determine geographical extent, composition, structure and function of vegetation communities (including meadow, wetland and woodlot), including any dependencies on groundwater or upwelling.	section 4.4.4
Table 3	Conduct inventory of fill regulated areas, fill extension areas, valley corridors and natural corridors.	section 4.4.2.3
Table 3	Conduct inventory of watercourses, regional storm floodplains, and stream corridors.	
Table 3	Document groundwater conditions, including water quality, temperate and location/depth of aquifers/ aquitards.	section 4.4.1.2
Table 3	Document surficial geology.	section 4.4.1.1
Table 3	Document pattern of groundwater movements.	section 4.4.1.2
Table 3	Compile water quality measurements.	section 4.4.2.4
Table 3	Update inventory of aquatic habitats and species.	section 4.4.3
Table 3	Identify important linkages to groundwater (i.e. upwellings and high baseflow contributions).	section 4.4.1.2
Table 3	Document wildlife habitat and occupation within the Study Area.	section 4.4.5
Table 3	Conduct inventory of any Environmentally Significant/ Sensitive Areas (ESA's), Provincially Significant Wetlands (PSW's) and Areas of Natural and Scientific Interest (ANSI's).	section 4.4.6

Page #	ToR Commitments	Section of this EA
Table 3	Conduct hydraulic conductivity calculations based on slug/pump test.	
Table 3	Document physiography, soil conditions and known contamination sites.	section 4.0
Table 3	Compile air quality measurements and compare to current Ontario Air Quality Criteria.	section 4.4.7
Table 4	Design vertical alignment (profile) to minimize the depth to platforms while retaining grades less than the maximum permissible grade of 3.5%.	section 6.1.1
Table 4	Design horizontal alignment to achieve curve radii of 600 metres or greater.	section 6.1.1
Table 4	Provide crossover tracks to permit trains to pass from one track to another ahead of all stations, which could function as terminal stations and at intermediate points along the line to provide operational flexibility.	Section 7.0
Table 4	Provide storage tracks at strategic locations to achieve operational flexibility.	Section 7.0
Table 4	Construct under road right-of-way to avoid disruption to neighbourhoods and minimize property acquisition requirements.	Section 6.0
Minister ToR Approval Condition – Potential effects on freight and passenger rail service, safety and operations during construction as an assessment factor and potential environmental impact.		Section 6.0

Spadina Subway Extension

Environment Assessment Process

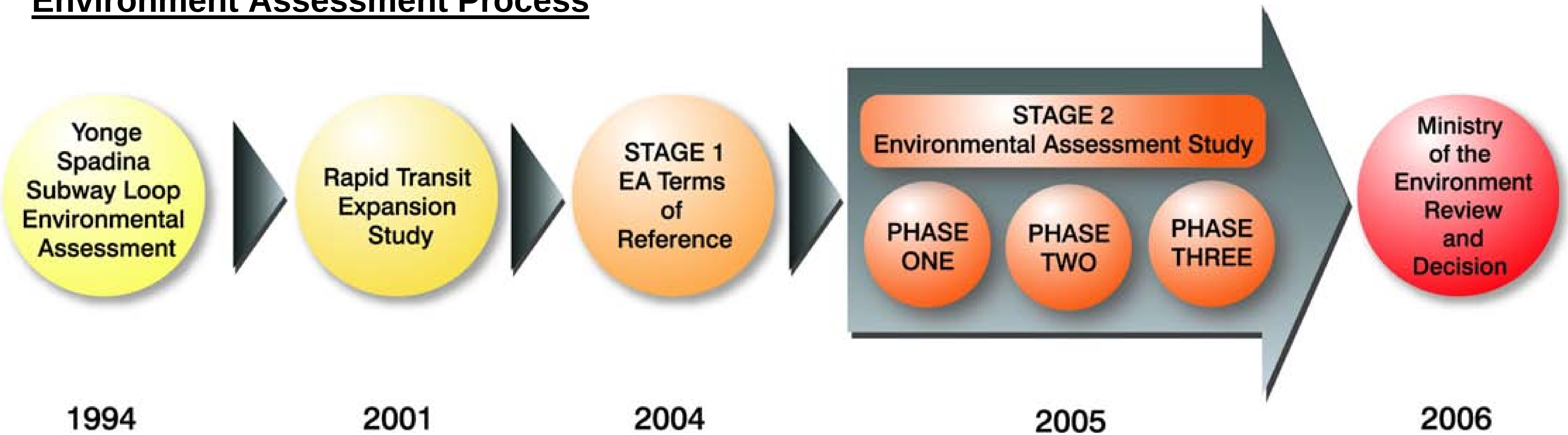


FIGURE 2-1: Environmental Assessment Process for the Spadina Subway Extension

The Undertaking is documented in section 7.0 of this EA. The results of Phase Three – Detailed Assessment of the Effects of the Undertaking are described in detail in section 8.0 of this EA.

Phase One - Routes and General Station Locations

Phase One of the Undertaking selection process included the generation, evaluation and selection of alternative routes and station locations. The Study Team defined routes as broad geographical corridors, within which, a number of subway alignments may occur. General station locations were defined by the Study Team as broad geographical areas, within which, a number of station concepts may occur.

The Study Team developed eight alternative routes, each with four general station locations in accordance with the project objectives as identified in the ToR. As per the 1994 EA and confirmed through the review of the alternatives to the Undertaking, the subway would be an extension of the Spadina Subway (starting from the existing Downsview Station) and terminating at the proposed inter-regional transit terminal on Steeles Avenue (associated planning and property protection for this facility is discussed in section 4.0). Therefore, the south and north limits for all eight of the route alternatives were common.

The Study Team developed evaluation criteria that were used to select the preferred route and general station locations. The evaluation criteria covered transportation service, land use, socio-economic environment, natural environment, cultural environment and cost/revenue and were organized to illustrate the correlation between the evaluation criteria and the five project objectives (see section 6.0). For each criterion, indicators were developed to measure the trade-offs among alternative routes and general station locations. The evaluation criteria were released for review and comment during the first round of consultation before being finalized. The Study Team then conducted field reconnaissance and data collection to gather information about each of the eight alternative routes and general station locations according to each indicator.

The Study Team used two formal evaluation methods: a qualitative method (Reasoned Argument Method) to evaluate the eight alternative routes and station locations and a numeric method (Multi-Attribute Tradeoff System) as a test of traceability of decisions made. Details of the generation, evaluation and selection of the technically preferred route and general station locations are presented in section 6.0 and Appendix K of this study.

Phase Two - Alignments and Station Concepts

Phase Two of the alternative methods process involved the generation and evaluation of alignments and station concepts and selection of the Undertaking. The Study Team used the boundaries of the technically preferred route and general station locations for this phase of the EA. The Study Team defined alignments as 26 m wide right-of-ways located within the preferred route. Station concepts were defined by the Study Team as preliminary layouts for platforms, parking facilities, bus terminals, passenger pickup and drop-off facilities, station entrances, and other station facilities located within the general station locations selected during Phase One.

As done in Phase One, the project objectives outlined in the ToR were used as a foundation for generating alignments and station concepts. Given the level of detail to which the alignments and station concepts were created, the development of reasonable alternatives required the addition of a sixth objective, ***"meet TTC geometric design standards"*** The generation criteria were released for review and comment during the second round of consultation.

Using the alignment generation criteria, four alignments were generated between Downsview Station and Finch West Station (located at the Keele Street/Finch Avenue intersection), with two sub-options within each alignment to address the alternative station locations for Sheppard West Station. Three alignments and associated York University Station concepts were generated between Finch West Station and Steeles West Station (located at proposed inter-regional transit terminal as protected for by York Region). Five station concepts were generated for Finch West Station and four station concepts were generated for Steeles West Station.

Similar to Phase One, the evaluation criteria of transportation service, land use, socio-economic environment, natural environment, cultural environment and cost/revenue as proposed in Table 5 of the ToR were organized to reflect the five project objectives. Similar to Phase One, indicators were developed for each criterion to measure the trade-offs among alternative alignments and station concepts. The evaluation criteria were released for review and comment during the second round of consultation. The criteria and indicators were finalized to incorporate public and stakeholder input following the second round of consultation.

The Study Team embarked on field studies to collect the required information for each alternative alignment and station concept to facilitate the comparative evaluation process. To maintain consistency, the same evaluation methods used in Phase One (Reasoned Argument Method and Multi-Attribute Tradeoff System) were employed by the Study Team to select the preferred alignment and station concepts.

Details of the generation, evaluation and selection of the technically preferred alignment and station concepts are presented in section 6 and Appendix L of this report.

Phase Three - Detailed Assessment of the Effects of the Undertaking

Phase Three involved the detailed assessment of the Undertaking that was selected in Phase Two. The environmental factors assessed during this phase of the Study were identified in the ToR (Table 6).

The detailed assessment of the Undertaking included:

1) A description of the environment (section 7.0);
2) A description of potential adverse and beneficial environmental effects (section 8.0);
3) A description of environmental protection measures (section 8.0); and,
4) An evaluation of the advantages and disadvantages of the project on the environment and of the environment on the project (section 8.0).

The detailed assessment considered the impacts of displacement of existing features, construction impacts and operation and maintenance impacts. For each negative environmental impact, environmental protection measures were identified and clear mechanisms were developed to ensure that they would be carried forward into the design, construction and operation of the project. Following the identification of environmental protection measures, the net or residual environmental effects of the Undertaking were identified.

A monitoring and contingency plan was developed to direct the collection of additional baseline information, to ensure compliance with the EA Study and environmental legislation/regulations and to determine if the environmental impacts and protection measures identified in the EA were accurate and effective.

The detailed assessment of the Undertaking is described in section 8.0 – Effects of the Undertaking on the Environment.

2.2. Canadian Environmental Assessment Act Requirements

The ***Canadian Environmental Assessment Act*** (CEAA) applies to federal authorities responsible for a decision of planned action – trigger – that enables the project to proceed in whole or in part. Specifically, Section 5 (1) of CEAA applies to projects where a federal authority:

1) Is the proponent of the project;
2) Provides funding to the project;
3) Provides land for the project; or
4) Issues a permit, license or authorization as prescribed in the Law List Regulations.

While no CEAA requirement has been triggered for this project to date, the Study Team prepared and submitted a Project Description to the Canadian Environmental Assessment Agency for review.

2.2.1. Project Description

In October 2004, a Project Description was prepared in order to bring greater efficiency and predictability to the federal environmental assessment process by confirming early in the EA process which federal authorities may be involved. As part of this EA, potentially affected federal agencies were consulted, namely the Canadian Environmental Assessment Agency, Transport Canada, Environment Canada, Department of Fisheries and Oceans, National Defense and Health Canada to advise on the project and monitor for any specific federal EA requirements. The level of detail of the Project Description is appropriate to the scale and complexity of the project and to the environmental sensitivities associated with the Study Area. The Project Description includes general information regarding the Study Area and the project, a discussion about external agency/public consultation and the provincial ***Environmental Assessment Act***, contact information for the proponent, information about federal involvement and authorizations required, detailed project information, existing conditions information, and a discussion regarding fish, fish habitat and navigable waters within the Study Area.

The Project Description was prepared and submitted to the Canadian Environmental Assessment Agency (CEA Agency) in October 2004. The Project Description was circulated by the CEA Agency to other federal departments and agencies that may be involved in the project. Based on a review of the Project Description, the CEA Agency advised the Study Team that a determination under CEAA was not required at that time. However, the CEA Agency identified several potential triggers that may lead to the preparation of a CEAA Screening Report in the future.

2.2.2. Monitoring for CEAA Triggers

At the conclusion of this EA, no CEAA requirements have been triggered. However, potential CEAA triggers to be monitored are detailed in section 9.0. TTC will continue to monitor the project for potential federal triggers and will consult with the CEA Agency and other stakeholders during design.

Consultation Program Summary

3.0 Consultation Program Summary

3.1. Introduction

Public and Stakeholder consultation is a key requirement of the Ontario ***Environmental Assessment Act***. As such, a comprehensive consultation program was developed during the EA Terms of Reference and implemented during the three phases of this EA. This section of the study presents a review of the consultation program undertaken as part of this study.

The integration of the results of this program into the technical assessment is documented in following sections. In addition, all of the materials associated with the consultation program are included in the detailed consultation reports attached in Appendix A.

Although consultation with stakeholders was a continuous effort for this EA, key recommendations were discussed at the following events/meetings:

1) EA Terms of Reference - April 20, 2004 and April 22, 2004,
2) EA first round of public consultation - February 10th, 2005 and February 13th, 2005,
3) EA second round of public consultation - May 17th, 2005 and May 18th, 2005,
4) EA third round of public consultation - October 2nd, 2005 and October 6th, 2005,
5) Toronto Transit Commission Meetings – November 28, 2005 and January 25, 2006,
6) Joint City of Toronto Planning and Transportation Committee Meeting – November 30, 2005, and
7) City of Toronto Council – December 5, 6 and 7, 2005.

The following sections provide additional details on the method and results of the consultation program.

3.2. Consultation Activities

The public and stakeholder consultation program offered a wide range of engagement and communication methods throughout the Terms of Reference (ToR) Stage and the three phases of this EA process.

The consultation program was designed to reach the following target audiences:

1) Residents, businesses and property owners located within and adjacent to the EA Study Area bounded by Sheppard Avenue (south), Highway 7 (north), Black Creek (west) and Wilmington Avenue / Dufferin Street (east);
2) City of Toronto and York Region transit users;
3) York University students, faculty and staff; and
4) Stakeholder agencies with a direct interest in the EA Study.

Public and stakeholders were able to choose their level of involvement from one or more of the following options:

3.2.1. Project Website

Established during the Terms of Reference stage and maintained throughout this EA process, the project website (accessed from www.ttc.ca) provided interested visitors with up-to-date study information, background materials, meeting notification, project newsletters, information on how to participate, contact details and online commenting opportunities.

3.2.2. Public Consultation Centres

During the ToR and this EA, public consultation centres provided information panels and looped audio-visual presentations for viewing. The Study Team was in attendance to answer questions regarding the Spadina Subway Extension. This included senior representatives of TTC Engineering and Property Development departments, URS Canada (lead consultant), LGL Limited (sub-consultant) and The Planning Partnership (sub-consultant).

Commenting areas (with tables and chairs) were set up to encourage members of the public to sit comfortably and make their comments following their review of the information panels and discussions with the Project Team. Fact sheets and simplified comment forms were provided. Comment boxes, pre-paid feedback envelopes, project cards, project email address and a fax number were provided to help the public provide their comments.

All events were hosted in publicly accessible locations with the Study Area.

3.2.3. Public and Stakeholder Workshops

Facilitated workshop sessions were organized to enable the public and stakeholders to be directly involved in providing input at each of phase of the EA process. Participants were asked to pre-register for the workshops via phone, email or fax. Each workshop session consisted of a presentation by representatives of the Study Team, a brief question and answer session, followed by facilitated breakout groups. The groups were guided (by a trained facilitator) through a workbook and its questions.

In addition to providing comments during table discussions, participants were asked to record their comments in the workbooks and hand them in at the end of the event. At the conclusion of each workshop, table facilitators reported back on the key ideas, comments and issues from each group. The Study Team subsequently reviewed comments recorded by facilitators along with workbook responses.

3.2.4. E-consultation

In all three phases, an 'e-consultation' feature was included on the project website which consisted of an on-line survey and was supported with information presented as a 'virtual consultation centre'. Respondents had the opportunity to comment on the same questions posed in the aforementioned workshop workbooks.

3.2.5. Other Commenting Options

From the beginning of the consultation program, the following methods were promoted to the public for submitting their comments at any time:

1) Fax number - 416-392-2974
2) Comment line - 416-338-3333 (24/7)
3) Email address - subway.ea@ttc.ca
4) Mailing address – 1138 Bathurst Street, Toronto, Ontario M5R 3H2

In addition, contacts were established with a broad range of federal, provincial and municipal agencies with a potential interest in this EA.

3.2.6. Supplemental Meetings

In addition to the formal points of contact, the Study Team met with agencies and key stakeholders to foster a collaborative planning process. A significant effort was undertaken to contact and engage directly affected property owners (see section 3.5.4 for details).

3.3. Communication Methods

A number of methods were used to promote the public consultation activities and provide updates at each phase of the study. They included the following:

1) Advertisements in the following local newspapers: Vaughan Citizen, North York Mirror, Toronto Star, Thornhill Liberal, Metro Daily, and York University Excalibur;
2) Flyers/Newsletters distributed by Canada Post to approximately 100,000 residences and businesses in the area bounded by Rutherford Road (north), Jane Street (west), Wilson Avenue (south) and Bathurst Street (east);
3) Posters displayed at the York University campus;
4) Information posted on the TTC's website;
5) Newsletters placed in pamphlet holders at Downsview, Finch and Sheppard Subway stations and delivered to area libraries and area community centres;
6) Media releases; and
7) Email and Canada Post direct mail to project mailing list.

In addition, letters were sent by regular mail to property owners potentially affected by the Spadina Subway Extension as follows:

1) March 18, 2005 – letter from Councillor Peter LiPreti (Keele Industrial Area property owners only);
2) June 16, 2005 – letter from Tom Middlebrook, Chief Engineer, TTC;
3) September 20/22, 2005 - letter from Tom Middlebrook, Chief Engineer, TTC;
4) October 5, 2005 – letter from Councillor Peter LiPreti (Keele Industrial Area property owners only); and
5) December 2005 – registered letters to directly affected property owners.

The Study Team supplemented the above written communication with telephone conversations and site visits. In November 2005, once this EA's recommendations were finalized and the associated property requirements confirmed, registered letters were sent to affected property owners.

3.4. Terms of Reference Stage

3.4.1. Introduction

Prior to conducting the Environmental Assessment Study, TTC and the City prepared a Terms of Reference, which included public and stakeholder agency consultation. Public open houses were held at C.W. Jefferys Collegiate Institute on April 20, 2004 and at York University on April 22, 2004. Technical Advisory Committee members (with representatives from key stakeholder agencies) were provided with copies of the first and second drafts of the Terms of Reference documents for review and comment. The results of the Terms of Reference consultations and follow-up conducted during this EA are summarized below. The detailed Consultation Record for the Terms of Reference is included in the document "Spadina Subway Extension – Downsview Station to Steeles Avenue Environmental Assessment Terms of Reference" (dated June 2004), which is posted on the TTC website and is available at the City of Toronto Urban Affairs Library (55 John Street, Toronto, ON).

3.4.2. Objectives

The objectives of public consultation during the preparation of the Terms of Reference were to:

1) Introduce the public to the proposed Terms of Reference for the Spadina Subway Extension Environmental Assessment;
2) Give the public the opportunity to provide comment or to ask TTC Project staff questions;
3) Gain public input on the Terms of Reference, including any recommendations or refinements;
4) Receive feedback on issues that were of interest/concern to the public;
5) Receive feedback from the public on their preference for being kept informed and involved with the Environmental Assessment; and
6) Offer the public the opportunity to get on the Project mailing list (email and regular mail) to keep them informed about future opportunities for continued public participation in this EA process.

The objectives for stakeholder agency consultation during the development of the Terms of Reference were to:

1) Involve key stakeholders from the commencement of the Terms of Reference preparation;
2) Engage other known stakeholders during the preparation of the draft Terms of Reference;
3) Identify other stakeholders to be involved in this EA.

3.4.3. Summary of Key Issues and Responses

During the consultations, the public and members of the Technical Advisory Committee expressed strong support for the EA work plan and proposed consultation methods (as described above).

Several members of the public and stakeholder agencies raised comments, which were subsequently addressed during this EA. Their comments, commitments made by TTC and the City during the Terms of Reference phase, and follow-up actions during this EA are summarized in Tables 3-1 and 3-2.

3.4.4. MOE Approval

On September 13, 2004, the Minister of the Environment approved the ToR. One key reason that this approval was granted was that the ToR requires the proponent to implement a Consultation Plan during the preparation of the EA. Furthermore, the Environmental Assessment Act requires continued consultation and documentation of the consultation for the preparation of the EA and additional opportunity for public and agency consultation with the EA is submitted to the Minister.

Table 3-1: Key Public Comments Addressed During this EA

SUBJECT	SUMMARY OF COMMENTS	TERMS OF REFERENCE COMMITTMENTS	FOLLOW-UP DURING EA STUDY
Terms of Reference	The majority of the public who made specific comments about the proposed Terms of Reference was supportive. However, a limited number of the public recommended that the EA scope include examination of other transportation technologies as well as consideration of the need and justification of the Project.	Other technologies and the need and justification for the Project were addressed in the original Environmental Assessment Study, which recommended a Subway Extension from Downsview Station to York University and was approved by the Minister of the Environment and Energy in 1994. This EA will study changes to the 1994 EA to extend the Spadina Subway from Downsview Station to Steeles Avenue via York University. As such, the new EA will bring forward the Alternatives to the Undertaking previously analyzed in the 1994 EA and will include a summary of further analysis on the need for the "Loop" conducted in the 2001 Rapid Transit Expansion Study. This EA will include full documentation of the previous studies.	Refer to section 5.0 – Alternatives to the Undertaking for documentation of the previous studies.
Environment	Comments related to this area focused on aspects of the environment to be studied in the EA including natural environment, urban form (livable urban environment, good urban form), air quality (vehicle emissions), noise, social/economic environment (including development).	The evaluation criteria will consist of a comprehensive set of standardized criteria. The factors and sub-factors to be considered in the development of the evaluation criteria have been reviewed and updated to include the key issues raised by the public during the recent Terms of Reference. During the early stages of this EA, the Project Team will develop a set of evaluation criteria for use in the analysis and evaluation process. These criteria will be reviewed by the public and other stakeholders at the first public consultation event to be held during this EA and will be refined based on these consultations.	During the EA, criteria and indicators were developed by the Study Team for the evaluation of alternative routes and the evaluation of alternative alignments and station layouts. These criteria and indicators were presented to the public and stakeholder agencies for review and comment and were refined based on these consultations.
Commuter Parking	Several members of the public expressed a desire for extensive commuter parking facilities at all stations along the proposed route.	The provision of parking and other commuter facilities (such as bus terminals and passenger pick-up and drop-off) will be examined during this EA.	The following commuter facilities are to be provided at Steeles West Station and Finch West Station: Bus Terminals (9 bays at Finch West Station and 41 bays at Steeles West Station), Passenger Pick-up and Drop-Off, and Commuter Parking (400 spaces at Finch West Station and 2,500 spaces at Steeles West Station).
Station Locations for the Spadina Subway Extension	A great number of people expressed a desire for a subway station conveniently located on the York University campus. A limited number of people also suggested stations near concentrations of population such as Jane/Finch and Jane/Steeles.	During this EA, alignment and station location alternatives will be developed and analyzed. These alternatives will be presented for public review and comment at a future consultation centre and posted on the TTC web site at that time. During this EA, a preliminary feeder bus network will be developed for each alternative alignment. One of the evaluation criteria used to compare the alignments will be bus access to areas beyond convenient walking distance to the proposed Spadina Subway Extension corridor, including the Jane/Finch and Jane/Steeles area.	The recommended alignment situates York University Station at the Common, which is the existing transit hub for the campus. Bus terminal locations at Steeles West Station and Finch West Station have been planned to offer convenient access for the 35 – Jane, 60 - Steeles West and 36- Finch West bus services.

Table 3-2: Key Stakeholder Agency Comments Addressed during this EA

STAKEHOLDER AGENCY	ISSUE	RESPONSE/ACTIONS	FOLLOW-UP DURING EA STUDY
Inter-Regional Transit Connections	Most comments addressed the importance of a convenient connection between the Spadina Subway Extension and the GO Transit Bradford rail line. Other comments addressed the importance of convenient connections between the subway and GO and inter-regional buses.	One of the key objectives of the Project is to provide improved connections between the TTC subway and GO Transit, York Region Transit and other inter-regional transit services. The alignment and station location alternatives will be developed and evaluated based on their ability to meet these requirements.	The recommended alignment includes the following inter-regional transit connections: GO Bradford Rail Line (at Sheppard West Station) and Brampton Transit, GO Transit, York Region Transit and Viva (at Steeles West Station).
Traffic Congestion	Many members of the public expressed frustration with the traffic congestion in northwest Toronto and southwest York Region. Many members of the public perceived that the Project would provide relief to this congestion and offer an alternative to driving.	During this EA, the effects of alternative subway alignments and station locations on the road system will be determined.	Refer to section 5.0 (Alternatives to the Undertaking).
City of Vaughan	Comments/clarification of Evaluation Criteria, including: Network Flexibility, Community Effects, Noise and Vibration and Transit Service.	Factors and sub factors (upon which the final evaluation criteria will be based) revised in accordance with comments. Detailed Evaluation Criteria to be developed and reviewed by stakeholders and the public during the Phase One of this EA.	Criteria and indicators for the selection of the preferred route and alignment during the EA were reviewed by stakeholder agencies (including the City of Vaughan) and the public.
Enbridge Pipelines	General location of Enbridge pipelines within preliminary EA study Area. Summary of requirements if Enbridge pipelines affected by Project.	Detailed information on pipeline locations to be collected in Phase One of EA (Inventory of Existing and Future Conditions). Permits and approvals requirements to be reviewed and confirmed during Phase Three of EA.	Enbridge Pipelines provided drawings during this EA. The requirement for permits and approvals from pipeline companies is documented in section 9.0 (Commitments to Future Work).
Sun-Canadian Pipeline	General location of Sun-Canadian pipelines within preliminary EA study Area.	Detailed information on pipeline locations to be collected in Phase One of EA (Inventory of Existing and Future Conditions).	Sun-Canadian Pipelines provided drawings during this EA.
	Summary of requirements if Sun-Canadian pipelines affected by Project (including Emergency Response Plan and Crossing Agreement).	Permits and approvals requirements to be reviewed and confirmed during Phase Three of EA.	The requirement for permits and approvals from pipeline companies is documented in section 9.0 (Commitments to Future Work).
	Request for engineering study of the electrical effects upon the pipelines cathodic protection system.	Stray current issues to be identified and resolved during detailed design and testing/commissioning phase of the Project. This issue is outside of the scope of the Environmental Assessment.	Stray current issues are addressed in section 8 (Phase Three - Detailed Assessment of the Effects of the Undertaking) and 9.0 (Commitments to Future Work).
	Need detailed design review of proposed subway tunnels relative to high-pressure pipelines.	Issue to be resolved during detailed design. TTC's standard practice is to involve utility companies in design reviews, which are conducted at key milestones during the design.	TTC to consult with utility companies during design of Spadina Subway Extension. (section 9.0 Commitments to Future Work).

Table 3-2 (Continued): Key Stakeholder Agency Comments Addressed during this EA

STAKEHOLDER	ISSUE	RESPONSE/ACTIONS	FOLLOW-UP DURING EA STUDY
Toronto and Region Conservation Authority	Study alternatives should be designed to avoid the natural features in the preliminary Study Area.	Factors and sub factors (upon which the final evaluation criteria will be based) revised in accordance with comments. Detailed Evaluation Criteria to be developed and reviewed by stakeholders and the public during the Phase One of this EA.	The recommended Route 1 located at mid-point between Black Creek and Humber River Watersheds. Impacts of the recommended alignment on natural features are very limited (tunnelling under Boynton and Boyer woodlots).
	EA report should include specific information regarding TRCA programs and policies.	TRCA programs and policies to be identified during finalization of Evaluation Criteria, identification of permits and approvals and development of monitoring program.	TRCA permits and approvals requirements are identified in section 9.0 (Commitments to Future Work).
	Evaluation Criteria to include additional considerations (re: form, function and ecology of aquatic habitats/ communities and wildlife/wildlife habitat, groundwater impacts, dewatering and dewatering discharge).	Factors and sub factors (upon which the final evaluation criteria will be based) revised in accordance with comments. Detailed Evaluation Criteria to be developed and reviewed by stakeholders and the public during the Phase One of this EA.	Criteria and indicators for the selection of the preferred route and alignment during this EA included form, function and ecology of aquatic habitats/ communities and wildlife/wildlife habitat, groundwater impacts, dewatering and dewatering discharge. These criteria and indicators were reviewed by TRCA.
Trans-Northern Pipelines	General location of Trans-Northern pipelines within preliminary EA Study Area. Summary of requirements if Trans-Northern pipelines affected by Project.	Detailed information on pipeline locations to be collected in Phase One of EA (Inventory of Existing and Future Conditions). Permits and approvals requirements to be reviewed and confirmed during Phase Three of EA.	Trans-Northern Pipelines provided drawings during this EA. The requirement for permits and approvals from pipeline companies is documented in section 9.0 (Commitments to Future Work).
Transport Canada	No Canadian Environmental Assessment Act (CEAA) triggers identified to date.	EA study work plan commits to monitoring for CEAA triggers during EA.	CEAA triggers were monitored during this EA, but none were identified.
York Region	Investigate a “skewed” alignment at Steeles Avenue.	EA study will include development and analysis of alternative alignment and station locations.	The northern alignments North 2 and North 3 (recommended) featured a “skewed” alignment at Steeles Avenue.
York University	Need to highlight that additional alignments will be developed and analyzed during this EA.	Terms of Reference document text revised to clearly state that additional alignments will be developed and analyzed.	During this EA, 8 routes, 4 southern alignments and 3 northern alignments were developed and analyzed.
	Important to co-ordinate between the Subway EA and the York Rapid Transit Program initiatives.	TTC will liaise with VIVA through York Region Transit participation on Technical Advisory Committee.	During EA study, the Technical Advisory Committee included a representative from York Region Transit. In addition, ad-hoc meetings held with VIVA staff.
CN Rail	Potential effects on freight and passenger rail service, safety and operations from construction activities where subway crosses CN/GO Bradford Line.	Condition of approval of the ToR by the Minister of the Environment.	All alternatives considered cross CN/GO Bradford Line. EA discusses construction methodology (see section 7.0) and TTC is committed to ongoing discussions with CN Rail during the design and construction phases (see section 9.0).

3.5. Environmental Assessment Study

3.5.1. Phase One Consultation: Routes and General Station Locations

Objectives

The consultation objectives during Phase One were to:

1) Introduce the public to this EA;
2) Provide opportunities for the public to comment or to ask questions;
3) Gather public and stakeholder input on the Phase One work including the Study Area boundaries, inventory of existing conditions, routes and general station locations, and evaluation criteria and indicators;
4) Make the public aware that consultation would be conducted during Phases Two and Three of the study; and
5) Find out how the public wanted to be kept informed and involved with the process.

Consultation Activities

To fulfill these objectives the following consultation activities were conducted during Phase One:

1) Two public consultation centres:
    - Thursday February 10th, 2005 at York University (11:00am to 3:00pm) (approximately 400 attendees).
    - Sunday February 13th, 2005 at C.W. Jefferys C.I. (11:00am to 1:30pm) (approximately 100 attendees).
2) Two public and Stakeholder Agency workshops
    - Thursday February 10th, 2005 at York University (4:30pm to 7:00pm) (60 participants).
    - Sunday February 13th, 2005 at C.W. Jefferys C.I. (1:30pm to 3:45pm) (50 participants).
3) Online commenting available from February 10th to February 24th 2005 (24 online workbooks completed).

Summary of Key Issues and Responses

Five key questions were asked during the Phase One consultations. These questions were administered using the workbook at the workshop sessions and through the online commenting form. A total of 111 submissions were received. The questions and comments received can be summarized as:

1) **Endorsement of 2001 Rapid Transit Expansion Study -** The purpose of the first question was to determine whether there was general public support for the key recommendations of the 2001 Rapid Transit Expansion Study, which pertain to the Spadina Subway Extension. Over 80% of respondents supported the Rapid Transit Expansion Study recommendations.
2) **Verification of Study Area -** Generally, the public agreed with the proposed Study Area, noting that it appeared logical. Accordingly, the Study Area, as presented in Phase One, was adopted for the Environmental Assessment.
3) **Existing and Future Conditions -** Generally, people found the inventory of existing and future conditions comprehensive. Some respondents stressed the importance of documenting natural features such as watercourses, wetlands and routes or paths that animals would use to move from place to place. No specific details or features were identified. However, others stressed the importance of documenting existing buildings, and built environments, such as the York University Campus buildings and the allotment gardens in the Finch Hydro corridor.
4) **Evaluation Criteria and Indicators -** In response to the request for comments on the proposed evaluation criteria and indicators to be used to select the preferred route and general station locations, members of the respondents emphasized the importance of safety, convenient access to subway stations for a wide range of transportation modes, minimizing noise and vibration impacts, minimizing construction and operating costs, and maximizing revenue. Several evaluation criteria and indicators were modified and/or added based on this input. Other proposed additional indicators were used during the detailed evaluation of alternative alignments during Phase Two.
5) **Alternative Subway Routes -** As stated above, one of the main objectives of this phase of consultation was to obtain public and stakeholder input on the Study Team's initial work on developing alternative routes and general station locations. Following the presentation of eight alternatives, participant responses indicated an early (prior to evaluation) preference for Route 1. Because only a limited number of respondents were in favour of eliminating some routes from the evaluation, the Study Team proceeded to analyze the eight alternatives.

3.5.2. Phase Two Consultation: Alignments and Station Concepts

Objectives

The purpose of the Phase Two consultations was for the public and key stakeholder agencies to:

1) Review and confirm route evaluation and recommended Route 1;
2) Provide preliminary feedback on alternative alignments and station layouts within Route 1; and
3) Review and comment on the type and importance of proposed evaluation criteria and indicators to be used to evaluate the alternative alignments and station concepts during Phase Two of this EA.

Consultation Activities

1) Two public consultation centres:
    - Tuesday May 17th, 2005 at York University (3:00pm to 7:00pm) (approximately 400 attendees).
    - Wednesday May 18th, 2005 at CW Jefferys C.I. (4:30pm to 6:45pm) (approximately 100 attendees).
2) Stakeholder Workshop: Tuesday May 17th, 2005 at York University (9:30 am to 12 noon) (40 participants).
3) Public Workshop: Wednesday May 18th, 2005 at CW Jefferys C.I. (7:00pm to 10:00pm) (35 participants).

4) Online commenting available from May 17th to June 1st, 2005 (57 online workbooks completed).

Summary of Key Issues and Responses

Four key questions were presented to the public and stakeholders during the Phase Two consultations. . These questions were administered using the workbook at the workshop sessions and through the online commenting form. A total of 100 submissions were received. The questions and comments received can be summarized as:

1) **Selection of Route 1** - The purpose of the first question was to determine public/stakeholder agency support for the selection of Route 1 as the preferred route and general station locations, based on the Study Team's analysis and evaluation of the eight alternatives. Having received strong endorsement of Route 1 by the public and stakeholders (over 90% of respondents), the Study Team proceeded with the development and evaluation of detailed alignments and station layouts located within the Route 1 corridor.
2) **Alignments** - The purpose of questions about the northern and southern alignment alternatives was to have the public and stakeholder agencies identify key issues to be considered by the Study Team during the alignment evaluation. The general comments received at this stage assisted the Study Team in preparation of the evaluation process.
3) **Station Layouts** - Respondents were requested to comment on alternative station layouts (including bus terminals, commuter parking and passenger pick-up and drop-off facilities) for Finch West Station and Steeles West Station. Comments were not sought for Sheppard West or York University Stations at this stage because these would only have pedestrian entrances (i.e. no bus terminal or PPUDO facilities). Similar to the alignments, the purpose of this question was to identify key issues/areas of concern to be considered by the Study Team during the evaluation of the alternatives.
4) **Evaluation Criteria and Indicators -** the Study Team sought input from the public and stakeholder agencies on the completeness and relative importance of various indicators to be used to evaluate the alternative alignments and station concepts. The comments received from the public and stakeholder agencies were used to prepare weightings for the evaluation of the alternative alignments and station concepts.

3.5.3. Phase Three Consultation: Detailed Assessment of the Effects of the Undertaking

Objectives

The purpose of the Phase Three consultation was for the public and key stakeholder agencies to:

1) Review the analysis of alternative alignments and station concepts;
2) Comment on the preferred alignment and station concepts; and
3) Comment on potential environmental impacts and mitigation measures for the preferred alignment.

Consultation Activities

1) Two public consultation centres
   - Sunday October 2nd, 2005 at C.W. Jefferys C.I. (11:00am to 2:00pm) (approximately 50 attendees).
   - Thursday October 6th, 2005 at York University (1:00pm to 5:00pm) (approximately 600 attendees).
2) Public Workshop: Sunday October 2nd, 2005 at C.W. Jefferys C.I. (2:00pm to 4:30pm) (27 participants).
3) Stakeholder Workshop: Thursday October 6th, 2005 at York University (9:30am to 12:00pm) (approximately 50 participants).
4) Online commenting available from October 1st to October 18th 2005 (35 online workbooks completed).

Summary of Key Issues and Responses

Three key questions were presented to the public and stakeholders during the Phase Three consultations. These questions were administered using the workbook at the workshop sessions and through the online commenting form. A total of 92 submissions were received. The questions and comments received can be summarized as:

1) **Selection of Preferred Alignment -** The purpose of the first question was to determine public and stakeholder agency support for the selection of alignment combination alternative S2 and alternative N3 as the preferred alignment, based on the Study Team's analysis and evaluation of the four alternative alignments in the south section and three alternative alignments in the north section. Due to strong public and stakeholder agency support received during consultation, the technically preferred alignment (S2 and N3) was carried forward as the recommended alignment. Following the Phase Three consultations, minor adjustments were made to the southern alignment in the vicinity of Downsview Station, in order to reduce adverse environmental effects. As part of S2 and N3, comments were received on Sheppard West Station and York University Station:
2) **Preferred Station Layouts** - The Study Team requested feedback on the evaluation of the alternative station concepts and the preferred station concepts Finch West Station and Steeles West Stations.

   i) ***Sheppard West Station*** - As a result of the public and stakeholder consultation, minor modifications to the station concept were undertaken to facilitate improved pedestrian access from Sheppard Avenue West. During the design of the Station, TTC is committed to working co-operatively with GO Transit to provide a convenient connection with the future GO Transit Bradford Rail Line Station and with PDP to integrate the station into future development initiatives.
   ii) ***Finch West Station*** - Due to major concerns raised about the proposed bus terminal location (south and east of the Keele/Finch intersection), the Study Team, in consultation with TTC Service Planning and the City of Toronto, developed a modified version of Option 1, which would locate the bus terminal on the east side of Keele Street, north of Finch Avenue West and would permit the shift of the subway platform to the north. This would result in shorter walk times between the subway platform and all commuter facilities and would provide a convenient connection between the subway platform and the proposed future Higher Order Transit Corridor in the Finch Hydro Corridor, as proposed in the new City of Toronto Official Plan.
   iii) ***York University Station*** - Based on strong public and stakeholder support, the York University Station concept presented during the Phase Three consultations was taken forward as the

recommended concept. TTC will work with York University during the design of York University Station to integrate the station entrances with adjacent buildings.

iv) ***Steeles West Station*** - As a result of concerns raised by stakeholder agencies, the orientation of the bus terminals were revised to create development blocks on the north and south side of Steeles Avenue. In addition, during the design of the Spadina Subway Extension, TTC and the City will work co-operatively with the City of Vaughan, York Region, York University and transit operators to optimize transit-supportive development in the vicinity of Steeles West Station.

3) **Environmental Impacts and Proposed Mitigation Measures** - This final question requested feedback on the list of anticipated environmental impacts of the preferred alignment and the proposed mitigation measures for such impacts. The public and stakeholder agencies made a number of recommended changes and additions to the list of environmental impacts and mitigation measures that were subsequently reviewed by the Study Team. As a result, modifications have been made to the list of environmental impacts and related mitigation measures.

3.5.4. Consultation with Directly Affected Property Owners

Early in the process, the Study Team identified that one of the key adverse environmental impacts of the Undertaking would result from the temporary or permanent disruption to existing businesses in the Keele Industrial Area (see Section 4.0 for details on location). In response, one of the key consultation components that went significantly beyond original Consultation Plan was the engagement of the directly affected property owners in order to allow those potentially affected to identify issues and concerns. Consultation with potentially affected property owners also included:

1) Telephone conversations with property owners (or their representatives);
2) On site visits to collect noise and vibration base line data;
3) One on one meetings with property owners and the Study Team
4) A supplemental Consultation Event, hosted by Councillor LiPreti and the City of Toronto Economic Development Office, for business representatives from the Keele Industrial Area
5) Toronto Transit Commission and City of Toronto Committee meetings

As a result, the majority of the directly affected property owners have had their concerns addressed by this EA and are in support of the subway extension.

3.6. Conclusions

3.6.1. Assessment of Public Consultation Program

The consultation program has enabled the public and stakeholder agencies to have genuine input and influence on the development of these EA recommendations. The program has been open and transparent with an emphasis on providing timely and continuous feedback that demonstrates how input has been considered at each phase of the assessment. Public and stakeholder agency input has contributed to:

1) The development of the Terms of Reference;
2) Identification of existing and future conditions;
3) Modifications to evaluation criteria and indicators;
4) The selection of the preferred route;
5) Criteria for the evaluation of the preferred station concepts;
6) Refinements and revised to the preferred alignment and station concepts; and
7) Identification of environmental impacts and mitigation measures.

3.6.2. Support for Key EA Recommendations

As summarized above and documented in Appendices A, B and C, it is clear that there is broad public and stakeholder agency support for the key EA study recommendations. Appendix C includes letters of endorsement received from Parc Downsview Park, the Toronto and Region Conservation Authority, York University, York Region and other stakeholder agencies.

Recommended Alternative to the Undertaking

Both the public and key stakeholder agencies overwhelmingly support the implementation of a radial extension of the existing Spadina Subway to York University and Steeles in the short-term and Vaughan Corporate Centre in the long-term. This reaffirms the findings of the 1994 EA, which recommended a subway extension as the preferred Alternative to the Undertaking.

Recommended Alternative Method of Carrying Out the Undertaking

Furthermore, because over 90% of canvassed stakeholder agency staff and members of the public supported the selection of Route 1, there is a high level of confidence that the proposed stations are situated in locations, which are broadly supported by the community.

The Study Team has made the following adjustments to the final recommendations of this EA, in response to public and stakeholder agency concerns:

1) Relocated the three-track structure to south of Downsview Station to minimize property impacts in the Kodiak Industrial subdivisions;

2) Reconfigured the Finch West bus terminal and adjusted the station platform location to achieve improved bus-to-subway transfers and to provide a convenient interchange with proposed long-term higher order transit service in the Finch hydro corridor; and

3) Shifted the bus terminals at Steeles West Station to free Steeles Avenue West frontage lands for transit-supportive redevelopment.

Because these adjustments have resolved the main concerns raised about the technically preferred Alternative Method of Carrying Out the Undertaking, there is further assurance that the EA recommendations are supported by the public and key stakeholder agencies.

Existing and Future Conditions

4.0 Existing and Future Conditions

The purpose of this section of this EA is to identify existing conditions within the Study Area, including the existing transportation planning context, transportation systems, natural environment, socio-economic environment, existing and planned land use, and future transportation demands. This information served as a baseline for the generation of alternatives, the prediction of condition changes/environmental effects and the identification of environmental protection measures. Several separate technical reports were prepared which describe the existing conditions in greater detail. Copies of these reports are provided in the Appendices of this EA.

4.1. Study Area

The Study Area, first proposed in the Terms of Reference then confirmed through existing conditions work, is bounded by Highway 7 and Steeles Avenue to the north, Keele Street, Dufferin Street and Wilmington Avenue to the east, Sheppard Avenue to the south, and Black Creek and Edgeley Boulevard to the west. The Study Area extends north of Steeles Avenue to include York Region's proposed corridor for a rapid transit connection to its future Vaughan Corporate Centre. A key plan of the Study Area is presented in Figure 4-1. Although the Study Area extends north of Steeles and consideration is given to impacts and potential for extending the subway north of Steeles Avenue, the purpose of this EA is to examine alternative alignments and station locations extending from Downsview Station to Steeles Avenue only.

4.2. Data Collection and Analysis

Data were obtained from published data sources and unpublished information provided by relevant stakeholders. Data were reviewed to identify data gaps and deficiencies, and to scope the type, location and level of detail for field investigations. Field investigations included drive-by and walk-by surveys, the majority of which were carried out within the Study Area in October and November 2004. A natural sciences investigation was conducted earlier in Summer 2004 to account for seasonal conditions. Relevant results from this investigation are included in the Appendices.

4.3. Transportation Planning Context

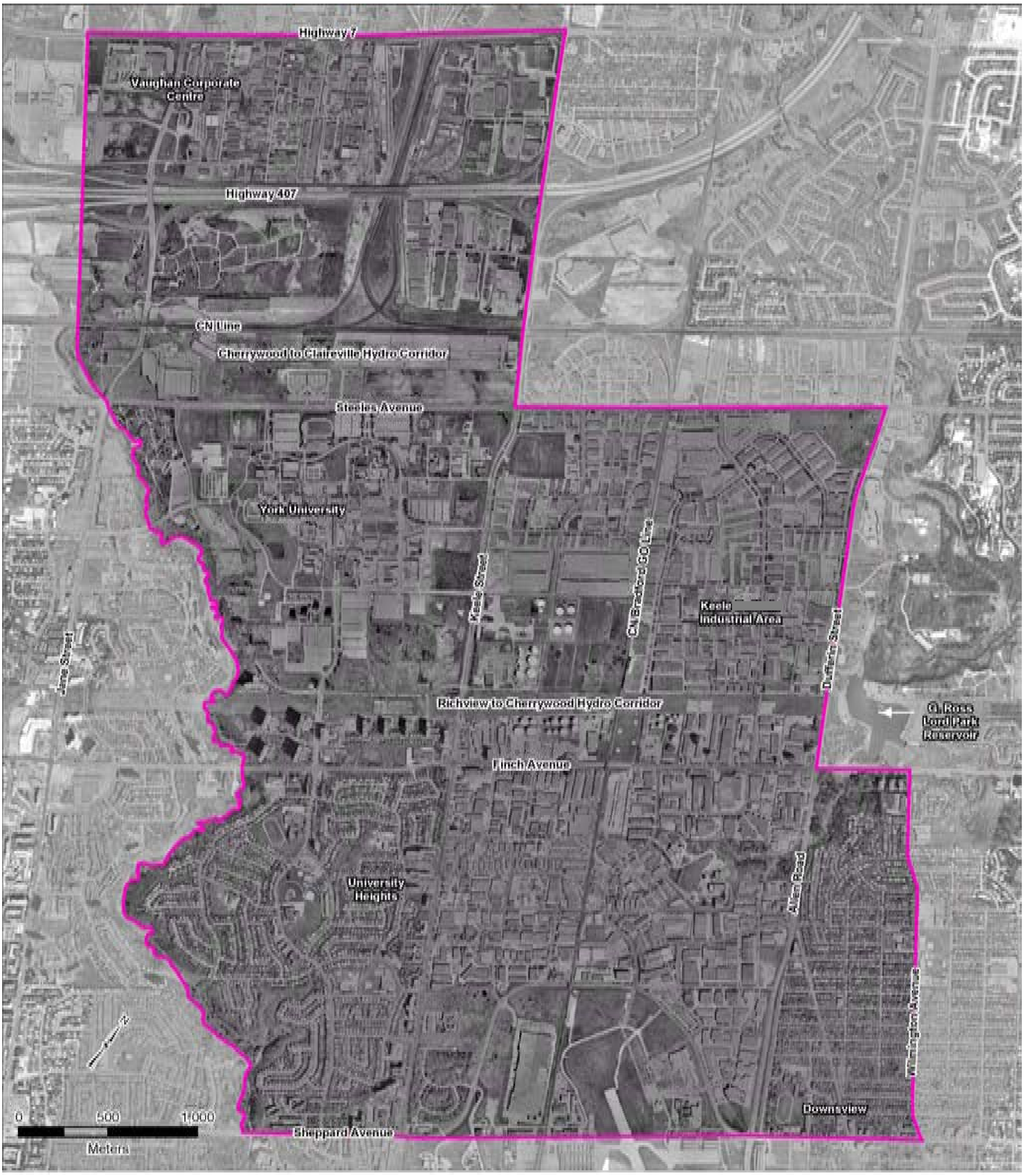
The following describes the existing and future planning context for rapid transit in the Study Area, with particular reference to provincial, regional and municipal planning policy.

The 1994 EA concluded that the most effective way to address the transportation needs in the Study Area would be to first extend the Spadina Subway to York University, then to extend the Yonge Subway Line to Steeles Avenue, and finally, to construct a subway line along Steeles Avenue to close the "Loop". Further details of the 1994 EA are discussed in 5.2.1.

In 1994, the Ministry of the Environment and Energy (MOEE) approved the EA to extend the Spadina Subway from Downsview Station to York University. The anticipated connection of the north ends of the Yonge and Spadina Subway Lines across Steeles Avenue in a "loop" was not part of the approval sought in 1994.

No further action was taken on the planned extension of the Spadina Subway from Downsview Station to York University due to changing economic circumstances including the withdrawal of provincial funding for transit capital programs and changing priorities.

In the past twelve years, urban policy and growth patterns have supported a re-evaluation of the EA approved alignment. The subway is now being proposed to extend from Downsview Station to Steeles Avenue. In the following section, the Planning Context describes the provincial, regional and city transportation and land use plans and policies that affect the Study Area.



LEGEND

The Study Area

FIGURE 4-1: KEY PLAN OF THE STUDY AREA

4.4. Planning Context

The Study Area is currently under the influence of a variety of planning policies, private sector redevelopment activities and major public sector investments. Figure 4-2 presents the land use and planning influences within the Study Area.

The current land use structure is characterized primarily by low-density residential neighbourhoods, and a 20 to 40 year old industrial/employment area (which are considered relatively stable). Other major land areas include York University and Parc Downsview Park. The former City of North York Official Plan (OP) established and protected this underlying urban structure. The overriding planning policy documents for the lands south of Steeles Avenue remain the former City of North York OP, including Secondary Plans for York University and the Downsview Area.

North of Steeles Avenue, York Region and the City of Vaughan have prepared plans that anticipate future rapid transit systems. The York Region OP and supporting Transportation Master Plan identify a system of Urban Centres and Corridors focused on the Vaughan Corporate Centre and Highway 7. The City of Vaughan incorporates this concept into their statutory planning documents.

Based on the long-term implementation of the Spadina Subway Extension connecting the future Vaughan Corporate Centre to Downsview Subway Station and the potential for enhanced GO Rail Transit services from Concord to Parc Downsview Park, it is expected that the inherent stability of the general area will give way to a variety of redevelopment activities focused primarily on York University, Keele Street corridor, Steeles Avenue corridor, Parc Downsview Park and the Allen/Sheppard Mixed Use Node. These changes have been anticipated in an array of planning and design studies described in this section.

All of these planning documents, with their various levels of statutory approval and influence, support higher density redevelopment in anticipation of expanded rapid transit facilities. Promoting higher densities at key locations ensures transit and other urban amenities are possible. These amenities in turn facilitate the expansion of York University's role within the Greater Toronto Area and the development of a major public space at Parc Downsview Park.

4.4.1. Provincial Policy

There are a number of provincial initiatives that address the future direction of growth management, land use and transit investment in the Greater Toronto Area (GTA).

Let's Move

In 1990, the Ontario Government unveiled the ***Let's Move*** program, which was the agenda for Transportation in the GTA for the 1990's. This program proposed the expansion of the GTA rapid transit system including the construction of a Yonge-Spadina Subway "Loop", linking the Yonge and Spadina Subway Lines. Resulting from the Let's Move program was the 1994 EA.

Removing Roadblocks: A Strategic Transportation Plan for the GTA and Hamilton-Wentworth

Approved by the Greater Toronto Services Board in June 2000, the Removing Roadblocks Plan identified seven corridors that required some form of rapid transit in separate rights-of-way. The York University Corridor is identified as Corridor 4 and extends from the Downsview Station to the future Vaughan Corporate Centre through York University.

GO Transit Inter-regional Bus Rapid Transit

In 2002, GO Transit published its plan for an inter-regional Bus Rapid Transit (BRT) system for the Greater Toronto Area. The intent of the proposed BRT system is to link Toronto with the surrounding regions in the GTA and areas outside the GTA. The GO BRT Plan proposes links to York University, the Vaughan Corporate Centre and Downsview Subway Station.

Ministry of Transportation Ontario Municipal Transit Improvements

In 2003, the Province of Ontario announced that it was investing $103.9 million to improve and renew public transit in 47 municipalities. Through this initiative, the City of Toronto will receive an estimated $33.3 million from the Province to fund the project, which includes a study to evaluate roadway improvements and service for BRT from the Spadina Subway to York University/Steeles Avenue. In response, TTC completed the Bus-Only Lanes, Downsview to York University Class EA.

Greater Toronto Transportation Authority

The Government of Ontario confirmed its commitment in the 2004 budget to create a Greater Toronto Transportation Authority (GTTA) as previously outlined in their discussion paper entitled ***Places to Grow***. The general function of this authority will be to co-ordinate and integrate public transit and roads across the region. However, the specific functions, mandate and the composition of the GTTA have not yet been determined.

Renewing the Toronto Transit Commission

In a news release on March 30, 2004, the Government of Canada, the Province of Ontario and the City of Toronto announced a $1 billion funding package to improve, modernize and expand the TTC system. This agreement will average $70 million per year from each government over five years.

Places to Grow. Better Choices. Brighter Future

Published in July 2004, the Ontario Ministry of Public Infrastructure Renewal published this document, which proposed a growth plan for the Greater Golden Horseshoe. One of the strategies for moving people identified within the discussion paper includes: extending the subway system, first to York University and over the long term extending rapid transit into Vaughan, Richmond Hill and other centres; and, building urban transit systems in the urbanizing areas, like the Mississauga Transitway, the 407 Transitway and the York Region Bus Rapid Transit (BRT).

Provincial Policy Statement

The Provincial Policy Statement provides direction on matters of provincial interest related to land use planning and development, and promotes the provincial "policy-led" planning system. On March 1, 2005, a new Provincial Policy Statement was released. The Policies of this document are explicitly supportive of public transit and its on-going expansion. Specifically, one policy states: ***"A land use pattern, density and mix of uses should be promoted that minimize the length and number of vehicle trips and support the development of viable choices and plans for public transit and other alternative transportation modes, including commuter rail and bus."***

The Planning Act

The Planning Act (2005) is the provincial legislation that grants power to municipalities to govern land in the name of "good planning". The Act was recently revised (proclamation March 1, 2005) with a significant change and now states that responsible planning agents shall "be consistent with" Provincial Interests and the Provincial Policy Statements. The stated purpose of the Act is:

1) To promote sustainable economic development in a healthy natural environment within the policy and by the means provided under this Act;
2) To provide for a land use planning system led by provincial policy;
3) To integrate matters of provincial interest in provincial and municipal planning decisions;
4) To provide for planning processes that are fair by making them open, accessible, timely and efficient;
5) To encourage co-operation and co-ordination among various interests; and
6) To recognize the decision-making authority and accountability of municipal councils in planning.

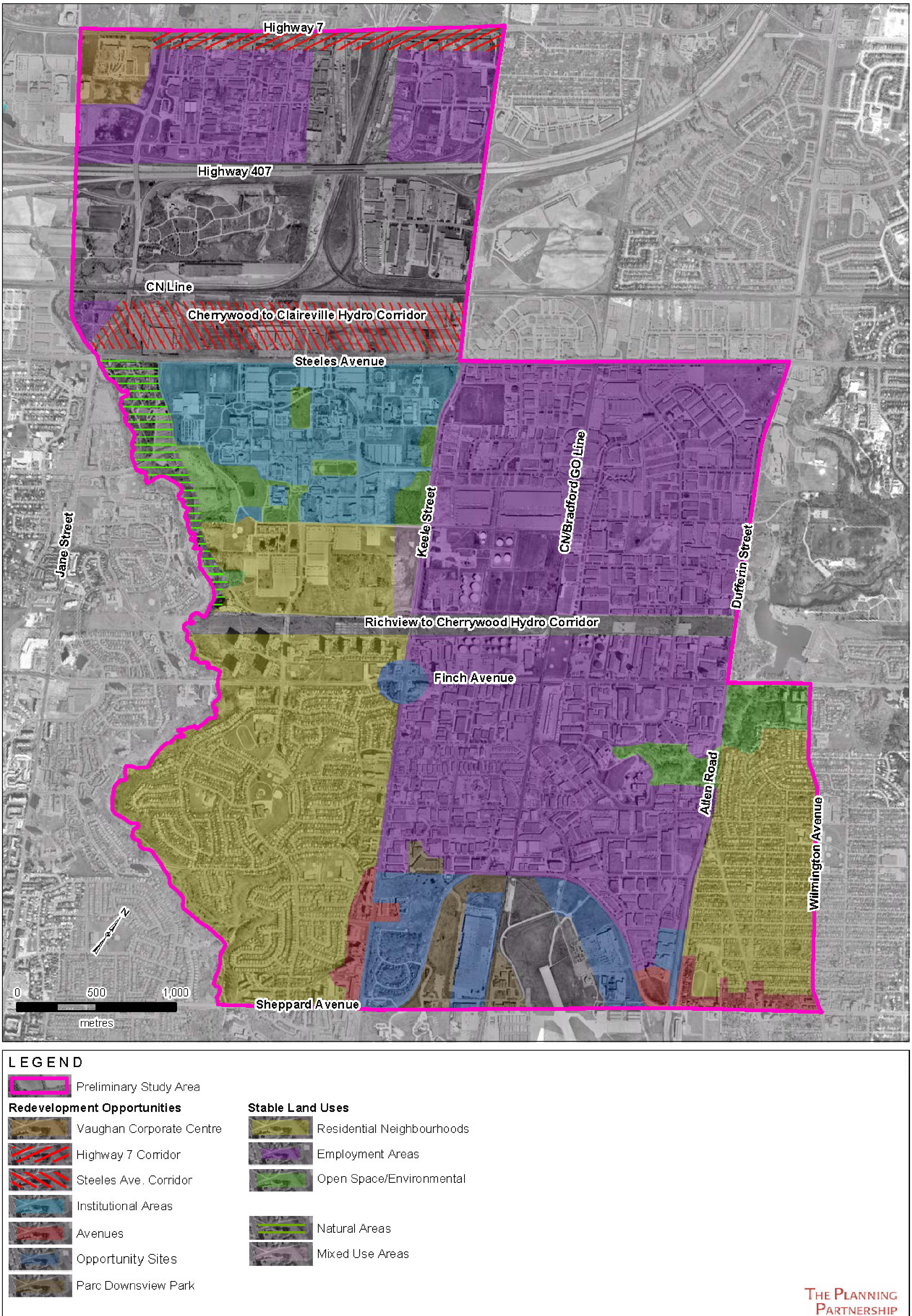


FIGURE 4-2: LAND USE AND PLANNING INFLUENCES

4.4.2. Regional Municipality of York Policy

Regional planning policies that affect the Study Area include the following documents.

The Region of York Official Plan/ROPA 43 ("in force")

York Region's Official Plan is an "in force" statutory planning document. It promotes the intensification of Centres and Corridors, which maximize land and infrastructure in a matter that supports rapid transit. Regional Centres and Corridors are identified on Map 5 of the Official Plan (Figure 4-3). The densities envisioned within these Centres and Corridors are meant to support the expansion of transit throughout the Region and into Toronto. The Plan calls for the extension of the Spadina Subway to York University and possibly north linked to Highway 7. Map 10 of the Plan (Figure 4-4) is the conceptual transit Network for the Region, including subway connections. The Region has adopted Regional Official Plan Amendment (ROPA) 43, which includes more detailed policy tools that promotes the planned Regional Structure, of Centres and Corridors.

The Region of York Transportation Master Plan ("in force")

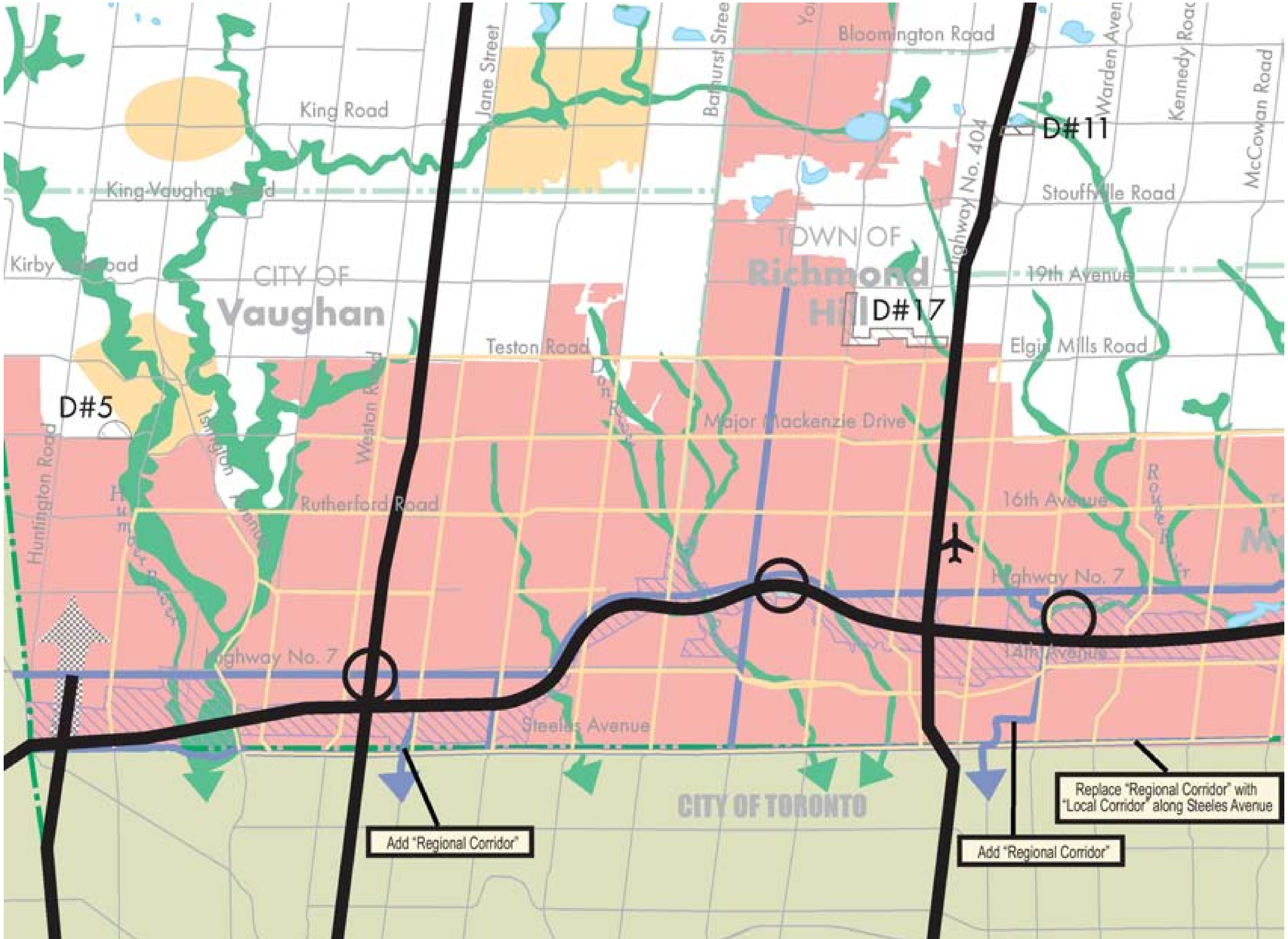
The 2002 York Region Transportation Master Plan, subtitled ***On the Move…Toward Sustainable Transportation*** extends as far north as Newmarket and Georgina to connect these areas to the north/south and the east/west transportation corridors. The Plan calls for the intensification of Regional Centres along Highway 7 in Vaughan, Richmond Hill and Markham. The Five Year action plan identifies the Jane Corridor–Vaughan Corporate Centre at Highway 7 to York University and the Downsview Subway Station as a required action to "jump start" the implementation of this Master Plan. The Plan focuses on rapid transit connections with bus rapid transit (BRT). The proposed deliverable is the BRT immediately with a possible subway or LRT (Light Rail Transit) by 2021 or 2031. The Plan also identifies York Region Transit's (YRT) and GO Transit's proposed expansion as illustrated in Figure 4-4. The Plan supports initiatives that will encourage growth management and non-auto modes of transportation by encouraging the Region's plan for Centre and Corridor intensification. This Transportation Master Plan calls for all statutory planning documents to support land use and urban design that will encourage and enhance transit use.

A Public-Private Partnership (P3) was established to undertake the York Region Rapid Transit Plan and to implement an early BRT plan, now known as VIVA. Since September 2005, VIVA has been providing service to York University and Downsview Station plus other areas of York Region. As part of the Highway 7 Corridor EA, York Region has assessed transit alternatives in a North-South corridor within the City of Vaughan. The Vaughan North-South-Corridor includes an extension of the Spadina Subway in the long-term (subject to a future amendment) and a BRT corridor in the short-term.

The York Region Transportation Master Plan proposed the immediate implementation of rapid transit in four main corridors including Jane Street from Downsview Subway Station to Highway 7 via York University, as well as surface rapid transit on Yonge Street from Highway 7, Warden Avenue from Highway 7 to Don Mills Station, Highway 7 from Jane Street to Highway 27, and from Yonge Street to Kennedy Road. This Plan also called for the development of an ultimate rapid transit plan that would include the extension of the Spadina Subway to the Vaughan Corporate Centre, as proposed by the City of Vaughan.

Business Case: A Solution for Gridlock in the North-western GTA

Business Case: A Solution for Gridlock in the North-western GTA is a report written by Price Waterhouse Coopers (PWC) and was prepared for the Spadina-York Subway Extension Committee (June 2001). The report presents the business case for why the subway should extend to Steeles Avenue and further north. The report begins with a review of relevant documents and previous reports affecting the proposal. The report identifies six areas where land use intensification opportunities will result from the expansion: Downsview/Keele Industrial Area, Finch and Keele, York University, Steeles Avenue Transit Terminal, Transitway Station (Hwy 407), and Vaughan Corporate Centre. PWC identifies many project benefits in the areas of transportation, land use, environment, health, education, health care and research, real estate and development, and tourism. The report concludes with public-private partnership options for the financing of the project.



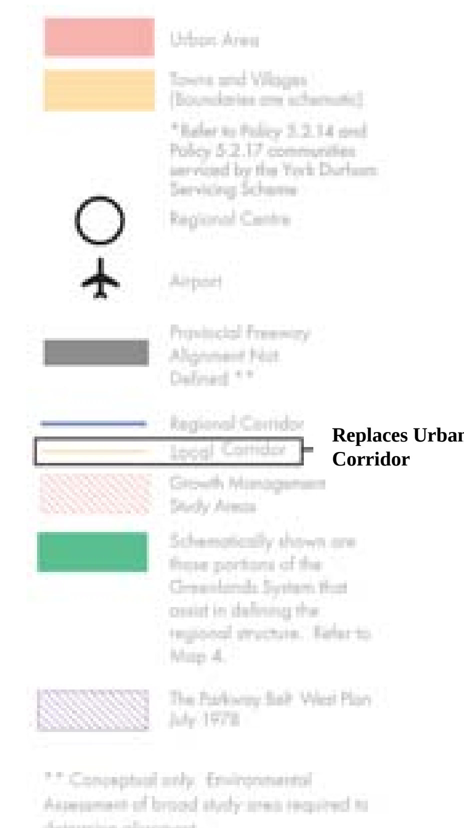


FIGURE 4-3: YORK REGION REGIONAL STRUCTURE

SOURCE: YORK REGION OFFICIAL PLAN, MAP 5, REGIONAL STRUCTURE, OCTOBER 2004

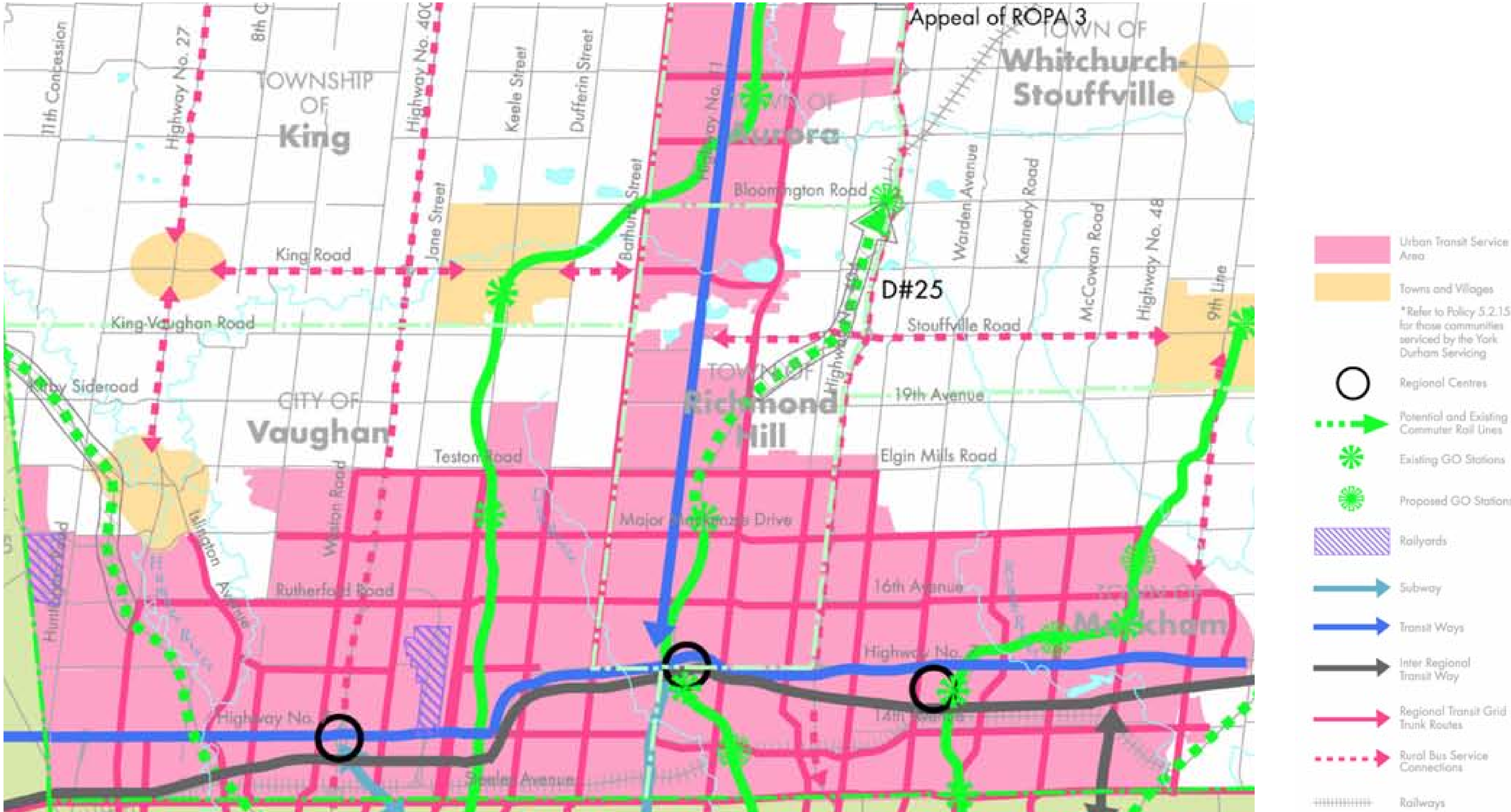


FIGURE 4-4 :YORK REGION CONCEPTUAL TRANSIT NETWORK

SOURCE: YORK REGION OFFICIAL PLAN, MAP 10, CONCEPTUAL TRANSIT NETWORK, NOVEMBER 2004

4.4.3. City of Vaughan

The Region of York's Official Plan identifies Highway 7 and the future Vaughan Corporate Centre as a key Corridor and Centre for mixed use and higher density development. The City of Vaughan's Official Plan further supports the Region's strategy creating policies and plans that support Corridors and Centres prompting higher densities and transit-supportive development. Key planning documents include Official Plan Amendment 500, 529 (Vaughan Corporate Centre) and 620 (Jane-Steeles).

Official Plan Amendment 500/529 ("in force")

Approved on March 6, 1998, OPA 500 identifies a number of transit improvements critical to the land use vision for the City of Vaughan, including rapid transit to the future Vaughan Corporate Centre.

The Vaughan Corporate Centre Secondary Plan is a statutory document approved under the Planning Act. It identifies a land use structure, and highlights the importance of a multi-modal transit network to support the planned development. A key component of the plan is a future extension of the Spadina Subway to Vaughan Corporate Centre.

Following the approval of OPA 500, the City of Vaughan took the further step in identifying the route for the Spadina Subway from York University to Vaughan Corporate Centre (OPA 529). Official Plan Amendment 529 is a statutory planning document that protects a corridor for high order transit facilities within the Vaughan Corporate Centre Secondary Plan. The protected corridor is intended to provide the important link between the Vaughan Corporate Centre and York University and the Spadina Subway. Generally, the protected corridor runs north south from the Highway 407 Corridor to just north of Highway 7, west of Jane Street.

Official Plan Amendment 620

Official Plan Amendment 620 Steeles Avenue Corridor - Jane to Keele is explicitly supportive of transit. Specifically, Section 4.1.d states "The establishment of the TTC Spadina Subway Extension from Downsview Station to the vicinity of this corridor is important to the ultimate achievement of the land use vision." The development of a Corridor along Steeles supports the Region's and the City's goals to build urban densities that support transit and other urban amenities. This OPA is in draft form as the City of Vaughan is currently considering higher densities to encourage transit-supportive development in the vicinity of the proposed inter-regional transit terminal.

Higher Order Transit Corridor Protection Study – York University to the Vaughan Corporate Centre

The January 2001 Higher Order Transit Corridor Protection Study – York University to the Vaughan Corporate Centre identified a preferred alignment and station locations within the City of Vaughan and York University, for a rapid transit connection to the Spadina Subway Line. This new proposal represented a change from the 1994 EA recommendation in that it extended rapid transit services into Vaughan as far as the planned Vaughan Corporate Centre development at Highway 7, to a location west of Jane Street. This is a background report to OPA 529.

Property Protection Study for the Steeles Rapid Transit Terminal Facilities – Rapid Transit Extension to York University

The Property Protection Study for the Steeles Rapid Transit Terminal Facilities – Rapid Transit Extension to York University identified the property requirements for a rapid transit station including a bus terminal and commuter parking facilities north of York University. York Region has secured property for this facility.

4.4.4. City of Toronto

The New City of Toronto Official Plan (transportation policies "in force", some other sections subject of on-going appeals to OMB)

In 1998, the municipalities of East York, Etobicoke, North York, Scarborough, Toronto and York under the former Metropolitan Toronto were amalgamated into the new City of Toronto. Since the amalgamation, the City has worked to create a unified vision. The new City of Toronto Official Plan is both approved by City Council (November 2002) and Minister of Municipal Affairs and Housing (March 2003). The whole plan is not "in force" because of outstanding appeals before the Ontario Municipal Board (OMB). However, on January 25, 2006, the OMB issued an Order approving and bringing into effect the transportation policies of the new Official Plan and repealing the transportation policies of the Official Plans of the former Metropolitan Toronto (Metro Plan) and each of it its municipalities.

Toronto's new OP is an extension of the transportation and land use policies found in the 1994 Metro Plan. Specifically, the new OP calls for reduced dependence on the private automobile and more efficient use of the existing road infrastructure by making transit, cycling and walking more attractive alternatives. The new OP defines the urban structure with Avenues and Centres as presented in Figure 4-5. Avenues are major corridors identified for growth and designed to build an urban form. Centres are vital mixed-use areas creating important transit nodes.

Avenues, like Corridors, are streets that have been identified for their redevelopment and intensification potential. The development within Avenues is to be transit supportive in design and use. Avenues in and around the Study Area include Wilson, Keele and the Sheppard/Allen intersection. The majority of the land within the Study Area as seen in Figure 4-6 is designated Employment, Neighbourhoods (stable), Apartment Neighbourhoods (stable), Institutional and some Mixed Use areas.

The City's new OP promotes measures to reduce car dependency and rush hour congestion by increasing trips made by transit, walking and cycling. The new City of Toronto Official Plan identifies specific Higher Order Transit Corridors as candidates for higher order transit, which includes subway expansion. As illustrated in Figure 4-7, the Spadina Extension to York University is one of the higher order transit corridors to be developed. This reflects the positive relationship between population and employment densities and higher transit use. Transit Corridors and Land Use concludes that transit is only relevant if it is accessible to and from origin to destination.

The Metro Plan - *The Liveable Metropolis* ("in Force")

Excluding the transportation policies of the plan, the Metropolitan Toronto Official Plan, adopted December 30, 1994, is still an "in force" statutory planning document. The Plan strives to maximize resources and to reduce urban sprawl by supporting the re-urbanization of the City's Centres and Corridors in order to create a healthy vibrant City. By promoting both living and working in compact urban Centres and Corridors, land and infrastructure, especially transit, will be most efficiently used. The Plan also promotes high quality design of the public realm.

The Transportation policies of the Plan, recently repealed, encouraged the use and expansion of rapid transit. The Plan defines Rapid Transit as "transit service operating within a separate right-of-way and with more widely spaced stations, allowing for greater speed and carrying capacity than surface transit service: rapid transit includes Metropolitan Rapid Transit (subway, busway, the Scarborough RT and light rail transit) and commuter rail." Appendix C of the Plan (Figure 4-8) is a map of the existing and future rapid transit facilities.

North York Official Plan

Excluding the transportation policies of the new City of Toronto Official Plan, the North York Official Plan remains an "in force" statutory planning document. It states the intent to "maximize accessibility to transit, promote increased use of transit facilities and ensure that the location of any new rapid transit facilities is compatible with its land use policies and objective". The OP designates sub-areas for potential re-urbanization where the urban area should be intensified and mixed-use encouraged. Within and near the vicinity of the Study Area, there are three sub-centres identified: Allen Road/Dufferin and Sheppard, Steeles and Keele (Southwest), and Finch and Jane. These sub-areas support a mixed-use typology creating new urban nodes that are transit supportive. Two of these sub-centre areas, York University and Downsview, have secondary plans, which provide a more detailed policy framework.

Within the Study Area, the land use designations reflect existing development patterns and primarily include: Industrial, Residential Density 1-4, Open Space, School District, as well as Downsview Specific Development Area and York University. Figure 4-9 presents the North York Land Use Plan.

North York Zoning By-Law ("in force")

The North York zoning by-law is also an "in force" statutory planning document, governing lands use and development within the Study Area and protects the existing land use patterns and implements the policies of the former North York Official Plan.

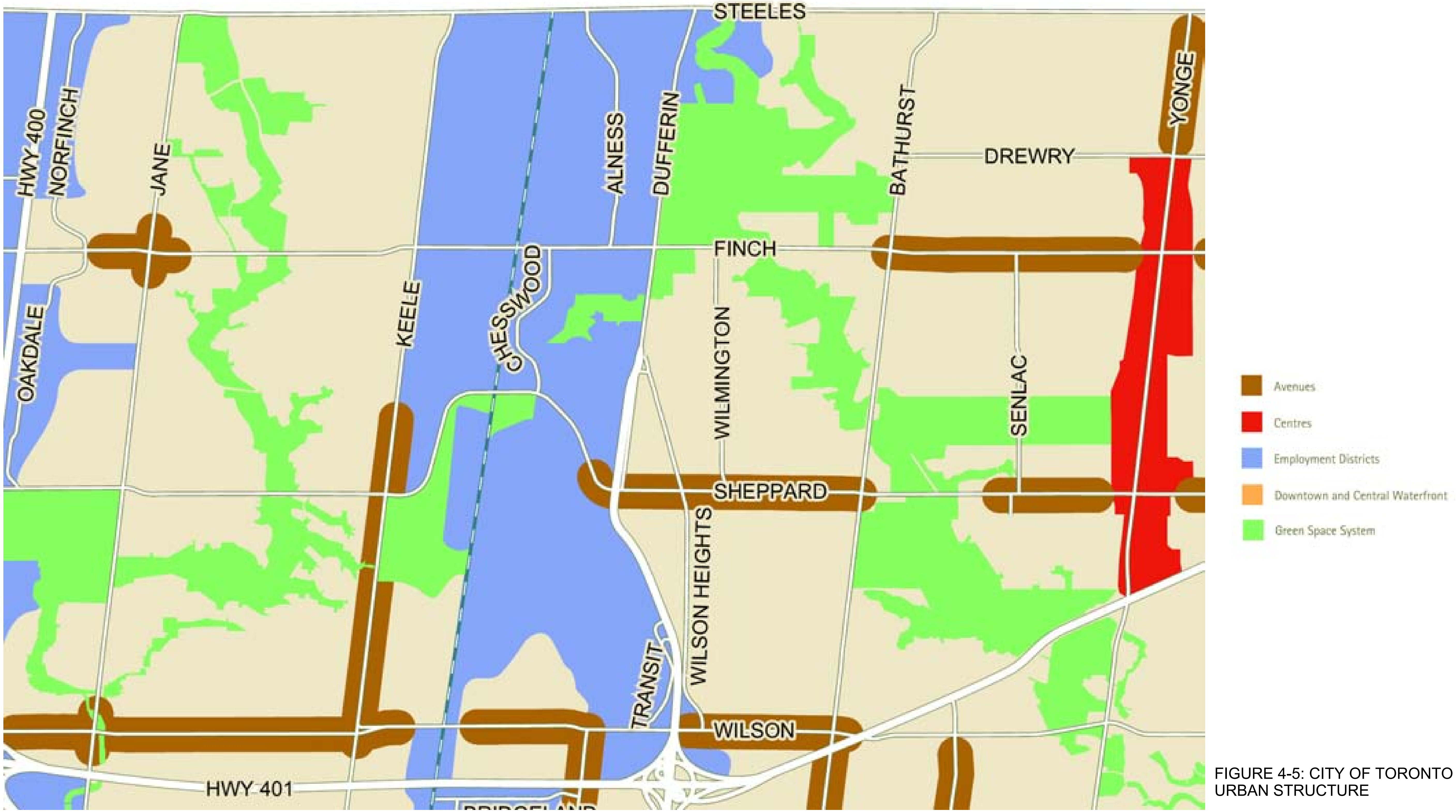


FIGURE 4-5: CITY OF TORONTO URBAN STRUCTURE

SOURCE: CITY OF TORONTO, TORONTO OFFICIAL PLAN, URBAN STRUCTURE, MAP 2, NOVEMBER 2002

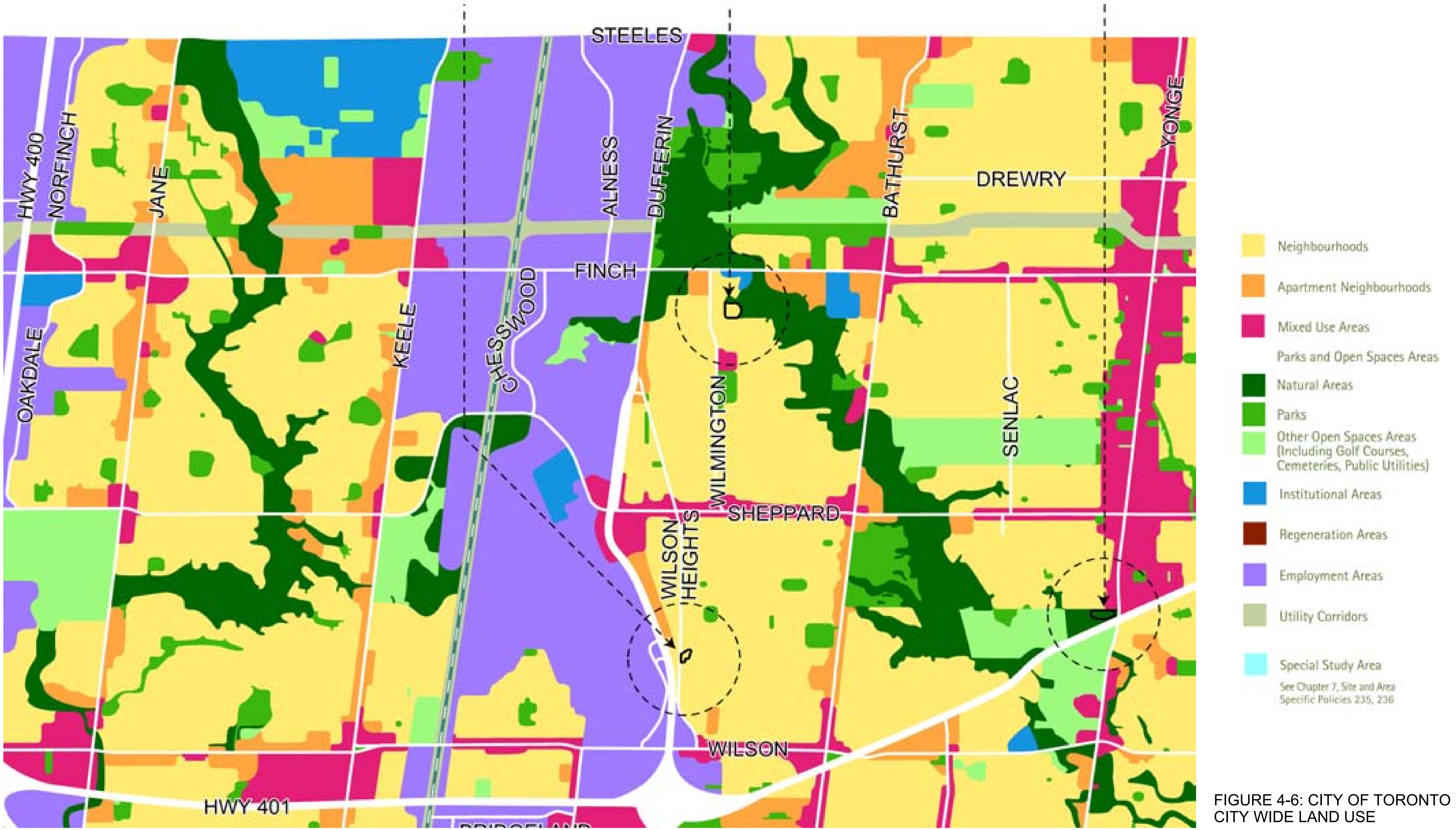


FIGURE 4-6: CITY OF TORONTO CITY WIDE LAND USE

SOURCE: CITY OF TORONTO, TORONTO OFFICIAL PLAN, LAND USE PLAN CITY WIDE MAP, MAP 12, NOVEMBER 2002

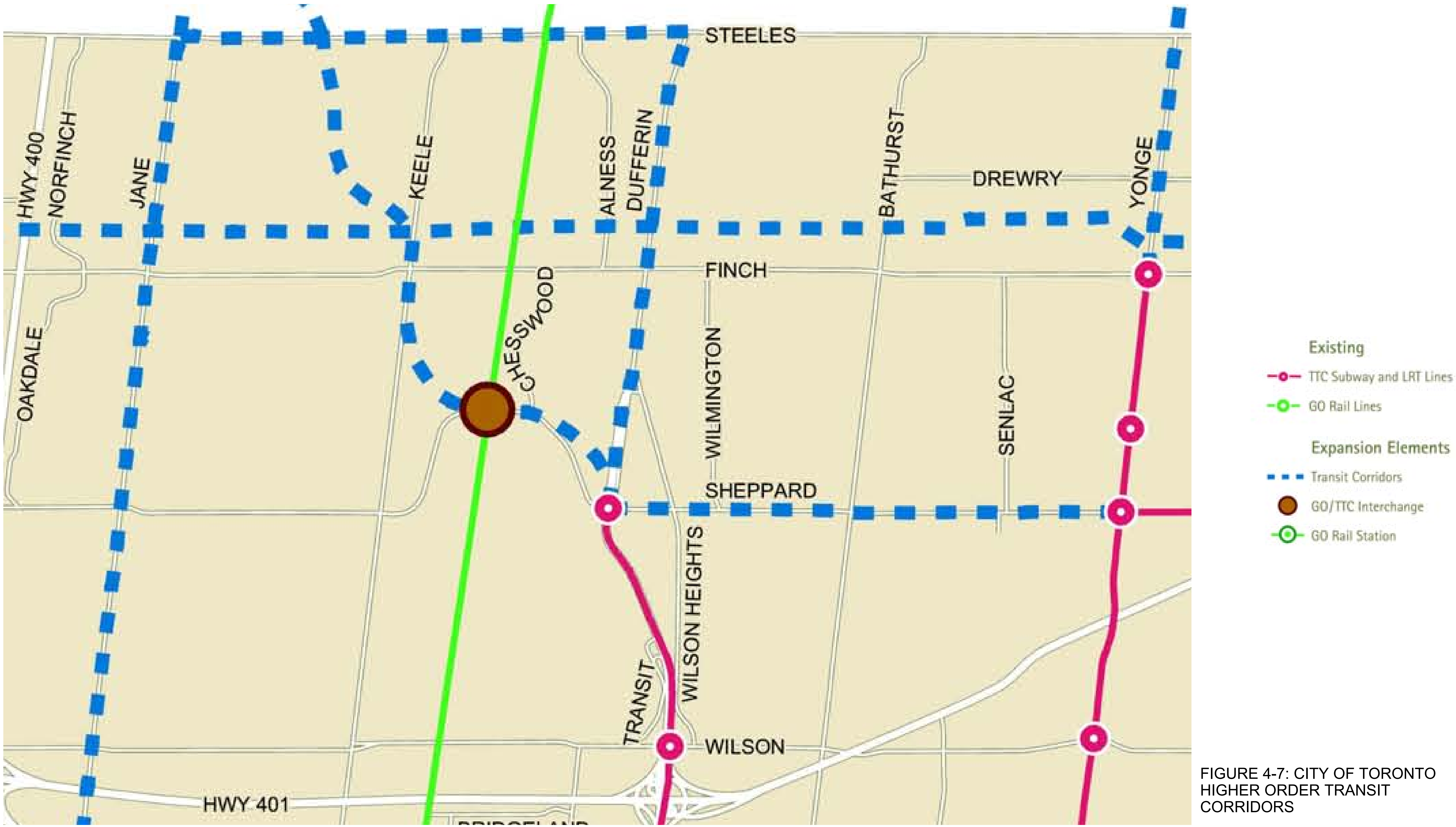


FIGURE 4-7: CITY OF TORONTO HIGHER ORDER TRANSIT CORRIDORS

SOURCE: CITY OF TORONTO, TORONTO OFFICIAL PLAN, HIGHER ORDER TRANSIT CORRIDORS, MAP 4, NOVEMBER 2002

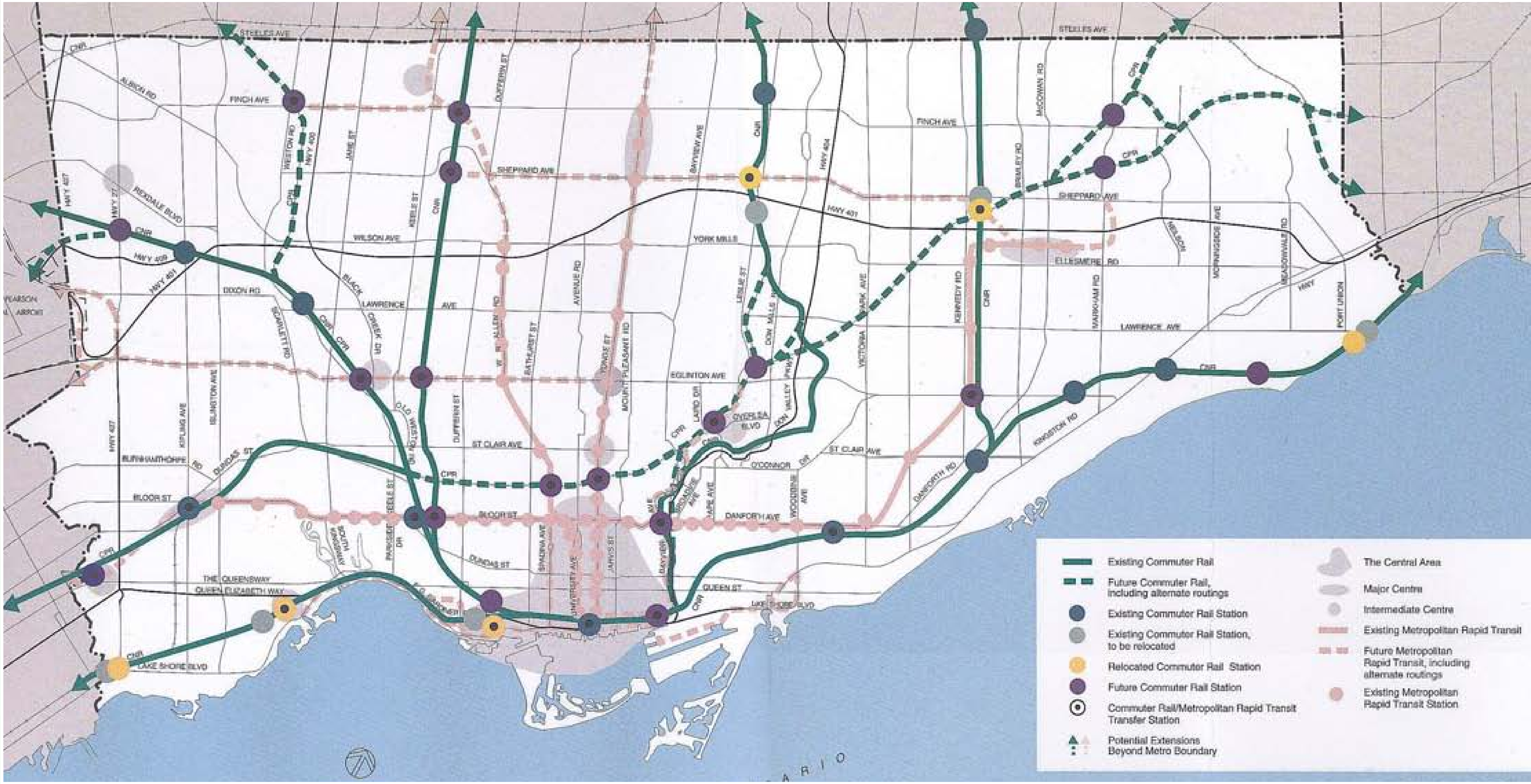
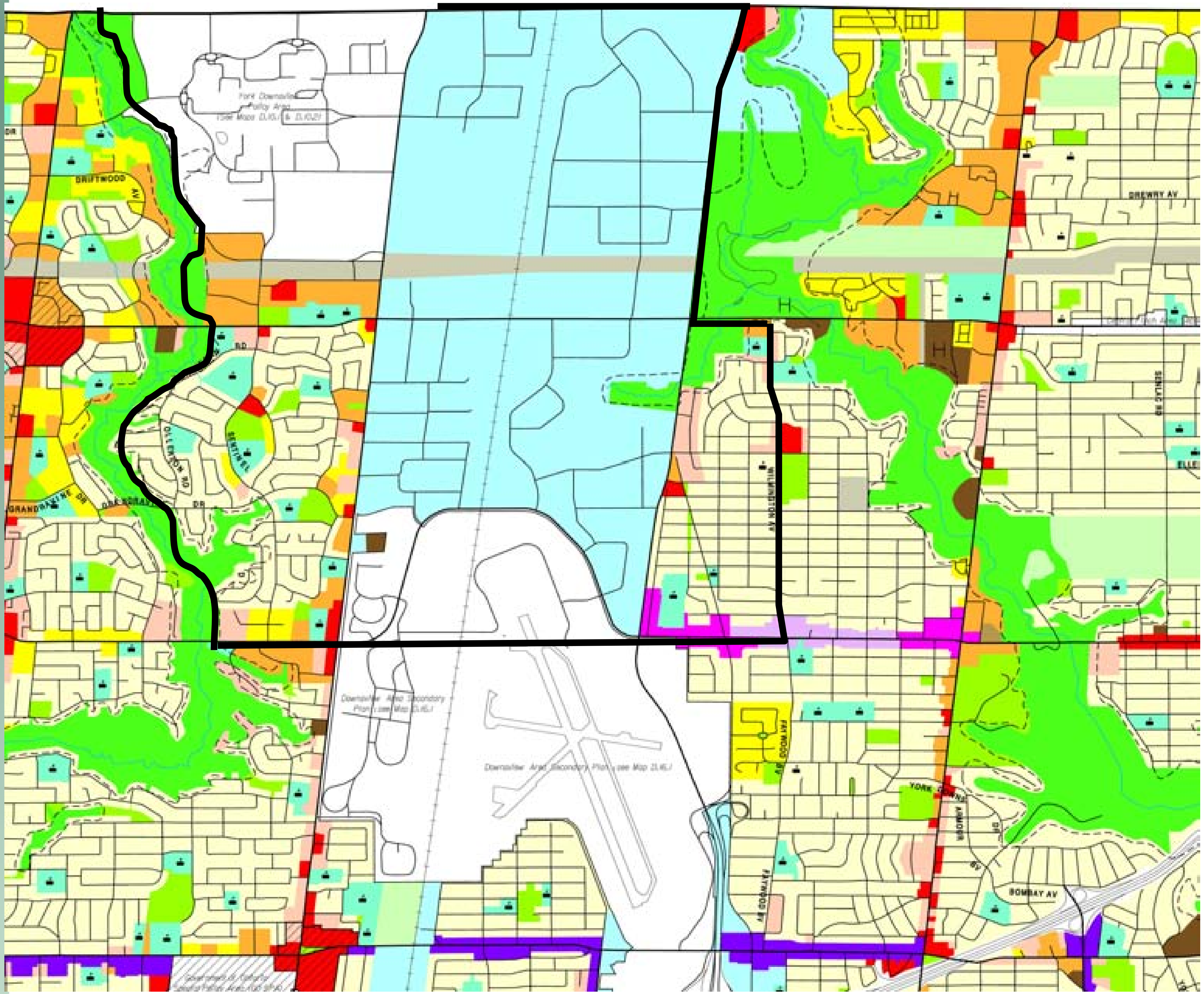


FIGURE 4-8: CITY OF TORONTO EXISTING AND FUTURE RAPID TRANSIT FACILITIES

SOURCE: THE OFFICIAL PLAN OF THE MUNICIPALITY OF METROPOLITAN TORONTO



LEGEND – LAND USE DISTRICTS

- RESIDENTIAL DENSITY ONE (RD1) (See Part C.4)
- RESIDENTIAL DENSITY TWO (RD2) (See Part C.4)
- RESIDENTIAL DENSITY THREE (RD3) (See Part C.4)
- RESIDENTIAL DENSITY FOUR (RD4) (See Part C.4)
- RESIDENTIAL DENSITY FIVE (RD5) (See Part C.4)
- LOCAL OPEN SPACE (LOS) (See Part C.2)
- TRANSITIONAL MIXED USE AREA (TMUA) (See Part C.10)
- SHEPPARD WEST-COMMERCIAL (SW-COM) (See Part D.14)
- MIXED COMMERCIAL RESIDENTIAL (MCR) (See Part D.14)
- MIXED USE (MU) (See Part C.10)
- ARTERIAL CORRIDOR AREA (ACA) (See Part C.10)
- SUB-CENTRE (See Part C.10)
- VALLEY OPEN SPACE (VOS) (See Part C.2)
- CEMETERY (CEM) (See Part C.2)
- PUBLIC UTILITY (PUT) (See Part C.7)
- INDUSTRIAL (IND) (See Part C.8)
- GENERAL-INSTITUTIONAL (G-INS) (See Part C.6)
- COMMERCIAL (COM) (See Part C.5)
- FALSTAFF RESIDENTIAL POLICY AREA (FRPA) (See Part D.8)
- SCHOOL SITE (MINOR INSTITUTIONAL-SEE DISTRICT PLANS)
- V.I.Z. BOUNDARY (See Part C.2)
- H HOSPITAL (See Part C.6)

FIGURE 4-9:NORTH YORK LAND USE PLAN

SOURCE: NORTH YORK OFFICIAL PLAN, NORTH YORK LAND USE PLAN, OCTOBER 31, 2002

York University Secondary Plan ("in force")

The York University Secondary Plan governs development of the University lands. The Plan is generally transit supportive and encourages intensified land use. However, it does not anticipate a subway. The land south of and surrounding Murray Ross Parkway is currently being developed into "The Village at York University" - a medium residential community. Referring to Figure 4-10 from the York University Secondary Plan, many of the recent buildings in proximity to the University Common have been designed and constructed to accommodate a subway corridor under the campus, including the Accolade East and Schulich School of Business.

The City and York University are currently updating the York University Secondary Plan. The updated Plan will incorporate the recommendation of this EA and further focus and intensify new development in the vicinity of the proposed Spadina Subway Extension stations.

Downsview Area Secondary Plan ("in force")

The Downsview Area Secondary Plan directs the development of Parc Downsview Park and other areas in proximity to Downsview Station. The goal of the Secondary Plan is the establishment of the Park, celebration of aviation history and economic development. The Plan also strives to create a mixture of land uses that will support the regional transportation system as seen in Figure 4-11. Parc Downsview Park is also currently considering a Master Plan for the redevelopment of their lands. Downsview Airport is still active and affects the potential development, specifically building heights and land uses in and around the runways. These clearances apply to the north-south runway. The east-west runway has been decommissioned.

Parc Downsview Park Inc. is itself an agent crown corporation, reporting to Parliament through the Minister of State, Infrastructure. Recently, the Downsview Airport lands have been used to host several large events such as World Youth Day (2002) and the SARS benefit concert (2003).

Sheppard West Dublin Secondary Plan ("in force")

The Sheppard West Dublin Secondary Plan extends along Sheppard from Allen Road to just beyond Bathurst and encompasses the street facing properties as seen in Figure 4-12. The objective of the Plan is to "encourage and maintain a diversity of residential, institutional, retail, service commercial, office and open space". Downsview Station has influenced the redevelopment of this area and the subway's expansion will continue to allow for the intensification of this mixed-use "Avenue".

Allen-Sheppard Urban Design and Development Framework Study and Allen-Sheppard Urban Design Guidelines

The Study was a collaborative 12-month process to devise an urban structure and design guidelines for the development of this area. These documents have no formal status under the Planning Act. The W. R. Allen Road/Sheppard Avenue Area is an urban node beginning at the intersection and encompassing 138 hectares. The Area includes Downsview Station and a portion of Parc Downsview Park. The Urban Design Guidelines for this Area support the existing community while planning for incremental intensification. The Guidelines focus design attention on public spaces, including parklands and streetscapes. The redevelopment of this Area (as seen in Figure 4-13) has already begun with the building of multi-story residential units with mixed-use ground floors.

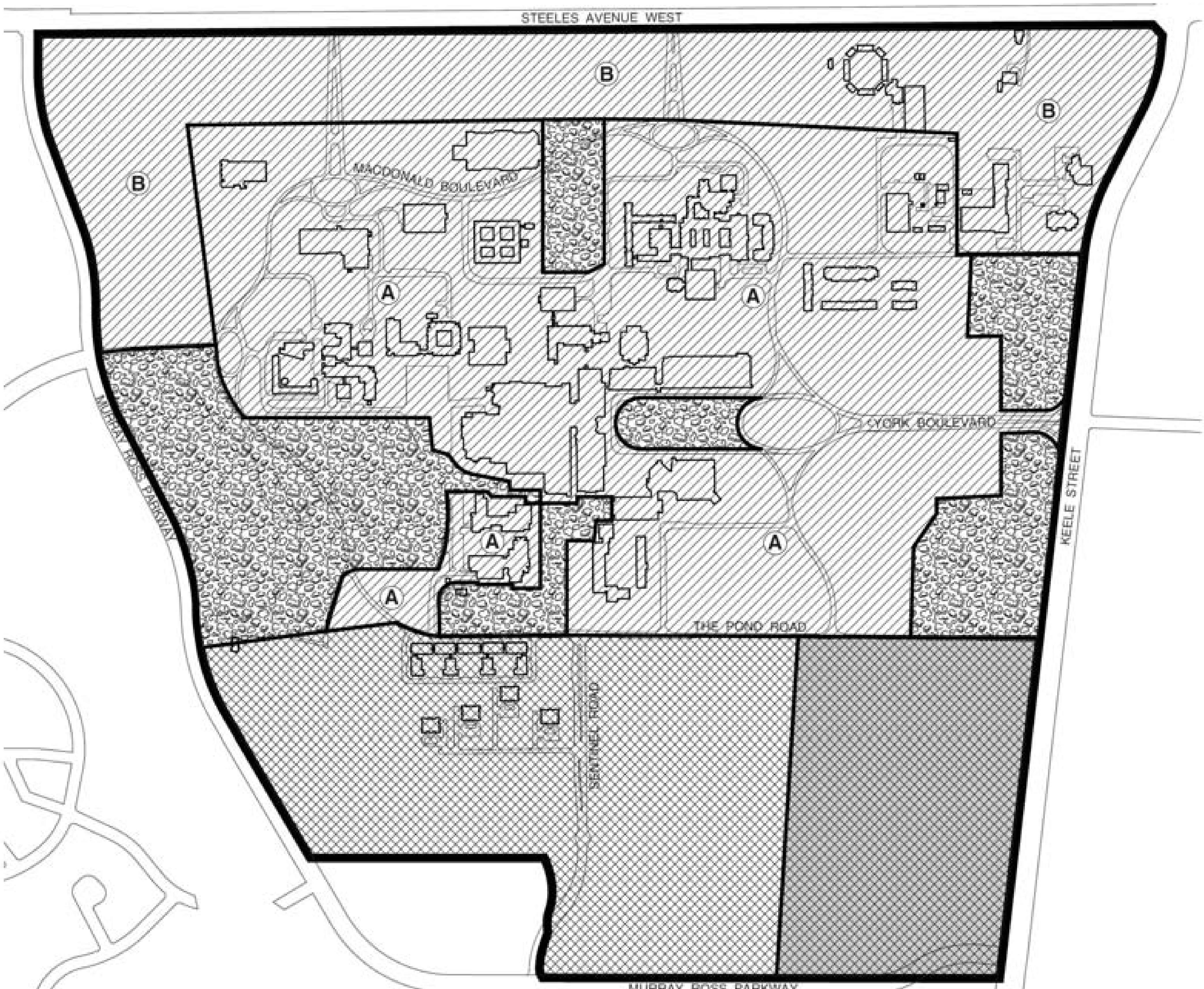
Keele Street Study

The Keele Street Study projects the intensification of Keele Street. It is not an "in force" statutory planning document but has been adopted by City Council. Identified as an "Avenue", the Study recommends strategies to utilize the development opportunities along Keele Street resulting from the changing land use environment, from the CFB Downsview closure, to the Park development and the Avenue designation. It has been identified that substantial growth can be accommodated with higher densities along Keele Street from Wilson Avenue to Finch Avenue and within Parc Downsview Park. The Study suggests that any substantial redevelopment in proximity to the Keele/Finch intersection would require a future Official Plan Amendment and/or Secondary Plan.

The City of Toronto has committed to update planning policies in the Keele/Finch area to recognize the opportunities for intensification afforded by the proposed subway station.

Keele Employment Area Study

The Keele Employment Area Study, by Price Waterhouse Coopers (August 2001), was prepared to understand the "employment linkages and opportunities between businesses in the Keele Industrial Area (KIA) and the labour force in the surrounding residential community". The Study suggests that the area is in transition from traditional manufacturing to more service-oriented employment. The Study found that only 9% of the resident labour force works in the KIA and that there is an opportunity to create stronger linkages with local employers. As well, transit within the interior of the KIA is limited and the Study suggested that the new subway alignment with proposed stops at Sheppard and/or Chesswood would allow for more economic and development opportunities within the KIA. The Keele Employment Area Study has no formal status under the Planning Act.



Secondary Plan Boundary
Apartment Neighbourhoods
Mixed Use Areas
Parks and Open Space Areas
Institutional Areas

FIGURE 4-10: CITY OF TORONTO
YORK UNIVERSITY SECONDARY PLAN

SOURCE: NEW CITY OF TORONTO, TORONTO OFFICIAL PLAN, YORK UNIVERSITY SECONDARY PLAN , MAP 10-1, NOVEMBER 2002

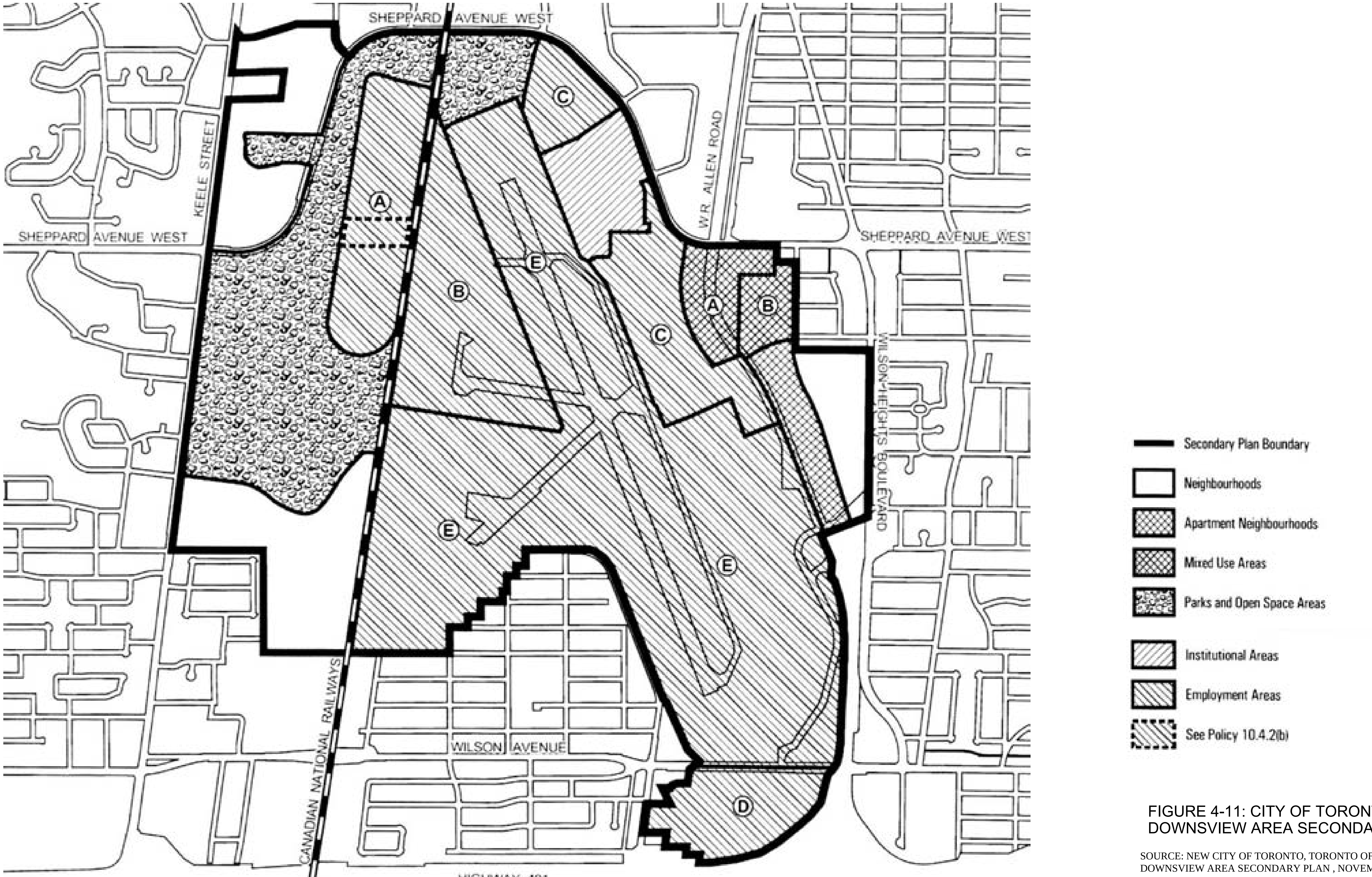


FIGURE 4-11: CITY OF TORONTO DOWNSVIEW AREA SECONDARY PLAN

SOURCE: NEW CITY OF TORONTO, TORONTO OFFICIAL PLAN, DOWNSVIEW AREA SECONDARY PLAN , NOVEMBER 2002

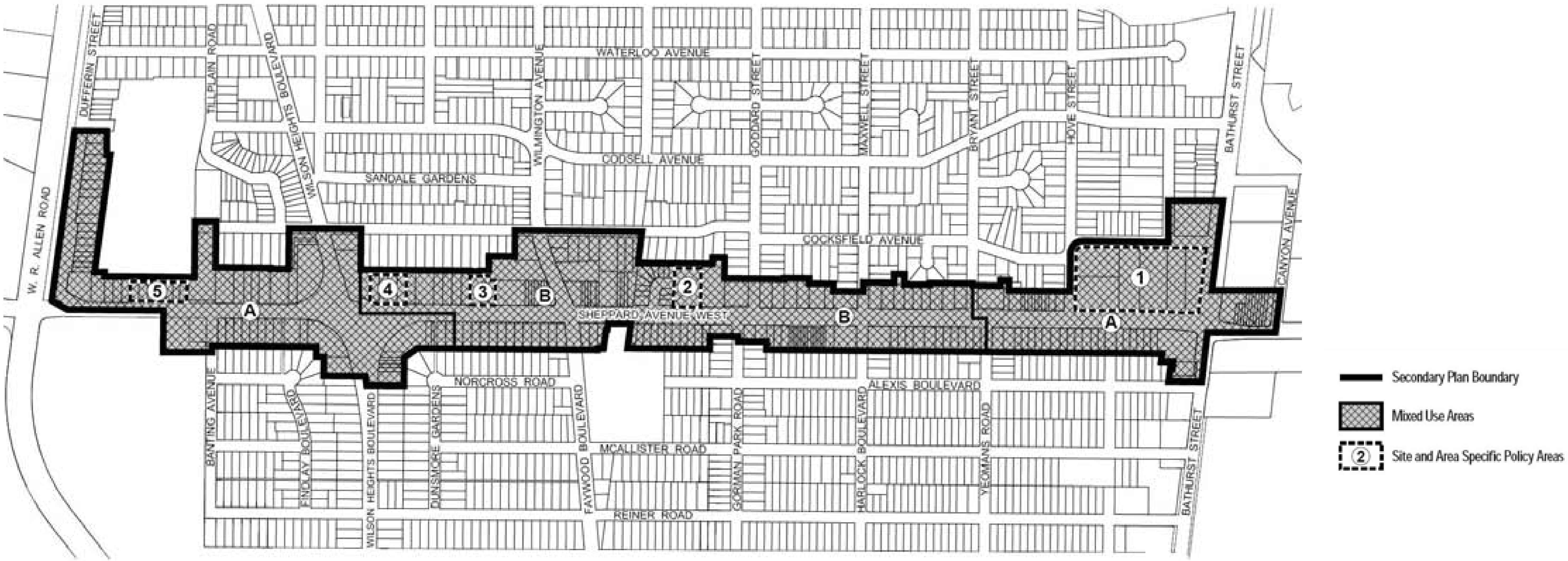


FIGURE 4-12: CITY OF TORONTO SHEPPARD WEST/DUBLIN SECONDARY PLAN

SOURCE: CITY OF TORONTO, TORONTO OFFICIAL PLAN, SHEPPARD WEST/DUBLIN SECONDARY PLAN, MAP 23-1 , NOVEMBER 2002

FIGURE 4-13: SHEPPARD/ALLEN QUARDRANTS AND PRECINCTS CITY OF TORONTO

SOURCE: CITY OF TORONTO

Rapid Transit Expansion Study

The Toronto Transit Commission's Rapid Transit Expansion Study (August 2001), examined the need and priorities of expanding the rapid transit system to meet the growing employment and residential population within the Greater Toronto Area. The Study focused on the relationship between urban density and the feasibility of rapid transit and the ancillary land use opportunities. The Toronto Transit Commission (TTC) identified the Spadina Subway Extension, from Downsview Station to Steeles corridor as one of two short-listed subway extension projects (along with the Sheppard Subway Extension) in the Rapid Transit Expansion Study. The Rapid Transit Expansion Study introduced an alternative alignment for the extension of the Spadina Subway Extension to what was recommended in the 1994 EA. This alternative alignment included the radial extension of the Spadina Subway beyond York University to Steeles Avenue instead of a "loop" to connect the Spadina and Yonge subway lines along Steeles Avenue. The Rapid Transit Expansion Study also recommended that both the Spadina and Sheppard Subway Extensions be considered for implementation in the next 10-15 years but stressed that there was an opportunity to enhance the prospects of rapid transit in other corridors in the interim period.

Further discussion of the Rapid Transit Expansion Study is found in section 5.0 of this EA.

Ridership Growth Strategy

The TTC's March 2003 Ridership Growth Strategy (RGS) included a number of specific transit proposals that are consistent with the higher order transit corridors and Avenues identified in the new Toronto Official Plan and the direction that emerged from the 2001 Rapid Transit Expansion Study. The Ridership Growth Strategy report identified the Group 3 Investment Package as including a continuous program of subway construction. The Spadina Subway Extension was one of two subway projects specifically identified as part of this initiative. The report is consistent with the outlook on transit and states, "an investment in subway construction represents a long-term commitment to city-building and to permanent high-quality transit service which influences city-wide development patterns"[2].

The RGS also highlighted the need to expand commuter parking lots to address the market segment that prefer to drive from their homes to a subway station and travel the rest of their trip by transit. The RGS estimated that the creation of "2,600 new commuter parking spaces would be expected to increase ridership on the TTC by approximately one million passengers annually"[3].

4.4.5. Reconfirming the Project Objectives

As evident from the extensive planning context as summarized in section 4.4, the Project Objectives are clearly linked to the existing planning and policies for the Study Area. Table 4-1 provides a clear correlation.

Table 4-1: Basis for Project Objectives

Project Objectives	Relevant Planning Document
Provide subway service to the Keele/Finch area, York University and a new inter-regional transit gateway and commuter parking facility at Steeles Avenue;	**Keele/Finch Area:** 1) North York Official Plan "in force" 2) Keele Street Study 3) New City of Toronto Official Plan – Map 4 Higher Order Transit Corridors ("transportation in force") **York University:** 1) Rapid Transit Expansion Study 2) City of Vaughan Property Protection Study for the Steeles Rapid Transit Terminal Facilities – Rapid Transit Extension to York University 3) City of Vaughan Higher Order Transit Corridor Protection Study – York University to the Vaughan Corporate Centre **New inter-regional transit gateway and commuter parking facility at Steeles Avenue:** 1) City of Vaughan Property Protection Study for the Steeles Rapid Transit Terminal Facilities – Rapid Transit Extension to York University 2) City of Vaughan Official Plan Amendment 500/529 ("in force") 3) Rapid Transit Expansion Study 4) Ridership Growth Strategy
Provide improved connections between the TTC subway system and GO Transit, York Region Transit and other inter-regional transit services;	1) New City of Toronto Official Plan – Map 4 Higher Order Transit Corridors ("transportation in force") 2) GO Transit Inter-Regional Bus Rapid Transit 3) Removing Roadblocks: A Strategic Transportation Plan for the GTA and Hamilton-Wentworth 4) The Region of York Transportation Master Plan ("in force")
Support local population and employment growth up to 2031, in accordance with the land use and transportation policies of the City of Toronto, the City of Vaughan and York Region Official Plans;	1) New City of Toronto Official Plan 2) Keele Employment Area Study 3) Business Case: A Solution for Gridlock in the North-Western GTA 4) The Region of York Official Plan/ROPA 43 ("in force") 5) City of Vaughan Official Plan Amendment 500/529 ("in force") 6) City of Vaughan Official Plan Amendment 620 7) City of Vaughan Higher Order Transit Corridor Protection Study – York University to the Vaughan Corporate Centre
Minimize any negative environmental impacts; and	As per the 1994 EA, this objective is intended to address the requirements of the ***Environmental Assessment Act***
Achieve reasonable capital and operating costs.	As per the 1994 EA, this objective is intended to guide the proponent in determining reasonable alternatives.

[2] Ridership Growth Strategy p.29, section 5.1.6.
[3] Rigership Growth Strategy, p. 24, section 5.1.2

4.5. Existing Transportation Systems

This section describes the existing transportation systems in the Study Area including the TTC system, regional and inter-regional transit systems, the road system and future transportation links.

4.5.1. TTC Transit System

Subway

The Yonge-University-Spadina (Y-U-S) Subway is a continuous U-shaped part of the subway network, which provides north-south rapid transit service in the City of Toronto.

The Yonge Line presently terminates at Finch Station in the north, where a major 23-bay bus terminal, a 2,900-car park-and-ride facility and a Passenger Pick-up/Drop-off facility are provided. The Spadina Line presently terminates at Downsview Station in the Sheppard Avenue West / Allen Road area and provides: a 12-bay bus terminal; a Passenger Pick-up/Drop-off facility; and, a 600-space commuter parking lot. Commuter facilities at Wilson Station include a 2,000-space commuter parking lot and a Passenger Pick-up/Drop-off facility. Commuter parking facilities are also provided at Yorkdale Station.

Surface Transit

Local surface transit service in the Study Area connects with the two present terminals of the subway lines; namely, Finch Station on the Yonge Line at the intersection of Finch Avenue and Yonge Street; and Downsview Station on the Spadina Line in the vicinity of Sheppard Avenue West and W.R. Allen Road. From these two terminals, TTC offers bus routes that are comprised of high frequency routes on the major arterials, and regular service on key collector routes, as well as various local and industrial services.

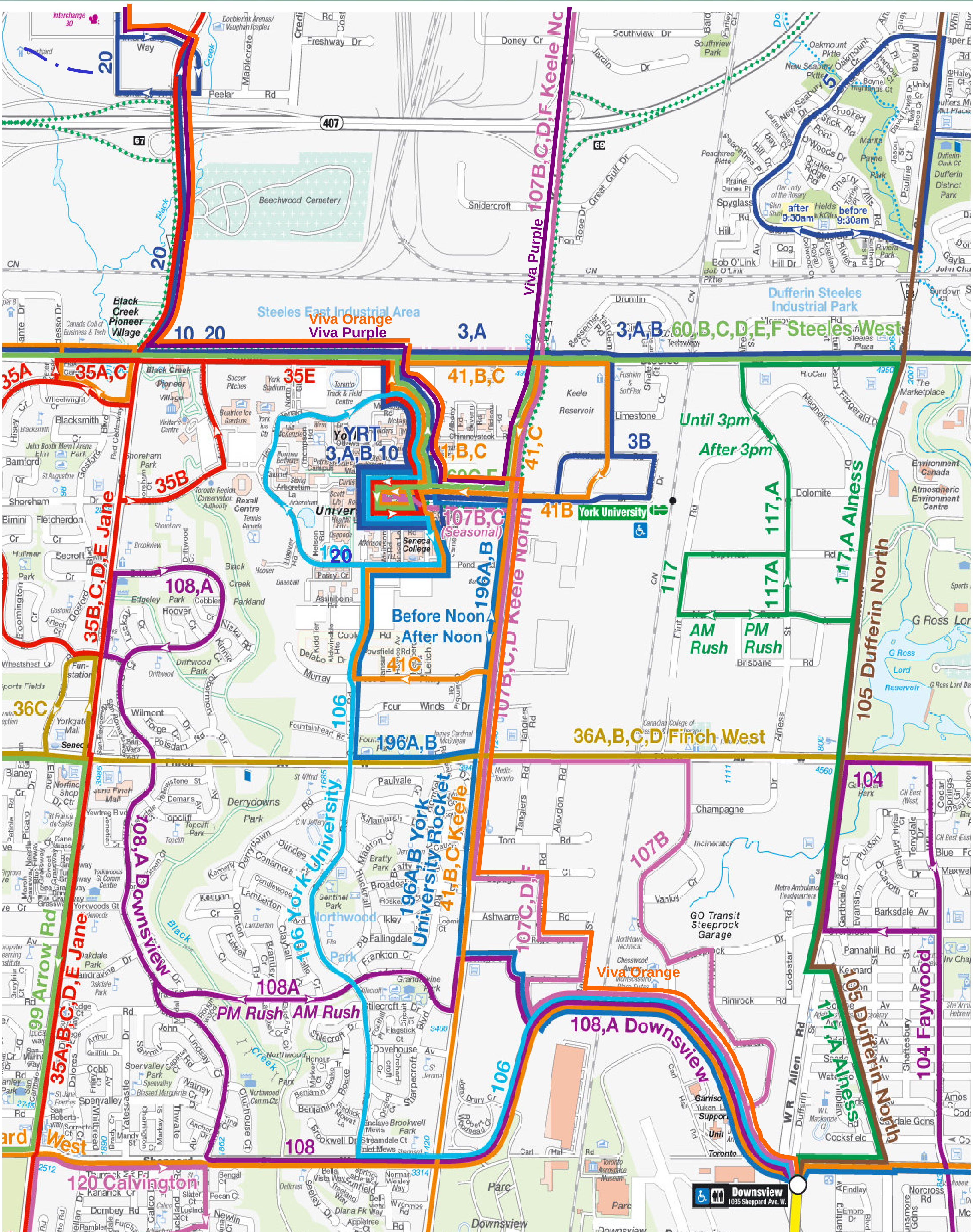
Figure 4-14 shows the current routing and service frequency on each of the existing services. The demands on the routes that serve the Study Area are reflected in the relative service levels on each route. The 36 Finch West, 196 York University Rocket, at 24 buses/hour during the AM peak, and 60 Steeles West, at 19 buses/hour in the AM peak, serve the highest transit traffic volumes to, from and through the Study Area.

The 36 Finch West has one of the highest number of daily passengers of all TTC's bus routes. Many of the passengers on the 36 Finch West are destined to the Yonge subway.

The 196 York University Rocket currently provides express bus service between Downsview Subway Station and York University, carrying over 10,000 people per day on service with service as frequent as every 2.5 minutes in the morning peak period. Only three bus routes in the TTC system have more frequent A.M. peak period service.

All routes are subject to significant delays due to chronic traffic congestion on all major arterials (please refer to section 4.5.4 for details). The worst areas are at the Keele/Finch and Dufferin/Finch intersections and on Finch Avenue between Keele and Dufferin. The delays encountered in the problem areas cause the whole route to operate slowly and unreliably.

Following completion of the ***Bus Only Lanes, Downsview Station to York University ESR*** study, the routing of the 196 York University Rocket was changed to operate via Sheppard Avenue, St. Regis Crescent, and Keele Street and is still on a trial basis. Figure 4-14 presents the existing transit services within the Study Area. While the routing can, at times, be slightly faster than the previous routing via Dufferin and Finch, the scheduled running times have not been changed and actual trip times still vary because of traffic congestion.



TTC Routes	Total Daily Passengers	TTC Routes	Total Daily Passengers	YRT Routes	Total Daily Passengers
35 Jane	38,800	108 Downsview	6,500	10 York University-Woodbridge	450
36 Finch West	37,000	117 Alness	2,600	3 Thornhill-York University	1,600
41 Keele	23,200	196 York University Rocket & 106 York University	16,700	20 Jane-Concord (YRT)	1,400
60 Steeles West	23,600	**GO Transit Services**		Viva Purple McCowan-Hwy 7-York University – Martin Grove	4,700
105 Dufferin North	1,200	GO Bus Service	10,000	Viva Orange Downsview Station – York University – Hwy 7- Martin Grove	1,200
107 Keele North	3,600	Bradford GO Train Service	6,700		

FIGURE 4-14: EXISTING TRANSIT

4.5.2. Inter-Regional Transit Systems

York Region Transit

York Region Transit serves York University with the following routes:

Table 4-2: York Region Transit

Route	Service Levels (Headway) Peak Period	Service Levels (Headway) Off-Peak Period	Daily Ridership[4]
#3 - Thornhill-York University	20 minute	45 minute	1,600
#10 - York University-Woodbridge	30 minute	45 minute	450
#20 - Jane-Concorde	20 minute	30-45 minute	1,400
VIVA Purple – Highway 7 Corridor	10 minute	15 minute	4,700
VIVA Orange – Martin Grove, York University, Downsview Station	10 minute	15 minute	1,200
TOTAL			9,350

York Region's rapid transit plans, known as the "VIVA", include a proposed BRT Line connecting the Highway 7 corridor to York University en route to Downsview Station. New roads, a commuter parking lot and an inter-regional bus terminal are proposed in the Jane Street / Steeles Avenue area. Currently, implementation of the BRT is subject to MOE's ongoing review of the supporting Individual EA. Once operational, many of the current routes in the Study Area will be modified to take advantage of this higher order transit service.

GO Transit

GO Transit provides both bus and rail service through the Study Area. York University is a major hub for GO Transit bus activity. As indicated in Table 4-3, ten different routes serve the campus during the morning peak period.

[4] November 2005 ridership data

Table 4-3: GO Bus routes within the Study Area

Route Name and Number		Number of Buses During Morning Peak (6:00 AM – 9:00 AM) EB	SB	WB	NB
44	Mount Joy GO Station/York University via 407	4	-	6	-
46	Oakville GO Station/York University via 407	5	-	6	-
46	Bramalea GO Station/York University via 407	3	-	-	-
47	Hamilton GO Station/York University via 407	5	-	6	-
48	Meadowvale GO Station/York University via 407	4	-	2	-
49	Pickering GO Express to York University	-	-	1	-
49	Pickering GO Station/York University via 407	5	-	6	-
49	Scarborough Town Centre/York University via 407	0	-	3	-
52	Oshawa/Durham College/York University via 407	3	-	2	-
53	Streetsville GO Station/York University via 407	8	-	1	-

GO Transit trains currently pass through the Study Area on the Bradford Line (CN Newmarket Subdivision) during the morning (southbound) and afternoon (northbound) peak periods, respectively. The service includes a temporary York University Station located just east of Keele Street. The University operates a shuttle bus connection between the GO station and York University via York Boulevard / Canarctic Drive.

GO Transit has recently completed an Environmental Assessment study for the rail-rail grade separation of the York and Newmarket Subdivisions. The ultimate completion of a grade separation at this location will allow for more flexible train schedules to address both existing and future demand and will enable provision of additional rail services, pending market demand and resolution of other factors such as equipment availability.

4.5.3. Rail Network

CN/Bradford GO Line bisects the Study Area. This corridor comprises a single north-south track located midblock between Dufferin Street and Keele Street. Rail traffic on this corridor is limited to light industrial traffic (one or two transfer movements daily) and 8 GO Trains as described above. Within the Study Area, industrial sidings are located at:

1) Mile 9.99 serving Bombardier (inactive)
2) Mile 11.60 serving Vitafoam Products Canada Limited (inactive)
3) Mile 11.97 serving Imperial Oil Limited, 3 sidings (active)
4) Mile 12.29 serving Van Water & Rogers (inactive)

The CN/Bradford GO Line crosses all east-west arterial roads within the Study Area. In all three instances, the crossings are grade-separated where rail passes over the road (see next page).

CN Bridge Sheppard

The existing single track main line passes over the centre position of the three track concrete deck at Mile 10.87. This two span bridge accommodates two lanes of traffic, plus an elevated sidewalk in each direction.

CN Bridge Finch

The existing single track main line passes over the centre position of the three track concrete deck at Mile 11.65. This two span bridge accommodates two travelled lanes of traffic, plus an elevated sidewalk in each direction. The bridge is sufficiently wide to accommodate a third lane in each direction (area hatched with line painting on either side of median).

CN Bridge Steeles

The two-track structure passes over Steeles Avenue at Mile 12.92. This two span concrete structure accommodates three lanes of traffic plus an elevated sidewalk per direction.

4.5.4. Road System

Existing Road Network

Figure 4-15 shows the existing arterial road system in the Study Area according to the City of Toronto and York Region Road Classification System. The arterial road system is as follows:

1) Dufferin Street is a north-south arterial road with a posted speed limit of 60 km/h. It has 4-lanes from Glen Shields Avenue (north) to Finch Avenue. There are reserved High Occupancy Vehicle (H.O.V.) lanes on Dufferin Street between Finch Avenue and Sheppard Avenue. During the weekday morning and afternoon peak periods, only buses, taxis and multi-person autos (three or more) are legally allowed to use these lanes. Dufferin Street is under the jurisdiction of York Region and the City of Toronto north and south of Steeles Avenue, respectively.
2) Jane Street is a major north-south arterial road with a 4-lane cross-section. Jane Street is under the jurisdiction of York Region and the City of Toronto north and south of Steeles Avenue, respectively.
3) Keele Street is a major north-south arterial road with a 4-lane cross-section. Keele Street is under the jurisdiction of York Region and the City of Toronto north and south of Steeles Avenue, respectively.
4) Steeles Avenue West is an east-west 6-lane arterial road, under the jurisdiction of the City of Toronto, with a posted speed limit of 60 km/h.
5) Finch Avenue West is an east-west 4-lane arterial road, under the jurisdiction of the City of Toronto, with a posted speed limit of 60 km/h.
6) Sheppard Avenue West is an east-west 4-lane arterial road, under the jurisdiction of the City of Toronto, with a posted speed limit of 60 km/h.
7) Highway 7 is a major east-west 6-lane arterial road (with a continuous two-way-left-turn lane). Highway 7 is under the jurisdiction of York Region with a posted speed of 80 km/h through the Study Area.

Existing Traffic Conditions

The existing traffic assessment for this study was based on a review of available turning movement data for the Study Area. Most recent available turning movement count data for the key intersections within the Study Area was obtained from the City of Toronto. This data was collected for the A.M. and P.M. Peak Hours. Signal timing information for the A.M. Peak, P.M. Peak and Off Peak Hours was also obtained from the City of Toronto for key intersections within the Study Area. These signal timings along with most recent available traffic turning movement counts were incorporated in the analysis of existing traffic conditions.

Assessment of the existing traffic at major signalized intersections was based on the existing traffic volumes for the A.M. and P.M. Peak Hours illustrated in Figures 4-16 and 4-17. This analysis reflects the existing lane configurations illustrated in Figure 4-18. Figure 4-19 summarizes the overall Level of Service (LOS) for each of the key intersections in the Study Area.

The analyses of the existing intersection conditions reveal poor overall intersection levels of service at all major intersections within the Study Area (at-capacity or over-capacity during the A.M. and P.M. Peak Hours). The intersections experience notably high delays and high volume-to-capacity ratios, with numerous critical movements.

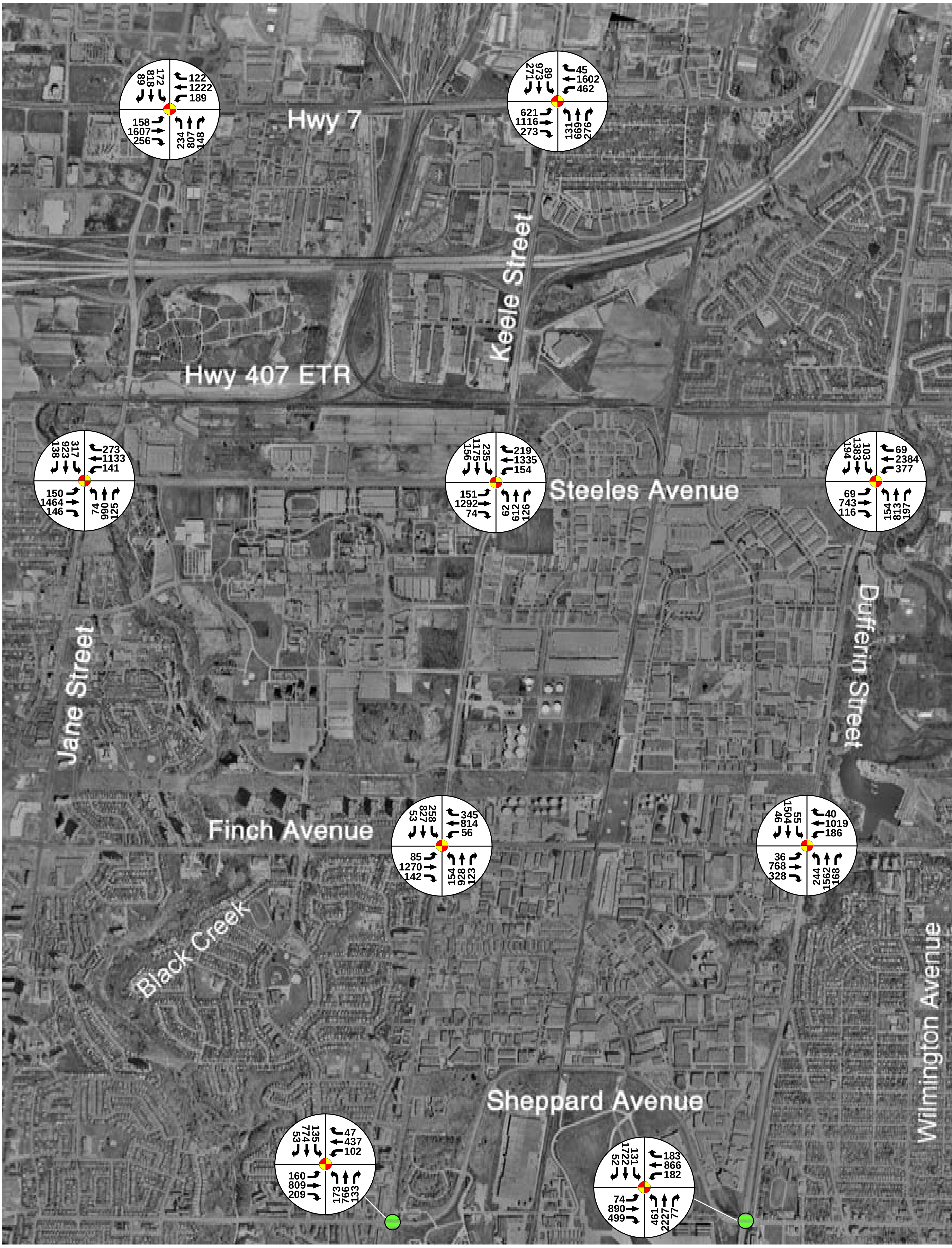
LEGEND

Standard Lane
High Occupancy Vehicle Lane / Bus Lane

Right-of-Way Widths from Official Plans:

45 metres and over
36 metres
27 metres

FIGURE 4-15: EXISTING ARTERIAL ROAD SYSTEM IN THE STUDY AREA



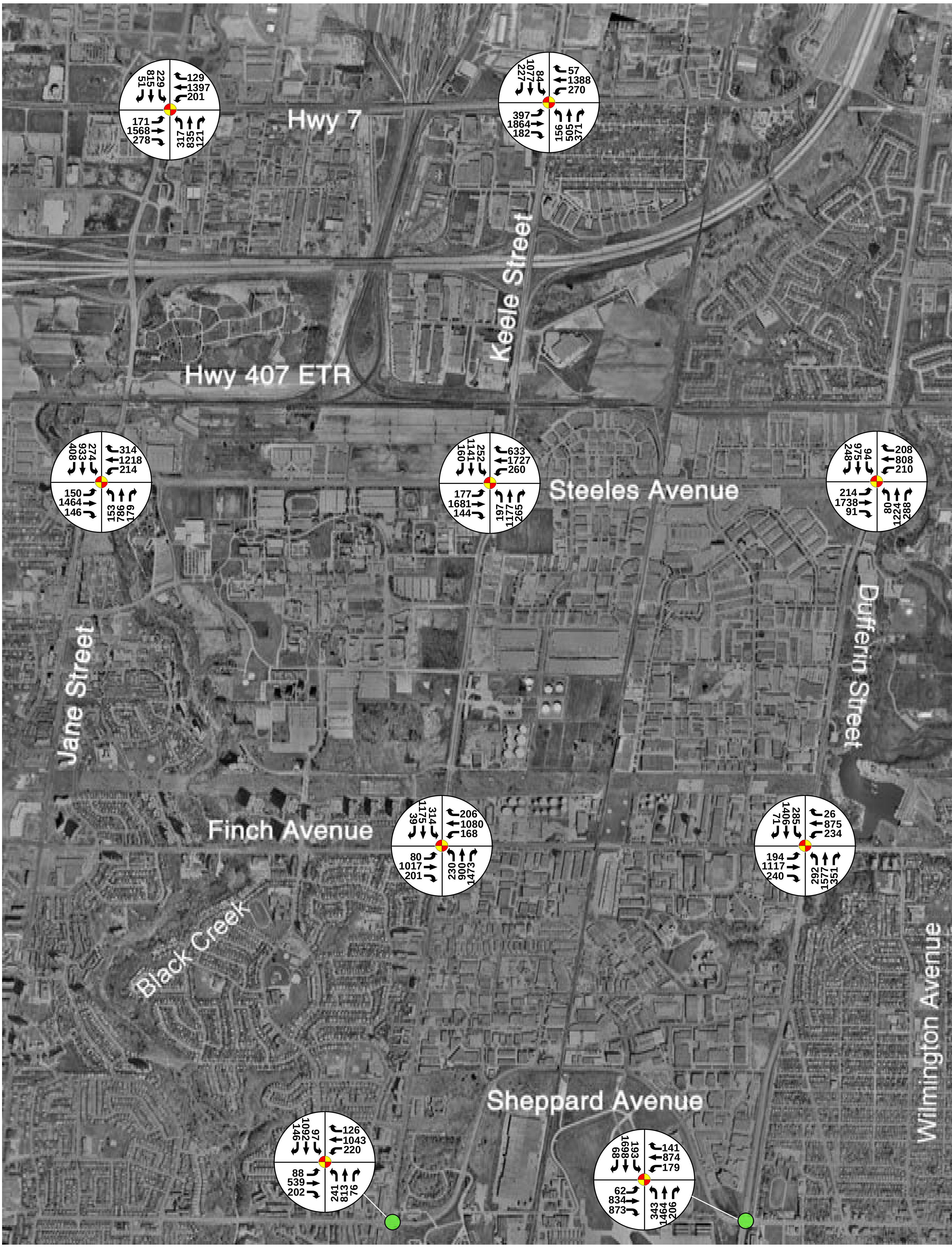
LEGEND (DRAWING NOT TO SCALE)

- TRAFFIC VOLUME

- SIGNALIZED INTERSECTION

FIGURE 4-16: EXISTING TRAFFIC VOLUMES AT THE STUDY INTERSECTION FOR A.M. PEAK HOUR

SPADINA SUBWAY EXTENSION



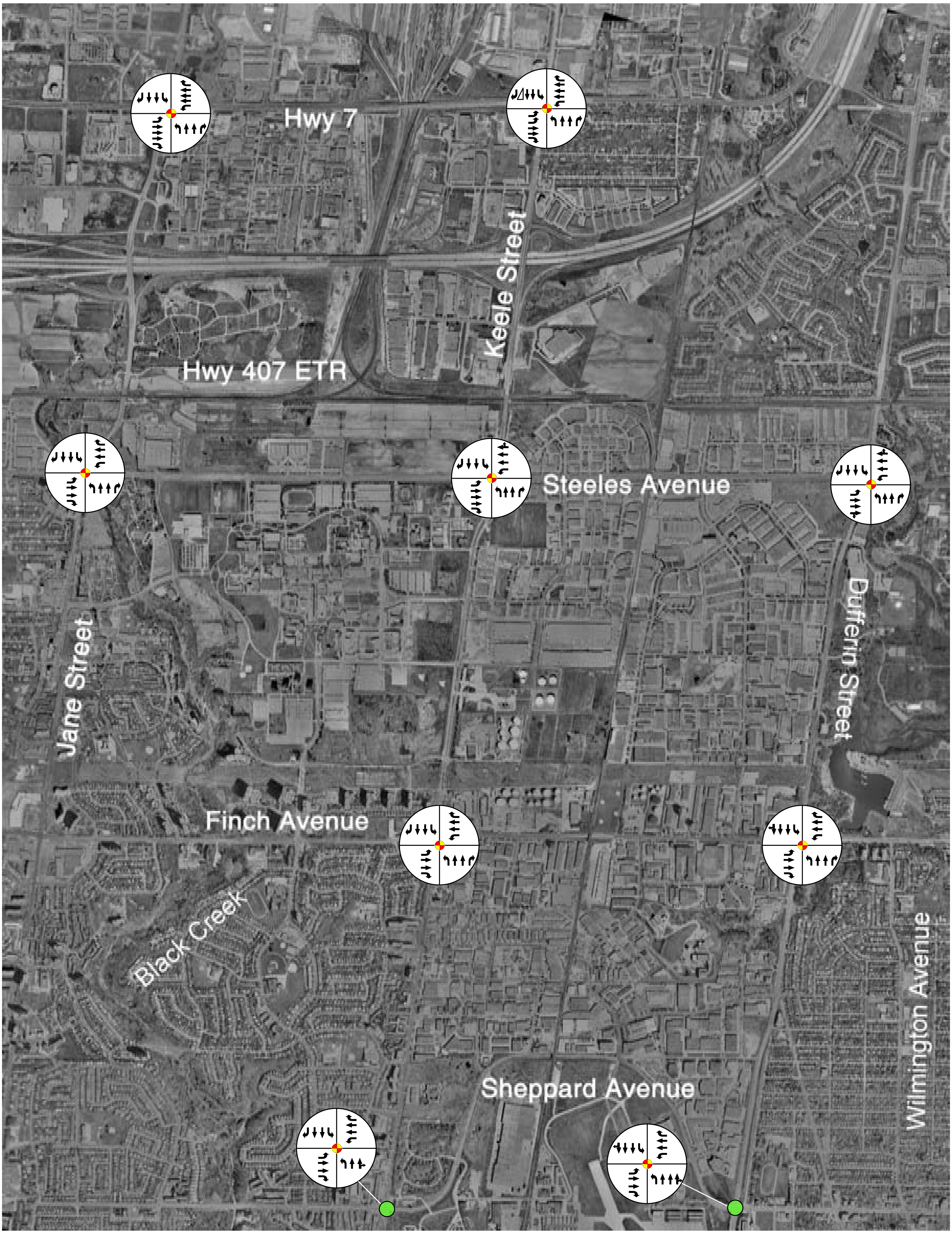
LEGEND (DRAWING NOT TO SCALE)

- TRAFFIC VOLUME

- SIGNALIZED INTERSECTION

FIGURE 4-17: EXISTING TRAFFIC VOLUMES AT THE STUDY INTERSECTION FOR P.M. PEAK HOUR

TORONTO · TORONTO TRANSIT COMMISSION · URS

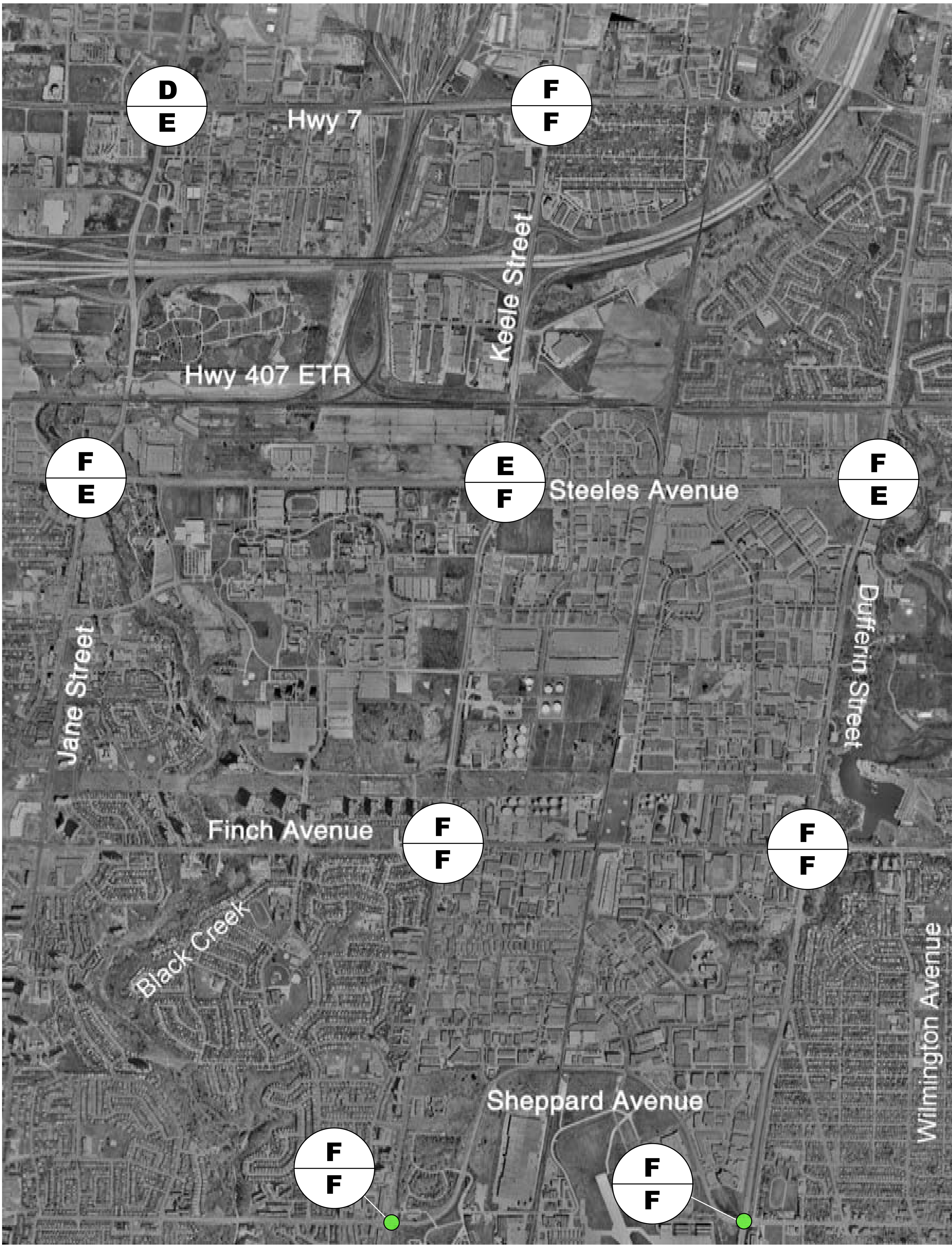


LEGEND **(DRAWING NOT TO SCALE)**

- TRAFFIC VOLUME

- SIGNALIZED INTERSECTION

FIGURE 4-18: EXISTING LANE CONFIGURATIONS



LEGEND (DRAWING NOT TO SCALE)

A — A.M. LEVEL OF SERVICE

B — P.M. LEVEL OF SERVICE

FIGURE 4-19: INTERSECTION OPERATIONS

The analyses of the existing intersection conditions confirm the existing traffic characteristics. Travel patterns by time-of-day show that traffic loading on all of the major arterials is very commuter-oriented. Sections of W.R. Allen Road are experiencing high traffic volumes throughout the day. Significant queuing and traffic congestion exists on many of the arterial roads within the Study Area, in particular on:

1) Dufferin Street, north of Finch Avenue (Figure 4-20);
2) Keele Street, south of Finch Avenue and north of Steeles Avenue; and
3) Finch Avenue, throughout the Study Area (Figure 4-21).

These congested traffic conditions are significantly contributed to by high inter-regional traffic volumes and are typical conditions on regional arterial systems. The nature of such traffic congestion is mainly associated with the travellers' commuting peak hours during the morning and afternoon peak commuting periods (e.g. from 6:00 A.M. to 9:00 A.M., and from 4:00 P.M. to 7:00 P.M.). While congested operations (in terms of delays, queuing, and low reserved capacity) are encountered at the major arterial - major arterial intersections, acceptable operations at collector-arterial intersections are exhibited, despite relatively high inbound and outbound traffic turning movements at the gateways to significant traffic generators, such as York University and other local industrial employment areas.

The intersections providing access to York University along Steeles Avenue are operating acceptably based on the analyses of the existing intersection conditions. The north-south traffic along Keele Street often experience delays caused by traffic congestion during the peak hours, particularly at the Keele/Finch and Dufferin/Finch intersections and on Finch Avenue between Keele and Dufferin.

A substantial amount of the inter-regional and local traffic is generally expected to convert into transit-related trips with the subway in place, thereby decreasing the number of vehicles on the road network and somewhat improving the overall road network. Thus, these vehicles, which generally come from the immediate area and from the north (i.e. York Region) would be diverted from the City of Toronto major arterial road network, thereby resulting in less auto trips in the Study Area.

Figure 4-20: Southbound Congestion on Dufferin Street, North of Finch Avenue

Figure 4-21: Eastbound Congestion on Finch Avenue, West of Dufferin Street

4.5.5. Planned Road Improvements

From a regional planning perspective, there is growing acknowledgement of the need to service future growth with an expanded transportation network. Ongoing planning initiatives in the City of Toronto and York Region reinforce this notion. A review of selected documents including Regional Municipality of York's and the City of Toronto's Capital Works Programs and Official Plan indicate that road widenings are planned on several streets in the Study Area:

1) Jane Street from Steeles Avenue to Highway 7 to be widened to 6 lanes (Regional Municipality of York);
2) Keele Street from Steeles Avenue to Highway 7 to be widened to 6 lanes (Regional Municipality of York); and,
3) Dufferin Street from Steeles Avenue to Glen Shields North to be widened to 6 lanes (Regional Municipality of York).

Additional planned roads in the City of Toronto are:

1) Chesswood Drive Extension from Finch Avenue West to Flint Road;
2) Murray Ross Parkway Extension from Keele Street to Tangiers Road Extension;
3) Tangiers Road Extension from Finch Avenue West to Petrolia Road;
4) Transit Road Extension Ramps from W. R. Allen Road to Transit Road Extension;
5) Transit Road Extension from Transit Road to Sheppard Avenue West;
6) Planned collector roads to serve growth on York University lands;
7) Downsview East/West Collector from Transit Road Extension to Sheppard Avenue West; and,
8) Downsview East/West Collector from Transit Road Extension to Keele Street.

Additional proposed roads in the City of Vaughan are identified in OPA 620 and include:

1) A new east west street, running parallel to and approximately 200 metres north of Steeles Avenue, between Jane Street and Keele Street
2) Street A – A new North South Road Connecting Murray Ross Parkway and the new east west street
3) Street B – A new north south street, in between Jane Street and Northwest Gate, that connects the new east west street to Steeles Avenue
4) Street C – A northerly extension of Northwest Gate that connects the new east west street to Steeles Avenue;

Other City of Vaughan roads are planned in the area bound by Jane Street, Steeles Avenue, Keele Street and the CN York Subdivision. The implementation of the east west street from Jane Street to Street C and all of Street C are considered part of the Undertaking for York Region's Highway 7 Corridor and Vaughan North-South Link Public Transit Improvements EA.

As part of their development plans, Parc Downsview Park are proposing a southern extension of Chesswood Drive from Sheppard Avenue to Carl Hall Road.

4.6. Existing Natural Environment

This section describes the existing natural environment in the Study Area including geology/subsurface stratigraphy, hydrogeology, surface water, aquatic habitats and communities, vegetation and vegetation communities, wildlife and wildlife habitat, designated natural areas and air quality.

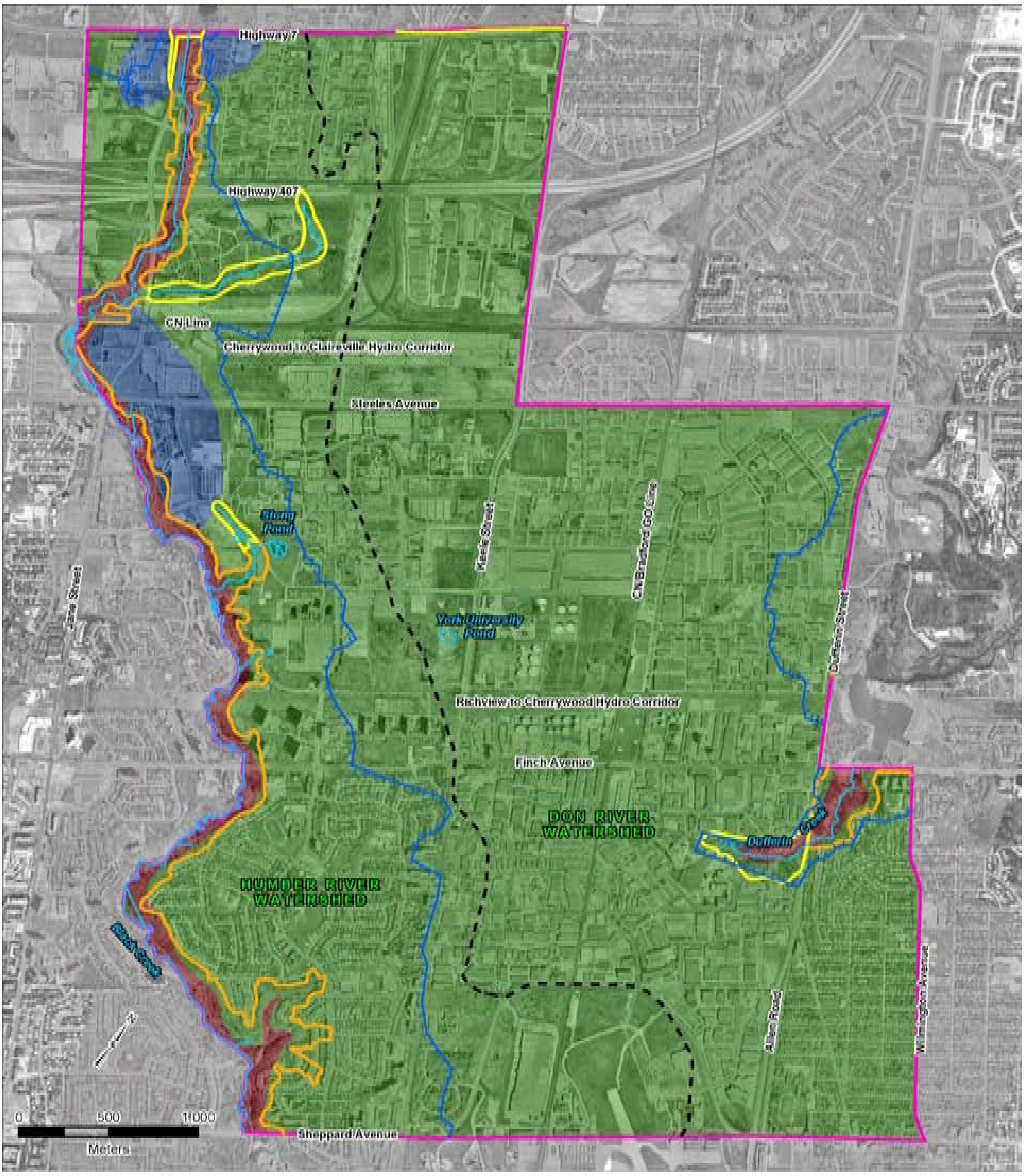
4.6.1. Geology/Subsurface Stratigraphy and Hydrogeology

Geology/Subsurface Stratigraphy

The soil deposits in the Toronto region consist predominantly of glacial till, glaciolacustrine, and glaciofluvial sand, silt and clay deposits. The soil deposits overlie the Georgian Bay Formation bedrock generally found about 50 to 75 m below the ground surface in the Study Area, with a bedrock valley located north of the Dufferin-Finch intersection, and trending in a NE-SW direction. The bedrock within the valley is typically located in the order of 125 m below existing ground surface. The surficial geology of the Study Area is presented in Figure 4-22.

The subsurface conditions in the Study Area have been evaluated by a combination of sampled boreholes (completed for the 1994 EA) and the York-Peel-Durham-Toronto Groundwater Management Strategy Study. The conditions along 1994 EA alignment are relatively well defined since much of the initial phases of subsurface exploration for the Project were completed in the early 1990's. The subsurface conditions in other areas of the Study Area are based on the York-Peel-Durham-Toronto (YPDT) Groundwater Management Strategy Study geologic model. The interpreted conditions based on the YPDT study must be considered as only a generalized illustration of the possible subsurface conditions and there remains a significant degree of uncertainty with respect to the local accuracy of the interpretation. Additional exploration work was undertaken to better define the conditions along the recommended alignment within the Study Area. The deposits encountered are grouped, in order from the ground surface down, as follows:

1) Fill: mixtures of re-worked native soils, imported earth and rock fill materials, and potential urban debris from past land-development activities, that typically range in thickness from about 1 to 5 m;
2) Upper Till: relatively firm to hard soils consisting predominantly of silty clay, clayey silt, or sandy silt with cobbles and boulders, typically ranging in thickness from about 10 m to 25 m;
3) Upper Sand/Silt Deposits: relatively dense soils consisting predominantly of sand and silt ranging in thickness up to about 10 m, though these deposits are absent in some of the reviewed borehole data; and,
4) Upper Clay Deposits: relatively firm to hard and layered deposits of silty clay or clayey silt; typically ranging in thickness from about 5 m to more than 15 m (in most areas, this deposit was not fully penetrated by boreholes where encountered).



LEGEND

- Preliminary Study Area
- Fill Regulation Line
- Fill Regulation Line Extension
- Groundwater Discharge Area
- UNIT 5B - Stone-poor, carbonate-derived silty to sandy till
- UNIT 8B - Interbedded flow till, rainout deposits and silt and clay
- UNIT 19 - Modern alluvial deposits
- Watershed Boundary
- Watercourse

NOTE: This figure presents the soils, watercourses/waterbodies, watershed boundaries, fill regulation lines (and extensions) and groundwater discharge areas located within the study area. The soil deposits within the study area consist predominantly of glacial till, glaciolacustrine, and glaciofluvial sand, silt and clay deposits which were laid down by glaciers and associated glacial rivers and lakes. The study area lies within the Don River and Humber River watersheds and the boundary between these two watersheds is identified on the aerial photo. Fill regulation lines (and fill regulation line extensions) are identified by the Toronto and Region Conservation Authority and are a general representation of valley and stream corridor boundaries. Groundwater discharge areas occur where there is an upward movement of groundwater and where groundwater seeps from the soil surface.

Geological reference made from "Ontario Geological Survey 2003. Surficial geology of Southern Ontario, Ontario Geological Survey, Miscellaneous Release--Data 128"

Data Sources: Golder Associates, Toronto and Region Conservation Authority.

Conservation for The Living City

Golder Associates

FIGURE 4-22: SOILS, SURFACE WATER AND GROUND WATER

Hydrogeology (Groundwater)

The Study Area is located between the valleys of the West Don River and Black Creek. The hydrogeology within the glacial deposits of the area can be relatively complex. The lower permeability glacial till layers tend to impede groundwater flow whereas the interstadial deposits of silt and sand serve as local shallow aquifers. Downward or upward (artesian) hydraulic gradients may be present within the Study Area and these will be indicated by groundwater levels measured with piezometers or wells. The primary water-bearing unit (the Upper Sand/Silt) along the east side of the Study Area, and, in particular the 1994 EA alignment appears to drain toward the east near the tributary to the West Don River, consistent with the location of discharge areas presented in Figure 4-22.

Available subsurface data in conjunction with mapping of groundwater discharge areas suggests that the Upper Sand/Silt deposits may be closer to the surface and more extensive in the western limits of the Study Area and drain towards the valley of Black Creek. The detailed subsurface information and experience with other projects in the area suggest that though Upper Sand/Silt deposits may be hydraulically connected, they may also be interrupted by the overlying Upper Till deposits or lenses of cohesive materials within the Upper Sand/Silt deposits.

A subsurface investigation, which includes assessing local hydraulic conductivity, was undertaken along the preferred route to confirm the generally anticipated subsurface geotechnical and hydrogeologic conditions and examine both the feasibility and potential construction methods that may be suitable for the subway extension (Appendix D).

4.6.2. Surface Water

Macro Drainage System

The Study Area generally drains east to the West Don River, with some minor sections draining west to Black Creek, a tributary of the Humber River. The area is, in general, fully developed, with a mix of residential, commercial and industrial development and associated roads. The existing sewer trunk system is being investigated as it appears to have been designed to convey the five-year pre-development flows. This may require on-site quantity controls for the subway stations and related facilities. It appears that there are no existing quality treatment systems, and that the Dufferin/Finch (G. Ross Lord) reservoir tends to behave as a settling facility for the Don River watershed.

Micro Drainage System

Local drainage subway stations and related facilities will be required to tie in to existing sewers. Existing sewer systems are generally designed to accommodate only minor runoff events for the existing level of development.

Floodplains and Flooding Potential

The floodplain and fill regulation lines (confirmed by the Toronto and Region Conservation Authority (TRCA)) are presented in Figure 4-22. Local conditions that may lead to flooding include local topographic low areas and inadequate existing drainage. For example, during the August 19, 2005 storm, the Finch Avenue Culvert at Black Creek just outside the Study Area suffered extensive damage due to excessive flooding. The City of Toronto, in partnership with TRCA, is reassessing storm drainage design parameters on a citywide basis.

Water Quality

The existing stormwater system was built before current Ministry of the Environment (MOE) guidelines were in place and there are no quality treatment facilities found within the macro drainage system. It is also known that the Dufferin/Finch Reservoir has received high levels of silt loading from stormwater runoff, resulting in frequent dredging.

The City of Toronto's Wet Weather Flow Management Master Plan (WWFMMP) provides direction on various methods for improving the quality of stormwater runoff. Any proposed works to be considered by this undertaking must be consistent with the approach and recommendations of this governing document.

Aquatic Habitats and Communities

The Study Area lies within the Don River and Humber River watersheds with the approximate watershed boundary being Keele Street. Figure 4-22 identifies the boundary between the Don River and Humber River watersheds. The West Don River subwatershed is located east of Keele Street and includes the G. Ross Lord Reservoir, Dufferin Creek and several small unnamed tributaries. The area west of Keele Street is located in the Black Creek subwatershed and includes Black Creek and several small unnamed tributaries. All watercourses fall within the jurisdiction of the TRCA and the Ministry of Natural Resources (OMNR) Aurora District. The location of watercourses/waterbodies located within the Study Area is presented in Figure 4-23.

Aquatic Habitat

There are several watercourses/water bodies located within the potential zone of influence of the subway, including:

1) Black Creek Pioneer Village Ponds;
2) Dufferin Creek;
3) Stong Pond; and,
4) York University Pond.

Black Creek Pioneer Village Ponds - Two ponds are located on the Black Creek Pioneer Village property. The northern pond is located south of Steeles Avenue and east of Black Creek. As advised by TRCA, a spillway controls the water level of the pond, which has dropped approximately 40 cm as indicated by the extent of bare mud areas. The pond is devoid of vegetation on 3 sides with bare mud flats extending 2 m to 3 m to permanently vegetated areas surrounding the pond. The southern edge of this pond is lined with a narrow band of cattails, which constitute the only emergent vegetation within the pond. No in-water aquatic vegetation was observed. The riparian edge surrounding the pond is narrow as Black Creek Pioneer Village paths and buildings are in close proximity. Riparian vegetation consists of cattails, red maple (***Acer rubrum***), silver maple (***A. saccharinum***), riverbank grape (***Vitus riparia***), raspberry (***Rubus***

sp.), willow, goldenrod (***Solidago*** sp.), red osier dogwood (***Cornus stolinifera***), black locust (***Robinia pseudoacacia***) and manicured grass. Fish were noted breeching in the pond, and small cyprinids were observed near the cattails. However, these species could not be identified. This pond drains into the southern pond (discussed below) through the spillway noted earlier.

The southern pond is located at the eastern boundary of the Black Creek Pioneer Village property, to the south of the pond discussed above, which feeds directly into it. The water depth in this pond is down approximately 50 cm as indicated by the extent of bare mud areas. Like the pond to the north, this pond contains no in-water aquatic vegetation. On the eastern and southern edges of this pond, the riparian area is comprised of mature trees and shrubs: willows, black locust, basswood (***Tilia americana***), staghorn sumac (***Rhus typhina***), white birch (***Betula papyrifera***), red maple and eastern white cedar (***Thuja occidentalis***). The western and southern edges are primarily a narrow band of willows, sumac, cedar and red pine (***Pinus resinosa***) whose width is limited by a walking trail and small footbridge. In-water cover is provided by fallen willow limbs. Cyprinids were observed, but could not be identified to species. This pond drains directly into Black Creek via a spillway. The length of the spillway between the pond and Black Creek is approximately 6 m. This spillway forms a barrier to fish movement between the pond and Black Creek. However, the spillway consists of a wooden plank, which regulates the water level of the pond and can be removed. When removed, fish movement between the pond and the creek is possible.

Dufferin Creek - Dufferin Creek daylights from a storm sewer outfall located approximately 500 m upstream (west) of Dufferin Street, then flows easterly under Dufferin Street and then northerly under Finch Avenue to the G. Ross Lord Reservoir. Dufferin Creek is a heavily urbanized watercourse that responds rapidly and intensely to rain events. The twin-celled concrete box culvert located at Dufferin Street is perched approximately 1.5 m at its outlet and therefore presents a significant barrier to fish migration. The watercourse is considered Type 2 (important) habitat, although no fish were observed in the reach between the storm sewer outfall and Dufferin Street. The absence of fish in this reach is likely attributed to poor water quality, extreme flows following rain events, and the barrier to fish migration located at Dufferin Street.

Stong Pond - This pond is located to the east of Pond Road within the York University Campus. The pond is in a park-like setting and has a manicured grass lawn to the waters edge along approximately 80% of its bank. A few willow shrubs (***Salix*** sp.) were present on the banks along the southern and western portions of the pond. A large number (>50) of Canada geese were occupying the pond on July 4, 2005, which is likely resulting in a large amount of nutrient input through faecal matter. Both small cyprinds and centrarchids were observed in the pond. No in-water aquatic vegetation was noted. The pond's outflow drops over a 1.25 m concrete spillway leading into a concrete channel under Pond Road. This flat-bottomed channel then has another vertical drop before entering a natural stream channel downstream of Pond Road. Both of these vertical drops would constitute a barrier to any passage of fish upstream during any flow period. This watercourse then follows a southwesterly route towards its confluence with Black Creek.

York University Pond - A small pond is located approximately 130 m west of Keele Street between Murray Ross Parkway and Pond Road. This pond has no inlet watercourse associated with it. However, there is a small outlet ditch located on the northwest side of the pond. The ditch is ephemeral, has a rocky barrier across it approximately 35 m west of the pond and is densely vegetated with cattails (***Typha latifolia***). The pond is shallow (8 cm to 10 cm) and mostly choked with cattails and reed-canary grass (***Phalaris arundinacea***), and its potential for use as fish habitat is very low. No fish were observed during site visits on July 29, 2004 and July 4, 2005.

Aquatic Communities

The TRCA classifies the Don River as intermediate riverine warmwater and Dufferin Creek as small riverine warmwater. Black Creek is classified by TRCA as intermediate riverine warmwater south of Steeles Avenue and as small riverine warmwater north of Steeles Avenue and along its minor tributaries. Black Creek is located in TRCA Management Zone 4 that targets darter species. A summary of fish species documented within the Study Area by TRCA is presented in Table 4-4.

No species at risk are located within the Study Area. A 1946 record for redside dace (***Clinostomus elongates***) exists for Black Creek at Sheppard Avenue. Redside dace is designated "threatened" by the Ontario Ministry of Natural Resources (OMNR) and "special concern" by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). Given the historic date of this record and the absence of recent records for redside dace within this reach of Black Creek, the presence of redside dace within the Study Area is unlikely.

4.6.3. Vegetation and Vegetation Communities

Much of the vegetation within the Study Area is of anthropogenic origin, resulting from past/present land use. Land use is urban and predominantly industrial, institutional, commercial and residential. A number of parks are located within the Study Area including William Baker Park, located between Keele Street and Sheppard Avenue just north of John Drury Crescent. Several parks are also located along Black Creek including Black Creek Parkland, Derrydowns Park, Topcliff Park and Northwood Park. Parc Downsview Park is also situated within the Study Area.

Vegetation Communities

A total of 11 Ecological Land Classification (ELC) vegetation communities have been identified within the Study Area. These communities include cultural meadows, cultural thickets, cultural woodlands, deciduous forests, meadow marshes, shallow marshes and open aquatic communities. These communities are delineated in Figure 4-23 and described in Table 4-5. The vegetation communities identified within the Study Area are considered widespread and common in Ontario and secure globally and locally. The most significant vegetation communities located within the Study Area are associated with the Dufferin Creek Valley, the Black Creek Valley, the West Don River Valley and the Boynton and Danby woodlots located at York University.

Vegetation

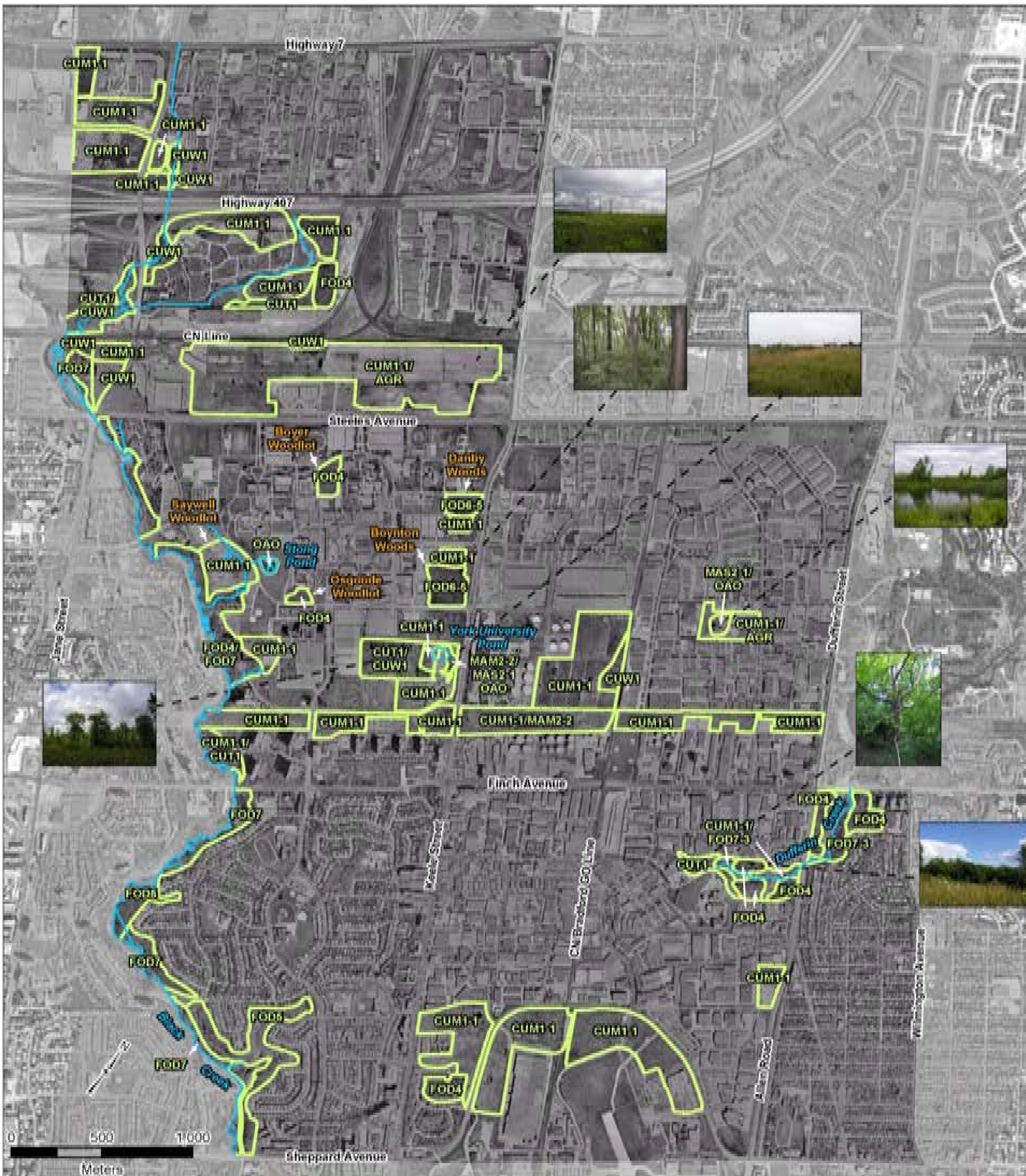
No vegetation recorded within the Study Area has federal or provincial status. Twenty-nine plant species are considered regionally or locally rare or uncommon or species of concern. These species are listed in Table 4-6. Over 50 % of the vegetation species recorded in the Study Area are introduced and non-native to southern Ontario.

4.6.4. Wildlife and Wildlife Habitat

The majority of the Study Area is open habitat of anthropogenic origin with few natural heritage features. Wildlife habitat is typical of an urban setting with species that are very tolerant of human disturbance. The CN/Bradford GO Line, hydro corridors, and stream corridors and valleylands in the Study Area act as corridors/wildlife pathways for wildlife tolerant of an urban environment and may serve to link locally important habitat units for wildlife occupants. These areas allow for wildlife movement along the watercourses to and from more protected areas surrounding the Study Area such as ESA's and ANSI's. The Study Area is highly urbanized and very few natural areas in locations other than along watercourses are linked together.

Wildlife Habitat

A summary of wildlife habitat located within the Study Area is presented in Table 4-7. None of the wildlife habitat is considered provincially or federally significant. Some wildlife habitat is considered locally significant for its function of supporting wildlife with local status and local animal movement corridors.



LEGEND

- Preliminary Study Area
- Watercourse
- Vegetation Community Boundary

Vegetation Communities

AGR	Agricultural
CUM1-1	Dry-Moist Old Field Meadow Type
CUT1	Mineral Cultural Thicket Ecosite
CUW1	Mineral Cultural Woodland Ecosite
FOD4	Dry-Fresh Deciduous Forest Ecosite
FOD5	Dry-Fresh Sugar Maple Deciduous Forest Ecosite
FOD6-5	Fresh-Moist Sugar Maple-Hardwood Deciduous Forest Type
FOD7	Fresh-Moist Lowland Deciduous Forest Ecosite
FOD7-3	Fresh-Moist Willow Lowland Deciduous Forest Type
MAM2-2	Reed-canary Grass Mineral Meadow Marsh Type
MAS2-1	Cattail Mineral Shallow Marsh Type
OAO	Open Aquatic

NOTE: This figure presents the natural heritage features located within the study area, including watercourses/waterbodies and vegetation communities. No fish species of conservation concern are located within the study area. A total of 11 Ecological Land Classification (ELC) vegetation communities have been identified within the study area including cultural meadows, thickets and woodlands, deciduous forests, meadow and shallow marshes, and open aquatic communities. No plant or wildlife species located within the study area has federal or provincial conservation status. However, a number of plant and wildlife species are considered regionally or locally significant.

Data Source: LGL Limited field survey's.

FIGURE 4-23: NATURAL HERITAGE

Table 4-4: Fish Species Collected by TRCA Within and Adjacent to the Study Area

Scientific Name	Common Name	COSEWIC	MNR	Local Status	Legal Status*	Fish Sampling Station Numbers and Years of Observation									
						West Don River Watershed		Black Creek Watershed							
						4	12	42	43	44	45	225	226	BC01	BC02
Carassius auratus	goldfish					1991 1998	1991	1991							
Catostomus commersoni	white sucker					1991	1991	1991 1994	1991	1984 1985	1991 1994		1991	2000	2000
Clinostomus elongatus	redside dace	SC	THR	SC	SARA(3)						1946				
Culaea inconstans	brook stickleback							1991 1994		1985		1991			
Cyprinus carpio	common carp							1994							
Etheostoma caeruleum	rainbow darter										1946				
Etheostoma flabellare	fantail darter										1946				
Etheostoma nigrum	johnny darter										1946				
Lepomis gibbosus	pumpkinseed					1998		1999		1984 1985					2000
Luxilus cornutus	common shiner						1991	1991			1946	1991	1991		
Pimephales notatus	bluntnose minnow								1991		1946 1991 1994			2000	
Pimephales promelas	fathead minnow					1991 1998	1991	1991 1994	1991	1984 1985	1991				
Rhinichthys atratulus	blacknose dace							1991 1994 1999	1991		1946 1991 1994			2000	2000
Semotilus atromaculatus	creek chub					1998	1991	1991 1994 1999	1991	1984 1985	1946 1991 1994	1991	1991	2000	2000

Station Locations

4 – West Don River, 250 m upstream of Finch Ave., between Dufferin St. and Bathurst St.
12 – West Don River, 500 m downstream of Steeles Ave., east of Dufferin St.
42 – Black Creek, at the crossing of Jane St. and Steeles Ave.
43 – Black Creek, at the crossing of Finch Ave., between Jane St. and Keele St.
44 – Black Creek, at the crossing of Shoreham Drive, east of Jane St.
45 – Black Creek, at the crossing of Sheppard Ave., between Jane St. and Keele St.
225 – Black Creek, at the crossing of Highway 7, just east of Jane St.
226 – Black Creek, 500 m downstream of Highway 407, west of Jane St.
BC01 – Black Creek, at the eastern terminus of Niska Rd., within Black Creek Parkland.
BC02 – Black Creek, 500 m upstream of Jane St. and south of Sheppard Ave.

COSEWIC Committee on the Status of Endangered Wildlife in Canada:
END – Endangered THR – Threatened SC - Special Concern
MNR Ministry of Natural Resources: Local Status:
END - Endangered THR – Threatened VUL – Vulnerable
Local Status: U – Uncommon R – Rare SC - Species of Concern
Legal Status: *In addition to the ***Fisheries Act***, which protects all fish species SARA - Species at Risk Act; Schedule (1), (2) or (3)

Table 4-5: Summary of Ecological Land Classification Vegetation Communities

ELC Code	Vegetation Type	SPECIES ASSOCIATION	Comments
Terrestrial – Natural/Semi-natural			
FOD	DECIDUOUS FOREST		
FOD4	Dry-Fresh Deciduous Forest Ecosite	Canopy: Manitoba maple (***Acer negundo***), sugar maple (***A. saccharum***), white ash (***Fraxinus americana***), ironwood (***Ostrya virginiana***), white pine (***Pinus strobus***), trembling aspen (***Populus tremuloides***), red oak (***Quercus rubra***), black locust (***Robinia pseudo-acacia***), basswood (***Tilia americana***), white elm (***Ulmus americana***) Understorey: Ironwood, Tartarian honeysuckle (***Lonicera tatarica***), choke cherry (***Prunus virginiana***), common buckthorn (***Rhamnus cathartica***) Ground Cover: Sparse ground cover including Canada mayflower (***Maianthemum canadense***) and garlic mustard (***Allaria petiolata***)	Tree cover > 60 % (FO), with deciduous trees > 75 % of canopy cover (D). Uncommon associations of tree species or associations that are the result of disturbance or management (4). Well to moderately well drained sands and loams in upper to middle slope positions, or tablelands (Dry-Fresh). Mid-aged to mature forest stands, with a small number of old growth trees. On the north shore of Dufferin Creek this community is home to a few old growth ironwood (***Ostrya virginiana***), each with a diameter at breast height (dbh) of approx. 45 cm.
FOD5	Dry-Fresh Sugar Maple Deciduous Forest Ecosite	Canopy: Sugar maple dominant with Manitoba maple (***Acer negundo***), white ash (***Fraxinus americana***), ironwood (***Ostrya virginiana***), white pine (***Pinus strobus***), trembling aspen (***Populus tremuloides***), red oak (***Quercus rubra***), black locust (***Robinia pseudo-acacia***), basswood (***Tilia americana***), white elm (***Ulmus americana***) Understorey: Ironwood, Tartarian honeysuckle (***Lonicera tatarica***), choke cherry (***Prunus virginiana***), common buckthorn (***Rhamnus cathartica***) Ground Cover: Sparse ground cover including Canada mayflower (***Maianthemum canadense***) and garlic mustard (***Allaria petiolata***)	Tree cover > 60 % (FO), with deciduous trees > 75 % of canopy cover (D). Sugar maple dominant (5). Well to moderately well drained sands and loams in upper to middle slope positions, or tablelands (Dry-Fresh). Mature forest stands. This community type is located on the top of steep banks adjacent to Black Creek.
FOD6-5	Fresh-Moist Sugar Maple-Hardwood Deciduous Forest Type	Canopy: Sugar maple, hybrid maple (***Acer X freemanii***), silver maple (***A. saccharinum***), red maple (***A. rubrum***), green ash, white ash, basswood, red oak, bur oak (***Quercus marcrocarpa***), white birch (***Betula papyrifera***), American beech (***Fagus grandifolia***), ironwood, white pine, eastern white cedar (***Thuja occidentalis***) Understorey: Ironwood, poison ivy (***Rhus radicans***), thicket creeper (***Parthenocissus inserta***) Ground Cover: Enchanter's-nightshade (***Circaea lutetiana canadensis***), spotted touch-me-not (***Impatiens capensis***), Jack-in-the-pulpit (***Arisaema triphyllum***), Mayapple (***Podophyllum peltatum***), garlic mustard	Tree cover > 60 % (FO), with deciduous trees > 75 % of canopy cover (D). Sugar maple dominant with uncommon associations of other hardwood species (6-5). Imperfect to poorly drained sands and loams in poorly drained table lands with complex microtopography (Fresh-Moist). Mature forest stands. In the Study Area, this community type is associated with York University campus; a storm drain and ditch are located in the centre of one FOD6-5 community.
FOD7	Fresh-Moist Lowland Deciduous Forest Type	Canopy: Crack willow (***Salix X rubens***), Manitoba maple, black walnut (***Juglans nigra***), trembling aspen, Carolina poplar (***Populus X canadensis***), white elm, basswood, green ash (***Fraxinus pennsylvanica***), Understorey: Alternate-leaved dogwood (***Cornus stolonifera***), riverbank grape, thicket creeper, poison ivy Ground Cover: Spotted touch-me-not, enchanter's nightshade, garlic mustard	Tree cover > 60 % (FO), with deciduous trees > 75 % of canopy cover (D). Lowland forests where dominant species is not willow and dominant species varies with location (7). Poorly to well-drained loams, sands and clays on lower slopes, bottomlands and in floodplains (Fresh-Moist). Young to mid-aged forest stands. In the Study Area, this community type has a more open canopy (<60% cover in some locations) and is associated with CUM1-1 in some locations. This community type is associated with Black Creek and Dufferin Creek in the Study Area.

Table 4-5 (continued): Summary of Ecological Land Classification Vegetation Communities

ELC Code	Vegetation Type	SPECIES ASSOCIATION	Comments
FOD7-3	Fresh-Moist Willow Lowland Deciduous Forest Type	**Canopy:** Crack willow dominant with Manitoba maple, black walnut, trembling aspen, Carolina poplar, white elm, basswood, green ash, **Understorey:** Alternate-leaved dogwood, riverbank grape, thicket creeper, poison ivy **Ground Cover:** Spotted touch-me-not, enchanter's nightshade, garlic mustard	Tree cover > 60 % (FO), with deciduous trees > 75 % of canopy cover (D). Willows dominant (7-3). Poorly to well-drained loams, sands and clays on lower slopes, bottomlands and in floodplains (Fresh-Moist). Young to mid-aged forest stands. In the Study Area, this community type has a more open canopy (<60% cover in some locations) and is associated with CUM1-1 in some locations. This community type is associated with Dufferin Creek in the Study Area.
Terrestrial – Cultural			
CUM	CULTURAL MEADOW		
CUM1-1	Dry-Moist Old Field Meadow Type	**Ground Cover:** Grasses such as brome (***Bromus inermis***), timothy (***Phleum pratense***), Canada bluegrass (***Poa compressa***), Kentucky bluegrass (***P. pratensis***) and forbs, including common buttercup (***Ranunculus acris***), rough-fruited cinquefoil (***Potentilla recta***), black medic (***Medicago lupulina***), common dandelion (***Taraxacum officinale***), purple clover (***Trifolium pratense***), bird vetch (***Viccia cracca***), butter-and-eggs (***Linaria vulgaris***), ox-eye daisy (***Chyrsanthemum leucanthemum***), wild strawberry (***Fragaria virginiana***), goat's beard (***Tragopogon dubius***), common milkweed (***Asclepias syriaca***)	Tree cover and shrub cover < 25 % (CUM). This community can occur on a wide range of soil moisture regimes (Dry-Moist). Pioneer community resulting from, or maintained by, anthropogenic-based influences. This community type is located in areas that have been previously cleared, such as in hydro corridors and in association with institutions and industrial/commercial lands. Portions of a number of the CUM1-1 communities in the Study Area have been planted with wheat (***Triticum aestivum***).
CUT	CULTURAL THICKET		
CUT1	Mineral Cultural Thicket Ecosite	**Canopy:** European buckthorn, tartarian honeysuckle, hawthorns (***Crataegus spp***.), riverbank grape, red-osier dogwood, wild red raspberry (***Rubus idaeus melanolasius***), white elm **Ground Cover:** Most herbaceous species listed in CUM1-1 as well as Canada goldenrold (***Solidago canadensis***) and tall goldenrod (***S. altissima***)	Tree cover < 25 % and shrub cover > 25 % (CUT). This community has developed on mineral soil (as opposed to bedrock). Pioneer community resulting from, or maintained by, anthropogenic-based influences. In these locations, shrubs have colonized these previously cleared areas. This community type has a higher incidence of non-native species. A grove of sassafras (***Sassafras albidum***) occurs within this vegetation community along the south top of bank of the Dufferin Creek valley.
CUW	CULTURAL WOODLAND		
CUW1	Mineral Cultural Woodland Ecosite	**Canopy:** Manitoba maple, crack willow, sugar maple, Norway maple (***Acer platanoides***), white ash, trembling aspen, black locust, basswood, white elm and **Understorey:** Tartarian honeysuckle, choke cherry, common buckthorn **Ground Cover:** Variable ground cover including garlic mustard, dame's rocket (***Hesperis matronalis***) and many species also found in CUM1-1 communities	Tree cover ranges from 35 % to 60 % (CUW). This community has developed on mineral soil (as opposed to bedrock). Young community resulting from, or maintained by, anthropogenic-based influences.

Table 4-5 (continued): Summary of Ecological Land Classification Vegetation Communities

ELC Code	Vegetation Type	SPECIES ASSOCIATION	Comments
Wetland			
MAM	MEADOW MARSH		
MAM2-2	Reed-canary Grass Mineral Meadow Marsh Type	**Ground Cover:** Reed-canary grass (***Phalaris arundinacea***) dominates with softstem bulrush (***Scirpus validus***) and sedges (***Carex spp***.)	Tree and shrub cover < 25 % and water table seasonally drops below the substrate surface (MAM). Mineral soil (2). Dominated by reed-canary grass (-2). This community is associated with a pond on York University campus and is also complexed with a CUM1-1 community along the hydro corridor to the east of Keele Street in the Study Area.
MAS	SHALLOW MARSH		
MAS2-1	Cattail Mineral Shallow Marsh Type	**Ground Cover:** Common cattail (***Typha latifolia***) dominates with narrow-leaved cattail (***Typha angustifolia***), water-plantain (***Alisma plantago-aquatica***), softstem bulrush	Tree and shrub cover < 25 % with standing or flowing watre for much or all of the growing season (MAS). Mineral soil (2). Dominated by cattails (-1). This community is associated with two ponds in the Study Area.
OAO	OPEN AQUATIC	N/A	No tree or shrub cover and little to no aquatic vegetation (OAO). Open water portions of ponds in the Study Area.

Table 4-6: Vascular Plants of Conservation Concern

Scientific Name	Common Name	COSEWIC	MNR	Local Status	Legal Status	TRCA Data	ELC Community								
							CUM1-1	CUT1	CUW1	FOD4	FOD5	FOD6-5	FOD7	MAM2-2	MAS2-1
Allium tricoccum	wild leek			C[4]		X									
Andropogon gerardii	big bluestem			C[4]		X									
Aster oolentangiensis	sky blue aster			C[4]		X									
Carex grayi	Gray's sedge			C[4]		X									
Claytonia virginica	Virginia spring beauty			C[4]		X									
Crataegus submollis	Emerson's thorn			C[4]		X									
Euonymus obovata	running strawberry bush			C[4]		X									
Hamamelis virginiana	witch-hazel			C[4]		X									
Juglans cinerea	butternut			C[4]		X									
Juglans nigra	black walnut			R[3]					X		X		X		
Juncus dudleyi	Dudley's rush			U[2]			X							X	
Juniperus virginiana	red cedar			U[1,3], R[2]					X						
Lilium michiganense	Michigan lily			C[4]		X									
Menispermum canadense	moonseed			C[4]		X									
Monarda fistulosa	wild bergamot			U[3]					X						
Panicum virgatum	switch grass			C[4]		X									
Potamogeton foliosus	leafy pondweed			C[4]		X									
Prunus nigra	Canada plum			C[4]		X									
Quercus alba	white oak			R[3], C[4]						X	X				
Rhus radicans ssp. ***negundo***	poison-ivy (incl. vine form)			R[2,3], C[4]			X	X	X	X	X	X	X		
Ribes triste	swamp red currant			U[3], R[2]								X			
Salix exigua	sandbar willow			U[3]									X		
Salix petiolaris	slender willow			C[4]		X									
Sassafras albidum	sassafras			R[1,2]				X							
Solidago arguta var. ***arguta***	sharp-leaved goldenrod			C[4]		X									
Sorghastrum nutans	Indian grass			C[4]		X									
Trillium erectum	purple trillium			C[4]		X									
Trillium grandiflorum	white trillium			C[4]		X									
Viburnum acerifolium	maple-leaved viburnum			C[4]		X									

COSEWIC – Committee on the Status of Endangered Wildlife in Canada:
END – Endangered THR – Threatened SC – Special Concern
Local Status:
U – Uncommon R – Rare C – Species of Concern
TRCA Data:
Data provided by TRCA

1 – Greater Toronto Area, 2 – City of Toronto, 3 – Region of York, 4 – Toronto and Region Conservation

OMNR – Ontario Ministry of Natural Resources:
END – Endangered THR – Threatened VUL – Vulnerable
Legal Status:
SARA – Species at Risk Act ESA – Endangered Species Act

Table 4-7: Wildlife Habitat Assessment Summary

Feature	Type of Habitat	Habitat Function				Comments
		Seasonal Concentration of Animals[1]	Rare Vegetation Communities[2] or Specialized Habitats for Wildlife[3]	Species of Conservation Concern[4]	Animal Movement Corridors[5]	
Disused fields, hydro rights-of-way, Federal Downsview lands, Dufferin Creek ravine	Dry-Moist Old Field Meadow Type (CUM1-1)	None recorded	None recorded	Locally significant species	None recorded	Few, common species of meadow, grassland, scrub and urban wildlife requiring small to moderately-sized habitat patches
Disused fields, hydro rights-of-way	Reed-canary Grass Mineral Meadow Marsh Type (MAM2-2), Cattail Mineral Shallow Marsh Type (MAS2-1)	None recorded	None recorded	Locally significant species	Local upland corridor along hydro rights-of-way	Few, common species of wet-meadow and marsh wildlife requiring small to moderately-sized habitat patches
Dufferin Creek ravine, York University woodlots, Black Creek valley	Dry-Fresh Deciduous Forest Ecosite (FOD4), Fresh-Moist Sugar Maple-Hardwood Deciduous Forest Type (FOD6-5), Fresh-Moist Lowland Deciduous Forest Type (FOD7), Fresh-Moist Willow Lowland Deciduous Forest Type (FOD7-3)	None recorded	Mature/old growth deciduous and coniferous trees present	Locally significant species	Local valleyland corridors along Dufferin Creek connecting to G. Ross Lord Reservoir, and along Black Creek valley and tributaries	Very few common species of forest-edge and urban wildlife requiring small habitat patches Road embankment and perched culvert at Dufferin Street creates barrier for wildlife within corridor; corridor terminates at storm sewer outfall Only habitat type with wood frog
Abandoned farmstead and shelterbelt	CUM1-1, Mineral Cultural Thicket Ecosite (CUT1), Mineral Cultural Woodland Ecosite (CUW1)	None recorded	None recorded	Locally significant species	Local upland corridor along hydro rights-of-way	Few, common species of scrub, woodland edge and meadow wildlife requiring small to moderately-sized habitat patches
Vacant land	Agricultural (AGR), CUM1-1	None recorded	None recorded	Locally significant species	None recorded	Few, common species of grassland and wet-meadow wildlife requiring small habitat patches One of two habitat types with frogs

1 Seasonal concentration of animals includes: winter deer yards; moose late winter habitat; colonial bird nesting sites; waterfowl stopover and staging areas; waterfowl nesting areas; shorebird migratory stopover areas; landbird migratory stopover areas; raptor winter feeding and roosting areas; wild turkey winter range; turkey vulture summer roosting areas; reptile hibernacula; bat hibernacula; bullfrog concentration areas; and, migratory butterfly stopover areas.
2 Rare vegetation communities include: alvars; tall-grass prairies; savannahs; rare forest types; talus slopes; rock barrens; sand barrens; and, Great Lakes dunes.
3 Specialized habitats for wildlife include: habitat for area-sensitive species; forests providing a high diversity of habitats; old-growth or mature forest stands; foraging areas with abundant mast; amphibian woodland breeding ponds; turtle nesting habitat; specialized raptor nesting habitat; special moose habitat (calving areas, aquatic feeding areas and mineral licks); and, mink otter, marten or fisher denning sites; cliffs and caves; and, seeps and springs.
4 Species of conservation concern include: globally rare; nationally rare; provincially rare; regionally rare; locally rare; and, species of concern to the planning authority.
5 Animal movement corridors include: dwelling habitat for plants and animals; and, conduits for daily and seasonal movements of animals, dispersal of organisms and genes and long-distance range shifts of species.

Wildlife

No terrestrial wildlife species recorded within the Study Area has federal or provincial conservation status. Twelve breeding bird species recorded in the Study Area have been identified by Bird Studies Canada (BSC) as species of conservation priority for the City of Toronto and York Region (see Table 4-8). However, all of these BSC annotated species are distributed widely, and are encountered commonly, in a range of habitats in the GTA and throughout their Ontario range. In addition, two mammal species, 23 bird species and one amphibian species (see Table 4-7) have been identified by TRCA as "species of concern" within the City of Toronto.

Numerous wildlife species located in the Study Area are regulated under the ***Fish and Wildlife Conservation Act*** and the ***Migratory Birds Convention Act***. No terrestrial wildlife listed under the ***Species at Risk Act*** or the ***Endangered Species Act*** was recorded in the Study Area. Crayfish were recorded in the Study Area and are defined as "fish" under the ***Fisheries Act*** and hence are regulated.

Table 4-8: Wildlife Species of Conservation Concern

Group	Scientific Name	Common Name	COSEWIC	MNR	Local Status	Legal Status	TRCA Data
Mammals	***Sylvilagus floridanus***	eastern cottontail			L4	FWCA (G)	
	Mustela vison	mink			L3	FWCA (F)	X
Birds	Setophaga ruticilla	American Redstart			L3, BSC	MBCA	
	Scolopax minor	American Woodcock			L3, BSC	MBCA	
	Hirundo rustica	Barn Swallow			BSC	MBCA	
	Ceryle alcyon	Belted Kingfisher			L4	FWCA (P)	
	Poecile atricapillus	Black-capped Chickadee			BSC	MBCA	
	Toxostoma rufum	Brown Thrasher			L3, BSC	MBCA	X
	Geothlypis trichas	Common Yellowthroat			L4	MBCA	
	Tyrannus tyrannus	Eastern Kingbird			BSC	MBCA	
	Sturnella magna	Eastern Meadowlark			L4, BSC	MBCA	
	Sayornis phoebe	Eastern Phoebe			L4	MBCA	X
	Contopus virens	Eastern Wood-Pewee			L4	MBCA	
	Dumetella carolinensis	Gray Catbird			L4, BSC	MBCA	
	Myiarchus crinitus	Great Crested Flycatcher			L4	MBCA	X
	Picoides villosus	Hairy Woodpecker			L4	MBCA	X
	Oporornis philadelphia	Mourning Warbler			L4, BSC	MBCA	
	Colaptes auratus	Northern Flicker			L4	MBCA	
	Mimus polyglottos	Northern Mockingbird			L4, BSC	MBCA	
	Sitta canadensis	Red-breasted Nuthatch			L4	MBCA	X
	Vireo olivaceus	Red-eyed Vireo			L4	MBCA	
	Passerculus sandwichensis	Savannah Sparrow			L4	MBCA	
	Actitis macularius	Spotted Sandpiper			L4, BSC	MBCA	
	Melospiza georgiana	Swamp Sparrow			L4, BSC	MBCA	
	Empidonax traillii	Willow Flycatcher			L4	MBCA	
	Gallinago delicata	Wilson's Snipe			L3	MBCA	
	Hylocichla mustelina	Wood Thrush			L3	MBCA	X
Amphibians	***Rana sylvatica***	wood frog			L2	FWCA (P)	

4.6.5. Designated Natural Areas

There are no Environmentally Significant/Sensitive Areas (ESAs) located within the Study Area. One environmentally significant area, Earl Bales Woods, is located approximately 3.0 km southeast of the Study Area near the intersection of Sheppard Avenue and Bathurst Street. Three other ESAs - Glendon Forest, Burke Brook Forest and Wilket Creek Forest - are located along the main branch of the West Don River downstream of the Study Area.

There are no provincially or non-provincially significant wetlands located within the Study Area.

There are no Areas of Natural and Scientific Interest (ANSI's) located within the Study Area. One locally significant life science ANSI, Earl Bales Woods, is located approximately 3.0 km southeast of the Study Area near the intersection of Sheppard Avenue and Bathurst Street.

The City of Toronto Natural Heritage System includes the following natural heritage areas within the Study Area:

1) William Baker Park in the northeast corner of Keele Street and Sheppard Avenue;
2) Downsview Airport lands along the south side of Sheppard Avenue;
3) Dufferin Creek valleylands south of Finch Avenue;
4) Black Creek and its valleylands;
5) West Don River and its valleylands;
6) Portions of the hydro corridor located between Finch Avenue and Steeles Avenue; and,
7) Several small isolated woodlots.

The policy for these “Natural Areas” is to maintain them primarily in a natural state, while allowing for compatible uses and conservation projects.

The York Region Greenlands System does not include any natural heritage areas within the Study Area.

The City of Vaughan OP (as amended by OPA 600) identifies Black Creek and its tributaries within the Study Area as “major open space and valley lands” and highly sensitive “hydrogeologically sensitive areas.” Several small isolated woodlots are also identified. The environmental policies identified in the OP are designed to retain and protect these natural areas.

The TRCA has identified target areas in support of a terrestrial natural heritage system. The target areas include existing forest, existing wetland and potential natural cover. Target areas identified by TRCA within the Study Area include:

1) A vacant field located on the west side of Dufferin Street mid-way between Sheppard Avenue and Finch Avenue;
2) The Dufferin Creek valley located west and east of Dufferin Street;
3) The hydro corridor right-of-way located north of Finch Avenue;
4) The York University Pond and surrounding cultural thickets, cultural meadows and marshes; and
5) The two woodlots and cultural meadows located west of Keele Street on the York University Campus.

The goals for these target areas is to maintain the natural heritage present and restore areas of potential natural cover to the extent feasible during development in support of a terrestrial natural heritage system.

4.7. Air Quality

Air pollutants associated with road traffic are carbon monoxide (CO), nitrogen oxides (NO and NO_2), and particulate matter (PM) denoted by size fractions as PM_{10} and $PM_{2.5}$ or as Suspended Particulate.

The existing ambient air quality conditions for the Study Area are based on the most recent measurements from monitoring stations near or representative of the Study Area. The closest monitoring station to the Study Area is the Toronto North Station located on Hendon Avenue, near Yonge Street and Finch Avenue. According to the most recent publicly available report entitled Air Quality in Ontario 2002[5], the pollutants relevant to this EA that are monitored at this location are NO_2 and $PM_{2.5}$. Data for CO concentrations are based on the 2002 measurements at the Toronto Downtown Station.

The relevant criteria to evaluate NO_2 and CO concentrations are the Ontario Ambient Air Quality Criteria (AAQC). Currently, no standard or criterion is available for $PM_{2.5}$ or NO. The federal government is in the process of implementing a Canada-Wide Standard (CWS) for $PM_{2.5}$. Table 4-9 presents the applicable AAQC and CWS, along with the 2002 measurements at the Toronto North or Toronto Downtown stations.

Table 4-9: Ambient Air Quality Summary (2002)

Pollutants (Unit)	Average Time	Criteria [1]	99^{th} Percentile [4]	Maximum Concentrations	Number of Times Above Criteria
$PM_{2.5}$ ($\mu g/m^3$) [2]	24-hour	30	43	46	10
NO_2 (ppb) [2]	1-hour	200	52	81	0
	24-hour	100		47	0
CO (ppm) [3]	1-hour	30	1.46	2.88	0
	8-hour	13		2.14	0

Notes:
[1] The criterion for $PM_{2.5}$ is the federal standard published in Canada-wide standards for Particulate Matter (PM) and Ozone adopted by the Canadian Council of Ministers (July, 2000)
[2] The pollutant measured at the Toronto North Station.
[3] The pollutant measured at the Toronto Downtown Station.
[4] If the 99^{th} percentile value is 1.46 ppm, then 99 percent of the data are equal to or below 1.46 ppm.

As shown in Table 4-9, both the 1-hour and 24-hour 2002 levels for NO_2, as well as the 1-hour and 8-hour levels for CO, are well below the applicable criteria.

The measured $PM_{2.5}$ concentrations in 2002 are above the federal proposed standard. Because exceedances of the standard particulate matter are common in urban areas, the Study Area is not identified as having particular concerns because of these exceedances.

It is concluded that the background measurements in the Study Area are well below the AAQC for CO and NO_2, while the 2002 $PM_{2.5}$ levels are above the federal proposed standard.

[5] MOE, 2002

As air quality in Ontario is expected to improve over the next decade due to several control measures under implementation. The background measurements for the Study Area at the 2002 levels are likely to be conservative.

4.8. Existing Socio-Economic and Cultural Environment

This section describes the existing land use/socio-economic environment and planned land use within the Study Area as well as archaeology, cultural heritage, noise and vibration, potentially contaminated sites, and utilities/pipelines.

4.8.1. Community/Recreational/Institutional Facilities

There are a number of community/recreational/institutional facilities located within the Study Area including community centres/arenas and pools, libraries, emergency service facilities (i.e. fire, police and ambulance stations, and a hospital), child care centres, schools (including York University-Figure 4-24), places of worship, parks and utility corridors. Figure 4-27 and Table 4-10 present the community/recreational/institutional facilities and cultural heritage features located within the Study Area.

4.8.2. Observed Existing Conditions

According to data provided by the City of Toronto, existing land use categories within the Study Area include: 'Residential (Singles, Townhouses, and Apartments)', 'Commercial (Retail/Services, Office, and Mixed)', 'Industrial', 'Institutional', 'Utilities and Transportation', 'Commercial Recreation', 'Open Space', 'Agricultural', 'Vacant', 'Other', and 'Utility Corridor'. Figure 4-25 identifies the existing land use within the Study Area.

The Study Area lands within the City of Toronto are generally established uses. The residential neighbourhoods are stable, with both established low density and apartments style housing options. Within the neighbourhoods, there are schools and open spaces to service the local residents. The industrial lands have a mix of service and manufacturing. These lands are considered stable employment areas. York University is an established institution and continues to develop its lands for academics, recreation and housing. Parc Downsview Park is in transition from a military base to a large urban park. This change affects neighbouring lands and will possibility stimulate redevelopment in proximity to Parc Downsview Park, such as the Keele/Sheppard and Sheppard/ Allen intersections.

An east/west rail line (CN York Subdivision), Highway 407 and Highway 7 bisect the portion of the Study Area in the City of Vaughan. This well-connected area is fast developing into a business park typology.

The section below provides a brief description of existing land uses in the Study Area. For the purposes of this discussion, the Study Area has been divided into eight general existing land use observation areas as shown in Figure 4-26.

Parc Downsview Park

Sheppard Avenue West borders Parc Downsview Park to the south and along the north side of Sheppard Ave hosts various commercial and industrial uses. Parc Downsview Park (PDP) has both large buildings and clusters of small buildings related to the airport activity and leased to other uses. Northwest of Sheppard Avenue, there is a large vacant parcel north of the Canadian Forces Base housing that backs onto Keele Street, which is part of the Parc Downsview Park Plan. There is a large stock of vacant land whose development will be directed by the Downsview Area Secondary Plan and Parc Downsview Park own Park Plan.

East of William R. Allen Road

The area east of William R. Allen Road is dominated by residential uses. Much of the housing stock is circa 1950's in established neighbourhoods. Along Wilson Heights Boulevard, the effects of the new Wilson and Downsview Stations can be seen in the recent redevelopment. A small area bordered by Wilson Heights Boulevard, Sheppard Avenue and the Downsview Station is an existing single-family neighbourhood with homes that have been recently redeveloped. Sheppard Avenue near the station is seeing dramatic revitalization with numerous new mid-rise (5-9 storeys) residential developments with commercial uses on the ground floor.

Industrial Park South of Finch Avenue

In general, the industrial park area south of Finch Avenue is industrial with supporting commercial uses. Along Sheppard Avenue, there are mostly small service/commercial shops in strip-mall style buildings. There are large retail developments located along William R. Allen Road, with a new development consisting of restaurants and retail outlets. The interior land is dominated by industrial type structures. There are a number of large single business operations mostly south of Steeprock Drive. Steeprock Drive also hosts the GO Transit Steeprock Garage. Along Chesswood Drive, there are multi-user industrial parks meeting the needs of smaller industries for leasable space. Dufferin Transfer Station (City of Toronto) is located on Vanley Crescent.

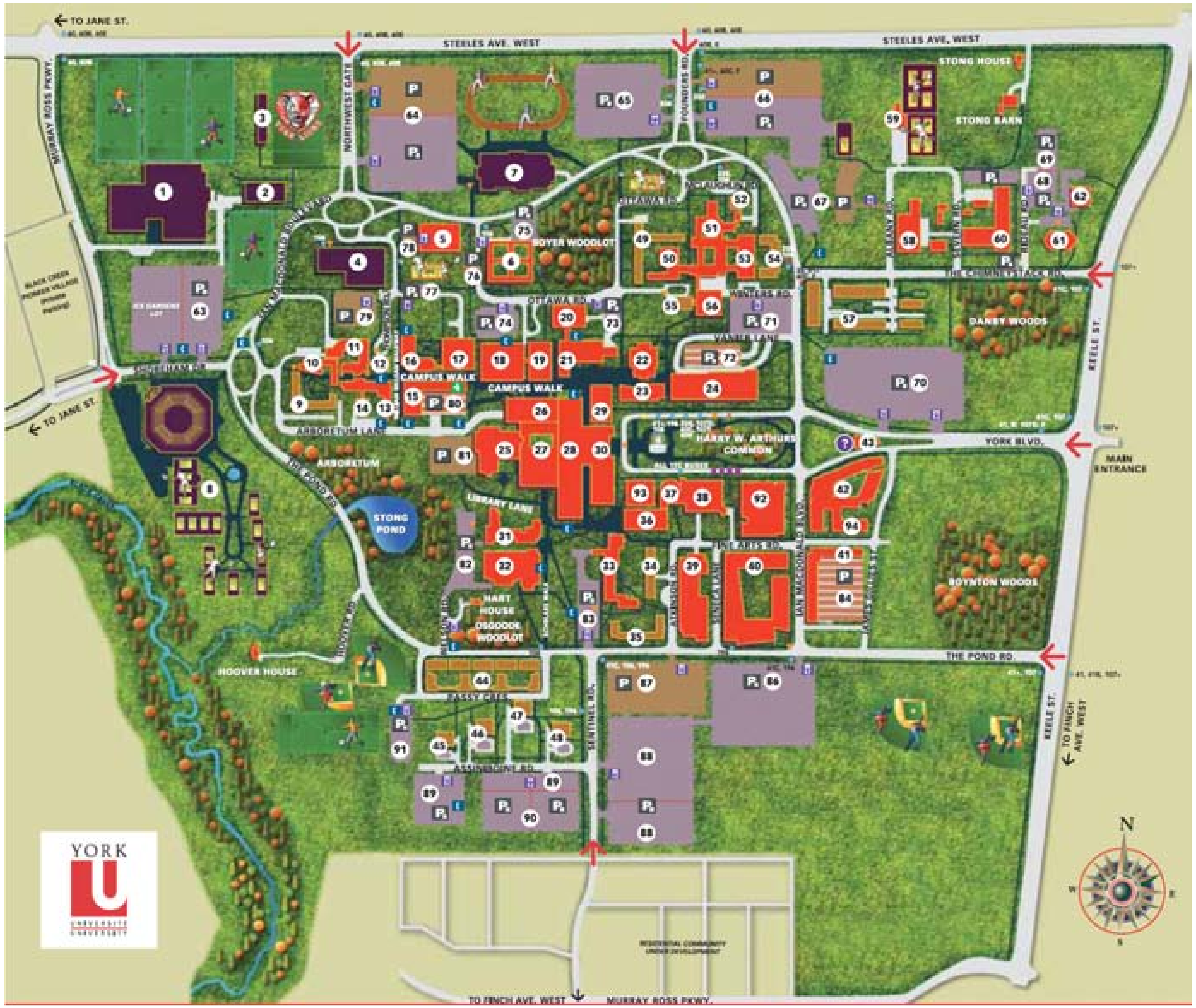
On the west side of the CN/Bradford GO Line, south of Finch Avenue, land parcels and buildings are much smaller (than the east side) and the street has a more defined grid pattern. The area has an established feel that may be a result of a stable network of business ownership and building occupation (see section 4.2.6.9 for details).

As with most areas, at intersections with arterial roads, the corners lend themselves to commercial services such as food and gas. On the east side of Keele Street, strip-mall developments face the backs of single-family residential homes or large apartment blocks across the road. The intersection of Sheppard Avenue and Keele Street hosts a commercial node including retail and service uses.

North of Finch Avenue and South of Steeles Avenue West

From Steeles Avenue to Finch Avenue, Keele Street consists of mostly large lots. On the west side of Keele Street is the York University Campus, which has extensive green space and vacant lands. Across from the University is the Keele Street Pumping Station and Reservoir, some retail strip-malls and a large distribution centre bordered by The Pond Road. East of Keele Street and north of Finch Avenue are tank farms bisected by the Finch Hydro Corridor. New "big box" retail activities are currently developing at Steeles Avenue and Dufferin Street and are continuing west towards the intersection of Steeles Avenue and Alness Street.

Finch Avenue west of Dufferin Street and east of Keele Street is generally larger retail, with some strip-malls serving the arterial road traffic. There is one very large industrial building bordered by Champagne Drive and a number of multi-storey (6-11) office buildings with ground floor commercial uses. On the north side, the tank farms stretch from east of the railroad to Tangiers Road (east of Keele Street). On the south side, east of the CN/Bradford GO Line, there is a large vacant lot, which appears to be a staging/storage area for transport trailers. Where Finch Avenue intersects with Keele Street and Bathurst Street, there is retail activity pertaining to food, gas and services. The intersection of Finch Avenue and Keele Street is predominately retail. The parcel of retail lands on the west side of the intersection is smaller than that of the others and transitions into residential uses. The intersection of Steeles and Dufferin has existing offices and some new service commercial uses.



Keele Campus Map

Academic, Administrative & Commercial Buildings

- 59 190 Albany Road (former National Tennis Centre)
- 92 Accolade Project East
- 93 Accolade Project West
- 28 Art Gallery of York University, Ross
- 33 Atkinson
- 29 Behavioural Science
- 24 Bookstore, York Lanes
- 37 Burton Auditorium
- 10 Calumet College
- 27 Central Square
- 58 Central Utilities
- 38 Centre for Film & Theatre
- 16 Chemistry
- 62 Computer Methods (non-York facility)
- 19 Computer Science and Engineering
- 26 Curtis Lecture Halls
- 6 East Office Building
- 94 Executive Learning Centre
- 21 Farquharson Life Sciences
- 50 Founders College
- 31 Health, Nursing & Environmental Studies
- 43 Honour Court & Information Centre
- 36 Joan & Martin Goldfarb Centre for Fine Arts
- 61 Kinsmen
- 20 Lumbers
- 51 McLaughlin College
- 11 Norman Bethune College
- 17 Observatory, Petrie
- 32 Osgoode Hall Law School
- 17 Petrie Science and Engineering
- 60 Physical Resources
- 28 Ross
- 25 Scott Library
- 27 Scott Religious Centre, Central Square
- 42 Seymour Schulich Building
- 40 Seneca @ York, Stephen E. Quinlan Building (non-York facility)
- 15 William Small Centre
- 18 Steacie Science and Engineering Library
- 22 Stedman Lecture Halls
- 13 Stong College
- 23 Student Centre
- 41 Student Services Centre
- 4 Tait McKenzie Centre
- 39 Technology Enhanced Learning
- 56 Vanier College
- 30 Vari Hall
- 5 West Office Building
- 53 Winters College
- 24 York Lanes Retail Centre

Student Residences & Apartments

- 48 2 Assiniboine Road
- 47 4 Assiniboine Road
- 46 6 Assiniboine Road
- 45 8 Assiniboine Road
- 34 Atkinson Residence
- 9 Calumet Residence
- 49 Founders Residence
- 57 Harry Sherman Crowe Co-op (non-York facility)
- 12 Norman Bethune Residence
- 44 Passy Gardens, 2-18 Passy Cres.
- 35 The Pond Road Residence
- 14 Stong Residence
- 52 Tatham Hall
- 55 Vanier Residence
- 54 Winters Residence

Sport & Recreation Facilities

- 2 Ice Arena (shared use)
- 1 Ice Gardens (shared use)
- 4 Tait McKenzie Centre
- 8 Tennis Canada - Rexall Centre
- 7 Toronto Track & Field Centre (shared use)
- 3 York Stadium

Parking Garages

- 80 Arboretum Parking Garage
- 84 Student Services Parking Garage
- 72 York Lanes Parking Garage

Reserved Parking Lots

- 89 Assiniboine Road Lots
- 83 Atkinson Lot
- 75 EOB Lot
- 66 Founders Road East Lot
- 65 Founders Road West Lot
- 73 Lumbers Lot
- 82 Nelson Road Lot
- 64 Northwest Gate Lot
- 91 Passy Crescent Lot
- 68 Physical Resources Lot
- 69 Rideau Road Lot
- 88 Sentinel Road East Lot
- 63 Shoreham Drive Lot
- 74 Steacie Lot
- 77 Tait McKenzie Lot
- 86 The Pond Road East Lot
- 71 Vanier Temporary Lot
- 70 York Boulevard Lot

Visitor Parking Lots

- 66 Founders Road East Lot
- 81 Library Lot
- 64 Northwest Gate Lot
- 90 Sentinel Road West Lot
- 87 The Pond Road West Lot
- 79 Thompson Road Lot
- 76 WOB East Lot
- 78 WOB West Lot

Visitor & Reserved Parking Lots

- 67 Albany Road Lot

Legend

- Parking
- Reserved Parking
- Emergency Telephones
- Security, 24 hours (T: 416.736.5333)
- Help Intercom
- 43 Honour Court & Information Centre
- Pedestrian Walkways
- TTC Bus Stops: 35 Jane, 35E Jane Express, 41, 41B, 41C, 60C, 60F Steeles W., 106 York University, 196 York U. Express, 107 Keele North
- Glendon-Keele Campus Shuttle & GO Train Shuttle
- Wheel-Trans Stops
- GO Transit Stops (East, West, North)
- York Region Transit Stops: 10 (Woodbridge), 3 (Thornhill)
- Vehicular Roadways
- Information

FIGURE 4-24: YORK UNIVERSITY KEELE CAMPUS MAP

SOURCE: YORK UNIVERSITY

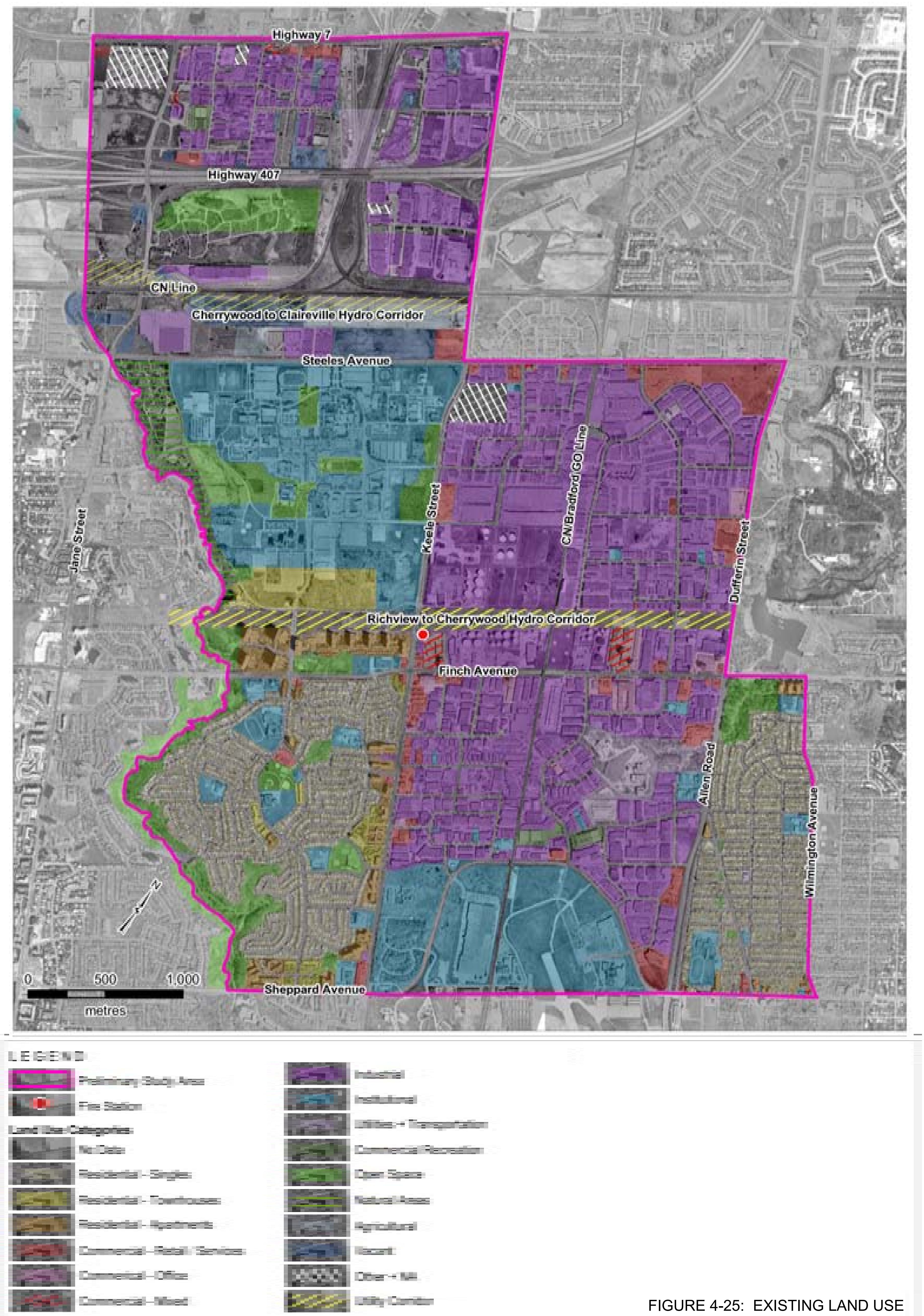


FIGURE 4-25: EXISTING LAND USE

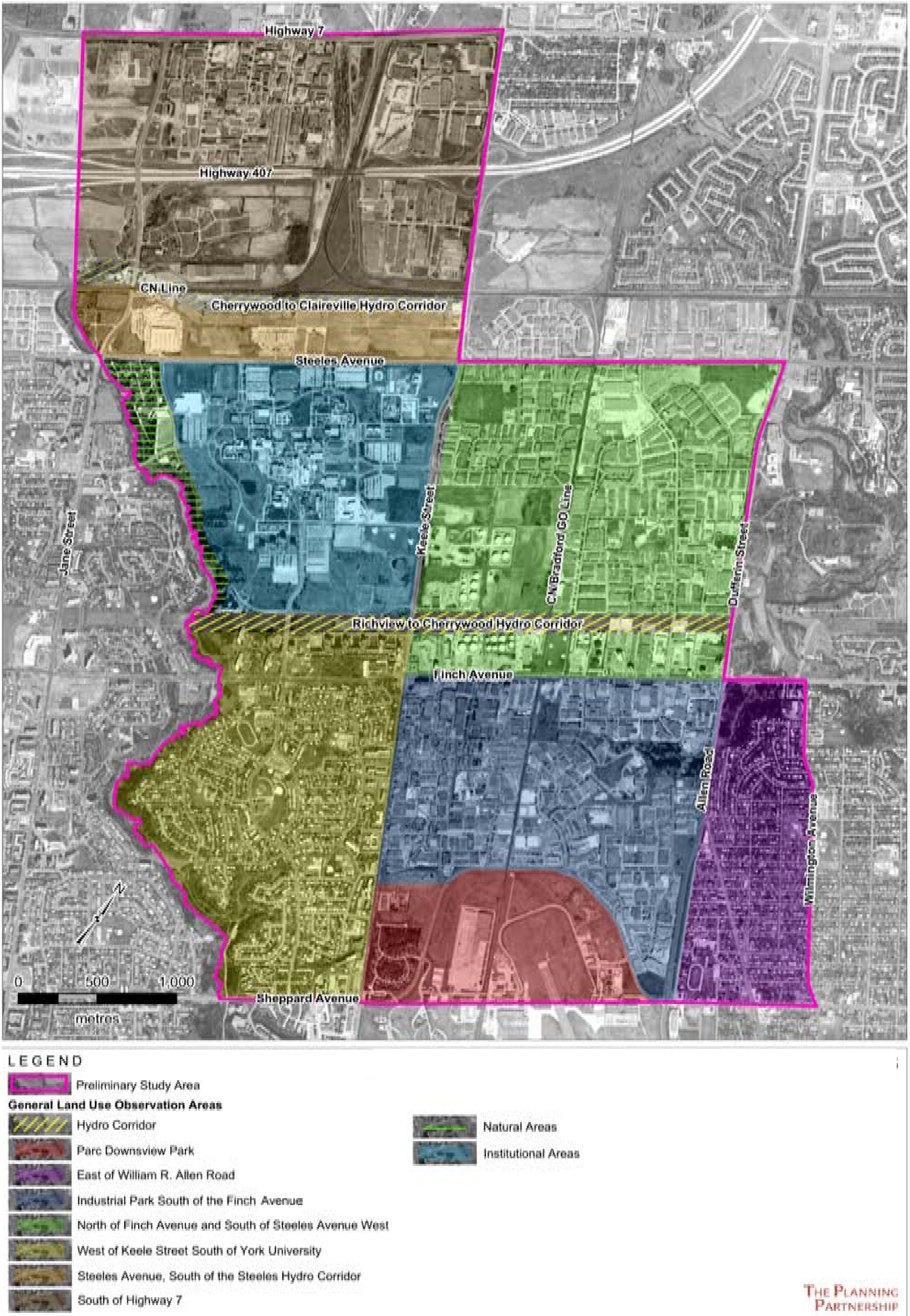
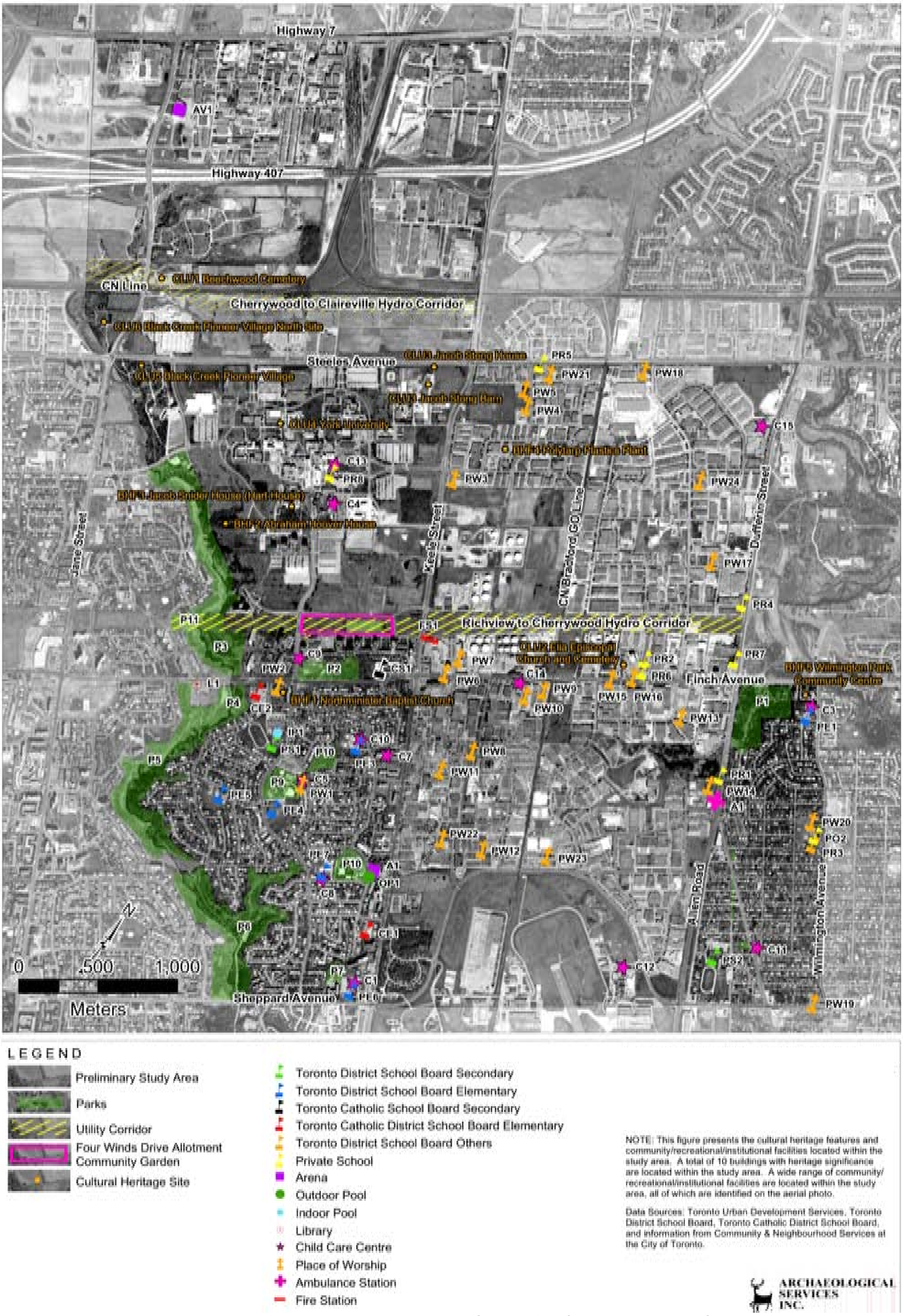


FIGURE 4-26: EXISTING LAND USE OBSERVATION AREAS



NOTE: This figure presents the cultural heritage features and community/recreational/institutional facilities located within the study area. A total of 10 buildings with heritage significance are located within the study area. A wide range of community/recreational/institutional facilities are located within the study area, all of which are identified on the aerial photo.

Data Sources: Toronto Urban Development Services, Toronto District School Board, Toronto Catholic District School Board, and information from Community & Neighbourhood Services at the City of Toronto.

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FIGURE 4-27: CULTURAL HERITAGE AND COMMUNITY/RECREATIONAL/INSTITUTIONAL FACILITIES

Table 4-10: Community/Recreational/Institutional Facilities Located Within The Study Area

Type of Facility	Facility Name	Facility Number (See Figure 4-27)
Child Care Centres	Cast for Kids (Child Care)	C1
	Wilmington Best Satellite (Child Care)	C2
	Wilmington Best (Child Care)	C3
	York University Co-op (Child Care)	C4
	Faith Lutheran Rainbow's End (Child Care)	C5
	Sunburst (Child Care)	C6
	Young Artists (Child Care)	C7
	Stilecroft (Child Care)	C8
	University City YMCA (Child Care)	C9
	Derrydown (Child Care)	C10
	Children are People Child Care	C11
	Children's Playground (Child Care)	C12
	The Lee Wiggins Child Care	C13
	Finch Business Park Child Care	C14
	Kinder Connection (Child Care)	C15
Places of Worship	Faith Lutheran Church	PW1
	St. Wilfrid Roman Catholic Church	PW2
	House of Praise Tabernacle	PW3
	Indonesian Christian Church	PW4
	Korean Full Gospel Central Church	PW5
	Friendship Community Church	PW6
	Toronto Shiva Satsangh	PW7
	Ebenezer Holiness Church	PW8
	Living Faith Ministry	PW9
	Light House Church	PW10
	Imdadul Islamic Centre	PW11
	Mount Zion Filipino	PW12
	Kingdom Hall of Jehovah Witness	PW13
	Revival Time Tabernacle	PW14
	Toronto Church of Christ	PW15
	Free Christian Reformed Church	PW16
	Deeper Life Crusades	PW17
	Benjamin Park Memorial Chapel	PW18
	Adath Sholom Synagogue	PW19
	Neth Jacob Synagogue	PW20
	Bethel Prayer	PW21
	Redemption City of Faith	PW22
	Nazarene Spiritual Baptist Church	PW23
	Apostolic Prayer Ministry	PW24
Emergency Services	Ambulance Station #1	AS1
	Fire Station #141	FS1
	Fire Station #143	FS2
	North York General Hospital (Branson Division)	H1
	Police Station (31 Division)	PoS1

Type of Facility	Facility Name	Facility Number (See Figure 4-27)
Parks	Garthdale Park	P1
	Fountainhead Park	P2
	Black Creek Parkland	P3
	Derrydowns Park	P4
	Topcliff Park	P5
	Northwood Park	P6
	Brookwell Park	P7
	Grandravine Park	P8
	Sentinel Park	P9
	Bratty Park	P10
	Driftwood Park	P11
Separate Schools	St. Jerome Catholic School (Elementary)	CE1
	St. Wilfrid Catholic School (Elementary)	CE2
	James Cardinal McGuigan Catholic Secondary School	CS1
Public Schools	Charles H. Best Elementary School (West)	PE1
	Charles H. Best Middle School (West)	PE2
	Derrydown Public School	PE3
	Elia Middle School	PE4
	Lamberton Public School	PE5
	Sheppard Public School	PE6
	Stilecroft Public School	PE7
	Dellcrest Public School	PO1
	Wilmington Public School	PO2
	C.W. Jefferys Collegiate Institute	PS1
	William Lyon Mackenzie Collegiate Institute	PS2
Private Schools	Adelfihas Christian Academy	PR1
	Alpha High School	PR2
	Community Hebrew Academy	PR3
	Merle L. Levine Academy Inc.	PR4
	Pushkin Private School	PR5
	Toronto Farsi School	PR6
	Toronto Institute of Technology	PR7
	Walden Learning Centre Academy	PR8
Post Secondary	York University	See Figure 4.24
	Seneca College	See Figure 4.24
Community/Recreation Centres	Grandravine Community and Recreation Centre	A1
	Irving W. Chapley Park Community Centre	CR1
	C. W. Jefferys Indoor Pool	IP1
	York Woods Public Library	L1
	Grandravine Outdoor Pool	OP1
	Irving W. Chapley Outdoor Pool	OP2
	Doublerink Arenas/Vaughan Iceplex	AV1

West of Keele Street and South of York University

On the west side of Keele Street, there are many large multi-storey (6-8) apartment blocks screening the arterial road from the single-family neighbourhood to the west (Northwood Park). Northwood Park is an established neighbourhood. A mall at the tip of Sentinel and Hucknall Road is mostly vacant. There is only one operating convenience store and the site is currently the subject of a redevelopment application. This area also hosts at least four schools with associated sports fields.

North of Finch Avenue, there is a school, parkland and large tower block development with four 22-storey apartment blocks on Fountainhead Road and other similar building styles nearby. Behind the school and parklands, there is a low-rise residential complex (4-8 stories). New townhouses are being built around the commercial and recreational centre. Currently, York University and Tribute Developments are planning to expand from current existing plans of "The Village at York University"(Phase Two).

York University

York University's Keele Street campus is one of the largest post-secondary campuses in Canada and offers full and part-time graduate and undergraduate degree programs to 65,000 students. The academic campus is concentrated centrally within the 230-hectare block bound by Murray Ross Parkway to the west and south, Steeles Avenue to the north and Keele Street to the east. The lands south of the University on the east and west side of Sentinel Road are currently being developed as new mixed housing (Tribute Communities is building "The Village at York University").

Steeles Avenue, South of the Steeles Hydro Corridor

The Steeles East Industrial Area is located on the north side of Steeles Avenue north of York University and south of the east-west CN/Bradford GO Line. These lands are generally vacant with a few large industrial style buildings. In particular, United Parcel Services Inc. (UPS) currently operates a package sorting and distribution centre at the northeast quadrant of the Jane Street / Steeles Avenue intersection. In December 2005, UPS filed an application with the City of Vaughan to expand their current operations. This expansion would utilize lands immediately east of their current facility. These lands are beginning to be developed, including buildings such as the new office multi-storey structure located on the northwest corner of Keele Street and Steeles Avenue. There is a very wide Steeles Hydro Corridor (Claireville-Cherrywood) to the north of this area. In addition, Beechwood Cemetery fronts onto Jane Street and is located right next to the hydro corridor.

North of Highway 407

The area north of Highway 407 is characterized by a business park design with large industrial lands that have supportive commercial uses. This area is bordered by Highway 407 and Highway 7 and is bisected by the east/west CN/Bradford GO Line that connects to the CN Freight Classification Yard.

4.8.3. Archaeology

Three sources of information were consulted during the inventory of archaeological resources: the site record forms for registered sites housed at the Ontario Ministry of Culture; published and unpublished documentary sources; and, the files of Archaeological Services Inc.

In Ontario, information concerning archaeological sites is stored in the Ontario Archaeological Sites Database (OASD) maintained by the Ontario Ministry of Culture. This database contains archaeological sites registered within the Borden system. Under the Borden system, Canada has been divided into grid blocks based on latitude and longitude. A Borden block is approximately 13 km east to west, and approximately 18.5 km north to south. A four-letter designator references each Borden block, and sites within the block are numbered sequentially as they are found. The Study Area is located in Borden Blocks AkGu and AkGv. According to the OASD, there are 15 previously registered sites within the Study Area (Table 4-11) and a number of historic communities.

Table 4-11: Registered archaeological sites within 2 kilometres of the Study Area

Borden #	Site name	Site Affiliation	Site Type	Researcher
AkGu-10	Risebrough	Late Woodland	Iroquoian Village	A. Roberts, 1971; M. Kapches, 1972
AkGu-12	Dufferin	Woodland	Campsite	Father Meighan, 1950
AkGu-68	Jerrett	Historic Euro-Canadian	Homestead	ASI*, 2001
AkGv-8	E.A. Parson	Late Woodland	Village	J.V. Wright, 1966; J. Morrison, 1979; U of T**; ASI, 1988
AkGv-70	Boynton	Historic Euro-Canadian	Homestead	ASI, 1988
AkGv-71	Bramalae	Undetermined Pre-contact	Isolated Find	ASI, 1988
AkGv-104	Burkholder House	Historic Euro-Canadian	Homestead	Warrick 1990
AkGv-105	Unassigned	Undetermined Pre-contact	Isolated find	Warrick 1991
AkGv-106	Goose	Undetermined Pre-contact	Isolated find	Warrick 1991
AkGv-107	Bingo	Undetermined Pre-contact	Campsite	Warrick 1991
AkGv-108	Unassigned	Early Archaic	Isolated find	Warrick 1991
AkGv-109	Left Shoe	Undetermined Pre-contact	Isolated find	Warrick 1991
AkGv-110	Right Shoe	Undetermined Pre-contact	Campsite	Warrick 1991
AkGv-111	Boot	Undetermined Pre-contact	Isolated find	Warrick 1991
AkGv-193	Kaiser Site	Historic Euro-Canadian	Homestead	ASI, 2002

* ASI – Archaeological Services Inc. **U of T – University of Toronto

Potable water is arguably the single most important resource necessary for any extended human occupation or settlement. Since water sources have remained relatively stable in south central Ontario after the Pleistocene era, proximity to water can be regarded as a useful index for the evaluation of archaeological site potential. Distance from water has been one of the most commonly used variables for predictive modelling of site location. The Ministry of Culture Primer on Archaeological Land Use Planning and Development in Ontario stipulates that undisturbed lands located within 300 m of a primary water source or 200 m of a secondary water source are considered to be of high archaeological potential.

Therefore, depending on the degree of previous land disturbance, it can be concluded that there is potential for recovery of pre-contact archaeological remains within the Study Area in general and within 200 – 300 metres of primary and secondary water sources in particular.

The 1878 ***Illustrated Historical Atlas of the County of York, Ontario*** was reviewed to determine the potential for the presence of historical archaeological remains within the Study Area during the nineteenth century.

A number of historic communities fall within the Study Area boundary including Dublin, Fisherville, Kaiserville, and Elia. These small nineteenth century communities had their beginnings as service areas for the farms, which surrounded them. Naturally, there was a tendency for the neighbourhood churches and schools to concentrate in the same area.

For the Euro-Canadian period, the majority of early nineteenth century farmsteads (i.e. those which are arguably the most potentially significant resources and whose locations are rarely recorded on nineteenth century maps) are likely to be captured by the basic proximity to water model outlined above, since these occupations were subject to similar environmental constraints. An added factor, however, is the development of the network of concessions roads through the course of the nineteenth century. These transportation routes frequently influenced the siting of farmsteads. Accordingly, undisturbed lands within 100 m of an early settlement road are also considered to have potential for the presence of Euro-Canadian archaeological sites.

A review of the general physiography of the Study Area and local nineteenth century land use within the Study Area suggests that the Study Area exhibits archaeological site potential and the potential for the presence of historic cultural material, specifically undisturbed lands located within 300 m of a primary water source or 200 m of a secondary water source, and undisturbed lands within 100 m of an early settlement or settlement road.

4.8.4. Cultural Heritage

The existence of previously identified built heritage features and cultural landscapes within the Study Area was determined through the City of Toronto's Heritage Preservation Services Department and the City of Vaughan's Cultural Services Department. In addition, the Ministry of Culture's Ontario Heritage Properties Database was consulted.

For the purposes of this assessment, the term cultural heritage resources was used to describe both cultural landscapes and built heritage features. A cultural landscape is perceived as a collection of individual built heritage features and other related features that together form farm complexes, roadscapes and nucleated settlements. Built heritage features are typically individual buildings or structures that may be associated with a variety of human activities, such as historical settlement and patterns of architectural development. This assessment addresses above ground cultural heritage resources over 50 years old.

Eleven properties are located within the Study Area and have been indicated as having heritage significance based on their inclusion on municipal heritage inventories and/or their heritage designation under Part IV of the ***Ontario Heritage Act***. Table 4-12 and Figure 4-27 present a list of these eleven properties. They include six (6) cultural landscapes and five (5) built heritage features.

All of the properties are located within the City of Toronto with the exception of the Beechwood Cemetery on Jane Street and the Black Creek Pioneer Village's north site (Dalziel property on Jane Street north of Steeles), which are located in the City of Vaughan.

Significant amongst these properties are the Beechwood Cemetery in the City of Vaughan, the Elia Episcopal Church and Cemetery (designated under Part IV of the ***Ontario Heritage Act***), and both the north and south sites of Black Creek Pioneer Village (with five designated structures under the ***Ontario Heritage Act*** at 7060 and 7100 Jane Street). Although Black Creek Pioneer Village is a nineteenth-century replica of modern construction, it is comprised of a variety of early, and in some cases rare, examples of nineteenth-century architecture.

Further background historic research and a field review will determine the existence of any previously unidentified resources within the Study Area once alternative alignments have been identified.

Table 4-12: Cultural Landscapes and Built Heritage Features Located Within the Study Area

Site #	Site Address	Feature Type	Site Name
CLU 1	7241 Jane Street ***City of Vaughan***	Cultural Landscape	Beechwood Cemetery
CLU 2	1130 Finch Avenue West ***City of Toronto***	Cultural Landscape	Ella Episcopal Church and Cemetery (1901*)
CLU 3	4700 Keele Street York University ***City of Toronto***	Cultural Landscape	Jacob Stong House and Barn (1854)
CLU 4	4700 Keele Street ***City of Toronto***	Cultural Landscape	York University Winter's College (1967), Staecie Science Library (1966), Scott Library (1970), Ross Building (1970), Atkinson College (1966), Tait McKenzie Physical Education (1966), Petrie Sciences (1968), Founder's College (1965), Osgoode Hall Law School (1968), Mclaughlin College (1969), Farquarson Life Sciences Building (1970), Lecture Hall One (1966), Behaviourial Sciences Building (1968) and Vanier College (1969).
CLU 5	1000 Murray Ross Parkway ***City of Toronto***	Cultural Landscape	Black Creek Pioneer Village (A creation of early nineteenth-century crossroads village comprised of over forty heritage buildings, including five on their original sites).
CLU 6	7060 Jane Street 7100 Jane Street ***City of Vaughan***	Cultural Landscape	Black Creek Pioneer Village North Site (Comprising Five structures designated under Part IV of the ***Ontario Heritage Act***: James Dalziel House John Dalziel House Sawyer's House Robert Nesbitt Sawmill The Dalziel Barn Includes a pioneer cemetery, a mill race and the remains of other heritage buildings previously occupying this site).
BHF 1	1725 Finch Avenue West City of Toronto	Built Heritage Feature	Northminister Baptist Church (1968)
BHF 2	4700 Keele Street, York University City of Toronto	Built Heritage Feature	Abraham Hoover House (1848, with later additions)
BHF 3	4700 Keele Street, York University City of Toronto	Built Heritage Feature	Jacob Snider House (Hart House, 1830) Relocated
BHF 4	350 Wildcat Road City of Toronto	Built Heritage Feature	Polytarp Plastics Plant (1972)
BHF 5	330 Wilmington Avenue ***City of Toronto***	Built Heritage Feature	Wilmington Park Community Centre (1959)

* Designated under Part IV of the ***Ontario Heritage Act***

4.8.5. Noise and Vibration

For the proposed Spadina Subway Extension, the potential for some ground-borne vibration levels is a factor to consider for noise/vibration sensitive land uses located in close proximity to the subway alignment. The range of noise/vibration sensitive land uses encompasses residential dwellings/buildings, institutional facilities including heritage buildings (impact on the structures and/or the artefacts), hospitals, group homes, places of worship and certain commercial/industrial establishments.

The MOE and the general EA practices for noise/vibration rely on a series of absolute and relative noise/vibration criteria. The relative criteria recognize the importance of the “existing” background/ambient noise/vibration conditions for impact assessment purposes.

As far as the points of reception are concerned, the existing land uses in the Study Area show that approximately 65% of the Study Area is commercial/industrial while the remaining 35% of the area consists of well-established residential neighbourhoods. The Study Area also contains a number of schools and places of worship, heritage buildings, several institutional buildings within the York University Campus, and numerous apartment buildings.

The dominant sources of ambient noise in the Study Area are essentially ten highways, major arterial roads and major collectors with existing bus traffic on these roads. Of less significance (more localized nature) is the noise due to the commercial/industrial buildings/establishments themselves. The dominant sources of vibration in the area are the heavy vehicle movements on the arterial roads and collectors, rail traffic on the CN/GO Bradford Line and internally generated vibration levels in industrial buildings and high-rise offices.

4.8.6. Potentially Contaminated Sites

A preliminary screening was conducted on properties located within the Study Area using the information in the EcoLog Environmental Risk Information Services (ERIS) Report. The screening was aimed at identifying the properties that have a high potential to contribute to environmental contamination in the vicinity of the proposed subway alignment. Properties located within 200m of the proposed subway alignments were examined. A property was categorized as having a high potential to contribute to environmental contamination if that property has the following characteristics:

1) Over 15 fifteen years use and storage of new and used hydrocarbon products and non-chlorinated solvents;
2) Over 15 fifteen years of liquid industrial and hazardous waste generation (e.g. oils and lubricants, photo processing chemicals, non-chlorinated solvents);
3) Bulk fuel handlings and storage facilities, primary business;
4) PCB storage site, reported PCB spills; and
5) Storage and use of new and used chlorinated solvents (non-laboratory use).

Figure 4-28 and Table 4-13 present a list of properties/sites and corresponding addresses of properties/sites identified as having a high potential to contribute to the environmental contamination in the vicinity of the proposed subway alignment (according to the above highlighted classification). A total of 36 properties/sites located within and adjacent to the Study Area were classified as having the potential to contribute to environmental contamination.

There are other possible contaminated sites within close proximity of the Study Area that may be of influence in selecting potential alignments including the:

1) Closed landfill located on the east side of Dufferin Street across from Martin Ross Avenue;
2) Closed landfill site in Fountainhead Park, west of Keele Street and north of Finch Avenue;
3) Closed landfill site on Gwendolyn Crescent, south of Sheppard Avenue and east of Bathurst Street; and
4) Petroleum operations (tank farms) located in the industrial area north of Finch Avenue and east of Keele Street.

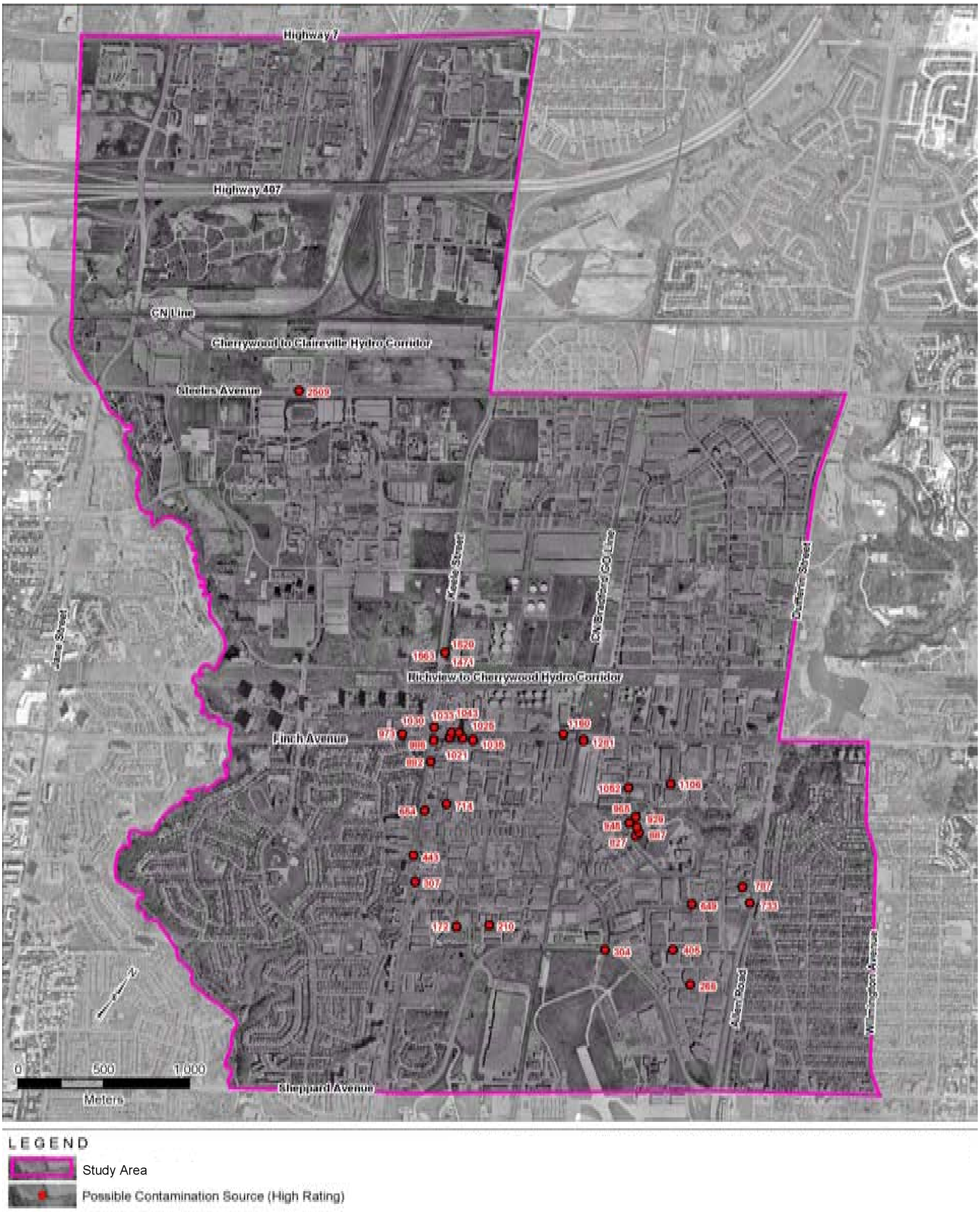


FIGURE 4-28: POSSIBLE CONTAMINATION SOURCES

Table 4-13: Properties/Sites having High Potential to contribute to Environmental Contamination

#	ID #	Property/Site Address	Contamination Characteristics
1	172	77 St Regis Crescent South	Bulk fuel storage, UST leak detected.
2	210	124 St. Regis Crescent South	> 15 years storage and use of new and used solvent, including chlorinated solvents.
3	266	39 Kodiak Crescent	>15 years storage and use of new and used solvent products, including chlorinated solvents.
4	304	Sheppard & Chesswood Drive	Storage and use of new and used solvent products, including chlorinated solvents.
5	307	3711 Keele Street	>15 years storage and use of new and used solvents, including chlorinated solvents.
6	405	33 Rimrock Road	<10 years storage and use of new and used resin washes; storage and transfer of large quantities of solvents, minor spill events to ground.
7	443	3720 Keele Street	Bulk petroleum product storage.
8	654	3811 Keele Street	Storage of new of new and used oils; bulk fuel storage; minor (< 100 L) spill events reported.
9	714	20 Toro Road	> 15 years storage and use of new and used solvent products, including chlorinated solvents.
10	882	3925 Keele Street	Bulk petroleum product storage.
11	973	1440 Finch Avenue	> 15 years storage and use of chemicals including chlorinated solvents, fuels and PCBs, oils and sludges.
12	986	3933 Keele Street	Bulk petroleum storage.
13	1021	1315 Finch Avenue West	PCB storage site.
14	1030	3939 Keele Street	Bulk petroleum storage.
15	1033	1300 Finch Avenue West, Unit 2	Storage and use of new and used chlorinated solvents.
16	1043	1290 Finch Avenue West	Generation and storage of halogenated solvent waste.
17	1471	3975 Keele Street	Numerous minor (<100 L) and major (>100 L) spills of fuel products; bulk storage; > 15 years storage of new and used fuel and oil products, also PCBs and non-chlorinated solvents.
18	1520	3975 Keele Street	Numerous minor (<100 L) and major (>100 L) spills of fuel products.
19	1563	3975 Keele Street	Numerous minor (<100 L) and major (>100 L) spills of fuel products; bulk petroleum storage; > 15 years storage of new and used fuel and oil products, also PCBs and non-chlorinated solvents.
20	2509	2720 Steeles Avenue West	Storage and use of new and used solvent products, including chlorinated solvents.
21	649	555 Steeprock Drive	Storage and use of new and used solvents, including chlorinated solvents.
22	733	4250 Dufferin Street	>15 years storage and use of new and used solvent products, including chlorinated solvents.
23	787	850 Steeprock Drive	Storage and use of new and used solvents, including chlorinated solvents.
24	827	28 Vanley Crescent	Storage and use of large quantities of new and used solvent products, including toluene and chlorinated solvents.
25	887	35 Vanley Crescent	>15 years storage, handling of new and used light hydrocarbons and solvent products, including chlorinated solvents; waste reclamation plant; storage of PCBs; bulk storage of liquid fuels.
26	929	35-75 Vanley Crescent	>15 years storage, handling of new and used light hydrocarbons and solvent products, including chlorinated solvents; waste reclamation plant; storage of PCBs; bulk storage of liquid fuels.
27	945	70 Vanley Crescent	> 15 years storage and use of new and used solvent products, including chlorinated solvents; bulk petroleum product storage.
28	965	75 Vanley Crescent	Former incinerator.
29	1025	1295 Finch Avenue West	Storage and use of new and used fuels, chlorinated solvents and other light hydrocarbon products.
30	1033	1300 Finch Avenue West, Unit 2	Storage and use of new and used chlorinated solvents.
31	1035	35 Tangiers Road	Bulk storage of fuel products.
32	1043	1290 Finch Avenue West	Generation and storage of halogenated solvent waste.
33	1052	4483 Chesswood Drive	Storage and use of new and used solvents, including chlorinated solvents; producer of chemicals.
34	1106	355 Champagne Drive	Storage and use of new and used solvent products, including chlorinated solvents, paints, oils and lubricants.
35	1160	1150 Finch Avenue West	Generation of range of hydrocarbon wastes, number reportable minor (<100 L) and major (>100 L) spills of hydrocarbon products, reported spills of PCB containing oils.
36	1281	1133 Finch Avenue West	Petroleum products storage and distribution, report spills and generator of light hydrocarbon products, reported spills of PCB containing oils.

4.8.7. Utilities/Pipelines

Municipal Utilities

There are 1650 mm diameter and 1800 mm diameter storm pipes located around Steeprock Drive and Chesswood Drive, north of Sheppard Avenue. In addition, there is a 2450 mm diameter storm pipe, which crosses the Richview Cherrywood Hydro Corridor. This storm pipe starts with a diameter of 1500 mm at Chesswood Drive then goes along Toro Road to Finch Avenue and through the Hydro Corridor, continuing in a northern direction until it reaches Canarctic Drive with a diameter of 900 mm. This gravity system outlets to the Dufferin Creek, immediately west of Dufferin Street. There are two large storm sewer pipes on Steeles Avenue. The sewer on the north side is a 1650 mm pipe that serves the City of Vaughan and outlets to a storm water management pond in the northeast quadrant of the Jane Street / Steeles Avenue intersection. The sewer on the south side is a 1500 mm pipe that serves the City of Toronto and outlets to the upper pond in Black Creek Pioneer Village.

The sanitary systems throughout the Study Area are also extensive. There is, however, no pipe in the area that has a diameter larger than 1500 mm.

Similarly, there are extensive water mains in the Study Area. The largest pipe, with a diameter of 1500 mm is located running along Keele Street from the Keele Street/Finch Avenue intersection to the Keele Street Pumping Station and Reservoir.

Hydro One Networks Inc.

There are two hydro corridors located within the Study Area. Hydro One Networks Inc. operates transmission lines running in an east-west direction across the Study Area. The first hydro corridor, namely the Richview-Cherrywood Corridor, runs 350 m to 450 m north of Finch Avenue. Referred to as the Finch Hydro Corridor, it has three 230 kV tower lines which have provision for up to eight circuits (Toronto Hydro also has a low voltage transmission line in this corridor), The corridor width is approximately 100 m wide right-of-way, which is owned by the Ontario Realty Corporation with some easements and licenses to gas and oil pipelines. In the interim, it is planned for this hydro corridor to provide a bus only connection between Dufferin Street and Keele Street (see section 4.5.1 for details).

The second hydro corridor, the Cherrywood-Claireville Hydro Corridor, is located approximately 250 m north of Steeles Avenue between Jane Street and Keele Street. Referred to as the Steeles Hydro Corridor, the 200 metre wide corridor is owned by the Ontario Realty Corporation and is occupied by one 230 kV tower lines and two 500kV tower lines with a proposal for a fourth line through this corridor. There is also a sewer line (2450mm diameter) and a high-pressure gas line present within the hydro corridor (along the north side).

Pipelines

The following pipelines exist in the Study Area and are all located within the Richview-Cherrywood Hydro Corridor right-of-way:

- Enbridge Pipe Line operates a 750mm diameter oil pipeline within a 3 metre easement;
- Sarnia Products Pipeline has 250mm and a 300mm diameter pipelines;
- Sun-Canadian Pipe Line operates 200mm and 300mm diameter, high-pressure oil pipelines; and
- Trans-Northern Pipelines operates a 250mm diameter pipeline within a 6 metre to 9 metre easement.

4.9. Future Transportation Demands

This section describes the future transportation demands within the Study Area including the future travel demands and screenline volumes.

4.9.1. Future Population and Employment

In order to estimate future travel demand, the City of Toronto uses a transportation demand forecasting model, which converts predicted population and employment trends throughout the Greater Toronto Area into travel demand patterns for all modes including roads and transit. Table 4-14 contains the regional 2021 population and employment control totals used in the GTA model. Each region provided this information at a regional and traffic zone level.

Table 4-14: Regional Land Use Assumptions

Region	Source	2001 POP	2001 EMP	2021 POP	2021 EMP
Toronto	Official Plan	2,450,750	1,453,650	2,800,050	1,718,950
Durham	Development Charges study	527,050	166,350	849,750	311,000
York	York Region Official Plan (September 2004 update)	772,000	386,000	1,272,000	721,200
Peel	Peel Region Official Plan (August 2003 update)	981,650	517,750	1,394,900	761,400
Halton	Halton Region Official Plan (June 2003 update)	389,250	169,000	592,300	308,000
Hamilton	1999-2001 TMP	498,100	192,350	566,800	229,650
TOTAL		5,618,800	2,885,100	7,475,800	4,050,200

The travel demand forecasting model accounts for existing and planned transportation improvements throughout the area. All planned road and transit changes for 2021 were coded in the GTA Model's network. City staff assembled all road and transit network information with the cooperation of staff from the Ontario Ministry of Transportation, GO Transit, York Region, Peel Region, City of Toronto, and the TTC.

Fare structures are assumed to remain, as they currently exist, including the local transit zone fare boundary at Steeles Avenue. However, it should be noted that within the timeframe examined in this analysis, fare structures may change significantly and if, as a result, the zone fare boundary at Steeles Avenue is modified or eliminated, transit ridership could increase above the levels forecast.

An extensive modelling exercise was undertaken as part of the 1994 EA. The application of this model was used in support of this EA in order to confirm that travel demands and patterns estimated for the 1994 EA are consistent with current estimates.

4.9.2. Screenline Volumes

Overall screenline volumes, at three separate screenlines between Downsview Station and Steeles Avenue, do not vary significantly between the routing alignments tested using the GTA Model. Therefore, a single series of numbers is shown below that represents the overall allocation of travel by mode to each screenline as presented in Table 4-15 and 4-16.

Table 4-15: 2001+ AM Peak Period Screenline Volumes - Corridor between Jane St. and Richmond Hill GO

		Model Volume (person-trips) – A.M. Peak Period					
		Rapid Transit	GO Rail	Surface Transit	Total Transit	Total Auto	TOTAL
South of Steeles	SB	-	5,200	12,800	18,000	36,100	54,100
	NB	-	-	8,200	8,200	14,600	22,800
South of Finch	SB	23,200	6,100	4,100	33,400	32,100	65,500
	NB	6,200	-	10,000	16,200	24,600	40,800
South of Sheppard	SB	36,400	6,100	3,200	45,600	36,700	82,300
	NB	15,800	-	7,800	23,600	30,600	54,200

Table 4-16: 2021 AM Peak Period Screenline Volumes with Subway Extension - Corridor between Jane St. and Richmond Hill GO

		Model Volume (person-trips) – A.M. Peak Period					
		Rapid Transit	GO Rail	Surface Transit	Total Transit	Total Auto	TOTAL
South of Steeles	SB	4,800	10,000	37,200	52,000	44,300	96,300
	NB	1,200	-	15,300	16,505	21,500	38,010
South of Finch	SB	49,800	11,200	700	61,700	39,100	100,800
	NB	13,800	-	8,500	22,310	35,300	57,610
South of Sheppard	SB	65,400	11,100	1,300	77,800	46,900	124,700
	NB	22,200	-	8,500	30,770	36,900	67,670

Total travel in the morning peak period southbound across the Jane-Street-to-Richmond-Hill-GO screen line south of Steeles, is forecast to grow 78% from 54,100 person-trips per day in 2001 to 96,300 in 2021. Recognizing the significant amount of congestion already on the road network (see section 4.5.4), the City's travel demand model estimates that the majority of new person trips will the travel by transit. Currently 33% of all trips are made by transit and this is forecast to grow to a 54% mode split to transit by 2021.

Similarly, for the screen line south of Sheppard Avenue, where total travel volumes are higher, southbound travel southbound across the screenline is expected to grow by 51% with the transit mode split increasing from 55% to 62%.

There is also expected to be a significant flow of passengers in the reverse direction travelling to York Region. In the am peak period, transit travel northbound north of Sheppard Avenue across the screen line is expected to grow 30% from 23,600 people per day in 2001 to 30,770 per day in 2021 with the extension of the Spadina Subway to Steeles Avenue.

4.10. The Rationale for the Undertaking

As estimated as part of the 1994 EA and reconfirmed as part of this EA, land use changes in the City of Toronto and York Region continue to result in greater demands on the existing transportation system.

The Undertaking is needed to increase the overall person carrying capacity of the north-south transportation system that provides an essential interregional connection between the City of Toronto and York Region. The Undertaking will also provide a solution, which is consistent with provincial and municipal policies that promote more intensive land use patterns, densities and a mix of uses that encourage a balance of travel by all transportation modes.

Review of the Alternatives to the Undertaking

5.0 REVIEW OF THE ALTERNATIVES TO THE UNDERTAKING

Alternatives to the Undertaking are functionally different ways of approaching or dealing with a problem or opportunity. Section 6.1(2)(b)(iii) of the ***Environmental Assessment Act*** states that an environmental assessment must consist of a description of and a statement of the rationale for the alternatives to the Undertaking. This requirement is subject to subsection 3 which states that the approved Terms of Reference (ToR) may provide that the environmental assessment consist of information other than that required by subsection (2). This section describes the alternatives to the undertaking consistent with the requirements of the approved Terms of Reference and the ***Environmental Assessment Act***.

5.1. Background

5.1.1. Approved Terms of Reference (ToR)

The approved Terms of Reference state that the new EA will study changes to the 1994 EA to extend the Spadina Subway from Downsview Station to York University (Yonge-Spadina Subway Loop EA). As such, This EA brings forward the alternatives to the undertaking previously analyzed in the 1994 EA and includes a summary of further analysis on the need for the Loop conducted in the 2001 Rapid Transit Expansion Study (RTES).

As discussed in previous sections, the ToR, which was approved in September 2004, outlines the process and content of this Environmental Assessment. The ToR states that this EA will include full documentation of the previous studies.

5.1.2. Defining the Undertaking

The 1994 EA confirmed the need and justification for transit improvements in northwest Toronto. The EA established that extending the north ends of the Yonge and Spadina Subway lines and connecting them across Steeles Avenue was the preferred alternative. The recommendation was based on an analysis of several alternatives to the Undertaking, including "doing nothing", roadway improvements, alternative technologies and modifications to the existing subway system.

In 1994, the Minister of the Environment and Energy authorized the Notice to Proceed with the first stage of the Undertaking for the extension of Spadina Subway from Downsview Station to York University only. At that time, it was anticipated that completion of the entire loop from Downsview Station to Finch Station (via Steeles) would be many years into the future.

The 2001 Rapid Transit Expansion Study helped the TTC to refine the proposed Undertaking by clarifying and defining "success" factors for transit projects. It was concluded that the extension of the Spadina Subway Line to Steeles would be one of the most advantageous projects for subway extension.

The key opportunities that prompted the TTC and City of Toronto to proceed with this EA in 2004 can be summarized as follows:

1) The RTES showed that a future subway loop along Steeles Avenue is no longer needed and that a radial extension via York University to a terminal station at Steeles Avenue is preferred.
2) The City of Toronto and York Region Official Plans support "Higher Order Transit Corridors" services to York University and the new Vaughan Corporate Centre (Highway 7 and Jane Street). The Plans call for improved surface transit speed, reliability and capacity in the short-term and subway expansion in the long-term.
3) Special planning studies, secondary plans and Official Plan Amendments support transit-supportive land development (at Allen/Sheppard, along Keele Street and within the Downsview and York University areas) and protect for a future Subway.
4) The Downsview lands (south of Sheppard Avenue West and east of Keele Street) have changed from a Canadian Forces Base to Parc Downsview Park (park, technology park and housing). This means that there will be more people on and travelling to the site who will need better public transit access.
5) York University's new buildings protect for an alternate future subway alignment, which is more central within the campus than the original alignment approved in 1994.
6) York Region has acquired property for an inter-regional transit terminal at Steeles Avenue, east of Jane Street.

Therefore, there is a need to develop and analyze alternative alignment and station locations (i.e. alternative methods of carrying out the Undertaking) for the Subway extension. Also, a terminal station (with surface commuter facilities) at Steeles Avenue is now possible, and that was not a part of the 1994 EA.

The preliminary description of the Undertaking was defined in the ToR as:

1) "The construction, operation and maintenance of underground subway tunnels from Downsview Station to Steeles Avenue, with subway stations (and related surface commuter facilities) located:
   i) At an interchange with the GO Transit Bradford Rail Line;
   ii) In the vicinity of Keele and Finch;
   iii) On the York University campus; and
   iv) At Steeles Avenue (between Keele and Jane Streets).
2) The alignment at the Steeles Avenue terminal Station will also protect for the long term extension of the Spadina Subway to the Vaughan Corporate Centre." [6]

5.1.3. Purpose of the Undertaking

Table 5-1 compares the stated purpose of the Undertaking from the 1994 Yonge-Spadina Subway Loop EA and the Approved Terms of Reference for this EA and demonstrates this EA continues to build on the objectives of the 1994 EA.

[6] Terms of Reference, page 5

Table 5-1: Comparison of Purpose of the Undertaking

1994 EA	ToR	Comparison
1) To improve the level of transit service and the utilization of the present Yonge-University-Spadina (Y-U-S) Subway;	i) To provide subway service to the Keele/Finch area, York University and a new inter-regional transit gateway and commuter parking facility at Steeles Avenue;	• ToR purpose specifically builds on the 1994 Yonge-Spadina Subway Loop EA conclusion that a subway is the appropriate mode of transit of this corridor. • ToR purpose accounts for an interregional transit terminal Steeles Avenue as planned by York Region and the City of Vaughan.
2) To increase the transit modal split for all trips, including cross-boundary trips between York Region and Metropolitan Toronto, by improving accessibility to rapid transit services and by improving the integration of services provided by the TTC, GO Transit and other transit operators;	ii) To provide improved connections between the Toronto Transit Commission subway system and GO Transit, York Region Transit and other inter-regional transit services;	• These objectives are consistent
3) To support existing and proposed Official Plan objectives, including residential intensification within the existing urban envelope and improved transit service to designated centres (such as North York Centre) and other major employment areas and to other major travel generators;	iii) To support local population and employment growth up to 2031 in accordance with the land use and transportation policies of the City of Toronto and York Region Official Plan;	• These objectives are consistent
4) To minimize negative social and natural environmental impacts; and	iv) To minimize any negative environmental impacts; and,	• These objectives are consistent
5) To provide service at reasonable costs.	v) To achieve reasonable capital and operating costs.	• These objectives are consistent

The ToR purpose specifically builds on the 1994 EA and the RTES that concluded that a subway is the appropriate mode of transit service for this corridor.

The ToR purpose accounts for the possible new interregional transit gateway and parking facility at Steeles. This was recommended in various studies including the 2003 Central Ontario Smart Growth Shape the Future Report and the 2001 City of Vaughan Property Protection for Steeles Rapid Transit Terminal Facilities – Rapid Transit to York University.

5.2. Review of the Alternatives to the Undertaking

As noted in the approved ToR, this Individual EA is being conducted to update the 1994 Yonge-Spadina Subway Loop EA.

In accordance with the ToR, this EA brings forward the alternatives to the Undertaking previously analyzed and include a summary of further analysis on the need for the loop conducted in the 2001 Rapid Transit Expansion Study. This review will provide a summary of the alternatives considered in the 1994 Spadina Subway EA and RTES. By reviewing these alternatives and the key changes to the environment since 1994, this Study confirms the alternative to the Undertaking, which best addresses the purpose of this Undertaking.

This section:

1) Identifies and reviews the Alternatives to the Undertaking considered in the 1994 EA;
2) Identifies and reviews the alternatives considered in RTES;
3) Presents the assessment of each alternative based on previous studies;
4) Identifies the key changes to the environment which have occurred since the completion of the 1994 EA and assess how they may affect the conclusions of the previous studies;
5) Examines the ability of each alternative to meet the purpose of the new Undertaking in the approved terms of reference for this EA; and,
6) Concludes with the preferred alternative to carry forward for detailed analysis of the alignments/routes.

5.2.1. Review of 1994 EA Alternatives to the Undertaking

The Project Objectives of the 1994 EA were to:

1) Increase the level of service of the Yonge-University-Spadina Subway;
2) Increase transit modal split for all trips, including cross-boundary trips by improving integration of services by TTC, GO and other transit operators;
3) Support Official Plan policy objectives including residential intensification within the existing urban envelope and improve transit service to designated centres (e.g., North York);
4) Minimize negative social and natural environmental effects; and,
5) Provide service at reasonable costs.

The 1994 EA determined that to evaluate transportation improvements in the Yonge-Spadina loop project, the most important factors were:

1) Transit service (i.e., sufficient system capacity and reliability)
2) Integration of transportation infrastructure; and
3) System accessibility.

Each of these factors is discussed below.

Transit Service

The 1994 EA identified that on the Yonge-University-Spadina Subway the theoretical headway of 120 seconds (corresponding to 36,000 passengers per hour per direction) was not being achieved based on two main factors. These factors were excess passenger loading and unloading time (dwell time) at Bloor-Yonge Station and delays in train turnaround time at Finch and Wilson Stations (the terminal station on the Spadina Subway in 1994). Given these delay factors, headways of 130 seconds (corresponding to a theoretical capacity of 32,400 passengers per hour per direction was being achieved. This capacity was deemed to be insufficient for projected growth of the ridership to 52,500 passengers per hour per direction beyond 2011 in the A.M. Peak across the north Metropolitan Toronto boundary (Steeles Avenue between Highway 400 and Bayview Avenue).

The 1994 EA concluded that the “problem of insufficient capacity to meet transit demands will continue to worsen”. [7]

Integration of Transportation Infrastructure

The 1994 EA examined the integration of the Yonge-University-Spadina Subway with the following:

1) Other TTC and York Region transit services;
2) GO rail and other interregional services;
3) Future Highway 407;
4) Proposed Highway 407 Transitway; and,
5) Future High Occupancy Vehicle lane network.

System Accessibility

Access to transit for both the existing population and employment areas as well as for areas with development potential was an important consideration. Some of the areas with development potential were identified as:

1) North York Centre;
2) York University;
3) Sheppard / Allen development node;

[7] 1994 Yonge-Spadina Subway Loop EA, page E-13

4) Steeles Avenue between Bathurst and Yonge Streets; Steeles and Yonge;
5) Future Concord and Langstaff gateways; and,
6) Vaughan Corporate Centre.

Benefits for the transit system were envisaged where there were additional opportunities for transit trip generation. It was acknowledged that the potential for additional financial and environmental costs would have to be weighed against the transit benefits.

Alternatives to the Undertaking

The 1994 EA examined a comprehensive range of alternatives to the Undertaking before a preferred course of action was recommended and subsequently approved by the Minister of the Environment and Energy.

The identification and evaluation of alternatives was an iterative process. At the first public consultation centre in February 1991, the following seven alternatives were identified:

1) Do nothing;
2) Improve existing operations;
3) Extend Yonge and Spadina Lines northerly without looping;
4) Improve surface transit to terminals;
5) Connect terminals with either improved bus service or LRT;
6) Extend Sheppard Subway Line from Yonge Street to Allen Road; and,
7) Connect the ends of the subway to form a loop.

As the Study progressed and with public consultation, these alternatives were refined and new combinations of alternatives were considered. Six categories of alternatives were subjected to detailed analysis as part of the 1994 EA.

The alternatives to the Undertaking were refined to include the following:

1) **Do Nothing**;
2) **Modifications to the Existing Subway System** (including terminal and Bloor Station improvements; Automatic Train Control; Bus or Light Rail Transit (LRT) between Yonge and Spadina Subway corridors);
3) **Roadway Improvements** (including reserved bus lanes and additional auto lanes);
4) **Sheppard Subway Extension** (from Sheppard/Yonge Station to Downsview Station);
5) **Extensions to the Existing Subway System** (extension of subway only; extension of subway with Bus or LRT connection and extension of subway with Sheppard Line); and,
6) **Looping of the Yonge-University-Spadina Subway**.

These six categories of alternatives were evaluated on the basis of how well they achieved the project objectives and their ability to respond to overall transportation needs. The following sections provide a summary of each of these alternatives and the evaluation of each as offered in the 1994 Yonge-Spadina Subway Loop EA.

1. Do Nothing

“Do nothing” was defined as the existing road and transit network. This alternative provided a base case scenario against which the other functionally different alternatives were compared. Existing terminals would be at Finch Station on the Yonge Subway and at the new Sheppard/Allen Road Station (subsequently named Downsview Station).

This alternative offered no change in the maximum service capacity of the Yonge-University-Spadina Subway (theoretical 32,400 passengers per hour per direction) and it was estimated that by 2011, both the Yonge and University subways would exceed capacity. In addition, road congestion would continue to increase due to growth. For the Study Area, the north Metro boundary (i.e., Steeles Avenue) capacity deficiency would grow to 18,600 person trips in the AM peak hour beyond 2011.

No advantages were noted related to land use intensification; however there would be no construction and thus no disruption to the social or natural environment. In terms of costs, while no capital expenditures were anticipated, there would be lost opportunity costs and increased indirect costs due to slower goods movement.

This alternative was rejected due to the lack of conformance with any of the Project Objectives.

2. Modifications to the Existing Subway System

This alternative examined a variety of transit system improvements to address the purpose of the Undertaking. As illustrated in Figure 5-1, the improvements examined in 1994 included:

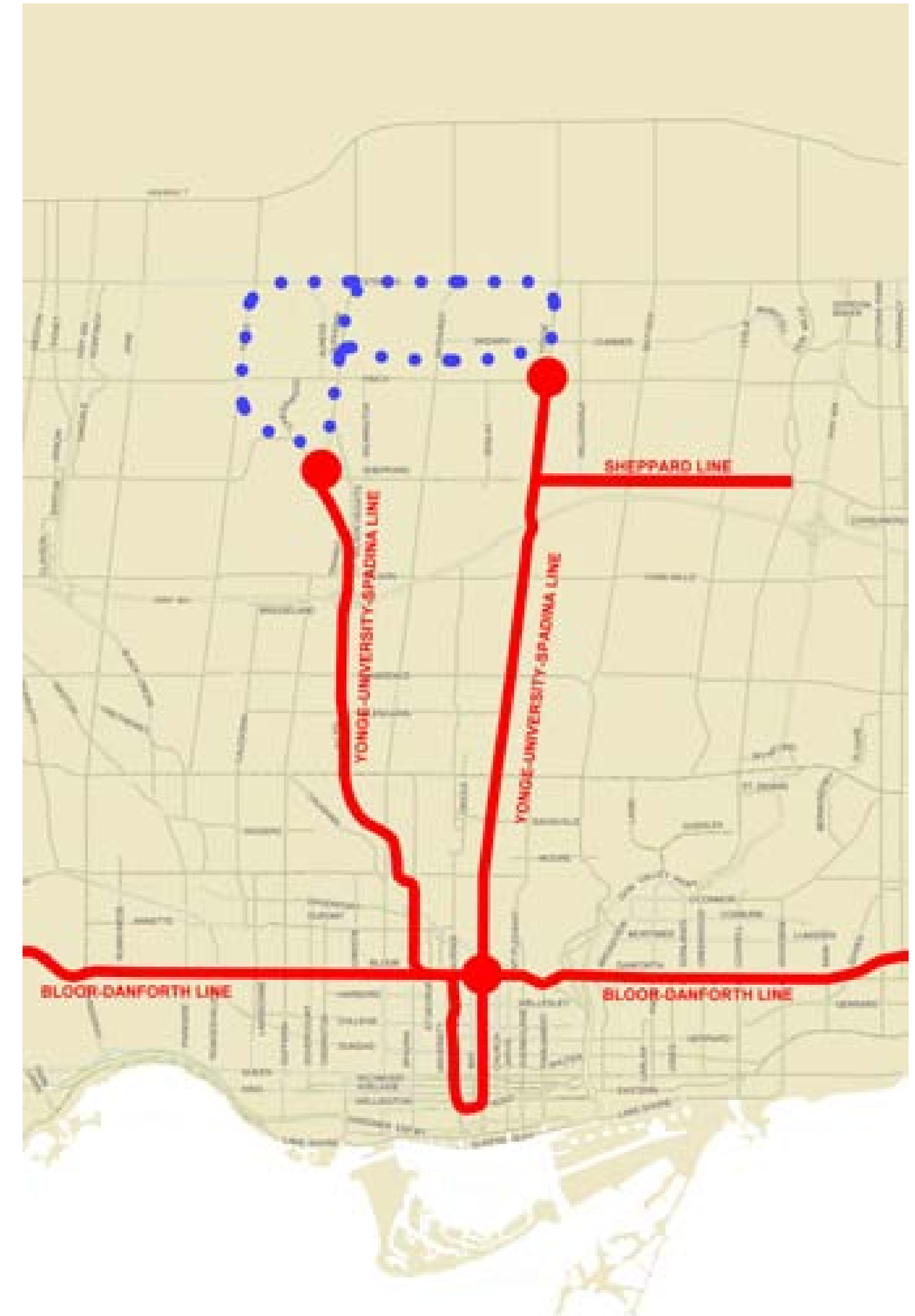
1) Terminal and Bloor Station improvements;
2) Automatic train control; and
3) Bus or Light Rapid Transit (LRT) between the Yonge and Spadina Subway corridors.

The terminal and Bloor Station improvements included construction of double pocket tracks at each terminal station, as well as construction of a third platform at Bloor Station to reduce excessive dwell (loading and unloading) time. Selective replacement and modification of signals were also included in this alternative.

The second improvement considered in this category of alternatives was the replacement of the existing signal system with a new and fully automated system in combination with the above-noted terminal and Bloor Station improvements.

TERMINAL AND BLOOR STATION IMPROVEMENTS

AUTOMATIC TRAIN CONTROL WITH TERMINAL AND BLOOR STATION IMPROVEMENTS



BUS/L.R.T. BETWEEN YONGE AND SPADINA CORRIDORS

LEGEND

- TERMINAL & BLOOR STATION
- EXISTING SUBWAY LINE
- BUS OR LRT
- AUTOMATIC TRAIN CONTROL

Source: Yonge – Spadina Subway Loop EA, 1994

FIGURE 5-1: Alternative to the Undertaking #2 – Modifications to the Existing Subway System

The 1994 EA also included a bus/LRT option between Yonge and Spadina Subway Lines. This alternative was defined as the operation of a bus or LRT in a reserved right-of-way on one of the proposed loop alternative alignments/routes in an east-west or north-south direction (i.e., Steeles Avenue, hydro right-of-way, Dufferin or Yonge Streets). Table 5-2 summarizes the operational effects and associated capital costs for each of these sub-alternatives.

Table 5-2: Comparison of Operating Statistics and Capital Costs for Existing Subway Modifications

	Terminal & Bloor Station Improvements	Automatic Train Control with Terminal & Bloor Station Improvements	Bus Between Yonge & Spadina Subways	LRT between Yonge & Spadina Subways
Yonge Line Capacity (persons/hr/direction)	40,800	43,200 – 45,500	32,400	32,400
Theoretical Headway (in seconds)	105	95 – 100	130	130
Construction Cost ($ Millions – 1991)	300	440	200	390

All costs are exclusive of property and in 1991 dollars.

The evaluation concluded that the bus/LRT alternatives would not provide any change to the configuration, capacity or operation of the Yonge-University-Spadina Subway. The same subway constraints would exist as with the do nothing alternative and as a result the Yonge Line south of Bloor Street would be over capacity beyond 2011.

Since the most capacity that a bus/LRT system could accommodate would be 9,600 persons per hour per direction, then two north–south corridors would be required for bus/LRT to accommodate the anticipated north–south demand. If the LRT was provided on an east-west corridor, then a new storage and maintenance yard would be required and its size and location would vary with the characteristics of the selected LRT.

The bus/LRT alternatives would potentially improve the utilization of the subway by diverting some trips from the Yonge Subway to the Spadina Subway. However, there would be no improvement in the capacity or reliability of the subway. There would be some support for the Official Plan objectives by introducing higher order transit service to areas such as North York Centre and York University. It was anticipated that these alternatives would have only minimal natural environmental impacts. Significant effects on the roadway system were anticipated due to the reduction of the roadway capacity by substituting bus or LRT only lanes.

In addition, the 1994 EA noted that the effects of a bus/LRT on the roadway system would be major during construction. Further, it was assumed that some displacement of homes and businesses would be required to construct and then operate a bus/LRT in an existing right-of-way where there was insufficient space for a two lane widening. If the Finch Hydro corridor could be used, there would be some loss of recreational land and some noise, vibration and visual intrusion in the immediate area. For similar reasons, the bus/LRT facilities would result in the loss of some natural environmental features.

In conclusion, the evaluation of these alternatives concluded each of the above three sub-options would only partially support the objective of improving transit service levels to accommodate the 2011 forecast.

The 1994 EA resulted in a decision to reject Alternative #2 (Modifications to Existing Subway System) and carry forward the proposed terminal and Bloor Station improvements in combination with other alternatives in specified cases in order to improve headways.

3. Roadway improvements

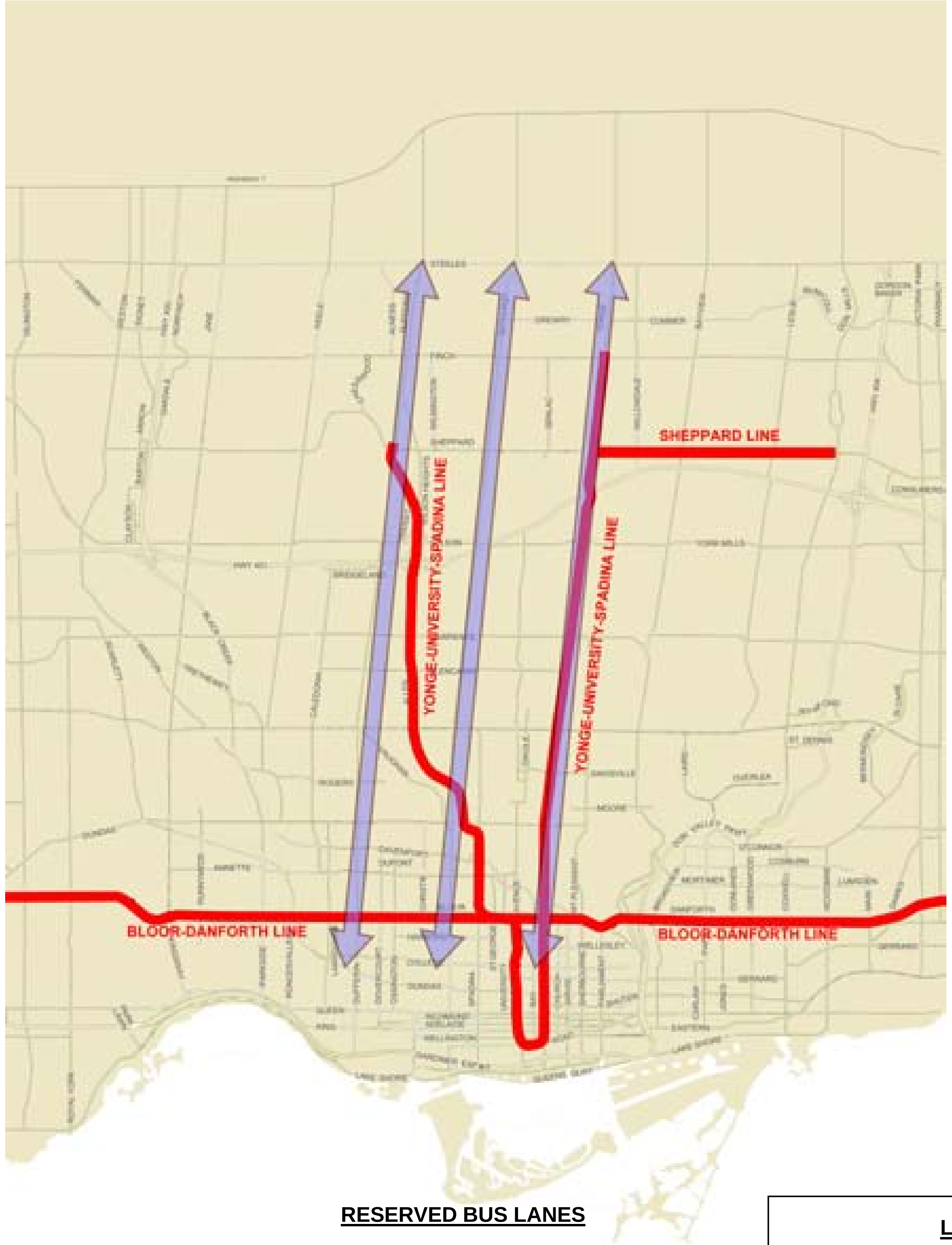
The potential for roadway improvements was considered as part of the evaluation of alternatives to the Undertaking in the 1994 Yonge-Spadina Subway Loop EA.

The road improvements alternative was defined as those enhancements which would provide sufficient capacity to accommodate the demand in the central Yonge Street corridor, over and above that which could be carried by the existing subway system and that which could be carried by the existing roadway system. These improvements could be achieved by either building new bus-only lanes or by building new automobile lanes on major arterials from the Study Area to downtown Toronto (see Figure 5-2).

The roadway improvements included reserved bus lanes or additional automobile lanes. The reserved bus lanes were defined as widening of arterial roads for buses only. This option would provide an increased capacity of 3,000 to 5,000 passengers per hour per lane widening. The new automobile lanes would provide an estimated 700 to 1,000 passengers per hour increase in capacity per lane widening.

Based on these parameters, the 1994 EA concluded that four to seven reserved bus lanes or sixteen to twenty-three additional automobile lanes would be required to satisfy the projected growth in travel demand. It was noted that such a solution would be contrary to the municipal and provincial transit supportive policies and the loss of natural environmental features and disruption to households and businesses was identified. The Official Plan policies supporting intensification in existing urban areas would not be supported. These options did not support the utilization of the Yonge-University-Spadina Subway. For the additional automobile lanes option, there would be no improvement in the transit modal split.

Costs to construct reserved bus lanes were estimated at $35 to $160 million and for additional automobile lanes the construction costs were estimated at $140 to $470 million. All costs are exclusive of property and in 1991 dollars. This category of alternatives was subsequently rejected due to the lack of conformance with the Project Objectives.



RESERVED BUS LANES

ADDITIONAL AUTO LANES

LEGEND

EXISTING SUBWAY LINE

CORRIDORS TO BE CONSIDERED

Source: Yonge – Spadina Subway Loop EA, 1994

FIGURE 5-2: Alternative to the Undertaking #3 Roadway Improvements

4. Sheppard Subway Extension

As illustrated in Figure 5-3, the construction of a Sheppard Subway Line westward along Sheppard Avenue from Sheppard Station on the Yonge Subway Line to Allen Road was considered as an Alternative to the Undertaking in the 1994 EA. In the 1990's, the Yonge-Spadina Subway Loop EA and the Sheppard Subway Line EA were being prepared at the same time. Therefore, the 1994 EA concluded that it was not likely that the Sheppard Subway westward extension would be developed independently of an easterly connection. Further, it should be noted that the extension of the Spadina Subway from Wilson Station to Downsview Station did not occur until 1996. The 1994 EA noted that there would be flexibility to provide a service connection between the [proposed] Sheppard Line and the Spadina and Yonge Lines.

In addition to a new subway, this option included the terminal and Bloor Station improvements (see alternative #2 outlined above). Based on the assumptions used in the 1994 EA, this alternative would provide a capacity of 37,200 passengers per hour per direction.

A new Sheppard Subway west of Yonge Street would not meet the forecasted demand and would only slightly improve the balance of demand south of Bloor Street by diverting some riders from the Yonge Subway to the Spadina Subway. Inter-regional transit opportunities and commuter travel times would be slightly improved by this option but the Steeles Avenue boundary capacity in the A.M. Peak would not be affected. This new subway would enhance intensification in the areas of North York Centre and at the Sheppard/Allen Road development node. Transit access to any future development at the Downsview Airport lands would also be improved.

Minor effects on the natural and social environment were anticipated with the largest impact being the immediate area of the station development, and in particular a new station location at Bathurst Street. Crossing the Don River between Bathurst Street and Yonge Street was identified as having the potential to cause minor environmental effects.

Costs for this alternative were estimated at $710 million in 1991 dollars including the terminal and Bloor Street improvements. All costs are exclusive of property and in 1991 dollars.

This alternative was rejected because it did not effectively support the utilization of the Yonge-University-Spadina Subway, and only contributed slightly to the balancing of demand between the Yonge and Spadina Subways.

5. Extensions to the Existing Subway System

A variety of northerly subway extensions were considered as part of the evaluation of alternatives to the undertaking in the 1994 EA. This category of alternatives included subway alignments extending northerly from the Spadina Subway at Downsview Station and from Yonge Subway at Finch Station. These extensions considered terminals at Steeles Avenue or the proposed Highway 407 corridor with a possible bus or light rail transit connection between them (i.e., along Finch, the Finch Hydro Corridor, Steeles or Highway 407 rights-of-way).

As illustrated in Figure 5-4, three options were developed for this category of alternatives:

1) Northerly extension of Spadina Subway and Yonge Subway;
2) Northerly extension of the Spadina and Yonge Subway with Bus/LRT connection on a reserved right-of-way between the lines (e.g., at Finch, hydro right-of-way, Steeles or Highway 407); and
3) Northerly extension of Yonge and Spadina Subway with Sheppard Subway between Yonge Street and Allen Road.

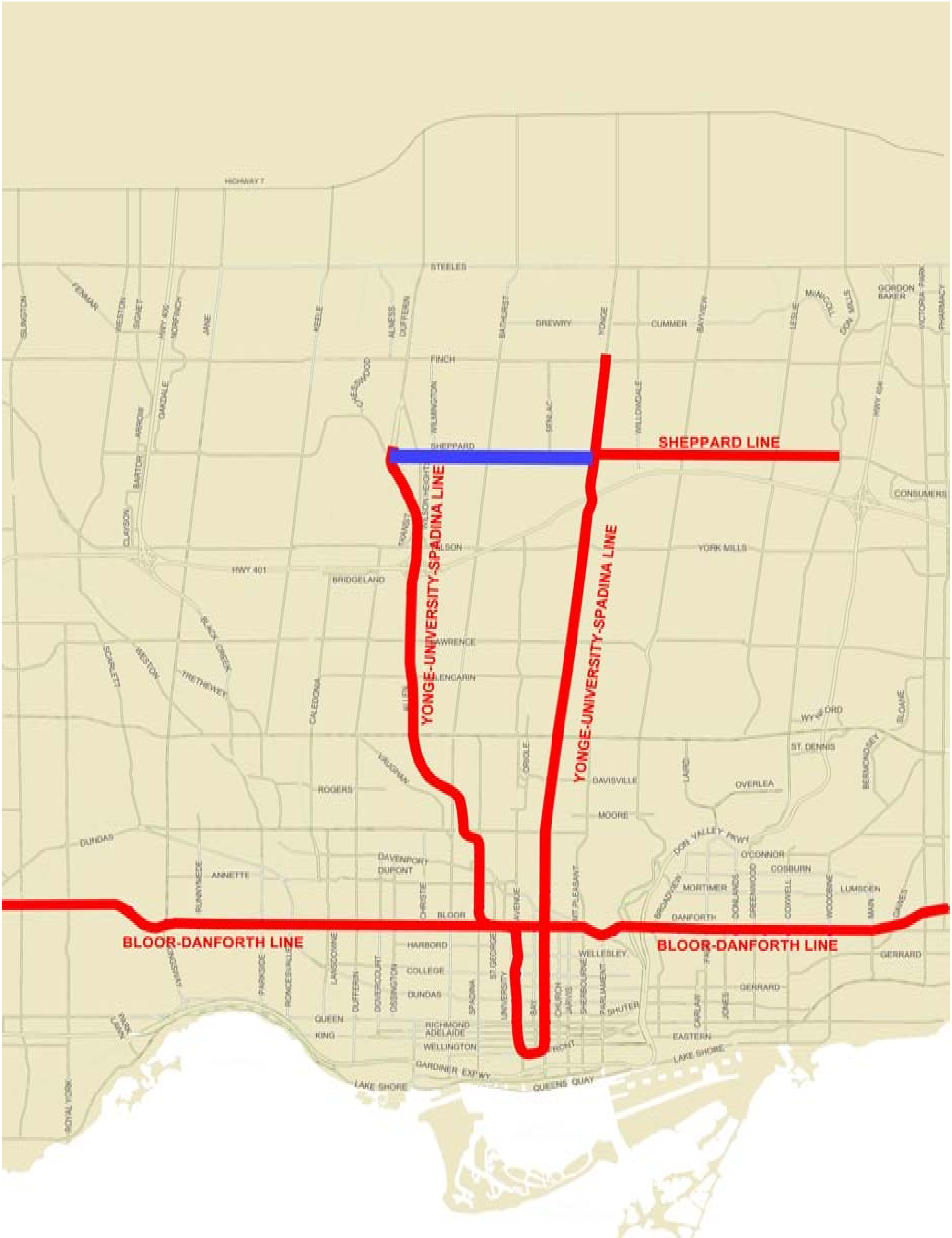
Each of these alternatives would include terminal and Bloor Station improvements (see alternative #2, above) and therefore provide for a capacity of 37,200 passengers per hour per direction.

This alternative defined the two subway line extensions as follows:

1) Yonge Subway: defined as extending the subway northerly along Yonge Street; and
2) Spadina Subway: defined as extending the subway along any of Keele, CNR (GO Bradford Rail Line) right-of-way or Dufferin Street corridors.

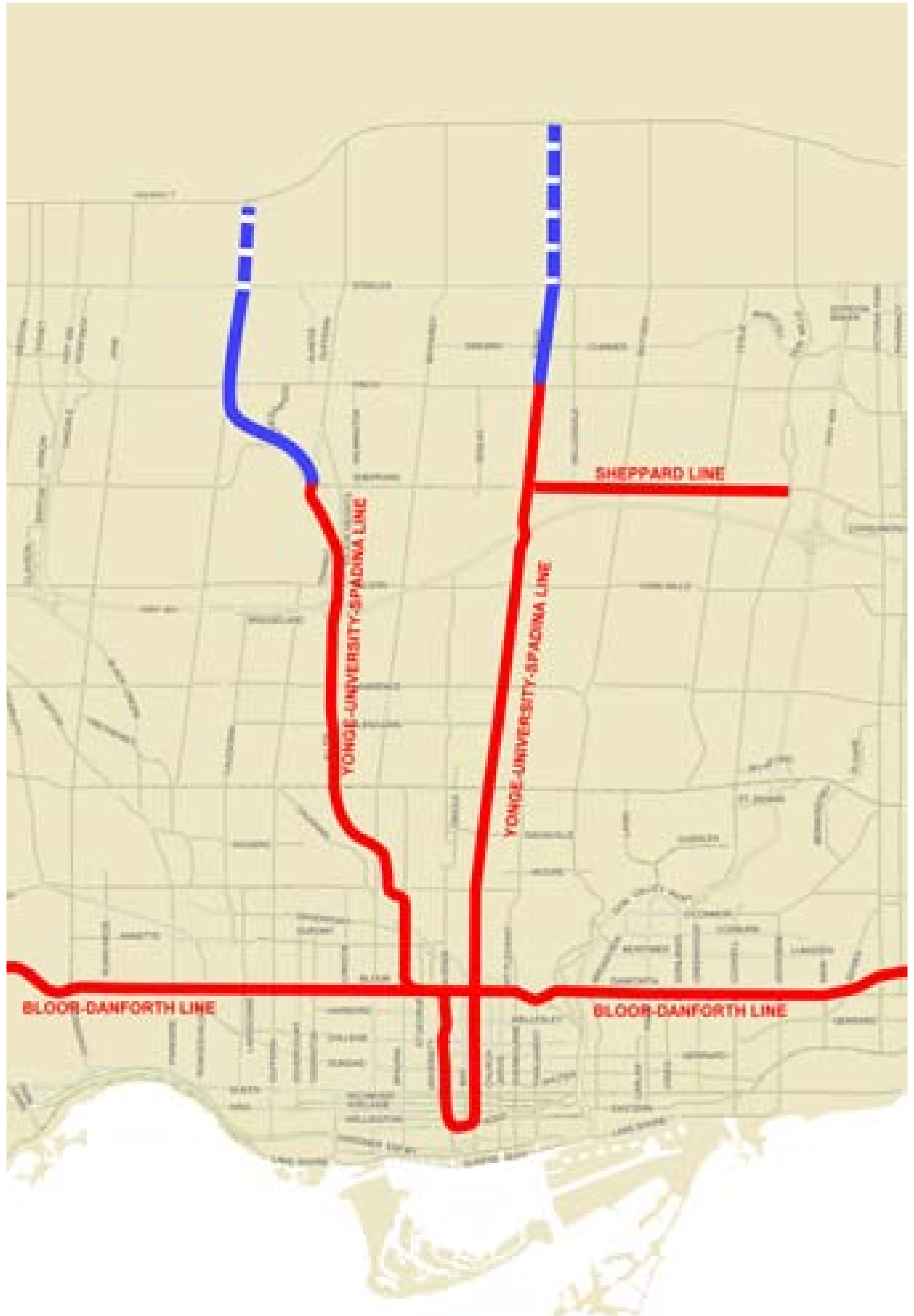
Each of the extensions was then developed with two staging options. The first staging option would have a northern limit of Steeles Avenue. The second staging option would have a northern limit in the vicinity of the Highway 407 corridor in possible gateway locations such as Concord or Langstaff.

As a result of the evaluation carried out for the 1994 EA, it was concluded that the three alternative extensions of the existing subway system (see three options on Figure 5-4) would offer a theoretical capacity of 37,200 passengers per hour per direction. This was not sufficient to meet the upper end of the projected demand on the Yonge Line south of Bloor Street.

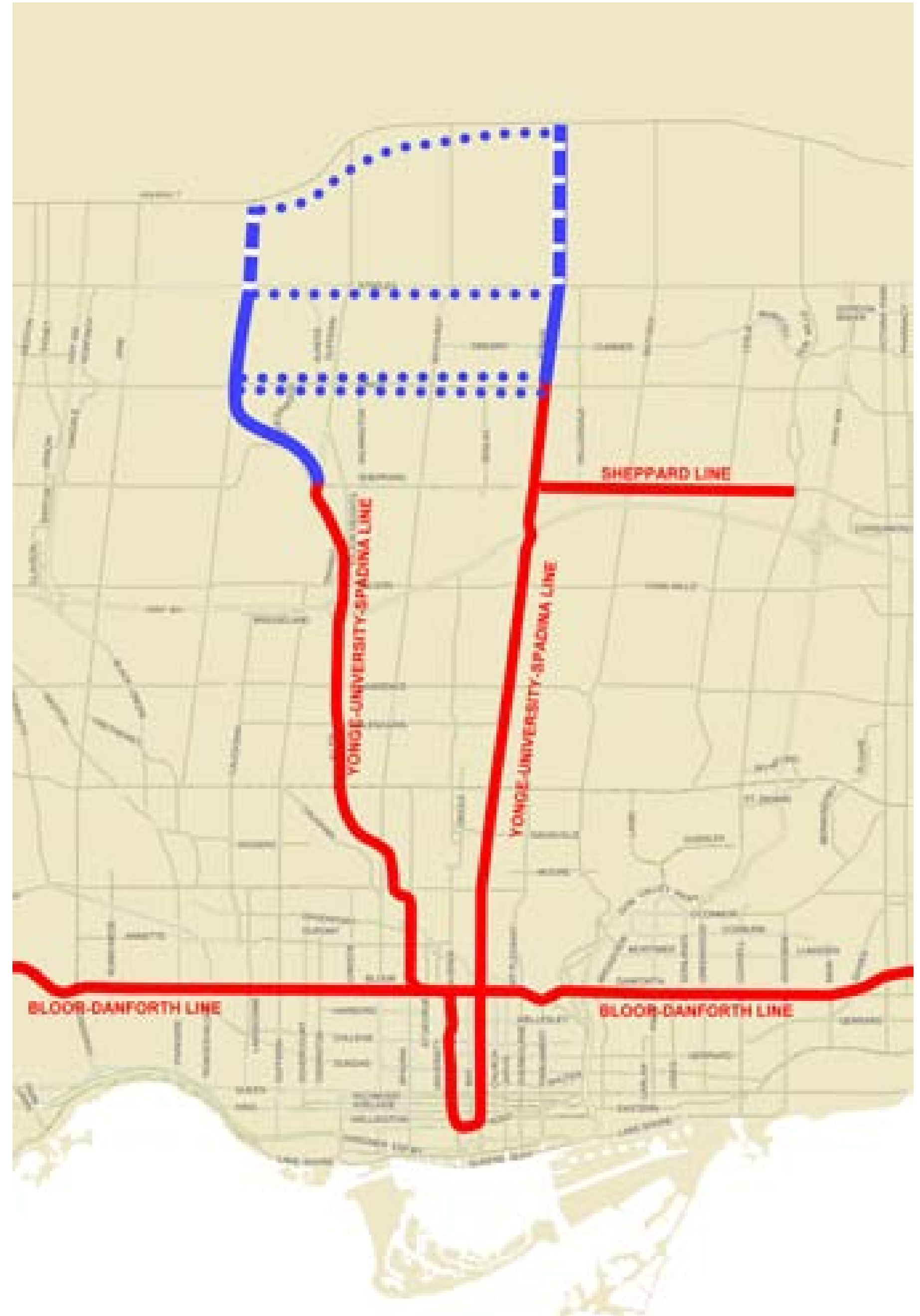


Source: Yonge – Spadina Subway Loop EA, 1994

FIGURE 5-3: Alternative #4 - Sheppard Subway Extension



NORTHERLY EXTENSIONS



NORTHERLY EXTENSIONS WITH BUS/L.R.T. CONNECTION

NORTHERLY EXTENSIONS WITH SHEPPARD LINE

LEGEND

- EXISTING SUBWAY LINE
- PROPOSED EXTENSIONS
- NORTHERLY EXTENSION OF SPADINA AND YONGE SUBWAY LINE
- BUS/L.R.T CONNECTION

Source: Yonge – Spadina Subway Loop EA, 1994

FIGURE 5-4: Alternative #5 - Extensions to the Existing Subway System

The northerly extension of the subway would both increase the transit modal split by improving access to transit facilities. These northerly extensions would provide an opportunity for the diversion of passengers for some trips from the Yonge Subway to the Spadina Subway to improve the balance of demand south of Bloor Street. The Steeles Avenue boundary capacity deficiency in the A.M. Peak beyond 2011 would be alleviated. It was noted that integration with other transit systems would be achieved by providing additional stations beyond the Steeles Avenue boundary. Also, a direct connection between the Yonge-University-Spadina subway and the CN/ Bradford GO Line would be possible.

The future expansion of the Yonge-University-Spadina Subway would not be precluded by these alternatives. The land use benefits of extending the Spadina Subway on Keele Street included improved access to York University and the Vaughan Corporate Centre. The benefits of the Yonge Subway extension included improved access to Yonge/Steeles and Richmond Hill Centre development areas and improved intensification opportunities for stations along these alignments/routes. The bus/LRT connections on the Sheppard Subway would provide support for centres within north Toronto and Vaughan. Property acquisition would be required for the Spadina Subway extension potentially displacing some industrial land uses and there may be some loss of natural environmental features in the area of the G. Ross Lord Park (assuming and east-west busway/LRT between the Yonge Subway and Spadina Subway in the Finch Hydro Corridor).

Major capital expenditure would be required for these alternatives. The costs were summarized as follows:

Table 5-3: Alternative #5 – Costs

Alternative	Cost ($ millions – 1991)
Northerly extension	955 - 1,730
Northerly extension with bus/LRT	985 – 2,030
Northerly extension with Sheppard Subway	1,365 – 2,140

All costs are exclusive of property and in 1991 dollars.

These alternatives were not recommended to be carried forward. However, it was noted that a northern extension of the Yonge and Spadina Subways were considered as a subset of the Yonge-Spadina Subway loop.

6. Looping of the Yonge-University-Spadina Subway

This alternative would consist of extending and connecting the northern ends of the Yonge and Spadina Subways.

This alternative was defined as a subway connection between Finch and Downsview Stations. The 1994 EA examined a variety of methods of implementing a loop alternative (see Figure 5-5). The loop alternatives would serve all major areas for development including York University and the Yonge/Steeles area.

The loop alternatives would create two independent looping subway systems (clockwise and counter clockwise), thereby removing all headway constraints currently present at the Finch and Downsview terminal stations. These loops would have theoretical headway of 105 seconds (corresponding to a theoretical capacity of 40,800 passengers per hour per direction). This would accommodate the peak hour demand beyond 2011.

A Yonge-University-Spadina Subway loop would achieve the following:

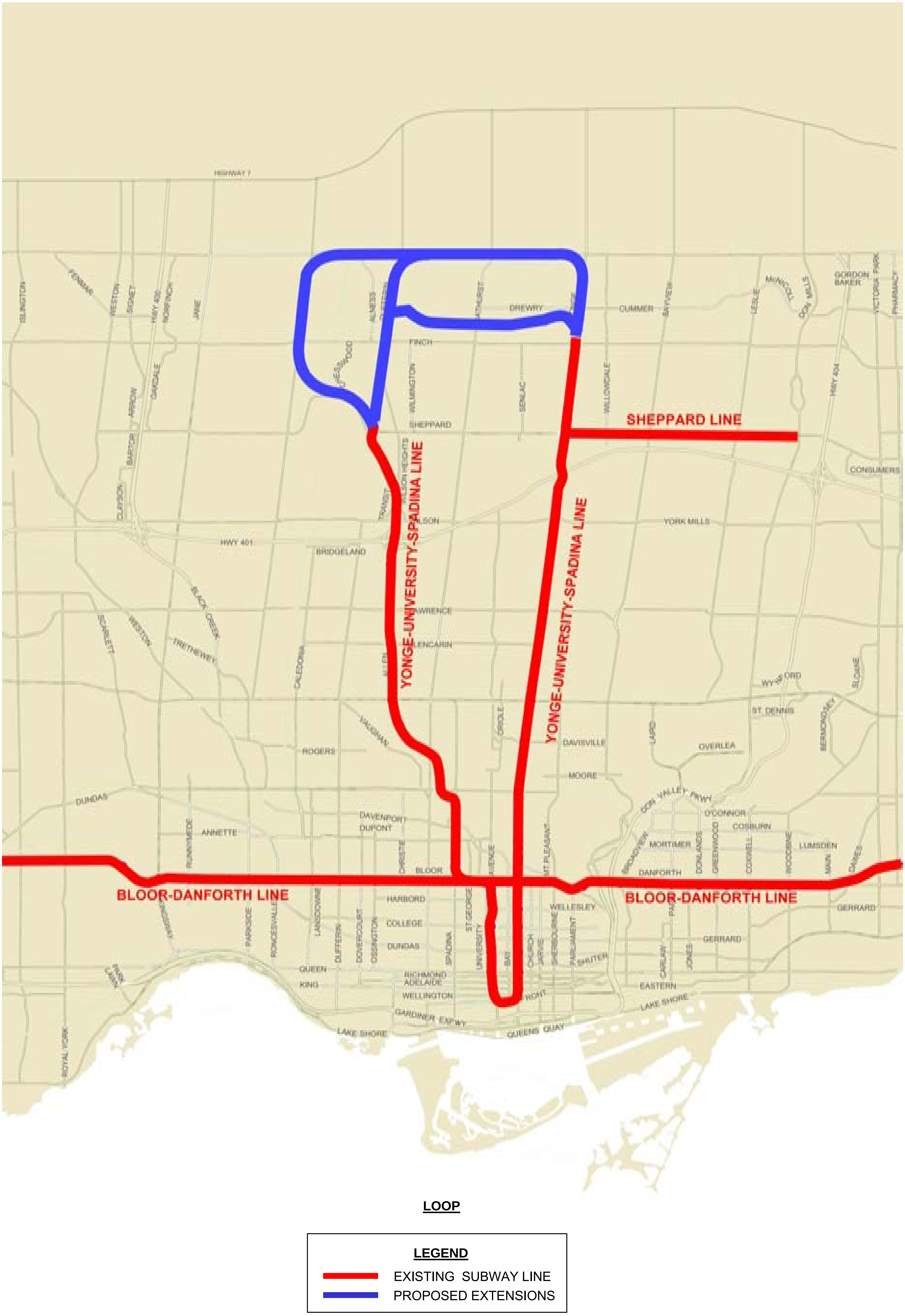
1) Improved utilization of the existing subway system;
2) Decrease the theoretical headway and provide system reliability;
3) Increase the transit modal split; and,
4) Support Official Plan objectives and provide land use development opportunities.

These positive outcomes were considered sufficient to offset the higher capital costs and some land use and natural environmental impacts of this alternative. Thus, the loop was selected as the preferred alternative.

The eleven loop alignments were screened during the examination of the alternative methods of carrying out the Undertaking portion of the 1994 EA. Following an iterative screening process, five alignments were carried forward for detailed analysis, evaluation and public consultation:

1) Hydro Loop,
2) Dufferin/Steeles Loop,
3) CNR/Hydro Loop,
4) CNR/Steeles Loop,
5) Keele/Steeles Loop, and
6) Jane/Steeles Loop (added in the second stage evaluation).

Following three rounds of evaluation, the Dufferin/Steeles and Keele/Steeles loops resulted in the most positive advantages and the fewest disadvantages. The public review of these alignments/routes identified that the Keele/Steeles Loop was overwhelmingly supported. The loop alternatives (see Figure 5-6) were recommended to be carried forward in the 1994 EA for further Study as the only alternatives to fully support the project objectives.



Source: Yonge – Spadina Subway Loop EA, 1994

FIGURE 5-5: Alternative #6 - Yonge-University-Spadina Subway Loop

5.2.2. Summary of 1994 EA Alternatives to the Undertaking

Table 5-4 summarizes the evaluation of the Alternatives to the Undertaking from the 1994 EA.

During the final stages of the 1994 EA, an analysis and evaluation of two alternative alignments was conducted. Both alignments featured the same terminal station location on the York University Campus, but had different locations for the GO/TTC interchange and the Keele/Finch area stations. One alternative included a GO/TTC interchange station at Finch Avenue and a station on Keele Street at the Finch Hydro Corridor (Finch Alternative). The other sited the GO/TTC interchange at Sheppard Avenue and a station at the Keele/Finch intersection (Sheppard Alternative).

The two key differences between the alternatives were related to the integration of existing and future transit services and support for Downsview area long term land use.

GO Transit plans called for a new Bradford GO Rail Line station at Finch Avenue, in the short term. The Finch Alternative, which would result in a TTC/GO interchange at Finch, was consistent with GO Transit's plans.

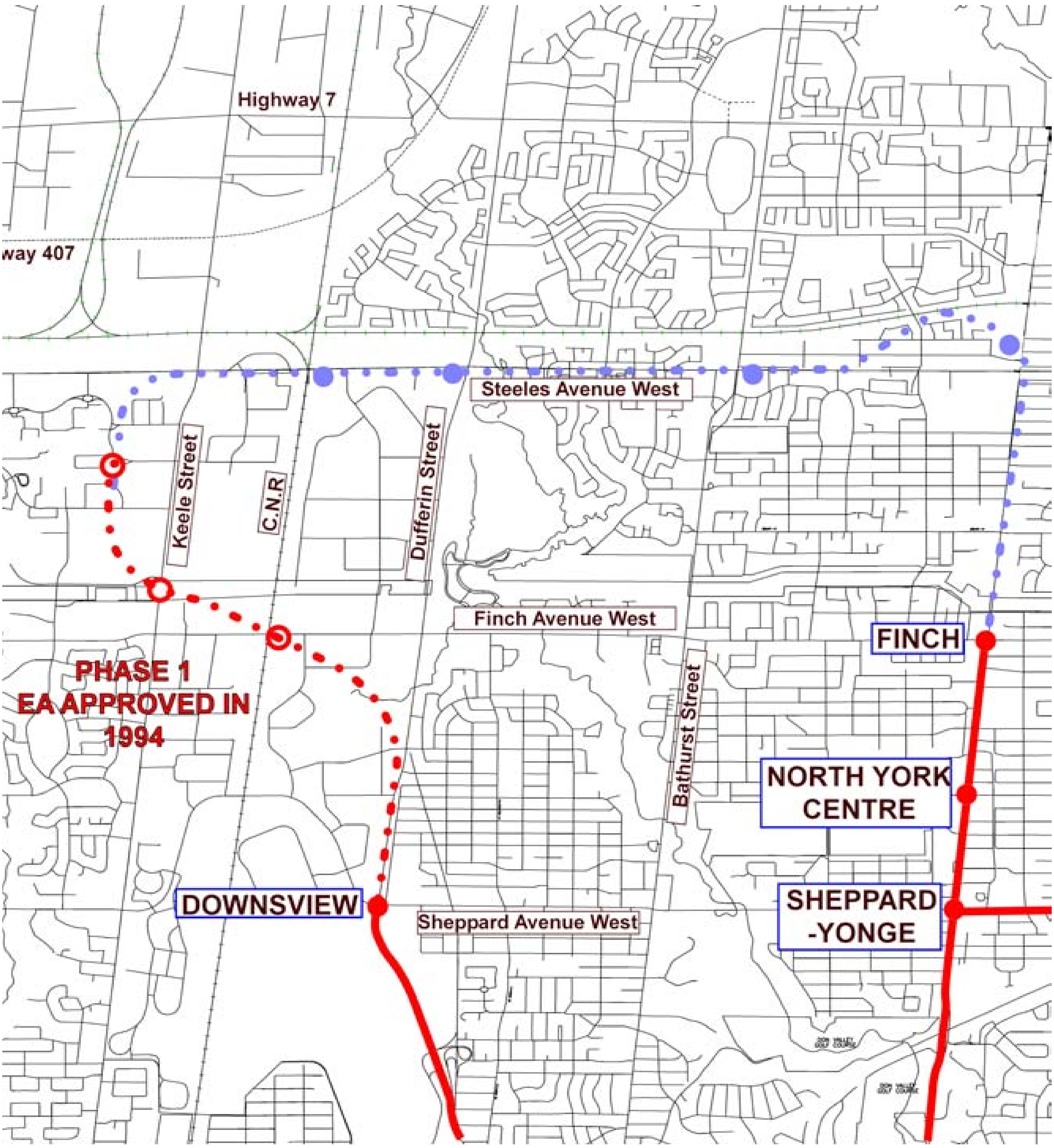
Assuming the introduction of a GO Rail station at Finch Avenue in the short term, provision of a long term station at the north end of the Downsview lands at Sheppard Avenue (as proposed under the Sheppard Alternative), would result in less than 1 km GO Station spacing between Finch and Sheppard, which would be too close for commuter train service. Furthermore, in the event of redevelopment of the Downsview area lands in the long term, it was observed that the best location for the GO Rail Station would be in the centre of the lands, rather than on the periphery at Sheppard Avenue. Since 1994, the short term GO station location has been constructed south of Steeles Avenue.

Therefore, the Finch Alternative was preferred from both the perspective of transit services integration and support for long term land use. The Finch Alternative was brought forward as the recommended alignment in the 1994 EA. The Sheppard Alternative was re-examined in the RTES and was recommended for further analysis, in view of changes in land use and transportation plans which occurred after the 1994 EA. As detailed in section 6.0, the Sheppard Alternative was analyzed in this EA (known as Route 1).

Table 5-4: Conformance with Project Objectives of the Alternatives to the Undertaking, 1994

	Project Objectives					
Alternatives	Level of Transit Service	Integration	Intensification (Land Use)	Social and Natural Environment	Cost	Recommendation
Do Nothing	No	No	No	No	$0	Do Not Carry Forward
Modifications to the Existing Subway System						
Terminal and Bloor Station Improvements	Partial	No	No	Yes	$300 M	Do Not Carry Forward
Automatic Train Control	Partial	No	No	Yes	$440 M	Do Not Carry Forward
Bus/L.R.T. between Yonge and Spadina Corridors	Partial	Partial	Partial	No	$90-390 M	Do Not Carry Forward
Roadway Improvements						
Reserved Bus Lanes	Partial	Yes	Yes	No	$35-160 M	Do Not Carry Forward
Additional Auto Lanes	No	No	Partial	No	$140-470 M	Carry Forward
Sheppard Subway Extension						
Sheppard Line(Yonge Street to Allen Road	Partial	Partial	Yes	Yes	$710 M	Do Not Carry Forward
Extensions to the Existing Subway System						
Northerly Extensions	Partial	Yes	Yes	Yes	$955-1730 M	Carry Forward As Staged Approach to Loop
Northerly Extensions with Bus/L.R.T Connection	Partial	Yes	Yes	No	$965-1910 M (SIC)	Do Not Carry Forward
Northerly Extensions with Sheppard Subway	Partial	Yes	Yes	Yes	$1365-2140 M	Do Not Carry Forward
Looping of the Yonge-University-Spadina Subway						
Loop	Yes	Yes	Yes	Yes	$815-1590	Carry Forward

Notes:
(1) Social and natural environmental effects are primarily based on a) Surface facilities generally having Significant direct effects along their routes and, if applicable, at stations; whereas, b) Subway facilities Being below grade having minimum/no effects except stations.
(2) No capital cost but major indirect on-going costs.
(3) Detailed analysis and evaluation charts are included in 1994 Yonge-Spadina Subway Loop EA, Appendix A.
(4) All costs are exclusive of property and in 1991 dollars.



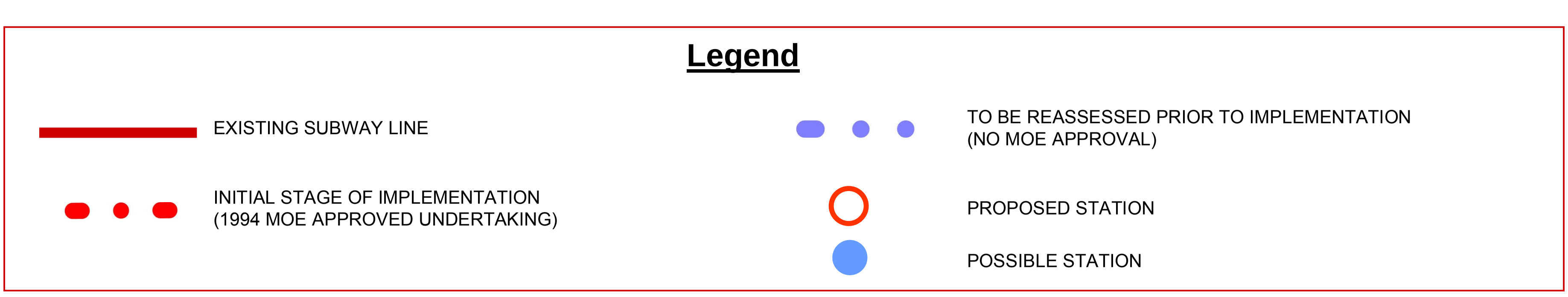


FIGURE 5-6: Preferred Yonge-University-Spadina Subway Loop

The two-phase approach outlined in the 1994 EA was to implement the northerly extension of the Spadina Subway from Downsview Station via Keele Street to York University as a first phase of the Undertaking. At that time, it was anticipated that completion of the entire loop from the Spadina Subway to the Yonge Subway via Steeles would be carried out many years into the future. The 1994 EA recommended that prior to committing funds to the completion of the loop an assessment be made to verify that "looping" is still an appropriate solution given the evolving conditions at the time.

In 1994, the Minister of the Environment and Energy authorized the TTC to proceed with the first phase to York University via a Notice to Proceed with the Undertaking. However, due to lack of funding, the Yonge-Spadina Subway Loop Project was not implemented

In 1996, the extension of the Spadina Subway to Sheppard Avenue (which received MOE approval in 1991) was complete and Downsview Station became the new terminal station.

5.2.3. Review of 2001 Rapid Transit Expansion Study (RTES)

In support of the new City of Toronto Official Plan, in 2001 TTC conducted the Rapid Transit Expansion Study (RTES) to examine the needs and priorities for expansion of Toronto Transit Commission's rapid transit system to 2021 in support of the population and employment growth envisioned in the new City of Toronto Official Plan and in recognition of Greater Toronto Area (GTA) development trends.

In order to assess future priorities, the RTES examined the projected population and employment growth for the City of Toronto and the GTA regions, reviewed proposed transit projects, updated costs, ridership and development potential for each project, analyzed the performance of each transit option based on the relationship between successful transit projects and the necessary density to support transit investments and developed an affordable and sustainable investment strategy for the City of Toronto.

A short list of projects "which have the highest potential for success" (see Figure 5-7) were retained for further analysis in the RTES. The following matters were investigated:

1) Estimates of ridership;
2) Updated capital costs;
3) Operating costs;
4) Estimates of population and employment within 500 metres of each station; and,
5) Implications for policy, inter-regional matters and operations.

The RTES included an examination of the attributes common to successful new transit projects. These attributes for success became the criteria used to assess the short list of transit projects. The attributes for success included the following critical factors:

1) Existing densities – 100 persons and jobs per hectare are needed to achieve transit modal splits conducive to rapid transit;
2) Policy framework – zoning for appropriate densities and parking standards;
3) Potential for redevelopment – attractiveness of stations and corridors; and,
4) Extent to which an existing area is already successful from a transit perspective.

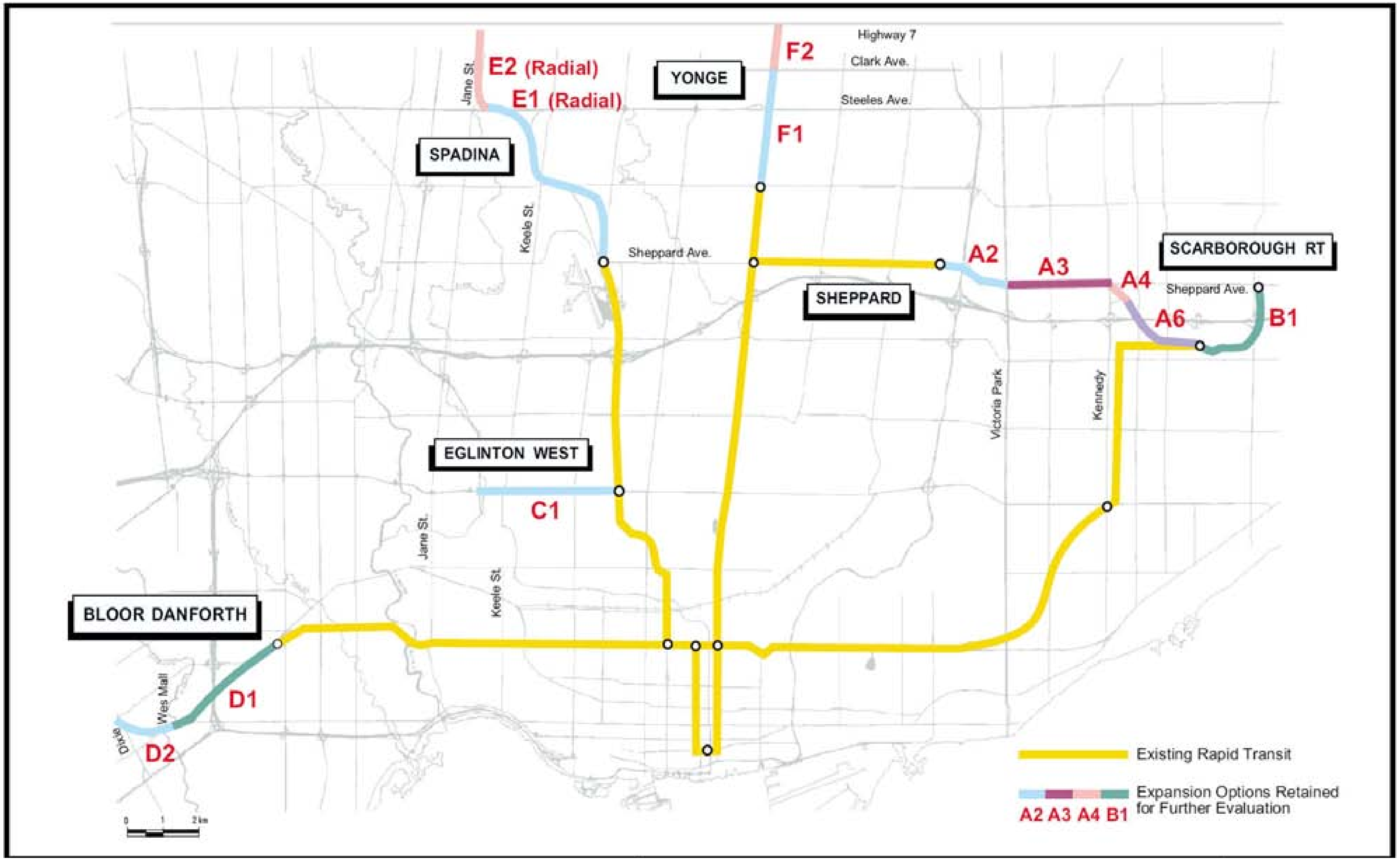
The RTES examined the Yonge-University-Spadina Subway Loop on the basis of operational benefits, cost-effectiveness and ability to eliminate operational constraints at terminal stations (such as terminal improvements and signalling system improvements).

A critical issue that affected the prioritization of rapid transit options in the RTES was whether or not the Yonge Subway would have sufficient capacity to cope with projected growth for the period from 2011 to 2021. A related issue was whether the concept of connecting the Yonge and Spadina Subways to increase the capacity of the lines was still required to alleviate congestion on the Yonge Subway south of Bloor Street. In other words, this Study provided a re-assessment of the need for the looping of the Yonge and Spadina Subways.

The TTC concluded that the looping of the two lines was no longer required in the foreseeable future. Specifically, the RTES outlined the rationale for the recommended elimination of the loop along Steeles Avenue as follows:

1) In the early 1980's, ridership on the Yonge Subway had peaked at 32,000 passengers per hour per direction or the practical capacity of the Yonge Subway. Since that time ridership on the Yonge Subway has declined significantly to a low of 20,400 passengers per hour per direction in 1996-1997. While ridership recovered to 27,000 passengers per hour per direction in 2001 there was still spare capacity for the short to medium term. The growth in ridership forecast for the Yonge Subway during the 1990's had not materialized;
2) Other TTC initiatives (capital and operating) were being implemented in the short term to respond to congestion and reliability concerns on the Yonge Subway at a lower cost than looping the two lines;
3) A large portion of future growth in travel from outside Toronto to the Toronto Central Area could be more effectively served by GO Rail commuter services; and
4) It was expected that, in the future, there would be better balance between residential and employment growth in the downtown and waterfront areas than there was in the past. This balanced growth would moderate the need for increased subway capacity into the downtown area.

The RTES concluded that the situation, which prompted the 1994, EA has changed significantly and consequently looping is not required in the foreseeable future.



Source: Rapid Transit Expansion Study 2001

FIGURE 5-7: Rapid Transit Options Retained for Further Analysis- 2001 Rapid Transit Expansion Study

Review of the Alternatives Considered in 2001

As part of the RTES reconsideration of the loop approach, the TTC further considered alternative alignments/routes for a northerly extension of the Spadina Subway.

The TTC Study concluded that based on the proposed 2.7 million population growth scenario in the City of Toronto, peak point ridership on the Yonge Subway Line was forecast to increase from 24,000 passengers per hour per direction in 1999 to approximately 30,000 per hour in 2021 (overall growth of 15%). If the population growth occurred in the Toronto downtown area, then commuting would be reduced during rush hours as a result of the improved balance between employment and the number of people living in the downtown area.

The Yonge Subway peak point forecast of 30,000 passengers per hour per direction would place the Yonge Subway within 10% of its theoretical capacity. Thus, the RTES identified operational and capital improvements other than the loop, which could provide additional capacity at a lower cost.

The RTES looked at terminal and signalling improvements, rapid transit and surface transit options and others. In all of these options, the TTC continued to recognize the need to improve the Yonge-Bloor Station, regardless of the option selected. Based on the analysis of these options and improvements, the RTES concluded that:

1) Looping of Yonge-Spadina Subways on Steeles Avenue could be pushed further north;
2) Radial extensions of the Spadina Subway beyond York University could be considered if Steeles Avenue was no longer the top of the loop; and
3) Alignments to penetrate westerly into the York University campus could be considered.

From this analysis, the RTES explored refinements to Phase One of the 1994 EA. The RTES identified two specific Spadina Subway radial options:

1) Option E1. Spadina Subway Radial (Downsview to Steeles)
2) Option E2. Spadina Subway Radial (Downsview to Vaughan Corporate Centre)

These two options are illustrated on Figure 5-7 and described below:

<u>Option E1 – Spadina Subway North to Steeles Avenue</u>

This option would provide York University with a central station inter-regional bus terminal for TTC, GO Transit and York Region on Steeles Avenue (permitting up to 3,500 parking spaces in the Hydro right-of-way north of Steeles Avenue).

Considerations related to this staging option included:

1) Precluding the ability to loop along Steeles Avenue (either no loop or a more northerly loop in the future);
2) Possible further radial extensions to the north or west;
3) Surface transit facilities could be moved from the York University core (the Common) and be located north of Steeles Avenue; and
4) Bus operations are preferred at Steeles and Keele/Finch stations;

<u>Option E2 - Spadina Subway Radial (Downsview to Vaughan Corporate Centre)</u>

A second possible option for a northerly extension of the Spadina Subway Line would be to extend the Spadina Subway Line in a single stage to the Vaughan Corporate Centre shown in Figure 5-7.

This extension from Downsview Station would be 8.6 kilometres in length and would entail one additional station at Jane Street/Highway 7 in the Vaughan Corporate Centre. With this option, it was assumed that a station at Highway 407 would be deferred pending the completion of the Highway 407 Transitway.

Considerations related to this staging option included:

1) Capital costs were high to reach the Vaughan Corporate Centre, an area which is not yet established;
2) Vaughan Corporate Centre densities are expected to remain below rapid transit supportive threshold levels for the foreseeable future; and
3) Bus service from Steeles to Vaughan Corporate Centre is an interim option from Option E1.

The TTC evaluation of these two options led to the conclusion that the Vaughan Corporate Centre development held the potential for large ridership in the future and that this extension to the Highway 7 area could divert riders from the congested Yonge Subway and thus, postpone the need to complete the Yonge-University-Spadina Subway loop. Both options were carried forward for further analysis in the RTES.

The RTES noted that the proposed radial Spadina Subway extension from Downsview Station to Steeles Avenue (Option E1) was the preferred option. This preference was due to its small cost relative to the operational and re-development potential that it provided. The proposed extension to Steeles would not preclude the ability to provide a direct transit connection on a new north-south alignment, west of Jane Street, to the Vaughan Corporate Centre to address Vaughan's long-term objective for rapid transit to the Corporate Centre.

In addition, the RTES identified a revised alignment the Spadina Subway Extension. Between Downsview Station and Keele/Finch Station an alignment was identified which would result in a GO/Finch Station being located at Sheppard Avenue (at the CN/ Bradford GO Line) and the shifting of the Keele/Finch Station approximately 200 metres to the south. This proposed alignment could be implemented to either Steeles or the Vaughan Corporate Centre (i.e., either Option E1 or E2). The question of the precise alignment was to be the subject of further analysis following the screening of the options to a short list.

The RTES recommended further analysis to determine the best alignment of the Subway between Downsview Station and York University, including review of an alternate GO Rail / TTC interchange station at Sheppard Avenue (instead of Finch Avenue) and a Keele/Finch Station closer to the Keele/Finch intersection.

Additional subway alignments and station location alternatives were identified, presented and reviewed with the public during the preparation of this EA study. These are more fully described in subsequent sections.

5.2.4. Identification of Key Changes since 1994

As documented previously in this EA, there have been a number of changes that have occurred in the Study Area. Five main areas of change have been identified as:

1) Policy context;
2) Planning initiatives;
3) Road and transit projects;
4) Land development decisions; and
5) Property acquisition activities.

This section provides a summary of the key changes, which have occurred since the 1994 EA, and identifies the relationship between changes and the alternatives to the Undertaking. Tables 5-5 to 5-8 provide an overview of the changes in the land use and transportation planning frameworks from 1994 to 2006 and document which of the original six alternatives, best addresses the change.

Table 5-5: Changes to Policy Context in the Study Area and Corresponding Alternatives to the Undertaking

Area or Source Of Change	Change to the Environment Since 1994	Alternative(s) to the Undertaking which address this change
Province	Provincially appointed Smart Growth Panel recommends extension of Spadina Subway to Vaughan Corporate Centre as component of inter-regional transit grid.	5. Extensions to the Existing Subway System
City of Toronto	One level of government due to amalgamation of Metropolitan Toronto and Cities. New Official Plan recommends Higher Order Transit services in exclusive right-of-ways, including Downsview Station to York University.	5. Extensions to the Existing Subway System
York Region	1994 and 2002 Official Plans establish regional centre at Highway 7 and Jane Street (Vaughan Corporate Centre). 1994 and 2002 Official Plans promote Spadina Subway Extension to Vaughan Corporate Centre.	5. Extensions to the Existing Subway System
City of Vaughan	Official Plan Amendment No. 400 (1995) identified the Regional Centre as the Vaughan Corporate Centre. Secondary Plan for Corporate Centre prepared (Official Plan Amendment No. 500 – 1998). Official Plan Amendment No. 400 and Official Plan Amendment No.500 support the subway extension to the Corporate Centre.	5. Extensions to the Existing Subway System
TTC	Rapid Transit Expansion Study, which recommends radial extension of Spadina Subway to York University, Steeles Avenue and, ultimately to Vaughan Corporate Centre.	5. Extensions to the Existing Subway System

Notes:
Alternatives to the Undertaking:

1) Do Nothing
2) Modifications to the Existing Subway System
3) Roadway Improvements
4) Sheppard Subway Extension
5) Extensions to the Existing Subway System
6) Looping of the Yonge-University-Spadina Subway

Table 5-6: Changes to Planning Initiatives in the Study Area and Corresponding Alternatives to the Undertaking

Area or Source Of Change	Change to the Environment Since 1994	Alternative(s) to the Undertaking which address this change
City of Toronto	York University and Downsview Secondary Plans encourage Spadina Subway Extension. Special studies conducted for Keele Street corridor and the vicinity of Downsview Station.	5. Extensions to the Existing Subway System
York Region	Official Plan creates Vaughan Corporate Centre (Highway 7 and Jane Street) with Spadina Subway Extension Several studies and Official Plan Amendments to identify protect and acquire lands for subway extension to Vaughan Corporate Centre.	5. Extensions to the Existing Subway System
City of Vaughan	Official Plan Amendment 529, which amends Official Plan Amendment 500, identifies and provides for acquisition of a subway alignment to the Vaughan Corporate Centre (S. 41 of the Planning Act) along with an inter-regional bus terminal on Steeles Avenue.	5. Extensions to the Existing Subway System

Notes:
Alternatives to the Undertaking:

1) Do Nothing
2) Modifications to the Existing Subway System
3) Roadway Improvements
4) Sheppard Subway Extension
5) Extensions to the Existing Subway System
6) Looping of the Yonge-University-Spadina Subway

Table 5-7: Changes to Road/Transit Projects in the Study Area and Corresponding Alternatives to the Undertaking

Area or Source Of Change	Change to the Environment Since 1994	Alternative(s) to the Undertaking which address this change
Highway 407	Highway opened in 1997.	N/A Although not operational in 1994, all travel demand projections undertaken in support of the Yonge-Spadina loop assumed that Highway 407 would be in place for the future planning horizons considered.
York Region Transit	Amalgamated York Region Transit serves entire Region. York Region Highway 7 Corridor and North-South Link Public Transit Improvements Environmental Assessment underway.	5. Extensions to the Existing Subway System The Individual EA recently completed by York Region considers BRT technology within the Highway 7 corridor, with connections to the Yonge subway and Spadina subway. The York Region EA seeks approval for a bus-based connection between the Jane/Highway 7 area and the terminal of the Spadina subway as an interim measure. The ultimate undertaking for the Region's EA is a subway extension to the Vaughan Corporate Centre (Jane / Highway 7 area).
TTC	Yonge Subway Line ridership remains lower than peak demand in 1980's. Bus-only lanes Downsview Station to York University Class EA underway.	5. Extensions to the Existing Subway System TTC is exploring and implementing improvements to the existing Yonge subway in order to satisfy long-term capacity needs, which are substantially less than what was projected in 1994. Recognizing the continued increase in transit ridership from the current subway terminus (Downsview Station) to York University and the increasing congestion on all roads within the Study Area, TTC has completed a Municipal Class EA in support of bus-only lanes from Downsview Station to York University. This project is recognized as an interim project and includes decommissioning commitments given that the bus-only lanes become redundant when the subway is extended.
GO Transit	Three A.M. and three P.M. peak trains on GO Bradford Rail Line. New temporary York University Station on Canarctic Drive.	N/A Although not operational in 1994, all travel demand projections undertaken in support of the Yonge-Spadina loop assumed increased GO Transit service on the Bradford Line. The location of the short term GO station eliminated station spacing as a constraint when considering a transfer between TTC and GO at Sheppard Avenue.

Notes:
Alternatives to the Undertaking:
1) Do Nothing
2) Modifications to the Existing Subway System
3) Roadway Improvements
4) Sheppard Subway Extension
5) Extensions to the Existing Subway System
6) Looping of the Yonge-University-Spadina Subway

Table 5-8: Changes to Land Development Decisions in the Study Area and Corresponding Alternatives to the Undertaking

Area or Source Of Change	Change to the Environment Since 1994	Alternative(s) to the Undertaking which address this change
York University	Recent development projects include provisions for future subway station at location recommended for further Study in the 2001 Rapid Transit Expansion Study.	5. Extensions to the Existing Subway System As part of the identified development provisions, the York University terminal station site has been redeveloped (the Schulich School of Business).
Downsview Lands	Former CFB Toronto Lands, now managed by Parc Downsview Park Inc. and to be developed as parkland, a technology park, housing and mixed uses. Continued operation of Bombardier Aerospace manufacturing facility and associated runway protected in Downsview Area Secondary Plan and by Federal legislation.	5. Extensions to the Existing Subway System (with a station within the Downsview lands)
Property Acquisition Activities	Property acquired at Steeles Avenue for future transit gateway. Acquisition of Hydro corridor lands for future commuter parking underway.	5. Extensions to the Existing Subway System

Notes:
Alternatives to the Undertaking:

1) Do Nothing
2) Modifications to the Existing Subway System
3) Roadway Improvements
4) Sheppard Subway Extension
5) Extensions to the Existing Subway System
6) Looping of the Yonge-University-Spadina Subway

5.3. Public Support for the Recommended Alternative to the Undertaking

The results of this review were presented at the first round of public Consultation (held on February 10 and 13, 2005). Based on all comments received, a radial extension of the subway received public support. Approximately 15% of the respondents agreed with the radial extension provided that it did not preclude a loop with the Yonge subway. As discussed in section 6.0 of this EA, the Undertaking does protect for a loop. However, this loop would be north of Steeles Avenue.

Through the consultation process for this EA, no new 'alternatives to,' or modified from those considered previously 'alternatives to' were identified during the course of this EA.

5.4. Recommended Alternative to the Undertaking

Based on the analysis undertaken in previous studies, the review undertaken by the Study Team and the public support secured during the first round of public consultation, radial extension of the Spadina Subway Line to Steeles Avenue via York University is the preferred alternative and is recommended in this EA to be carried forward for analysis of more detailed alignments, stations and facilities.

Alternative Methods of Carrying Out the Undertaking

6.0 Alternative Methods of Carrying Out the Undertaking

6.1. Introduction

Sub-section 6.1(b) of the ***Environmental Assessment Act*** requires that an environmental assessment include a description of and a statement of the rationale for the alternative methods of carrying out the undertaking. This section describes the approach used by the Study Team to generate, evaluate and select the preferred subway extension.

6.1.1. Overall Approach for Selecting the Preferred Subway Extension

Section 6.5 of the Terms of Reference (ToR) describes the approach to be used to evaluate alternative methods of carrying out the undertaking. The ToR identified three alignments to be analyzed during the environmental assessment including:

1) The 1994 EA approved alignment from Downsview Station to York University;
2) The Rapid Transit Expansion Study (RTES) alignment from Downsview Station to Steeles Avenue via York University with a GO-TTC Interchange at Finch Avenue; and,
3) The RTES alignment from Downsview Station to Steeles Avenue via York University with a GO-TTC Interchange at Sheppard Avenue.

In addition to these three alignments, the ToR also committed the Study Team to develop other alignments and station locations. These alternatives would be analyzed to determine their ability to meet the purpose and goals of the undertaking based on technical design criteria, TTC standard practices, costs and construction methods. Therefore, the ToR envisioned a one-step selection process that would evaluate the three alignments identified previously and new alignments to be identified by the Study Team during conduct of the environmental assessment.

In support, the EA ToR prepared a draft list of design and evaluation criteria to be used in the selection of the Preferred Method of Carrying out the Undertaking.

6.1.2. Systematic Approach to Alignment and Station Selection

As described in section 2.0 of this EA, the Study Team determined that the number of potential permutations and combinations of alignments and station locations was not manageable and alignments and station locations with high potential may be excluded without an appropriate level of analysis. As a result, the Study Team initiated a three phase process to ensure that no alternative method of carrying out the Undertaking with high potential would be excluded without an appropriate level of analysis.

This three phase process (see Figure 6-1), although not identified in the ToR, was considered reasonable, practical and in step with the ToR, the purpose and objectives of the Undertaking and standard environmental assessment practice.

This section describes Phases One and Two, which included activities such as generating alternative methods of carrying out the Undertaking and preferred alignment/station concept, developing evaluation criteria, collecting and analyzing data, evaluating alternatives and selecting a preferred route/ general station location. These common activities for each step of the process are described below. The result of the analysis contained in this section results in the identification of the Undertaking, which is described in section 7.0 of this EA. Phase Three of the study, as shown in Figure 6-1, involves the detailed assessment of the effects of the Undertaking, which is described in section 8.0 of this EA.

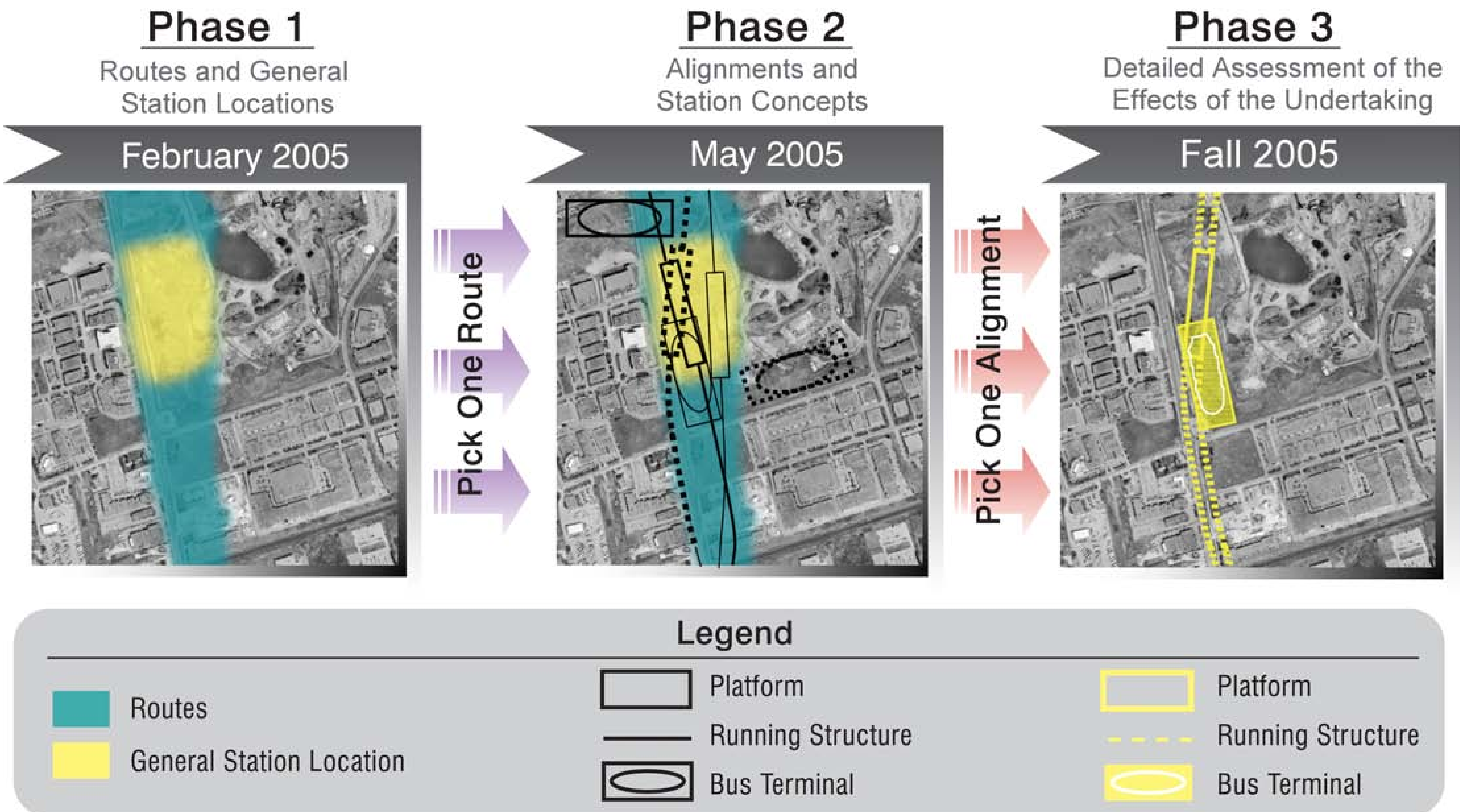


FIGURE 6-1: Spadina Subway Extension Selection Process

6.1.3. Systematic Approach to Analysis Criteria

Section 6.5 of the ToR describes the approach to be followed, including the development of evaluation criteria. The ToR states that:

> ***"Evaluation criteria will be applied to each alignment to determine the extent and magnitude of environmental impacts during the construction and operation of the proposed Spadina Subway Extension. Each alignment will be evaluated based on its ability to satisfy the evaluation criteria"***[1]

Proposed criteria to be used to evaluate alternative methods were presented in Table 5 of the ToR. In reviewing Table 5 of the EA ToR, the Study Team determined that:

1) All draft criteria could be traced back to the five project objectives and thus, by grouping each criteria under one of the five Project Objectives, alternative selection always considers the overall project objectives.
2) In light of the three phase approach, certain criteria required very detailed analysis that could not be calculated at the routes and general station location stage (Phase One) and thus were deferred to Phase Two. Other issues were considered fundamental to the success of the project, and therefore were elevated to generation criteria (for routes and alignments).
3) In response to comments received during consultation, refinements to indicators and measures were made to better address project issues.

Tables 6-1 and 6-2 summarize the refinement to the original ToR indicators.

The ToR did not indicate the methodology for comparing alternatives. Therefore, the Study Team used two complementary evaluation methods to assist in the evaluation of alternatives: a qualitative method (Reasoned Argument Method) to evaluate the alternatives to select a preferred method of carrying out the Undertaking and a numeric method (Multi-Attribute Tradeoff System) as a test of traceability of decisions made.

Reasoned Argument Method (RAM) is the process of getting from one decision to the next through a series of logical steps. The method uses the measured amounts from the analysis step to rank alternatives from most preferred to least preferred. Indicators that generate no appreciable difference (i.e. are the exact same or are considered essentially equal) are identified as "not decision making criteria" and are eliminated from further analysis. Based on the preference by indicator, the alternatives are subsequently ranked at a criteria level, followed by the project objective level. This approach facilitates the creation of a list of advantages and disadvantages for each alternative. The relative significance of the effects is examined to provide a clear rationale for the selection of the preferred alternative.

The numeric method used was the Multi-Attribute Trade-off System (MATS) – Personal Computer Version (2.02). MATS-PC is a computer program designed by the U.S. Department of the Interior. Reclamation to help planners evaluate multi-attribute alternatives to reach a judgment of each alternative's relative worth or desirability. MATS-PC is an effective tool because it allows the application of sensitivity tests to determine how different weights and assumptions influence the results of the analysis. The output of the model is the composite of the analytical measurements and the weights assigned to each indicator. The preference is identified by the highest numerical output.

[1] Spadina Subway Extension Terms of Reference, P.12

Table 6-1: Analysis Criteria used in the Selection of Routes

Objectives	Criteria	Indicators	Rationale
A) Provide subway service to the Keele/Finch area, York University and a new inter-regional transit terminal at Steeles Avenue.	A1) Convenience for riders to walk to local stations.	A1.1) Existing population and employment within 500 m walking distance of subway stations. A1.2) Future population and employment within 500 m walking distance of subway stations. A1.3) Students, faculty and staff within 500 m walking distance of York University Station.	Stations should be located closer to higher density development (major traffic generators or attractors) to maximize ridership. Existing and future ridership levels should be taken into consideration when siting stations. The station to be located at York University should maximize convenience for students, faculty and staff.
B) Provide improved connections between the TTC subway and GO Transit, York Region Transit and TTC buses.	B1) Convenience for other modes of travel.	B1.1) Connection to Finch West Bus (Route 36) and Keele Bus (Route 41) in the Keele/Finch area. B1.2) Ease of accessibility for other travel modes (taxi, bicycle, pedestrians, Wheeltrans, passenger pick up and drop off, commuter parking, ambulatory/non-ambulatory disabled persons).	The subway extension should intercept heavily used TTC bus routes in the Keele/Finch area to maximize ridership. All potential routes and general station locations for the subway extension will intercept YRT bus and GO Transit bus and trains to maximize ridership. The Steeles Avenue inter-regional transit terminal will intercept TTC, YRT and GO Transit buses; therefore, there is no distinction to be made among the subway stations. Similarly, there is no distinction to be made among the subway stations to be located along the GO Transit Bradford Line. The subway extension should maximize the potential for all modes of transportation to interface with the subway extension. This, in turn, increases the overall ridership of the subway extension.
C) Support local population and employment growth.	C1) Conform with current approved planning documents.	C1.1) Conformity with the goals, objectives and policies of the City of Toronto planning documents including the Metro plan, City of North York Official Plan, York University Secondary Plan, and Downsview Area Secondary Plan. C1.2) Conformity with the goals, objectives and policies of the Region of York and the City of Vaughan planning documents including the Region of York Official Plan and ROPA 43, and the City of Vaughan OPAs 450, 500, 529 and 620.	The subway extension is proposed through already developed areas, and areas that have been planned for many years without consideration of the new subway service. It is important to consider the impacts of the subway on current approved planning policy and to confirm whether or not that context remains valid.
	C2) Maximize redevelopment potential in support of the subway extension.	C2.1) Consistency with the objectives of the new City of Toronto Official Plan and the Keele Street Study. C2.2) Consideration of the development objectives of the Parc Downsview Park and York University. C2.3) Potential to stimulate transit supportive development in proximity to station locations.	Notwithstanding current approved planning policies, the objectives of the City's new Official Plan (not approved) and the impact of the subway extension as a stimulator of land use changes, must be recognized. The requirement for transit supportive, intensified development in proximity to subway stations may require changes to current planning policy.

Table 6-1 (Continued): Analysis Criteria used in the Selection of Routes

Objectives	Criteria	Indicators	Rationale
D) Minimise adverse environmental effects.	D1) Protect existing stable land uses.	D1.1) Length of subway route adjacent to residential neighbourhoods. D1.2) Length of subway route within Keele Industrial area. D1.3) Number of sensitive operations at York University within the zone of influence of the subway extension.	The station extension should not have an adverse effect on existing stable land uses including residential, employment and institutional lands.
	D2) Minimise the potential effects on important natural and cultural heritage features.	D2.1) Number of important natural heritage features within the zone of influence of the subway extension. D2.2) Area of groundwater discharge within the zone of influence of the subway extension. D2.3) Number of important cultural heritage features within the zone of influence of the subway extension.	The subway extension should not have an adverse effect on important natural and cultural heritage features such as valleylands, woodlots, archaeological sites and Black Creek Pioneer Village. Groundwater discharge areas are considered important due to their role in sustaining baseflow in watercourses. The requirement to dewater adds complexity to construction and may result in adverse environmental effects.
E) Achieve reasonable capital and operating costs.	E1) Minimise capital and operating costs of the subway extension.	E1.1) Length of subway route.	The length of the route will impact the capital and operating costs. The duration of a trip will also be reduced.
	E2) Maximize revenue generated from the subway extension.	E2.1) Total number of A.M. peak period passengers on the subway extension.	The subway extension should be located to maximize ridership and therefore revenue generation.
	E3) Maximize the subway extension in lands with no property costs to the project.	E3.1) Length of subway route within existing road rights-of-way.	A subway extension located within a municipally owned right-of-way will reduce the requirement to purchase property.

Table 6-2: Analysis Criteria used in the Selection of Alignments

Objectives	Criteria	Indicators	Rationale
A) Provide subway service to the Keele/Finch area, York University and a new inter-regional transit terminal at Steeles Avenue.	A1) Potential for riders to walk to local stations.	A1.1) Existing population and employment within 500 m walking distance of subway stations. A1.2) Future population and employment within 500 m walking distance of subway stations. A1.3) Students, faculty and staff within 500 m walking distance of York University Station.	Stations should be located closer to higher density development (major traffic generators or attractors) to maximize ridership. Existing and future ridership levels should be taken into consideration when siting stations. The station to be located at York University should maximize convenience for students, faculty and staff.
	A2) Speed and comfort for subway passengers.	A2.1) Travel time from Downsview Station to Steeles West Station. A2.2) Speed and comfort for subway passengers.	The vertical profile and horizontal alignment influences operating speed, operating costs, maintenance costs, passenger comfort and passenger travel time. An alignment should be selected that exceeds the minimum geometric design standards.
B) Provide improved connections between the TTC subway and GO Transit, York Region Transit and TTC buses.	B1) Convenience for transfers from buses (including Wheel-Trans and Mobility Plus) or GO Rail to subway.	B1.1) Transfer time from bus to subway platform at Steeles West Station and Finch West Station. B1.2) Transfer time from GO Rail to subway platform at Sheppard West Station. B1.3) Delay time for through passengers on the 36 - Finch West bus route and the 41- Keele bus route at Finch West Station. B1.4) Transfer time from subway to future LRT in hydro corridor at Finch West Station	Subway stations will intercept GO Transit buses and trains, YRT buses and local TTC buses. Selecting a station concept that minimizes transfer time between alternative transportation systems and modes will reduce total travel time. Reduced travel time enhances the attractiveness of the subway extension. Through passengers on TTC buses will also be delayed while the bus enters the subway station, allow passengers to board/alight and returns to its original route. The intent is to reduce the delay associated with diversion through the subway station. Passenger safety and comfort should be maximized while walking between subway facilities.
	B2) Convenience for access from other travel modes (taxi, bicycle, pedestrians (including ambulatory/non-ambulatory disabled persons), passenger pick up and drop off and commuter parking.	B2.1) Opportunity to link with cycling routes identified in the City of Toronto's and City of Vaughan's Cycling Master Plans. B2.2) Transfer time from other travel modes to subway platform. B2.3) Quality of walking environment from other travel modes to subway platform.	Reduced travel distance enhances the convenience of the subway extension for other travel modes. This in turn increases the attractiveness of the subway extension. Passenger safety and comfort should be maximized while walking between subway facilities.
	B3) Flexibility for potential future subway extension into York Region.	B3.1) Number, type and sensitivity of significant environmental features potentially affected by a future subway extension into York Region. B 3.2) Number and type of curves between Steeles West Station and Highway 407.	The potential exists to expand the subway system into York Region at a future date. The alignment selected in the vicinity of Steeles West Station will have an influence on a future extension. Environmental constraints are located north of Steeles Avenue that should be avoided. The termination of the subway extension being planned as part of the Environmental Assessment will determine the alignment of a future extension into York Region.
C) Support local population and employment growth.	C1) Maximize redevelopment potential in support of the subway extension.	C1.1) Ability to combine stations with the existing and future built form.	The requirement for transit supportive development in proximity to subway stations may require changes to current planning policy.
	C2) Maximize the potential to create a high quality urban/pedestrian environment.	C2.1) Potential to create a safe environment for pedestrians, cyclists and transit passengers.	The ability to improve the urban environment with the subway extension and its station locations should be maximized. A safe environment for pedestrians, cyclists and passengers should also be achieved.

Table 6-2 (Continued): Analysis Criteria used in the Selection of Alignments

Objectives	Criteria	Indicators	Rationale
D) Minimise adverse environmental effects.	D1) Potential effects on natural heritage features.	D1.1) Area, type, significance and sensitivity of aquatic and terrestrial landscapes, ecosystems/communities and populations/species located within alignment and station footprint areas. D1.2) Area, type, significance and sensitivity of aquatic and terrestrial landscapes, ecosystems/communities and populations/species located within adjacent zones of influence.	Aquatic and terrestrial landscapes, ecosystems/communities and populations/species are valuable resources that should be maintained. The intent is to minimize the loss of and disturbance to natural heritage features. Note: Zones of influence will be impact-specific based on measurement and modelling of groundwater dewatering/drawdown, air emissions, noise, vibration, etc. generated by the subway extension. Analysis will follow provincially recognized protocols.
	D2) Potential effects on geology and hydrogeology.	D2.1) Magnitude and significance of permanent groundwater drawdown (if any) on hydrogeological conditions. D2.2) Potential for soil erosion.	Groundwater recharge/discharge areas and aquifers sustain watercourse baseflow in urban areas. The requirement to temporarily dewater adds complexity to construction and may result in impacts to watercourses. Construction of facilities into or through aquifers may require special construction measures to eliminate or minimize permanent changes to groundwater flow conditions. Poor soil conditions will impact capital cost estimates and may cause erosion/water discharge problems during construction.
	D3) Potential effects on hydrology.	D3.1) Area of flood storage capacity removed. D3.2) Length/area of watercourses/ waterbodies altered. D3.3) Ease and effectiveness of stormwater management at subway facilities.	New development in flood plains is to be prohibited or restricted according to Provincial Policy Statement. Disruption of existing drainage patterns can impact flows and flood levels, riparian rights and aquatic environments. Stormwater management practices are required to treat runoff from hardened surfaces such as parking lots. Some stations provide greater opportunities for quality and quantity control than others. Impacts (based on each configuration) to be compared. I.e. The greater the hard surface area, the greater the need for increased quality/quantity control requirements and increased associated cost (bigger oil/grit separator).
	D4) Potential effects on socio-economic features.	D4.1) Number, type and sensitivity of residences, businesses and community/recreational/institutional facilities located within alignment and station footprint areas. D4.2) Number, type, and sensitivity of residences, businesses and community/recreational/institutional facilities located within adjacent zones of influence.	Residences, businesses and community/recreational/institutional facilities contribute to community character, cohesion and stability. The intent is to minimize displacement of residents, employees, service providers and clients. This indicator includes facilities at York University and ATC Downsview. Emissions of particulate matter, greenhouse gases, noise, vibrations, electromagnetic fields may pose a health risk or nuisance to humans. Some businesses may be sensitive to vibrations or electromagnetic interference. This indicator includes facilities at York University and CFB Downsview. Note: Zones of influence will be impact-specific based on measurement and modelling of air emissions, noise, vibration and electromagnetic interference generated by the subway extension. Analysis will follow provincially recognized protocols.

Table 6-2 (Continued): Analysis Criteria used in the Selection of Alignments

Objectives	Criteria	Indicators	Rationale
D) Minimise adverse environmental effects. (continued)	D5) Potential effects on pedestrian and traffic access/ flow.	D5.1) Number of permanent road closures or access modifications. D5.2) Traffic impacts due to operations of station commuter facilities (bus terminals, passenger pick-up and drop-off and commuter parking)	Subway facilities may result in road closures and access modifications that can disrupt traffic and pedestrian movements and access. Subway facilities can also disrupt traffic flows during passenger pick up and drop off, bus boarding/alighting and commuter parking. Passenger safety must be maintained during these activities. Major intersections in the vicinity of the Finch West Station include Keele/Finch, Keele/Murray Ross, Keele/Four Winds and Finch/Tangiers. Major intersections in the vicinity of Steeles West Station include New East/West Road/Jane, Jane/Steeles and Steeles/Westgate.
		D5.3) Impact on safety of transportation system.	Queues could potentially block access/ egress to bus terminals. At 50th percentile, this will be a common occurrence, which will negatively affect bus operations.
		D5.4) Accessibility for emergency services including fire, police and ambulance.	Subway facilities should be readily accessible to police, fire and ambulance services in the event of an emergency.
	D6) Potential effects on freight and rail passenger service and its signal systems at Sheppard West Station.	D6.1) Impacts on the operation of the CN Newmarket/GO Bradford rail line during construction and operation of the subway extension.	The interface between the CN/ Bradford GO Line and the TTC subway extension should not interfere with existing freight and rail passenger service and signalling.
	D7) Potential effects on cultural heritage resources.	D7.1) Number, type, significance and sensitivity of archaeological sites, built heritage features and cultural landscapes located within alignment and station footprint areas. D7.2) Number, type, significance and sensitivity of archaeological sites, built heritage features and cultural landscapes located within adjacent zones of influence.	Archaeological sites, built heritage features and cultural landscapes are valuable resources that should be maintained. The intent is to minimize the loss of and disturbance to cultural heritage resources. Note: Zones of influence will be impact-specific based on measurement and modelling of air emissions, noise, vibration, etc. generated by the subway extension. Analysis will follow provincially recognized protocols.
	D8) Potential effects on pipelines located in the Finch Hydro corridor.	D8.1) Number, type, and length of pipelines requiring relocation due to subway extension.	Relocation of major oil and gas pipelines is a lengthy and expensive process that should be avoided or minimized, where possible.
E) Achieve reasonable capital and operating costs.	E1) Minimise capital costs.	E1.1) Capital costs including underground and surface subway facilities, fleet and storage.	The subway extension should be planned to minimize capital costs of the subway system and feeder bus network.
	E2) Minimise the costs of property acquisition.	E2.1) Total property cost. E2.2) Potential environmental cleanup costs.	The subway extension should be located to minimize property acquisition costs. The cost of decommissioning contaminated sites is significant and should be avoided, where possible.
	E3) Minimise the net operating cost.	E3.1) The dollar value of net fare and other revenues including commuter parking. E3.2) Operations and maintenance cost of the subway extension, including feeder bus operations.	A subway facility should be planned to minimize costs and maximize revenues.

6.2. Phase One - Routes and General Station Locations

Phase One of the Spadina Subway Extension selection process involved generation and evaluation of routes and general station locations followed by the selection of a preferred route and general station locations along that route. The preferred route and general station locations were then carried forward to Phase Two for further analysis. The Study Team defined routes as broad geographical corridors, within which a number of subway alignments may occur. General station locations were defined by the Study Team as broad geographical areas, within which, a number of station concepts may occur. This section describes the process used to generate, evaluate and select routes and general station locations for the subway extension.

6.2.1. Generation of Routes and General Station Locations

The project objectives outlined in the ToR were used as a foundation for generating routes and general station locations. The project objectives encompass transportation service, land use, socio-economic environment, natural environment and cost/revenue. Based on these project objectives, criteria were developed to guide the Study Team in the generation of routes and general station locations. The route generation criteria were released for review and comment during the first round of consultation. The route generation criteria are presented in Table 6-3.

Table 6-3: Objectives and Criteria used to Generate Routes and General Station Locations

Objectives	Criteria
A) Provide subway service to the Keele/Finch area, York University and a new inter-regional transit terminal and commuter parking facility at Steeles Avenue.	A1) Locate subway station within 500 m of the Keele/Finch Intersection.
	A2) Locate subway station within York University Keele Street Campus.
	A3) Terminate subway extension at York Region's inter-regional transit terminal site on the north side of Steeles Avenue between Jane Street and Keele Street.
B) Provide improved connections between the TTC subway system and GO Transit, York Region Transit and other inter-regional transit services.	B1) Locate subway station where the subway extension crosses the GO Bradford rail line.
	B2) Provide bus terminals, where appropriate, to allow bus passengers (TTC, GO and York Region Transit) to transfer to the subway.
C) Support local population and employment growth.	C1) Protect for a future subway extension to the Vaughan Corporate Centre.
	C2) Subway stations should be 1.0 km apart to maximize the areas serviced by the subway (based on maximum walking distance of 500 m).
D) Minimize any negative environmental impacts.	D1) Where possible, avoid residential areas, fuel tank farms, and significant natural and cultural heritage features.
E) Achieve reasonable capital and operating costs.	E1) Make route as straight as possible or use very large curves so that trains can operate at maximum speeds.
	E2) Start the subway extension where the existing track ends at Downsview Station.

Using the route generation criteria, the Study Team generated eight routes and general station locations. The routes and general station locations illustrated in Figures 6-2 to 6-9 and are summarized in Table 6-4. The locations of Downsview Station and Steeles West Station were common for all eight routes (see criteria E.2 and A.3 from Table 6-2). A route that placed a station at GO/Finch and GO/ Chesswood in combination with a station at Keele/Finch was not generated because neither of these routes met TTC design standards (criteria E.1).

ROUTE 1: GO / SHEPPARD KEELE / FINCH YORK UNIVERSITY "COMMON"

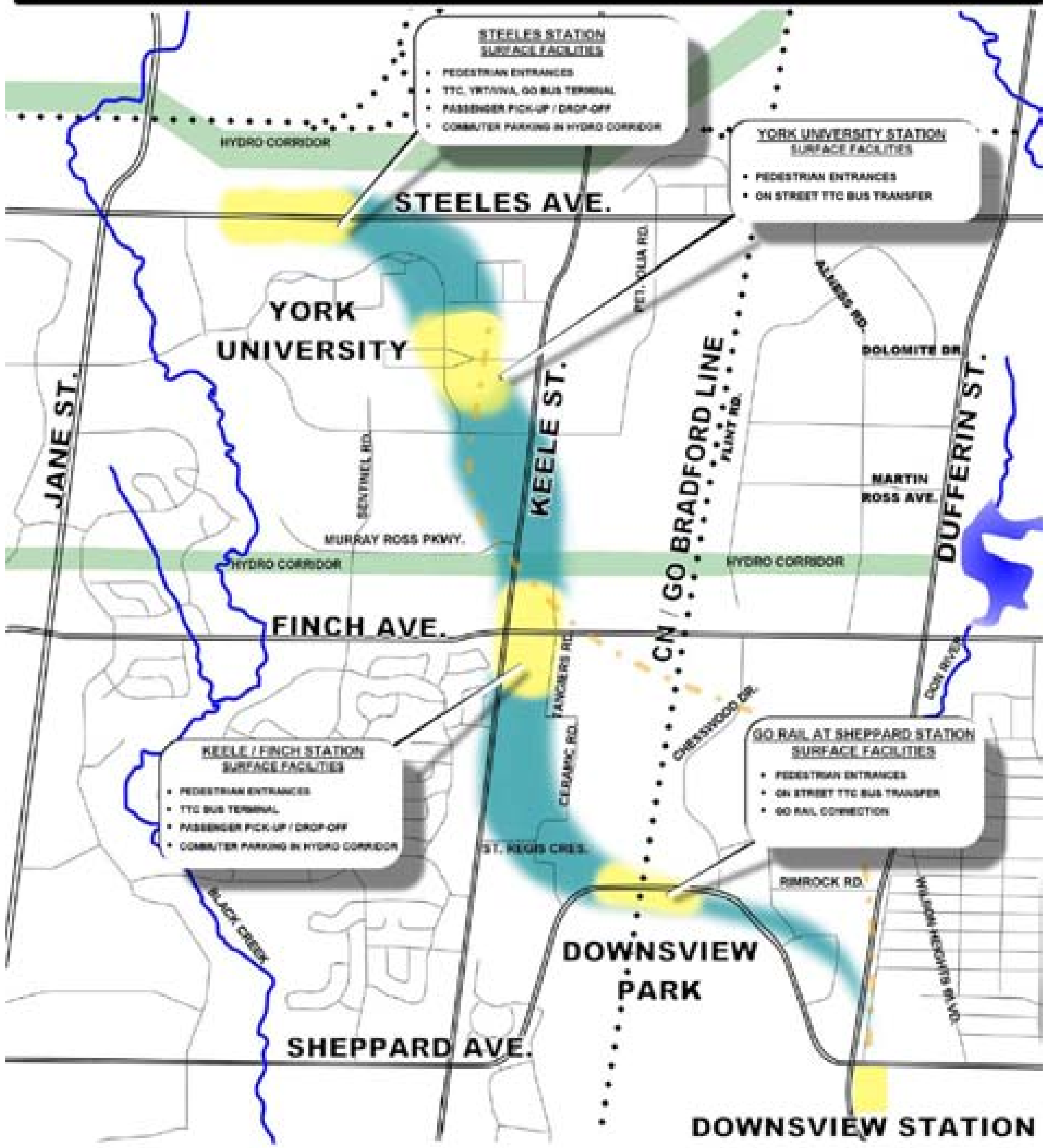


FIGURE 6-2:Route 1

ROUTE 2: GO / SHEPPARD KEELE / MURRAY ROSS YORK UNIVERSITY "COMMON"

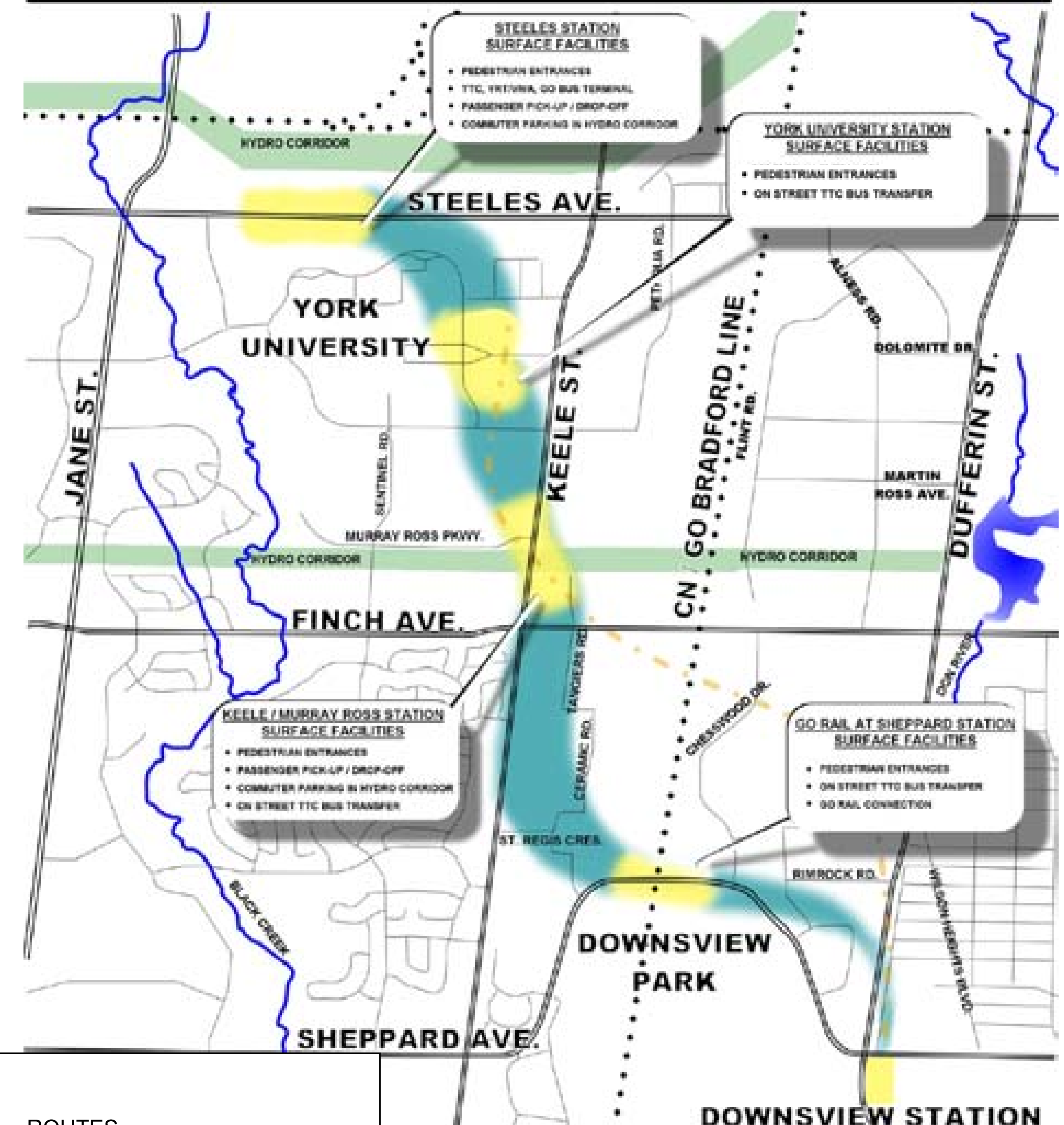


FIGURE 6-3:Route 2

Legend

(teal)	ROUTES
(yellow)	GENERAL STATION LOCATIONS
(dashed)	1994 EA ALIGNMENT

ROUTE 3: GO / SHEPPARD KEELE / MURRAY ROSS YORK UNIVERSITY "SENTINEL"

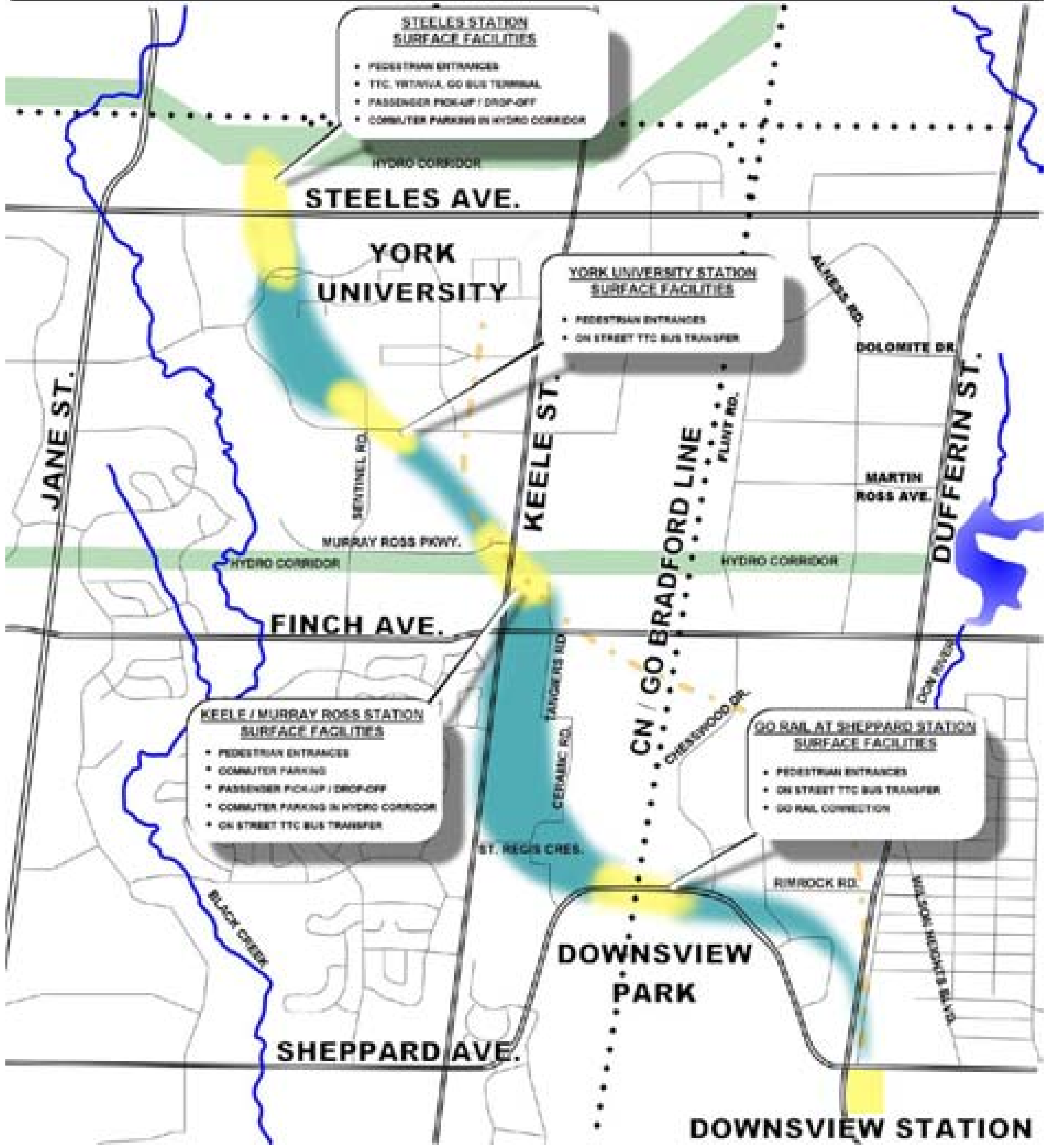


FIGURE 6-4:Route 3

ROUTE 4: GO / SHEPPARD KEELE / FINCH YORK UNIVERSITY "SENTINEL"

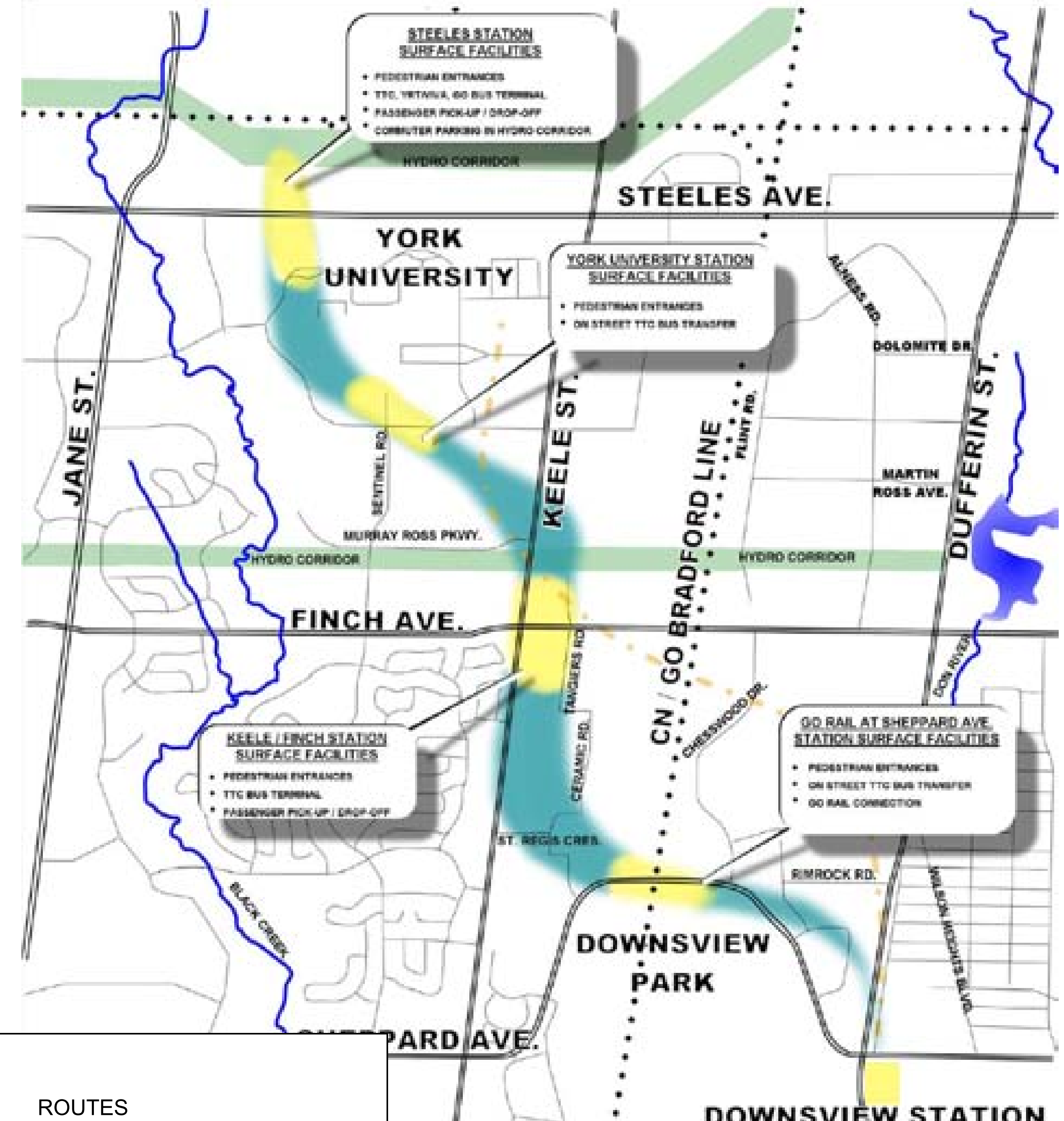


FIGURE 6-5:Route 4

Legend

- ROUTES
- GENERAL STATION LOCATIONS
- 1994 EA ALIGNMENT

ROUTE 5: GO / FINCH KEELE / MURRAY ROSS YORK UNIVERSITY "COMMON"

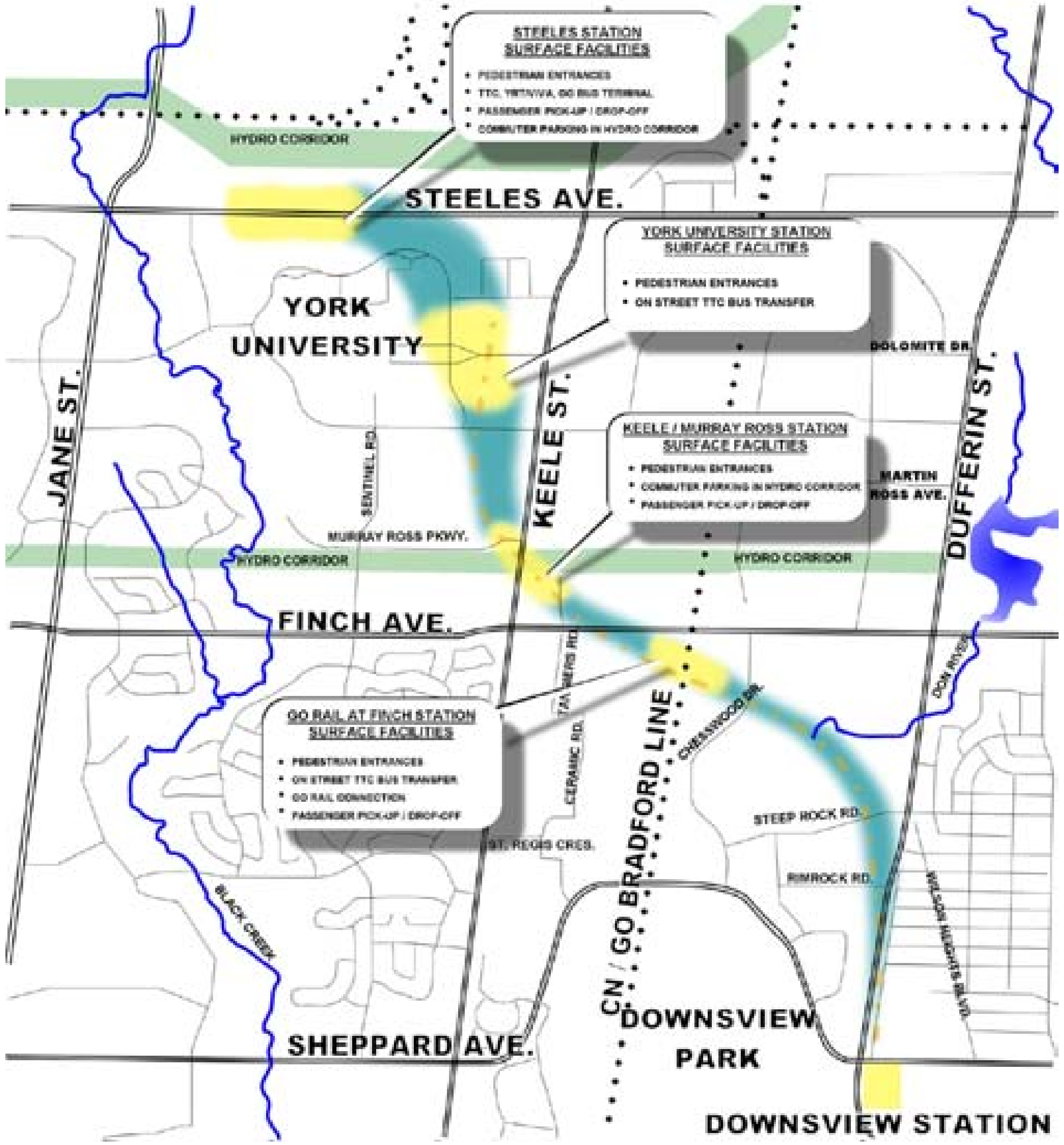


FIGURE 6-6:Route 5

ROUTE 6: GO / FINCH KEELE / MURRAY ROSS YORK UNIVERSITY "SENTINEL"

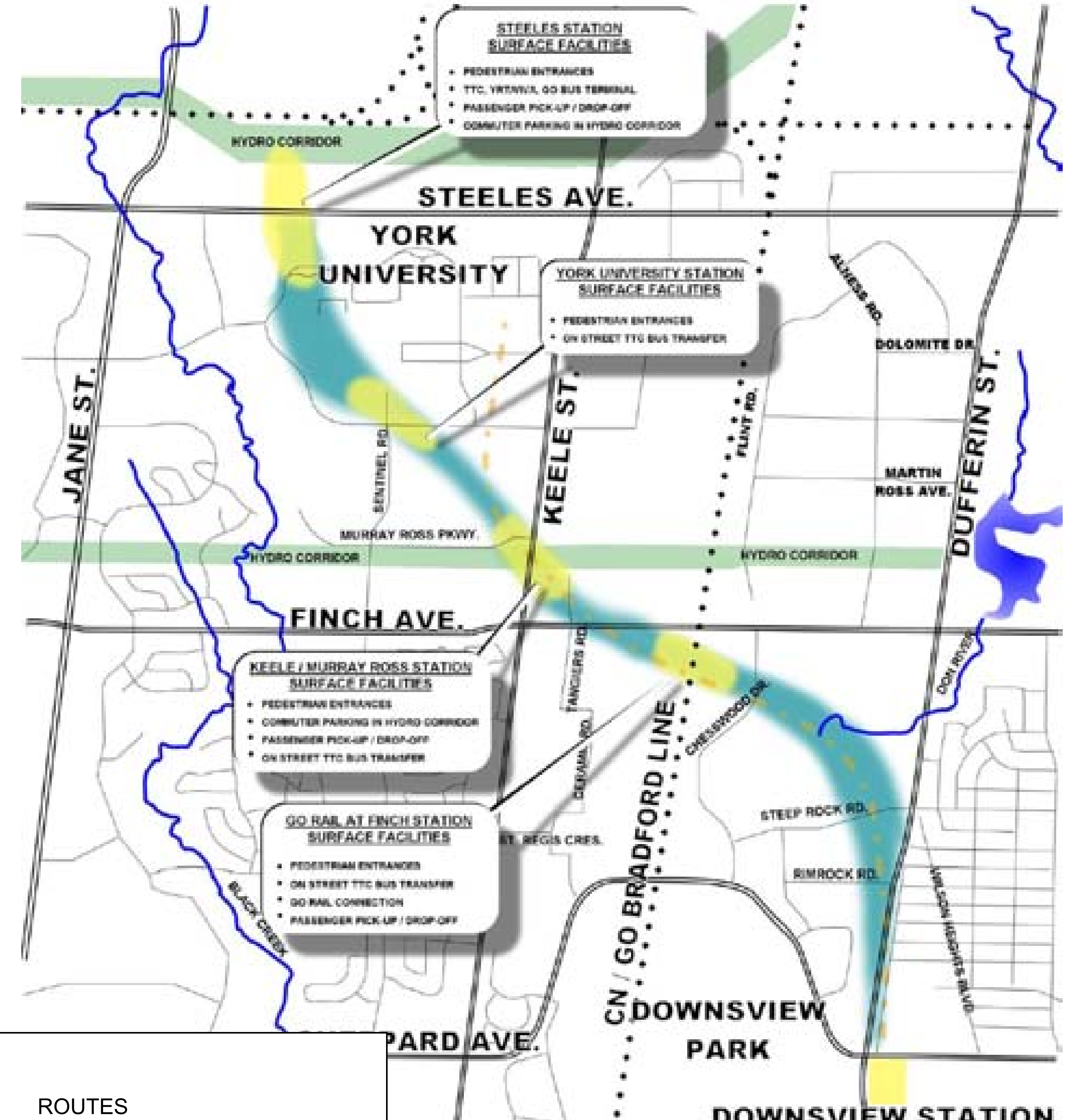


FIGURE 6-7:Route 6

Legend

(teal)	ROUTES
(yellow)	GENERAL STATION LOCATIONS
(dashed yellow)	1994 EA ALIGNMENT

SPADINA SUBWAY EXTENSION

ROUTE 7: GO / CHESSWOOD KEELE / MURRAY ROSS YORK UNIVERSITY "COMMON"

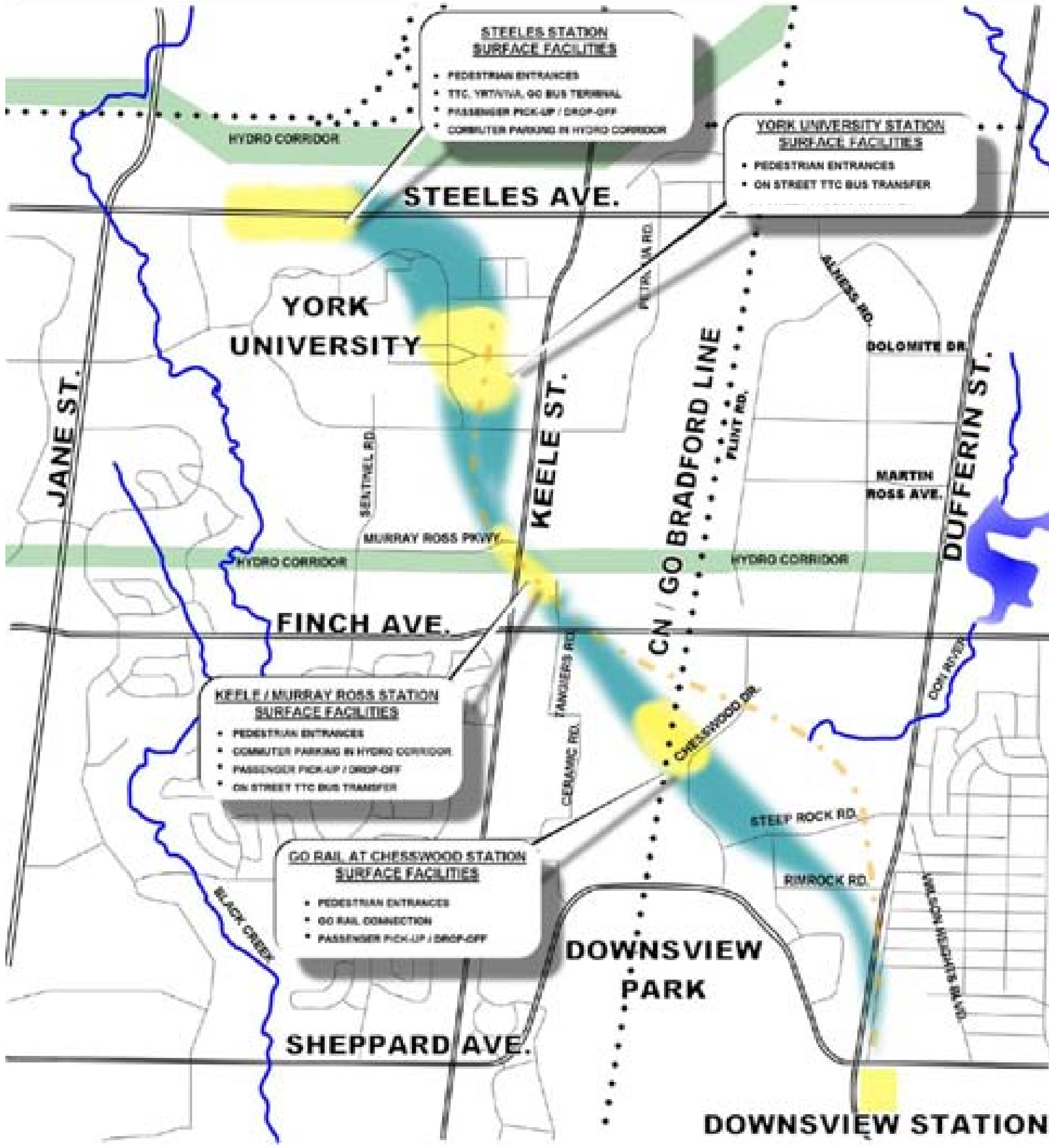


FIGURE 6-8:Route 7

ROUTE 8: GO / CHESSWOOD KEELE / MURRAY ROSS YORK UNIVERSITY "SENTINEL"

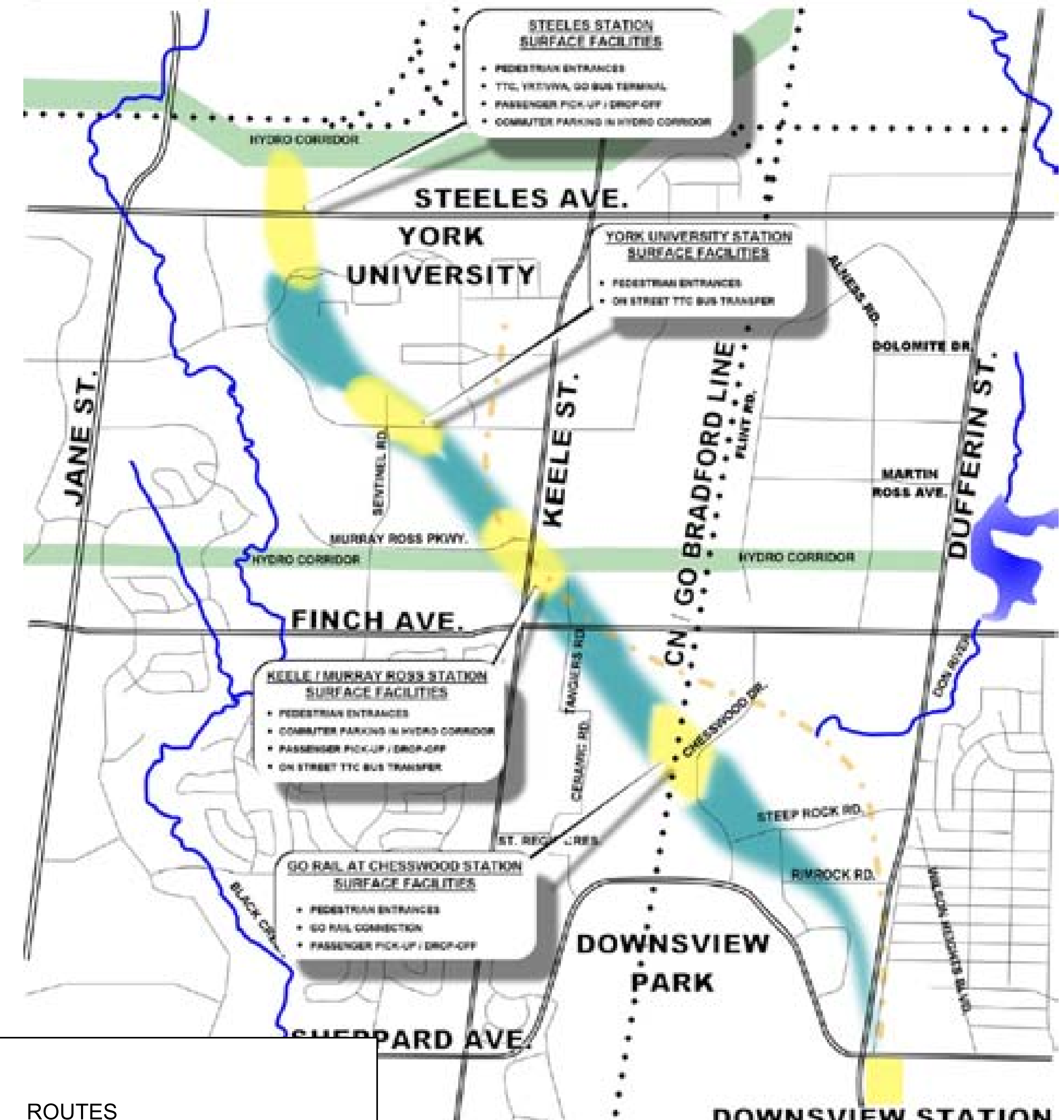


FIGURE 6-9:Route 8

Legend

(turquoise)	ROUTES
(yellow)	GENERAL STATION LOCATIONS
(dashed)	1994 EA ALIGNMENT

Table 6-4: Summary of Routes and General Station Locations

Route	General Station Locations	Comments
1	• GO Bradford Line/Sheppard Ave • Keele Street/Finch Avenue • York University Common • Steeles Inter-regional Transit Terminal	Route captures the GO-TTC Interchange at Sheppard Avenue as identified in RTES.
2	• GO Bradford Line/Sheppard Ave • Keele Street/Murray Ross Parkway • York University Common • Steeles Inter-regional Transit Terminal	This route is similar to Route 1, except the station proposed to service Keele /Finch is located within the hydro corridor at the Keele Street/Murray Ross Parkway Intersection.
3	• GO Bradford Line/Sheppard Ave • Keele Street/Murray Ross Parkway • York University Sentinel • Steeles Inter-regional Transit Terminal	This route is similar to Route 2, except the station proposed at York University is located at the Sentinel Road/The Pond Road Intersection.
4	• GO Bradford Line/Sheppard Ave • Keele Street/Finch Avenue • York University Sentinel • Steeles Inter-regional Transit Terminal	This route is similar to Route 1, except the station proposed at York University is located at the Sentinel Road/The Pond Road Intersection.
5	• GO Bradford Line/Finch Avenue • Keele Street/Murray Ross Parkway • York University Common • Steeles Inter-regional Transit Terminal	Route captures 1994 EA approved alignment. The route is extended north from York University Station to the proposed Steeles West terminal station as identified in RTES.
6	• GO Bradford Line/Finch Avenue • Keele Street/Murray Ross Parkway • York University Sentinel • Steeles Inter-regional Transit Terminal	This route is similar to Route 5, except York University Station is located at the Sentinel Road/The Pond Road Intersection
7	• GO Bradford Line/Chesswood Ave • Keele Street/Murray Ross Parkway • York University Common • Steeles Inter-regional Transit Terminal	This route is similar to Route 2, except the proposed TTC / GO Station is located within the Keele Industrial Area (on Chesswood Avenue).
8	• GO Bradford Line/Chesswood Ave • Keele Street/Murray Ross Parkway • York University Sentinel • Steeles Inter-regional Transit Terminal	This route is similar to Route 3, except the proposed TTC / GO Station is located within the Keele Industrial Area (on Chesswood Avenue).

As discussed previously, criterion, indicators and measures were developed to assess the merits and impacts for each route and general station locations. The evaluation criteria were released for review and comment during the first round of consultation. Following the first round of consultation, the criteria and indicators were finalized.

An appropriate measure was then defined for each indicator and then the measure was applied to each route and associated general station locations. Table 6-5 documents the final criteria, indicators and resulting measure for the eight routes.

Using the evaluation criteria, the Study Team collected the required information for each route and general station location to facilitate the comparative evaluation. The detailed data collected and analysis undertaken by the Study Team is presented in Appendix K.

Table 6-5: Analysis of General Station Locations and Routes

Objectives	Criteria	Indicators	Measures	Route 1	Route 2	Route 3	Route 4	Route 5	Route 6	Route 7	Route 8
A) Provide subway service to the Keele/Finch area, York University and a new inter-regional transit terminal at Steeles Avenue.	A1) Convenience for riders to walk to local stations.	A1.1) Existing population and employment within 500 m walking distance of subway stations.	# of Residents	2400	2700	2700	2400	2700	2700	2700	2700
			# of Jobs	3700	2400	2400	3700	2300	2300	4200	4200
			Total	6100	5100	5100	6100	5000	5000	6900	6900
		A1.2) Future population and employment within 500 m walking distance of subway stations.	# of Residents	16100	15400	15400	16100	13600	13600	13600	13600
			# of Jobs	8600	8400	8400	8600	9900	9900	10000	10000
			Total	24700	23800	23800	24700	23500	23500	23600	23600
		A 1.3) Students, faculty and staff within 500 m walking distance of York University station.	# of Students and Staff	76,300	76,300	70,200	70,200	76,300	70,200	76,300	70,200
B) Provide improved connections between the TTC subway and GO Transit, York Region Transit and TTC buses.	B1) Convenience for other modes of travel.	B.1.1) Connection to Finch West Bus (Route 36) and Keele Bus (Route 41) in the Keele/Finch area.	# of A.M. peak period transfers (1)	1500-2000	0	0	1500-2000	1500-2000	1500-2000	0	0
		B 1.2) Ease of accessibility for other travel modes (taxi, bicycle, pedestrians, Wheeltrans, passenger pick up and drop off, commuter parking, ambulatory/non-ambulatory disabled persons).	Subjective (High, High Medium, Medium, Medium Low, Low)	High - all alternative routes / general station locations have equal potential to address accessibility by all modes of travel							
C) Support local population and employment growth.	C1) Conform with current, approved planning documents.	C1.1) Conformity with the goals, objectives and policies of the City of Toronto planning documents including the Metro plan, City of North York Official Plan, York University Secondary Plan, and Downsview Area Secondary Plan.	Subjective	Medium Low	Medium	Medium	Medium Low	Medium	Medium	Medium	Medium
		C 1.2) Conformity with the goals, objectives and policies of the Region of York and City of Vaughan planning documents including the Region of York Official Plan and ROPA 43, and the City of Vaughan OPAs 450, 500, 529 and 620.	Subjective	High	High	High Medium	High Medium	High	High Medium	High	High Medium
	C2) Maximize redevelopment potential in support of the subway extension.	C2.1) Consistency with the objectives of the new City of Toronto Official Plan and the Keele Street Study.	Subjective	Medium	Medium	Medium	Medium	Medium	Medium	Medium	Medium
		C2.2) Consideration of the development objectives of Parc Downsview Park and York University.	Subjective	High	High	High	Medium	High	Medium	High	Medium
		C2.3) Potential to stimulate transit supportive development in proximity to station locations.	Subjective	High Medium	High	High	Medium	High	High Medium	High Medium	Medium

Table 6-5 (continued): Analysis of General Station Locations and Routes

Objectives	Criteria	Indicators	Measures	Route 1	Route 2	Route 3	Route 4	Route 5	Route 6	Route 7	Route 8
	C3) Maximize the potential to create a high quality urban/pedestrian environment.	C3.1) Ability to integrate stations with the existing and future built form.	Subjective	Medium	High Medium	Medium	Medium Low	Medium	Medium Low	High Medium	Medium Low
		C3.2) Potential to create a safe environment for pedestrians, cyclists and passengers.	Subjective	High	High	High Medium	High Medium	High Medium	Medium	High Medium	Medium
D) Minimize adverse environmental effects.	D1) Protect existing stable land uses.	D1.1) Length of subway route adjacent to residential neighbourhoods.	Length (km) of Route	2.1km	2.1km	2.2km	2.2km	0.8km	0.9km	0.8km	0.9km
		D1.2) Length of subway route within Keele Industrial area.	Length (km) of Route	3.5km	3.5km	3.5km	3.5km	2.9km	2.9km	2.8km	2.8km
		D1.3) Number of sensitive operations at York University within the zone of influence of the subway extension.	# of Sensitive Operations/ Buildings within Route	2	2	4	4	2	4	2	4
	D2) Minimize the potential effects on important natural and cultural heritage features.	D2.1) Number of important natural heritage features within the zone of influence of the subway extension.	# of Important Natural Heritage Features within Route	3	3	3	3	4	4	3	3
		D2.2) Area of groundwater discharge within the zone of influence of the subway extension.	Area (hectares) of Groundwater Discharge within each Route	4	4	19	19	5	20	4	19
		D2.3) Number of important cultural heritage features within the zone of influence of the subway extension.	# of Important Cultural Heritage Features	1	1	2	2	1	2	1	2
E) Achieve reasonable capital and operating costs.	E1) Minimize the capital and operating costs of the subway extension.	E1.1) Length of subway route.	Length (km) of Route	5.5 - 6.2 km	5.5 - 6.2 km	5.5 - 6.2 km	5.5 - 6.2 km	5.4 - 6.1 km	5.2 - 5.9 km	5.1 - 5.8 km	4.9 - 5.6 km
	E2) Maximize the revenue generated from the subway extension.	E2.1) Total number of A.M. peak period passengers on the subway extension.	# of Users Boarding and Alighting (1)	25,700	23,700	23,900	26,000	23,300	23,500	21,200	21,500
	E3) Maximize the subway extension in lands with no property costs to the project.	E3.1) Length of subway route within existing road rights-of-way.	Length (km) of Route	up to 3.0km	up to 2.4km	up to 1.6km	up to 1.6km	up to 1.4km	up to 0.6km	up to 1.0km	up to 0.2km

6.2.2. Evaluation of Routes and General Station Locations

Once the analysis was complete, the Study Team evaluated the relative performance of each route using both RAM and MATS. As indicated previously, the Reasoned Argument Method was to evaluate the alternatives and to select a preferred method of carrying out the Undertaking. MATS (a numeric method) was used as a test of traceability of decisions made.

On an indicator-by-indicator basis, each route was placed in order from most preferred to least preferred. The results of this step are documented in Table 6-6. Then, based on the results at the indicator level, an overall most preferred to least preferred order was created for each project objective. Taking all five-project objectives into consideration, an order of preference was identified (see Figure 6-10).

In summary, the analysis produced the following results:

First Choice: Route 1

Route 1 is the most preferred in that it provides a cost-effective solution with the best connections between other modes, good service to each of the four identified catchment areas and strong support for future growth, while minimizing adverse environmental effects.

This route was identified as the technically preferred during the second round of public consultation.

Second Choice: Route 2

Route 2 fails to provide the important connection between the 36-Finch West bus and the subway but does support future growth at reasonable cost with minimal adverse environmental effects.

This route was not carried forward.

Third Choice: Route 4

Route 4 provides the comparable connections between other modes (versus Route 1), good service to each of the four identified catchment areas and strong support for future growth. Route 4 has some of the highest negative adverse environmental effects. It is also moderate in its cost effectiveness.

This route was not carried forward.

Fourth Choice: Route 7

Although Route 7 provides good service into the centre of the Keele Industrial Area (good catchment), it fails to provide the important connection between subway and the 36-Finch West bus. Support of future growth is limited but Route 7 has some of the lowest negative adverse environmental effects. It is one of the least preferred in its cost effectiveness.

This route was not carried forward.

Fifth Choice: Route 5

Route 5 provides the important connection between the 36-Finch West bus and the subway and is also moderate in its cost effectiveness. It is an alignment with some of the fewest negative adverse environmental effects. However, the existing walk-in catchment is low.

This route was not carried forward.

Sixth Choice: Route 3

Route 3 fails to provide the important connection between the 36-Finch West bus and the Subway and has one of the lowest walk-in catchment potential. Support of future growth is limited and Route 3 has some of the highest negative adverse environmental effects. It is also moderate in its cost effectiveness.

This route was not carried forward.

Seventh Choice: Route 6

Route 6 provides the important connection between the 36-Finch West bus and the subway and has one of the lowest walk-in catchment potential. Support of future growth is limited and Route 6 has some of the highest negative adverse environmental effects. It is also low in its cost effectiveness.

This route was not carried forward.

Eighth Choice: Route 8

Although the shortest route, Route 8 is the least preferred since it generates the lowest ridership and has the lowest potential to use road rights of way (resulting in high property needs for the subway right-of-way). Support of future growth is limited and Route 8 has some highest negative adverse environmental effects.

This route was not carried forward.

Table 6-6: Evaluation of General Station Locations and Routes

● MOST PREFFERED ◕ ◑ ◔ ○ LEAST PREFFERED

Objectives	Criteria	Indicators	Route 1	Route 2	Route 3	Route 4	Route 5	Route 6	Route 7	Route 8
A) Provide subway service to the Keele/Finch area, York University and a new inter-regional transit terminal at Steeles Avenue.	A1) Convenience for riders to walk to local stations.	A1.1) Existing population and employment within 500 m walking distance of subway stations.	◕	◑	◑	◕	◑	◑	●	●
		A1.2) Future population and employment within 500 m walking distance of subway stations.	All Routes yield similar results. Not a determining factor for selecting Route							
		A 1.3) Students, faculty and staff within 500 m walking distance of York University Station.	All Routes yield similar results. Not a determining factor for selecting Route							
B) Provide improved connections between the TTC subway and GO Transit, York Region Transit and TTC buses.	B1) Convenience for other modes of travel.	B.1.1) Connection to Finch West Bus (Route 36) and Keele Bus (Route 41) in the Keele/Finch area.	●	◕	◕	●	●	●	◕	◕
		B 1.2) Ease of accessibility for other travel modes (taxi, bicycle, pedestrians, Wheeltrans, passenger pick up and drop off, commuter parking, ambulatory/non-ambulatory disabled persons).	All Routes yield similar results. Not a determining factor for selecting Route							
C) Support local population and employment growth.	C1) Conform with current approved planning documents.	C1.1) Conformity with the goals, objectives and policies of the City of Toronto planning documents including the Metro plan, City of North York Official Plan, York University Secondary Plan, and Downsview Area Secondary Plan.	All Routes yield similar results. Not a determining factor for selecting Route							
		C1.2) Conformity with the goals, objectives and policies of the Region of York and City of Vaughan planning documents including the Region of York Official Plan and ROPA 43, and the City of Vaughan OPAs 450, 500, 529 and 620.	All Routes yield similar results. Not a determining factor for selecting Route							
	C2) Maximize redevelopment potential in support of the subway extension.	C2.1) Consistency with the objectives of the new City of Toronto Official Plan and the Keele Street Study.	●	●	●	●	◕	◕	◕	◕
C) Support local population and employment growth	C2) Maximize redevelopment potential in support of the subway extension.	C2.2) Consideration of the development objectives of Parc Downsview Park and York University.	◕	●	◑	◑	◑	◔	◑	◔
		C2.3) Potential to stimulate transit supportive development in proximity to station locations.	●	◕	◑	◕	◑	◑	◔	◔
	C3) Maximize the potential to create a high quality urban/pedestrian environment.	C3.1) Ability to integrate stations with the existing and future built form.	◕	●	◕	◑	◕	◑	◕	◔
		C3.2) Potential to create a safe environment for pedestrians, cyclists and passengers.	●	●	◑	◑	◕	◑	◑	◑

Table 6-6 (continued): Evaluation of General Station Locations and Routes

● MOST PREFFERED ◕ ◑ ◔ ○ LEAST PREFFERED

Objectives	Criteria	Indicators	Route 1	Route 2	Route 3	Route 4	Route 5	Route 6	Route 7	Route 8
D) Minimize adverse environmental effects.	D1) Protect existing stable land uses.	D1.1) Length of subway route adjacent to residential neighbourhoods.	◕	◕	◕	◕	●	●	●	●
		D1.2) Length of subway route within Keele Industrial area.	All Routes yield similar results. Not a determining factor for selecting Route							
		D1.3) Number of sensitive operations at York University within the zone of influence of the subway extension.	●	●	◕	◕	●	◕	●	◕
	D2) Minimize the potential effects on important natural and cultural heritage features.	D2.1) Number of important natural heritage features within the zone of influence of the subway extension.	●	●	●	●	◕	◕	●	●
		D2.2) Area of groundwater discharge within the zone of influence of the subway extension.	●	●	◑	◑	◕	◔	●	◑
		D2.3) Number of important cultural heritage features within the zone of influence of the subway extension.	All Routes yield similar results. Not a determining factor for selecting Route							
E) Achieve reasonable capital and operating costs.	E1) Minimize the capital and operating costs of the subway extension.	E1.1) Length of subway route.	◑	◑	◑	◑	◑	◕	◕	●
	E2) Maximize the revenue generated from the subway extension.	E2.1) Total number of A.M. peak period passengers on the subway extension.	●	◕	◕	●	◕	◕	◑	◑
	E3) Maximize the subway extension in lands with no property costs to the project.	E3.1) Length of subway route within existing road rights-of-way.	●	●	◕	◕	◕	◑	◑	◔
	E4) Quality of subway service.	E4.1) Ability to develop alignments with the routes that minimize the use of curves < 600 m radius.	All Routes yield similar results. Not a determining factor for selecting Route							

Evaluation of the Routes

	Objective	Indicator	Route 1	Route 2	Route 3	Route 4	Route 5	Route 6	Route 7	Route 8
A)	Provide subway service to the Keele/Finch area, York University and a new inter-regional transit terminal at Steeles Avenue.	• Existing Population and employment within 500m walking distance of stations. • Future population and employment within 500m walking distance of stations. • Student activity within 500m walking distance of York University station.	◕	◑	◑	◕	◑	◑	●	●
B)	Provide improved connections between the TTC subway and GO Transit, York Region Transit and TTC buses.	• Connection to Finch West Bus (Route 36) and Keele Bus (Route 41) in Keele/Finch Area. • Ease of accessibility for other travel modes (taxi, bicycle, Wheel-Trans, passenger pick up and drop off, ambulatory / non-ambulatory disabled persons).	●	◕	◕	◕	●	●	◕	◕
C)	Support local population and employment growth.	• Conform with the City of Toronto planning documents. • Conform with the Region of York and the City of Vaughan planning documents. • Conform with the development objectives of Downsview lands and York University. • Potential to stimulate transit supportive development in proximity to station locations. • Ability to integrate stations within the existing and future built form. • Potential to enhance the existing and future built form and create a safe pedestrian environment.	●	●	◑	◕	◑	◔	◔	○
D)	Minimize adverse environmental effects.	• Proximity to residential neighborhoods. • Length of subway route within Keele Industrial Area. • Proximity to sensitive operations at York University. • Proximity to important natural and cultural heritage areas/features.	◕	◕	◔	◔	◑	◔	●	◔
E)	Achieve reasonable capital and operating costs.	• Length of subway route. • Total number of passengers on the subway extension. • Length of subway route within existing road rights-of-way.	●	◕	◑	◑	◑	◔	◔	○
	OVERALL ORDER OF PREFERENCE		1	2	6	3	5	7	4	8

Most Preferred ● ◕ ◑ ◔ ○ Least Preferred

FIGURE 6-10: Evaluation Summary of the Routes

6.2.3. Phase One Routes and General Station Locations Sensitivity Analysis Using MATS

To confirm the preference for Route 1, a number of sensitivity tests were performed using MATS. Sensitivity tests considered including two approaches for assigning weights to the objectives and indicators used for the MATS analysis.

The first approach adopted by the Study Team was at the "indicator-level". This involved assigning weights to specific individual indicators. The indicator-level weights approach was adopted for Test 1. This approach provided an opportunity to place equal emphasis (weight) on all indicators. For Test 1, all indicators were assigned equal weights (i.e. equal importance). Consequently, to obtain an equal weight for each indicator, the total number of indicators divided the total maximum score of 100%, which were 22 (100%/22 = 4.5%).

The second approach used by the Study Team was at "objective-level". This approach involved assigning weights to an entire objective. For this approach, weights were placed from the objective level and subdivided amongst the corresponding criteria and indicators. This approach ensured that the weight assigned to an entire objective was subdivided proportionally amongst the corresponding criteria and indicators of that objective, similar to a tier system. The objective-level weights approach was used for Test 2, 3, 4, 5, 6 and 7 as summarized in Table 6-5.

Through a mathematical comparison of each measure and accounting for the assigned weights, a numerical result was produced. The highest result identifies the most preferred alternative. A summary of the results of the MATS analysis and sensitivity tests is presented in Figure 6-11. In all cases, Route 1 received the highest score. The detailed MATS analysis is presented in Appendix K.

Table 6-7: MATS Sensitivity Tests Applied at the Route Level

Test #	Weighting for each Project Objective					Comments
	A	B	C	D	E	
1	20	20	20	20	20	All objectives were considered equal.
2	10	30	30	10	20	Emphasis was placed on objective B (provide improved connections between the TTC subway and GO Transit, York Region Transit and TTC Buses) and objective C (Support local population and employment growth)
3	20	20	20	30	10	The Study Team placed emphasis on objective D (minimize adverse environmental effects).
4	15	15	10	20	40	Emphasis was placed on objective E (achieve reasonable capital and operating costs).
5	10	10	40	10	30	Emphasis was placed on objective C (support local population and employment growth).
6	30	10	10	15	35	Emphasis was placed on objective A (provide subway service to the Keele/Finch area, York University and a new inter-regional transit terminal at Steeles Avenue) and objective E (achieve reasonable capital and operating costs).
7	5	35	15	10	35	Emphasis was placed on objective B (provide improved connections between the TTC subway and GO Transit, York Region Transit and TTC Buses) and objective E (achieve reasonable capital and operating costs).

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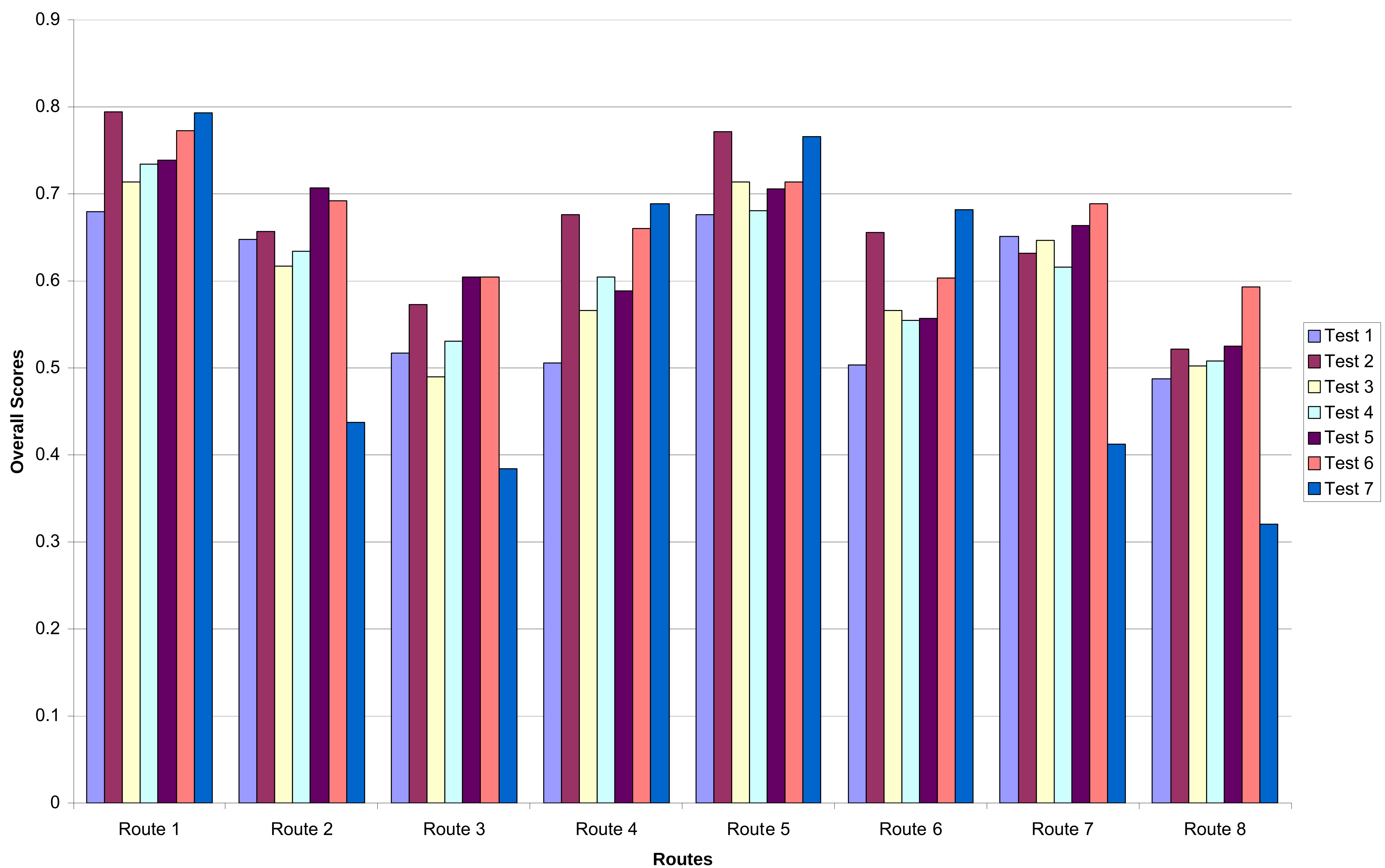
Figure 6-11: Results of MATS analysis



6.2.4. Technically Preferred Route and General Station Locations

Based on the analysis undertaken by the Study Team, Route 1 was selected as the technically preferred route and general station locations. Route 1 includes stations at the following general locations:

1) Sheppard Avenue West at the Bradford GO rail Line (Sheppard West Station),
2) The intersection of Keele Street and Finch Avenue West (Finch West Station),
3) The Common area of the York University campus (York University Station), and
4) The proposed inter-regional transit terminal at Steeles Avenue West (Steeles West Station).

Route 1 was selected as the technically preferred route for the following reasons:

1) The proposed Sheppard West Station connects to the GO Bradford Line and will encourage redevelopment of the Downsview lands;
2) The proposed Finch West Station will provide a convenient connection to the busy 36 Finch West bus route;
3) The proposed York University Station is situated in the Common area, which is the existing transit hub for the University;
4) The route maximizes use of the Keele Street road right-of-way, which reduces property impacts and costs;
5) The route minimizes impacts to the natural environment and avoids Black Creek and Dufferin Creek; and
6) The route protects for future expansion into York Region and Vaughan Corporate Centre.

6.2.5. Route 1 as the Recommended Route

During the second round of public and stakeholder consultation, the selection of Route 1 was supported by over 90% of respondents.

Route 1 captured the GO-TTC Interchange at Sheppard Avenue alignment identified in the RTES and the ToR. The other two alignments identified in the ToR, the 1994 EA approved alignment and the GO-TTC Interchange at Finch Avenue alignment, were removed from further analysis, since the route that captured these alignments (Route 5) was not selected. Route 1 was carried forward to Phase Two.

6.3. Phase Two - Alignments and Station Concepts

6.3.1. Overall Approach

Phase Two of the Spadina Subway Extension selection process involved generation and evaluation of numerous alignments and station concepts and the selection of a preferred alignment and associated station concepts. The preferred alignment and station concepts were then carried forward to Phase Three.

This section describes the process used to generate, evaluate and select alignments and station concepts for the Subway Extension.

At the outset of the development of alternative alignments, the Study Team determined the following benefits of maximizing the length of the subway alignment within the Keele Street road right-of-way:

1) The number of properties with subway tunnels running below would be minimized. As such, potential property impacts would be avoided;
2) Construction of Finch West Station which must be constructed by cut-and-cover method) within the Keele Street right-of-way would minimize the number of private properties to be acquired for the station and related commuter facilities in the vicinity of the Keele and Finch intersection. This would result in fewer properties to be acquired for the subway project, resulting in decreased business disruption and socio-economic impacts; and
3) Using the municipal-owned road right-of-way, instead of private properties for the subway tunnels and Finch West Station, would minimize property costs.

For these reasons, it was determined that the best location for Finch West Station would be under the Keele Street right-of-way, in the vicinity of Finch Avenue West. Because the alignment would be within the road right-of-way, the Finch West Station box could be shifted north or south, without impacting private property.

Because all potential alignments would converge at the Keele/Finch intersection, Route 1 was divided into a southern section, from Downsview Station to Finch Avenue West and a northern section from Finch Avenue West to Steeles Avenue West. Alternative alignments were developed and evaluated for both sections. Any of the northern and southern alternatives could be combined to achieve the best overall Spadina Subway Extension alignment. Associated with the south alignment is Sheppard West Station. The alternative station concepts are assessed as part of the southern section. Similarly, York University Station is assessed as part of the northern section.

Similarly, the Study Team determined that the siting of alternative locations for the bus terminals for the Finch West Station and Steeles West Station could be undertaken independently of the subway alignment. Therefore, the alternative station concepts were also split out to form a separate assessment process. Figure 6-12 illustrates the subdividing of the recommended Route 1.

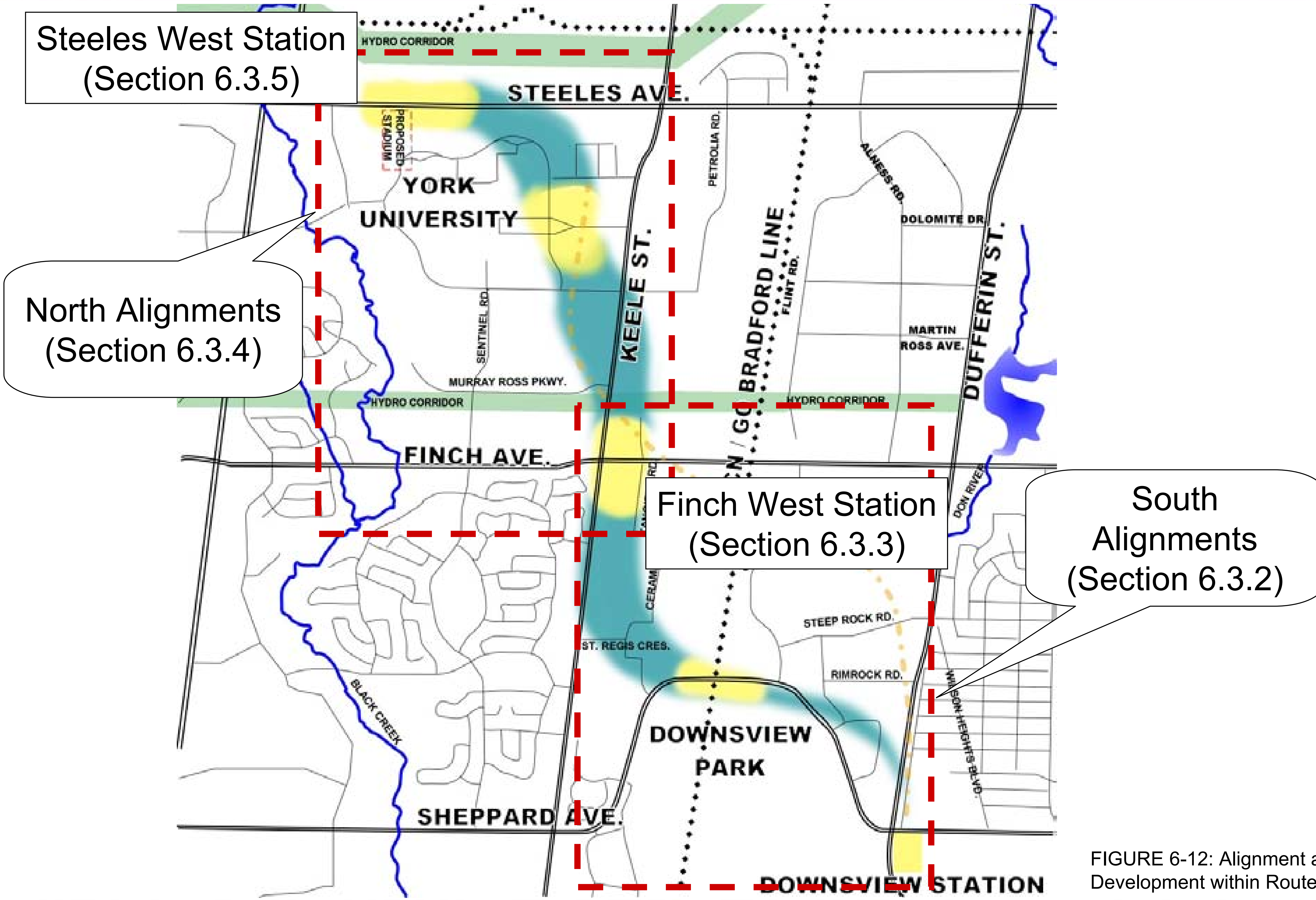


FIGURE 6-12: Alignment and Station Concept Development within Route #1

The project objectives outlined in the ToR were used as a foundation for generating alignments and station concepts (similar to Phase One). All alignments and station concepts were required to meet TTC design criteria for subways. Suggested revisions and refinements that met the relevant standards were incorporated into the work contained in this section. The alignment generation criteria were released for review and comment during the second round of consultation. The alignment generation criteria are presented in Table 6-8.

Table 6-8: Objectives and Criteria used to Generate Alignments and Station Concepts

Objectives	Criteria
A. Provide subway service to the Keele/Finch area, York University and a new inter-regional transit terminal and commuter parking facility at Steeles Avenue.	A1) Route 1 provides subway service to Steeles Avenue via the Keele/Finch intersection and York University.
	A2) Steeles West Station ▪ Cut-and-cover construction ▪ Station entrances on Steeles Avenue ▪ TTC, YRT/VIVA, GO bus terminal (35 - 40 bus bay requirements) ▪ Passenger pick-up and drop-off ▪ Commuter parking in hydro corridor
	A3) York University Station ▪ Cut-and-cover construction ▪ Station entrances ▪ On-street bus transfers for local routes only
	A4) Finch West Station ▪ Cut-and-cover construction ▪ Station entrances ▪ TTC bus terminal (off street, 9 bays) ▪ Passenger pick-up and drop-off, where possible ▪ Commuter parking in hydro corridor
	A5) Sheppard West Station ▪ Cut-and-cover construction ▪ Station entrances ▪ On-street TTC bus transfer, where possible ▪ GO Rail connection
	A6) Meet geometric design standards: ▪ absolute minimum radius – 300 m ▪ desirable minimum radius – 700 m A7) All stations must be on at least 200 m of straight track A8) Maintain a two-minute headway. A9) Provide cross over and storage tracks for operational needs. A10) Protect for extension into York Region (Vaughan Corporate Centre).
B. Provide improved connections between the TTC subway system and GO Transit, York Region Transit and other inter-regional transit services.	B1) Route 1 provides improved connections between TTC subway system and other transit services.
	B2) Steeles West Station, York University Station, Finch West Station and Sheppard West Station - See Objective A
C. Support local population and employment growth.	C1) Route 1 supports local population and employment growth.
	C2) Steeles West Station, York University Station, Finch West Station and Sheppard West Station - See Objective A
D. Minimize any negative environmental impacts.	D1) Construct subway under road right-of-way to the maximum extent possible to avoid disruption and minimize property acquisition. D2) Avoid petroleum storage facilities (immediately west of Tangiers Road) D3) Avoid structures with deep foundations (buildings and existing bridges). D4) Construct below existing grade to minimize impacts to crossing roads and adjacent properties. D5) Avoid impacts to cultural and natural heritage features. D6) Avoid stable residential areas.
E. Achieve reasonable capital and operating costs.	E1) Route 1 achieves reasonable capital and operating costs.

The evaluation methods used in Phase Two included MATS and RAM to maintain consistency with Phase One. As identified above, the alignments and station concepts were separated into four distinct segments, which were:

1) The south alignments, including Sheppard West Station (TTC / GO Rail transfer station),
2) Finch West Station,
3) The north alignments, including York University Station, and
4) Steeles West Station.

The following sections describe each segment in detail.

6.3.2. Alternative Methods to be considered: South Alignments

Four alignments between the Downsview Station and Finch West Station were created. Sheppard West Station (located at the GO Bradford Line/Sheppard Avenue intersection) is a line subway station consisting of a subway platform and station entrances. The four alignments are:

1) Alternative S1, which runs along the south perimeter of Route 1, with the minimum allowable curve immediately north of Downsview Station, maximizing the use of the government-owned Department of National Defence and Parc Downsview Park lands located south of Sheppard Avenue;
2) Alternative S2, which runs immediately south of Sheppard Avenue, mainly within the Parc Downsview Park lands;
3) Alternative S3, which runs immediately north of Sheppard Avenue, under privately-owned properties within the Keele Industrial Area; and
4) Alternative S4, which runs along the north perimeter of Route 1, within the Keele Industrial area.

The Sheppard West Station subway platform could be located either east or west of the CN/Bradford GO Line. The location of the platform on the west side of the CN/Bradford GO Line results in the more westerly curves (See Figure 6-13). As a result, a total of eight alignments were assessed, namely: S1 West (i.e. station location west of CN/Bradford GO Line), S1 East (i.e. station location east of CN/Bradford GO Line), S2 West, S2 East, S3 West, S3 East, S4 West and S4 East.

The potential for running the alignment under the Sheppard Avenue road right-of-way was investigated early in this EA. It was determined that the subway tunnels would conflict with the footings for the Railway bridge and that costly and disruptive reconstruction of the bridge would be required. As well, the subway alignment would be extremely deep at this point which would result in passenger inconvenience due to the vertical distance between the ground level station entrances and the Sheppard West Station platform level. Accordingly, the use of the Sheppard Avenue road right-of-way was not considered further.

The resulting south alignments are illustrated in Figure 6-13. Table 6-9 contains the results of the analysis of each of the alternative alignments. Supporting calculations and documentation are contained in Appendix L. Table 6-10 includes the detailed evaluation for the Reasoned Argument Method.

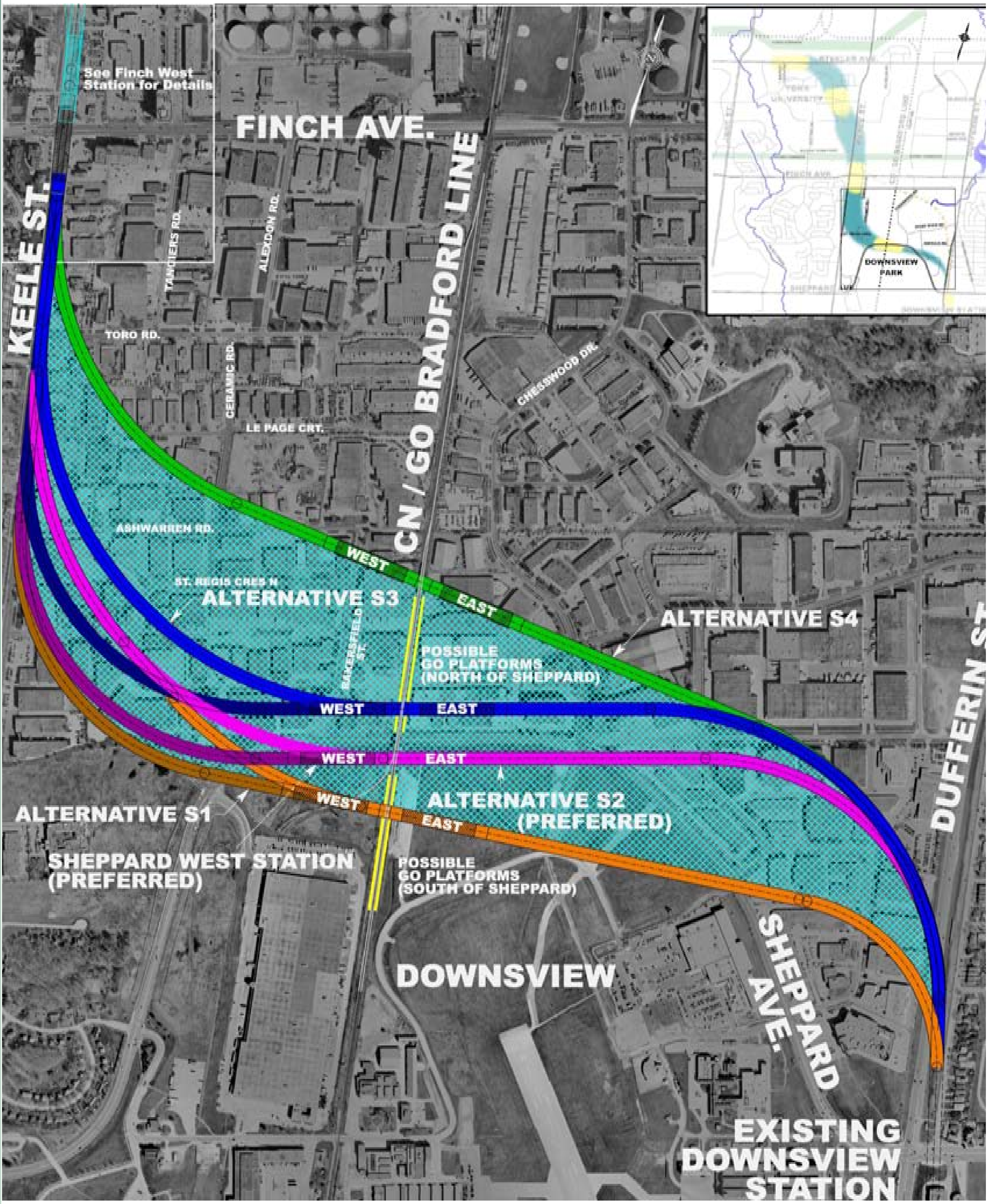


FIGURE 6-13: South Alignment Alternatives

Table 6-9: Analysis of South Alignments and Sheppard West Station

Objectives	Criteria	Indicators	Measures	S1 West	S1 East	S2 West	S2 East	S3 West	S3 East	S4 West	S4 East
A) Provide subway service to the Keele/Finch area, York University and a new inter-regional transit terminal at Steeles Avenue.	A1) Potential for riders to walk to local stations.	A1.1) Existing population and employment within 500 m walking distance of subway stations.	Number of people and employees within 500 m radius of main entrance (Population per Hectare)	42.5	42.5	40	40	40	40	49	49
		A1.2) Future population and employment within 500 m walking distance of subway stations.	Number of people and employees within 500 m radius of main entrance (Population per Hectare)	80	80	68	68	68	68	74	74
		A1.3) Students, faculty and staff within 500 m walking distance of York University Station.	Number of people and employees within 500 m radius of main entrance (based on Data provided to URS by York University)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	A2) Speed and comfort for subway passengers.	A2.1) Travel time from Downsview Station to Steeles West Station.	Total length of alignment (metres).	3124	2995	3278	3150	3218	3091	2825	2825
			Estimated run times	Difference in travel time between fastest and slowest alignment is imperceptible to transit riders (<20 seconds)							
		A2.2) Speed and comfort for subway passengers.	Length of Curves with Radii less than 457m (radius and length)	R=330m @ 459m	R=330m @ 459m	0	0	0	0	0	0
			Length of curves with radii between 457m and 750 m (radius and length)	R=470m @ 692m	R=700m @ 442m R=700m @ 589m Total: 1031m	R=470m @ 753m R=470m @ 791m Total: 1544m	R=470m @ 753m R=700m @ 1178m Total: 1931m	R=580m @ 929m R=470m @ 791m Total: 1720m	R=580m @ 929m R=700m @ 1177m Total: 2106	R=600m @ 719m R=600m @ 768m Total: 1487m	R=600m @ 719m R=600m @ 768m Total: 1487m
B) Provide improved connections between the TTC subway and GO Transit, York Region Transit and TTC buses.	B1) Convenience for transfers from bus and train operations (including Wheeltrans).	B1.1) Transfer time from bus to subway platform	Walking time based on 1.2 m/s + 10 second premium for every vertical movement measured from WB on street bus bay to centre of subway platform (Min.)	2	4	1	1	3	3	8	5
		B1.2) Transfer time from GO Rail to subway platform at Sheppard West Station.	Walking time based on 1.2 m/s + 10 second premium for every vertical movement measured from centre of GO platform to centre of subway platform (Min)	2	2	4	4	3	3	4	4
		B1.3) Delay time for through passengers on the 36-Finch West bus route and the 41-Keele bus route at Finch West Station.	Total travel time (excluding internal circulation and dwell time within the station) based on travel time (assumed 30 km/hr) + additional delays for specific movements at key intersections (36 Finch) (Min)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
			Total travel time (excluding internal circulation and dwell time within the station) based on travel time (assumed 30 km/hr) + additional delays for specific movements at key intersections (41 Keele) (Min)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Table 6-9 (continued): Analysis of South Alignments and Sheppard West Station

Objectives	Criteria	Indicators	Measures	S1 West	S1 East	S2 West	S2 East	S3 West	S3 East	S4 West	S4 East
B) Provide improved connections between the TTC subway and GO Transit, York Region Transit and TTC buses.	B1) Convenience for transfers from bus and train operations (including Wheeltrans).	B1.4) Transfer time from subway to future LRT in hydro corridor at Finch West Station.	Walking time based on 1.2 m/s + 10 second premium for every vertical movement measured from centre of LRT platform to centre of subway platform. (Min)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	B2) Convenience for access from other travel modes (taxi, bicycle, pedestrians, passenger pick up and drop off, commuter parking, ambulatory/non-ambulatory disabled persons).	B2.1) Opportunity to link with cycling routes identified in the City of Toronto's and City of Vaughan's Cycling Master Plans.	Cycling time based on 15 km/h from entrance to identified bike path/bike lanes in cycling master plans.(Min)	0	0	0	0	0	0	0	0
		B2.2) Transfer time from other travel modes to subway platform.	Walking time based on 1.2 m/s from PPUDO/taxi stand to closest station entrance. (Min)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
			Walking time based on 1.2 m/s from middle of commuter parking lot to closest station entrance.(Min)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		B2.3) Quality of walking environment from other travel modes to subway platform.	Weather protected (yes/no) connection from Sheppard to station entrance	NO	NO	YES	YES	YES	YES	NO	NO
			Entrance type (Staffed/automated)	All stations will include both staffed and automated entrances; location to be confirmed at next phase							
			Walking time from station entrance/bicycle racks to subway platform based on 1.2 m/s + 10 second premium for every vertical movement .Max time(Min)	2	2	2	2	2	2	2	2
	B3) Flexibility for potential future subway extension into York Region.	B3.1) Number, type and sensitivity of significant environmental features potentially affected by a future subway extension into York Region.	Number of natural heritage features.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
			Area of groundwater discharge (100m zone of influence) (ha)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
			Number of residences, businesses and community/ recreational/ institutional facilities.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
			Number of cultural heritage features. (100m zone of influence)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
			Compatibility with planned land use.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Table 6-9 (continued): Analysis of South Alignments and Sheppard West Station

Objectives	Criteria	Indicators	Measures	S1 West	S1 East	S2 West	S2 East	S3 West	S3 East	S4 West	S4 East
B) Provide improved connections between the TTC subway and GO Transit, York Region Transit and TTC buses.	B3) Flexibility for potential future subway extension into York Region.	B3.2) Number and type of curves between Steeles West Station and Highway 407.	Total length of alignment (metres)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
			Length of curves with radii less than 457 m.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
			Length of curves with radii between 457 m and 750 m.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C) Support local population and employment growth.	C1) Maximize redevelopment potential in support of the subway extension.	C1.1) Ability to combine stations with the existing and future built form.	Amount of area identified as redevelopment within station zone of influence (ha)	28	26	26	25	22	23	10	18
			Amount of redevelopment within station zone of influence	2210	2170	2080	2040	1900	1920	1240	1580
			Amount of redevelopment frontage encumbered by transit facilities (m)	350	330	810	700	730	650	170	170
	C2) Maximize the potential to create a high quality urban/pedestrian environment.	C2.1) Potential to create a safe environment for pedestrians, cyclists and transit passengers.	Number of pedestrian-bus conflicts at key uncontrolled station entrances (I.e. bus forecasts x pedestrian movements)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
			Active Surveillance (low, medium, high)	LOW	LOW	HIGH	HIGH	HIGH	HIGH	MEDIUM	MEDIUM
D) Minimize adverse environmental effects.	D1) Potential effects on natural heritage features	D1.1) Area, type, significance and resiliency of aquatic and terrestrial landscapes, ecosystems/communities and populations/species located within alignment and station footprint areas.	Area of natural heritage features (hectares)	3.37	2.86	2.04	1.64	0	0	0	0
			Type of natural heritage features (ELC classification)	cultural meadow	cultural meadow	cultural meadow	cultural meadow	NONE	NONE	NONE	NONE
			Significance of natural heritage features (local, regional, provincial, federal)	local	local	local	local	NONE	NONE	NONE	NONE
			Resiliency of natural heritage features (low, medium, high)	High	High	High	High	NONE	NONE	NONE	NONE
		D1.2) Area, type, significance and sensitivity of aquatic and terrestrial landscapes, ecosystems/communities and populations/species located within adjacent zones of influence.(100m)	Area of natural heritage features (hectares)	19.48	16.78	10.67	8.32	2.55	2.01	0	0

Table 6-9 (continued): Analysis of South Alignments and Sheppard West Station

Objectives	Criteria	Indicators	Measures	S1 West	S1 East	S2 West	S2 East	S3 West	S3 East	S4 West	S4 East
D) Minimize adverse environmental effects.	D1) Potential effects on natural heritage features	D1.2) Area, type, significance and sensitivity of aquatic and terrestrial landscapes, ecosystems/communities and populations/species located within adjacent zones of influence.(100m)	Type of natural heritage features (ELC classification)	cultural meadow	cultural meadow	cultural meadow	cultural meadow	cultural meadow	cultural meadow	N/A	N/A
			Significance of natural heritage features (local, regional, provincial, federal)	local	local	local	local	local	local	N/A	N/A
			Resiliency of natural heritage features (low, medium, high)	High	High	High	High	High	High	N/A	N/A
	D2) Potential effects on geology and hydrogeology.	D2.1) Magnitude and significance of permanent groundwater drawdown (if any) on hydrogeological conditions.	Area of groundwater recharge/discharge affected (ha)	4.83	5.93	4.59	2.96	3.9	2.22	1.2	1.2
			Significance of groundwater recharge/discharge areas affected. (local, regional, provincial)	local	local	local	local	local	local	local	Local
			Area of aquifers affected.	temporary, low to moderate	temporary, low to moderate	temporary, low to moderate	temporary, low to moderate	temporary, low to moderate	temporary, low to moderate	temporary, low	temporary, low
			Significance of aquifers affected. (local, regional, provincial)	local	local	local	local	local	local	local	Local
		D2.2) Potential for soil erosion.	Area of soil to be disturbed (ha).	9.18	8.79	9.64	9.26	9.24	8.87	8.06	8.06
			Type of soil to be disturbed.	Stone-poor, Carbonates (silty-sandy till)	Stone-poor, Carbonates (silty-sandy till)	Stone-poor, Carbonates (silty-sandy till)	Stone-poor, Carbonates (silty-sandy till)	Stone-poor, Carbonates (silty-sandy till)	Stone-poor, Carbonates (silty-sandy till)	Stone-poor, Carbonates (silty-sandy till)	Stone-poor, Carbonates (silty-sandy till)
	D3) Potential effects on hydrology.	D3.1) Area of flood storage capacity removed.	Area of flood storage capacity removed (hectares).	Route selected avoids existing floodplains – no impact							
		D3.2) Length/area of watercourses/ waterbodies altered.	Length/area of surface water features (metres/hectares).	Route selected avoids existing watercourses – no impact							
		D3.3) Ease and effectiveness of stormwater management at subway facilities.	Opportunities consistent with City of Toronto WWFMMP	Surface Storage and treatment Available	Surface Storage and treatment Available	Surface Storage and treatment Available	Surface Storage and treatment Available	OGS	OGS	OGS	OGS

Table 6-9 (continued): Analysis of South Alignments and Sheppard West Station

Objectives	Criteria	Indicators	Measures	S1 West	S1 East	S2 West	S2 East	S3 West	S3 East	S4 West	S4 East
D) Minimize adverse environmental effects.	D4) Potential effects on socio-economic features.	D4.1) Number of employment properties and community/recreational/institutional facilities located within alignment and station footprint areas.	Number of individual properties directly impacted	19	25	20	28	38	31	38	38
			Number of Community/Recreational	0	0	0	0	0	0	0	0
			Number of Institution	0	0	0	0	0	0	0	0
		D4.2) Area, type, and sensitivity of residences, businesses and community/recreational/institutional facilities located within adjacent zones of influence. (150m)	Amount of area identified as stable employment within zone of influence (ha)	8	12	15	19	24	27	36	36
			Amount of area identified as stable residential within zone of influence (ha)	10	7	10	8	8	7	5	5
	D5) Potential effects on pedestrian and traffic access/ flow.	D5.1) Number of permanent road closures or access modifications.	Number of closures	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
			Number of driveways with reduced access (e.g. full access reduced to right-in/right-out)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		D5.2) Traffic Impacts due to operations of station commuter facilities (bus terminals, passenger pick-up and drop-off and commuter parking).	Number of critical movements within vicinity of station	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
			Sum of intersection delays (in Min) at key intersections at an approximate 250m radius from station.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
			Number of entrances/egresses obstructed by average peak hour queue lengths	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		D5.3) Impact on safety of transportation system.	Number of new signalized conflict points (total change increase/ decrease) on the arterial network.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
			Number of unsignalized conflict points (total change increase/decrease) on the arterial network.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		D5.4) Accessibility for emergency services including fire, police and ambulance.	Impact on response times for EMS services (Number of critical intersections within study area).	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	D6) Effects on freight and rail passenger service and its signal systems at the GO/Sheppard subway station.	D6.1) Impacts on the operation of the CN Newmarket/GO Bradford rail line during construction and operation of the subway extension.	Angle of crossing at CN Line (degrees)	93	93	98	98	98	98	105	105

Table 6-9 (continued): Analysis of South Alignments and Sheppard West Station

Objectives	Criteria	Indicators	Measures	S1 West	S1 East	S2 West	S2 East	S3 West	S3 East	S4 West	S4 East
D) Minimize adverse environmental effects.	D7) Potential effects on cultural heritage resources.	D7.1) Number, type, significance and sensitivity of archaeological sites, built heritage features and cultural landscapes located within alignment and station footprint areas.	Number of known archaeological sites.	0	0	0	0	0	0	0	0
			Unlikeliness of the discovery of archaeological remains (Low/Medium/High).	High	High	High	High	High	High	High	High
			Number of heritage properties on municipal inventory or designated under the Ontario Heritage Act.	0	0	0	0	0	0	0	0
			Number of heritage properties identified during a field review.	0	0	0	0	0	0	0	0
		D7.2) Number, type, significance and sensitivity of archaeological sites, built heritage features and cultural landscapes located within adjacent zones of influence. (100m)	Number of heritage properties on municipal inventory or designated under the Ontario Heritage Act.	0	0	0	0	0	0	0	0
			Number of heritage properties identified during a field review.	0	0	0	0	0	0	0	0
	D8) Potential effects on pipelines located in the Finch Hydro Corridor	D8.1) Number, type, and length of pipelines requiring relocation due to subway extension.	Number of pipeline crossing	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
			Vertical separation (in metres) between pipelines and subway tunnel	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
E) Achieve reasonable capital and operating costs.	E1) Minimize the capital costs.	E1.1) Capital costs including underground and surface subway facilities, fleet and storage.	Capital costs estimated in 2005 dollars after GST Rebate (millions)	519	507	525	514	520	508	484	484
	E2) Minimize the costs of property acquisition.	E2.1) Total property cost.	Estimated real estate costs in 2005 dollars. (million)	7.6	8.6	7.7	8.2	14.6	20.6	15.3	17.5
		E2.2) Potential environmental cleanup costs.	Number of known or potential contaminated sites within zone of influence of subway extension.	5	6	9	10	10	9	6	6
	E3) Minimize the net operating cost.	E3.1) The dollar value of net fare and other revenues including commuter parking.	Total annual ridership on subway extension measured in number of riders. (Table 14, Route 1 Station usage and link volume forecasts 2021 - opportunities land use - AM Peak Period.	3050700	3050700	3050700	3050700	3050700	3050700	3050700	3050700

Table 6-9 (continued): Analysis of South Alignments and Sheppard West Station

Objectives	Criteria	Indicators	Measures	S1 West	S1 East	S2 West	S2 East	S3 West	S3 East	S4 West	S4 East
E) Achieve reasonable capital and operating costs	E3) Minimize the net operating cost	E3.2) Operations and maintenance cost of the subway extension, including feeder bus operations.	Total length of track on curve (all radii).	1151	1490	1544	1931	1720	2106	1487	1487
			Reduction (addition) to total route length for existing bus services in the study area.	Total bus hours saved per week is 1411 hrs. Total bus kilometres saved each week are 32600km. Bus resources saved is 25 morning peak buses and 18 afternoon peak buses.							
			Contains project elements with higher operating & maintenance needs.	NO	NO	NO	NO	NO	NO	NO	NO

Table 6-10: Evaluation of South Alignments and Sheppard West Station

● MOST PREFFERED ◕ ◑ ◔ ○ LEAST PREFFERED

Objectives	Criteria	Indicators	Measures	S1 West	S1 East	S2 West	S2 East	S3 West	S3 East	S4 West	S4 East
A) Provide subway service to the Keele/Finch area, York University and a new inter-regional transit terminal at Steeles Avenue.	A1) Potential for riders to walk to local stations.	A1.1) Existing population and employment within 500 m walking distance of subway stations.	Number of people and employees within 500 m radius of main entrance (Population per Hectare)	◕	◕	◑	◑	◑	◑	●	●
		A1.2) Future population and employment within 500 m walking distance of subway stations.	Number of people and employees within 500 m radius of main entrance (Population per Hectare)	◑	◑	◕	◕	◕	◕	●	●
		A1.3) Students, faculty and staff within 500 m walking distance of York University Station.	Number of people and employees within 500 m radius of main entrance (based on Data provided to URS by York University)	All Options yield similar results. Not a determining factor for selecting Options.							
	A2) Speed and comfort for subway passengers.	A2.1) Travel time from Downsview Station to Steeles West Station.	Total length of alignments (metres).	All Options yield similar results. Not a determining factor for selecting Options.							
			Estimated run times	All Options yield similar results. Not a determining factor for selecting Options.							
		A2.2) Speed and comfort for subway passengers.	Length of Curves with Radii less than 457m (radius and length)	All Options yield similar results. Not a determining factor for selecting Options.							
			Length of curves with radii between 457m and 750 m (radius and length)	All Options yield similar results. Not a determining factor for selecting Options.							
B) Provide improved connections between the TTC subway and GO Transit, York Region Transit and TTC buses.	B1) Convenience for transfers from bus and train operations (including Wheeltrans).	B1.1) Transfer time from bus to subway platform	Walking time based on 1.2 m/s + 10 second premium for every vertical movement measured from WB on street bus bay to centre of subway platform.(Min.)	All Options yield similar results. Not a determining factor for selecting Options.							
		B1.2) Transfer time from GO Rail to subway platform at Sheppard West Station.	Walking time based on 1.2 m/s + 10 second premium for every vertical movement measured from centre of GO platform to centre of subway platform.(Min)	All Options yield similar results. Not a determining factor for selecting Options.							

Table 6-10 (continued): Evaluation of South Alignments and Sheppard West Station

● MOST PREFFERED ◕ ◑ ◔ ○ LEAST PREFFERED

Objectives	Criteria	Indicators	Measures	S1 West	S1 East	S2 West	S2 East	S3 West	S3 East	S4 West	S4 East
B) Provide improved connections between the TTC subway and GO Transit, York Region Transit and TTC buses.	B1) Convenience for transfers from bus and train operations (including Wheeltrans).	B1.3) Delay time for through passengers on the 36-Finch West bus route and the 41-Keele bus route at Finch West Station.	Total travel time (excluding internal circulation and dwell time within the station) based on travel time (assumed 30 km/hr) + additional delays for specific movements at key intersections (36 Finch) (Min)	All Options yield similar results. Not a determining factor for selecting Options.							
			Total travel time (excluding internal circulation and dwell time within the station) based on travel time (assumed 30 km/hr) + additional delays for specific movements at key intersections (41 Keele) (Min)	All Options yield similar results. Not a determining factor for selecting Options.							
		B1.4) Transfer time from subway to future LRT in hydro corridor at Finch West Station.	Walking time based on 1.2 m/s + 10 second premium for every vertical movement measured from centre of LRT platform to centre of subway platform (Min)	All Options yield similar results. Not a determining factor for selecting Options.							
	B2) Convenience for access from other travel modes (taxi, bicycle, pedestrians, passenger pick up and drop off, commuter parking, ambulatory/non-ambulatory disabled persons).	B2.1) Opportunity to link with cycling routes identified in the City of Toronto's and City of Vaughan's Cycling Master Plans.	Cycling time based on 15 km/h from entrance to identified bike path/bike lanes in cycling master plans (Min)	All Options yield similar results. Not a determining factor for selecting Options.							
		B2.2) Transfer time from other travel modes to subway platform.	Walking time based on 1.2 m/s from PPUDO/taxi stand to closest station entrance (Min)	All Options yield similar results. Not a determining factor for selecting Options.							
			Walking time based on 1.2 m/s from middle of commuter parking lot to closest station entrance (Min)	All Options yield similar results. Not a determining factor for selecting Options.							
		B2.3) Quality of walking environment from other travel modes to subway platform.	Weather protected (yes/no) connection from Sheppard to station entrance	◕	◑	●	●	●	●	○	◔
			Entrance type (Staffed/automated)	All Options yield similar results. Not a determining factor for selecting Options.							
		B2.3) Quality of walking environment from other travel modes to subway platform.	Walking time from station entrance/bicycle racks to subway platform based on 1.2 m/s + 10 second premium for every vertical movement .Max time(Min)	All Options yield similar results. Not a determining factor for selecting Options.							

Table 6-10 (continued): Evaluation of South Alignments and Sheppard West Station

● MOST PREFFERED ◕ ◑ ◔ ○ LEAST PREFFERED

Objectives	Criteria	Indicators	Measures	S1 West	S1 East	S2 West	S2 East	S3 West	S3 East	S4 West	S4 East
B) Provide improved connections between the TTC subway and GO Transit, York Region Transit and TTC buses.	B3) Flexibility for potential future subway extension into York Region.	B3.1) Number, type and sensitivity of significant environmental features potentially affected by a future subway extension into York Region.	Number of natural heritage features.	All Options yield similar results. Not a determining factor for selecting Options.							
			Area of groundwater discharge (100m zone of influence) (ha)	All Options yield similar results. Not a determining factor for selecting Options.							
			Number of residences, businesses and community/ recreational/ institutional facilities.	All Options yield similar results. Not a determining factor for selecting Options.							
			Number of cultural heritage features. (100m zone of influence)	All Options yield similar results. Not a determining factor for selecting Options.							
			Compatibility with planned land use.	All Options yield similar results. Not a determining factor for selecting Options.							
			Total length of alignment (metres)	All Options yield similar results. Not a determining factor for selecting Options.							
	B3) Flexibility for potential future subway extension into York Region.	B 3.2) Number and type of curves between Steeles West Station and Highway 407.	Length of curves with radii less than 457 m.	All Options yield similar results. Not a determining factor for selecting Options.							
			Length of curves with radii between 457 m and 750 m.	All Options yield similar results. Not a determining factor for selecting Options.							
C) Support local population and employment growth.	C1) Maximize redevelopment potential in support of the subway extension.	C1.1) Ability to combine stations with the existing and future built form.	Amount of Redevelopment Frontage encumbered by transit facilities (m). Minimize	◕	●	◑	◑	◑	◕	●	●
			Amount of area identified as redevelopment within zone of influence. Maximize	●	●	●	◕	◑	◕	◑	◑
			Amount of redevelopment frontage within zone of influence. Maximize	●	●	●	◕	◑	◕	◑	◑

Table 6-10 (continued): Evaluation of South Alignments and Sheppard West Station

● MOST PREFFERED ◕ ◑ ◔ ○ LEAST PREFFERED

Objectives	Criteria	Indicators	Measures	S1 West	S1 East	S2 West	S2 East	S3 West	S3 East	S4 West	S4 East
C) Support local population and employment growth.	C2) Maximize the potential to create a high quality urban/pedestrian environment.	C2.1) Potential to create a safe environment for pedestrians, cyclists and transit passengers.	Number of pedestrian-bus conflicts at key uncontrolled station entrances (I.e. bus forecasts x pedestrian movements)	All Options yield similar results. Not a determining factor for selecting Options.							
			Active Surveillance (low,medium,high)	◑	◑	●	●	●	●	◕	◕
D) Minimize adverse environmental effects.	D1) Potential effects on natural heritage features	D1.1) Area, type, significance and resiliency of aquatic and terrestrial landscapes, ecosystems/communities and populations/species located within alignment and station footprint areas.	Area of natural heritage features (hectares)	●	●	◕	◕	◑	◑	◑	◑
			Resiliency of natural heritage features (low, medium, high)	●	●	●	●	◕	◕	◕	◕
			Significance of natural heritage features (local, regional, provincial, federal)	All Options yield similar results. Not a determining factor for selecting Options.							
			Resiliency of natural heritage features (low, medium, high)	All Options yield similar results. Not a determining factor for selecting Options.							
		D1.2) Area, type, significance and sensitivity of aquatic and terrestrial landscapes, ecosystems/communities and populations/species located within adjacent zones of influence.(100m)	Area of natural heritage features (hectares)	All Options yield similar results. Not a determining factor for selecting Options.							
			Type of natural heritage features (ELC classification)	All Options yield similar results. Not a determining factor for selecting Options.							
			Significance of natural heritage features (local, regional, provincial, federal)	All Options yield similar results. Not a determining factor for selecting Options.							
			Resiliency of natural heritage features (low, medium, high)	All Options yield similar results. Not a determining factor for selecting Options.							
	D2) Potential effects on geology and hydrogeology.	D2.1) Magnitude and significance of permanent groundwater drawdown (if any) on hydrogeological conditions.	Area of groundwater recharge/discharge affected (ha)	All Options yield similar results. Not a determining factor for selecting Options.							
			Significance of groundwater recharge/discharge areas affected. (local, regional, provincial)	All Options yield similar results. Not a determining factor for selecting Options.							
			Area of aquifers affected.	All Options yield similar results. Not a determining factor for selecting Options.							
			Significance of aquifers affected. (local, regional, provincial)	All Options yield similar results. Not a determining factor for selecting Options.							

Table 6-10 (continued): Evaluation of South Alignments and Sheppard West Station

● MOST PREFFERED ◕ ◑ ◔ ○ LEAST PREFFERED

Objectives	Criteria	Indicators	Measures	S1 West	S1 East	S2 West	S2 East	S3 West	S3 East	S4 West	S4 East
D) Minimize adverse environmental effects.	D2) Potential effects on geology and hydrogeology.	D2.2) Potential for soil erosion.	Area of soil to be disturbed.	All Options yield similar results. Not a determining factor for selecting Options.							
			Type of soil to be disturbed.	All Options yield similar results. Not a determining factor for selecting Options.							
	D3) Potential effects on hydrology.	D3.1) Area of flood storage capacity removed.	Area of flood storage capacity removed (hectares).	All Options yield similar results. Not a determining factor for selecting Options.							
		D3.2) Length/area of watercourses/ waterbodies altered.	Length/area of surface water features (metres/hectares).	All Options yield similar results. Not a determining factor for selecting Options.							
		D3.3) Ease and effectiveness of stormwater management at subway facilities.	Opportunities consistent with City of Toronto WWFMMP	●	●	●	●	◕	◕	◕	◕
	D4) Potential effects on socio-economic features.	D4.1) Number of employment properties and community/recreational/institutional facilities located within alignment and station footprint areas.	Number of individual properties directly impacted. Minimize	●	●	●	◕	◑	◕	◑	◑
			Amount of station alignment footprint located under a road ROW. Maximize	●	◑	●	◕	●	◕	◑	◑
			Number of Institution	All Options yield similar results. Not a determining factor for selecting Options.							
		D4.2) Area, type, and sensitivity of residences, businesses and community/recreational/institutional facilities located within adjacent zones of influence. (150m)	Number of individual properties directly impacted. Minimize	◑	◕	◑	◕	◑	●	●	●
			Amount of station alignment footprint located under a road ROW. Maximize	●	●	●	◕	◕	◑	◑	◑

Table 6-10 (continued): Evaluation of South Alignments and Sheppard West Station

● MOST PREFFERED ◕ ◑ ◔ ○ LEAST PREFFERED

Objectives	Criteria	Indicators	Measures	S1 West	S1 East	S2 West	S2 East	S3 West	S3 East	S4 West	S4 East
D) Minimize adverse environmental effects.	D5) Potential effects on pedestrian and traffic access/ flow.	D5.1) Number of permanent road closures or access modifications.	Number of closures	All Options yield similar results. Not a determining factor for selecting Options.							
			Number of driveways with reduced access (e.g. full access reduced to right-in/right-out)	All Options yield similar results. Not a determining factor for selecting Options.							
		D5.2) Traffic Impacts due to operations of station commuter facilities (bus terminals, passenger pick-up and drop-off and commuter parking).	Number of critical movements within vicinity of station	All Options yield similar results. Not a determining factor for selecting Options.							
			Sum of intersection delays (in Min) at key intersections at an approximate 250m radius from station.	All Options yield similar results. Not a determining factor for selecting Options.							
			Number of entrances/egresses obstructed by average peak hour queue lengths	All Options yield similar results. Not a determining factor for selecting Options.							
		D5.3) Impact on safety of transportation system.	Number of new signalized conflict points (total change increase/ decrease) on the arterial network.	All Options yield similar results. Not a determining factor for selecting Options.							
			Number of unsignalized conflict points (total change increase/decrease) on the arterial network.	All Options yield similar results. Not a determining factor for selecting Options.							
		D5.4) Accessibility for emergency services including fire, police and ambulance.	Impact on response times for EMS services (Number of critical intersections within study area).	All Options yield similar results. Not a determining factor for selecting Options.							
	D6) Effects on freight and rail passenger service and its signal systems at the GO/Sheppard subway station.	D6.1) Impacts on the operation of the CN Newmarket/GO Bradford rail line during construction and operation of the subway extension.	Angle of crossing at CN Line (degrees)	●	●	◕	◕	◕	◕	◑	◑
	D7) Potential effects on cultural heritage resources.	D7.1) Number, type, significance and sensitivity of archaeological sites, built heritage features and cultural landscapes located within alignment and station footprint areas.	Number of known archaeological sites.	All Options yield similar results. Not a determining factor for selecting Options.							
			Unlikeliness of the discovery of archaeological remains (Low/Medium/High).	All Options yield similar results. Not a determining factor for selecting Options.							
			Number of heritage properties on municipal inventory or designated under the Ontario Heritage Act.	All Options yield similar results. Not a determining factor for selecting Options.							
			Number of heritage properties identified during a field review.	All Options yield similar results. Not a determining factor for selecting Options.							

Table 6-10 (continued): Evaluation of South Alignments and Sheppard West Station

● MOST PREFFERED ◕ ◑ ◔ ○ LEAST PREFFERED

Objectives	Criteria	Indicators	Measures	S1 West	S1 East	S2 West	S2 East	S3 West	S3 East	S4 West	S4 East
D) Minimize adverse environmental effects.	D7) Potential effects on cultural heritage resources.	D7.2) Number, type, significance and sensitivity of archaeological sites, built heritage features and cultural landscapes located within adjacent zones of influence. (100m)	Number of heritage properties on municipal inventory or designated under the Ontario Heritage Act.	All Options yield similar results. Not a determining factor for selecting Options.							
			Number of heritage properties identified during a field review.	All Options yield similar results. Not a determining factor for selecting Options.							
	D8) Potential effects on pipelines located in the Finch Hydro Corridor	D8.1) Number, type, and length of pipelines requiring relocation due to subway extension.	Number of pipeline crossing	All Options yield similar results. Not a determining factor for selecting Options.							
			Vertical separation (in metres) between pipelines and subway tunnel	All Options yield similar results. Not a determining factor for selecting Options.							
E) Achieve reasonable capital and operating costs.	E1) Minimize the capital costs.	E1.1) Capital costs including underground and surface subway facilities, fleet and storage.	Capital costs estimated in 2005 dollars after GST Rebate (millions)	◑	◕	◔	◑	◔	◕	●	●
	E2) Minimize the costs of property acquisition.	E2.1) Total property cost.	Estimated real estate costs in 2005 dollars. (million)	●	●	●	●	◕	◔	◕	◑
		E2.2) Potential environmental cleanup costs.	Number of known or potential contaminated sites within zone of influence of subway extension.	●	●	◕	◕	◕	◕	●	●
	E3) Minimize the net operating cost.	E3.1) The dollar value of net fare and other revenues including commuter parking.	Total annual ridership on subway extension measured in number of riders. (Table 14, Route 1 Station usage and link volume forecasts 2021 - opportunities land use - AM Peak Period.	All Options yield similar results. Not a determining factor for selecting Options.							
		E3.2) Operations and maintenance cost of the subway extension, including feeder bus operations.	Total length of track on curve (all radii).	●	◕	◑	○	◑	○	◕	◕
			Reduction (addition) to total route length for existing bus services in the study area.	All Options yield similar results. Not a determining factor for selecting Options.							
			Contains project elements with higher operating & maintenance needs.	All Options yield similar results. Not a determining factor for selecting Options.							

SPADINA SUBWAY EXTENSION

Evaluation of South Alignment

Objectives	South Alternatives (Including Sheppard West Station)								Comments
	S1 West	S1 East	S2 West	S2 East	S3 West	S3 East	S4 West	S4 East	
	Orange		Pink		Blue		Green		
A) Provide subway service to the Keele/Finch area, York University and a new inter-regional transit terminal at Steeles Avenue.	◑	◑	◕	◕	◕	◕	●	●	• Stations within developed area (S4) have marginally higher walk in opportunity from Keele Industrial Area versus stations in undeveloped Downsview lands (S1). However, existing population and employment within walking distance for all station locations is lower than typically required for a subway station.
B) Provide improved connections between the TTC subway and GO Transit, York Region Transit and TTC buses.	◑	◔	●	●	◕	◕	○	○	• All alignments provide a connection to the GO Bradford Line. • Stations close to Sheppard Avenue (S2 and S3) provide a possible connection from the subway and GO stations to the 84 - Sheppard West bus.
C) Support local population and employment growth.	●	◕	◕	◑	◑	◔	○	○	• Opportunities for development on the Downsview Park lands are greater to the west of the GO line, where the airport clearance envelope is less restrictive. Therefore, western station locations are more preferred. • Station locations set back from Sheppard provide more flexibility for development.
D) Minimize adverse environmental effects.	●	◕	●	◕	◑	◔	○	○	• S1 and S2 use undeveloped Downsview Park lands and Keele Street right of way to minimize impacts to existing businesses. • S3 and S4 affect more properties within the Keele Industrial Area.
E) Achieve reasonable capital and operating costs.	◕	◕	◑	◑	◑	◔	●	◕	• Differences for each alignment relate to length of the alignment (construction cost) and property costs. The cost estimates for alternatives is within a 10% range.
OVERALL	2	4	1	3	4	5	6	7	Option S2 West is preferred because it offers: • A low potential impact to the Keele Industrial Area . •The opportunity to encourage transit supportive development in the area (on the Downsview lands). • A convenient transfer from the GO Bradford line to the TTC Spadina Subway and the 84 - Sheppard West bus.

Most Preferred ● ◕ ◑ ◔ ○ Least Preferred

FIGURE 6-14: Summary of Evaluation for South Alignments

6.3.3. Summary of Evaluation Results: South Alignments

In summary, the analysis produced the following results:

S1 West

This alignment avoids most of the stable employment lands within Keele Industrial Area and provides street frontage redevelopment opportunities for the PDP lands. This alignment produced results similar to S2 West option.

Although this alignment was not carried forward, the refinements to the technically preferred south alignment share many similarities with this alignment option.

S1 East

Similar to S1 West, this alignment avoids most of the stable employment lands within the Keele Industrial Area. Although this station location will support development opportunities on the Downsview lands, the presence of Downsview Airport limits development potential east of the GO Bradford Line. On-street transfers between the 84 Sheppard West bus and the subway station is limited given the distance from the road to the station.

This alignment was not carried forward.

S2 West

This alignment avoids most of the stable employment lands within Keele Industrial Area and will support development opportunities on the Downsview lands. The opportunity for on-street transfers between the 84 Sheppard West bus and the subway station is high. However, the 84 Sheppard West bus will continue to operate out of the existing Downsview Station and therefore this was not a significant consideration for any of the alignments.

This alignment was the technically preferred as presented during the third round of public consultation.

S2 East

This alignment promotes redevelopment of PDP lands (although airport limits opportunities on the east side of the GO Bradford Line). Impacts to stable employment lands within the Keele Industrial Area are lower than the options discussed below. The opportunity for on street transfers between the 84 Sheppard West bus and the subway station was high.

This alignment was not carried forward.

S3 West

Compared with S3 East, S3 West occupies less stable employment lands and more of Keele Street right-of-way. However, in comparison to S1 and S2, the potential impact to the Keele Industrial Area was high, resulting in higher negative socio-economic impacts and higher property acquisition costs. Support for development opportunities on the Downsview lands was less than S2 West and S1 West. The opportunity for on street transfers between the 84 Sheppard West bus and the subway station was high. However, the 84 Sheppard West bus will continue to operate out of the existing Downsview Station and therefore this was not a significant consideration for any of the alignments.

This alignment was not carried forward.

S3 East)

For this option, the potential impact on the Keele Industrial Area was high in terms of negative socio-economic impacts and property acquisition costs. The opportunity for on street transfers between the 84 Sheppard West bus and the subway station was high. However, the 84 Sheppard West bus will continue to operate out of the existing Downsview Station and therefore this was not a significant consideration for any of the alignments.

This alignment was not carried forward.

S4 East & West

Option S4 East & West provides relatively little to no redevelopment opportunities and may impact substantial numbers of properties within the stable employment lands of the Keele Industrial Area. Compared with the other three south subway alignments, the length of the alignment for S4 East and West was shorter between stations with less track curves.

This alignment was not carried forward.

6.3.4. South Alignment and Sheppard West Station Concept Sensitivity Analysis

The sensitivity analysis, which was undertaken using MATS, placed the most emphasis on 6 indicators including:

1) Transfer time from bus to station platform (walking time based on 1.2 m/s + 10 second premium for every vertical movement measured from WB on street bus bay to centre of subway);
2) Ability to combine stations with existing and future built form (amount of area identified as redevelopment within station zone of influence);
3) Ability to combine stations with existing and future built form (amount of redevelopment within station zone of influence);
4) Number individual properties directly impacted;
5) Amount of area identified as stable employment within zone of influence; and
6) Total property cost.

The results of the MATS (Table 6-11) analysis indicated that South 2 West was preferred south subway alignment.

Table 6-11:MATS Results – South Alignment

	S1 West	S1 East	S2 West	S2 East	S3 West	S3 East	S4 West	S4 East
Numerical Result	0.60	0.57	0.64	0.60	0.50	0.48	0.32	0.4
Ranking	2	3	1	2	4	5	7	6

6.3.5. Consultation and Refinement of the Technically Preferred Alignment: S2 West

In consultation with Parc Downsview Park, the technically preferred alignment was shifted approximately 100 metres south of Sheppard Avenue within the Parc Downsview Park lands (see Figure 6-15) to:

1) Provide better access to the Station within the prime Parc Downsview Park development lands;
2) Permit flexibility for development of buildings or a linear park on the Sheppard frontage, even if the subway extension (or Sheppard West Station only) is not implemented for many years into the future; and
3) Reduce property impacts for the alignment section between Downsview Station and Sheppard West Station.

As the benefits of this revised alignment are contingent on future development of the Parc Downsview Park lands, it will be necessary to review this element of the preferred alignment in the context of evolving Parc Donwsview Park development plans.

During the third round of consultations, the technically preferred alignment (including the refinement described above) was strongly endorsed by the public and the majority of key stakeholder agencies. Further refinements to the south alignment are discussed in section 7.0.

During Phase Two of this Study, more detailed requirements for subway operations were determined. As documented in Appendix Q, the provision for a scheduled short-turn service at Downsview Station (similar to existing scheduled short-turn service at St. Clair West Station) would require a double-ended three-track crossover immediately north of the Downsview platform.

The double-ended three-track crossover requires three closely spaced tracks, with high speed switches at each end. The structure within which this specialized trackwork is accommodated has a variable structural configuration and includes structural spans of various lengths (even short sections where there are no columns in between the three tracks. As the structure would be quite shallow as well as structurally complex, construction using tunnelling is not possible (see section 7.0 for more discussion on construction). The construction of this special track work would require the demolition of buildings and the displacement of the associated businesses directly above the alignment through the section of special trackwork (see Figure 6-15).

In order to reduce both the capital cost and property impacts associated with the double-ended three-track crossover north of Downsview Station, further refinements to the alignment were conducted following the third round of consultations. Based on this final alignment, TTC contacted each of the affected property owners through registered mail.

The directly affected property owners were provided an opportunity to comment publicly at the November 28, 2005 Toronto Transit Commission meeting. Several deputations by property owners and businesses along Kodiak Crescent were heard by the Commission. In general, the property owners were concerned that the displacement, either temporary or permanent, would be too disruptive to their businesses. However, most owners indicated to the Study Team that were not concerned about the subway operating below their property provided that noise and vibration impacts were mitigated.

In response to the concerns of the local business community, the Commission directed TTC staff to determine if there were alternative construction techniques or alternative locations for the double-ended three-track crossover. The Study Team determined that alternative construction techniques for the three-track crossover could reduce but would not eliminate surface impacts to two properties (i.e. two buildings and the associated businesses would still be displaced). TTC assessed the possibility of shifting the special trackwork to the west (into the Parc Downsview Park lands) or south of Downsview station.

TTC determined that an acceptable solution would be to accommodate the special track work south of Downsview station and the scheduled short-turn service would operate out of Wilson Station. This would allow the running structure under the potentially affected businesses to be constructed by tunnelling, thereby avoiding surface disruptions. This decision was reported back to the property owners at the December 16, 2005 and January 25, 2006 Toronto Transit Commission meetings. As documented in Appendix Q, the special trackwork to the south of Downsview station requires only a minor modification to the track work previously approved under the “New Subway Storage and Maintenance Facility EA”.

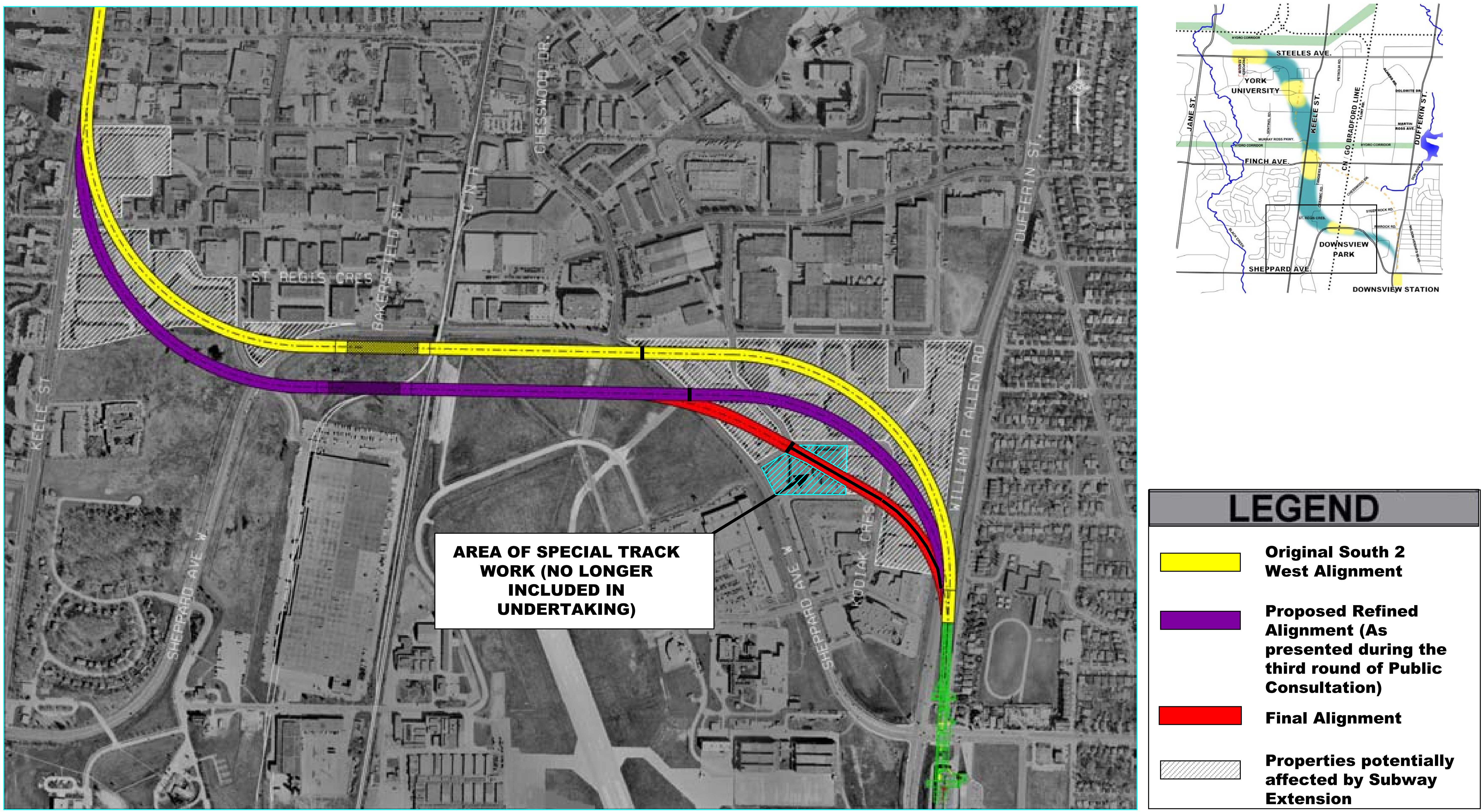


FIGURE 6-15: Refinements to the South Alignment

6.3.6. Alternative Methods to be considered: Finch West Station

For Finch West Station, five alternative concepts were developed. Each concept identified passenger pick-up and drop-off and commuter parking at the same location within the hydro corridor lands, but had different bus terminal locations as described below:

1) Option 1 – The bus terminal would be located on the east side of Keele Street, immediately south of the hydro corridor;
2) Option 2 – The bus terminal would be located north and east of the Keele/Finch intersection, on lands currently occupied by a commercial/industrial condominium complex;
3) Option 3 – The bus terminal would be located at the south-east corner of the Keele/Finch intersection;
4) Option 4 – The bus terminal would be situated at the north-east corner of the intersection; and
5) Option 5 – The bus terminal would be located south and east of the Keele/Finch intersection.

In order to protect existing stable residential areas, no alternatives were developed for the west side of Keele Street. Another important consideration was a potential to link with a future Higher Order Transit Corridor running along the hydro corridor, as proposed in the new City of Toronto Official Plan.

The resulting Finch West Station concepts are illustrated in Figures 6-16 to 6-20. Table 6-12 contains the results of the analysis of each of the alternative alignments. Supporting calculations and documentation are contained in Appendix L. Table 6-13 includes the detailed evaluation for the Reasoned Argument Method

Legend

- STATION PLATFORM
- SUBWAY LINE
- UNDERGROUND WALKWAY
- E ENTRANCE

FIGURE 6-16 Finch West station Option 1

Legend

- STATION PLATFORM
- SUBWAY LINE
- UNDERGROUND WALKWAY
- E ENTRANCE

FIGURE 6-17 Finch West station Option 2

Legend

- STATION PLATFORM
- SUBWAY LINE
- UNDERGROUND WALKWAY
- E ENTRANCE

FIGURE 6-18 Finch West station Option 3

Legend

- STATION PLATFORM
- SUBWAY LINE
- UNDERGROUND WALKWAY
- E ENTRANCE

FIGURE 6-19 Finch West station Option 4

FIGURE 6-20 Finch West station Option 5

Table 6-12:Analysis for Finch West Station

Objectives	Criteria	Indicators	Measures	Option 1	Option 2	Option 3	Option 4	Option 5
A) Provide subway service to the Keele/Finch area, York University and a new inter-regional transit terminal at Steeles Avenue.	A1) Potential for riders to walk to local stations.	A1.1) Existing population and employment within 500m walking distance of subway stations.	Number of people and employees within 500 m radius of main entrance (Population per Hectare)	86	86	86	86	86
		A1.2) Future population and employment within 500m walking distance of subway stations.	Number of people and employees within 500 m radius of main entrance (Population per Hectare)	117	117	117	117	117
		A1.3) Students, faculty and staff within 500 m walking distance of York University Station.	Number of people and employees within 500 m radius of main entrance (based on Data provided to URS by York University)	N/A	N/A	N/A	N/A	N/A
	A2) Speed and comfort for subway passengers.	A2.1) Travel time from Downsview Station to Steeles West Station.	Total length of alignment (metres).	N/A	N/A	N/A	N/A	N/A
			Estimated run times	Difference in travel time between fastest and slowest alignment was imperceptible to transit riders (<20 seconds)				
		A2.2) Speed and comfort for subway passengers.	Length of Curves with Radii less than 457m (radius and length)	N/A	N/A	N/A	N/A	N/A
			Length of curves with radii between 457m and 750 m (radius and length)	N/A	N/A	N/A	N/A	N/A
B) Provide improved connections between the TTC subway and GO Transit, York Region Transit and TTC buses.	B1) Convenience for transfers from bus and train operations (including Wheeltrans).	B1.1) Transfer time from bus platform to subway platform Finch West Station.	Walking time based on 1.2 m/s + 10 second premium for every vertical movement measured from middle bus bay to centre of subway platform (Min.)	4	4	2	2	3
		B1.2) Transfer time from GO Rail to subway platform at Sheppard West Station.	Walking time based on 1.2 m/s + 10 second premium for every vertical movement measured from centre of GO platform to centre of subway platform (Min)	N/A	N/A	N/A	N/A	N/A
		B1.3) Delay time for through passengers on the 36-Finch West bus route and the 41-Keele bus route at Finch West Station.	Total travel time (excluding internal circulation and dwell time within the station) based on travel time (assumed 30 km/hr) + additional delays for specific movements at key intersections (36 Finch) (Min)	5	5	8	5	6
			Total travel time (excluding internal circulation and dwell time within the station) based on travel time (assumed 30 km/hr) + additional delays for specific movements at key intersections (41 Keele) (Min)	3	4	3	4	2
		B1.4) Transfer from subway to future LRT in hydro corridor at Finch West Station.	Potential to provide a connection from subway platform to LRT in Hydro corridor/new LRT terminal.	HIGH	High	Low	Low	Medium

Table 6-12 (continued): Analysis for Finch West Station

Objectives	Criteria	Indicators	Measures	Option 1	Option 2	Option 3	Option 4	Option 5
B) Provide improved connections between the TTC subway and GO Transit, York Region Transit and TTC buses.	B2) Convenience for access from other travel modes (taxi, bicycle, pedestrians, passenger pick up and drop off, commuter parking, ambulatory/non-ambulatory disabled persons).	B2.1) Opportunity to link with cycling routes identified in the City of Toronto's and City of Vaughan's Cycling Master Plans.	Cycling time based on 15 km/h from entrance to identified bike path/bike lanes in cycling master plans.(Min)	1	1	1	1	1
		B2.2) Transfer time from other travel modes to subway platform.	Walking time based on 1.2 m/s from PPUDO/taxi stand to closest station entrance. (Min)	5	5	5	5	5
			Walking time based on 1.2 m/s from middle of commuter parking lot to closest station entrance.(Min)	6	6	6	6	6
		B2.3) Quality of walking environment from other travel modes to subway platform.	Weather protected (yes/no)	NO	NO	NO	NO	NO
			Entrance type (Staffed/automated)	All stations will included both staffed and automated entrances; location to be confirmed at next phase				
			Walking time from station entrance/bicycle racks to subway platform based on 1.2 m/s + 10 second premium for every vertical movement .Max time(Min)	2	2	1	2	2
	B3) Flexibility for potential future subway extension into York Region.	B3.1) Number, type and sensitivity of significant environmental features potentially affected by a future subway extension into York Region.	Number of natural heritage features.	N/A	N/A	N/A	N/A	N/A
			Area of groundwater discharge (ha) (100m zone of influence)	N/A	N/A	N/A	N/A	N/A
			Number of residences, businesses and community/recreational/ institutional facilities.	N/A	N/A	N/A	N/A	N/A
			Number of cultural heritage features. (100m zone of influence)	N/A	N/A	N/A	N/A	N/A
			Compatibility with planned land use.	N/A	N/A	N/A	N/A	N/A
		B 3.2) Number and type of curves between Steeles West Station and Highway 407.	Total length of alignment (metres)	N/A	N/A	N/A	N/A	N/A
			Length of curves with radii less than 457 m.	N/A	N/A	N/A	N/A	N/A
			Length of curves with radii between 457 m and 750 m.	N/A	N/A	N/A	N/A	N/A
C) Support local population and employment growth.	C1) Maximize redevelopment potential in support of the subway extension.	C1.1) Ability to combine stations with the existing and future built form.	Amount of area identified as redevelopment within zone of influence (ha)	All have equal potential				
			Length of redevelopment frontage within zone of influence (m)	Equal frontage for all station concepts (approx. 700 m)				

Table 6-12 (continued): Analysis for Finch West Station

Objectives	Criteria	Indicators	Measures	Option 1	Option 2	Option 3	Option 4	Option 5
C) Support local population and employment growth.	C1) Maximize redevelopment potential in support of the subway extension.	C1.1) Ability to combine stations with the existing and future built form.	Developable frontage encumbered by station amenities - length of Right of Way (metres)	125	70	195	195	15
	C2) Maximize the potential to create a high quality urban/pedestrian environment.	C2.1) Potential to create a safe environment for pedestrians, cyclists and transit passengers.	Number of pedestrian-bus conflicts at key uncontrolled station entrances (I.e. bus forecasts x pedestrian movements)	9300	8900	20400	31200	12900
			Active Surveillance (low, medium, high)	HIGH	LOW	MEDIUM	MEDIUM	LOW
D) Minimize adverse environmental effects.	D1) Potential effects on natural heritage features.	D1.1) Area, type, significance and resiliency of aquatic and terrestrial landscapes, ecosystems/communities and populations/species located within alignment and station footprint areas.	Area of natural heritage features (hectares)	2.51	2.51	2.51	2.51	2.51
			Type of natural heritage features (ELC classification)	cultural meadow, meadow marsh	cultural meadow, meadow marsh	cultural meadow, meadow marsh	cultural meadow, meadow marsh	Cultural meadow, meadow marsh
			Significance of natural heritage features (local, regional, provincial, federal)	local	local	local	local	Local
			Resiliency of natural heritage features (low, medium, high)	medium	medium	medium	medium	Medium
		D1.2) Area, type, significance and sensitivity of aquatic and terrestrial landscapes, ecosystems/communities and populations/species located within adjacent zones of influence.(100m)	Area of natural heritage features (hectares)	3.93	4.12	4.12	4.12	4.12
			Type of natural heritage features (ELC classification)	cultural meadow, meadow marsh	cultural meadow, meadow marsh	cultural meadow, meadow marsh	cultural meadow, meadow marsh	Cultural meadow, meadow marsh
			Significance of natural heritage features (local, regional, provincial, federal)	local	local	local	local	Local
			Resiliency of natural heritage features (low, medium, high)	Medium	Medium	Medium	Medium	Medium
	D2) Potential effects on geology and hydrogeology.	D2.1) Magnitude and significance of permanent groundwater drawdown (if any) on hydrogeological conditions.	Area of groundwater recharge/discharge affected (ha)	0	0	0.02	0	0.02
			Significance of groundwater recharge/discharge areas affected. (local, regional, provincial)	local	local	local	local	Local

Table 6-12 (continued): Analysis for Finch West Station

Objectives	Criteria	Indicators	Measures	Option 1	Option 2	Option 3	Option 4	Option 5
D) Minimize adverse environmental effects	D2) Potential effects on geology and hydrogeology.	D2.1) Magnitude and significance of permanent groundwater drawdown (if any) on hydrogeological conditions.	Area of aquifers affected.	temporary, low to moderate	temporary, low to moderate	temporary, low to moderate	temporary, low to moderate	temporary, low to moderate
			Significance of aquifers affected. (local, regional, provincial)	local	local	local	local	Local
		D2.2) Potential for soil erosion.	Area of soil to be disturbed (ha).	7.4	6.5	2.91	3.96	3.43
			Type of soil to be disturbed.	Stone-poor, Carbonates (silty-sandy till)	Stone-poor, Carbonates (silty-sandy till)	Stone-poor, Carbonates (silty-sandy till)	Stone-poor, Carbonates (silty-sandy till)	Stone-poor, Carbonates (silty-sandy till)
	D3) Potential effects on hydrology.	D3.1) Area of flood storage capacity removed.	Area of flood storage capacity removed (hectares).	Route selected avoids existing floodplains – no impact				
		D3.2) Length/area of watercourses/ waterbodies altered.	Length/area of surface water features (metres/hectares).	Route selected avoids existing watercourses – no impact				
		D3.3) Ease and effectiveness of stormwater management at subway facilities.	Opportunities consistent with City of Toronto WWFMMP	OGS				
	D4) Potential effects on socio-economic features.	D4.1) Number of employment properties and community/recreational/institutional facilities located within alignment and station footprint areas.	Number of businesses directly affected	23	33	3	3	5
			Number of Community/Recreational facilities impacted	0	0	0	0	0
			Number of Institution buildings impacted.	0	0	0	0	0
		D4.2) Area, type, and sensitivity of residences, businesses and community/recreational/institutional facilities located within adjacent zones of influence. (150m)	Area of stable residential within zone of influence (ha)	Due to the redevelopment potential and ownership structure, impact on stable lands was not considered relevant for these alignments.				
			Area of stable employment within zone of influence (ha)	Due to the redevelopment potential and ownership structure, impact on stable lands was not considered relevant for these alignments.				
	D5) Potential effects on pedestrian and traffic access/ flow.	D5.1) Number of permanent road closures or access modifications.	Number of closures	0	0	0	0	0
			Number of driveways with reduced access (e.g. full access reduced to right-in/right-out)	0	0	0	0	0
		D5.2) Traffic Impacts due to operations of station commuter facilities (bus terminals, passenger pick-up and drop-off and commuter parking).	Number of critical movements within vicinity of station	27	21	22	26	21
			Sum of intersection delays (in Min) at key intersections at an approximate 250m radius from station.	6	6	6	6	6

Table 6-12 (continued): Analysis for Finch West Station

Objectives	Criteria	Indicators	Measures	Option 1	Option 2	Option 3	Option 4	Option 5
D) Minimize adverse environmental effects	D5) Potential effects on pedestrian and traffic access/ flow.	D5.2) Traffic Impacts due to operations of station commuter facilities (bus terminals, passenger pick-up and drop-off and commuter parking). .	Number of entrances/egresses obstructed by average peak hour queue lengths	1	0	2	4	2
		D5.3) Impact on safety of transportation system	Number of new signalized conflict points (total change increase/ decrease) on the arterial network.	16	16	16	16	16
			Number of unsignalized conflict points (total change increase/decrease) on the arterial network.	-7	-9	-2	-2	-4
		D5.4) Accessibility for emergency services including fire, police and ambulance.	Impact on response times for EMS services (Number of critical intersections within study area).	6	7	6	6	6
	D6) Effects on freight and rail passenger service and its signal systems at the GO/Sheppard subway station.	D6.1) Impacts on the operation of the CN Newmarket/GO Bradford rail line during construction and operation of the subway extension.	Angle of crossing at CN Line (degrees)	N/A	N/A	N/A	N/A	N/A
	D7) Potential effects on cultural heritage resources.	D7.1) Number, type, significance and sensitivity of archaeological sites, built heritage features and cultural landscapes located within alignment and station footprint areas.	Number of known archaeological sites.	0	0	0	0	0
			Unlikeliness of the discovery of archaeological remains (Low/Medium/High).	Medium	High	High	High	High
			Number of heritage properties on municipal inventory or designated under the Ontario Heritage Act.	0	0	0	0	0
			Number of heritage properties identified during a field review.	0	0	0	0	0
		D7.2) Number, type, significance and sensitivity of archaeological sites, built heritage features and cultural landscapes located within adjacent zones of influence. (100m)	Number of heritage properties on municipal inventory or designated under the Ontario Heritage Act.	1	1	1	1	1
			Number of heritage properties identified during a field review.	1	1	1	1	1
	D8) Potential effects on pipelines located in the Finch Hydro Corridor	D8.1) Number, type, and length of pipelines requiring relocation due to subway extension.	Number of pipeline crossing	N/A	N/A	N/A	N/A	N/A
			Vertical separation (in metres) between pipelines and subway tunnel	N/A	N/A	N/A	N/A	N/A
E) Achieve reasonable capital and operating costs.	E1) Minimize the capital costs.	E1.1) Capital costs including underground and surface subway facilities, fleet and storage.	Capital costs estimated in 2005 dollars after GST Rebate (millions)	34	34	33	34	31
	E2) Minimize the costs of property acquisition.	E2.1) Total property cost.	Estimated real estate costs in 2005 dollars. (million)	36.8	39.6	17.9	9.6	19.3

Table 6-12 (continued): Analysis for Finch West Station

Objectives	Criteria	Indicators	Measures	Option 1	Option 2	Option 3	Option 4	Option 5
E) Achieve reasonable capital and operating costs.	E2) Minimize the costs of property acquisition	E2.2) Potential environmental cleanup costs.	Number of known or potential contaminated sites within zone of influence of subway extension.	24	24	24	20	24
	E3) Minimize the net operating cost.	E3.1) The dollar value of net fare and other revenues including commuter parking.	Total annual ridership on subway extension measured in number of riders. (Table 14, Route 1 Station usage and link volume forecasts 2021 - opportunities land use - AM Peak Period.	3318000	3318000	3318000	3318000	3318000
		E3.2) Operations and maintenance cost of the subway extension, including feeder bus operations.	Total length of track on curve (all radii).	N/A	N/A	N/A	N/A	N/A
			Reduction (addition) to total route length for existing bus services in the study area.	Total bus hours saved per week was 1411 hrs. Total bus kilometres saved each week were 32600km. Bus resources saved are 25 morning peak buses and 18 afternoon peak buses.				
			Contains project elements with higher operating & maintenance needs.	NO	NO	NO	NO	NO

Table 6-13:Evaluation for Finch West Station

● MOST PREFFERED ◕ ◑ ◔ ○ LEAST PREFFERED

Objectives	Criteria	Indicators	Measures	Option 1	Option 2	Option 3	Option 4	Option 5
A) Provide subway service to the Keele/Finch area, York University and a new inter-regional transit terminal at Steeles Avenue.	A1) Potential for riders to walk to local stations.	A1.1) Existing population and employment within 500 m walking distance of subway stations.	Number of people and employees within 500 m radius of main entrance (Population per Hectare)	All Options yield similar results. Not a determining factor for selecting Options.				
		A1.2) Future population and employment within 500 m walking distance of subway stations.	Number of people and employees within 500 m radius of main entrance (Population per Hectare)	All Options yield similar results. Not a determining factor for selecting Options.				
		A1.3) Students, faculty and staff within 500 m walking distance of York University Station.	Number of people and employees within 500 m radius of main entrance (based on Data provided to URS by York University)	All Options yield similar results. Not a determining factor for selecting Options.				
	A2) Speed and comfort for subway passengers.	A2.1) Travel time from Downsview Station to Steeles West Station.	Total length of alignments (metres).	All Options yield similar results. Not a determining factor for selecting Options.				
			Estimated run times	All Options yield similar results. Not a determining factor for selecting Options.				
		A2.2) Speed and comfort for subway passengers.	Length of Curves with Radii less than 457m (radius and length)	All Options yield similar results. Not a determining factor for selecting Options.				
			Length of curves with radii between 457m and 750 m (radius and length)	All Options yield similar results. Not a determining factor for selecting Options.				
B) Provide improved connections between the TTC subway and GO Transit, York Region Transit and TTC buses.	B1) Convenience for transfers from bus and train operations (including Wheeltrans).	B1.1) Transfer time from bus platform to subway platform Finch West Station.	Walking time based on 1.2 m/s + 10 second premium for every vertical movement measured from middle bus bay to centre of subway platform (Min.)	◑	◑	●	●	◕
		B1.2) Transfer time from GO Rail to subway platform at Sheppard West Station.	Walking time based on 1.2 m/s + 10 second premium for every vertical movement measured from centre of GO platform to centre of subway platform (Min)	All Options yield similar results. Not a determining factor for selecting Options.				
		B1.3) Delay time for through passengers on the 36-Finch West bus route and the 41-Keele bus route at Finch West Station.	Total travel time (excluding internal circulation and dwell time within the station) based on travel time (assumed 30 km/hr) + additional delays for specific movements at key intersections (36 Finch) (Min)	●	●	◕	●	●
			Total travel time (excluding internal circulation and dwell time within the station) based on travel time (assumed 30 km/hr) + additional delays for specific movements at key intersections (41 Keele) (Min)	◑	◔	◕	◔	●
		B1.4) Transfer from subway to future LRT in hydro corridor at Finch West Station.	Potential to provide a connection from subway platform to LRT in Hydro corridor/new LRT terminal.	All Options yield similar results. Not a determining factor for selecting Options.				

Table 6-13 (continued): Evaluation of Finch West Station

● MOST PREFFERED ◕ ◑ ◔ ○ LEAST PREFFERED

Objectives	Criteria	Indicators	Measures	Option 1	Option 2	Option 3	Option 4	Option 5
B) Provide improved connections between the TTC subway and GO Transit, York Region Transit and TTC buses.	B2) Convenience for access from other travel modes (taxi, bicycle, pedestrians, passenger pick up and drop off, commuter parking, ambulatory/non-ambulatory disabled persons).	B2.1) Opportunity to link with cycling routes identified in the City of Toronto's and City of Vaughan's Cycling Master Plans.	Cycling time based on 15 km/h from entrance to identified bike path/bike lanes in cycling master plans.(Min)	All Options yield similar results. Not a determining factor for selecting Options.				
		B2.2) Transfer time from other travel modes to subway platform.	Walking time based on 1.2 m/s from PPUDO/taxi stand to closest station entrance. (Min)	All Options yield similar results. Not a determining factor for selecting Options.				
			Walking time based on 1.2 m/s from middle of commuter parking lot to closest station entrance.(Min)	All Options yield similar results. Not a determining factor for selecting Options.				
		B2.3) Quality of walking environment from other travel modes to subway platform.	Weather protected (yes/no)	All Options yield similar results. Not a determining factor for selecting Options.				
			Entrance type (Staffed/automated)	All Options yield similar results. Not a determining factor for selecting Options.				
			Walking time from station entrance/bicycle racks to subway platform based on 1.2 m/s + 10 second premium for every vertical movement .Max time(Min)	All Options yield similar results. Not a determining factor for selecting Options.				
	B3) Flexibility for potential future subway extension into York Region.	B3.1) Number, type and sensitivity of significant environmental features potentially affected by a future subway extension into York Region.	Number of natural heritage features.	All Options yield similar results. Not a determining factor for selecting Options.				
			Area of groundwater discharge (100m zone of influence) (ha)	All Options yield similar results. Not a determining factor for selecting Options.				
			Number of residences, businesses and community/recreational/ institutional facilities.	All Options yield similar results. Not a determining factor for selecting Options.				
			Number of cultural heritage features. (100m zone of influence)	All Options yield similar results. Not a determining factor for selecting Options.				
			Compatibility with planned land use.	All Options yield similar results. Not a determining factor for selecting Options.				
		B 3.2) Number and type of curves between Steeles West Station and Highway 407.	Total length of alignment (metres)	All Options yield similar results. Not a determining factor for selecting Options.				
			Length of curves with radii less than 457 m.	All Options yield similar results. Not a determining factor for selecting Options.				
			Length of curves with radii between 457 m and 750 m.	All Options yield similar results. Not a determining factor for selecting Options.				

Table 6-13 (continued): Evaluation of Finch West Station

● MOST PREFFERED ◕ ◑ ◔ ○ LEAST PREFFERED

Objectives	Criteria	Indicators	Measures	Option 1	Option 2	Option 3	Option 4	Option 5
C) Support local population and employment growth.	C1) Maximize redevelopment potential in support of the subway extension.	C1.1) Ability to combine stations with the existing and future built form.	Amount of area identified as redevelopment within zone of influence (ha)	All Options yield similar results. Not a determining factor for selecting Options.				
			Amount of redevelopment frontage within zone of influence (m)	All Options yield similar results. Not a determining factor for selecting Options.				
			Developable frontage encumbered by station amenities - length of Right of Way (metres)	◑	◕	◔	◔	●
	C2) Maximize the potential to create a high quality urban/pedestrian environment.	C2.1) Potential to create a safe environment for pedestrians, cyclists and transit passengers.	Number of pedestrian-bus conflicts at key uncontrolled station entrances (I.e. bus forecasts x pedestrian movements)	●	●	◑	○	●
			Active Surveillance (low, medium, high)	●	◑	◕	◕	◑
D) Minimize adverse environmental effects.	D1) Potential effects on natural heritage features.	D1.1) Area, type, significance and resiliency of aquatic and terrestrial landscapes, ecosystems/communities and populations/species located within alignment and station footprint areas.	Area of natural heritage features (hectares)	All Options yield similar results. Not a determining factor for selecting Options.				
			Type of natural heritage features (ELC classification)	All Options yield similar results. Not a determining factor for selecting Options.				
			Significance of natural heritage features (local, regional, provincial, federal)	All Options yield similar results. Not a determining factor for selecting Options.				
			Resiliency of natural heritage features (low, medium, high)	All Options yield similar results. Not a determining factor for selecting Options.				
		D1.2) Area, type, significance and sensitivity of aquatic and terrestrial landscapes, ecosystems/communities and populations/species located within adjacent zones of influence.(100m)	Area of natural heritage features (hectares)	All Options yield similar results. Not a determining factor for selecting Options.				
			Type of natural heritage features (ELC classification)	All Options yield similar results. Not a determining factor for selecting Options.				
			Significance of natural heritage features (local, regional, provincial, federal)	All Options yield similar results. Not a determining factor for selecting Options.				
			Resiliency of natural heritage features (low, medium, high)	All Options yield similar results. Not a determining factor for selecting Options.				

Table 6-13 (continued): Evaluation of Finch West Station

● MOST PREFFERED ◕ ◑ ◔ ○ LEAST PREFFERED

Objectives	Criteria	Indicators	Measures	Option 1	Option 2	Option 3	Option 4	Option 5
D) Minimize adverse environmental effects	D2) Potential effects on geology and hydrogeology.	D2.1) Magnitude and significance of permanent groundwater drawdown (if any) on hydrogeological conditions.	Area of groundwater recharge/discharge affected (ha)	All Options yield similar results. Not a determining factor for selecting Options.				
			Significance of groundwater recharge/discharge areas affected. (local, regional, provincial)	All Options yield similar results. Not a determining factor for selecting Options.				
			Area of aquifers affected.	All Options yield similar results. Not a determining factor for selecting Options.				
			Significance of aquifers affected. (local, regional, provincial)	All Options yield similar results. Not a determining factor for selecting Options.				
		D2.2) Potential for soil erosion.	Area of soil to be disturbed.	All Options yield similar results. Not a determining factor for selecting Options.				
			Type of soil to be disturbed.	All Options yield similar results. Not a determining factor for selecting Options.				
	D3) Potential effects on hydrology.	D3.1) Area of flood storage capacity removed.	Area of flood storage capacity removed (hectares).	All Options yield similar results. Not a determining factor for selecting Options.				
		D3.2) Length/area of watercourses/ waterbodies altered.	Length/area of surface water features (metres/hectares).	All Options yield similar results. Not a determining factor for selecting Options.				
		D3.3) Ease and effectiveness of stormwater management at subway facilities.	Opportunities consistent with City of Toronto WWFMMP	All Options yield similar results. Not a determining factor for selecting Options.				
	D4) Potential effects on socio-economic features.	D4.1) Number of employment properties and community/recreational/institutional facilities located within alignment and station footprint areas.	Number of businesses directly affected	●	◕	◔	◔	◕
			Number of Community/Recreational facilities impacted	All Options yield similar results. Not a determining factor for selecting Options.				
			Number of Institution buildings impacted.	All Options yield similar results. Not a determining factor for selecting Options.				
		D4.2) Area, type, and sensitivity of residences, businesses and community/recreational/institutional facilities located within adjacent zones of influence. (150m)	Area of stable residential within zone of influence (ha)	All Options yield similar results. Not a determining factor for selecting Options.				
			Area of stable employment within zone of influence (ha)	All Options yield similar results. Not a determining factor for selecting Options.				
	D5) Potential effects on pedestrian and traffic access/ flow.	D5.1) Number of permanent road closures or access modifications.	Number of closures	All Options yield similar results. Not a determining factor for selecting Options.				
			Number of driveways with reduced access (e.g. full access reduced to right-in/right-out)	All Options yield similar results. Not a determining factor for selecting Options.				

Table 6-13 (continued): Evaluation of Finch West Station

● MOST PREFFERED ◕ ◑ ◔ ○ LEAST PREFFERED

Objectives	Criteria	Indicators	Measures	Option 1	Option 2	Option 3	Option 4	Option 5
D) Minimize adverse environmental effects	D5) Potential effects on pedestrian and traffic access/ flow.	D5.2) Traffic Impacts due to operations of station commuter facilities (bus terminals, passenger pick-up and drop-off and commuter parking).	Number of critical movements within vicinity of station	All Options yield similar results. Not a determining factor for selecting Options.				
			Sum of intersection delays (in Min) at key intersections at an approximate 250m radius from station.	All Options yield similar results. Not a determining factor for selecting Options.				
			Number of entrances/egresses obstructed by average peak hour queue lengths	◕	●	◑	○	◑
		D5.3) Impact on safety of transportation system.	Number of new signalized conflict points (total change increase/ decrease) on the arterial network.	All Options yield similar results. Not a determining factor for selecting Options.				
			Number of unsignalized conflict points (total change increase/decrease) on the arterial network.	All Options yield similar results. Not a determining factor for selecting Options.				
		D5.4) Accessibility for emergency services including fire, police and ambulance.	Impact on response times for EMS services (Number of critical intersections within study area).	All Options yield similar results. Not a determining factor for selecting Options.				
	D6) Effects on freight and rail passenger service and its signal systems at the GO/Sheppard subway station.	D6.1) Impacts on the operation of the CN Newmarket/GO Bradford rail line during construction and operation of the subway extension.	Angle of crossing at CN Line (degrees)	All Options yield similar results. Not a determining factor for selecting Options.				
	D7) Potential effects on cultural heritage resources.	D7.1) Number, type, significance and sensitivity of archaeological sites, built heritage features and cultural landscapes located within alignment and station footprint areas.	Number of known archaeological sites.	All Options yield similar results. Not a determining factor for selecting Options.				
			Unlikeliness of the discovery of archaeological remains (Low/Medium/High).	All Options yield similar results. Not a determining factor for selecting Options.				
			Number of heritage properties on municipal inventory or designated under the Ontario Heritage Act.	All Options yield similar results. Not a determining factor for selecting Options.				
			Number of heritage properties identified during a field review.	All Options yield similar results. Not a determining factor for selecting Options.				
		D7.2) Number, type, significance and sensitivity of archaeological sites, built heritage features and cultural landscapes located within adjacent zones of influence. (100m)	Number of heritage properties on municipal inventory or designated under the Ontario Heritage Act.	All Options yield similar results. Not a determining factor for selecting Options.				
			Number of heritage properties identified during a field review.	All Options yield similar results. Not a determining factor for selecting Options.				

Table 6-13 (continued): Evaluation of Finch West Station

● MOST PREFFERED ◕ ◑ ◔ ○ LEAST PREFFERED

Objectives	Criteria	Indicators	Measures	Option 1	Option 2	Option 3	Option 4	Option 5
D) Minimize adverse environmental effects	D8) Potential effects on pipelines located in the Finch Hydro Corridor	D8.1) Number, type, and length of pipelines requiring relocation due to subway extension.	Number of pipeline crossing	All Options yield similar results. Not a determining factor for selecting Options.				
			Vertical separation (in metres) between pipelines and subway tunnel	All Options yield similar results. Not a determining factor for selecting Options.				
E) Achieve reasonable capital and operating costs.	E1) Minimize the capital costs.	E1.1) Capital costs including underground and surface subway facilities, fleet and storage.	Capital costs estimated in 2005 dollars after GST Rebate (millions)	All Options yield similar results. Not a determining factor for selecting Options.				
	E2) Minimize the costs of property acquisition.	E2.1) Total property cost.	Estimated real estate costs in 2005 dollars. (million)	○	○	◕	●	◕
	E2) Minimize the costs of property acquisition	E2.2) Potential environmental cleanup costs.	Number of known or potential contaminated sites within zone of influence of subway extension.	All Options yield similar results. Not a determining factor for selecting Options.				
	E3) Minimize the net operating cost.	E3.1) The dollar value of net fare and other revenues including commuter parking.	Total annual ridership on subway extension measured in number of riders. (Table 14, Route 1 Station usage and link volume forecasts 2021 - opportunities land use - AM Peak Period.	All Options yield similar results. Not a determining factor for selecting Options.				
		E3.2) Operations and maintenance cost of the subway extension, including feeder bus operations.	Total length of track on curve (all radii).	All Options yield similar results. Not a determining factor for selecting Options.				
			Reduction (addition) to total route length for existing bus services in the study area.	All Options yield similar results. Not a determining factor for selecting Options.				
			Contains project elements with higher operating & maintenance needs.	All Options yield similar results. Not a determining factor for selecting Options.				

Evaluation of Finch West Station

Objectives	Option 1	Option 2	Option 3	Option 4	Option 5	
A) Provide subway service to the Keele/Finch area, York University and a new inter-regional transit terminal at Steeles Avenue.	●	●	●	●	●	• Existing population and employment within walking distance of the Finch West Station is the same for all station concepts. • All options serve the Keele Street / Finch Avenue area.
B) Provide improved connections between the TTC subway and GO Transit, York Region Transit and TTC buses.	◕	◑	◔	◑	●	• A bus terminals close to Keele and Finch (e.g. Options 3 and 4) will be impacted by the traffic in the Finch/Keele intersection resulting in long delays for buses. • Access away from this intersection from Keele Street (Option 1) or Tangiers Road (Option 2) or both (Option 5) is more preferred.
C) Support local population and employment growth.	◕	●	◑	◔	●	• A bus terminal set back from Finch and Keele provides better opportunities for transit-oriented development: • Locating the bus terminal on the corner of Finch and Keele (Options 3 and 4) limits development opportunities. • Locating the bus terminal along the frontage of Keele (Options 1, 3 and 4) limits development opportunities.
D) Minimize adverse environmental effects.	◔	○	●	◕	◑	• The north east quadrant of Keele and Finch has the highest number of businesses. Options 1 and 2 impact this area. • Existing frontage along Keele Street has the fewest number of businesses directly impacted (Options 3 and 4).
E) Achieve reasonable capital and operating costs.	◑	◑	◕	●	◕	• High property value for the multi-unit development on northeast corner of Finch and Keele (impacted by Options 1 and 2).
OVERALL	3	4	2	2	1	Option 5 is preferred because it offers: • A quick transfer time to subway for passengers on the 36 – Finch West bus route and the 41 – Keele bus route. • The most developable frontage along Keele Street and Finch Avenue West. • The fewest impacts to existing businesses / lower property cost. • The least amount of disruptions to existing traffic.

Most Preferred ● ◕ ◑ ◔ ○ Least Preferred

FIGURE 6-21: Summary of Evaluation for Finch West Station

6.3.7. Summary of Evaluation Results: Finch West Station

In summary, the RAM analysis produced the following results:

Option 1

This station concept locates the bus terminal, the passenger pick-up and drop-off and commuter parking results in close proximity to one another, which results in a compact station footprint. The opportunity to integrate this station with future LRT in the Finch hydro corridor was high. However, the bus terminal uses developable frontages along the Keele Street. Furthermore, the bus terminal footprint impacts a high number of businesses in the northeast quadrant of the Keele / Finch intersection resulting in negative socio-economic impacts and high property costs.

This option was not carried forward, but in response to public and stakeholder comments, a variation of Option 1 was considered. This option is described in more detail in section 6.3.9.

Option 2

Although locating the bus terminal set back from Finch Avenue and west of Keele Street minimizes the potential for frontage redevelopment along Finch Avenue, the bus terminal footprint impacts a high number of businesses in the northeast quadrant of the Keele / Finch intersection resulting in negative socio-economic impacts and high property costs. The bus terminal was also located away from the subway platform, which will increase the from bus to subway transfer times. The opportunity to integrate this station with future LRT in the hydro corridor was high.

This option was not carried forward.

Option 3

This station concept uses considerable developable frontage on both Finch Avenue and Keele Street. Furthermore, by positioning the terminal at the intersection, traffic congestion associated with the busy Keele / Finch intersection will routinely block bus driveways, resulting in increased delay and reduced service reliability for bus operations.

This option was not carried forward.

Option 4

Similar to Option 3, this station concept uses considerable developable frontage on both Finch Avenue and Keele Street. Furthermore, by positioning the terminal at the intersection, traffic congestion associated with the busy Keele / Finch intersection will routinely block bus driveways, resulting in increased delay and reduced service reliability for bus operations.

This option was not carried forward.

Option 5

This station concept provides quick transfer times for passengers on buses and preserves developable frontage along both Keele Street and Finch Avenue. Negative impacts to businesses are considerably lower than Options 1 and 2.

As illustrated in Figure 6-21, the results of the RAM analysis indicated that Finch West Station Option 5 was preferred because it offers:

1) A quick transfer time for passengers on both the Finch West Bus (36) and the Keele Street Bus (41) routes;
2) The most developable frontage along both Keele Street and Finch Avenue West;
3) The fewest impacts to existing business within the station area which will translate into lower capital and property costs; and,
4) The least amount of disruptions to existing traffic within the station area.

6.3.8. Finch West Station Station Concept Sensitivity Analysis

The detailed MATS analysis is presented in Appendix L.

For Finch West Station, the Study Team placed the most emphasis on 3 indicators including:

1) Indicator B1.3 A – Delay time for through passengers on 36 Finch West Bus
2) Indicator C1.1 C - Ability to combine stations with existing and future built form (amount of area identified as redevelopment within station zone of influence); and,
3) Indicator D4.1 A – Number of individual properties directly impacted.

A total of five concepts were evaluated for Finch West Station using the indicator-level weights. As illustrated in Table 6-14, the highest-ranking Finch West Station concept was Option 5. However, if a modification could be made to either of the second place station concepts that either reduced negative impacts or increased benefit, then the preferred station concept could change.

Table 6-14:MATS Analysis – Finch West Station

	Option 1	Option 2	Option 3	Option 4	Option 5
MATS Results	0.35	0.35	0.31	0.30	0.36
Ranking	2	2	3	4	1

6.3.9. Consultation and Refinement on the Technically Preferred Alignment: Finch West Station

Consistent with the overall Project objectives, Option 5 for Finch West Station was selected as the technically preferred because it:

1) Provides fast, convenient and reliable access for buses operating on Keele Street and Finch Avenue West;
2) Minimises walk times between the bus terminal and the subway platform for transferring passengers;
3) Preserves the Keele and Finch street frontages for transit-supportive redevelopment;
4) Minimises impacts on existing businesses and residents, and
5) Achieves reasonable costs.

During the third round of consultation the public generally supported the selection of Option 5 but expressed concern over the distance between the main entrance and the commuter facilities in the Finch hydro corridor. Substantive concerns to Option 5 were expressed by the key stakeholder agencies, who favoured a more compact station concept that would reduce the transfer time between the bus terminal and subway platform and provide a more convenient entrance location to the passenger pick-up and drop-off and commuter parking facilities.

Representatives of TTC, City Planning and City Works (Traffic section) worked collaboratively to develop a modified Option 1. The recommended Finch West Station concept, as shown in Figure 6-22, would have:

1) Reduced business loss impacts (impacts to the industrial/commercial condominium complex are limited to a minor loss of parking and the elimination of all direct vehicular access onto Keele Street);
2) Acceptable transit and traffic operations; and
3) The desired compact station form, while still providing connections to the north and south sides of Finch Avenue West.

Analysis and evaluation of the technically preferred (Option 5), the original Option1 and the modified Option 1 is documented in Tables 6-15 and 6-16. Based on the revised analysis, the Modified Option 1 determined to be the most preferred because:

1) This station concept locates the bus terminal, the passenger pick-up and drop-off and commuter parking results in close proximity to one another which results in a compact station footprint;
2) The opportunity to integrate this station with future LRT in the Finch hydro corridor was high;
3) It provides comparable service for the 36 Finch West and 41 Keele Street (versus Option5); and
4) It avoids most of the business impacts, thereby reducing negative socio-economic impacts and high property costs.

The modified Option 1 still results in a loss of developable frontage along Keele Street. However, since the bus terminal footprint still avoids the corners at Keele Street and Finch Avenue, City Planning confirmed that the transportation benefits of this concept outweighed the reduced development opportunity along the Keele Street frontage.

The Study Team also conducted another set of MATS analysis where the modified Option 1 was compared to Finch West Station Option 1 and Finch West Station Option 5. Based on these weights, the modified Option 1 obtained the highest overall score from the MATS analysis, with an overall score of 0.546, followed by Option 5 with an overall score of 0.434 while Option 1 had the least overall score of 0.274.

Recognizing that this recommendation directly affects different property owners (versus the technically preferred Option 5, which was presented at the third round of public consultation), TTC notified all directly affected parties by registered mail prior to presenting the draft findings to the Toronto Transit Commission on November 28th, 2005.

Limited comments or concerns were raised by the affected property owners and the modified Option 1 was approved at the November 28, 2005 Commission meeting.

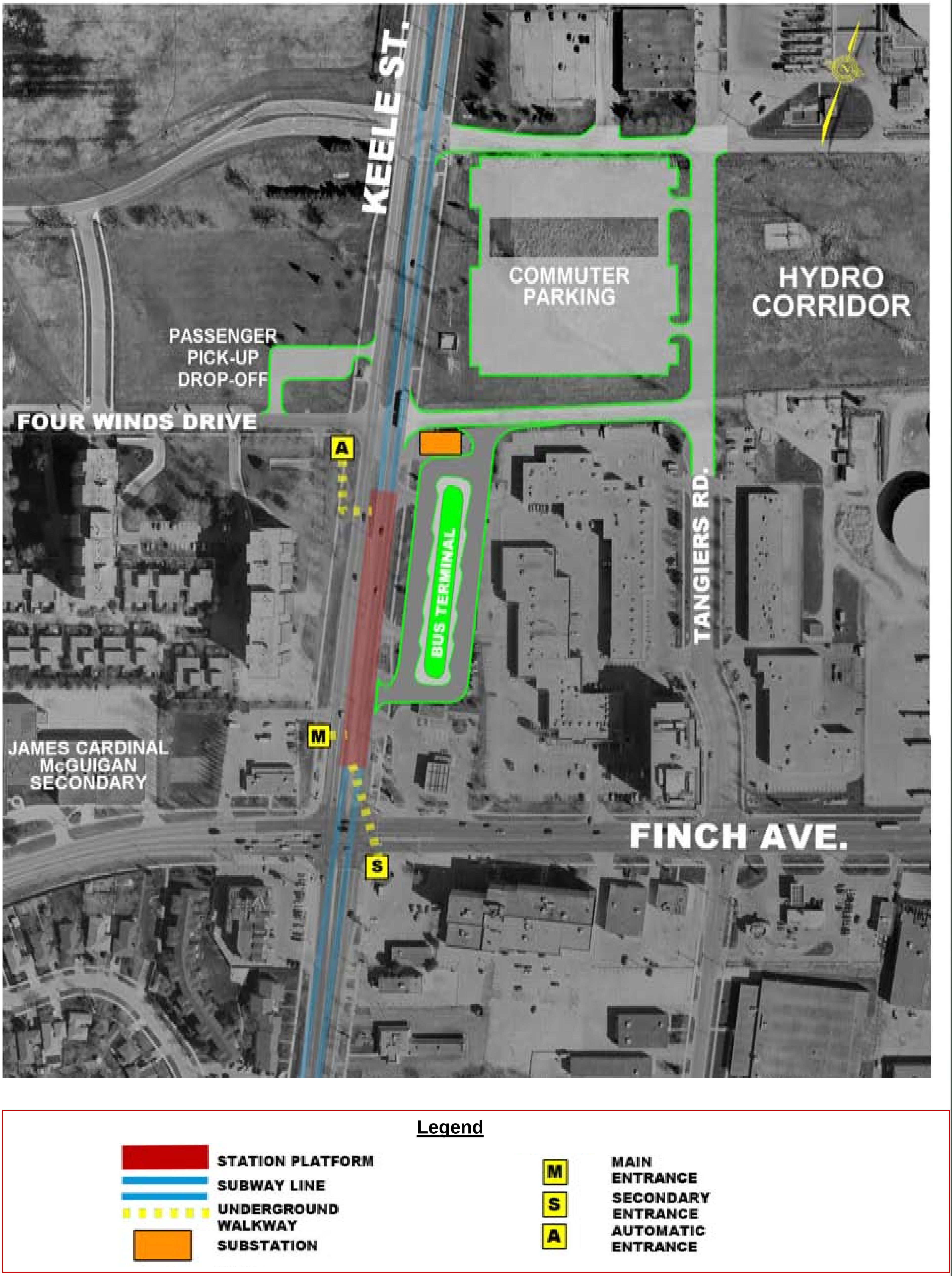


FIGURE 6-22: Recommended Finch West Station Concept

Table 6-15: Analysis of Finch West Station, Modified Option 1

Objectives	Criteria	Indicators	Measures	Option 1	Option 1A	Option 5
A) Provide subway service to the Keele/Finch area, York University and a new inter-regional transit terminal at Steeles Avenue.	A1) Potential for riders to walk to local stations.	A1.1) Existing population and employment within 500 m walking distance of subway stations.	Number of people and employees within 500 m radius of main entrance (Population per Hectare)	86	86	86
		A1.2) Future population and employment within 500 m walking distance of subway stations.	Number of people and employees within 500 m radius of main entrance (Population per Hectare)	117	117	117
		A1.3) Students, faculty and staff within 500 m walking distance of York University Station.	Number of people and employees within 500 m radius of main entrance (based on Data provided to URS by York University)	N/A	N/A	N/A
	A2) Speed and comfort for subway passengers.	A2.1) Travel time from Downsview Station to Steeles West Station.	Total length of alignment (metres)	N/A	N/A	N/A
			Estimated run times	Difference in travel time between fastest and slowest alignment was imperceptible to transit riders (<20 seconds)		
		A2.2) Speed and comfort for subway passengers.	Length of Curves with Radii less than 457m (radius and length)	N/A	N/A	N/A
			Length of curves with radii between 457m and 750 m (radius and length)	N/A	N/A	N/A
B) Provide improved connections between the TTC subway and GO Transit, York Region Transit and TTC buses.	B1) Convenience for transfers from bus and train operations (including Wheeltrans).	B1.1) Transfer time from bus platform to subway platform Finch West Station.	Walking time based on 1.2 m/s + 10 second premium for every vertical movement measured from middle bus bay to centre of subway platform (Min.)	4	1	3
		B1.2) Transfer time from GO Rail to subway platform at Sheppard West Station.	Walking time based on 1.2 m/s + 10 second premium for every vertical movement measured from centre of GO platform to centre of subway platform (Min)	N/A	N/A	N/A
		B1.3) Delay time for through passengers on the 36-Finch West bus route and the 41-Keele bus route at Finch West Station.	Total travel time (excluding internal circulation and dwell time within the station) based on travel time (assumed 30 km/hr) + additional delays for specific movements at key intersections (36 Finch) (Min)	5	4	4
			Total travel time (excluding internal circulation and dwell time within the station) based on travel time (assumed 30 km/hr) + additional delays for specific movements at key intersections (41 Keele) (Min)	3	1	1
B) Provide improved connections between the TTC subway and GO Transit, York Region Transit and TTC buses.	B1) Convenience for transfers from bus and train operations (including Wheeltrans).	B1.4) Transfer from subway to future LRT in hydro corridor at Finch West Station.	Potential to provide a connection from subway platform to LRT in Hydro corridor/new LRT terminal	HIGH	HIGH	Medium

Table 6-15 (Continued): Analysis of Finch West Station, Modified Option 1

Objectives	Criteria	Indicators	Measures	Option 1	Option 1A	Option 5
B) Provide improved connections between the TTC subway and GO Transit, York Region Transit and TTC buses.	B2) Convenience for access from other travel modes (taxi, bicycle, pedestrians, passenger pick up and drop off, commuter parking, ambulatory/non-ambulatory disabled persons).	B2.1) Opportunity to link with cycling routes identified in the City of Toronto's and City of Vaughan's Cycling Master Plans.	Cycling time based on 15 km/h from entrance to identified bike path/bike lanes in cycling master plans (Min)	1	1	1
		B2.2) Transfer time from other travel modes to subway platform.	Walking time based on 1.2 m/s from PPUDO/taxi stand to closest station entrance (Min)	5	2	4
			Walking time based on 1.2 m/s from middle of commuter parking lot to closest station entrance (Min)	6	1	5
		B2.3) Quality of walking environment from other travel modes to subway platform.	Weather protected (yes/no)	NO	YES	NO
			Entrance type (Staffed/automated)	All stations will include both staffed & automated entrances. Location to be confirmed at next phase.		
			Walking time from station entrance/bicycle racks to subway platform based on 1.2 m/s + 10 second premium for every vertical movement Max time (Min)	2	2	2
	B3) Flexibility for potential future subway extension into York Region.	B3.1) Number, type and sensitivity of significant environmental features potentially affected by a future subway extension into York Region.	Number of natural heritage features.	N/A	N/A	N/A
			Area of groundwater discharge (ha) (100m zone of influence)	N/A	N/A	N/A
			Number of residences, businesses and community/recreational/ institutional facilities.	N/A	N/A	N/A
			Number of cultural heritage features. (100m zone of influence)	N/A	N/A	N/A
			Compatibility with planned land use.	N/A	N/A	N/A
		B 3.2) Number and type of curves between Steeles West Station and Highway 407.	Total length of alignment (metres)	N/A	N/A	N/A
			Length of curves with radii less than 457 m.	N/A	N/A	N/A
			Length of curves with radii between 457 m and 750 m.	N/A	N/A	N/A
C) Support local population and employment growth.	C1) Maximize redevelopment potential in support of the subway extension.	C1.1) Ability to combine stations with the existing and future built form.	Amount of area identified as redevelopment within zone of influence (ha)	All have equal potential		
			Amount of redevelopment frontage within zone of influence (m)	Equal frontage for all station concepts (approx. 700 m)		
			Developable frontage encumbered by station amenities - length of Right of Way (metres)	125	125	15

Table 6-15 (Continued): Analysis of Finch West Station, Modified Option 1

Objectives	Criteria	Indicators	Measures	Option 1	Option 1A	Option 5
C) Support local population and employment growth.	C2) Maximize the potential to create a high quality urban/pedestrian environment.	C2.1) Potential to create a safe environment for pedestrians, cyclists and transit passengers.	Number of pedestrian-bus conflicts at key uncontrolled station entrances (I.e. bus forecasts x pedestrian movements)	9300	9300	12900
			Active Surveillance (low, medium, high)	HIGH	HIGH	LOW
D) Minimize adverse environmental effects.	D1) Potential effects on natural heritage features.	D1.1) Area, type, significance and resiliency of aquatic and terrestrial landscapes, ecosystems/communities and populations/species located within alignment and station footprint areas.	Area of natural heritage features (hectares)	2.51	2.51	2.51
			Type of natural heritage features (ELC classification)	Cultural meadow, meadow marsh	Cultural meadow, meadow marsh	Cultural meadow, meadow marsh
			Significance of natural heritage features (local, regional, provincial, federal)	Local	Local	Local
			Resiliency of natural heritage features (low, medium, high)	Medium	Medium	Medium
		D1.2) Area, type, significance and sensitivity of aquatic and terrestrial landscapes, ecosystems/communities and populations/species located within adjacent zones of influence. (100m)	Area of natural heritage features (hectares)	3.93	3.93	4.12
			Type of natural heritage features (ELC classification)	Cultural meadow, meadow marsh	Cultural meadow, meadow marsh	Cultural meadow, meadow marsh
			Significance of natural heritage features (local, regional, provincial, federal)	Local	Local	Local
			Resiliency of natural heritage features (low, medium, high)	Medium	Medium	Medium
	D2) Potential effects on geology and hydrogeology.	D2.1) Magnitude and significance of permanent groundwater drawdown (if any) on hydrogeological conditions.	Area of groundwater recharge/discharge affected (ha)	0	0	0.02
			Significance of groundwater recharge/discharge areas affected. (Local, regional, provincial)	Local	Local	Local
			Area of aquifers affected	Temporary, low to moderate	Temporary, low to moderate	Temporary, low to moderate
			Significance of aquifers affected (local, regional, provincial)	Local	Local	Local
		D2.2) Potential for soil erosion.	Area of soil to be disturbed (ha)	7.4	7.4	3.43
			Type of soil to be disturbed	Stone-poor, Carbonates (silty-sandy till)	Stone-poor, Carbonates (silty-sandy till)	Stone-poor, Carbonates (silty-sandy till)
	D3) Potential effects on hydrology.	D3.1) Area of flood storage capacity removed.	Area of flood storage capacity removed (hectares)	Route selected avoids existing floodplains – no impact		
D) Minimize adverse environmental effects.	D3) Potential effects on hydrology.	D3.2) Length/area of watercourses/ waterbodies altered.	Length/area of surface water features (metres/hectares)	Route selected avoids existing watercourses – no impact		
		D3.3) Ease and effectiveness of stormwater management at subway facilities.	Opportunities consistent with City of Toronto WWFMMP	OGS		

Table 6-15 (Continued): Analysis of Finch West Station, Modified Option 1

Objectives	Criteria	Indicators	Measures	Option 1	Option 1A	Option 5
D) Minimize adverse environmental effects.	D4) Potential effects on socio-economic features.	D4.1) Number of employment properties and community/recreational/institutional facilities located within alignment and station footprint areas.	Number of businesses directly affected	23	2	5
			Number of Community/Recreational facilities impacted	0	0	0
			Number of Institution buildings impacted.	0	0	0
		D4.2) Area, type, and sensitivity of residences, businesses and community/recreational/institutional facilities located within adjacent zones of influence. (150m)	Area of stable residential within zone of influence (ha)	Due to the redevelopment potential and ownership structure, impact on stable lands was not considered relevant for these alignments.		
			Area of stable employment within zone of influence (ha)	Due to the redevelopment potential and ownership structure, impact on stable lands was not considered relevant for these alignments.		
	D5) Potential effects on pedestrian and traffic access/ flow.	D5.1) Number of permanent road closures or access modifications.	Number of closures	2	2	0
			Number of driveways with reduced access (e.g. full access reduced to right-in/right-out)	0	0	0
		D5.2) Traffic Impacts due to operations of station commuter facilities (bus terminals, passenger pick-up and drop-off and commuter parking).	Number of critical movements within vicinity of station	27	27	21
			Sum of intersection delays (in Min) at key intersections at an approximate 250m radius from station.	6	6	6
			Number of entrances/egresses obstructed by average peak hour queue lengths	1	2	2
		D5.3) Impact on safety of transportation system.	Number of new signalized conflict points (total change increase/ decrease) on the arterial network.	16	16	16
			Number of unsignalized conflict points (total change increase/decrease) on the arterial network	-7	-7	-4
		D5.4) Accessibility for emergency services including fire, police and ambulance.	Impact on response times for EMS services (Number of critical intersections within study area)	6	6	6
	D6) Effects on freight and rail passenger service and its signal systems at the GO/Sheppard subway station.	D6.1) Impacts on the operation of the CN Newmarket/GO Bradford rail line during construction and operation of the subway extension.	Angle of crossing at CN Line (degrees)	N/A	N/A	N/A

Table 6-15 (Continued): Analysis of Finch West Station, Modified Option 1

Objectives	Criteria	Indicators	Measures	Option 1	Option 1A	Option 5
D) Minimize adverse environmental effects.	D7) Potential effects on cultural heritage resources.	D7.1) Number, type, significance and sensitivity of archaeological sites, built heritage features and cultural landscapes located within alignment and station footprint areas.	Number of known archaeological sites.	0	1	0
			Unlikeliness of the discovery of archaeological remains (Low/Medium/High).	Medium	Medium	High
			Number of heritage properties on municipal inventory or designated under the Ontario Heritage Act.	0	0	0
			Number of heritage properties identified during a field review.	0	0	0
		D7.2) Number, type, significance and sensitivity of archaeological sites, built heritage features and cultural landscapes located within adjacent zones of influence. (100m)	Number of heritage properties on municipal inventory or designated under the Ontario Heritage Act.	1	1	1
			Number of heritage properties identified during a field review.	1	1	1
	D8) Potential effects on pipelines located in the Finch Hydro Corridor	D8.1) Number, type, and length of pipelines requiring relocation due to subway extension.	Number of pipeline crossing	N/A	N/A	N/A
			Vertical separation (in metres) between pipelines and subway tunnel	N/A	N/A	N/A
E) Achieve reasonable capital and operating costs.	E1) Minimize the capital costs.	E1.1) Capital costs including underground and surface subway facilities, fleet and storage.	Capital costs estimated in 2005 dollars after GST Rebate (millions)	URS (M)	34	34
	E2) Minimize the costs of property acquisition.	E2.1) Total property cost.	Estimated real estate costs in 2005 dollars. (million)	URS (M)	36.8	9.1
		E2.2) Potential environmental cleanup costs.	Number of known or potential contaminated sites within zone of influence of subway extension.	GOLDER	24	24
	E3) Minimize the net operating cost.	E3.1) The dollar value of net fare and other revenues including commuter parking.	Total annual ridership on subway extension measured in number of riders.(Table 14, Route 1 Station usage and link volume forecasts 2021 - opportunities land use - AM Peak Period.	TTC	3318000	3318000
		E3.2) Operations and maintenance cost of the subway extension, including feeder bus operations.	Total length of track on curve (all radii).	N/A	N/A	N/A
			Reduction (addition) to total route length for existing bus services in the study area.	Total bus hours saved per week was 1411 hrs. Total bus kilometres saved each week were 32600km. Bus resources saved are 25 morning peak buses and 18 afternoon peak buses.		
			Contains project elements with higher operating & maintenance needs.	NO	NO	NO

Table 6-16:Evaluation of Finch West Station, Modified Option1

●	◕	◑	◔	○
MOST PREFFERED				LEAST PREFFERED

Objectives	Criteria	Indicators	Measures	Option 1	Option 1A	Option 5
A) Provide subway service to the Keele/Finch area, York University and a new inter-regional transit terminal at Steeles Avenue.	A1) Potential for riders to walk to local stations.	A1.1) Existing population and employment within 500 m walking distance of subway stations.	Number of people and employees within 500 m radius of main entrance (Population per Hectare)	All Options yield similar results. Not a determining factor for selecting Options.		
		A1.2) Future population and employment within 500 m walking distance of subway stations.	Number of people and employees within 500 m radius of main entrance (Population per Hectare)	All Options yield similar results. Not a determining factor for selecting Options.		
		A1.3) Students, faculty and staff within 500 m walking distance of York University Station.	Number of people and employees within 500 m radius of main entrance (based on Data provided to URS by York University)	All Options yield similar results. Not a determining factor for selecting Options.		
	A2) Speed and comfort for subway passengers.	A2.1) Travel time from Downsview Station to Steeles West Station.	Total length of alignments (metres).	All Options yield similar results. Not a determining factor for selecting Options.		
			Estimated run times	All Options yield similar results. Not a determining factor for selecting Options.		
		A2.2) Speed and comfort for subway passengers.	Length of Curves with Radii less than 457m (radius and length)	All Options yield similar results. Not a determining factor for selecting Options.		
			Length of curves with radii between 457m and 750 m (radius and length)	All Options yield similar results. Not a determining factor for selecting Options.		
B) Provide improved connections between the TTC subway and GO Transit, York Region Transit and TTC buses.	B1) Convenience for transfers from bus and train operations (including Wheeltrans).	B1.1) Transfer time from bus platform to subway platform Finch West Station.	Walking time based on 1.2 m/s + 10 second premium for every vertical movement measured from middle bus bay to centre of subway platform (Min.)	◕	●	◕
		B1.2) Transfer time from GO Rail to subway platform at Sheppard West Station.	Walking time based on 1.2 m/s + 10 second premium for every vertical movement measured from centre of GO platform to centre of subway platform (Min)	All Options yield similar results. Not a determining factor for selecting Options.		
		B1.3) Delay time for through passengers on the 36-Finch West bus route and the 41-Keele bus route at Finch West Station.	Total travel time (excluding internal circulation and dwell time within the station) based on travel time (assumed 30 km/hr) + additional delays for specific movements at key intersections (36 Finch) (Min)	◕	●	●
		B1.3) Delay time for through passengers on the 36-Finch West bus route and the 41-Keele bus route at Finch West Station.	Total travel time (excluding internal circulation and dwell time within the station) based on travel time (assumed 30 km/hr) + additional delays for specific movements at key intersections (41 Keele) (Min)	◕	●	●

Table 6-16 (continued): Evaluation of Finch West Station, Modified Option 1

● MOST PREFFERED ◕ ◑ ◔ ○ LEAST PREFFERED

Objectives	Criteria	Indicators	Measures	Option 1	Option 1A	Option 5
B) Provide improved connections between the TTC subway and GO Transit, York Region Transit and TTC buses.	B1) Convenience for transfers from bus and train operations (including Wheeltrans).	B1.4) Transfer from subway to future LRT in hydro corridor at Finch West Station.	Potential to provide a connection from subway platform to LRT in Hydro corridor/new LRT terminal.	◕	●	●
		B2.1) Opportunity to link with cycling routes identified in the City of Toronto's and City of Vaughan's Cycling Master Plans.	Cycling time based on 15 km/h from entrance to identified bike path/bike lanes in cycling master plans.(Min)	All Options yield similar results. Not a determining factor for selecting Options.		
		B2.2) Transfer time from other travel modes to subway platform.	Walking time based on 1.2 m/s from PPUDO/taxi stand to closest station entrance. (Min)	◕	●	◕
			Walking time based on 1.2 m/s from middle of commuter parking lot to closest station entrance.(Min)	◕	●	◕
		B2.3) Quality of walking environment from other travel modes to subway platform.	Weather protected (yes/no)	◕	●	◕
			Entrance type (Staffed/automated)	All Options yield similar results. Not a determining factor for selecting Options.		
			Walking time from station entrance/bicycle racks to subway platform based on 1.2 m/s + 10 second premium for every vertical movement .Max time(Min)	All Options yield similar results. Not a determining factor for selecting Options.		
	B3) Flexibility for potential future subway extension into York Region.	B3.1) Number, type and sensitivity of significant environmental features potentially affected by a future subway extension into York Region.	Number of natural heritage features.	All Options yield similar results. Not a determining factor for selecting Options.		
			Area of groundwater discharge (100m zone of influence) (ha)	All Options yield similar results. Not a determining factor for selecting Options.		
			Number of residences, businesses and community/recreational/ institutional facilities.	All Options yield similar results. Not a determining factor for selecting Options.		
			Number of cultural heritage features. (100m zone of influence)	All Options yield similar results. Not a determining factor for selecting Options.		
			Compatibility with planned land use.	All Options yield similar results. Not a determining factor for selecting Options.		

Table 6-16 (continued): Evaluation of Finch West Station, Modified Option 1

● MOST PREFFERED ◕ ◑ ◔ ○ LEAST PREFFERED

Objectives	Criteria	Indicators	Measures	Option 1	Option 1A	Option 5
B) Provide improved connections between the TTC subway and GO Transit, York Region Transit and TTC buses.	B3) Flexibility for potential future subway extension into York Region.	B 3.2) Number and type of curves between Steeles West Station and Highway 407.	Total length of alignment (metres)	All Options yield similar results. Not a determining factor for selecting Options.		
			Length of curves with radii less than 457 m.	All Options yield similar results. Not a determining factor for selecting Options.		
			Length of curves with radii between 457 m and 750 m.	All Options yield similar results. Not a determining factor for selecting Options.		
C) Support local population and employment growth.	C1) Maximize redevelopment potential in support of the subway extension.	C1.1) Ability to combine stations with the existing and future built form.	Amount of area identified as redevelopment within zone of influence (ha)	All Options yield similar results. Not a determining factor for selecting Options.		
			Amount of redevelopment frontage within zone of influence (m)	All Options yield similar results. Not a determining factor for selecting Options.		
			· Developable frontage encumbered by station amenities - length of Right of Way (metres)	◕	◕	●
	C2) Maximize the potential to create a high quality urban/pedestrian environment.	C2.1) Potential to create a safe environment for pedestrians, cyclists and transit passengers.	Number of pedestrian-bus conflicts at key uncontrolled station entrances (I.e. bus forecasts x pedestrian movements)	●	●	◕
			Active Surveillance (low,medium,high)	●	●	◕
D) Minimize adverse environmental effects.	D1) Potential effects on natural heritage features.	D1.1) Area, type, significance and resiliency of aquatic and terrestrial landscapes, ecosystems/communities and populations/species located within alignment and station footprint areas.	Area of natural heritage features (hectares)	All Options yield similar results. Not a determining factor for selecting Options.		
			Type of natural heritage features (ELC classification)	All Options yield similar results. Not a determining factor for selecting Options.		
			Significance of natural heritage features (local, regional, provincial, federal)	All Options yield similar results. Not a determining factor for selecting Options.		
		D1.1) Area, type, significance and resiliency of aquatic and terrestrial landscapes, ecosystems/communities and populations/species located within alignment and station footprint areas.	Resiliency of natural heritage features (low, medium, high)	All Options yield similar results. Not a determining factor for selecting Options.		

Table 6-16 (continued): Evaluation of Finch West Station, Modified Option 1

●	◕	◑	◔	○
MOST PREFFERED				LEAST PREFFERED

Objectives	Criteria	Indicators	Measures	Option 1	Option 1A	Option 5
D) Minimize adverse environmental effects.	D1) Potential effects on natural heritage features.	D1.2) Area, type, significance and sensitivity of aquatic and terrestrial landscapes, ecosystems/communities and populations/species located within adjacent zones of influence.(100m)	Area of natural heritage features (hectares)	All Options yield similar results. Not a determining factor for selecting Options.		
			Type of natural heritage features (ELC classification)	All Options yield similar results. Not a determining factor for selecting Options.		
			Significance of natural heritage features (local, regional, provincial, federal)	All Options yield similar results. Not a determining factor for selecting Options.		
			Resiliency of natural heritage features (low, medium, high)	All Options yield similar results. Not a determining factor for selecting Options.		
	D2) Potential effects on geology and hydrogeology.	D2.1) Magnitude and significance of permanent groundwater drawdown (if any) on hydrogeological conditions.	Area of groundwater recharge/discharge affected (ha)	All Options yield similar results. Not a determining factor for selecting Options.		
			Significance of groundwater recharge/discharge areas affected. (local, regional, provincial)	All Options yield similar results. Not a determining factor for selecting Options.		
			Area of aquifers affected.	All Options yield similar results. Not a determining factor for selecting Options.		
			Significance of aquifers affected. (local, regional, provincial)	All Options yield similar results. Not a determining factor for selecting Options.		
		D2.2) Potential for soil erosion.	Area of soil to be disturbed.	All Options yield similar results. Not a determining factor for selecting Options.		
			Type of soil to be disturbed.	All Options yield similar results. Not a determining factor for selecting Options.		
	D3) Potential effects on hydrology.	D3.1) Area of flood storage capacity removed.	Area of flood storage capacity removed (hectares).	All Options yield similar results. Not a determining factor for selecting Options.		
		D3.2) Length/area of watercourses/ waterbodies altered.	Length/area of surface water features (metres/hectares).	All Options yield similar results. Not a determining factor for selecting Options.		
		D3.3) Ease and effectiveness of stormwater management at subway facilities.	Opportunities consistent with City of Toronto WWFMMP	All Options yield similar results. Not a determining factor for selecting Options.		
	D4) Potential effects on socio-economic features.	D4.1) Number of employment properties and community/recreational/institutional facilities located within alignment and station footprint areas.	Number of businesses directly affected	◑	●	◕
			Number of Community/ Recreational facilities impacted	All Options yield similar results. Not a determining factor for selecting Options.		
			Number of Institution buildings impacted.	All Options yield similar results. Not a determining factor for selecting Options.		

Table 6-16 (continued): Evaluation of Finch West Station, Modified Option 1

● MOST PREFFERED ◕ ◑ ◔ ○ LEAST PREFFERED

Objectives	Criteria	Indicators	Measures	Option 1	Option 1A	Option 5
D) Minimize adverse environmental effects.	D4) Potential effects on socio-economic features.	D4.2) Area, type, and sensitivity of residences, businesses and community/recreational/institutional facilities located within adjacent zones of influence. (150m)	Area of stable residential within zone of influence (ha)	All Options yield similar results. Not a determining factor for selecting Options.		
			Area of stable employment within zone of influence (ha)	All Options yield similar results. Not a determining factor for selecting Options.		
	D5) Potential effects on pedestrian and traffic access/ flow.	D5.1) Number of permanent road closures or access modifications.	Number of closures	◕	◕	◕
			Number of driveways with reduced access (e.g. full access reduced to right-in/right-out)	●	◕	◕
		D5.2) Traffic Impacts due to operations of station commuter facilities (bus terminals, passenger pick-up and drop-off and commuter parking).	Number of critical movements within vicinity of station	All Options yield similar results. Not a determining factor for selecting Options.		
			Sum of intersection delays (in Min) at key intersections at an approximate 250m radius from station.	All Options yield similar results. Not a determining factor for selecting Options.		
	D5) Potential effects on pedestrian and traffic access/ flow.	D5.2) Traffic Impacts due to operations of station commuter facilities (bus terminals, passenger pick-up and drop-off and commuter parking).	Number of entrances/egresses obstructed by average peak hour queue lengths	All Options yield similar results. Not a determining factor for selecting Options.		
		D5.3) Impact on safety of transportation system.	Number of new signalized conflict points (total change increase/ decrease) on the arterial network.	All Options yield similar results. Not a determining factor for selecting Options.		
			Number of unsignalized conflict points (total change increase/decrease) on the arterial network.	All Options yield similar results. Not a determining factor for selecting Options.		
		D5.4) Accessibility for emergency services including fire, police and ambulance.	Impact on response times for EMS services (Number of critical intersections within study area).	All Options yield similar results. Not a determining factor for selecting Options.		
	D6) Effects on freight and rail passenger service and its signal systems at the GO/Sheppard subway station.	D6.1) Impacts on the operation of the CN Newmarket/GO Bradford rail line during construction and operation of the subway extension.	Angle of crossing at CN line (degrees)	All Options yield similar results. Not a determining factor for selecting Options.		
	D7) Potential effects on cultural heritage resources.	D7.1) Number, type, significance and sensitivity of archaeological sites, built heritage features and cultural landscapes located within alignment and station footprint areas.	Number of known archaeological sites.	All Options yield similar results. Not a determining factor for selecting Options.		
			Unlikeliness of the discovery of archaeological remains (Low/Medium/High).	All Options yield similar results. Not a determining factor for selecting Options.		

Table 6-16 (continued): Evaluation of Finch West Station, Modified Option 1

● MOST PREFFERED ◕ ◑ ◔ ○ LEAST PREFFERED

Objectives	Criteria	Indicators	Measures	Option 1	Option 1A	Option 5
D) Minimize adverse environmental effects.	D7) Potential effects on cultural heritage resources.	D7.1) Number, type, significance and sensitivity of archaeological sites, built heritage features and cultural landscapes located within alignment and station footprint areas.	Number of heritage properties on municipal inventory or designated under the Ontario Heritage Act.	All Options yield similar results. Not a determining factor for selecting Options.		
			Number of heritage properties identified during a field review.	All Options yield similar results. Not a determining factor for selecting Options.		
		D7.2) Number, type, significance and sensitivity of archaeological sites, built heritage features and cultural landscapes located within adjacent zones of influence. (100m)	Number of heritage properties on municipal inventory or designated under the Ontario Heritage Act.	All Options yield similar results. Not a determining factor for selecting Options.		
			Number of heritage properties identified during a field review.	All Options yield similar results. Not a determining factor for selecting Options.		
	D8) Potential effects on pipelines located in the Finch Hydro Corridor	D8.1) Number, type, and length of pipelines requiring relocation due to subway extension.	Number of pipeline crossing	All Options yield similar results. Not a determining factor for selecting Options.		
			Vertical separation (in metres) between pipelines and subway tunnel	All Options yield similar results. Not a determining factor for selecting Options.		
E) Achieve reasonable capital and operating costs.	E1) Minimize the capital costs.	E1.1) Capital costs including underground and surface subway facilities, fleet and storage.	Capital costs estimated in 2005 dollars after GST Rebate (millions)	All Options yield similar results. Not a determining factor for selecting Options.		
	E2) Minimize the costs of property acquisition.	E2.1) Total property cost.	Estimated real estate costs in 2005 dollars. (million)	◑	●	◕
		E2.2) Potential environmental cleanup costs.	Number of known or potential contaminated sites within zone of influence of subway extension.	All Options yield similar results. Not a determining factor for selecting Options.		
	E3) Minimize the net operating cost.	E3.1) The dollar value of net fare and other revenues including commuter parking.	Total annual ridership on subway extension measured in number of riders.(Table 14, Route 1 Station usage and link volume forecasts 2021 - opportunities land use - AM Peak Period.	All Options yield similar results. Not a determining factor for selecting Options.		
		E3.2) Operations and maintenance cost of the subway extension, including feeder bus operations.	Total length of track on curve (all radii).	All Options yield similar results. Not a determining factor for selecting Options.		
			Reduction (addition) to total route length for existing bus services in the study area.	All Options yield similar results. Not a determining factor for selecting Options.		
			Contains project elements with higher operating & maintenance needs.	All Options yield similar results. Not a determining factor for selecting Options.		

6.3.10. Alternative Methods to be considered: North Alignments

Using the alignment generation criteria (Table 6-9), the Study Team generated three alignments between Finch West Station and Steeles West Station (located north of Steeles Avenue between Keele Street and Jane Street). York University Station is a line station consisting of a subway platform and station entrances. For this reason, no station concepts were generated for this subway station. The resulting North Alignments are illustrated in Figure 6-23. The three north alignments, which converge at Steeles West Station, include:

1) Alternative N1, which generally runs under Ian MacDonald Boulevard within the York University campus and Steeles Avenue West. This alignment was originally proposed in the 2001 Rapid Transit Expansion Study. Under this alternative, the proposed York University Station would be located on Ian MacDonald Boulevard, at the east end of the Common. The proposed Steeles West Station would be located under the Steeles Avenue West road right-of-way;

2) Alternative N2, which would run under the Keele Street right-of-way up to The Pond Road and would run in relatively direct alignment between existing campus buildings. The proposed York University Station would be located north and east of York Lanes and the Common. The proposed Steeles West Station would be centred on the Steeles Avenue / northwest Gate intersection, with a north-west to south-east orientation; and

3) Alternative N3, which would run under the Keele Street right-of-way up to The Pond Road and in a direct alignment between Keele Street and Steeles Avenue West, passes under the existing Schulich School of Business and York Lanes buildings. The proposed York University Station platform would be located at the east end of the Common. Steeles West Station would have a similar location and orientation as for Alignment N2.

Table 6-17 contains the results of the analysis of each of the alternative alignments. Supporting calculations and documentation are contained in Appendix L. Table 6-18 includes the detailed evaluation for the Reasoned Argument Method.

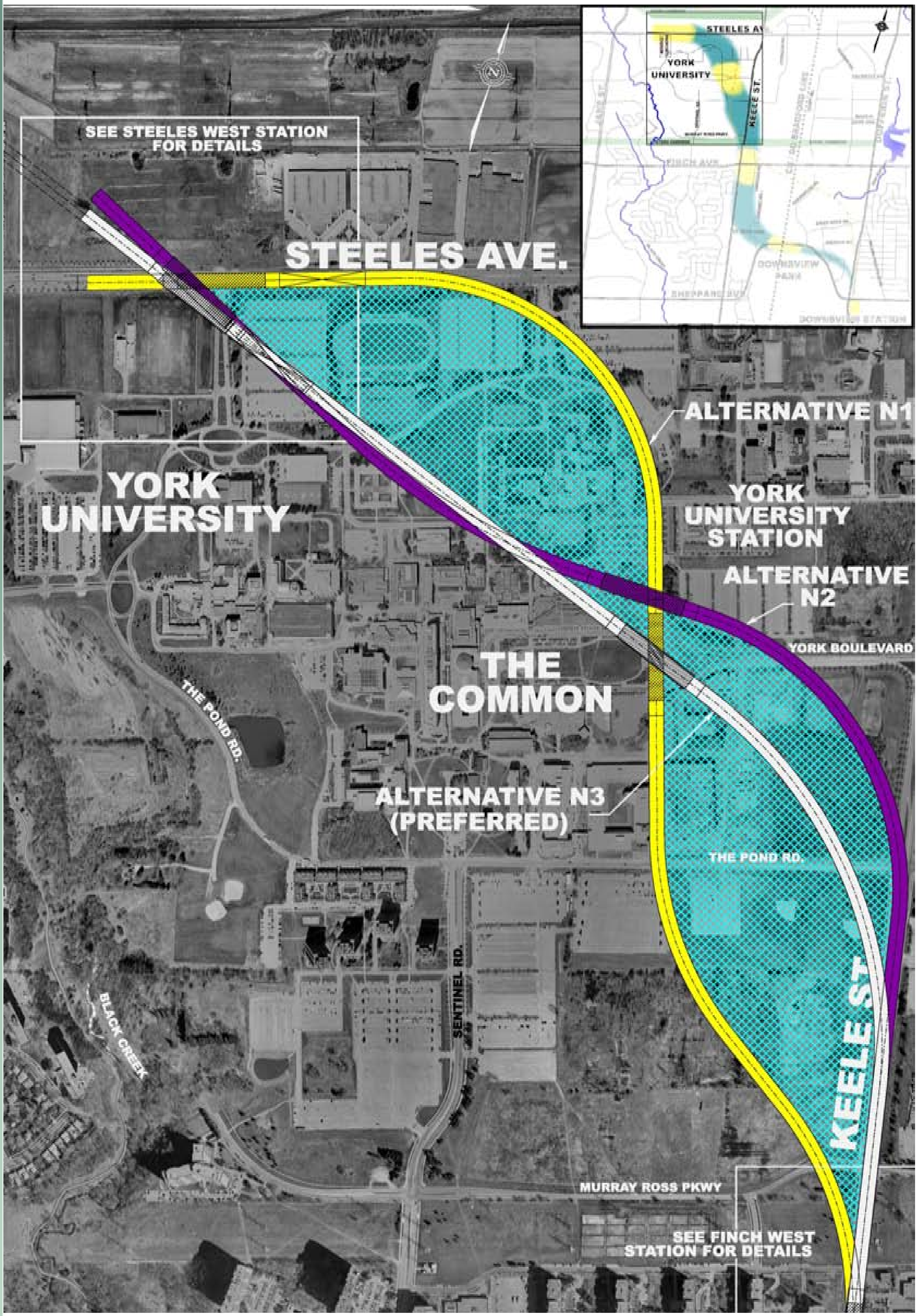


FIGURE 6-23: North Alignments

Table 6-17:Analysis of North Alignments (including York University station)

Objectives	Criteria	Indicators	Measures	N1	N2	N3
A) Provide subway service to the Keele/Finch area, York University and a new inter-regional transit terminal at Steeles Avenue.	A1) Potential for riders to walk to local stations.	A1.1) Existing population and employment within 500 m walking distance of subway stations.	Number of people and employees within 500 m radius of main entrance (Population per Hectare)	23	23	23
		A1.2) Future population and employment within 500 m walking distance of subway stations.	Number of people and employees within 500 m radius of main entrance (Population per Hectare)	30	30	30
		A1.3) Students, faculty and staff within 500 m walking distance of York University Station.	Number of people and employees within 500 m radius of main entrance (based on Data provided to URS by York University)	78000	76700	78000
	A2) Speed and comfort for subway passengers.	A2.1) Travel time from Downsview Station to Steeles West Station.	Total length of alignment (metres)	3056	2998	2842
			Estimated run times	Difference in travel time between fastest and slowest alignment was imperceptible to transit riders (<20 seconds)		
		A2.2) Speed and comfort for subway passengers.	Length of Curves with Radii less than 457m (radius and length)	R=435m @ 688m	0	0
			Length of curves with radii between 457m and 750 m (radius and length)	R=565m @ 444m R=500m @ 793m R=565m @ 375m Total: 1612m	R=500m @ 576m	R=750m @ 768m R=600m @ 545m Total: 1313m
B) Provide improved connections between the TTC subway and GO Transit, York Region Transit and TTC buses.	B1) Convenience for transfers from bus and train operations (including Wheeltrans).	B1.1) Transfer time from bus to subway platform at Steeles West Station and Finch West Station.	Walking time based on 1.2 m/s + 10 second premium for every vertical movement measured from middle bus bay to centre of subway platform (Min.)	N/A	N/A	N/A
		B1.2) Transfer time from GO Rail to subway platform at Sheppard West Station.	Walking time based on 1.2 m/s + 10 second premium for every vertical movement measured from centre of GO platform to centre of subway platform (Min)	N/A	N/A	N/A
		B1.3) Delay time for through passengers on the 36-Finch West bus route and the 41-Keele bus route at Finch West Station.	Total travel time (excluding internal circulation and dwell time within the station) based on travel time (assumed 30 km/hr) + additional delays for specific movements at key intersections (36 Finch) (Min)	N/A	N/A	N/A
			Total travel time (excluding internal circulation and dwell time within the station) based on travel time (assumed 30 km/hr) + additional delays for specific movements at key intersections (41 Keele) (Min)	N/A	N/A	N/A

Table 6-17 (Continued): Analysis of North Alignments (including York University station)

Objectives	Criteria	Indicators	Measures	N1	N2	N3
B) Provide improved connections between the TTC subway and GO Transit, York Region Transit and TTC buses.	B1) Convenience for transfers from bus and train operations (including Wheeltrans).	B1.4) Transfer time from subway to future LRT in hydro corridor at Finch West Station.	Walking time based on 1.2 m/s + 10 second premium for every vertical movement measured from centre of LRT platform to centre of subway platform (Min)	N/A	N/A	N/A
	B2) Convenience for access from other travel modes (taxi, bicycle, pedestrians, passenger pick up and drop off, commuter parking, ambulatory/non-ambulatory disabled persons).	B2.1) Opportunity to link with cycling routes identified in the City of Toronto's and City of Vaughan's Cycling Master Plans.	Cycling time based on 15 km/h from entrance to identified bike path/bike lanes in cycling master plans (Min)	2	2	2
		B2.2) Transfer time from other travel modes to subway platform.	Walking time based on 1.2 m/s from PPUDO/taxi stand to closest station entrance (Min)	N/A	N/A	N/A
			Walking time based on 1.2 m/s from middle of commuter parking lot to closest station entrance (Min)	N/A	N/A	N/A
		B2.3) Quality of walking environment from other travel modes to subway platform.	Weather protected (yes/no)	YES	YES	YES
			Entrance type (Staffed/automated)	All stations will include both staffed and automated entrances; location to be confirmed at next phase		
			Walking time from station entrance/bicycle racks to subway platform based on 1.2 m/s + 10 second premium for every vertical movement Max time (Min)	N/A	N/A	N/A
	B3) Flexibility for potential future subway extension into York Region.	B3.1) Number, type and sensitivity of significant environmental features potentially affected by a future subway extension into York Region.	Number of natural heritage features	2	2	2
			Area of groundwater discharge (100m zone of influence) (ha)	28	21	23
			Number of residences, businesses and community/recreational/ institutional facilities.	1	0	0
			Number of cultural heritage features. (100m zone of influence)	4	1	1

Table 6-17 (Continued): Analysis of North Alignments (including York University station)

Objectives	Criteria	Indicators	Measures	N1	N2	N3
B) Provide improved connections between the TTC subway and GO Transit, York Region Transit and TTC buses.	B3) Flexibility for potential future subway extension into York Region.	B 3.2) Number and type of curves between Steeles West Station and Highway 407.	Total length of alignment (metres)	2188	1945	1996
			Length of curves with radii less than 457 m.	0	0	0
			Length of curves with radii between 457 m and 750 m.	R=500m @ 793m	0	R=600m @ 545m
C) Support local population and employment growth.	C1) Maximize redevelopment potential in support of the subway extension.	C1.1) Ability to combine stations with the existing and future built form.	Amount of area identified as redevelopment within station zone of influence	All have equal potential		
			Amount of redevelopment frontage within station zone of influence (ha)	21	21	21
			Amount of redevelopable frontage encumbered by transit facilities (metres)	170	190	240
	C2) Maximize the potential to create a high quality urban/pedestrian environment.	C2.1) Potential to create a safe environment for pedestrians, cyclists and transit passengers.	Number of pedestrian-bus conflicts at key uncontrolled station entrances (I.e. bus forecasts x pedestrian movements)	N/A	N/A	N/A
			Active Surveillance (low, medium, high)	HIGH	HIGH	HIGH
D) Minimize adverse environmental effects.	D1) Potential effects on natural heritage features.	D1.1) Area, type, significance and resiliency of aquatic and terrestrial landscapes, ecosystems/communities and populations/species located within alignment and station footprint areas.	Area of natural heritage features (hectares)	1.65	1.65	1.57
			Type of natural heritage features (ELC classification)	Cultural meadow	Cultural meadow, deciduous forest	Cultural meadow, deciduous forest
			Significance of natural heritage features (local, regional, provincial, federal)	Local	Local	Local
			Resiliency of natural heritage features (low, medium, high)	High	Medium (+)	Medium (+)
	D1) Potential effects on natural heritage features.	D1.2) Area, type, significance and sensitivity of aquatic and terrestrial landscapes, ecosystems/communities and populations/species located within adjacent zones of influence. (100m)	Area of natural heritage features (hectares)	13.85	15.92	15.54

Table 6-17 (Continued): Analysis of North Alignments (including York University station)

Objectives	Criteria	Indicators	Measures	N1	N2	N3
D) Minimize adverse environmental effects.	D1) Potential effects on natural heritage features.	D1.2) Area, type, significance and sensitivity of aquatic and terrestrial landscapes, ecosystems/communities and populations/species located within adjacent zones of influence. (100m)	Type of natural heritage features (ELC classification)	Cultural meadow, cultural thicket, cultural woodland, meadow marsh, shallow marsh, open aquatic	Cultural meadow, meadow marsh, shallow marsh, open aquatic, deciduous forest	Cultural meadow, meadow marsh, shallow marsh, open aquatic, deciduous forest
			Significance of natural heritage features (local, regional, provincial, federal)	Local	Local	Local
			Resiliency of natural heritage features (low, medium, high)	Medium	Medium (+)	Medium (+)
	D2) Potential effects on geology and hydrogeology.	D2.1) Magnitude and significance of permanent groundwater drawdown (if any) on hydrogeological conditions.	Area of groundwater recharge/discharge affected (ha)	3.12	1.82	2.68
			Significance of groundwater recharge/discharge areas affected (local, regional, provincial)	Local	Local	Local
			Area of aquifers affected	Temporary, low	Temporary, low	Temporary, low
			Significance of aquifers affected (local, regional, provincial)	Local	Local	Local
		D2.2) Potential for soil erosion.	Area of soil to be disturbed (ha)	8.4	8.38	7.98
			Type of soil to be disturbed	Stone-poor, Carbonates (silty-sandy till)	Stone-poor, Carbonates (silty-sandy till)	Stone-poor, Carbonates (silty-sandy till)
	D3) Potential effects on hydrology.	D3.1) Area of flood storage capacity removed.	Area of flood storage capacity removed (hectares)	Route selected avoids existing floodplains – no impact		
		D3.2) Length/area of watercourses/ waterbodies altered.	Length/area of surface water features (metres/hectares)	Route selected avoids existing watercourses – no impact		
		D3.3) Ease and effectiveness of stormwater management at subway facilities.	Opportunities consistent with City of Toronto WWFMMP	OGS		
	D4) Potential effects on socio-economic features.	D4.1) Number of employment properties and community/recreational/ institutional facilities located within alignment and station footprint areas.	Number of sensitive buildings over or adjacent to the alignment	3	1	3

Table 6-17 (Continued): Analysis of North Alignments (including York University station)

Objectives	Criteria	Indicators	Measures	N1	N2	N3
D) Minimize adverse environmental effects.	D4) Potential effects on socio-economic features.	D4.2) Area, type, and sensitivity of residences, businesses and community/recreational/ institutional facilities located within adjacent zones of influence. (150m)	Area of stable employment within zone of influence (ha)	0.1	6	5
			Area of stable development on the York University Campus within the zone of influence (ha)	46	40	43
	D5) Potential effects on pedestrian and traffic access/ flow.	D5.1) Number of permanent road closures or access modifications.	Number of closures	N/A	N/A	N/A
			Number of driveways with reduced access (e.g. full access reduced to right-in/right-out)	N/A	N/A	N/A
		D5.2) Traffic Impacts due to operations of station commuter facilities (bus terminals, passenger pick-up and drop-off and commuter parking).	Number of critical movements within vicinity of station	N/A	N/A	N/A
			Sum of intersection delays (in Min) at key intersections at an approximate 250m radius from station	N/A	N/A	N/A
			Number of entrances /egresses obstructed by average peak hour queue lengths	N/A	N/A	N/A
		D5.3) Impact on safety of transportation system.	Number of new signalized conflict points (total change increase/ decrease) on the arterial network.	N/A	N/A	N/A
			Number of unsignalized conflict points (total change increase/decrease) on the arterial network	N/A	N/A	N/A
		D5.4) Accessibility for emergency services including fire, police and ambulance.	Impact on response times for EMS services (Number of critical intersections within study area)	N/A	N/A	N/A
	D6) Effects on freight and rail passenger service and its signal systems at the GO/ Sheppard subway station.	D6.1) Impacts on the operation of the CN Newmarket/GO Bradford rail line during construction and operation of the subway extension.	Angle of crossing at CN Line (degrees)	N/A	N/A	N/A
	D7) Potential effects on cultural heritage resources.	D7.1) Number, type, significance and sensitivity of archaeological sites, built heritage features and cultural landscapes located within alignment and station footprint areas.	Number of known archaeological sites	0	0	0
			Unlikeliness of the discovery of archaeological remains (Low/Medium/High)	High	High	High

Table 6-17 (Continued): Analysis of North Alignments (including York University station)

Objectives	Criteria	Indicators	Measures	N1	N2	N3
D) Minimize adverse environmental effects.	D7) Potential effects on cultural heritage resources.	D7.2) Number, type, significance and sensitivity of archaeological sites, built heritage features and cultural landscapes located within adjacent zones of influence. (100m)	Number of heritage properties on municipal inventory or designated under the Ontario Heritage Act.	1	1	1
			Number of heritage properties identified during a field review.	1	1	1
	D8) Potential effects on pipelines located in the Finch Hydro Corridor	D8.1) Number, type, and length of pipelines requiring relocation due to subway extension.	Number of pipeline crossing	4	4	4
			Vertical separation (in metres) between pipelines and subway tunnel	5.3	5.3	5.3
E) Achieve reasonable capital and operating costs.	E1) Minimize the capital costs.	E1.1) Capital costs including underground and surface subway facilities, fleet and storage.	Capital costs estimated in 2005 dollars after GST Rebate (millions)	458	449	460
	E2) Minimize the costs of property acquisition.	E2.1) Total property cost.	Estimated real estate costs in 2005 dollars. (million)	0	0	0
		E2.2) Potential environmental cleanup costs.	Number of known or potential contaminated sites within zone of influence of subway extension.	3	11	11
	E3) Minimize the net operating cost.	E3.1) The dollar value of net fare and other revenues including commuter parking.	Total annual ridership on subway extension measured in number of riders. (Table 14, Route 1 Station usage and link volume forecasts 2021 - opportunities land use - AM Peak Period.	10290900	10290900	10290900
		E3.2) Operations and maintenance cost of the subway extension, including feeder bus operations.	Total length of track on curve (all radii).	1988	1761	1313
			Reduction (addition) to total route length for existing bus services in the study area.	Total bus hours saved per week was 1411 hrs. Total bus kilometres saved each week were 32600km. Bus resources saved are 25 morning peak buses and 18 afternoon peak buses.		
			Contains project elements with higher operating & maintenance needs.	NO	NO	NO

Table 6-18:Evaluation of North Alignments (including York University station)

● MOST PREFFERED ◕ ◑ ◔ ○ LEAST PREFFERED

Objectives	Criteria	Indicators	Measures	N1	N2	N3
A) Provide subway service to the Keele/Finch area, York University and a new inter-regional transit terminal at Steeles Avenue.	A1) Potential for riders to walk to local stations.	A1.1) Existing population and employment within 500 m walking distance of subway stations.	Number of people and employees within 500 m radius of main entrance (Population per Hectare)	All Options yield similar results. Not a determining factor for selecting Options.		
		A1.2) Future population and employment within 500 m walking distance of subway stations.	Number of people and employees within 500 m radius of main entrance (Population per Hectare)	All Options yield similar results. Not a determining factor for selecting Options.		
		A1.3) Students, faculty and staff within 500 m walking distance of York University Station.	Number of people and employees within 500 m radius of main entrance (based on Data provided to URS by York University)	All Options yield similar results. Not a determining factor for selecting Options.		
	A2) Speed and comfort for subway passengers.	A2.1) Travel time from Downsview Station to Steeles West Station.	Total length of alignments (metres).	All Options yield similar results. Not a determining factor for selecting Options.		
			Estimated run times	All Options yield similar results. Not a determining factor for selecting Options.		
		A2.2) Speed and comfort for subway passengers.	Length of Curves with Radii less than 457m (radius and length)	All Options yield similar results. Not a determining factor for selecting Options.		
			Length of curves with radii between 457m and 750 m (radius and length)	All Options yield similar results. Not a determining factor for selecting Options.		
B) Provide improved connections between the TTC subway and GO Transit, York Region Transit and TTC buses.	B1) Convenience for transfers from bus and train operations (including Wheeltrans).	B1.1) Transfer time from bus to subway platform at Steeles West Station and Finch West Station.	Walking time based on 1.2 m/s + 10 second premium for every vertical movement measured from middle bus bay to centre of subway platform (Min.)	All Options yield similar results. Not a determining factor for selecting Options.		
		B1.2) Transfer time from GO Rail to subway platform at Sheppard West Station.	Walking time based on 1.2 m/s + 10 second premium for every vertical movement measured from centre of GO platform to centre of subway platform (Min)	All Options yield similar results. Not a determining factor for selecting Options.		
		B1.3) Delay time for through passengers on the 36-Finch West bus route and the 41 Keele bus route at Finch West Station.	Total travel time (excluding internal circulation and dwell time within the station) based on travel time (assumed 30 km/hr) + additional delays for specific movements at key intersections (36 Finch) (Min)	All Options yield similar results. Not a determining factor for selecting Options.		
			Total travel time (excluding internal circulation and dwell time within the station) based on travel time (assumed 30 km/hr) + additional delays for specific movements at key intersections (41 Keele) (Min)	All Options yield similar results. Not a determining factor for selecting Options.		

Table 6-18 (Continued): Evaluation of North Alignments (including York University station)

●	◕	◑	◔	○
MOST PREFFERED				LEAST PREFFERED

Objectives	Criteria	Indicators	Measures	N1	N2	N3
B) Provide improved connections between the TTC subway and GO Transit, York Region Transit and TTC buses.	B1) Convenience for transfers from bus and train operations (including Wheeltrans).	B1.4) Transfer time from subway to future LRT in hydro corridor at Finch West Station.	Walking time based on 1.2 m/s + 10 second premium for every vertical movement measured from centre of LRT platform to centre of subway platform (Min)	◕	●	●
	B2) Convenience for access from other travel modes (taxi, bicycle, pedestrians, passenger pick up and drop off, commuter parking, ambulatory/non-ambulatory disabled persons).	B2.1) Opportunity to link with cycling routes identified in the City of Toronto's and City of Vaughan's Cycling Master Plans.	Cycling time based on 15 km/h from entrance to identified bike path/bike lanes in cycling master plans (Min)	All Options yield similar results. Not a determining factor for selecting Options.		
		B2.2) Transfer time from other travel modes to subway platform.	Walking time based on 1.2 m/s from PPUDO/taxi stand to closest station entrance (Min)	All Options yield similar results. Not a determining factor for selecting Options.		
			Walking time based on 1.2 m/s from middle of commuter parking lot to closest station entrance (Min)	All Options yield similar results. Not a determining factor for selecting Options.		
		B2.3) Quality of walking environment from other travel modes to subway platform.	Weather protected (yes/no)	All Options yield similar results. Not a determining factor for selecting Options.		
			Entrance type (Staffed/automated)	All Options yield similar results. Not a determining factor for selecting Options.		
			Walking time from station entrance/bicycle racks to subway platform based on 1.2 m/s + 10 second premium for every vertical movement Max time (Min)	All Options yield similar results. Not a determining factor for selecting Options.		
	B3) Flexibility for potential future subway extension into York Region.	B3.1) Number, type and sensitivity of significant environmental features potentially affected by a future subway extension into York Region.	Number of natural heritage features.	◑	●	◕
			Area of groundwater discharge (100m zone of influence) (ha)	◕	●	●
			Number of residences, businesses and community/recreational/ institutional facilities.	◕	●	●
			Number of cultural heritage features (100m zone of influence)	●	●	●

Table 6-18 (Continued): Evaluation of North Alignments (including York University station)

● MOST PREFFERED ◕ ◑ ◔ ○ LEAST PREFFERED

Objectives	Criteria	Indicators	Measures	N1	N2	N3
B) Provide improved connections between the TTC subway and GO Transit, York Region Transit and TTC buses.	B3) Flexibility for potential future subway extension into York Region.	B 3.2) Number and type of curves between Steeles West Station and Highway 407.	Total length of alignment (metres)	All Options yield similar results. Not a determining factor for selecting Options.		
			Length of curves with radii less than 457 m.	All Options yield similar results. Not a determining factor for selecting Options.		
			Length of curves with radii between 457 m and 750 m.	All Options yield similar results. Not a determining factor for selecting Options.		
C) Support local population and employment growth.	C1) Maximize redevelopment potential in support of the subway extension.	C1.1) Ability to combine stations with the existing and future built form.	Amount of redevelopment frontage encumbered by transit facilities. Minimize	●	◕	◑
			Amount of area identified as redevelopment within zone of influence. Maximize	●	●	●
			Amount of area identified with university redevelopment potential on York university lands. Maximize	●	●	●
			Amount of redevelopment frontage within zone of influence. Maximize.	●	●	●
			Amount of redevelopment frontage on York University lands. Maximize.	●	●	●

Table 6-18 (Continued): Evaluation of North Alignments (including York University station)

● MOST PREFFERED ◕ ◑ ◔ ○ LEAST PREFFERED

Objectives	Criteria	Indicators	Measures	N1	N2	N3
C) Support local population and employment growth.	C2) Maximize the potential to create a high quality urban/pedestrian environment.	C2.1) Potential to create a safe environment for pedestrians, cyclists and transit passengers.	Number of pedestrian-bus conflicts at key uncontrolled station entrances (I.e. bus forecasts x pedestrian movements)	All Options yield similar results. Not a determining factor for selecting Options.		
			Active Surveillance (low, medium, high)	All Options yield similar results. Not a determining factor for selecting Options.		
D) Minimize adverse environmental effects.	D1) Potential effects on natural heritage features.	D1.1) Area, type, significance and resiliency of aquatic and terrestrial landscapes, ecosystems/communities and populations/species located within alignment and station footprint areas.	Area of natural heritage features (hectares)	All Options yield similar results. Not a determining factor for selecting Options.		
			Type of natural heritage features (ELC classification)	All Options yield similar results. Not a determining factor for selecting Options.		
			Significance of natural heritage features (local, regional, provincial, federal)	◕	◕	●
			Resiliency of natural heritage features (low, medium, high)	●	◕	◕
	D1) Potential effects on natural heritage features.	D1.2) Area, type, significance and sensitivity of aquatic and terrestrial landscapes, ecosystems/communities and populations/species located within adjacent zones of influence.(100m)	Area of natural heritage features (hectares)	All Options yield similar results. Not a determining factor for selecting Options.		
D) Minimize adverse environmental effects.	D1) Potential effects on natural heritage features.	D1.3) Type of natural heritage features (ELC classification)	cultural meadow, cultural thicket, cultural woodland, meadow marsh, shallow marsh, open aquatic	All Options yield similar results. Not a determining factor for selecting Options.		
			Significance of natural heritage features (local, regional, provincial, federal)	All Options yield similar results. Not a determining factor for selecting Options.		
			Resiliency of natural heritage features (low, medium, high)	All Options yield similar results. Not a determining factor for selecting Options.		
	D2) Potential effects on geology and hydrogeology.	D2.1) Magnitude and significance of permanent groundwater drawdown (if any) on hydrogeological conditions.	Area of groundwater recharge/discharge affected (ha)	All Options yield similar results. Not a determining factor for selecting Options.		
			Significance of groundwater recharge/discharge areas affected. (local, regional, provincial)	All Options yield similar results. Not a determining factor for selecting Options.		

Table 6-18 (Continued): Evaluation of North Alignments (including York University station)

● MOST PREFFERED ◕ ◑ ◔ ○ LEAST PREFFERED

Objectives	Criteria	Indicators	Measures	N1	N2	N3
D) Minimize adverse environmental effects.	D2) Potential effects on geology and hydrogeology.	D2.1) Magnitude and significance of permanent groundwater drawdown (if any) on hydrogeological conditions.	Area of aquifers affected.	All Options yield similar results. Not a determining factor for selecting Options.		
			Significance of aquifers affected. (local, regional, provincial)	All Options yield similar results. Not a determining factor for selecting Options.		
		D2.2) Potential for soil erosion.	Area of soil to be disturbed.	All Options yield similar results. Not a determining factor for selecting Options.		
			Type of soil to be disturbed.	All Options yield similar results. Not a determining factor for selecting Options.		
	D3) Potential effects on hydrology.	D3.1) Area of flood storage capacity removed.	Area of flood storage capacity removed (hectares).	All Options yield similar results. Not a determining factor for selecting Options.		
		D3.2) Length/area of watercourses/ waterbodies altered.	Length/area of surface water features (metres/hectares).	All Options yield similar results. Not a determining factor for selecting Options.		
		D3.3) Ease and effectiveness of stormwater management at subway facilities.	Opportunities consistent with City of Toronto WWFMMP	All Options yield similar results. Not a determining factor for selecting Options.		
	D4) Potential effects on socio-economic features.	D4.1) Number of employment properties and community/recreational/ institutional facilities located within alignment and station footprint areas.	Number of individual properties directly impacted. Minimize	◕	●	●
			Number of buildings directly impacted on the York University Campus. Minimize	●	◕	◑
			Amount of station/alignment footprint located under a road ROW. Maximize.	●	◕	◑
D) Minimize adverse environmental effects.	D4) Potential effects on socio-economic features.	D4.2) Area, type, and sensitivity of residences, businesses and community/recreational/ institutional facilities located within adjacent zones of influence. (150m)	Area of stable employment within zone of influence (ha)	All Options yield similar results. Not a determining factor for selecting Options.		
			Area of stable development on the York University Campus within the zone of influence (ha)	All Options yield similar results. Not a determining factor for selecting Options.		
	D5) Potential effects on pedestrian and traffic access/ flow.	D5.1) Number of permanent road closures or access modifications.	Number of closures	All Options yield similar results. Not a determining factor for selecting Options.		
			Number of driveways with reduced access (e.g. full access reduced to right-in/right-out)	All Options yield similar results. Not a determining factor for selecting Options.		

Table 6-18 (Continued): Evaluation of North Alignments (including York University station)

MOST PREFFERED ● ◕ ◑ ◔ ○ LEAST PREFFERED

Objectives	Criteria	Indicators	Measures	N1	N2	N3
	D5) Potential effects on pedestrian and traffic access/ flow.	D5.2) Traffic Impacts due to operations of station commuter facilities (bus terminals, passenger pick-up and drop-off and commuter parking).	Number of critical movements within vicinity of station	All Options yield similar results. Not a determining factor for selecting Options.		
			Sum of intersection delays (in Min) at key intersections at an approximate 250m radius from station	All Options yield similar results. Not a determining factor for selecting Options.		
			Number of entrances /egresses obstructed by average peak hour queue lengths	All Options yield similar results. Not a determining factor for selecting Options.		
		D5.3) Impact on safety of transportation system.	Number of new signalized conflict points (total change increase/ decrease) on the arterial network	All Options yield similar results. Not a determining factor for selecting Options.		
			Number of unsignalized conflict points (total change increase/decrease) on the arterial network	All Options yield similar results. Not a determining factor for selecting Options.		
		D5.4) Accessibility for emergency services including fire, police and ambulance.	Impact on response times for EMS services (Number of critical intersections within study area)	All Options yield similar results. Not a determining factor for selecting Options.		
	D6) Effects on freight and rail passenger service and its signal systems at the GO/ Sheppard subway station.	D6.1) Impacts on the operation of the CN Newmarket/GO Bradford rail line during construction and operation of the subway extension.	Angle of crossing at CN Line (degrees)	All Options yield similar results. Not a determining factor for selecting Options.		
D) Minimize adverse environmental effects.	D7) Potential effects on cultural heritage resources.	D7.1) Number, type, significance and sensitivity of archaeological sites, built heritage features and cultural landscapes located within alignment and station footprint areas.	Unlikeliness of the discovery of archaeological remains (Low/Medium/High)	All Options yield similar results. Not a determining factor for selecting Options.		
		D7.2) Number, type, significance and sensitivity of archaeological sites, built heritage features and cultural landscapes located within adjacent zones of influence. (100m)	Number of heritage properties on municipal inventory or designated under the Ontario Heritage Act	All Options yield similar results. Not a determining factor for selecting Options.		
			Number of heritage properties identified during a field review	All Options yield similar results. Not a determining factor for selecting Options.		
	D8) Potential effects on pipelines located in the Finch Hydro Corridor	D8.1) Number, type, and length of pipelines requiring relocation due to subway extension.	Number of pipeline crossing	All Options yield similar results. Not a determining factor for selecting Options.		
			Vertical separation (in metres) between pipelines and subway tunnel	All Options yield similar results. Not a determining factor for selecting Options.		

Table 6-18 (Continued): Evaluation of North Alignments (including York University station)

●	◕	◑	◔	○
MOST PREFFERED				LEAST PREFFERED

Objectives	Criteria	Indicators	Measures	N1	N2	N3
E) Achieve reasonable capital and operating costs.	E1) Minimize the capital costs.	E1.1) Capital costs including underground and surface subway facilities, fleet and storage.	Capital costs estimated in 2005 dollars after GST Rebate (millions)	◕	●	◑
	E2) Minimize the costs of property acquisition.	E2.1) Total property cost.	Estimated real estate costs in 2005 dollars. (million)	All Options yield similar results. Not a determining factor for selecting Options.		
		E2.2) Potential environmental cleanup costs.	Number of known or potential contaminated sites within zone of influence of subway extension	●	◕	◕
	E3) Minimize the net operating cost.	E3.1) The dollar value of net fare and other revenues including commuter parking.	Total annual ridership on subway extension measured in number of riders. (Table 14, Route 1 Station usage and link volume forecasts 2021 - opportunities land use - AM Peak Period	All Options yield similar results. Not a determining factor for selecting Options.		
		E3.2) Operations and maintenance cost of the subway extension, including feeder bus operations.	Total length of track on curve (all radii)	◑	◕	●
			Reduction (addition) to total route length for existing bus services in the study area	All Options yield similar results. Not a determining factor for selecting Options.		
			Contains project elements with higher operating & maintenance needs	All Options yield similar results. Not a determining factor for selecting Options.		

Evaluation of North Alignment

Objectives	Option N1 (Yellow)	Option N2 (Purple)	Option N3 (White)	
A) Provide subway service to the Keele/Finch area, York University and a new inter-regional transit terminal at Steeles Avenue.	●	◕	●	• The York University station for alternatives N1 and N3 will be in the Common, the transportation hub of the University. • Option N2 connects to the back of York Lanes and therefore is less preferred.
B) Provide improved connections between the TTC subway and GO Transit, York Region Transit and TTC buses.	◕	●	●	• N1 would have the highest impacts to the socio-economic and natural environment if the subway were to be extended north into York Region.
C) Support local population and employment growth.	●	◕	◕	• Option N1 impacts the least amount of developable frontage along Steeles Avenue.
D) Minimize adverse environmental effects.	◕	◕	●	• Overall, the impacts to the campus are negligible for all three alignments. Minor differences include: • N1 is adjacent to more sensitive buildings (versus N2 and N3). • N2 is below more wooded area (versus N1 and N3).
E) Achieve reasonable capital and operating costs.	◑	◕	●	• Although there are differences in costs for each alignment, all alternatives are within a 3% range. • With the greatest number of curves and the longest alignment, N1 is least preferred. • With the fewest number of curves and the shortest alignment length, N3 is most preferred.
OVERALL	2	2	1	Option N3 is preferred because it offers: • The best connection to the York University Common, the transportation hub of the campus. • The shortest length from Finch West station to Steeles West station. • The lowest operating and maintenance cost. • The fewest impacts to the environment for this extension AND any future extensions into York Region.

Most Preferred ● ◕ ◑ ◔ ○ Least Preferred

FIGURE 6-24: Summary of Evaluation for North Alignment

6.3.11. Summary of Evaluation Results: North Alignments

In summary, the RAM analysis produced the following results:

N1

This is the longest of the three north alignments with the most curves, which will result in the highest operating and maintenance costs. N1 avoids the Boynton Woods and Boyer Woodlot. The location of York University Station provides opportunities to integrate the station entrances and exists to existing development patterns of the University. The alignment employs the Steeles Avenue right-of-way and offers redevelopment opportunities along both sides of Steeles Avenue. The resulting alignment for future extensions into York Region would result in the greatest potential for negative impacts to the natural environment. N1 also directly impacts the proposed Phase II of the Tribute Homes development (along Murray Ross Parkway).

This option was not carried forward.

N2

This option is a more direct alignment in comparison to N1. The diagonal crossing of Steeles Avenue will impacts some street frontage redevelopment opportunities along Steeles Avenue as compared to N1. N2 is somewhat circuitous as it avoids all buildings on York University lands, and it passes under the Boynton Woods and the Boyer Woodlot.

This option was not carried forward.

N3

This option is the most direct alignment resulting in the lowest operating and maintenance costs. The diagonal crossing of Steeles Avenue will impact some street frontage redevelopment opportunities along Steeles Avenue as compared to N1. N3 passes under a number of York University buildings as well as the Boynton Woods and the Boyer Woodlot. Furthermore, this option provides:

1) The best connection to the York University Common which is the transportation hub of the Keele Campus;
2) The shortest length (track/alignment) from Finch West Station to Steeles West Station; and
3) The fewest impacts to the environment for this extension and any future extension of the Spadina Subway into the York Region.

This option was carried forward as the technically preferred.

6.3.12. North Alignments Sensitivity Analysis

For the MATS analysis for the North Alignments, the Study Team placed the most emphasis on 3 indicators including:

1) Ability to combine stations with existing and future built form (amount of redevelopment frontage within station zone of influence);
2) Ability to combine stations with existing and future built form (amount of redevelopment frontage encumbered by transit facility); and
3) Total length of track on curve.

As illustrated in Table 6-19, the results of the MATS analysis indicated that N3, although second highest, achieved comparable results to N3. A detailed MATS analysis is presented in Appendix L.

Table 6-19:MATS Results – North Alignments

	N1	N2	N3
MATS Results	0.29	0.40	0.37
Ranking	3	1	2

6.3.13. Consultation and Refinement on the Technically Preferred Alignment: N3

In consultation with representatives of York University, the Study Team selected N3 as the technically preferred alignment for the reasons listed above.

During the third round of consultations, the technically preferred alignment was strongly endorsed by the public and the majority of key stakeholder agencies. Therefore, the N3 alignment was carried forward as the recommended alignment.

6.3.14. Alternative Methods to be considered: Steeles West Station

The challenge for Steeles West Station was to address the bus bay/ bus terminal needs as defined by the transit operators; namely TTC, York Region Transit, VIVA and GO Transit. The lands already acquired by York Region in support of a new inter-regional bus terminal are no longer sufficient based on current bus service levels estimated. Therefore, for Steeles West Station, four bus terminal concepts were developed. All of the following concepts would use the lands owned by York Region, which are designated for a future inter-regional bus terminal:

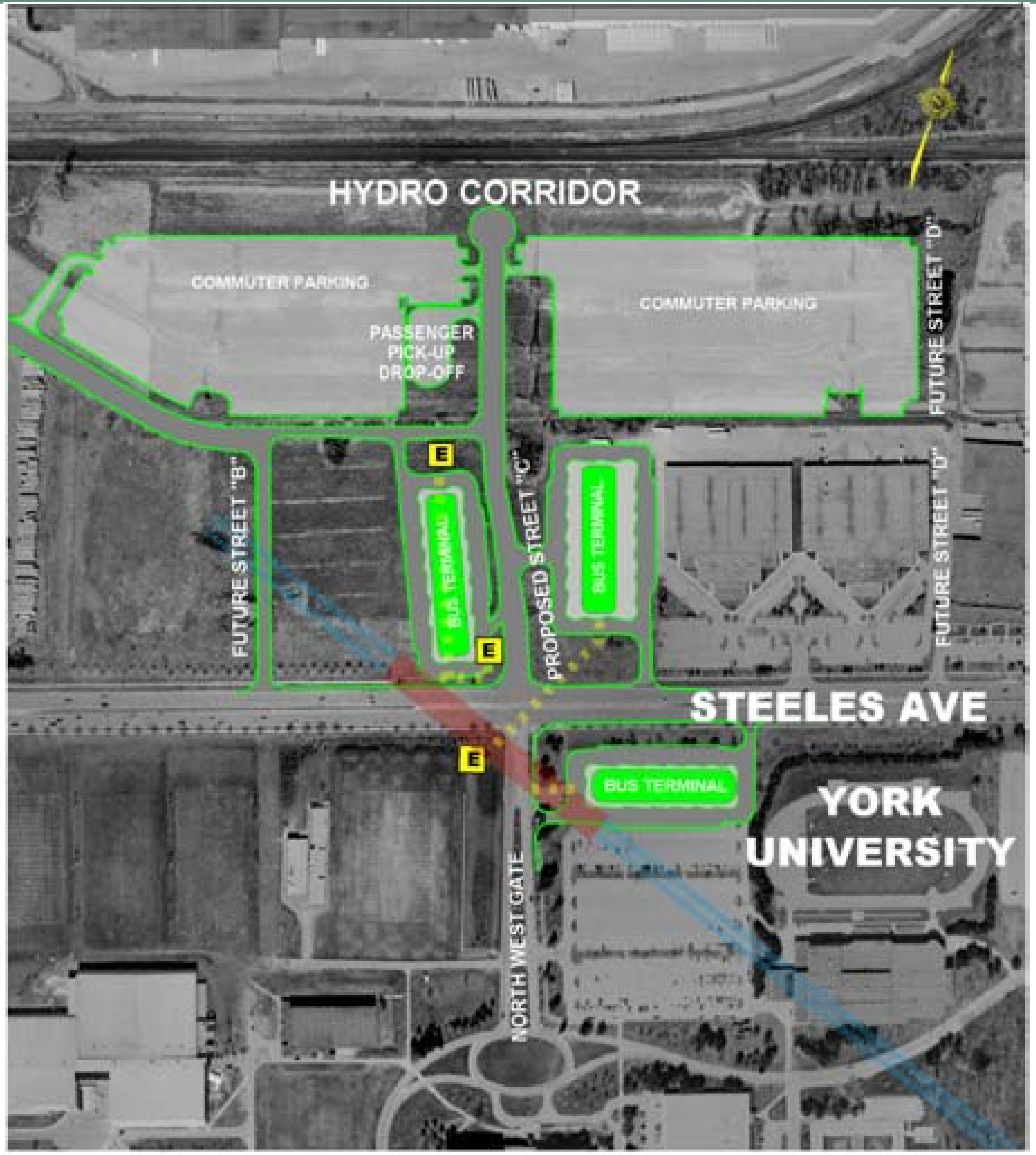
1) Option 1A - This option would include three surface level bus terminals: two located north of Steeles on the lands between the proposed future Street B and Street C and one terminal on the York University lands, south of Steeles Avenue;
2) Option 1B – This option would be similar to Option 1A, but with the terminals north of Steeles located on lands on each side of the future Street C;
3) Option 2 – Two surface bus terminals would be located on property purchased by York Region owned lands and within the hydro corridor, north of Steeles Avenue; and
4) Option 3 – Under this option, a two-level bus terminal would be constructed on the York Region lands, north of Steeles Avenue (similar to Wilson Station bus terminal).

Each of the station options is illustrated in Figures 6-25 to 6-28. Table 6-20 and 6-21 presents the numerical data and the results of such analysis respectively.

Legend

STATION PLATFORM
SUBWAY LINE
UNDERGROUND WALKWAY
E ENTRANCE

FIGURE 6-25 Steeles West Station Concept 1A



Legend

STATION PLATFORM
SUBWAY LINE
UNDERGROUND WALKWAY
E ENTRANCE

FIGURE 6-26 Steeles West Station Concept 1B

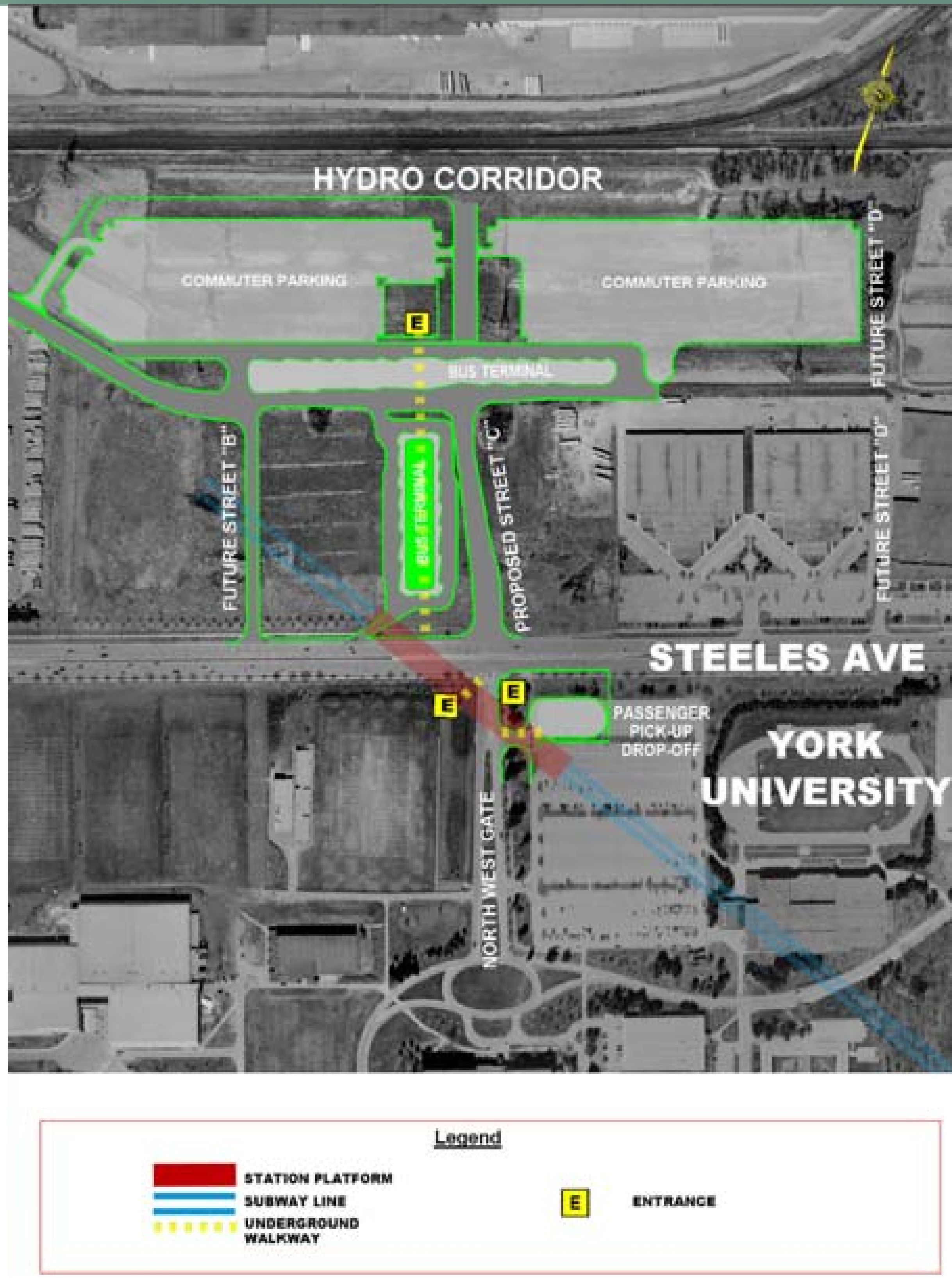


FIGURE 6-27Steeles West Station Concept 2

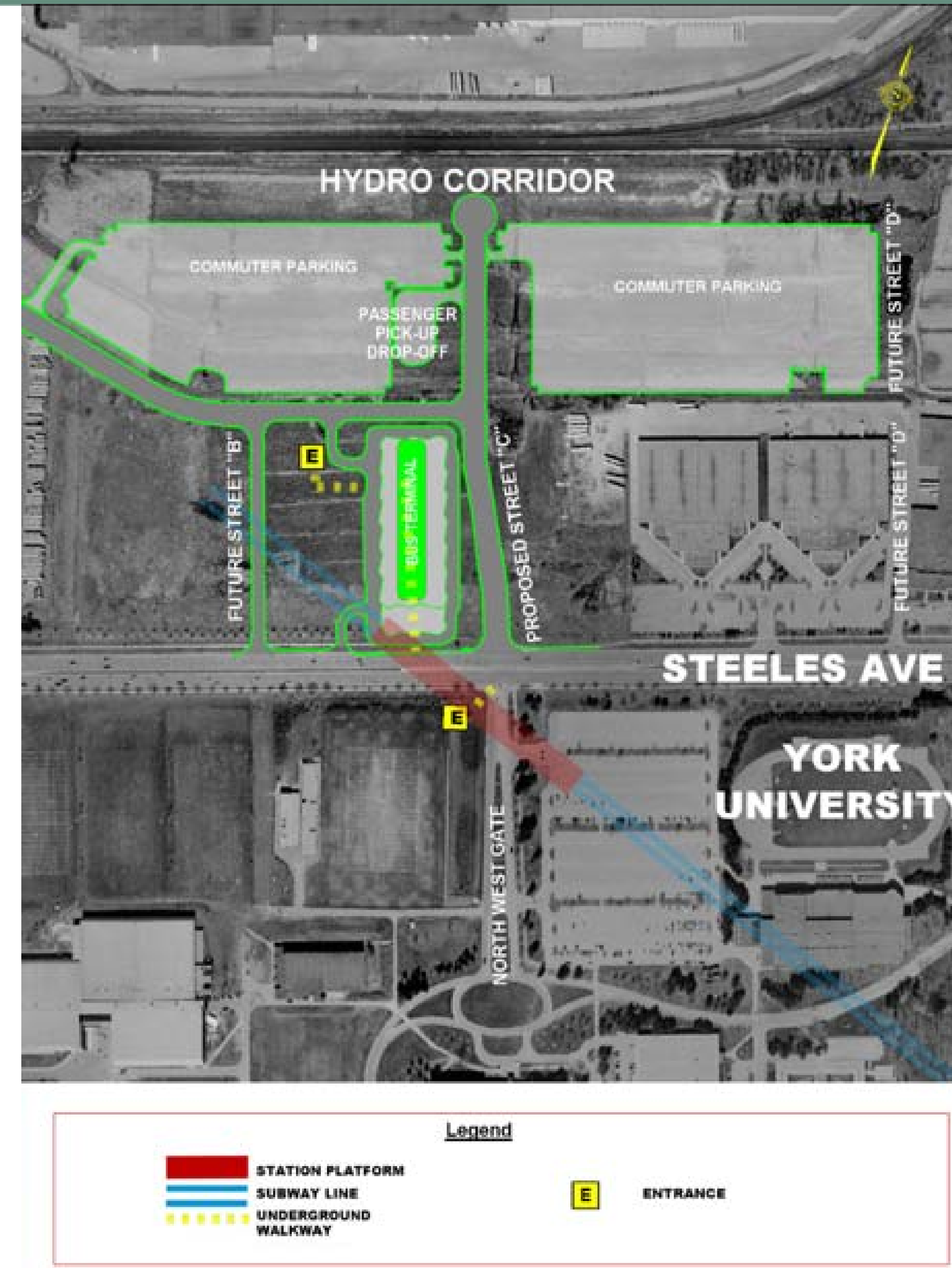


FIGURE 6-28 Steeles West Station Concept 3

Table 6-20:Analysis of Steeles West Station Alternatives

Objectives	Criteria	Indicators	Measures	Option 1A	Option 1B	Option 2	Option 3
A) Provide subway service to the Keele/Finch area, York University and a new inter-regional transit terminal at Steeles Avenue.	A1) Potential for riders to walk to local stations.	A1.1) Existing population and employment within 500 m walking distance of subway stations.	Number of people and employees within 500m radius of main entrance (Population per Hectare)	0	0	0	0
		A1.2) Future population and employment within 500 m walking distance of subway stations.	Number of people and employees within 500m radius of main entrance (Population per Hectare)	30	30	30	30
		A1.3) Students, faculty and staff within 500 m walking distance of York University Station.	Number of people and employees within 500 m radius of main entrance (based on Data provided to URS by York University)	N/A	N/A	N/A	N/A
	A2) Speed and comfort for subway passengers.	A2.1) Travel time from Downsview Station to Steeles West Station.	Total length of alignment (metres).	N/A	N/A	N/A	N/A
			Estimated run times	Difference in travel time between fastest and slowest alignment was imperceptible to transit riders (<20 seconds)			
		A2.2) Speed and comfort for subway passengers.	Length of Curves with Radii less than 457m (radius and length)	N/A	N/A	N/A	N/A
			Length of curves with radii between 457m and 750 m (radius and length)	N/A	N/A	N/A	N/A
B) Provide improved connections between the TTC subway and GO Transit, York Region Transit and TTC buses.	B1) Convenience for transfers from bus and train operations (including Wheeltrans).	B1.1) Transfer time from bus to subway platform at Steeles West Station and Finch West Station.	Walking time based on 1.2 m/s + 10 second premium for every vertical movement measured from middle bus bay to centre of subway platform (Min.)	3	3	5	4
		B1.2) Transfer time from GO Rail to subway platform at Sheppard West Station.	Walking time based on 1.2 m/s + 10 second premium for every vertical movement measured from centre of GO platform to centre of subway platform (Min)	N/A	N/A	N/A	N/A
		B1.3) Delay time for through passengers on the 36-Finch West bus route and the 41-Keele bus route at Finch West Station.	Total travel time (excluding internal circulation and dwell time within the station) based on travel time (assumed 30 km/hr) + additional delays for specific movements at key intersections (36 Finch) (Min)	N/A	N/A	N/A	N/A
			Total travel time (excluding internal circulation and dwell time within the station) based on travel time (assumed 30 km/hr) + additional delays for specific movements at key intersections (41 Keele) (Min)	N/A	N/A	N/A	N/A
		B1.4) Transfer time from subway to future LRT in hydro corridor at Finch West Station.	Walking time based on 1.2 m/s + 10 second premium for every vertical movement measured from centre of LRT platform to centre of subway platform (Min)	N/A	N/A	N/A	N/A

Table 6-20 (Continued): Analysis of Steeles West Station Alternatives

Objectives	Criteria	Indicators	Measures	Option 1A	Option 1B	Option 2	Option 3
B) Provide improved connections between the TTC subway and GO Transit, York Region Transit and TTC buses.	B2) Convenience for access from other travel modes (taxi, bicycle, pedestrians, passenger pick up and drop off, commuter parking, ambulatory/non-ambulatory disabled persons).	B2.1) Opportunity to link with cycling routes identified in the City of Toronto's and City of Vaughan's Cycling Master Plans.	Cycling time based on 15 km/h from entrance to identified bike path/bike lanes in cycling master plans (Min)	0	0	0	0
		B2.2) Transfer time from other travel modes to subway platform.	Walking time based on 1.2 m/s from PPUDO/taxi stand to closest station entrance (Min)	6	6	2	6
			Walking time based on 1.2 m/s from middle of commuter parking lot to closest station entrance (Min)	7	8	6	7
		B2.3) Quality of walking environment from other travel modes to subway platform.	Weather protected (yes/no)	YES	YES	NO	YES
			Entrance type (Staffed/automated)	All stations will include both staffed and automated entrances; location to be confirmed at next phase			
			Walking time from station entrance/bicycle racks to subway platform based on 1.2 m/s + 10 second premium for every vertical movement Max time (Min)	N/A	N/A	N/A	N/A
	B3) Flexibility for potential future subway extension into York Region.	B3.1) Number, type and sensitivity of significant environmental features potentially affected by a future subway extension into York Region.	Number of natural heritage features.	N/A	N/A	N/A	N/A
			Area of groundwater discharge (100m zone of influence) (ha)	N/A	N/A	N/A	N/A
			Number of residences, businesses and community/recreational/ institutional facilities.	N/A	N/A	N/A	N/A
			Number of cultural heritage features. (100m zone of influence)	N/A	N/A	N/A	N/A
			Ability to modify station to reflect changing bus demands	High	High	MEDIUM	LOW
		B 3.2) Number and type of curves between Steeles West Station and Highway 407.	Total length of alignment (metres)	N/A	N/A	N/A	N/A
			Length of curves with radii less than 457 m.	N/A	N/A	N/A	N/A
			Length of curves with radii between 457 m and 750 m.	N/A	N/A	N/A	N/A
C) Support local population and employment growth.	C1) Maximize redevelopment potential in support of the subway extension.	C1.1) Ability to combine stations with the existing and future built form.	Assess the potential for redevelopment and the types of built form H > 40ha, 39>M>20, L< 20	All have equal potential			
			Amount of redevelopment frontage within zone of influence	Equal frontage for all station concepts (approx. 400 m)			
			Amount of redevelopment frontage encumbered by transit facility (m)	290	290	90	90

Table 6-20 (Continued): Analysis of Steeles West Station Alternatives

Objectives	Criteria	Indicators	Measures	Option 1A (Option 1)	Option 1B (Option 2)	Option 2 (Option 3)	Option 3 (Option 4)
C) Support local population and employment growth.	C2) Maximize the potential to create a high quality urban/pedestrian environment.	C2.1) Potential to create a safe environment for pedestrians, cyclists and transit passengers.	Number of pedestrian-bus conflicts at key uncontrolled station entrances (I.e. bus forecasts x pedestrian movements)	5400	6600	2300	2300
			Active Surveillance (low, medium, high)	MEDIUM	MEDIUM	MEDIUM	HIGH
D) Minimize adverse environmental effects.	D1) Potential effects on natural heritage features.	D1.1) Area, type, significance and resiliency of aquatic and terrestrial landscapes, ecosystems/communities and populations/species located within alignment and station footprint areas.	Area of natural heritage features (hectares)	14.78	14.52	12.55	13.19
			Type of natural heritage features (ELC classification)	Cultural meadow	Cultural meadow	Cultural meadow	Cultural meadow
			Significance of natural heritage features (local, regional, provincial, federal)	Local	Local	Local	Local
			Resiliency of natural heritage features (low, medium, high)	High	High	High	High
	D1) Potential effects on natural heritage features.	D1.2) Area, type, significance and sensitivity of aquatic and terrestrial landscapes, ecosystems/communities and populations/species located within adjacent zones of influence. (100m)	Area of natural heritage features (hectares)	9.2	8.57	10.66	10.23
			Type of natural heritage features (ELC classification)	Cultural meadow, cultural woodland	Cultural meadow, cultural woodland	Cultural meadow, cultural woodland	Cultural meadow, cultural woodland
			Significance of natural heritage features (local, regional, provincial, federal)	Local	Local	Local	Local
			Resiliency of natural heritage features (low, medium, high)	High	High	High	High
	D2) Potential effects on geology and hydrogeology.	D2.1) Magnitude and significance of permanent groundwater drawdown (if any) on hydrogeological conditions.	Area of groundwater recharge/discharge affected (ha)	9.98	8.36	8.52	9.06
			Significance of groundwater recharge/discharge areas affected. (Local, regional, provincial)	Local	Local	Local	Local
			Area of aquifers affected.	Temporary, moderate	Temporary, moderate	Temporary, moderate	Temporary, moderate
			Significance of aquifers affected. (Local, regional, provincial)	Local	Local	Local	Local
		D2.2) Potential for soil erosion.	Area of soil to be disturbed (ha).	16.46	16.83	13.58	13.41

Table 6-20 (Continued): Analysis of Steeles West Station Alternatives

Objectives	Criteria	Indicators	Measures	Option 1A (Option 1)	Option 1B (Option 2)	Option 2 (Option 3)	Option 3 (Option 4)
D) Minimize adverse environmental effects	D2) Potential effects on geology and hydrogeology.	D2.2) Potential for soil erosion.	Type of soil to be disturbed.	Stone-poor Carbonate (silty-sandy till), rainout deposits, silt & clay	Stone-poor Carbonate (silty-sandy till), rainout deposits, silt & clay	Stone-poor Carbonate (silty-sandy till), rainout deposits, silt & clay	Stone-poor Carbonate (silty-sandy till), rainout deposits, silt & clay
	D3) Potential effects on hydrology.	D3.1) Area of flood storage capacity removed.	Area of flood storage capacity removed (hectares).	Route selected avoids existing floodplains – no impact			
		D3.2) Length/area of watercourses/ waterbodies altered.	Length/area of surface water features (metres/hectares).	Route selected avoids existing watercourses – no impact			
		D3.3) Ease and effectiveness of stormwater management at subway facilities.	Opportunities consistent with City of Toronto WWFMMP	OGS	Surface Storage and treatment Available		
	D4) Potential effects on socio-economic features.	D4.1) Number of employment properties and community/recreational/institutional facilities located within alignment and station footprint areas.	Number of Employment	2	2	2	3
			Number of Community/Recreational	0	0	0	0
			Number of Institution	1	1	0	0
		D4.2) Area, type, and sensitivity of residences, businesses and community/recreational/institutional facilities located within adjacent zones of influence. (150m)	Ability to minimize impact on existing stable residential lands within zone of influence (High < 25 ha, 25 ha < Medium <40, Low >40)	Due to the redevelopment potential and ownership structure, impact on stable lands was not considered relevant for these alignments.			
			Ability to minimize impact on existing stable employment lands within zone of influence (High < 25 ha, 25 ha < Medium <40, Low >40)	Due to the redevelopment potential and ownership structure, impact on stable lands was not considered relevant for these alignments.			
	D5) Potential effects on pedestrian and traffic access/ flow.	D5.1) Number of permanent road closures or access modifications.	Number of closures	0	0	(1) Prohibition of E-W Road for Transit Use Only	0
			Number of driveways with reduced access (e.g. full access reduced to right-in/right-out)	0	0	0	0
		D5.2) Traffic Impacts due to operations of station commuter facilities (bus terminals, passenger pick-up and drop-off and commuter parking).	Number of critical movements within vicinity of station	42	40	40	39
			Sum of intersection delays (in Min) at key intersections at an approximate 250m radius from station.	10	10	10	11
			Number of entrances/egresses obstructed by average peak hour queue lengths	0	1	0	0

Table 6-20 (Continued): Analysis of Steeles West Station Alternatives

Objectives	Criteria	Indicators	Measures	Option 1A (Option 1)	Option 1B (Option 2)	Option 2 (Option 3)	Option 3 (Option 4)
D) Minimize adverse environmental effects	D5) Potential effects on pedestrian and traffic access/ flow.	D5.3) Impact on safety of transportation system.	Number of new signalized conflict points (total change increase/ decrease) on the arterial network.	22	22	22	22
			Number of unsignalized conflict points (total change increase/decrease) on the arterial network.	2	4	7	1
		D5.4) Accessibility for emergency services including fire, police and ambulance.	Impact on response times for EMS services (Number of critical intersections within study area).	9	9	9	10
	D6) Effects on freight and rail passenger service and its signal systems at the GO/Sheppard subway station.	D6.1) Impacts on the operation of the CN Newmarket/GO Bradford rail line during construction and operation of the subway extension.	Angle of crossing at CN Line (degrees)	N/A	N/A	N/A	N/A
	D7) Potential effects on cultural heritage resources.	D7.1) Number, type, significance and sensitivity of archaeological sites, built heritage features and cultural landscapes located within alignment and station footprint areas.	Number of known archaeological sites.	0	0	0	0
			Unlikeliness of the discovery of archaeological remains (Low/Medium/High).	High	High	High	High
			Number of heritage properties on municipal inventory or designated under the Ontario Heritage Act.	1	1	1	1
			Number of heritage properties identified during a field review.	1	1	1	1
		D7.2) Number, type, significance and sensitivity of archaeological sites, built heritage features and cultural landscapes located within adjacent zones of influence. (100m)	Number of heritage properties on municipal inventory or designated under the Ontario Heritage Act.	1	1	1	1
			Number of heritage properties identified during a field review.	1	1	1	1
	D8) Potential effects on pipelines located in the Finch Hydro Corridor	D8.1) Number, type, and length of pipelines requiring relocation due to subway extension.	Number of pipeline crossing	N/A	N/A	N/A	N/A
			Vertical separation (in metres) between pipelines and subway tunnel	N/A	N/A	N/A	N/A
E) Achieve reasonable capital and operating costs.	E1) Minimize the capital costs.	E1.1) Capital costs including underground and surface subway facilities, fleet and storage.	Capital costs estimated in 2005 dollars after GST Rebate (millions)	121	122	112	138
	E2) Minimize the costs of property acquisition.	E2.1) Total property cost.	Estimated real estate costs in 2005 dollars. (million)	3.4	4.2	0.6	1.7
		E2.2) Potential environmental cleanup costs.	Number of known or potential contaminated sites within zone of influence of subway extension.	2	2	0	0
	E3) Minimize the net operating cost.	E3.1) The dollar value of net fare and other revenues including commuter parking.	Total annual ridership on subway extension measured in number of riders. (Table 14, Route 1 Station usage and link volume forecasts 2021 - opportunities land use - AM Peak Period.	7929600	7929600	7929600	7929600
		E3.2) Operations and maintenance cost of the subway extension, including feeder bus operations.	Total length of track on curve (all radii).	N/A	N/A	N/A	N/A

Table 6-20 (Continued): Analysis of Steeles West Station Alternatives

Objectives	Criteria	Indicators	Measures	Option 1A (Option 1)	Option 1B (Option 2)	Option 2 (Option 3)	Option 3 (Option 4)
E) Achieve reasonable capital and operating costs.	E3) Minimize the net operating cost.	E3.2) Operations and maintenance cost of the subway extension, including feeder bus operations.	Reduction (addition) to total route length for existing bus services in the study area.	Total bus hours saved per week was 1411 hrs. Total bus kilometres saved each week were 32600km. Bus resources saved are 25 morning peak buses and 18 afternoon peak buses.			
			Contains project elements with higher operating & maintenance needs.	NO	NO	NO	YES - TTC expects significant Operating & Maintenance to bus terminals on structures (e.g. Warden, Victoria Park, Wilson)

Table 6-21:Evaluation of Steeles West Station Alternatives

● MOST PREFFERED ◕ ◑ ◔ ○ LEAST PREFFERED

Objectives	Criteria	Indicators	Measures	Option 1A	Option 1B	Option 2	Option 3
A) Provide subway service to the Keele/Finch area, York University and a new inter-regional transit terminal at Steeles Avenue.	A1) Potential for riders to walk to local stations.	A1.1) Existing population and employment within 500 m walking distance of subway stations.	Number of people and employees within 500m radius of main entrance (Population per Hectare)	All Options yield similar results. Not a determining factor for selecting Options.			
		A1.2) Future population and employment within 500 m walking distance of subway stations.	Number of people and employees within 500m radius of main entrance (Population per Hectare)	All Options yield similar results. Not a determining factor for selecting Options.			
		A1.3) Students, faculty and staff within 500 m walking distance of York University Station.	Number of people and employees within 500 m radius of main entrance (based on Data provided to URS by York University)	All Options yield similar results. Not a determining factor for selecting Options.			
	A2) Speed and comfort for subway passengers.	A2.1) Travel time from Downsview Station to Steeles West Station.	Total length of alignment (metres).	All Options yield similar results. Not a determining factor for selecting Options.			
			Estimated run times	All Options yield similar results. Not a determining factor for selecting Options.			
		A2.2) Speed and comfort for subway passengers.	Length of Curves with Radii less than 457m (radius and length)	All Options yield similar results. Not a determining factor for selecting Options.			
			Length of curves with radii between 457m and 750 m (radius and length)	All Options yield similar results. Not a determining factor for selecting Options.			
B) Provide improved connections between the TTC subway and GO Transit, York Region Transit and TTC buses.	B1) Convenience for transfers from bus and train operations (including Wheeltrans).	B1.1) Transfer time from bus to subway platform at Steeles West Station and Finch West Station.	Walking time based on 1.2 m/s + 10 second premium for every vertical movement measured from middle bus bay to centre of subway platform (Min.)	●	●	◑	◕
		B1.2) Transfer time from GO Rail to subway platform at Sheppard West Station.	Walking time based on 1.2 m/s + 10 second premium for every vertical movement measured from centre of GO platform to centre of subway platform (Min)	All Options yield similar results. Not a determining factor for selecting Options.			
		B1.3) Delay time for through passengers on the 36-Finch West bus route and the 41-Keele bus route at Finch West Station.	Total travel time (excluding internal circulation and dwell time within the station) based on travel time (assumed 30 km/hr) + additional delays for specific movements at key intersections (36 Finch) (Min)	All Options yield similar results. Not a determining factor for selecting Options.			
			Total travel time (excluding internal circulation and dwell time within the station) based on travel time (assumed 30 km/hr) + additional delays for specific movements at key intersections (41 Keele) (Min)	All Options yield similar results. Not a determining factor for selecting Options.			

Table 6-21 (Continued): Evaluation of Steeles West Station Alternatives

●	◕	◑	◔	○
MOST PREFFERED				LEAST PREFFERED

Objectives	Criteria	Indicators	Measures	Option 1A	Option 1B	Option 2	Option 3
B) Provide improved connections between the TTC subway and GO Transit, York Region Transit and TTC buses.	B1) Convenience for transfers from bus and train operations (including Wheeltrans).	B1.4) Transfer time from subway to future LRT in hydro corridor at Finch West Station.	Walking time based on 1.2 m/s + 10 second premium for every vertical movement measured from centre of LRT platform to centre of subway platform. (Min)	All Options yield similar results. Not a determining factor for selecting Options.			
	B2) Convenience for access from other travel modes (taxi, bicycle, pedestrians, passenger pick up and drop off, commuter parking, ambulatory/non-ambulatory disabled persons).	B2.1) Opportunity to link with cycling routes identified in the City of Toronto's and City of Vaughan's Cycling Master Plans.	Cycling time based on 15 km/h from entrance to identified bike path/bike lanes in cycling master plans.(Min)	All Options yield similar results. Not a determining factor for selecting Options.			
		B2.2) Transfer time from other travel modes to subway platform.	Walking time based on 1.2 m/s from PPUDO/taxi stand to closest station entrance. (Min)	All Options yield similar results. Not a determining factor for selecting Options.			
			Walking time based on 1.2 m/s from middle of commuter parking lot to closest station entrance.(Min)	◕	◑	●	◕
		B2.3) Quality of walking environment from other travel modes to subway platform.	Weather protected (yes/no)	●	●	◕	●
			Entrance type (Staffed/automated)	All Options yield similar results. Not a determining factor for selecting Options.			
			Walking time from station entrance/bicycle racks to subway platform based on 1.2 m/s + 10 second premium for every vertical movement .Max time(Min)	All Options yield similar results. Not a determining factor for selecting Options.			
	B3) Flexibility for potential future subway extension into York Region.	B3.1) Number, type and sensitivity of significant environmental features potentially affected by a future subway extension into York Region.	Number of natural heritage features.	All Options yield similar results. Not a determining factor for selecting Options.			
			Area of groundwater discharge (100m zone of influence) (ha)	All Options yield similar results. Not a determining factor for selecting Options.			
			Number of residences, businesses and community/recreational/ institutional facilities.	All Options yield similar results. Not a determining factor for selecting Options.			
			Number of cultural heritage features. (100m zone of influence)	All Options yield similar results. Not a determining factor for selecting Options.			
			Ability to modify station to reflect changing bus demands	All Options yield similar results. Not a determining factor for selecting Options.			
	B3) Flexibility for potential future subway extension into York Region.	B 3.2) Number and type of curves between Steeles West Station and Highway 407.	Total length of alignment (metres)	All Options yield similar results. Not a determining factor for selecting Options.			
			Length of curves with radii less than 457 m.	All Options yield similar results. Not a determining factor for selecting Options.			
			Length of curves with radii between 457 m and 750 m.	All Options yield similar results. Not a determining factor for selecting Options.			

Table 6-21 (Continued): Evaluation of Steeles West Station Alternatives

● MOST PREFFERED ◕ ◑ ◔ ○ LEAST PREFFERED

Objectives	Criteria	Indicators	Measures	Option 1A	Option 1B	Option 2	Option 3
C) Support local population and employment growth.	C1) Maximize redevelopment potential in support of the subway extension.	C1.1) Ability to combine stations with the existing and future built form.	Assess the potential for redevelopment and the types of built form H > 40ha, 39>M>20, L< 20	All Options yield similar results. Not a determining factor for selecting Options.			
			Amount of redevelopment frontage within zone of influence	All Options yield similar results. Not a determining factor for selecting Options.			
			Amount of redevelopment frontage encumbered by transit facility (m)	◑	◑	●	●
	C2) Maximize the potential to create a high quality urban/pedestrian environment.	C2.1) Potential to create a safe environment for pedestrians, cyclists and transit passengers.	Number of pedestrian-bus conflicts at key uncontrolled station entrances (I.e. bus forecasts x pedestrian movements)	All Options yield similar results. Not a determining factor for selecting Options.			
			Active Surveillance (low, medium, high)	◕	◕	◕	●
D) Minimize adverse environmental effects.	D1) Potential effects on natural heritage features.	D1.1) Area, type, significance and resiliency of aquatic and terrestrial landscapes, ecosystems/communities and populations/species located within alignment and station footprint areas.	Area of natural heritage features (hectares)	All Options yield similar results. Not a determining factor for selecting Options.			
			Type of natural heritage features (ELC classification)	All Options yield similar results. Not a determining factor for selecting Options.			
			Significance of natural heritage features (local, regional, provincial, federal)	All Options yield similar results. Not a determining factor for selecting Options.			
			Resiliency of natural heritage features (low, medium, high)	All Options yield similar results. Not a determining factor for selecting Options.			
D) Minimize adverse environmental effects		D1.2) Area, type, significance and sensitivity of aquatic and terrestrial landscapes, ecosystems/communities and populations/species located within adjacent zones of influence.(100m)	Area of natural heritage features (hectares)	All Options yield similar results. Not a determining factor for selecting Options.			
			Type of natural heritage features (ELC classification)	All Options yield similar results. Not a determining factor for selecting Options.			
			Significance of natural heritage features (local, regional, provincial, federal)	All Options yield similar results. Not a determining factor for selecting Options.			
			Resiliency of natural heritage features (low, medium, high)	All Options yield similar results. Not a determining factor for selecting Options.			

Table 6-21 (Continued): Evaluation of Steeles West Station Alternatives

● MOST PREFFERED ◕ ◑ ◔ ○ LEAST PREFFERED

Objectives	Criteria	Indicators	Measures	Option 1A	Option 1B	Option 2	Option 3
D) Minimize adverse environmental effects	D2) Potential effects on geology and hydrogeology.	D2.1) Magnitude and significance of permanent groundwater drawdown (if any) on hydrogeological conditions.	Area of groundwater recharge/discharge affected (ha)	All Options yield similar results. Not a determining factor for selecting Options.			
			Significance of groundwater recharge/discharge areas affected. (local, regional, provincial)	All Options yield similar results. Not a determining factor for selecting Options.			
			Area of aquifers affected.	All Options yield similar results. Not a determining factor for selecting Options.			
			Significance of aquifers affected. (local, regional, provincial)	All Options yield similar results. Not a determining factor for selecting Options.			
		D2.2) Potential for soil erosion.	Area of soil to be disturbed (ha).	All Options yield similar results. Not a determining factor for selecting Options.			
	D2) Potential effects on geology and hydrogeology.	D2.2) Potential for soil erosion.	Type of soil to be disturbed.	All Options yield similar results. Not a determining factor for selecting Options.			
	D3) Potential effects on hydrology.	D3.1) Area of flood storage capacity removed.	Area of flood storage capacity removed (hectares).	All Options yield similar results. Not a determining factor for selecting Options.			
		D3.2) Length/area of watercourses/ waterbodies altered.	Length/area of surface water features (metres/hectares).	All Options yield similar results. Not a determining factor for selecting Options.			
		D3.3) Ease and effectiveness of stormwater management at subway facilities.	Opportunities consistent with City of Toronto WWFMMP	All Options yield similar results. Not a determining factor for selecting Options.			
	D4) Potential effects on socio-economic features.	D4.1) Number of employment properties and community/recreational/institutional facilities located within alignment and station footprint areas.	Number of Employment	All Options yield similar results. Not a determining factor for selecting Options.			
			Number of Community/Recreational	All Options yield similar results. Not a determining factor for selecting Options.			
			Number of Institutions	All Options yield similar results. Not a determining factor for selecting Options.			
		D4.2) Area, type, and sensitivity of residences, businesses and community/recreational/institutional facilities located within adjacent zones of influence. (150m)	Ability to minimize impact on existing stable residential lands within zone of influence (High < 25 ha, 25 ha < Medium <40, Low >40)	All Options yield similar results. Not a determining factor for selecting Options.			
			Ability to minimize impact on existing stable employment lands within zone of influence (High < 25 ha, 25 ha < Medium <40, Low >40)	All Options yield similar results. Not a determining factor for selecting Options.			

Table 6-21 (Continued): Evaluation of Steeles West Station Alternatives

●	◕	◑	◔	○
MOST PREFFERED				LEAST PREFFERED

Objectives	Criteria	Indicators	Measures	Option 1A	Option 1B	Option 2	Option 3
D) Minimize adverse environmental effects	D5) Potential effects on pedestrian and traffic access/ flow.	D5.1) Number of permanent road closures or access modifications.	Number of closures	●	●	◕	●
			Number of driveways with reduced access (e.g. full access reduced to right-in/right-out)	All Options yield similar results. Not a determining factor for selecting Options.			
		D5.2) Traffic Impacts due to operations of station commuter facilities (bus terminals, passenger pick-up and drop-off and commuter parking).	Number of critical movements within vicinity of station	All Options yield similar results. Not a determining factor for selecting Options.			
			Sum of intersection delays (in Min) at key intersections at an approximate 250m radius from station.	All Options yield similar results. Not a determining factor for selecting Options.			
			Number of entrances/egresses obstructed by average peak hour queue lengths	All Options yield similar results. Not a determining factor for selecting Options.			
		D5.3) Impact on safety of transportation system.	Number of new signalized conflict points (total change increase/ decrease) on the arterial network.	All Options yield similar results. Not a determining factor for selecting Options.			
			Number of unsignalized conflict points (total change increase/decrease) on the arterial network.	●	◕	◑	●
		D5.4) Accessibility for emergency services including fire, police and ambulance.	Impact on response times for EMS services (Number of critical intersections within study area).	All Options yield similar results. Not a determining factor for selecting Options.			
	D6) Effects on freight and rail passenger service and its signal systems at the GO/Sheppard subway station.	D6.1) Impacts on the operation of the CN Newmarket/GO Bradford rail line during construction and operation of the subway extension.	Angle of crossing at CN Line (degrees)	All Options yield similar results. Not a determining factor for selecting Options.			
	D7) Potential effects on cultural heritage resources.	D7.1) Number, type, significance and sensitivity of archaeological sites, built heritage features and cultural landscapes located within alignment and station footprint areas.	Number of known archaeological sites.	All Options yield similar results. Not a determining factor for selecting Options.			
			Unlikeliness of the discovery of archaeological remains (Low/Medium/High).	All Options yield similar results. Not a determining factor for selecting Options.			
			Number of heritage properties on municipal inventory or designated under the Ontario Heritage Act.	All Options yield similar results. Not a determining factor for selecting Options.			
			Number of heritage properties identified during a field review.	All Options yield similar results. Not a determining factor for selecting Options.			
		D7.2) Number, type, significance and sensitivity of archaeological sites, built heritage features and cultural landscapes located within adjacent zones of influence. (100m)	Number of heritage properties on municipal inventory or designated under the Ontario Heritage Act.	All Options yield similar results. Not a determining factor for selecting Options.			
			Number of heritage properties identified during a field review.	All Options yield similar results. Not a determining factor for selecting Options.			

Table 6-21 (Continued): Evaluation of Steeles West Station Alternatives

● MOST PREFFERED ◕ ◑ ◔ ○ LEAST PREFFERED

Objectives	Criteria	Indicators	Measures	Option 1A	Option 1B	Option 2	Option 3
D) Minimize adverse environmental effects	D8) Potential effects on pipelines located in the Finch Hydro Corridor	D8.1) Number, type, and length of pipelines requiring relocation due to subway extension.	Number of pipeline crossing	All Options yield similar results. Not a determining factor for selecting Options.			
			Vertical separation (in metres) between pipelines and subway tunnel	All Options yield similar results. Not a determining factor for selecting Options.			
E) Achieve reasonable capital and operating costs.	E1) Minimize the capital costs.	E1.1) Capital costs including underground and surface subway facilities, fleet and storage.	Capital costs estimated in 2005 dollars after GST Rebate (millions)	◕	◕	●	◑
	E2) Minimize the costs of property acquisition.	E2.1) Total property cost.	Estimated real estate costs in 2005 dollars. (million)	◔	○	●	◕
		E2.2) Potential environmental cleanup costs.	Number of known or potential contaminated sites within zone of influence of subway extension.	All Options yield similar results. Not a determining factor for selecting Options.			
	E3) Minimize the net operating cost.	E3.1) The dollar value of net fare and other revenues including commuter parking.	Total annual ridership on subway extension measured in number of riders. (Table 14, Route 1 Station usage and link volume forecasts 2021 - opportunities land use - AM Peak Period.	All Options yield similar results. Not a determining factor for selecting Options.			
		E3.2) Operations and maintenance cost of the subway extension, including feeder bus operations.	Total length of track on curve (all radii).	All Options yield similar results. Not a determining factor for selecting Options.			
	E3) Minimize the net operating cost.	E3.2) Operations and maintenance cost of the subway extension, including feeder bus operations.	Reduction (addition) to total route length for existing bus services in the study area.	All Options yield similar results. Not a determining factor for selecting Options.			
			Contains project elements with higher operating & maintenance needs.	●	●	●	◕

Evaluation of Steeles West Station

Objectives	Option 1A	Option 1B	Option 2	Option 3	
A) Provide subway service to the Keele/Finch area, York University and a new inter-regional transit terminal at Steeles Avenue.	●	●	●	●	• Existing population and employment within walking distance is the same for all station concepts. • All options serve York University and provide an inter-regional transit terminal for TTC, GO buses, York Transit and VIVA.
B) Provide improved connections between the TTC subway and GO Transit, York Region Transit and TTC buses.	●	●	◑	◕	• Option 2 has the longest transfer time from bus to subway. • Limited ability to provide weather protected waiting area within the Hydro Corridor (Option 2). • Limited ability for Option 3 to adjust to reflect changing bus routes and service levels.
C) Support local population and employment growth.	◕	◕	●	●	• Options 1A and 1B encumbers more frontage along Steeles Avenue that could be used for development.
D) Minimize adverse environmental effects.	●	◕	◑	●	• Option 2 may require part of the proposed East-West road (north of Steeles) to be transit only. • The driveway locations for the bus terminals for Options 1A and 3 support more efficient and safer movement of buses and traffic on the surrounding roads.
E) Achieve reasonable capital and operating costs.	◕	◕	●	◑	• Significant capital cost to construct a stacked bus terminal (Option 3). • Significant operating and maintenance costs for a stacked bus terminal (Option 3). • Increased property cost with options 1A and 1B.
OVERALL	1	2	3	2	Option 1A is preferred because it offers: • The quickest transfer time from bus to subway platform. • The greatest flexibility to address changing bus service demands. • The lowest capital, operating and maintenance costs. • A quality waiting environment for bus passengers.

Most Preferred ● ◕ ◑ ◔ ○ Least Preferred

FIGURE 6-29: Summary of Evaluation for Steeles West Station

6.3.15. Summary of Evaluation Results: Steeles West Station

For Steeles West Station, the challenge is to provide adequate facilities to meet rapidly increasing demand for bus services from York Region and beyond to York University and the proposed subway extension, while minimizing the impact on developable land. In 2001, York Region acquired property on the north side of Steeles Avenue for an 18-bay bus terminal. Since that time, due to the growth in GO Transit, York Region Transit and Viva services, the required number of bus bays for the Steeles West bus terminal has more than doubled and can no longer be entirely accommodated on the intended site.

Option 1A

This station concept offers the lowest capital, operating and maintenance costs and the location of the bus terminals north of Steeles Avenue will result in shorter bus terminal to subway platform transfer times. Although the bus terminals impact frontage along Steeles Avenue, they provide an overall better quality waiting environment for bus passengers and better bus/subway transfer times (versus Option 2). By locating the two bus terminals north of Steeles Avenue into a single block, Option 1A offers flexibility to adapt the bus terminal configuration and size in response to changes in the requirements of the several bus operators using Steeles West Station (including number of bus routes, frequency of services, types of vehicles, etc). These changes are inevitable due to:

1) the continuing trend of rapid growth in transit demand in York Region and beyond;
2) differing station berthing requirements of the various bus operators;
3) possible long-term extension of the Spadina Subway from Steeles West Station to anticipated improvements in fare integration between GTA transit operators; and
4) the Vaughan Corporate Centre.

Due to these circumstances, Option 1A would offer a significant advantage over Option 1B.This option was carried forward.

Option 1B

The benefits and negative impacts of this alternative are similar to Option 1A.

The most critical difference between Option 1A and 1B is that under Option 1A, the bus terminals north of Steeles Avenue are situated on a single block, whereas Option 1B is bi-sected by the proposed Street C (which is a continuation of the existing North West Gate and is intended to serve the proposed Steeles West Station commuter facilities as well as existing and future development north and south of Steeles Avenue). Because Street C bi-sects the proposed Option 1B bus terminal lands there would be less flexibility to adapt to changing bus operator requirements. Furthermore, there would be limited opportunities for cost savings, such as shared pedestrian tunnels, elevators and escalators, which could be potentially achieved for Option 1A.

In addition to the foregoing concerns, Option 1B would also result in marginally longer walk times between the bus terminal east of Street C and the subway platform, compared to Option 1A. As well, an additional property would be impacted compared to Option 1A.

This option was not carried forward.

Option 2

Option 2 has the longest transfer times between bus and subway. Furthermore, due to clearance issues associated with the high voltage hydro lines, there will likely be restrictions in the amount of shelter that can be provided on the bus platform within the Steeles hydro corridor.

This option was not carried forward.

Option 3

The multi-storey bus terminal facility would require significant capital and ongoing maintenance costs. As well, there would be limited ability to expand or reduce the size of the bus terminal structure in the event of changes in future bus bay requirements. Furthermore, the ramping requirements for the multi-level facility would require additional lands beyond the property purchased by York Region.

This option was not carried forward.

6.3.16. Steeles West Station Sensitivity Analysis

For the MATS analysis for the Steeles West Station analysis, the Study Team placed the most emphasis on 6 indicators including:

1) Quality of walking environment from other travel modes (weather protected);
2) Ability to modify station to reflect changing bus demands;
3) Ability to combine station with existing and future built form (amount of redevelopment frontage encumbered by transit facility);
4) Number of permanent road closures or access modifications needed;
5) Capital costs including underground and surface subway facilities, fleet and storage; and,
6) Contains project elements with higher operating and maintenance needs.

The MATS analysis conducted by the Study Team confirmed that Steeles West Station Option 1A was the preferred (see Figure 6-22).

Table 6-22:MATS Results – Steeles West Station

	Option 1A	Option 1B	Option 2	Option 3
MATS Results	0.65	0.63	0.43	0.55
Ranking	1	2	4	3

6.3.17. Consultation and Refinement on the Technically Preferred Steeles West Station

During the third round of public consultation, Steeles West Station, Option 1A was presented as the technically preferred. Over 90% of the public agreed with the selection of Option 1A (either completely or with minor comments). Conversely, less than half of the stakeholders agreed with Option 1A, with the single most common issue being the use of developable land to accommodate the bus terminals.

As a result of discussions held with York Region, the City of Vaughan, York University and the City of Toronto, the orientation of the bus terminals was adjusted to preserve the affected north and south frontages of Steeles Avenue West for future transit-supportive development to address the concerns raised about use of developable lands fronting Steeles Avenue. Opportunities for integration of pedestrian entrances and the bus terminals with new development will be explored further during the design of Steeles West Station.

The refined station concept (Option 1A) was circulated to several key stakeholders and was accepted as a reasonable refinement. Therefore, Option 1A became the recommended Steeles West Station concept.

Description of the Undertaking

7.0 Description of the Undertaking

The purpose of this section is to define the Undertaking for which approval is being sought. This focuses on:

1) Subway Alignment – this provides details on the location and configuration for the running structure that connects each of the four stations together;
2) Ancillary Features – this represents supporting elements that are required for the operation of the Undertaking;
3) Stations – this describes the amenities found at each of the four stations; and
4) Implementation – this section discusses matters relating to anticipated construction methodology and duration as well as capital cost estimates for the extension and supporting infrastructure.

The Undertaking comprises the construction, operation and maintenance of the extension of the Spadina Subway from Downsview Station to Steeles Avenue, as illustrated in Figure 7-1. The total length of the recommended alignment is 6.2 km long and includes four new stations:

1) Sheppard West Station – on Parc Downsview Park lands, south of Sheppard Avenue and west of the GO Bradford Rail Line;
2) Finch West Station – on Keele Street, immediately north of Finch Avenue, including a bus terminal, PPUDO, commuter parking and extensions to Murray Ross Parkway and Tangiers Road;
3) York University Station – within the Common of York University's Keele Street campus; and
4) Steeles West Station – diagonally centred on the Steeles Avenue and Northwest Gate intersection including bus terminals for TTC, GO and YRT, PPUDO and commuter parking.

It is noted that the implementation of the Undertaking does not preclude:

1) Construction of and subsequent connection to a future GO Bradford Rail Line Station on Parc Downsview Park lands;
2) A future subway extension from Steeles Avenue to Vaughan Corporate Centre (at Jane Street/ Highway 7) as planned in the Highway 7 Corridor and Vaughan North-South Link Public Transit Improvements Environmental Assessment;
3) A future looping of the Yonge and Spadina Subways, north of Steeles Avenue; and
4) A future connection from the subway to higher order transit in the Finch Hydro Corridor (see Figure 4-9 as proposed in the new Toronto Official Plan).

In support of this extension, additional subway fleet will be required which will necessitate improvements to the Wilson Yard. This will include added storage tracks and a new track extending from the east side of the yard to Downsview Station. The EA approvals for these works were secured in 1994 through the New Subway Storage and Maintenance Facility EA.

Although illustrated on all subsequent plans, the proposed East-West Street and Street "C", a portion of the commuter parking and a portion of the north bus terminal are to be approved through the York Region Highway 7 Corridor and Vaughan North-South Link Public Transit Improvements EA (see section 7.3.5).

7.1. Subway Alignment

7.1.1. Subway and Track Technology

TTC's subway cars have a length of approximately 22.8m and a width of 3.1m. The rated capacity for each subway car is 250-passengers. Trainsets of 6 cars result in a train length of approximately 137 m. Maximum operating speed is 80 km/hr. Trains are powered by electric motors, which utilize 600VDC current. Train operations, both locomotive control and opening/closing car doors, are manually controlled by on-board staff. Wayside signalling regulates the movement of trains along the line. Since this Undertaking is an extension of the existing 31 km Yonge-University-Spadina Subway, the current technology and operational requirements on the existing line will govern the operation of this Undertaking.

The track technology to be used is a combination of floating concrete slabs and double ties, which are designed to minimize the noise and vibration effects of subway operations to an acceptable level. The double tie trackbed system is designed to reduce vibration levels in the frequency range 30 Hz to 120 Hz by 14-16 dB in the box structure and by 12-15 dB in the tunnel structure. Sections of the Spadina Subway and the Sheppard Subway were built using such technology and have achieved desired results.

SPADINA SUBWAY EXTENSION

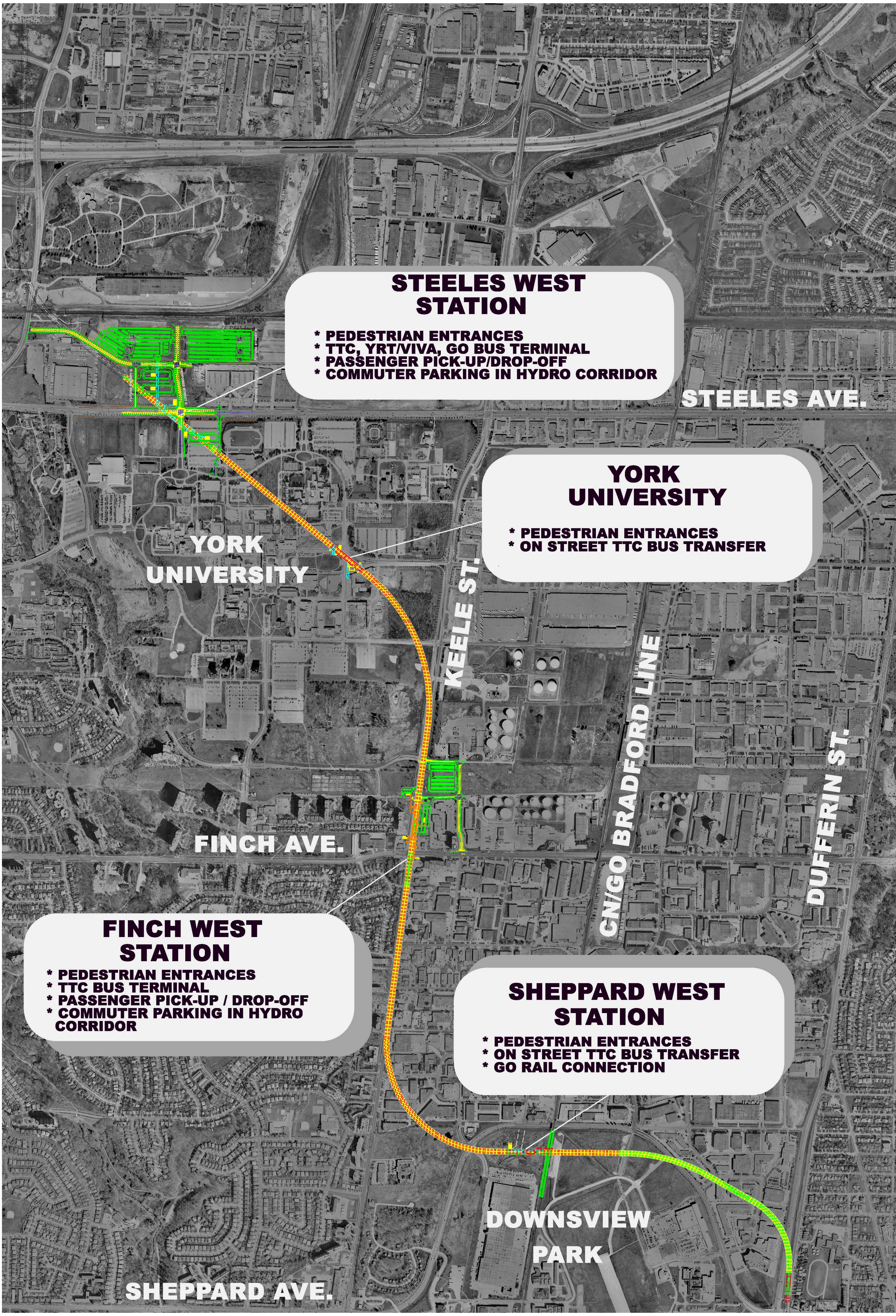


Figure 7-1: Recommended Undertaking

TORONTO   TORONTO TRANSIT COMMISSION   URS

7.1.2. Running Structure

The recommended alignment for which approval is sought is illustrated in greater detail in Drawing Numbers 0317-G-1 though 0317-G-10 and is summarized below.

Horizontal Alignment

Drawings 0317-G-1 though 0317-G-10 illustrate the recommended horizontal and vertical alignment of the 6.2 km Spadina Subway Extension. In plan, the alignment utilizes four curves as listed in Table 7-1:

Table 7-1: Horizontal Curve Information

Curve #	Location	Radius (Centreline of running structure)	Superelevation	Maximum Operating Speed Balanced (Unbalanced)	Length of Spiral Transition Curves
1	North of Downsview Station	310 m	0.100 m	50 km/h (62 km/h)	70 m
2	North of Downsview Station curve #1	760 m	0.100 m	80 km/h (80 km/h)	70 m
3	West of Sheppard West Station	485 m	0.100 m	64 km/h (80 km/h)	70 m
4	South of York University Station	755 m	0.100 m	80 km/h (80 km/h)	70 m

All curves meet TTC Design Standards and exceed the standard for minimum radii.

Vertical Alignment

Minimum and maximum design parameters used on the vertical alignment are:

1) Minimum Grade 0.3%
2) Maximum Grade 2.0%
3) Minimum Vertical Curve K=60 m

Sight lines for signalling will be confirmed during design of the Spadina Subway Extension.

7.1.3. Future Alignment Refinements

The alignment, as illustrated in this EA, is preliminary in nature. Refinements in the horizontal and/or vertical alignment will continue through design and may be undertaken to:

1) Improve operating characteristics,
2) Reduce future maintenance requirements,
3) Minimize impacts to properties,
4) Reduce construction related impacts, and
5) Reduce capital costs.

Any refinements to the alignment as recommended in this EA will be subject to the commitments and amending procedures outlined in this EA, which are described in section 9.0.

7.2. Ancillary Features

7.2.1. Subway Operational Needs

In support of the subway operations, “special track work areas” were identified based on the following subway operations requirements:

6) Provision for switching trains between northbound and southbound tracks at Finch West Station, to be used to provide reliable service or in emergency situations, which would require double cross-over tracks south of the station);
7) Turn back of trains at Steeles West Station terminus, requiring double cross-over tracks immediately south of the platform;
8) Tail-track structure north of Steeles West Station platform to allow full operating speed into Steeles West Station as well as to provide for temporary storage of trains; and
9) The connecting track from Wilson Yard to Downsview Station, which has already been granted EA approved status (through the New Subway Storage and Maintenance Facility EA).

The locations for each of the items 1 to 3 above are identified in Figure 7-2. Additional information on the operational needs is included in Appendix Q.

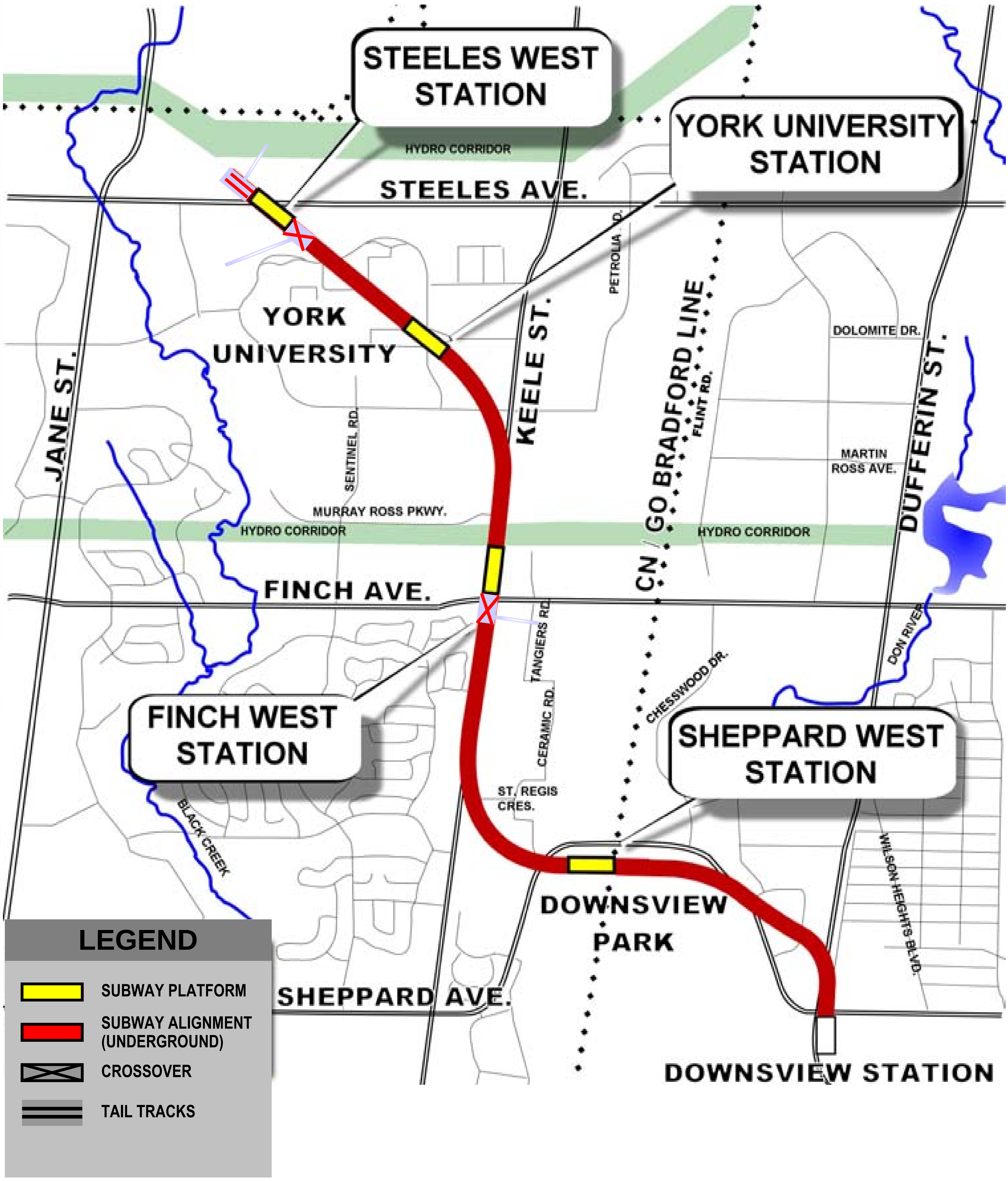


Figure 7-2: Subway Operational Needs

7.2.2. Electrical Substations

Electrical power is required to operate lights, equipment and safety systems associated with the stations. Electrical power is also required to power the trains themselves (referred to as traction power). The connections between TTC's subway and Toronto Hydro's power distribution grid occur in a facility that is referred to as an electrical substation. These substations contain transformers, switches and circuit panels to support the systems listed above. Substations can be constructed at-grade, below grade or a combination of the two. Figure 7-3 illustrates an existing substation that is split above grade / below grade.

To meet the traction power requirements for TTC's subway system, substations are typically 2.0 kilometres apart but cannot exceed 2.5 km in spacing. Since subway stations require power for lights and equipment, TTC usually locates the electrical substations near subway stations.

Because the Undertaking is 6.2 km long, this extension will require a minimum of three substations, which will be combined with Sheppard West Station, Finch West Station and Steeles West Station. However, in the event that suitable power supply cannot be delivered with the three substations, York University Station could provide the additional electrical capacity. The need for a substation at York University Station will be confirmed during the design phase. In the event that York University Station requires a substation, the University has requested that it be constructed entirely underground.

For Finch West Station, the opportunity to locate the substation within the Finch Hydro Corridor will be discussed with Hydro One and the Ontario Realty Corporation (ORC) during design. In the event that an appropriate location within the Hydro Corridor cannot be found, an underground facility, or a split above-grade/below-grade substation may be required at the north end of the bus terminal. Although conceptually identified in Drawings Numbers 0317-A-4 to 0317-A-6, the final location and configuration of electrical substations will be refined during design.

Figure 7-3: Typical Electrical Substation – Above Grade Portion – (Don Mills Station, Sheppard Subway)

Ground level view from Don Mills Road east to Don Mills Station substation enclosure

Aerial view of Don Mills Station substation showing substation enclosure and transformers

7.2.3. Emergency Exit Buildings

In accordance with NFPA130, emergency egress from the tunnel shall be provided throughout the underground system so that the distance to an exit shall not be greater than 381 m. Therefore the maximum distance from emergency exit to emergency exit or emergency exit to station shall be 762 metres. These structures extend from the underground tunnels to above grade and are designed to provide an emergency exit for passengers and an emergency access for fire fighting crews. They can also provide emergency ventilation and secondary power sources.

The below grade portion of the structures consists of a central vertical access/egress shaft complete with spiral ramp or walkway leading from the tunnel to the surface. At grade, the structure typically comprises a one-storey building about 3 metres in height and 10 square metres in area, as illustrated in Figure 7-4.

Possible locations for the Emergency Exit Buildings (EEB's) are illustrated in Figure 7-5.

Figure 7-4: Typical Emergency Exit Building - Sheppard Subway

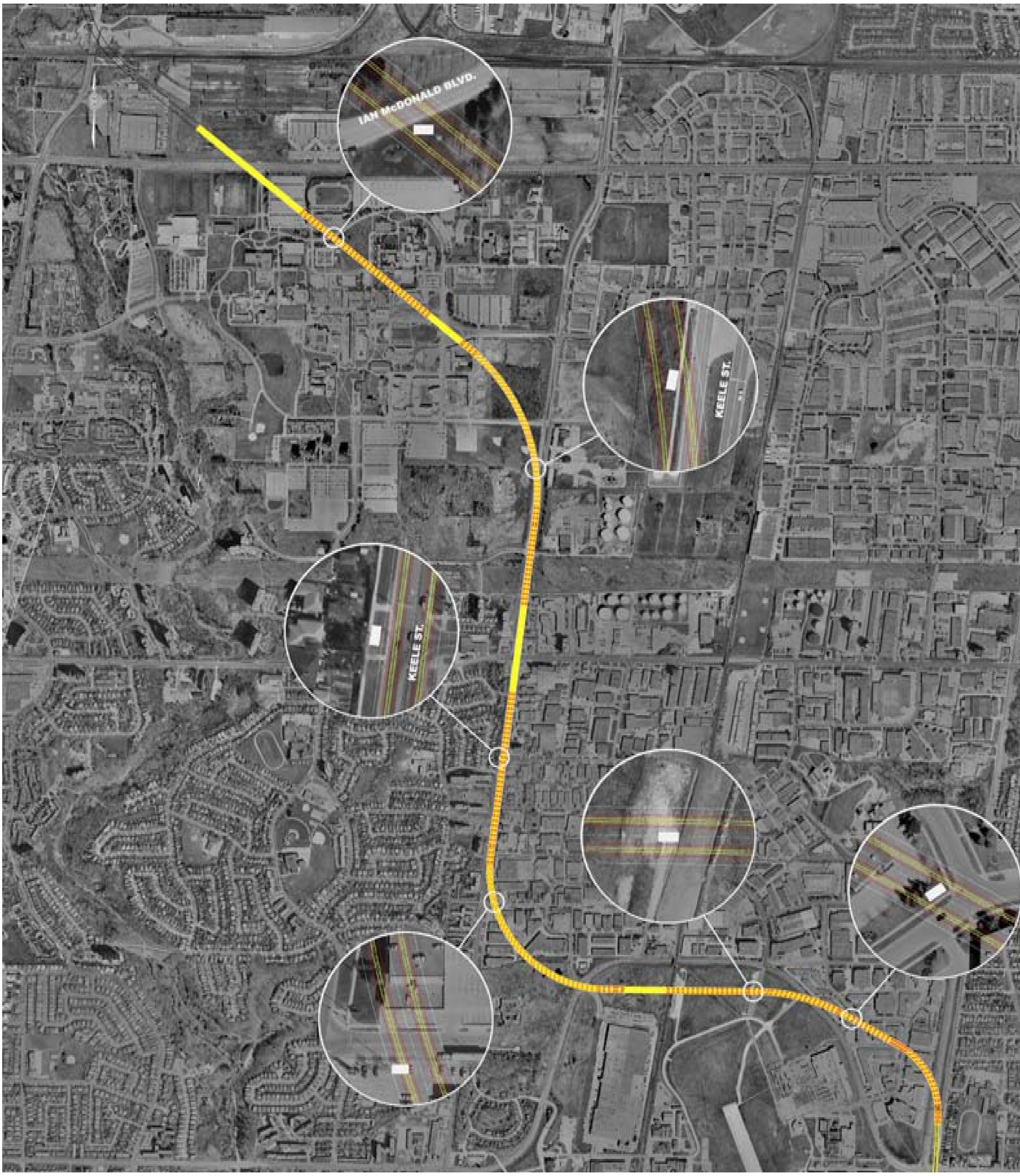


Figure 7-5: Emergency Service Building Locations

7.3. Stations

Each of the four stations along the Spadina Subway Extension has unique features that are described in greater detail below and are illustrated in the associated station drawings. However, there are some elements that are common to all. To further aid in the understanding of these station layouts, Figure 7-6 provides an overview of a typical station.

7.3.1. Overview of Station Elements

The following discusses each of the general components than comprise a station.

Subway Platform

Stations typically have a "centre platform" configuration in which passengers board and alight trains via a single platform between the two tracks. Centre platforms are preferred over side platforms because they allow greater utilization of vertical circulation, convenient cross-platform transfer where required and greater capacity to accommodate surges in traffic flow, especially during service interruptions. Some rooms, such as ancillary rooms, signal rooms and service rooms are provided at the platform level.

Concourse

The concourse level is located directly above the platform and is connected to the platform through stairs, escalators and an elevator. The concourse permits transfers between TTC bus platforms at ground level and subway platforms. These transfers occur within the "fare paid" zone. For passengers entering directly into the station (i.e. have not paid a transit fare), the concourse includes a collector's booth and turnstiles, which serve as the fare collections point. Other rooms, such as staff rooms, electrical rooms, and service rooms are also housed at this level.

Barrier Free Access

All Spadina Subway Extension stations will be designed to achieve accessibility for both passengers and TTC employees. In accordance with TTC's Design Standards, if a person is capable of arriving at the subway station entrances by bus, private car, Wheel-Trans or as a pedestrian, then means will be provided to enable them access to and from the subway trains. TTC's key design principles to achieve barrier-free access are as follows:

1) Stations shall be designed for use by all passengers, and contain certain enhancements to address the needs of persons with disabilities;
2) A wheelchair accessible route shall be provided to an accessible entrance from the Wheel-Trans bay, the passenger pick-up and drop-off zone, the designated spaces at commuter parking lots and any new entrances from a development;
3) Where practical, barrier free entrances should be combined or minimized; and
4) Potential obstacles (e.g. garbage cans, fare vending machines, landscaping, etc) shall be located such that they do not obstruct passage through the accessible route.

In order to achieve barrier-free access, elevators will be provided at each station. In accordance with the Design Standards, specific requirements for landscaping, entrances, fare control, vertical and horizontal circulation, signage, washrooms and commuter facilities will be incorporated into the stations during design.

Station Entrances

Station entrances provide access / egress for each station associated with walk-in traffic. In some instances, these entrances can be combined with other functions (e.g. Passenger Pick-up / Drop-off). In the following descriptions of the recommended stations, three types of station entrances are discussed:

1) **Main Entrance** – The main entrance to any station will be equipped with stairs, escalators and an elevator in order to accommodate both higher pedestrian volumes, as well as barrier free access. The station entrance will be enclosed. Main entrances may be staffed by a TTC employee but the more common practise is to locate the collector's booth at the concourse level.
2) **Secondary Entrance** – Secondary entrances typically comprise a set of stairs from ground level, which connect down to the concourse level. Secondary entrances may include escalators, which are dependent on the depth of the station and the proximity to the main entrance. Secondary entrances must connect to the "unpaid" fare zone within the concourse level. If this is not possible, then an automatic entrance is required.
3) **Automatic Entrance** – An automatic entrance is an unstaffed station entrance, which is equipped with token vending equipment and high turnstiles to allow passengers to pay their fare before entering the subway station. Automatic entrances may include escalators, which are dependent on the depth of the station and the proximity to the main entrance. Automatic entrances are designed to either include barrier free access or be sized to allow for the addition of barrier free services at a later date.

Bicycle Facilities

Facilities for cyclists (i.e. bicycle lock-ups) are to be provided at each station. The final location and configuration will be determined during design.

Taxi Facilities

Designated taxi stands shall be provided at all stations, where possible. The final location and configuration of these facilities will be determined during design. As part of current TTC practises, passengers arriving by accessible cabs (i.e. cab service for persons with disabilities) shall load and unload from a designated location within the bus terminal.

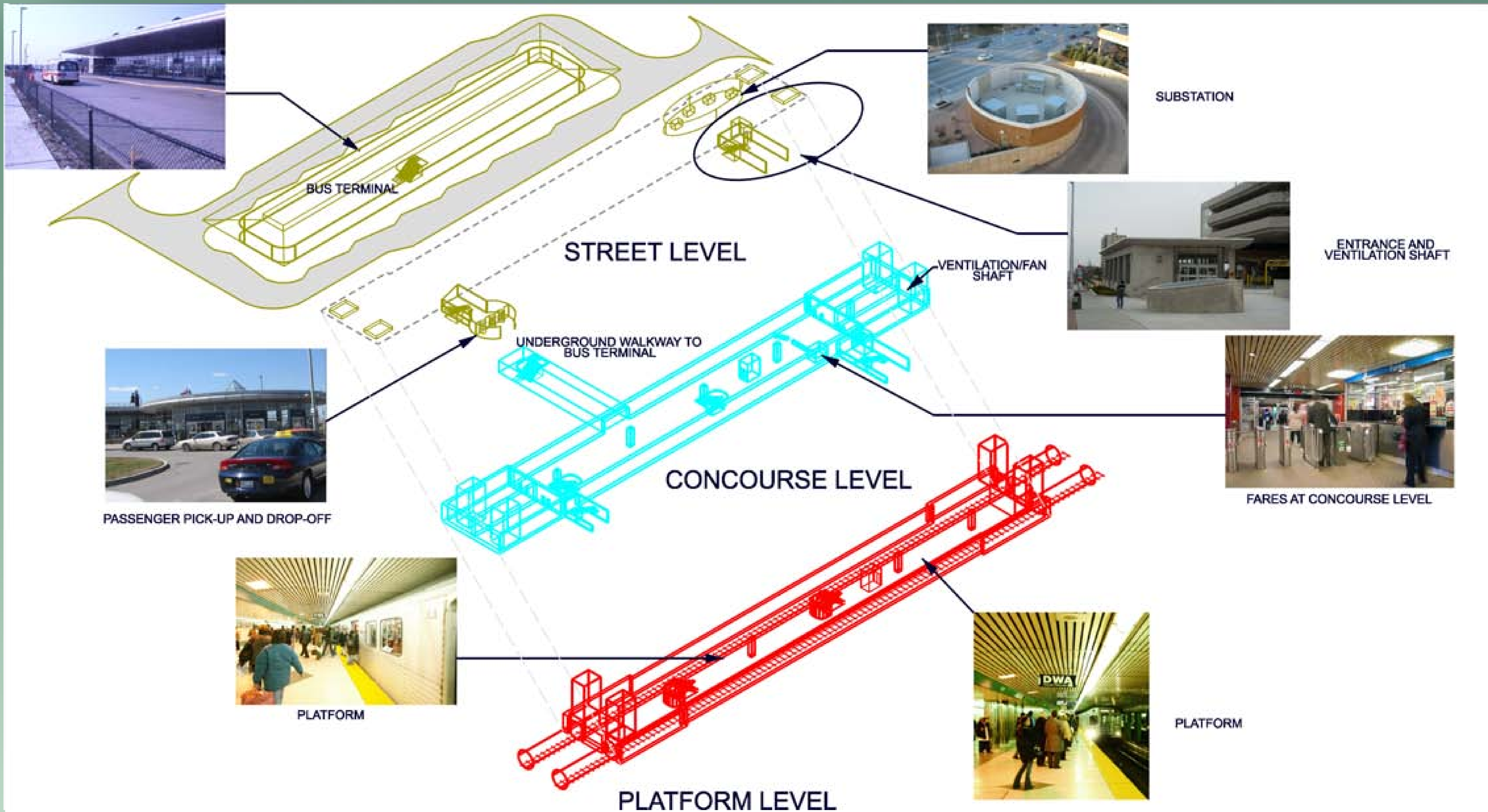


Figure 7-6: Typical Station Layout

Ventilation Shafts

Ventilation shafts are incorporated into the subway station in order to balance air pressure within the tunnels and stations and to provide for emergency exhaust and fresh air supply in case of an underground fire. Ventilation fans can also be used to alleviate high summer temperatures in the underground stations.

The ventilation shafts will be equipped with high capacity emergency fan systems to remove smoke in the event of a fire in the station or on a train.

Bus Facilities

Passenger transfers between buses and the subway represent the largest volume of passenger movement at a station. Off street bus facilities (bus terminals) are provided where the subway intercepts more than one bus route. Since bus terminals are the link between bus service and subway service, bus terminals must be located as close as possible to the subway platform. The island or carousel style platform is the recommended configuration for TTC. The major components of a bus terminal are:

1) A central island or platform that provides both indoor waiting areas as well as an outdoor platform. A canopy provides weather protection for passengers that are waiting as well as boarding / alighting buses.
2) Bus bays, which are sized to accommodate either a regular or an articulated bus.
3) Bus driveway circulation, which facilitates bus movements around the platform and bus bays. For TTC, bus circulation is always one-way (clockwise) around the platform.
4) Bus driveway / access road, which connects the terminal to the local road network.

Passenger Pick-up and Drop-Off

Passenger Pick-up and Drop-off (PPUDO) facilities provide short-term parking. PPUDO areas, convenient to station entrances, provide an off-street location for automobile drivers to pick up or drop off passengers.

Commuter Parking

Commuter parking facilities provide commuters the opportunity to transfer from the private automobile to transit. Commuter parking is provided at terminal stations for rapid transit lines. Commuter parking at line stations is dependent on the particular location of each station and the compatibility with adjacent land uses.

7.3.2. Sheppard West Station Concept

Sheppard West Station will provide access to the subway for the adjacent Keele Industrial Area to the north of Sheppard Avenue as well as to Parc Downsview Park. This station will also provide an interchange with the GO Bradford Rail line. The final location and configuration for the GO Rail Station will be subject to a separate study by GO Transit.

Station entrances

Sheppard West Station will have two entrances.

The main entrance is proposed at the west end, which will facilitate walk-in activity from Sheppard Avenue and existing and future development in the area, via sidewalks along future roads.

A secondary entrance will be provided at the east end of the station, which will connect to the GO Station. The final configuration of this entrance will be coordinated with GO Transit's separate planning initiative in support for the new GO station.

Integration Opportunities with Transit Supportive Development

The station is located entirely within Parc Downsview Park lands and may be integrated into new transit-supportive development that is proposed for the Downsview lands. The final station configuration is subject to refinement as both the subway and the Parc Downsview Park redevelopment plans proceed into design.

In light of the proposed subway, Parc Downsview Park has commenced a planning initiative to explore development opportunities and enhancement to the urban recreational green space already under development to the south of the proposed station location.

The recommended location for Sheppard West Station is shown schematically on Figure 7-7 and in greater detail on Drawing Numbers 0317-A-1 to 0317-A-3. The network of streets that are illustrated in the aforementioned figures and drawings are schematic only and will be developed through PDP's ongoing planning initiative. The integration of Sheppard West Station and the surrounding development may require refinements to the current station concept. These refinements are expected to be minor in nature and will be confirmed during the design phase.

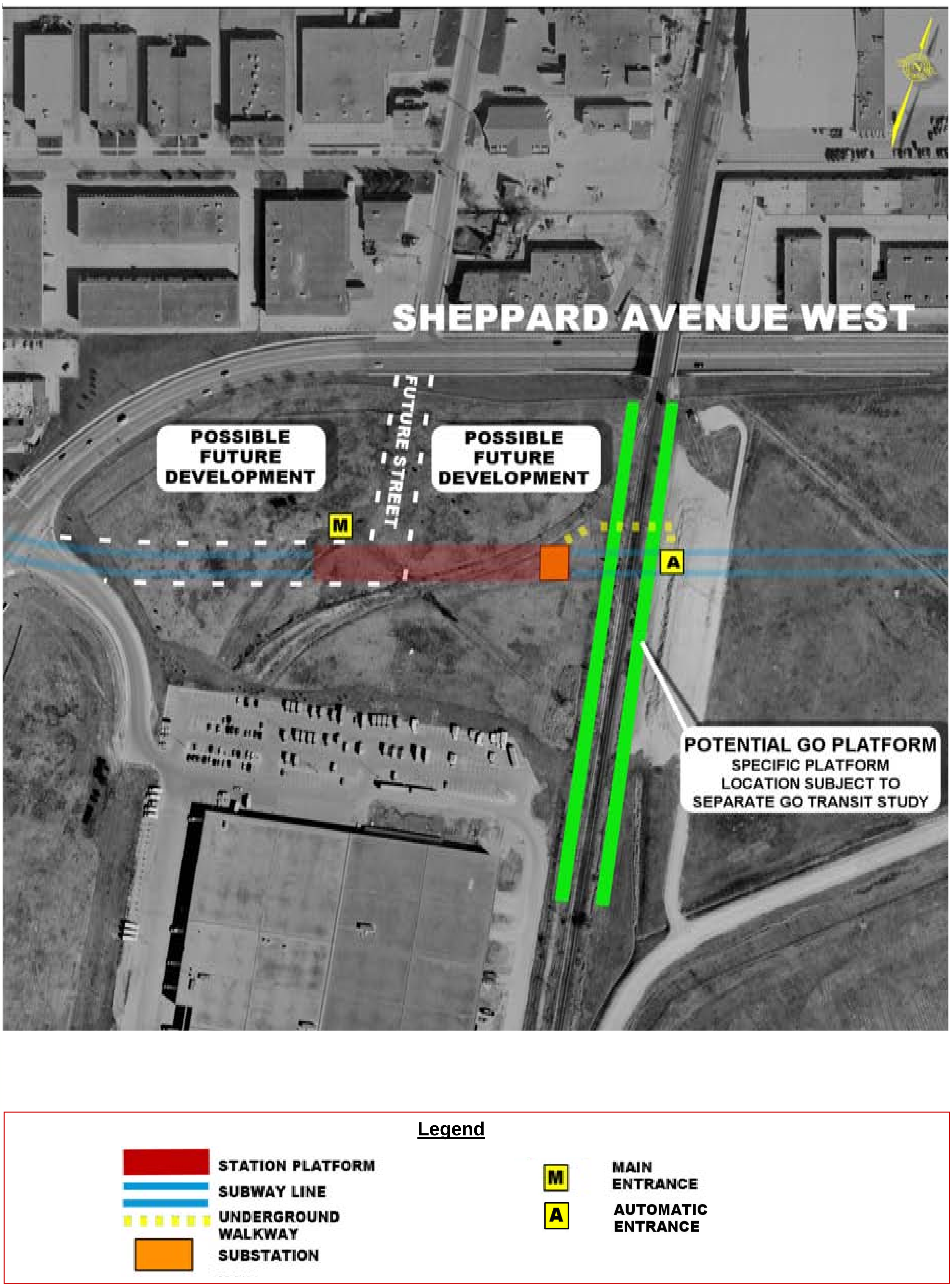


Figure 7-7: Sheppard West Station

7.3.3. Finch West Station Concept

The majority of the passengers for Finch West Station will be resulting from transfers from the 107-Chesswood, 36-Finch West and the 41-Keele bus routes. Walk-in opportunities from the existing high-density residential community (northwest of the Keele/Finch intersection) are also expected to generate substantial daily ridership. The commuter parking and passenger pick-up / drop-off (PPUDO) will serve a local function and will contribute a modest amount of additional ridership that will be concentrated during the morning and afternoon peak periods.

Station entrances

The greatest potential for pedestrian traffic will originate from the existing medium/high density development in the northwest quadrant of the Keele Street / Finch Avenue intersection. Therefore, the main entrance will be placed on the northwest corner of Finch Avenue and Keele Street.

The recommended design also includes a secondary entrance on the south side of Finch Avenue to capture ridership from the Keele Industrial Area and residential area west of Keele Street, south of Finch Avenue.

A third (automatic) entrance at Four Winds Drive is proposed to provide a convenient connection to the PPUDO. This entrance will also serve the potential future transit supportive development on the southeast corner of the York University lands.

Bus Terminal

The north end of the concourse level connects to the bus platform via a short underground passageway to the bus terminal. Feeder bus routes for this station will utilize Finch Avenue as a major east-west corridor and Keele Street as a major north-south corridor. A ten-bay bus terminal is proposed, based on the following minimum requirements (Table 7-2):

Table 7-2: Finch West Bus Terminal Bay Requirements

Route	AM Headway		Bus Bays Required
	Existing	2021	
41 Keele	6 min	6 min	2
107 Chesswood	N/A	15 min	1
36 Finch West (including all branches)	2 min 40 s	2 min	5
Wheel-Trans / Unloading Bay			1
TOTAL[8]			**9**

To protect for future changes in TTC's bus fleet, some of the bus bays have been increased in size to allow for articulated buses (five in total). Furthermore, bus routes and service frequencies are subject to change in accordance with changes in demand / ridership patterns.

The primary point of bus access/egress for the station will be either from Tangiers Road or from a new transit priority signal on Keele Street immediately opposite Four Winds Drive. To facilitate bus movements, a new east-west transit-only road is proposed opposite Four Winds Drive. This bus road will commence at a transit-only signal on Keele Street, and extend eastward to Tangiers Road. A partially signalized intersection or a second right-in/right-out driveway will be provided at the south end of the bus terminal (on Keele Street).

Passenger Pick Up and Drop Off (PPUDO)

As part of this station, a 10 space PPUDO will be provided. The size has been estimated based on preliminary travel demand projections. A location on the west side of Keele Street will utilize Four Winds Drive, Columbia Gate Boulevard and Murray Ross Parkway to facilitate vehicular access and egress.

Passengers from the PPUDO will access the station via the automatic entrance on the west side of Keele Street.

Commuter Parking

The majority of the ridership at this station is forecast to arrive from walk in and bus transfers. Commuter parking has been provided given the availability of Hydro Corridor lands that cannot be used for redevelopment. A provision of approximately 400 spaces has been identified for commuter parking. In order to minimize the impacts to the residential community on the west side of Keele Street, the commuter parking will be located in the Hydro corridor, to the east of Keele Street.

Recognizing the small amount of parking and thus the limited number of passengers generated by the parking, a separate entrance for the commuter facility is not warranted. Therefore, to enter the station, commuters will cross at the Four Winds Drive intersection, which will be signalized and access the station via the automatic entrance. A barrier free path will be provided by crossing Keele Street at the signalised Four Winds Drive intersection and accessing the station via the main entrance.

Supporting Road Network Improvements

As stated previously, a northern extension of Tangiers Road and an eastern extension of Murray Ross Parkway are considered part of the Undertaking. Both of these roads are listed as planned roads in the North York Official Plan (in force) and the new City of Toronto Official Plan.

New signals on Keele Street opposite Four Winds Drive will facilitate transit priority out of the bus terminal as well as pedestrian connections across Keele Street.

A preliminary traffic impact study in support of the recommended Finch West Station concept has been prepared and is contained in Appendix N. Additional traffic analysis will be undertaken as part of the design phase.

[8] Station layout illustrates 10 bays since two sided island configuration will result in an even number of bays.

Integration Opportunities with Transit Supportive Development

The City's Keele Street Study explored opportunities to redevelop the lands surrounding the Keele / Finch intersection. With the introduction of subway, the City is committed to review zoning in the area in order to encourage intensification and rejuvenation of this area.

In addition, currently undeveloped lands on the southeast part of York University's property could develop with higher density, transit-supportive development. This potential opportunity will be addressed as part of York University and the City of Toronto's initiative to update the current York University Secondary Plan.

The recommended Finch West Station concept is shown schematically in Figure 7-8 and in greater detail on Drawing Numbers 0317-A-4 to 0317-A-6.

7.3.4. York University Station Concept

York University Station will serve walk-in passengers from the York University campus and surrounding area. The recommended station is located at the east end of the Common, which is the current transit hub and central focus point for the University.

An off-street bus terminal, PPUDO and commuter parking are not proposed for this station. This was an important change from the approved 1994 EA in response to the development of a new interregional transit terminal at Steeles Avenue, which is within walking distance from the northwest part of the York University Campus and the desire by York University to ultimately create a pedestrian only zone within the campus core. Local Bus service will continue to circulate through the campus to provide local service.

Station Entrances

The station entrances for York University may be incorporated into existing buildings. The three buildings that may be connected to the Subway are the Schulich School of Business, Accolade East at the southeast end of the subway platform, and York Lanes at the northwest end of the platform.

The final configuration and placement of the entrances will be coordinated with York University during the design phase.

Integration Opportunities with Transit Supportive Development

In the immediate vicinity of the station, York University has identified a short-term expansion plan for York Lanes. However, in response to the proposed subway extension, York University and the City of Toronto are working collaboratively to update the current York University Secondary Plan to permit the addition of more transit-supportive development on the lands surrounding York University and Steeles West Station.

The recommended York University Station concept is shown schematically in Figure 7-9 and in greater detail on Drawing Numbers 0317-A-7 to 0317-A-9.

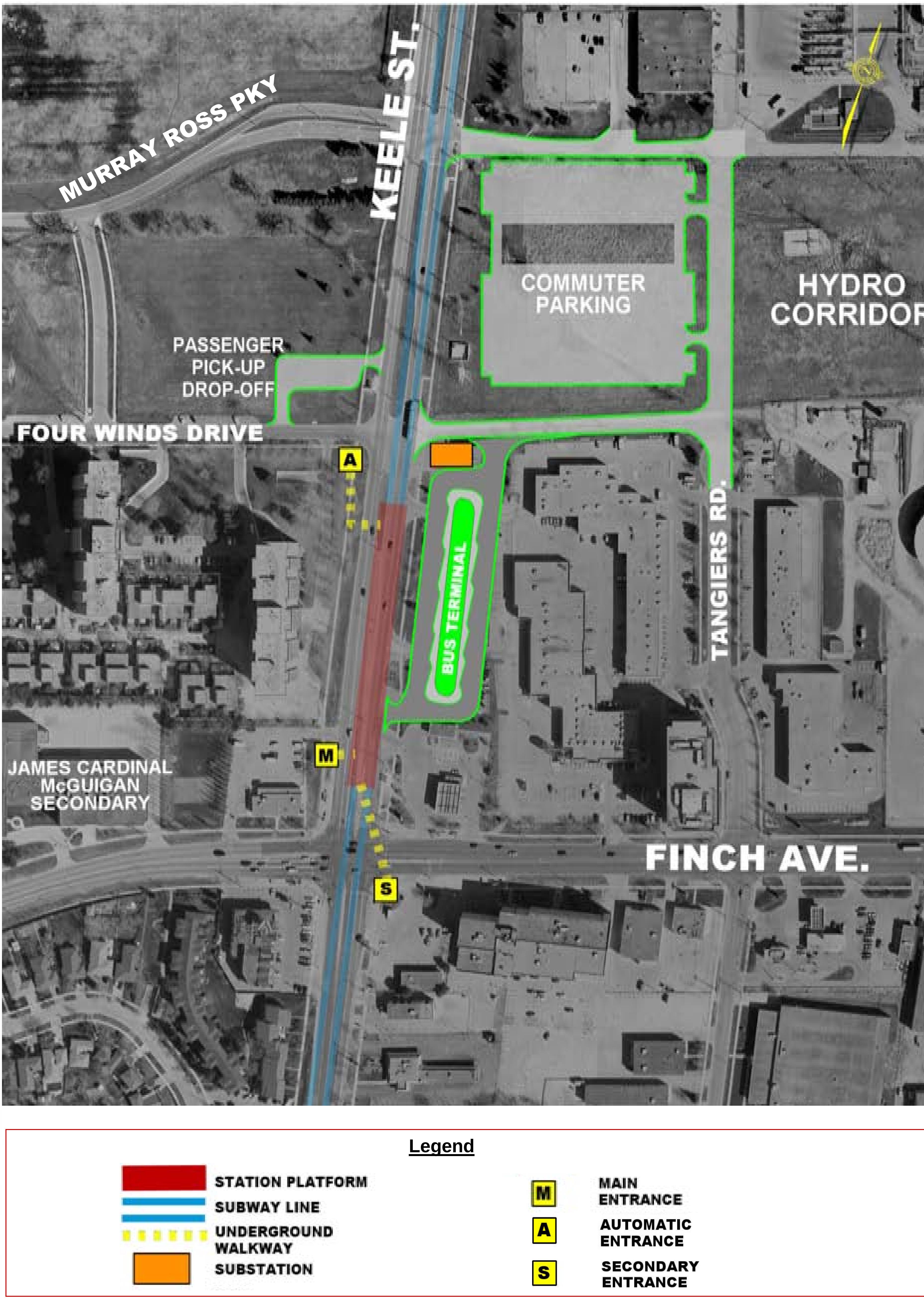


Figure 7-8: Finch West Station

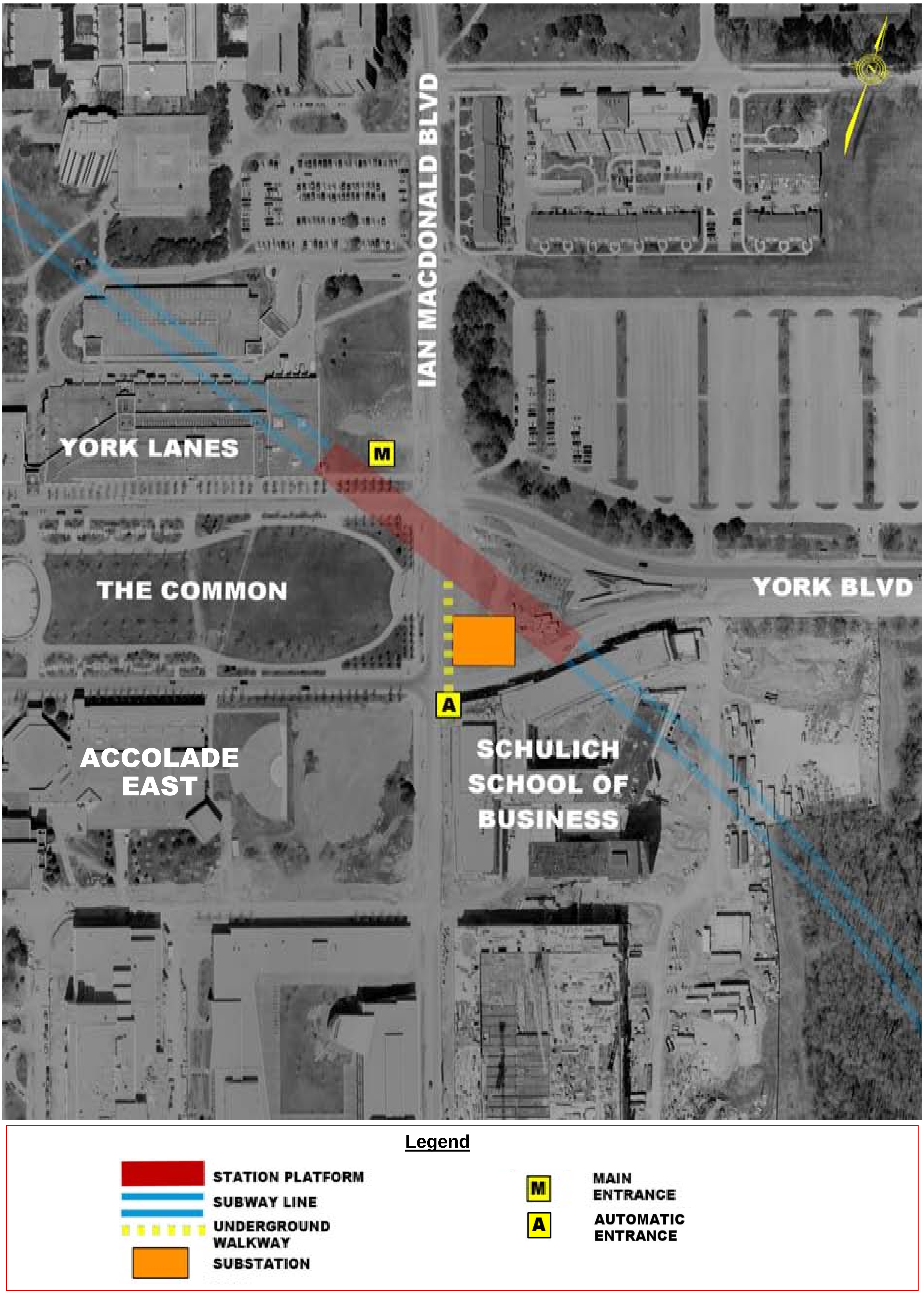


Figure 7-9: York University Station

7.3.5. Steeles West Station Concept

Steeles West Station will accommodate transfers between the feeder bus network, commuters (either from the commuter parking lots or from the PPUDO) and walk-in activity from the University as well as future transit supportive development in the area.

Station Entrances

The main entrance is proposed on the southeast quadrant of the Northwest Gate / Steeles Avenue intersection. This main entrance will provide access to existing local destinations including:

1) The northwest part of the York University campus (250 m or a 3.5 minute walk[9] to the Tait Mackenzie Centre);
2) The Toronto Track and Field Centre (400 m away or a 6 minute walk);
3) The Rexall Tennis Centre (600 m away or a 8 minute walk); and
4) Black Creek Pioneer Village (700 m away or a 10 minute walk).

Secondary entrances will be provided on the northwest corner of Steeles Avenue West and Northwest Gate. An automatic entrance will be provided in the Hydro Corridor to connect the PPUDO and commuter parking to the station.

Bus Terminal

The three major transit operators in the area, namely, TTC, GO Transit and YRT/VIVA have identified the following terminal needs (see Table 7-3). Although not specifically requested, Brampton Transit may also require space at this terminal (to be confirmed during the design phase). For the purposes of assessing impact, it is assumed that GO Transit and York Region Transit would occupy the north bus terminals and TTC would occupy the south terminals. The final assignment of terminal locations will be subject to future fare integration initiatives and service planning needs of the service providers at this station.

The south bus terminal has been set back from Steeles Avenue in order to:

1) Improve bus access, queuing storage and transit-priority signal placement on Steeles Avenue
2) Reduce transfer times between the bus terminal and the subway
3) Preserve Steeles Avenue frontage for future transit supportive development opportunities

For the northern two bus terminals, two island platforms have been proposed and are situated in the block bound by the East-West Street and Streets B and C as defined in the City of Vaughan draft OPA 620. Recognizing the high volume of bus activity for these two terminals, several bus driveways are proposed. The two bus terminals can be positioned within the proposed development block such that the Steeles Avenue frontage is preserved for transit-supportive development.

[9] Based on average walk speed of 1.2 m/s

Table 7-3: Steeles West Bus Terminal Bay Requirements

Route	AM Headway Existing	AM Headway 2021	Bus Bays Required
GO Transit			
Route 33 - Guelph/Georgetown	35'00"	20'00"	
Route 35 - Brampton/Bramalea	60'00"	10'00"	
Route 36 - Brampton/Bramalea	10'00"	10'00"	
Route 42 - Bolton	55'00"	30'00"	
Route 66 - Newmarket	15'00"	20'00"	
Route 68 - Bradford	15'00"	20'00"	
Route 44 - Mount Joy	25'00"	10'00"	
Route 46 - Oakville	25'00"	15'00"	
Route 47 - Hamilton	25'00"	15'00"	
Route 48 - Meadowvale	35'00"	15'00"	
Route 49 - Pickering	30'00"	10'00"	
Route 49 - Scarborough	30'00"	7'30"	
Route 52 – Oshawa	40'00"	15'00"	
Route 53 - Streetsville	10'00"	7'30"	
Route 55 - Bramalea	20'00"	10'00"	
Route 65 - Barrie		20'00"	10
Unloading Bays			2
TTC			
35 Jane	3'40"	3'40'"	2
41 Keele	6'00"	6'00"	1
107 Chesswood	N/A	15'00"	1
108 Driftwood	7'15"	7'15"	1
106 Sentinel	10'00"	10'00"	1
60 Steeles West	6'20"	6'00"	3
84 Sheppard West	21'00"	21'00"	1
Wheel-Trans (share with unloading bays)			0
Unloading Bays			2
YRT			
YRT Route 3	10'00"	10'00"	2
YRT Route 20	30'00"	15'00"	1
Proposed YRT Route 360 (Maple Express)	40'00"	20'00"	1
Proposed YRT Replacement Route for Jane 35D	6'00"	5'00"	2
Proposed YRT Replacement Route for TTC 107 (Keele North)	8'15"	5'00"	2
VIVA	5'00"	3'00"	4
Unloading Bays			1
Total Loading Bays (including 7 articulated bays – 5 for TTC and 2 for VIVA)			**32**
Unloading Bays			**5**
Does not include layover bays which are in addition to the above		**TOTAL**	**37**

Passenger Pick Up and Drop Off (PPUDO)

As part of this station, a 40 to 45 space PPUDO will be provided in the Hydro Corridor. The size has been estimated based on preliminary travel demand projections. A location in the northwest quadrant of the future East-West Street / Street C intersection will utilize a northern extension of Street C for vehicular access / egress.

Passengers from the PPUDO will access the station from an automatic entrance that will be immediately adjacent to the proposed facility.

Commuter Parking

As per all terminal subway stations, the provision of commuter parking is a requirement. Recognizing that Steeles West Station will be the terminus of the Subway approximately 2,500 parking spaces will be provided. Given the size of this commuter facility and resulting vehicular demand, a minimum of three driveway entrances are proposed for this facility; one at the west end of the lot, connecting to the East – West Street and two from the northern extension of Street C (north of the PPUDO).

A secondary entrance that serves both the PPUDO and the commuter parking will serve as the barrier free path. This station entrance is proposed within the Hydro corridor, north of the proposed east-west road and is subject to subsequent technical reviews by Hydro One Networks Inc. during the design phase.

Supporting Road Network Improvements

Steeles West Station integrates the proposed 5-lane East-West Street A along the south limit of the Hydro corridor, the proposed northerly extension of Northwest Gate (referred to as Street 'C') and the proposed widening of Jane Street, from 4 to 6 lanes into the overall transportation infrastructure required to support the proposed terminal station. Approvals for the new roads will be secured as part of the Highway 7 Corridor and Vaughan North-South Link Public Transit Improvements EA, while the widening of Jane Street will be the subject of a future Municipal Class EA, in accordance with the Region's approved Transportation Master Plan.

In addition, a bus terminal driveway will connect the southern bus terminal to Steeles Avenue West, with a transit priority signal on Steeles Avenue. Similarly, the northern bus terminals will be connected to the proposed east-west collector and Steeles Avenue, via a new north-south road (referred to as Street 'B'). All road improvements not already addressed as part of another approval process are considered part of the Undertaking.

A preliminary traffic impact study in support of the recommended Steeles West Station concept has been prepared and is contained in Appendix N. Additional analysis will be undertaken as part of the design phase.

Integration Opportunities with Transit Supportive Development

The bus terminal facilities shown represent the anticipated spatial requirements for intermodal transfers at Steeles West Station. This inter-regional node presents an excellent opportunity to maximize the benefits of government policies promoting compatible transit infrastructure and land use. City of Toronto, City of Vaughan, York Region, TTC, GO Transit and York University will work closely during the York University Secondary Plan Update, the City of Vaughan Official Plan Amendment 620, and the Steeles West Station Site plan approval process to optimize the interface and integration of the Steeles West Station bus terminals with transit supportive development.

In response to requests by York Region, the City of Vaughan, York University and the City of Toronto, the bus terminals have been set back approximately 50 metres from Steeles Avenue in order to preserve this frontage for transit-supportive development. TTC has included this request in Steeles West Station as it also provides sufficient queuing and storage capacity at each of the bus driveways. A 50 metre setback was identified as a reasonable development parcel depth. Greater setbacks were not considered as the increased setback results in an overall increase in distance between the bus terminal and subway, which would increase overall travel time and decrease passenger convenience.

In response to the proposed subway extension, York University and the City of Toronto are working collaboratively to update the current York University Secondary Plan to permit the addition of more transit-supportive development on the lands surrounding York University and Steeles West Station.

Similarly, the City of Vaughan proposes to finalize OPA 620 and will include increased densities around Steeles West Station.

The recommended Steeles West Station concept is shown schematically in Figure 7-10 and in greater detail on Drawing Numbers 0317-A-10 to 0317-A-13.

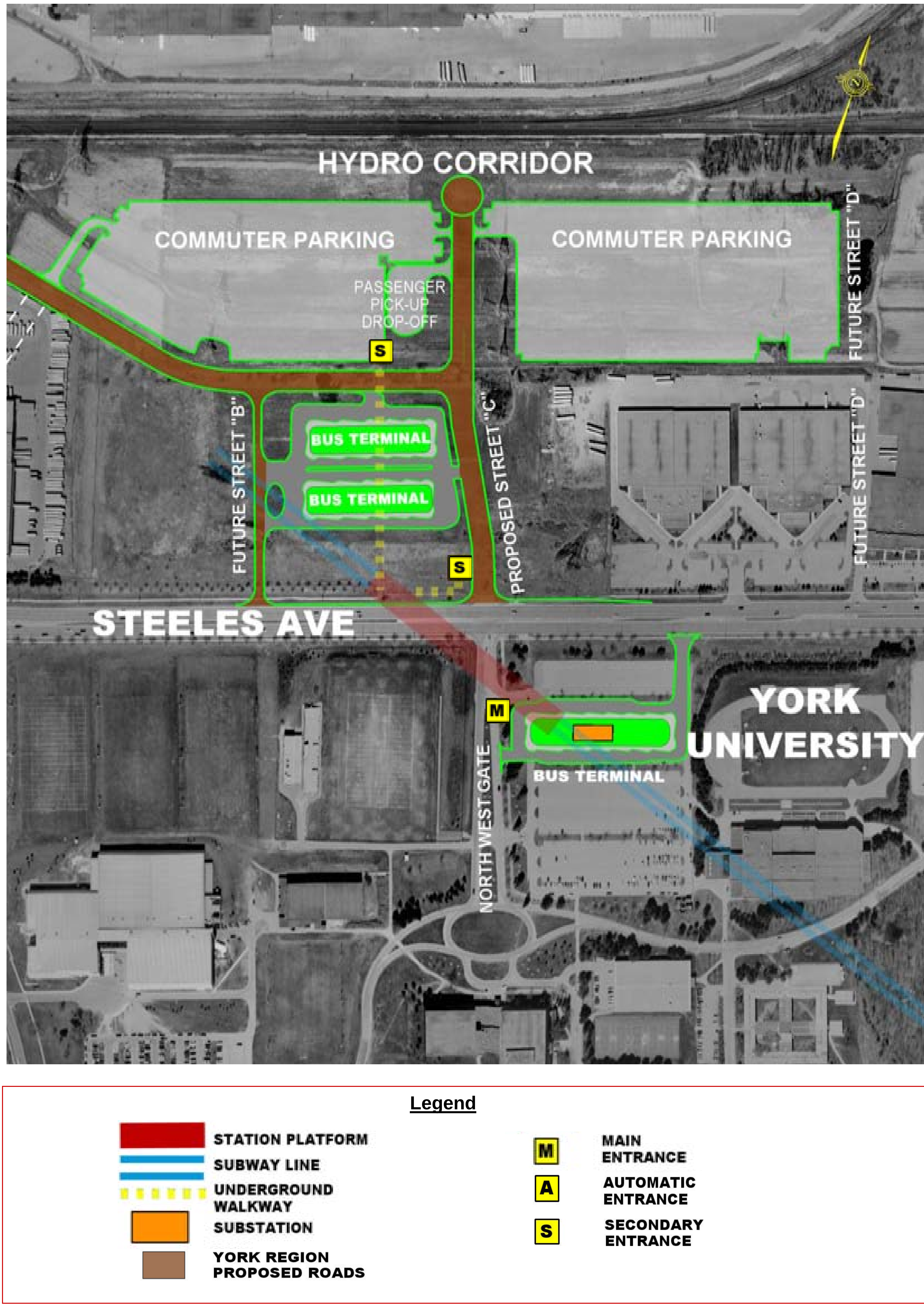


Figure 7-10: Steeles West Station

7.4. Implementation

A variety of construction methods were considered as part of this EA. The following is a discussion of the various types of construction to be employed along the 6.2 km subway extension.

7.4.1. Construction Methods Considered but not Carried Forward

At-Grade Construction

Recognizing the construction cost savings associated with constructing subways along the surface, the Study Team explored all Routes in order to determine if this type of construction were possible along some of the planned extension. It was determined during Phases 1 and 2 of this EA that there are no practical corridors which supports the extension of the subway at grade, without significant negative environmental impacts (predominantly socio-economic) and disruption to the existing transportation system (roads, the CN/Bradford GO Line and the Downsview airport flight path).

Therefore, alignments at grade were not carried forward.

Open Cut Construction

Recognizing their undeveloped nature, open cut construction was considered through the northern section of the Parc Downsview Park lands. Open cut construction involves excavating from the ground level to the base of the subway structure. The difference is that once the subway structure is constructed, no backfilling occurs, creating an open “trench”. TTC currently operates several open cut sections of subway (see Figure 7-11).

Figure 7-11: Open Cut section, Yonge Subway, South of Eglinton

Open cut construction was considered as a possible means to reduce capital cost expenditures. However, based on nearby open sections on the Spadina Subway, TTC Operations identified long-term maintenance and system reliability issues in this general vicinity, due to drifting snow. Furthermore, although an open cut configuration does not preclude eventual development above the subway, Parc Downsview Park expressed concern that an open cut configuration would be incompatible with their short and long term plans and requested that TTC not pursue the open cut concept any further.

Based on these arguments, open cut was not carried forward.

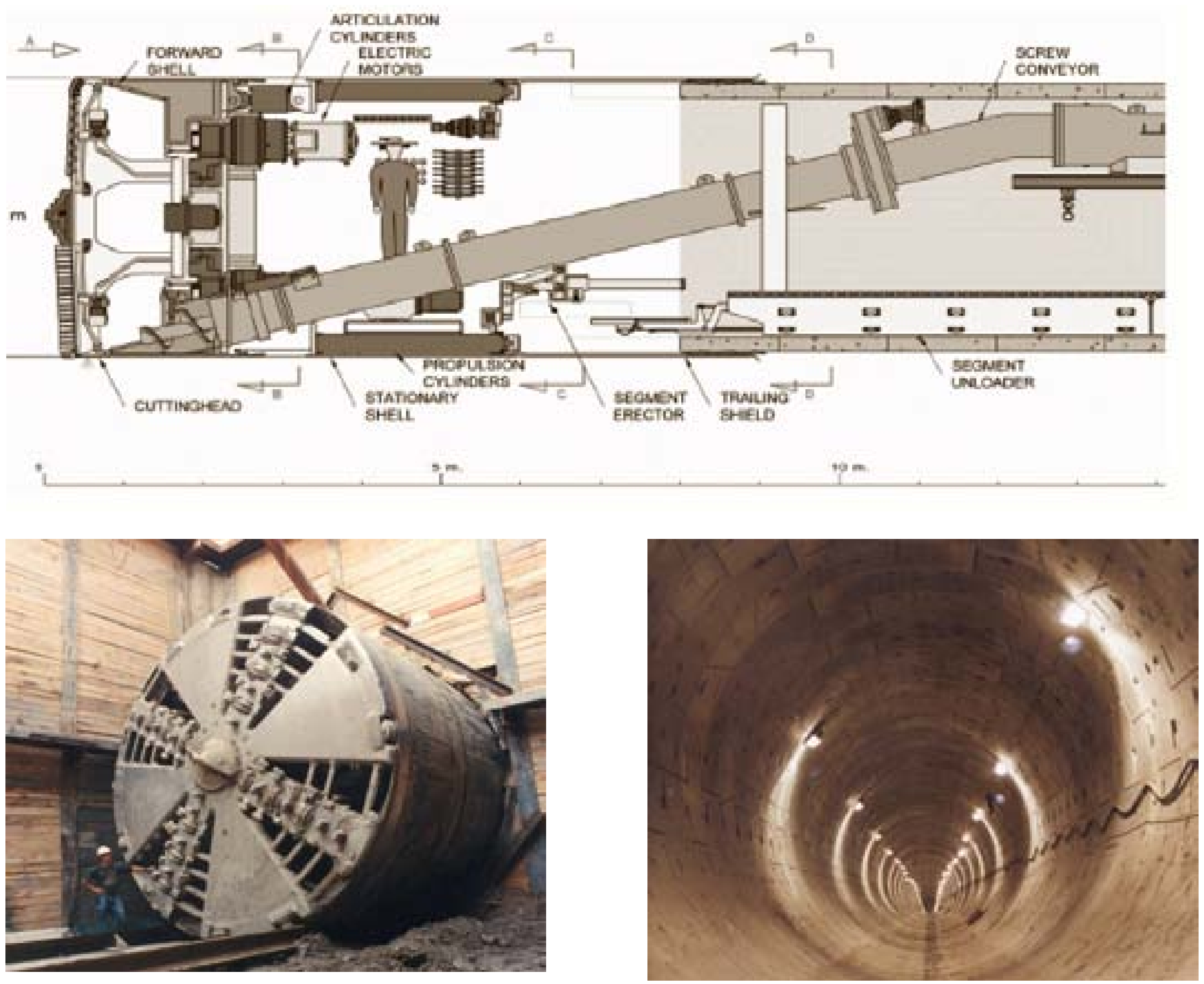
7.4.2. Construction Methods Carried Forward

As illustrated in Figure 7-14 the following construction methods are carried forward for this Undertaking.

Tunnelling

Tunnelling uses a large machine, usually built for the specific project, to excavate a tunnel, handle the excavated material, and place the initial tunnel lining, in a continuous, highly automated process. The front end of the machine consists of a circular cutting face that excavates the soil and pulls it into its round shell.

Figure 7-12: Tunnel Boring Machine Tunnelling



The amount of material excavated using a Tunnel boring machine (TBM) is less than half that required for cut-and-cover construction. Tunnelling also minimizes disruption to traffic and buildings. Tunnelling method is proposed for the running structures from Sheppard West Station to Steeles West Station. Earth Pressure Balance (EPB) tunnelling methodology maintains a constant pressure along the cutting face through the use of a continuous injection of a slurry mixture. Excavated soil and slurry mixture are removed and the soil and slurry are separated to allow the reuse of the slurry. EPB reduces construction related settlement above the tunnel and minimizes the amount of ground water that enters into the construction area. A more detailed discussion of the benefits of EPB are discussed in section 8.0 but EPB will mitigate impacts to:

1) Buildings – Although relatively few in number, the alignment passes under a variety of buildings (see Table 7-4).
2) Major Underground Utilities – There are six oil pipelines in the Finch Hydro corridor and a large watermain along Keele Street (north of Finch).
3) Woodlots – The alignment passes under two woodlots on the York University campus.

Table 7-4: Buildings under which Tunnelling Occurs

11-15 Kodiak Cr
23 Kodiak Cr
40 Kodiak Cr
44 Kodiak Cr
1140 Sheppard Ave W
1150 Sheppard Ave W
1170 Sheppard Ave W
77 Regis Cr
3675 Keele St
3685 Keele St
3695 Keele St
3933 Keele St
York University – Schulich School of Business
York University – York Lanes
York University – York Lanes Parkade
York University – Metropolitan Track and Field Centre
2900 Steeles Ave West (UPS –proposed addition)

Tunnel Boring Machine Launch and Removal

The tunnel boring machine requires both a launch site and a removal site. The machine with its trailing gear for conveyor belts and line assembly may occupy a length of about 70m, and it requires an initial open cut excavation for it to be mobilized. Once tunnelling commences, the contractor will occupy the launch site for soil removal and tunnel liner insertion until the tunnel section is complete.

During this EA, preliminary discussions were held about possible TBM launch and removal sites. For the purposes of determining environmental effects of the Undertaking, the following approach is assumed:

1) Sheppard West Station on the Parc Downsview Park lands would provide sufficient space for launch of the TBM;
2) The bus terminal site for Steeles West Station would also provide sufficient space for launch of the TBM;
3) The Finch West Station cut-and-cover section (such as the cross-over) could be used to remove the TBM machine; and
4) The site at Allen Road / Dufferin Street near Downsview Station would be used to remove the TBM.

Significant research, analysis and design are required to confirm the tunnelling sequence. This work will be conducted during the design phase of the Spadina Subway Extension.

Tunnel Boring Machine Operations and Maintenance

The TBM is typically operated on two shifts per day advancing at a rate of 15 metres a day. Regular maintenance of the TBM will be required. Depending on the type of soil encountered, maintenance may vary across different depths and stages of construction. Stations and EEB's can serve as maintenance shafts, however the final operations and maintenance sequence will be determined during design and construction planning.

Installation of Tunnel Liners and Grouting

The machine has equipment to assemble and place either a steel rib or lagging assembly or a precast concrete tunnel liner ring immediately behind its shell tailpiece as it advances. In soft ground, the machine advances by means of thrusting jacks reacting against the tunnel lining just placed. This structure is assembled immediately after the TBM shield advances and it is placed tightly against the excavated soil surface. Any resulting annular space between the soil surface and the tunnel liner is then backfilled with grout.

Building Underpinning

Building underpinning is used when structural reinforcement may be required for tunnel sections under or adjacent to a specific building. Depending on the depth/type of the foundation and the depth of the tunnel, building underpinning may be required for several properties. In this process, temporary support or reinforcement is provided by the use of drilled or jacked supporting piles so as to protect existing structure. To control ground settlement and distortion, ground freezing and grouting are usually the preferred soil improvement methods. Buildings that will require underpinning will be determined during design. (See Table 7-4 for a listing of buildings along the alignment.

Crossing of CN/Bradford GO Line

In order to construct the Undertaking while preserving freight and passenger rail along the CN/ Bradford GO Line, a variety of construction techniques can be employed, including:

1) Mining is the process of removing soils without surface disruption by replacing the structural integrity of the native soil with an engineered structure. There are a variety of specific methods but in general, mining is ideal for short lengths of tunnel or for tunnels with changing or irregular shapes and profiles. Based on a limited opportunity for track diversion and the need to preserve operations at all times, mining is proposed for the section of the alignment that passes under the CN Newmarket Subdivision right-of-way (used for freight traffic and the GO Transit Bradford commuter rail service).
2) Temporary bridges can be constructed over the subway alignment. Once in place construction occurs underneath the bridge

Significant research and analysis are required to confirm the ultimate construction methodology, which will be finalized in consultation with CN and GO during the design phase.

Cut-and-Cover Construction

Tunnelling is an effective means of creating an underground linear facility, which has a uniform cross section. The geotechnical parameters that allow tunnelling also require separation between tunnels and nearby structures, including other tunnels. This separation is usually the equivalent of at least 1 tunnel diameter (approximately 6 m). For some portions of the subway line, excavation by a TBM is not practical or economical. This includes:

1) **Stations** – The large spans (station platform widths), relatively short lengths and complicated spatial arrangements normally preclude economical tunnelling.
2) **Cross-Overs** – Similar to the three track structure, the cross-overs for Finch West Station and Steeles West Station have special structural configurations and require the placement of special track work.

In these instances cut-and-cover is the preferred method of construction. In addition, where the alignment can be close to the surface and access from the surface during construction results in negligible adverse environmental effects, cut-and-cover can be more economical than tunnelling.

This method has been used to construct subway systems for more than 100 years. The ground surface is opened (cut) a sufficient depth to construct the subway tunnel structure and ancillary facilities. The sides of the excavation are usually supported by vertical temporary walls to minimize the volume of material excavated and to protect adjacent facilities and buildings. The walls require cross-bracing or tiebacks for support. Once the construction excavation is complete, the contractor builds the structure from the bottom to the top of the structure. Once the structure construction is complete, the remaining excavation is backfilled and the surface is reinstated.

The cut-and-cover method results in larger quantities of excavated material and is suitable for shallow cuts (no more than 20 m depth). It also requires few special procedures and can be constructed in an expedited manner.

Recognizing that cut-and-cover can be more disruptive than tunnelling, the environmental impacts and mitigation measures are discussed in greater detail in section 8.0. The following sections provide an overview of this construction methodology.

Within Road Rights of Way

When the excavation occurs within a road or street, existing utilities are often encountered and these must be maintained by temporary support or by relocation. When vehicular traffic must be maintained, temporary decking is placed over the cut using the side walls for support. The top down procedure may be used to minimize the length of time that the surface areas are disturbed. The stages of construction are illustrated and described in Figure 7-13.

Maintaining Services – Utilities

In an urban setting all residents and businesses are serviced by a wide range of utilities. To avoid impacts to these services, cut-and-cover requires special consideration for the maintenance of utilities. To facilitate cut-and-cover construction, utilities can be relocated. This is often completed in advance of the subway construction. Alternatively, the utility can be temporarily suspended through the construction site. The most appropriate method for the utilities that may be affected will be determined during the design phase

7.4.3. Property Acquisition

Approximately 40% of the subway alignment utilizes municipal road allowance. However, significant sections of the alignment cross under private properties. In addition, portions of private holdings will need to be acquired along the proposed alignment to accommodate emergency exit buildings, vent shafts and other associated facilities. The impacts and mitigation measures are described in detail in section 8.0.

7.4.4. Anticipated Duration of Major Construction Activities

As illustrated in Figure 7-15, the anticipated duration of a project of this scope would be approximately 6.5 years, including the following overlapping activities:

1) Design (2 to 3 years);
2) Construction (3 to 4 years); and
3) Testing and commissioning (1 year).

7.4.5. Project Costs

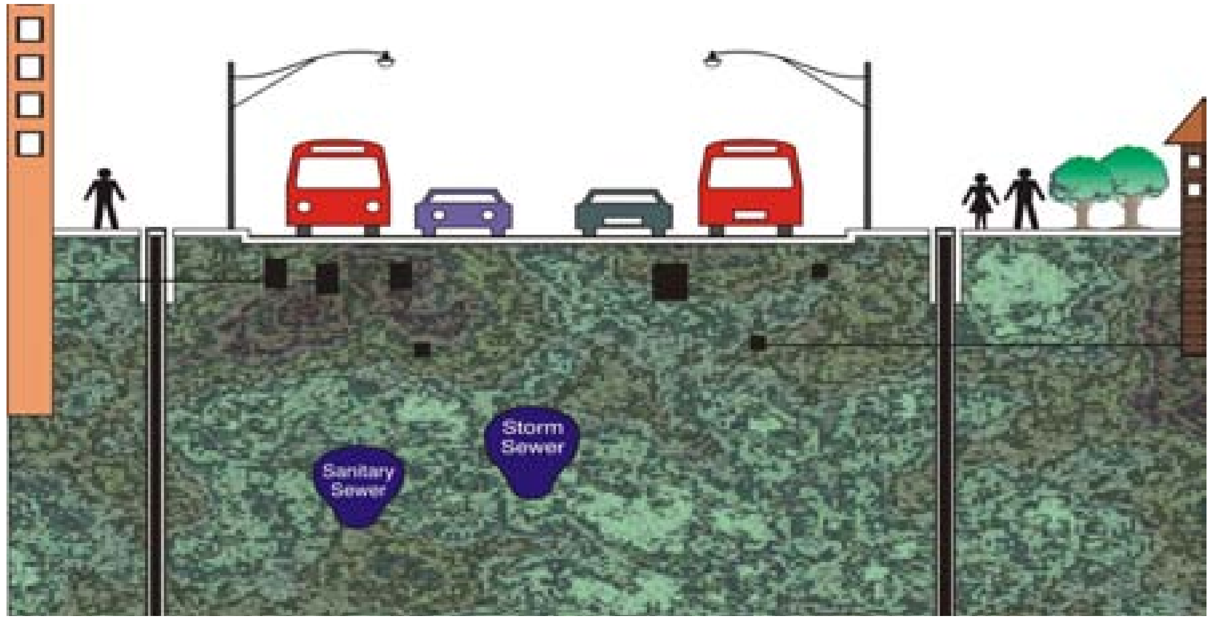
Based on the station concepts and subway alignment as identified on the following Drawings, the entire project cost is estimated at $1.4 billion in 2005 dollars. Table 7-4 provides breakdown of the total costs.

Table 7-5: Summary of cost items

Project Component	Approximate cost
Stations (including entrances, bus terminals and commuter facilities)	$ 482 M
Running Structure (including structures, track, control systems)	$ 665 M
Additional vehicles (estimated 36 subway cars)	$ 108 M
Property	$ 60 M
Improvements to Wilson Yard	$ 85 M
TOTAL	$ 1,400 M

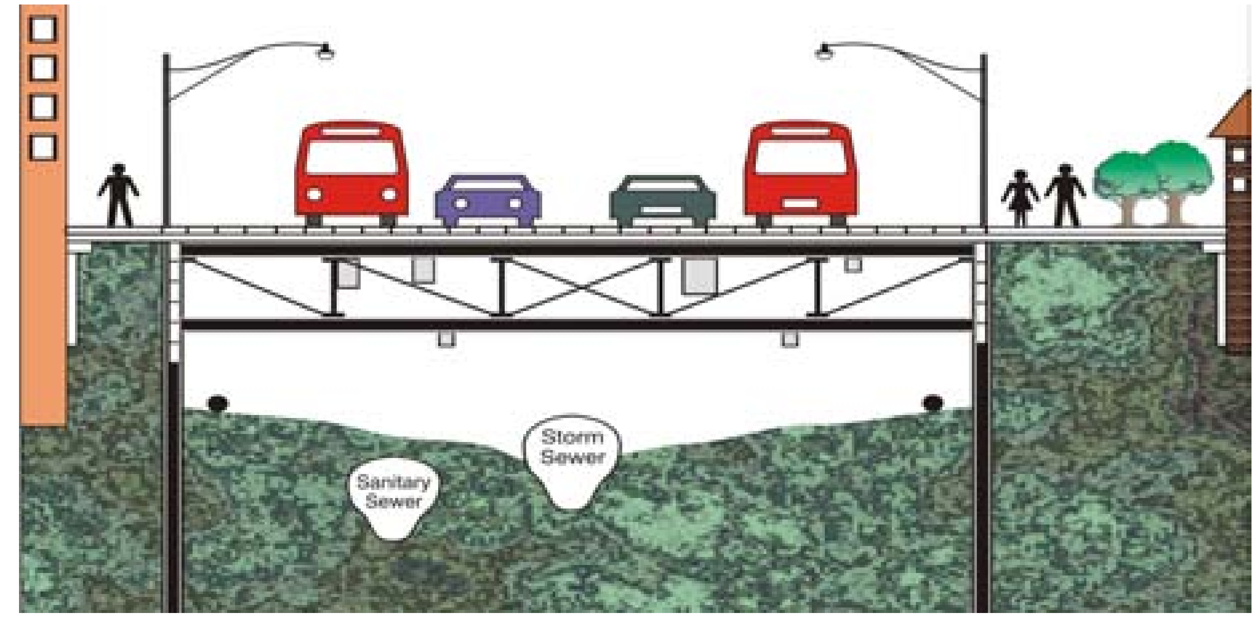
Notes:

1) An order of magnitude cost estimate and is based on 2005 unit prices for materials and labour.
2) Includes engineering and permitting costs as well as an escalation allowance, recognizing that implementation will occur over several years.
3) Property costs are an allowance for all properties identified within this EA.
4) No allowance has been made for temporary construction easement property costs.
5) The EA for improvements to Wilson Yard has been previously approved as part of the “New Subway Storage and Maintenance Facility EA”.



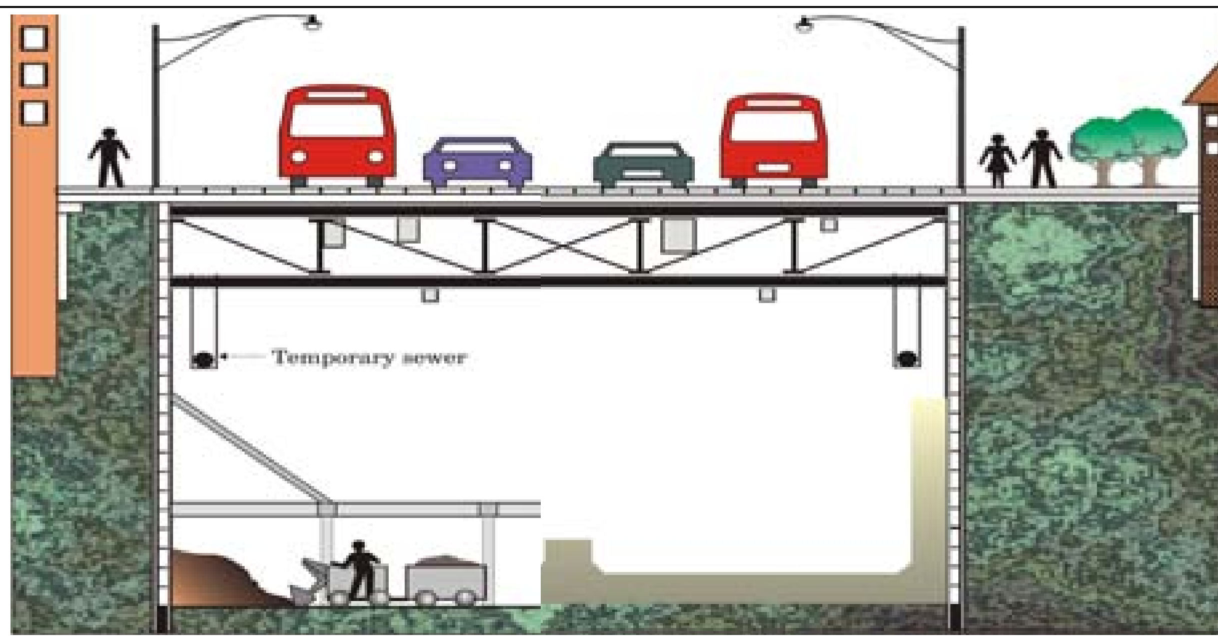
Step 1. Utility Location and Piling

Utilities that are in conflict with the proposed works are relocated to outside the construction limits and then sheet piling is installed.



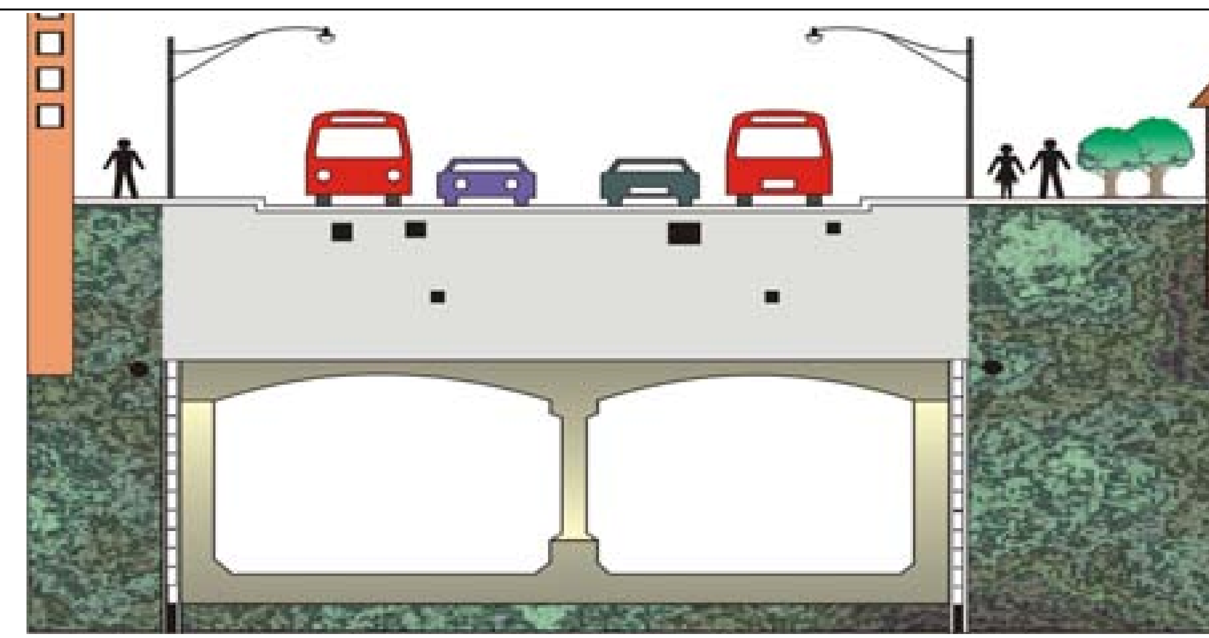
Step 2. Installation of Decking

As soon as sufficient excavation is made, temporary decking, either of wood or steel is installed so surface activities such as roads can be reinstalled. Utilities that were not relocated are suspended from the decking.



Step 3. Excavation and Soil Removal / Construction of New Subway Structure

The excavation and new construction are completed underneath the decking. Surface activities continue to operate on the temporary decking.



Step 4. Removal of Decking / Street Restoration

When the finished construction is close to the surface, the temporary decking is removed and all surface amenities (e.g. roads) are reinstated.

Figure 7-13: “Top Down” Method of Cut and Cover Construction

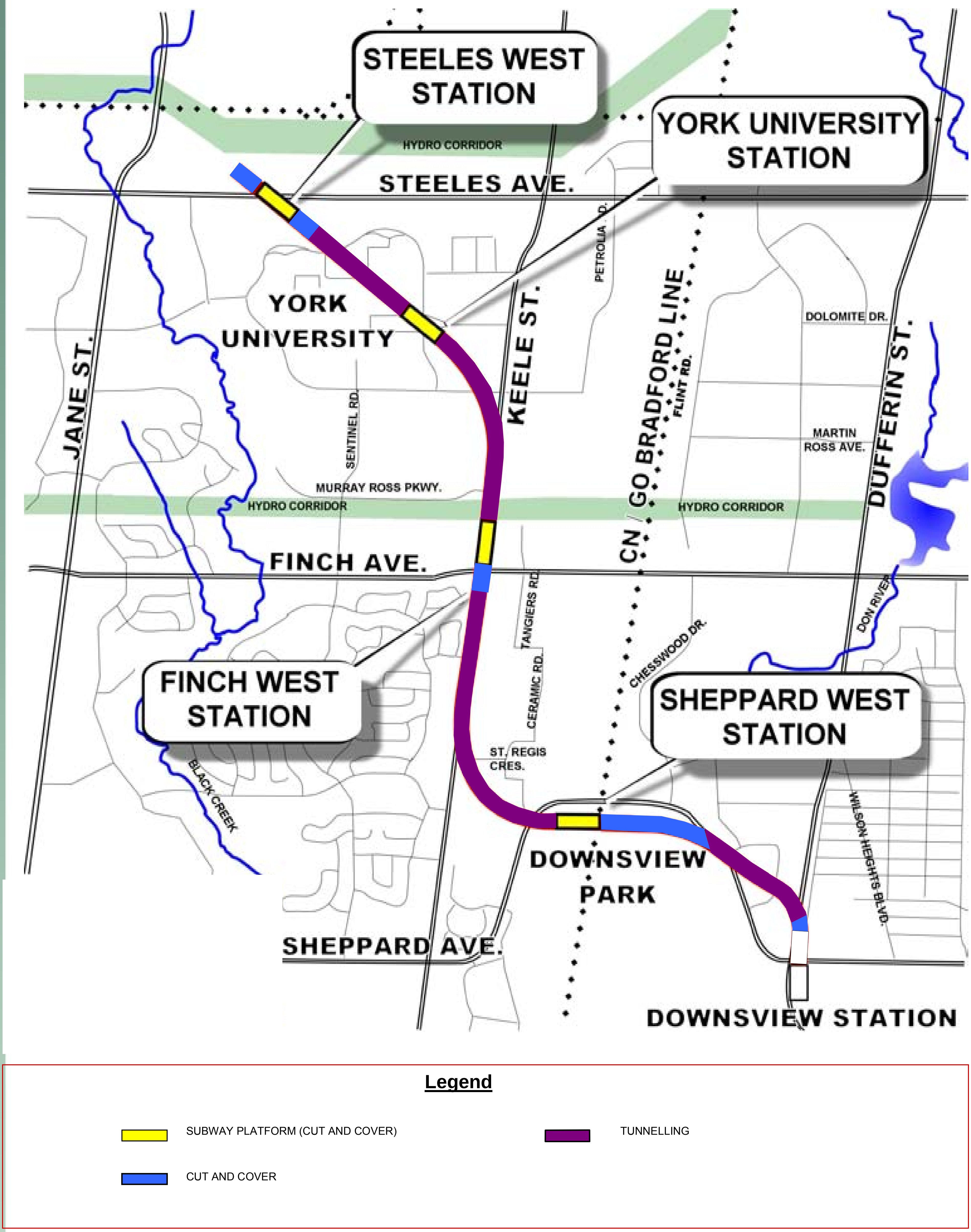


Figure 7-14: Subway Construction Methodology

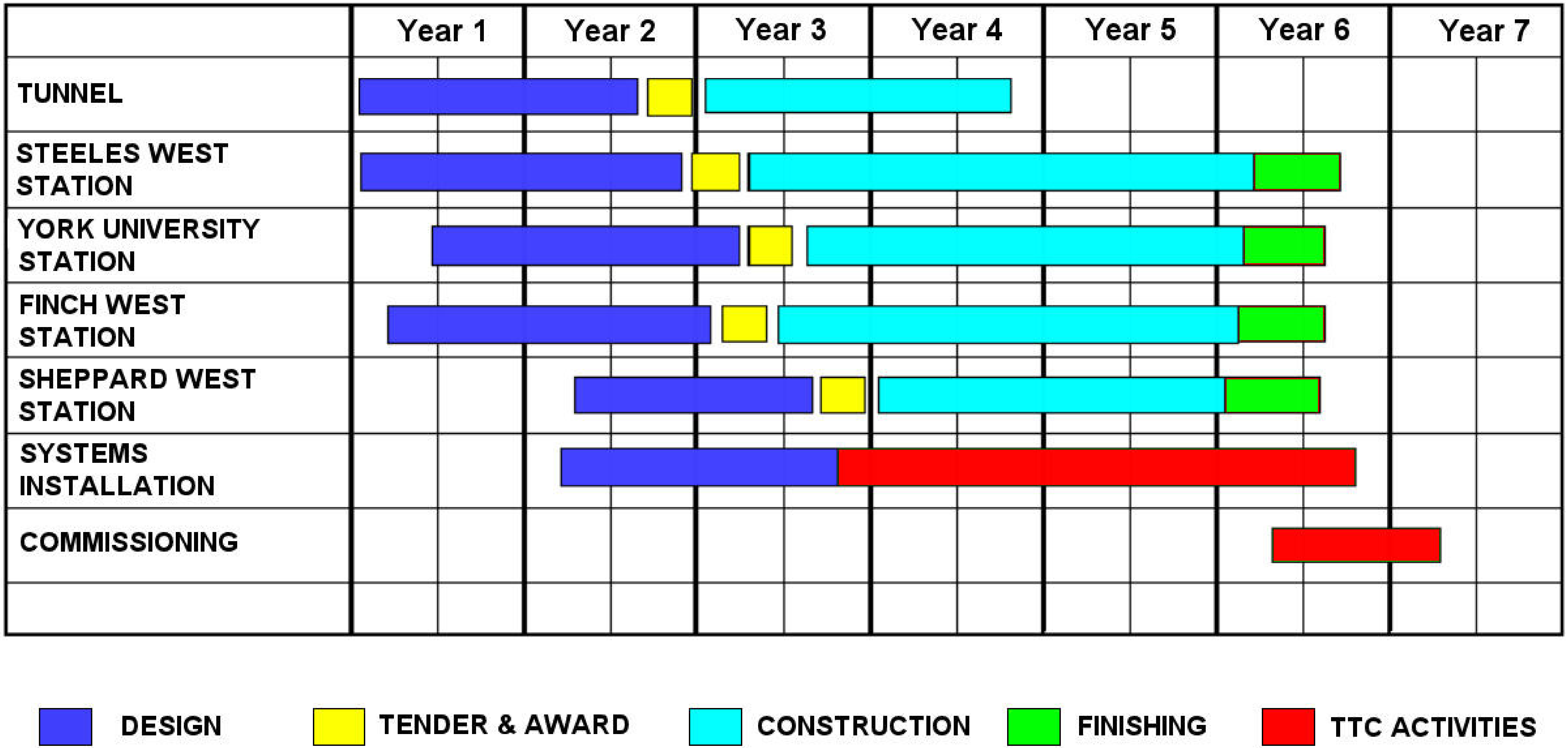
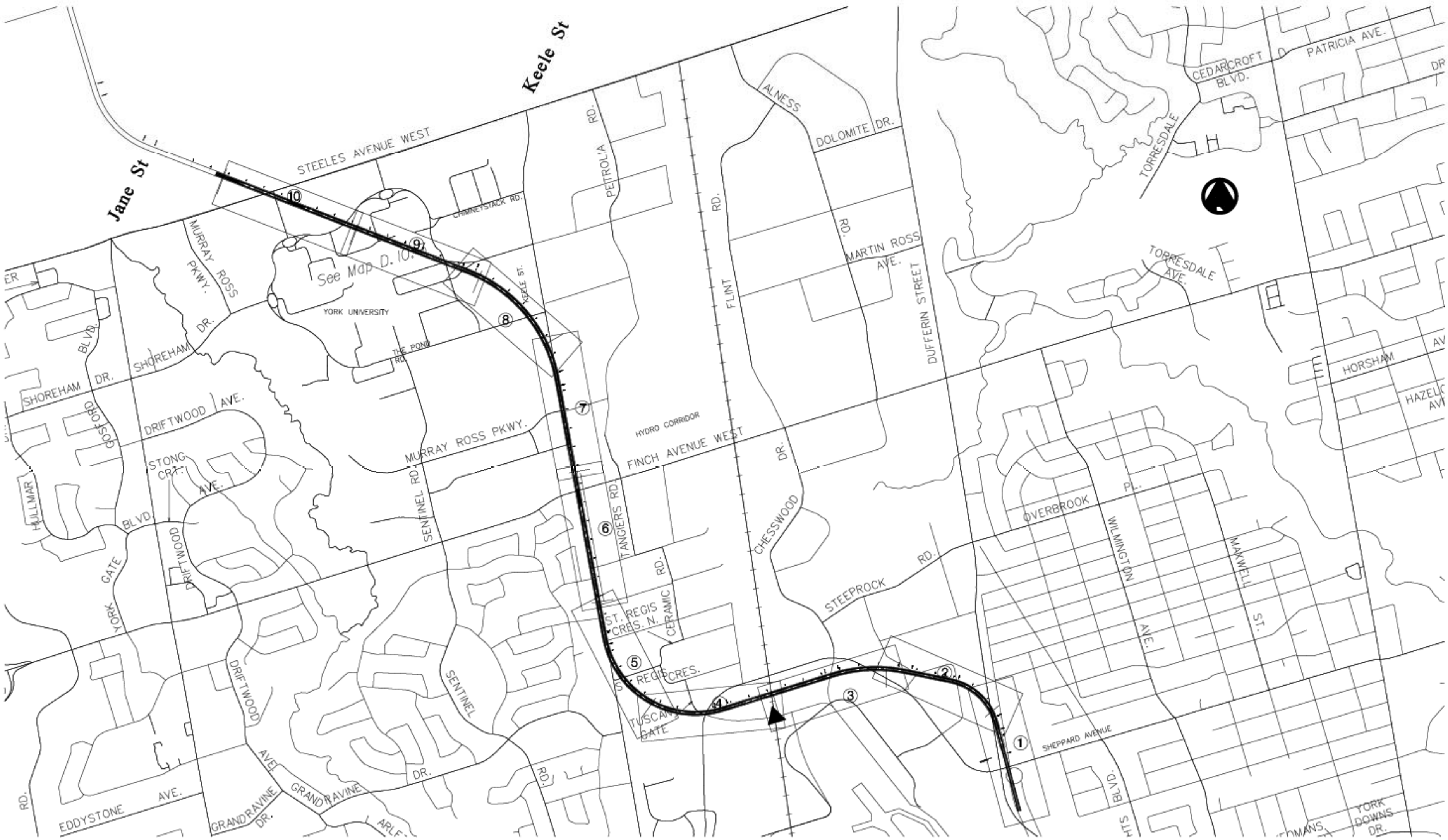


Figure 7-15: Approximate Project Implementation Schedule



SPADINA SUBWAY EXTENSION ENVIRONMENTAL ASSESSMENT

KEY PLAN

TTC SUBWAY

- SUBWAY RAIL TRACK
- RAIL CROSSOVER TRACK
- STRUCTURE / TUNNEL
- SUBWAY RIGHT OF WAY
- STATION PLATFORM
- STATION ENTRANCE
- UNDERGROUND CONCOURSE
- SUBSTATION
- VENT SHAFT
- ELEVATOR
- BUS BAY

ROADWAY

- ENTRANCE
- EXISTING ROADWAY
- EXISTING SIDEWALK
- EXSITING DROPPED CURB

MISCELLANEOUS

- 30-32 PROPERTY LINE AND NUMBER
- EXISTING BUILDING
- EXISTING CONCRETE ISLAND
- PROPOSED CONCRETE ISLAND
- EXISTING FENCE
- DECIDUOUS TREES
- EXISTING SIGN
- EXISTING TRAFFIC ARROW

SEWERS

- STORM SEWER (EXISTING)
- SANITARY SEWER (EXISTING)
- STORM SEWER MAINTENANCE HOLE
- SANITARY SEWER MAINTENANCE HOLE
- CATCH BASIN
- TWIN INLET CATCH BASIN

UTILITIES

- GAS MAIN
- WATER MAIN
- BURIED TELEPHONE CABLE DUCT
- OIL PIPE LINE
- PIPE LINE RIGHT OF WAY
- HYDRO TOWER
- VALVE AND VALVE BOX
- FIRE HYDRANT
- MAINTENANCE HOLE GAS, WATER, BELL
- EXISTING LIGHT STANDARD
- TRAFFIC LIGHT POLE
- TELEPHONE POLE

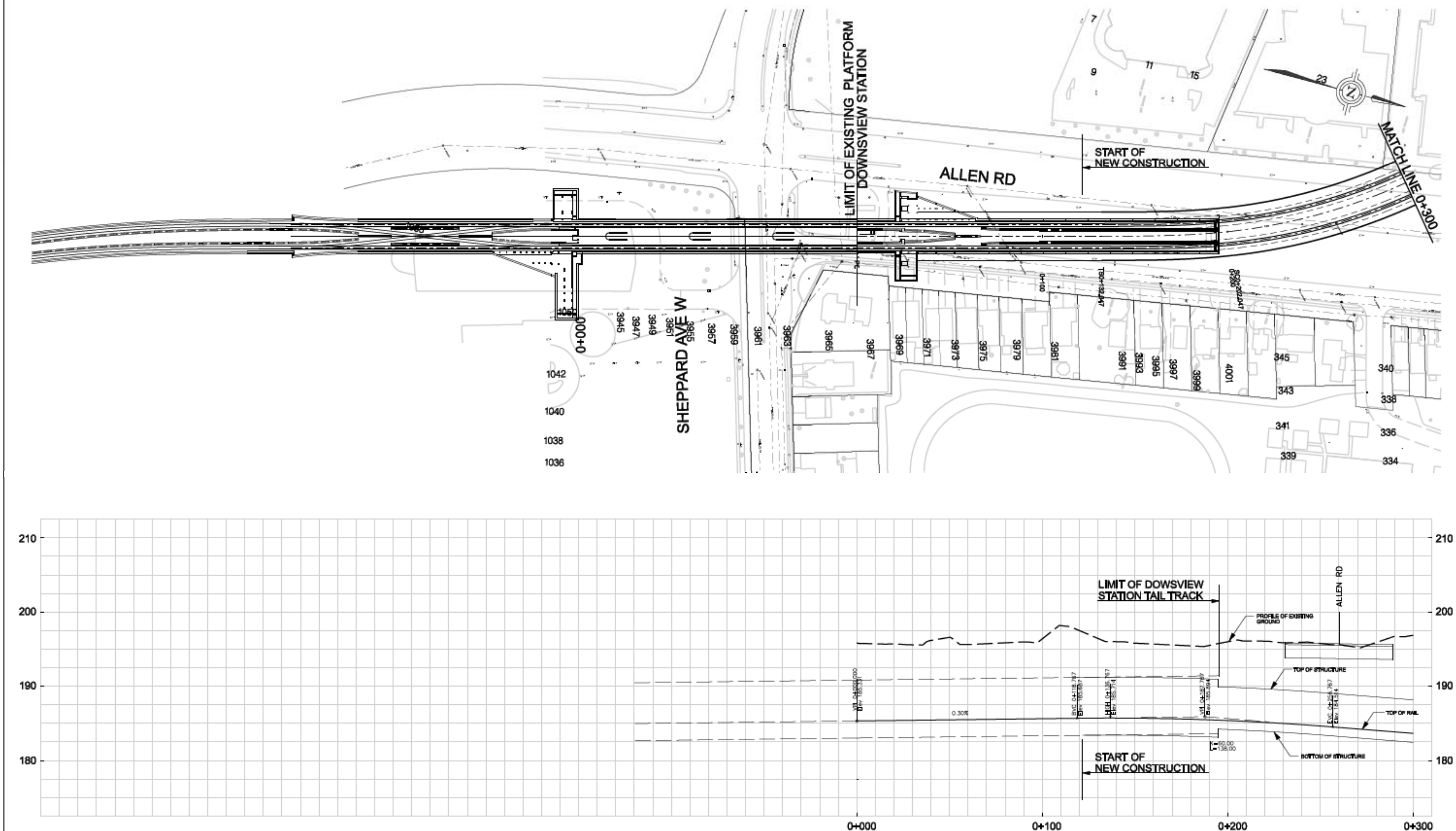
TORONTO

URS

SPADINA SUBWAY EXTENSION ENVIRONMENTAL ASSESSMENT

LEGEND

DATE	JANUARY 2006
EXHIBIT	



SPADINA SUBWAY EXTENSION ENVIRONMENTAL ASSESSMENT

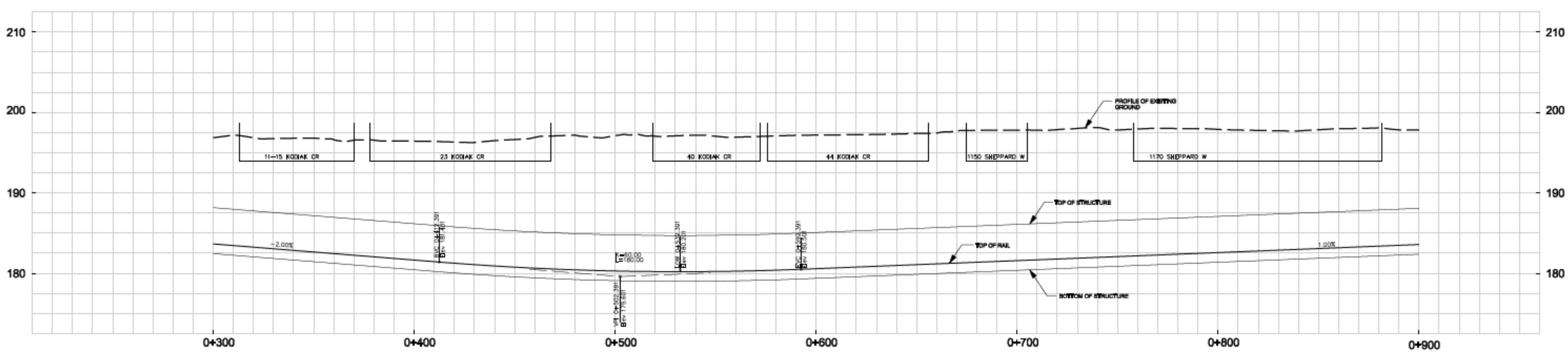
HORIZONTAL AND VERTICAL ALIGNMENT
STA. 0+000 TO STA.0+300

SCALES

DATE JANUARY 2006

EXHIBIT

DWG. NO. 0317-G-1



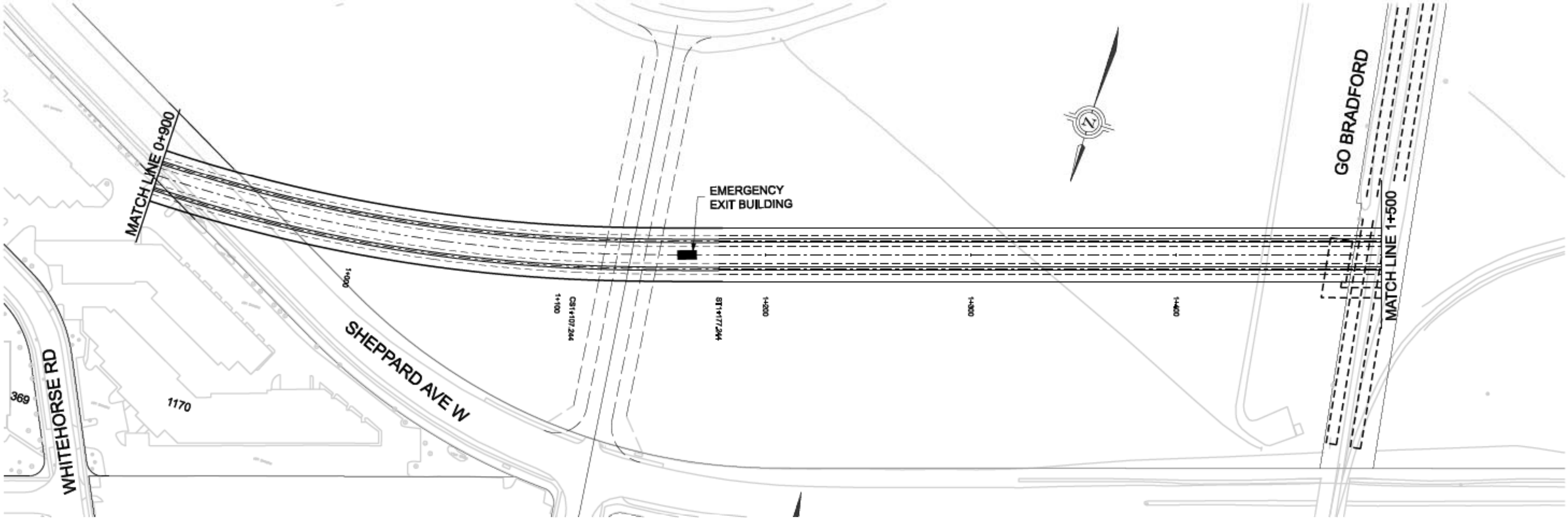
TORONTO

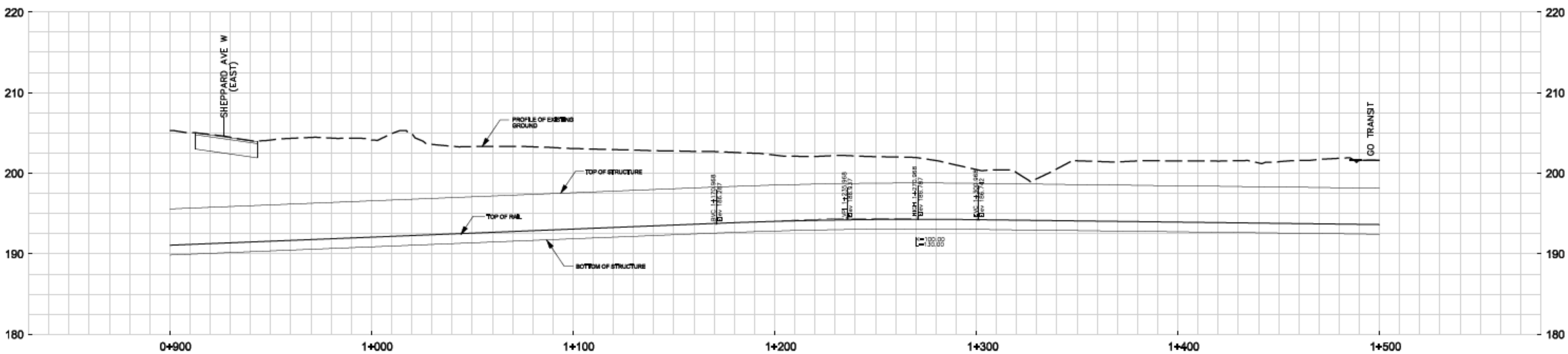
URS

SPADINA SUBWAY EXTENSION ENVIRONMENTAL ASSESSMENT

HORIZONTAL AND VERTICAL ALIGNMENT
STA. 0+300 TO STA. 0+900

SCALES	HORZ. 0 10 20 30 40m; VERT. 0 5 10m
DATE	JANUARY 2006
EXHIBIT	DWG. NO. 0317-G-2





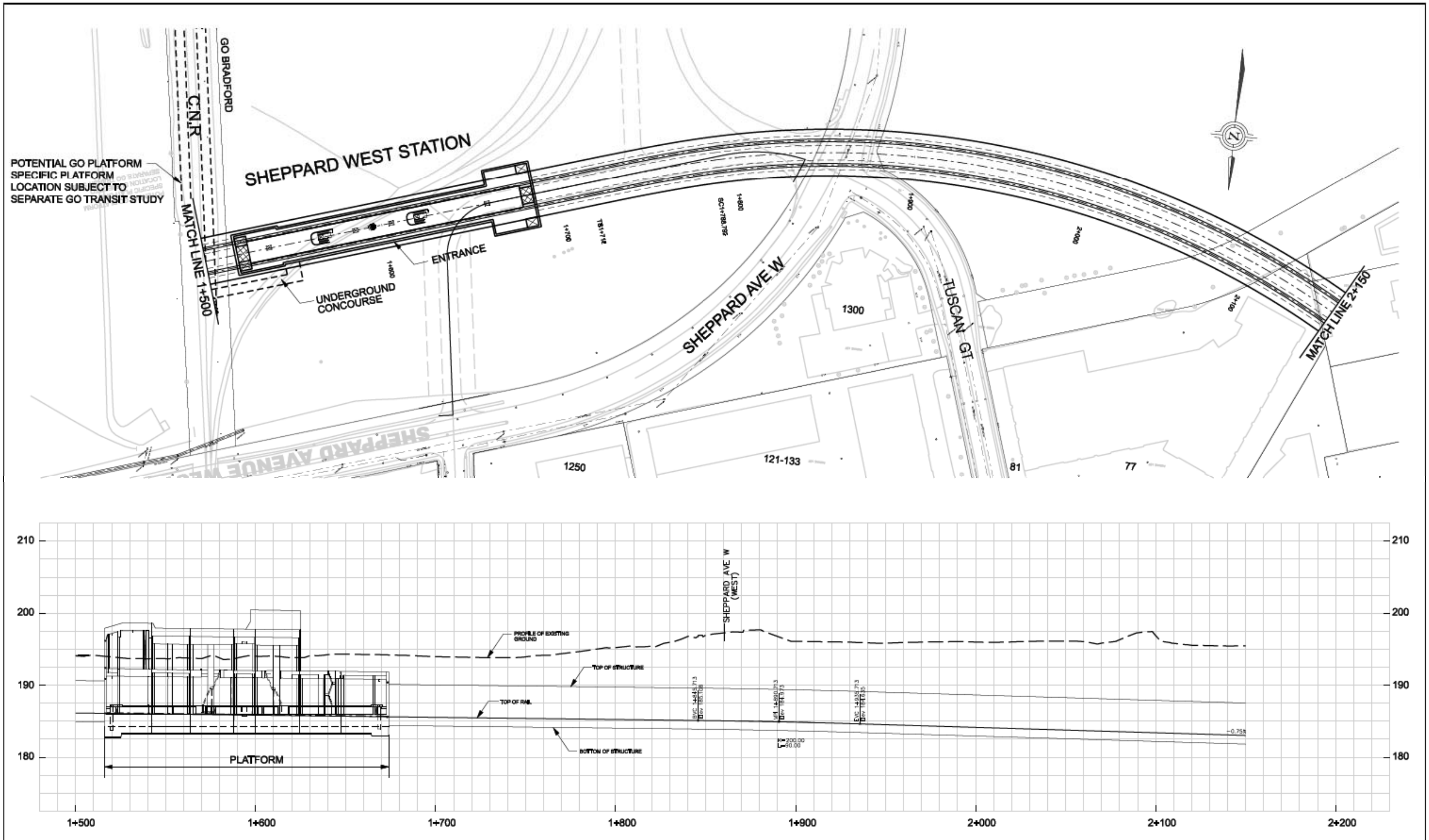
TORONTO

URS

SPADINA SUBWAY EXTENSION ENVIRONMENTAL ASSESSMENT

HORIZONTAL AND VERTICAL ALIGNMENT
STA. 0+900 TO STA. 1+500

SCALES	HORIZ. 0 10 20 30 40m / VERT. 0 5 10m
DATE	JANUARY 2006
EXHIBIT	DWG. NO. 0317-G-3



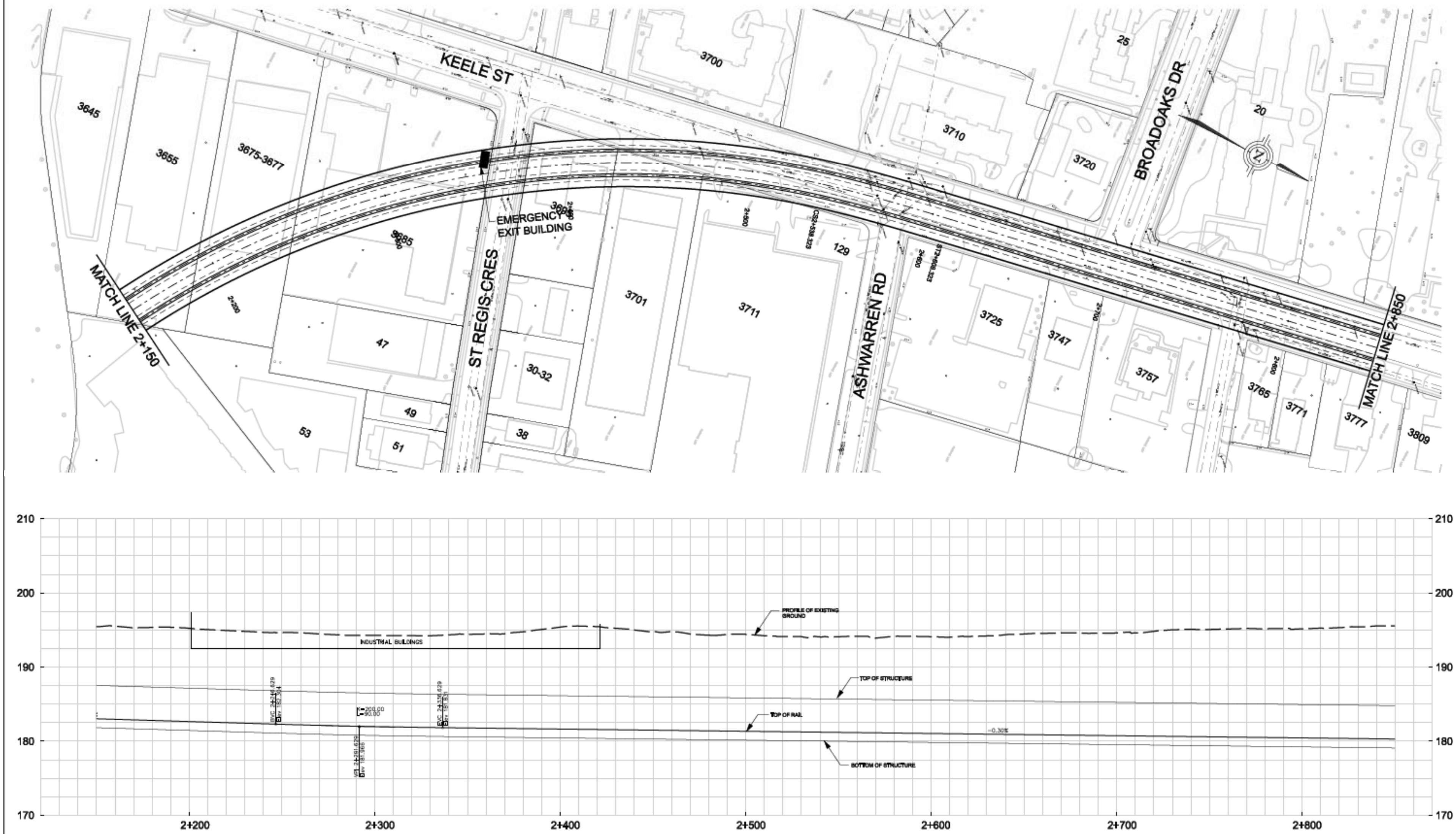
TORONTO

URS

SPADINA SUBWAY EXTENSION ENVIRONMENTAL ASSESSMENT

HORIZONTAL AND VERTICAL ALIGNMENT
STA. 1+500 TO STA. 2+150

SCALES	HORZ. 0 10 20 30 40m; VERT. 0 5 10m
DATE	JANUARY 2006
EXHIBIT	DWG. NO. 0317-G-4



TORONTO

URS

SPADINA SUBWAY EXTENSION ENVIRONMENTAL ASSESSMENT

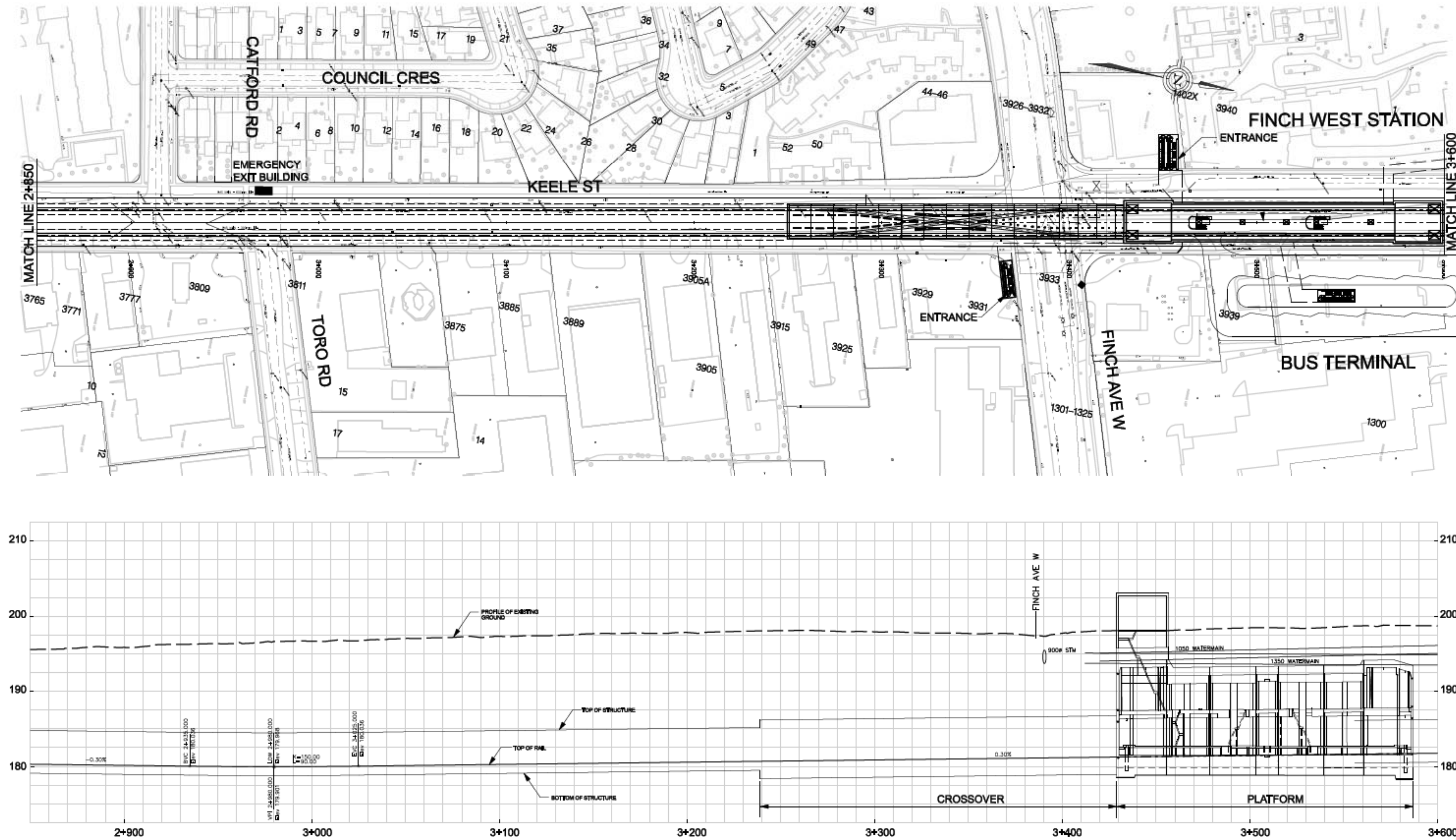
HORIZONTAL AND VERTICAL ALIGNMENT
STA. 2+150 TO STA. 2+850

SCALES: HORZ. 0 10 20 30 40m; VERT. 0 5 10m

DATE: JANUARY 2006

EXHIBIT

DWG. NO. 0317-G-5



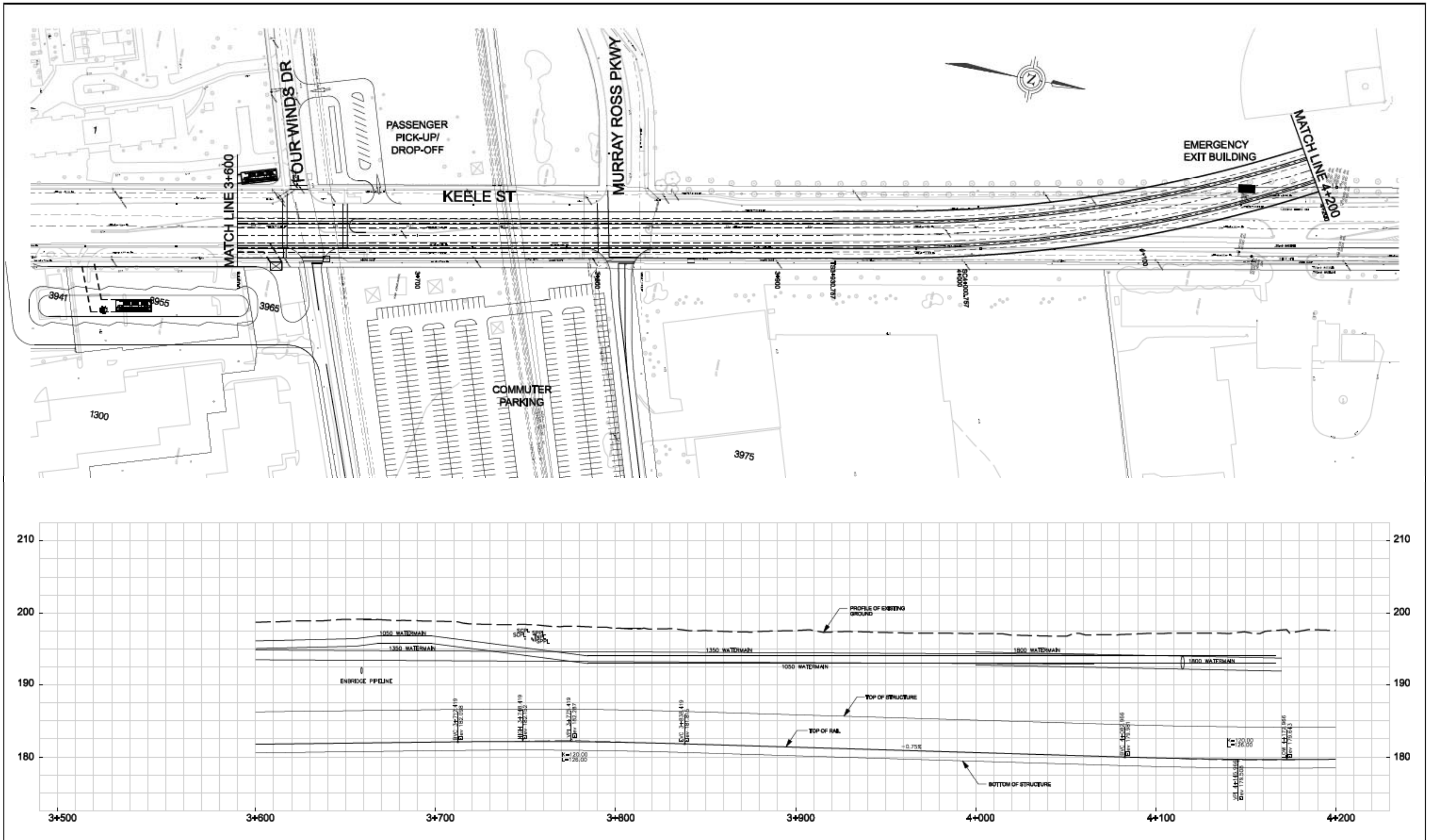
TORONTO

URS

SPADINA SUBWAY EXTENSION ENVIRONMENTAL ASSESSMENT

HORIZONTAL AND VERTICAL ALIGNMENT
STA. 2+850 TO STA. 3+600

SCALES	HORIZ. 0 10 20 30 40m; VERT. 0 5 10m
DATE	JANUARY 2006
EXHIBIT	DWG. NO. 0317-G-6



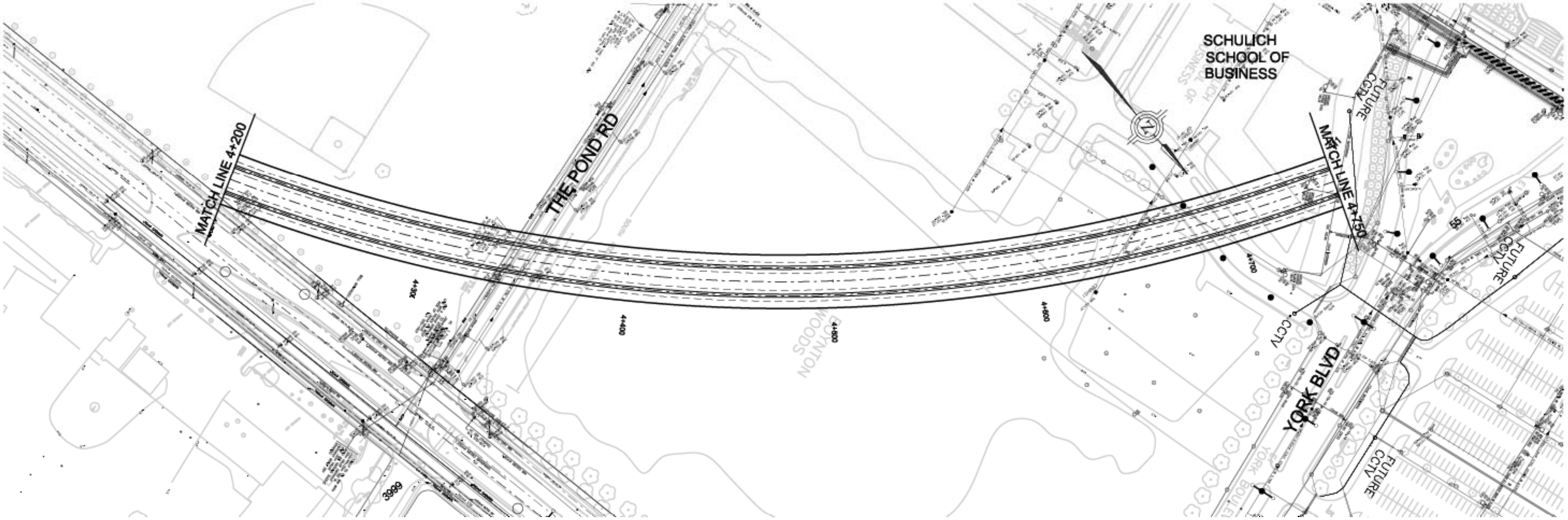
TORONTO

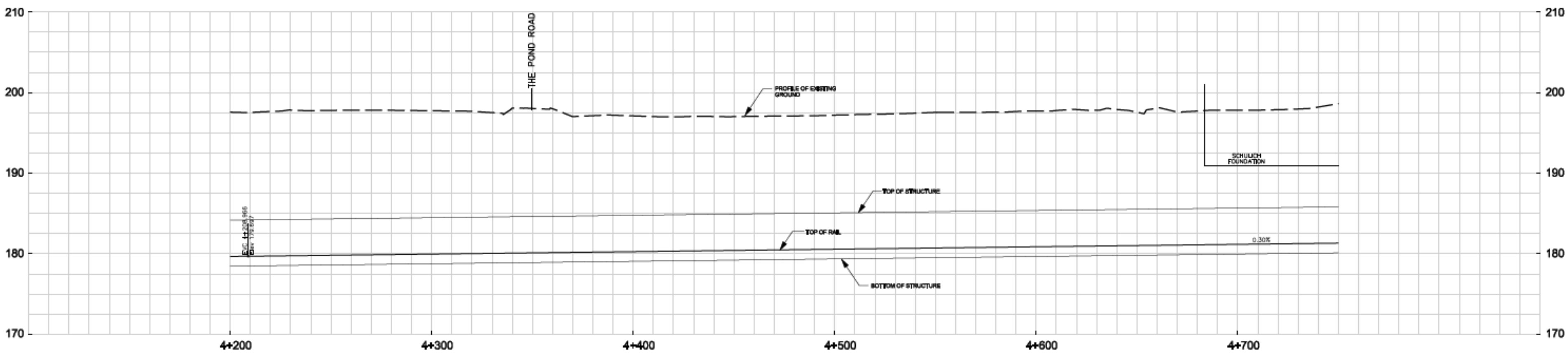
URS

SPADINA SUBWAY EXTENSION ENVIRONMENTAL ASSESSMENT

HORIZONTAL AND VERTICAL ALIGNMENT
STA. 3+600 TO STA. 4+200

SCALES	HORIZ. 0 10 20 30 40m; VERT. 0 5 10m
DATE	JANUARY 2006
EXHIBIT	DWG. NO. 0317-G-7





TORONTO

URS

SPADINA SUBWAY EXTENSION ENVIRONMENTAL ASSESSMENT

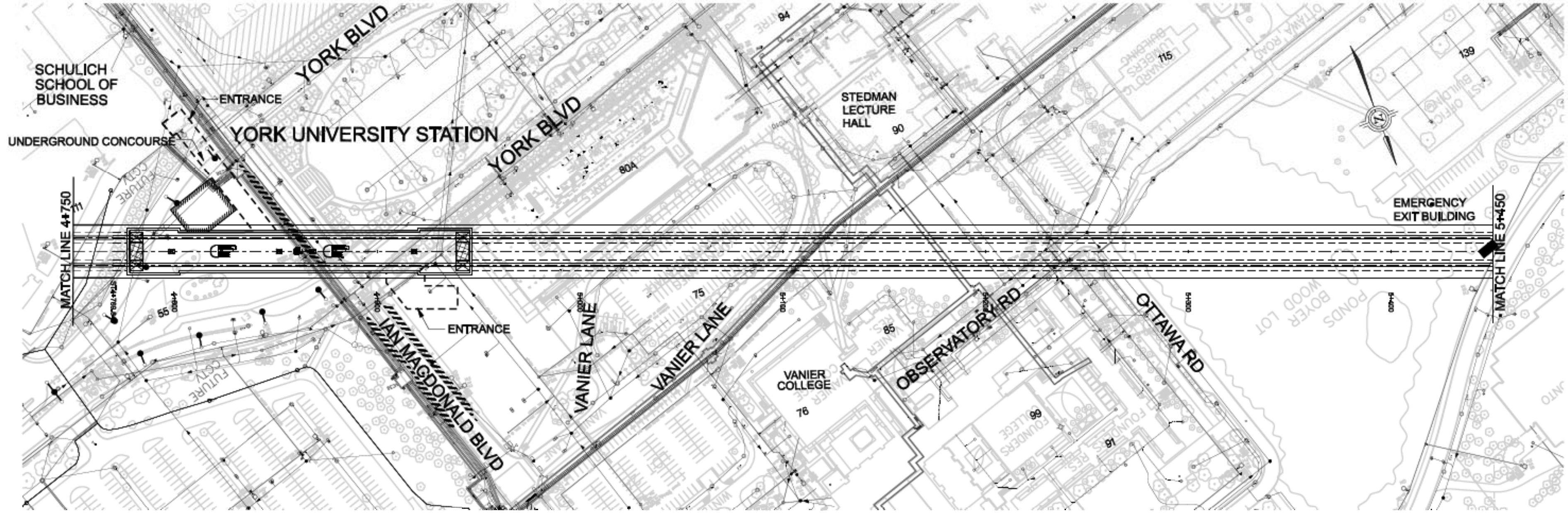
HORIZONTAL AND VERTICAL ALIGNMENT
STA. 4+200 TO STA. 4+750

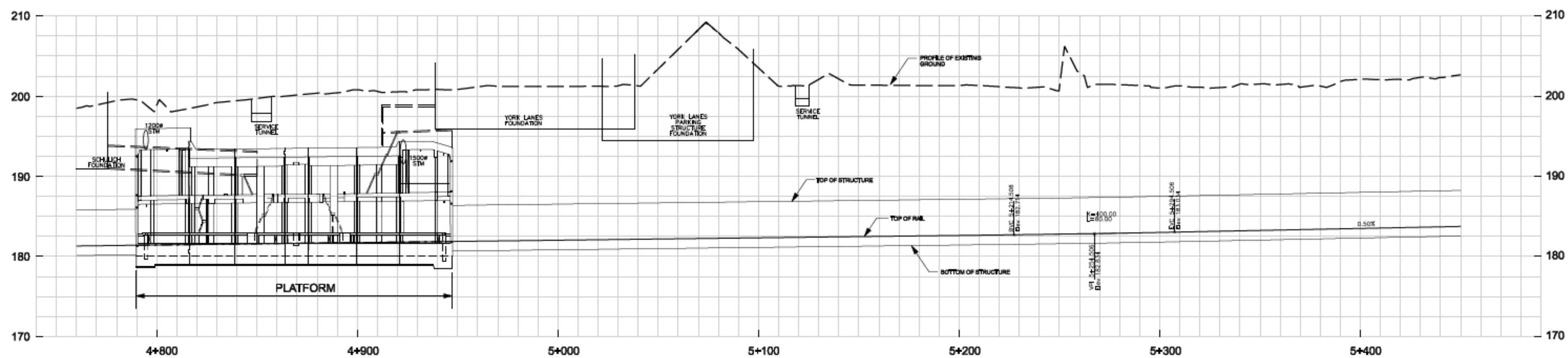
SCALES

DATE JANUARY 2006

EXHIBIT

DWG. NO. 0317-G-8





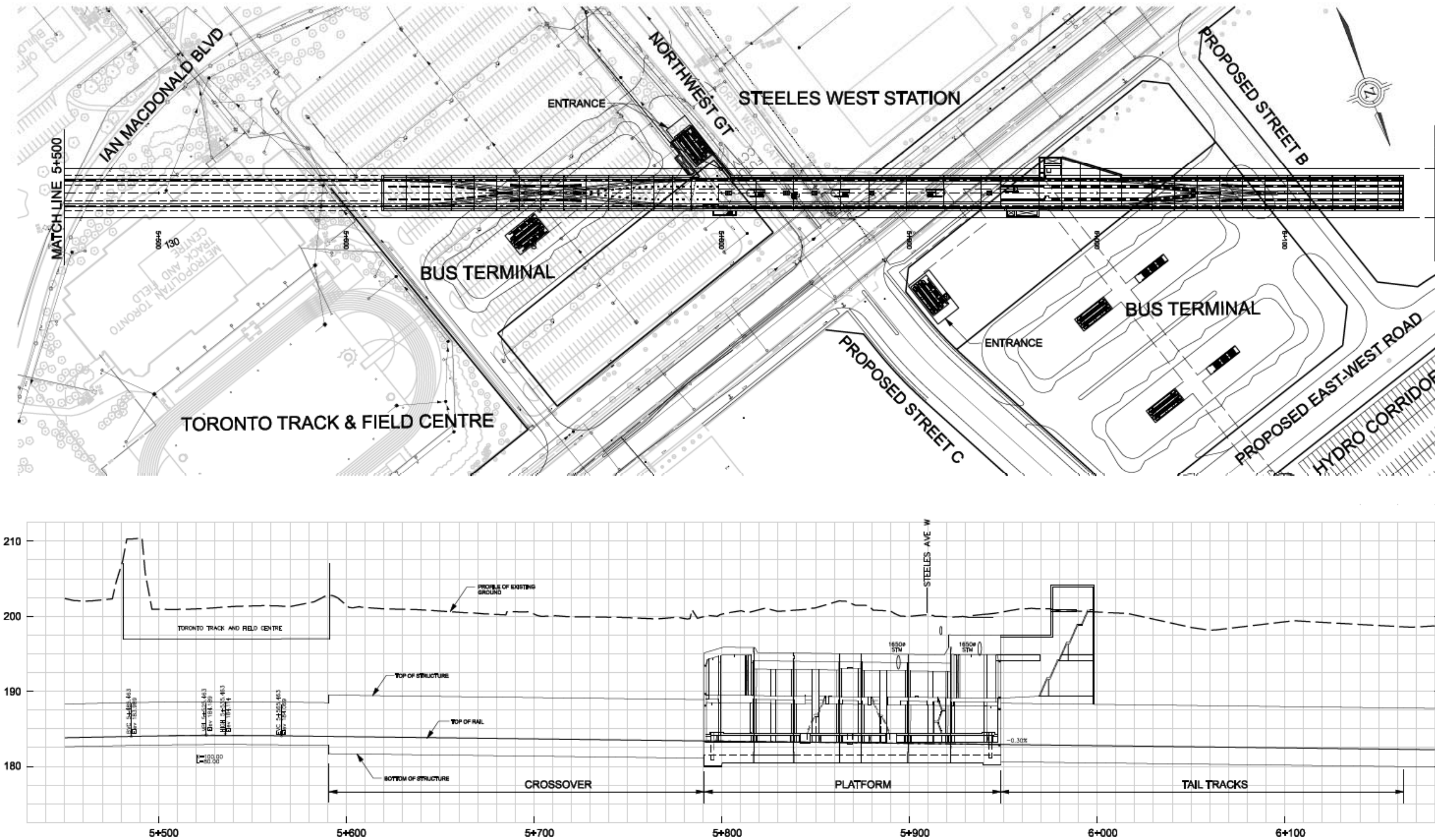
TORONTO

URS

SPADINA SUBWAY EXTENSION ENVIRONMENTAL ASSESSMENT

HORIZONTAL AND VERTICAL ALIGNMENT
STA. 4+750 TO STA. 5+450

SCALES	HORZ. 0 10 20 30 40m; VERT. 0 5 10m
DATE	JANUARY, 2006
EXHIBIT	DWG. NO. 0317-G-9



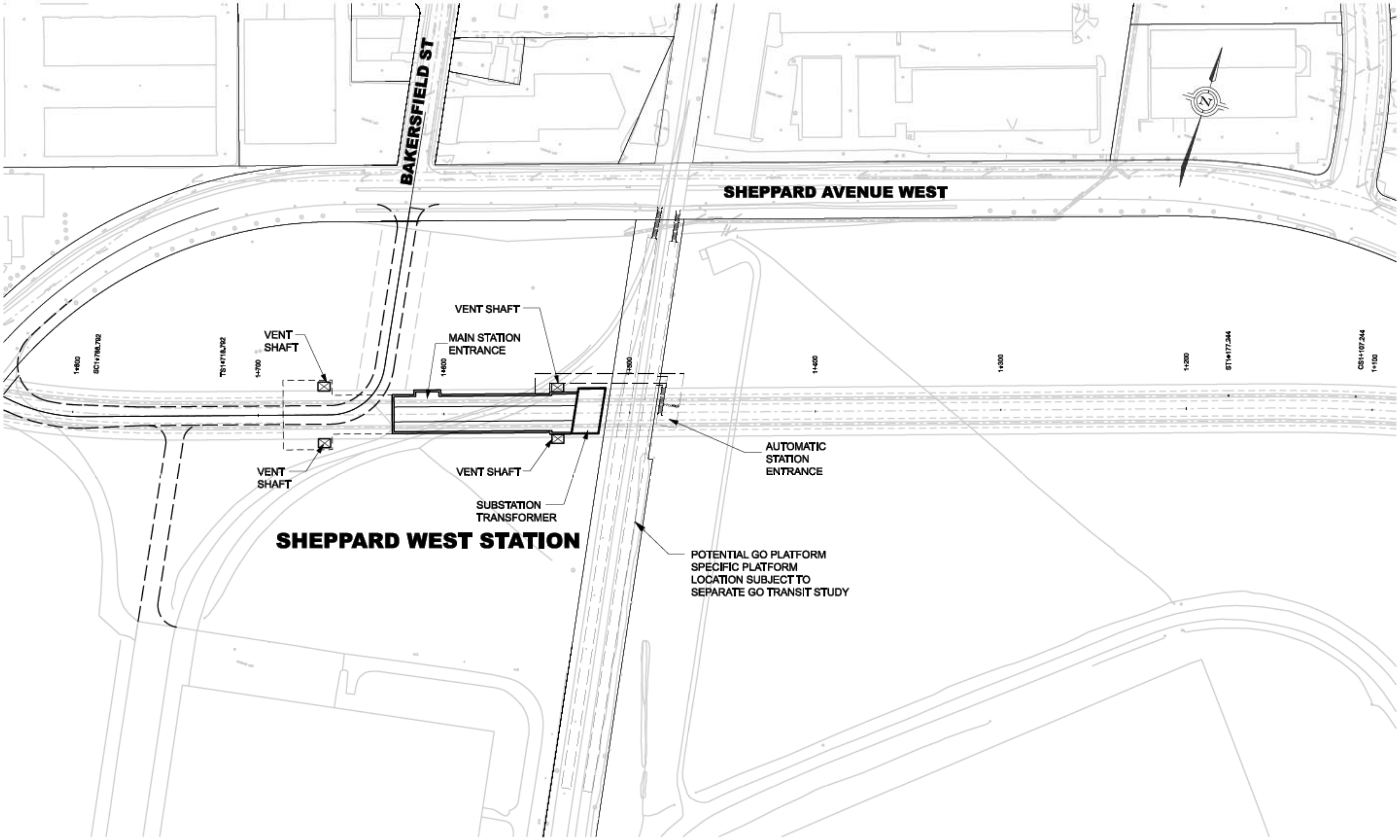
TORONTO

URS

SPADINA SUBWAY EXTENSION ENVIRONMENTAL ASSESSMENT

HORIZONTAL AND VERTICAL ALIGNMENT
STA. 5+450 TO STA. 6+180

SCALES	HORIZ. / VERT.
DATE	JANUARY 2006
EXHIBIT	DWG. NO. 0317-G-10



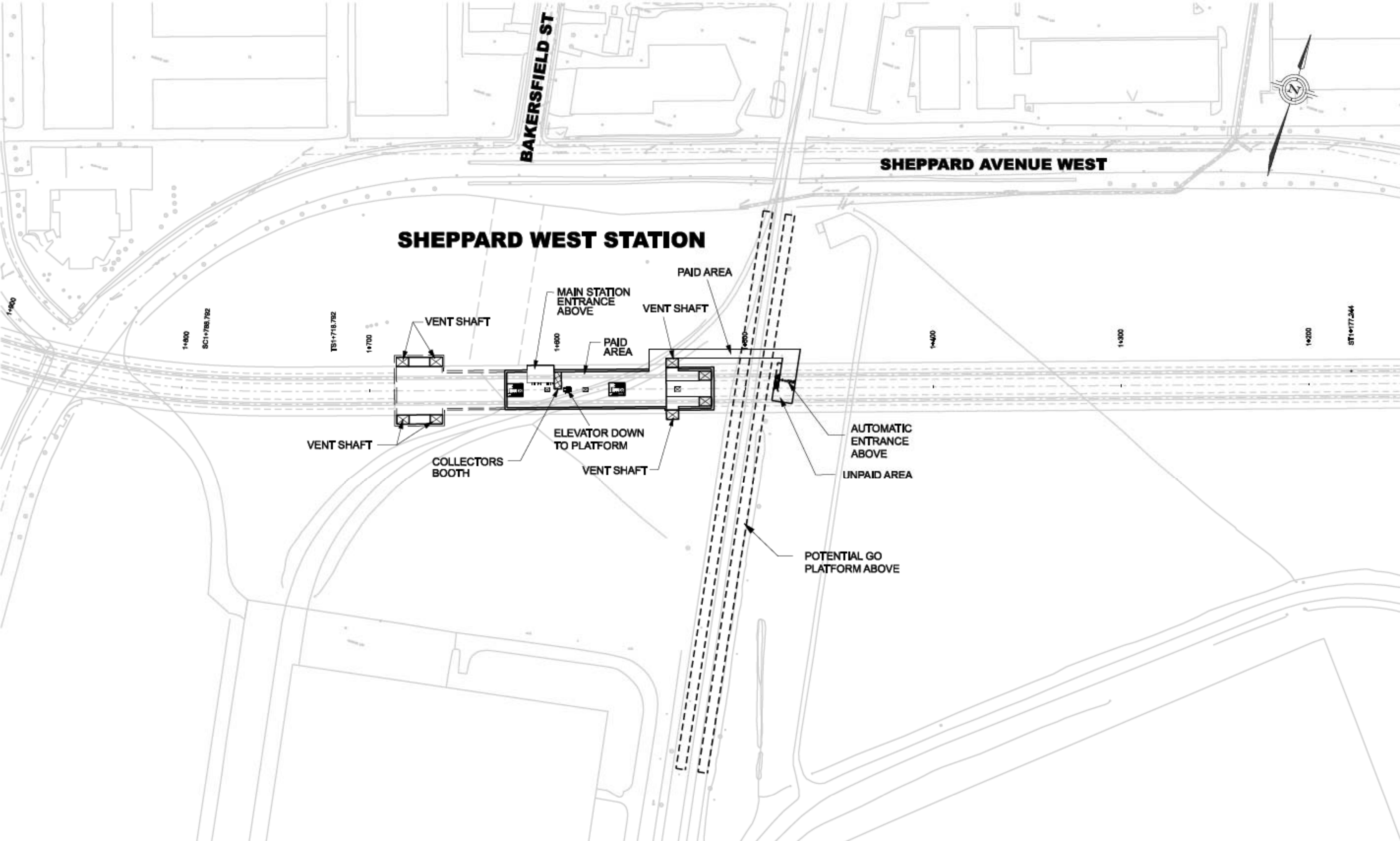
SPADINA SUBWAY EXTENSION ENVIRONMENTAL ASSESSMENT

TORONTO

URS

SHEPPARD WEST STATION
GRADE LEVEL

SCALE	HORIZ. 0 10 20 30 40m
DATE	JANUARY 2006
EXHIBIT	DWG. NO. 0317-A-1



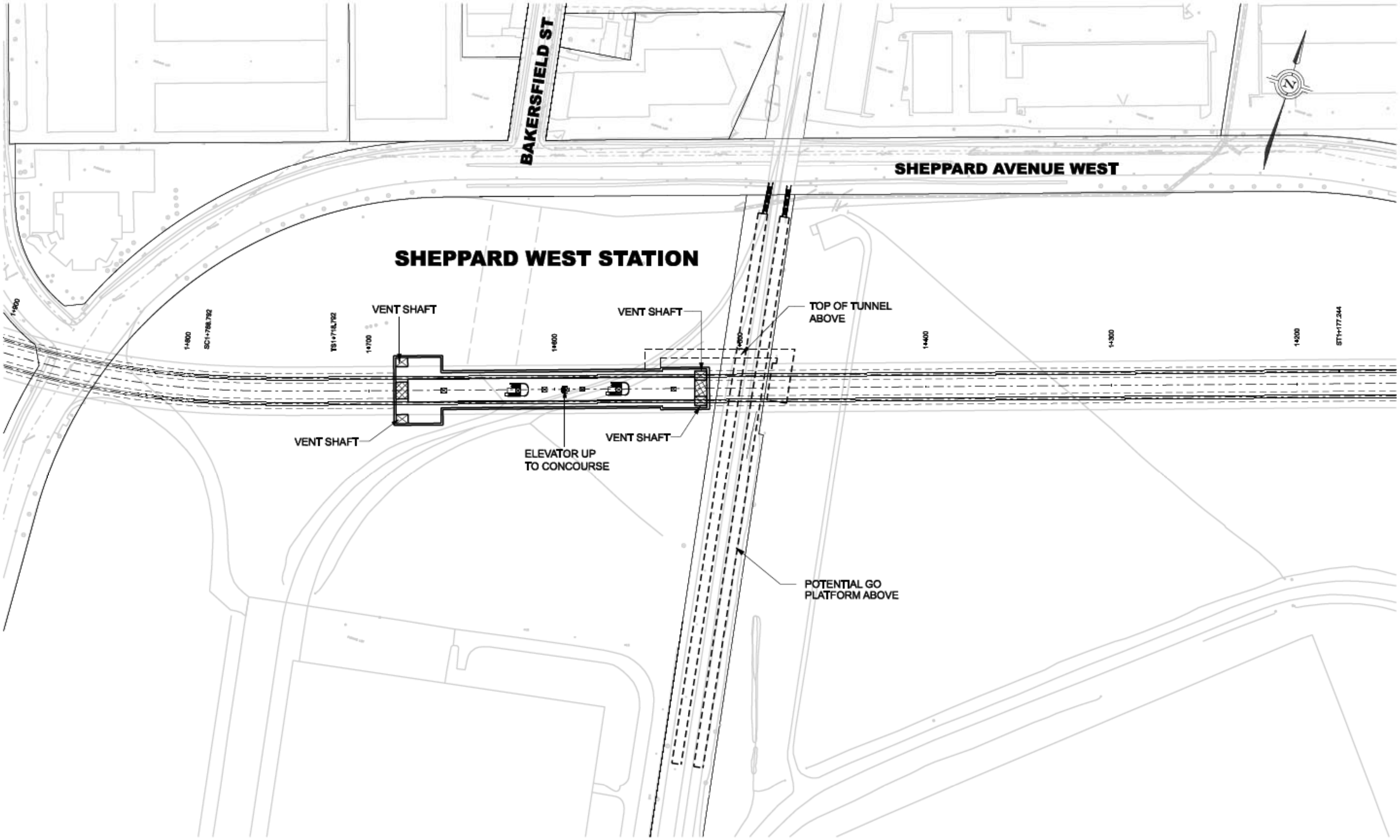
TORONTO

URS

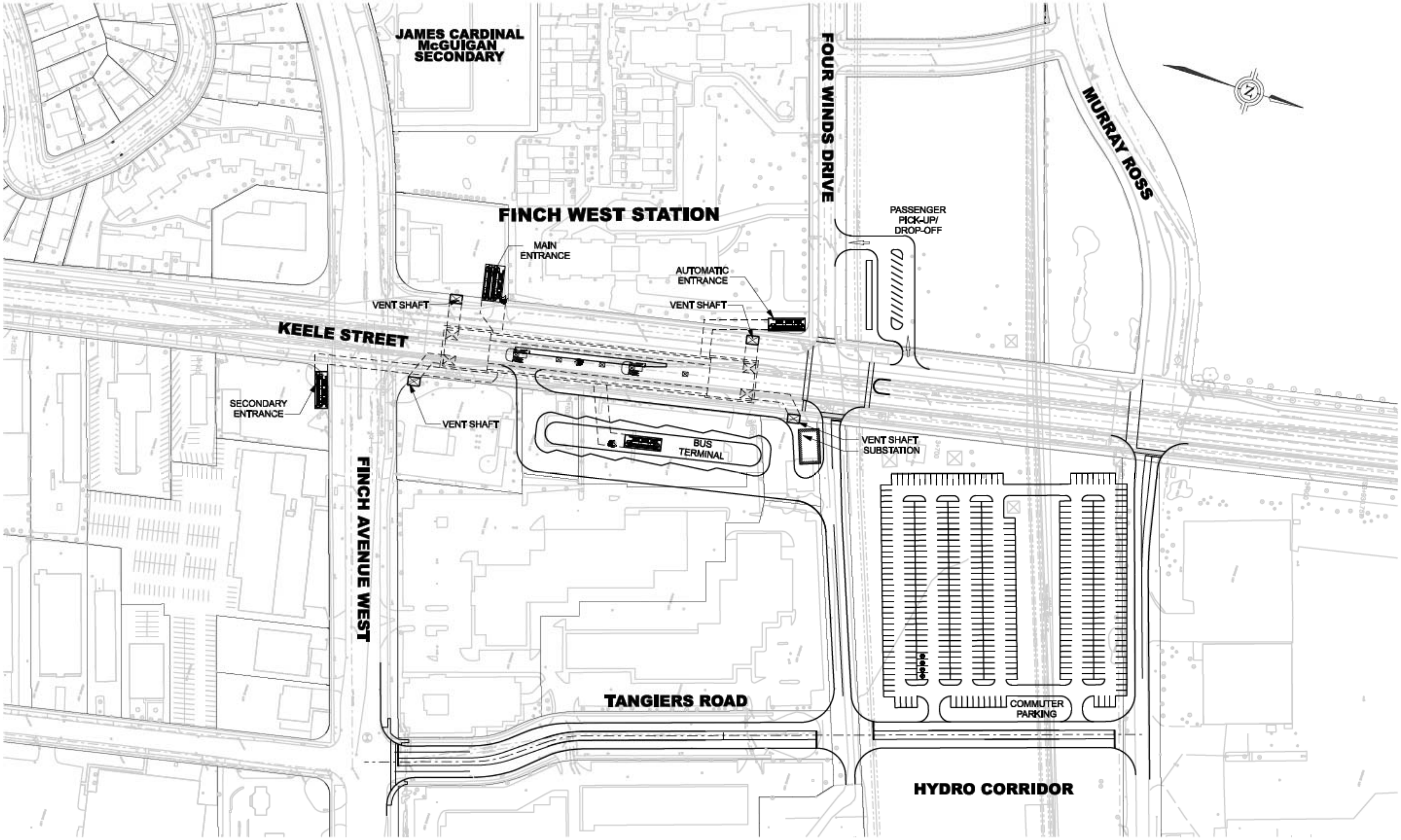
SPADINA SUBWAY EXTENSION ENVIRONMENTAL ASSESSMENT

SHEPPARD WEST STATION
CONCOURSE LEVEL

SCALE	HORIZ. 0 10 20 30 40m
DATE	JANUARY 2006
EXHIBIT	DWG. NO. 0317-A-2



TORONTO	URS	**SPADINA SUBWAY EXTENSION ENVIRONMENTAL ASSESSMENT**	SCALE HORZ. 0 10 20 30 40m
		SHEPPARD WEST STATION PLATFORM LEVEL	DATE JANUARY 2006
			EXHIBIT — DWG. NO. 0317-A-3



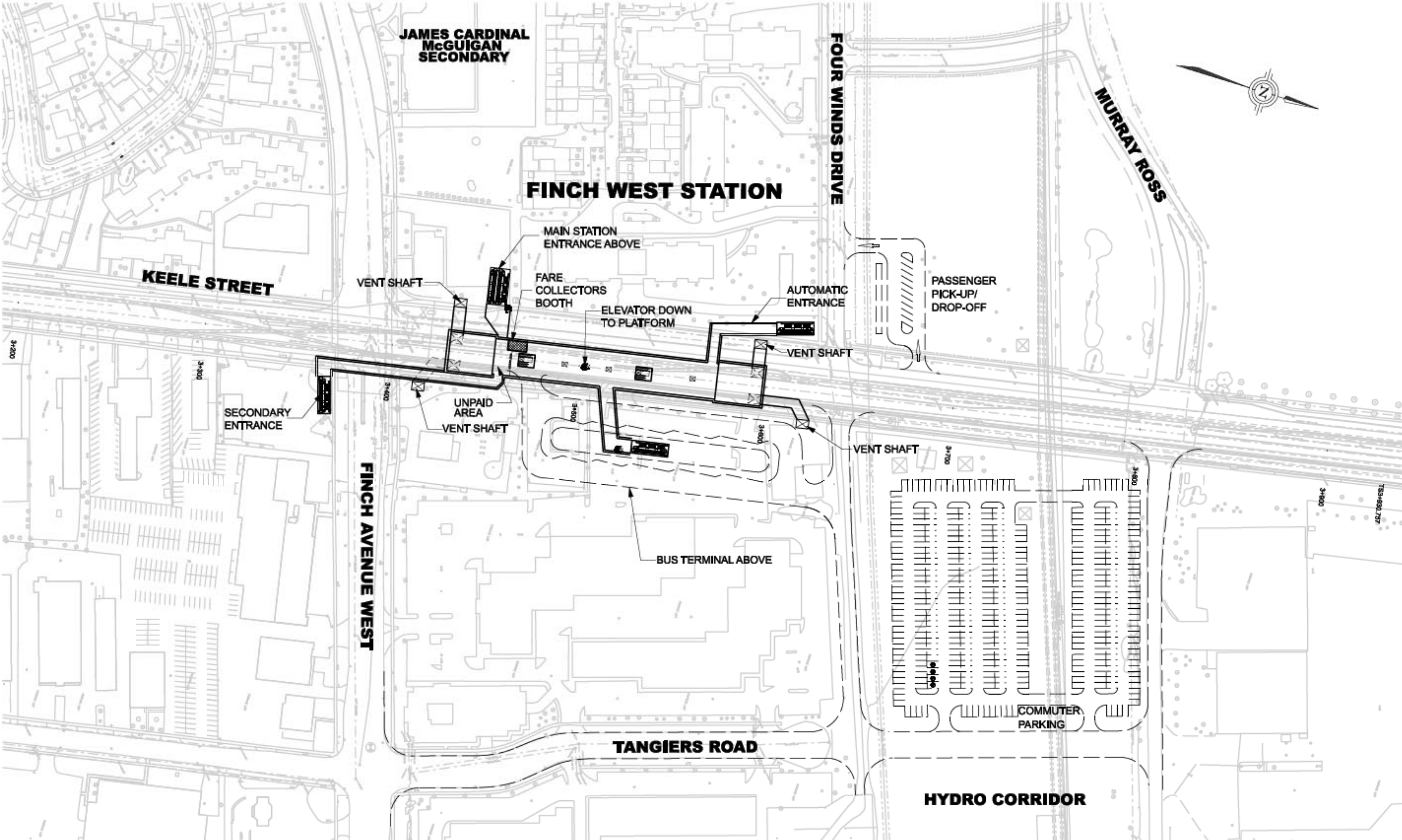
TORONTO

URS

SPADINA SUBWAY EXTENSION ENVIRONMENTAL ASSESSMENT

FINCH WEST STATION
GRADE LEVEL

SCALE	HORZ. 0 10 20 30 40m
DATE	JANUARY 2006
EXHIBIT	DWG. NO. 0317-A-4



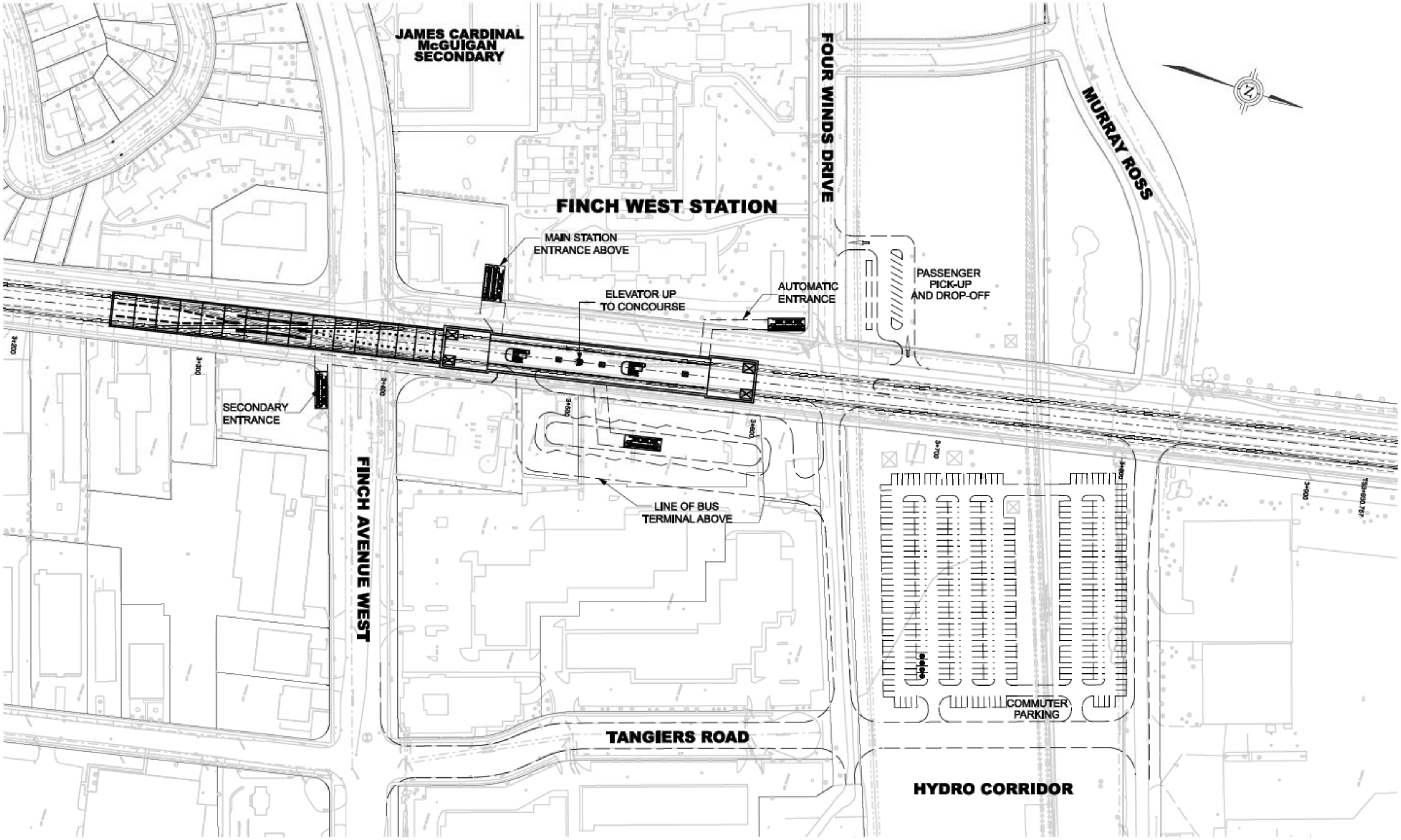
TORONTO

URS

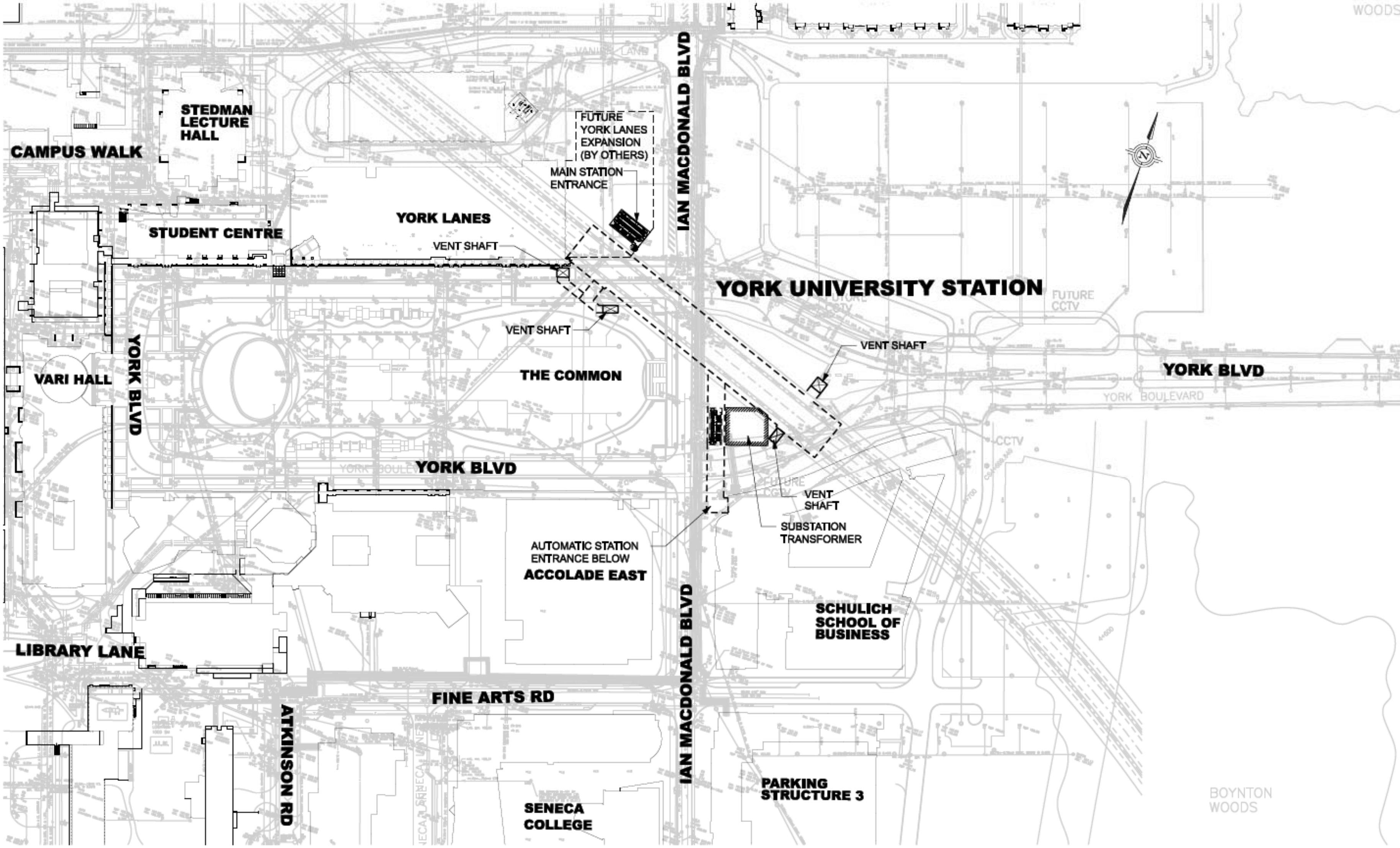
SPADINA SUBWAY EXTENSION ENVIRONMENTAL ASSESSMENT

FINCH WEST STATION
CONCOURSE LEVEL

SCALE	HORZ. 0 10 20 30 40m
DATE	JANUARY 2006
EXHIBIT	DWG. NO. 0317-A-5



TORONTO	URS	SPADINA SUBWAY EXTENSION ENVIRONMENTAL ASSESSMENT	SCALE	HORZ. 0 10 20 30 40m
		FINCH WEST STATION PLATFORM LEVEL	DATE	JANUARY 2006
			EXHIBIT	DWG. NO. 0317-A-6



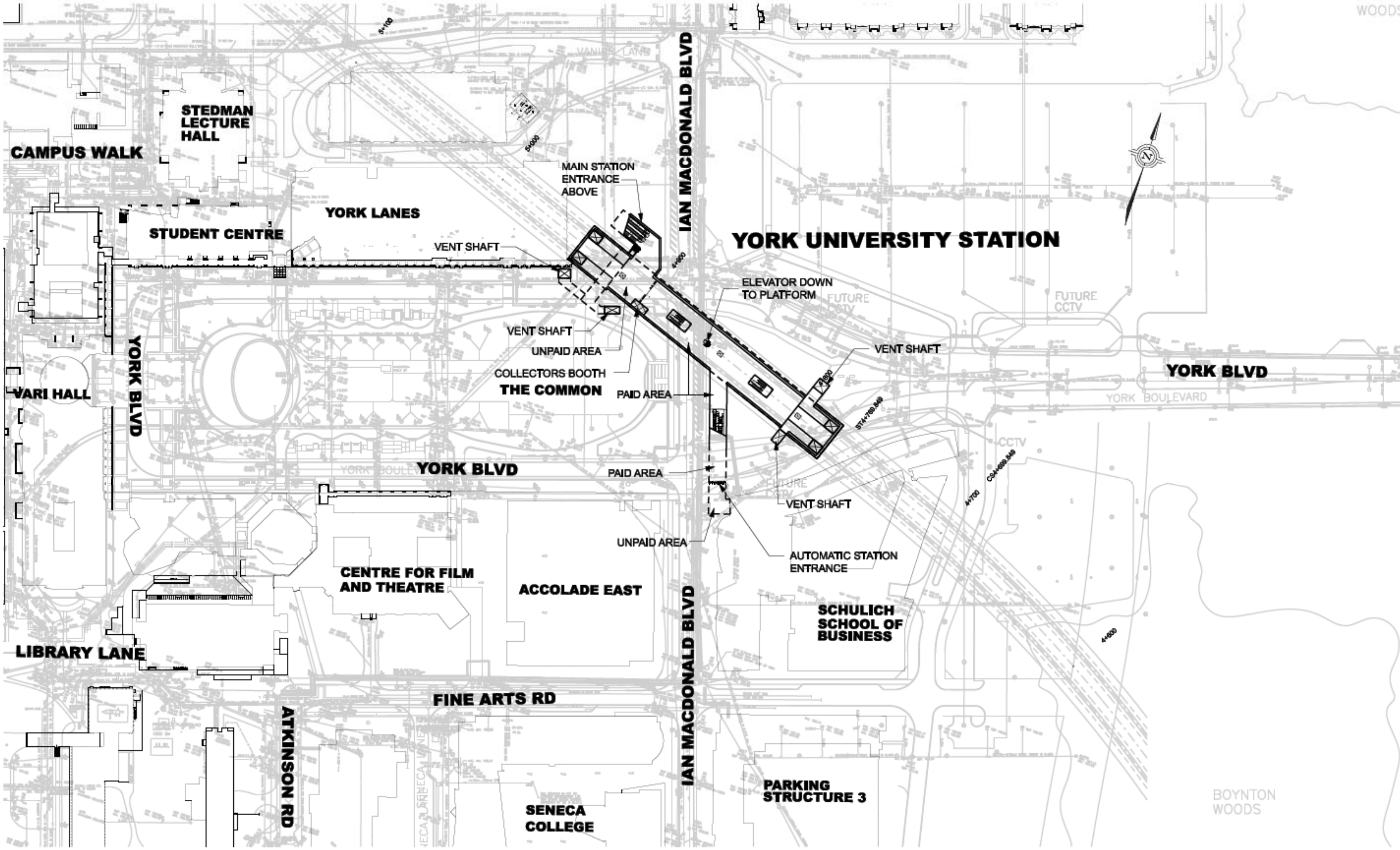
TORONTO

URS

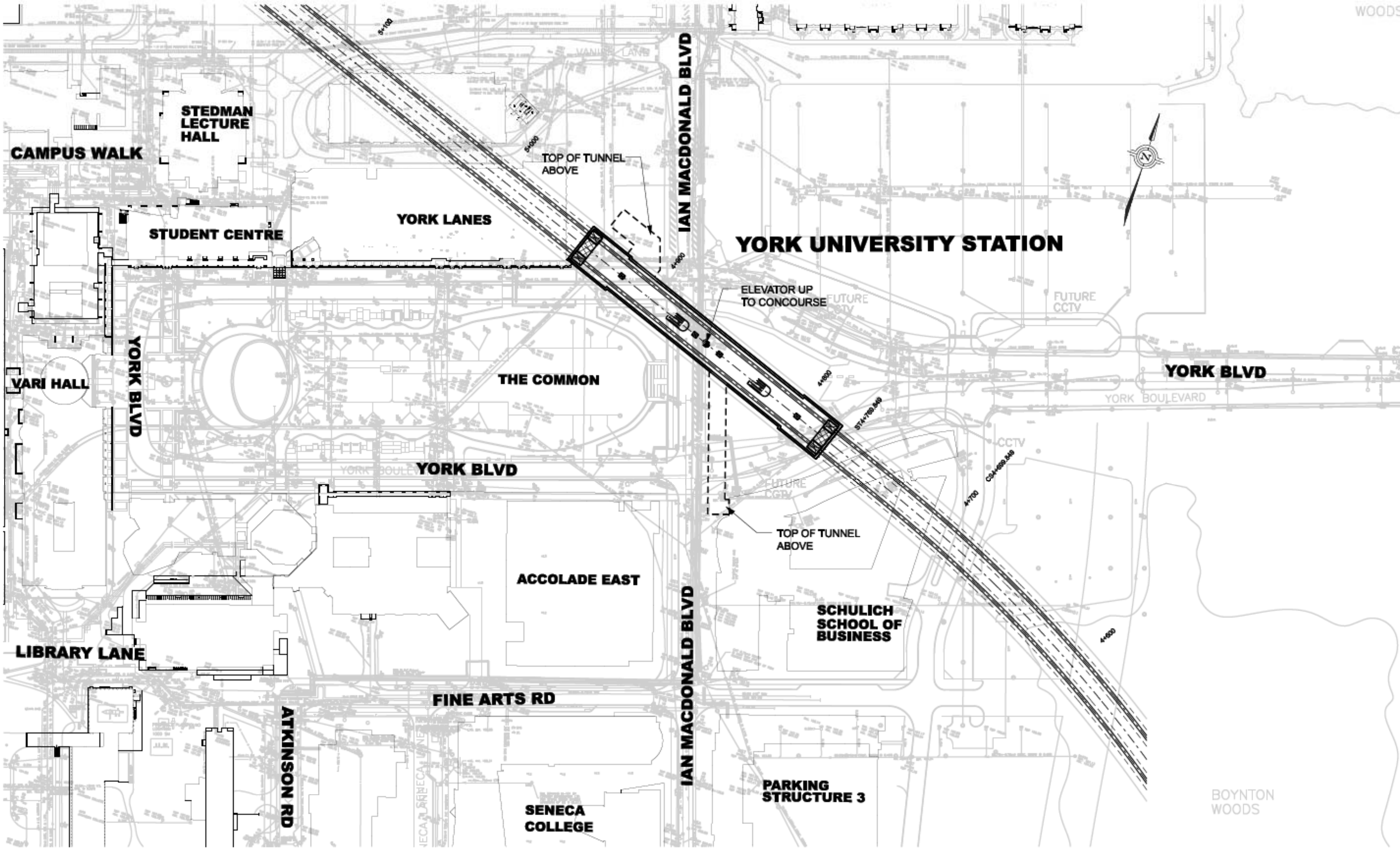
SPADINA SUBWAY EXTENSION ENVIRONMENTAL ASSESSMENT

YORK UNIVERSITY STATION
GRADE LEVEL

SCALE	HORIZ. 0 10 20 30 40m
DATE	JANUARY 2006
EXHIBIT	DWG. NO. 0317-A-7



TORONTO	URS	**SPADINA SUBWAY EXTENSION ENVIRONMENTAL ASSESSMENT**	SCALE 0 10 20 30 40m
		YORK UNIVERSITY STATION CONCOURSE LEVEL	DATE JANUARY 2006
			EXHIBIT — DWG. NO. 0317-A-8



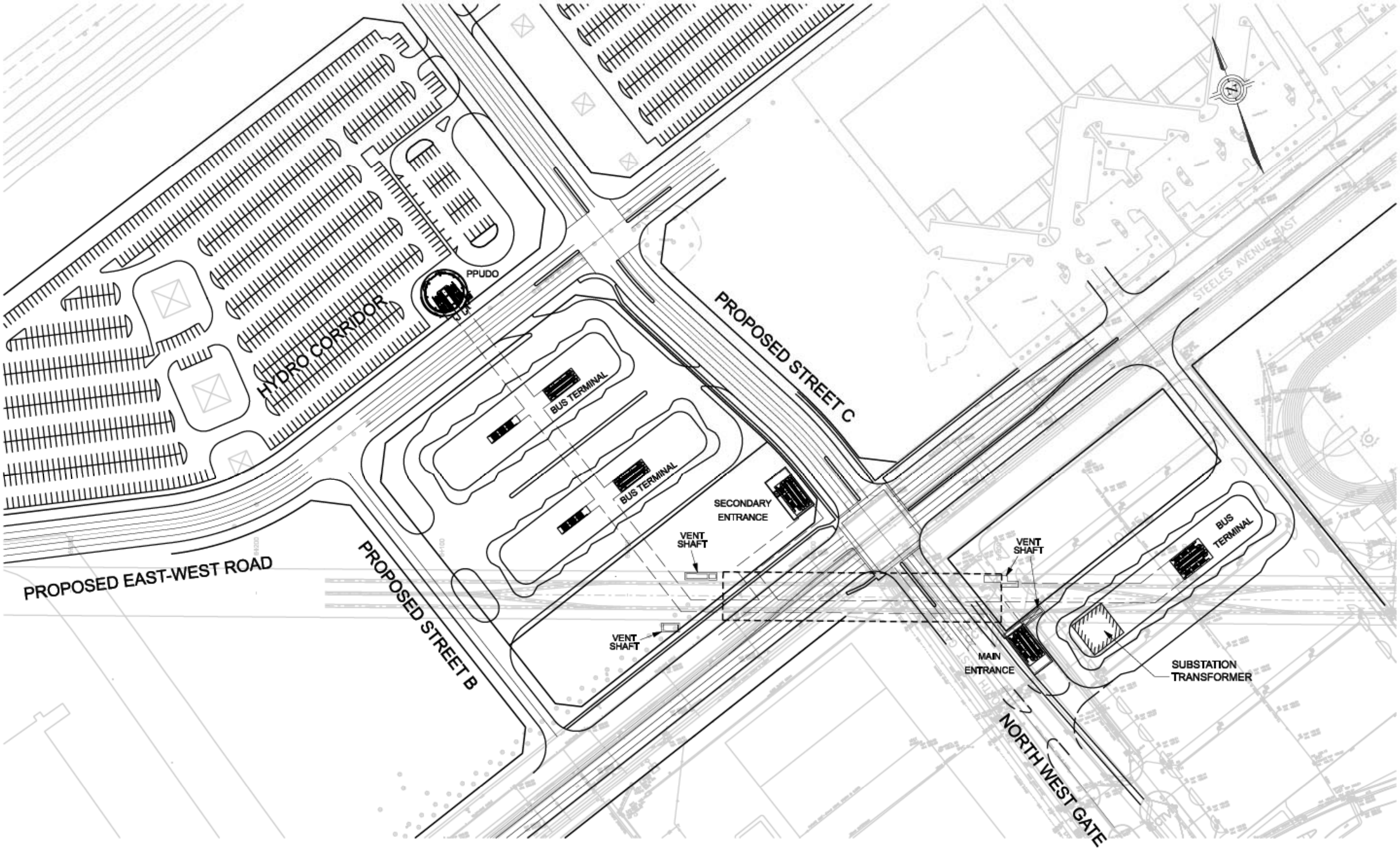
TORONTO

URS

SPADINA SUBWAY EXTENSION ENVIRONMENTAL ASSESSMENT

YORK UNIVERSITY STATION
PLATFORM LEVEL

SCALE	HORZ. 0 10 20 30 40m
DATE	JANUARY 2006
EXHIBIT	DWG. NO. 0317-A-9



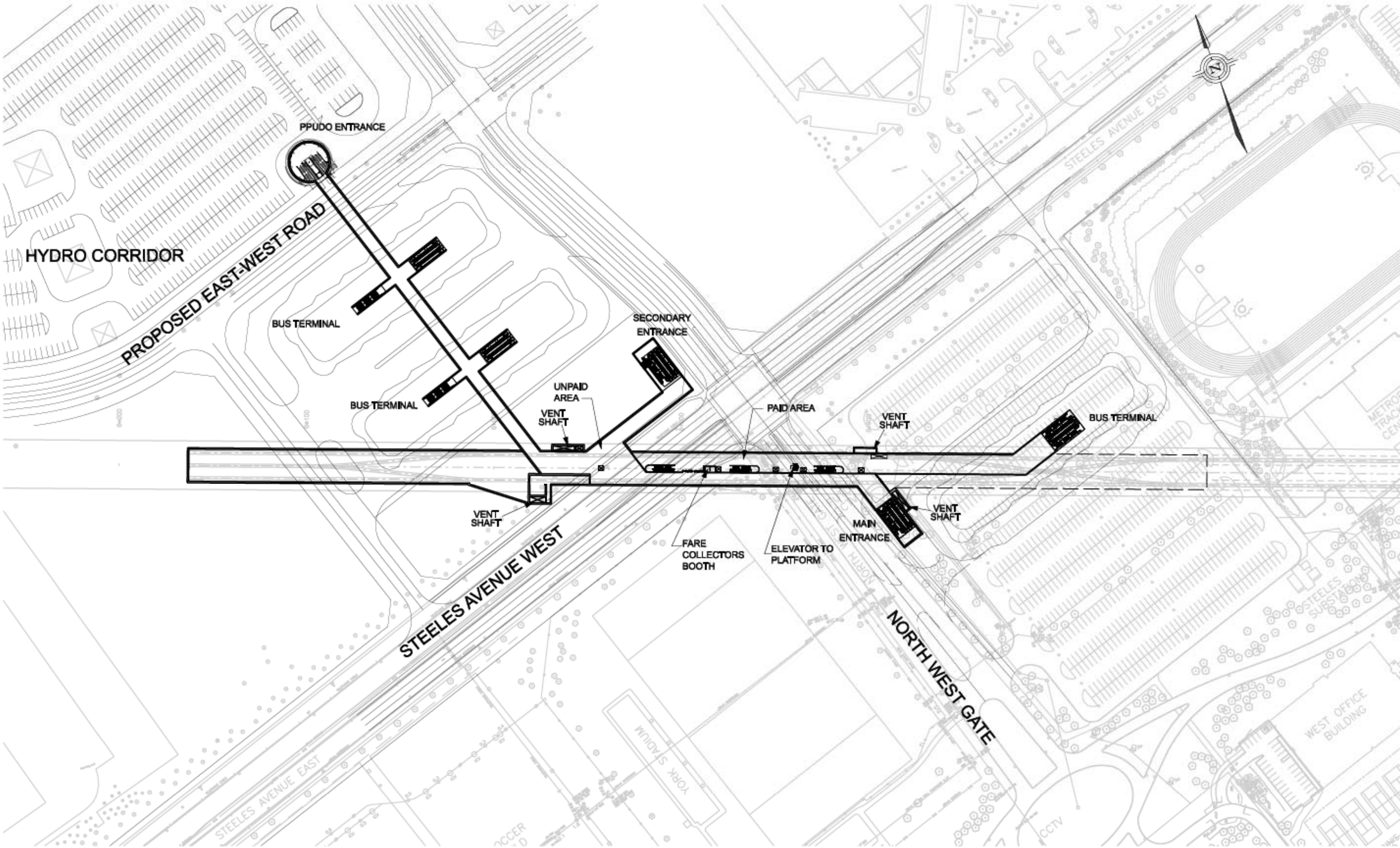
TORONTO

URS

SPADINA SUBWAY EXTENSION ENVIRONMENTAL ASSESSMENT

STEELES WEST STATION
GRADE LEVEL

SCALE	HORZ. 0 10 20 30 40m
DATE	JANUARY 2006
EXHIBIT	DWG. NO. 0317-A-10



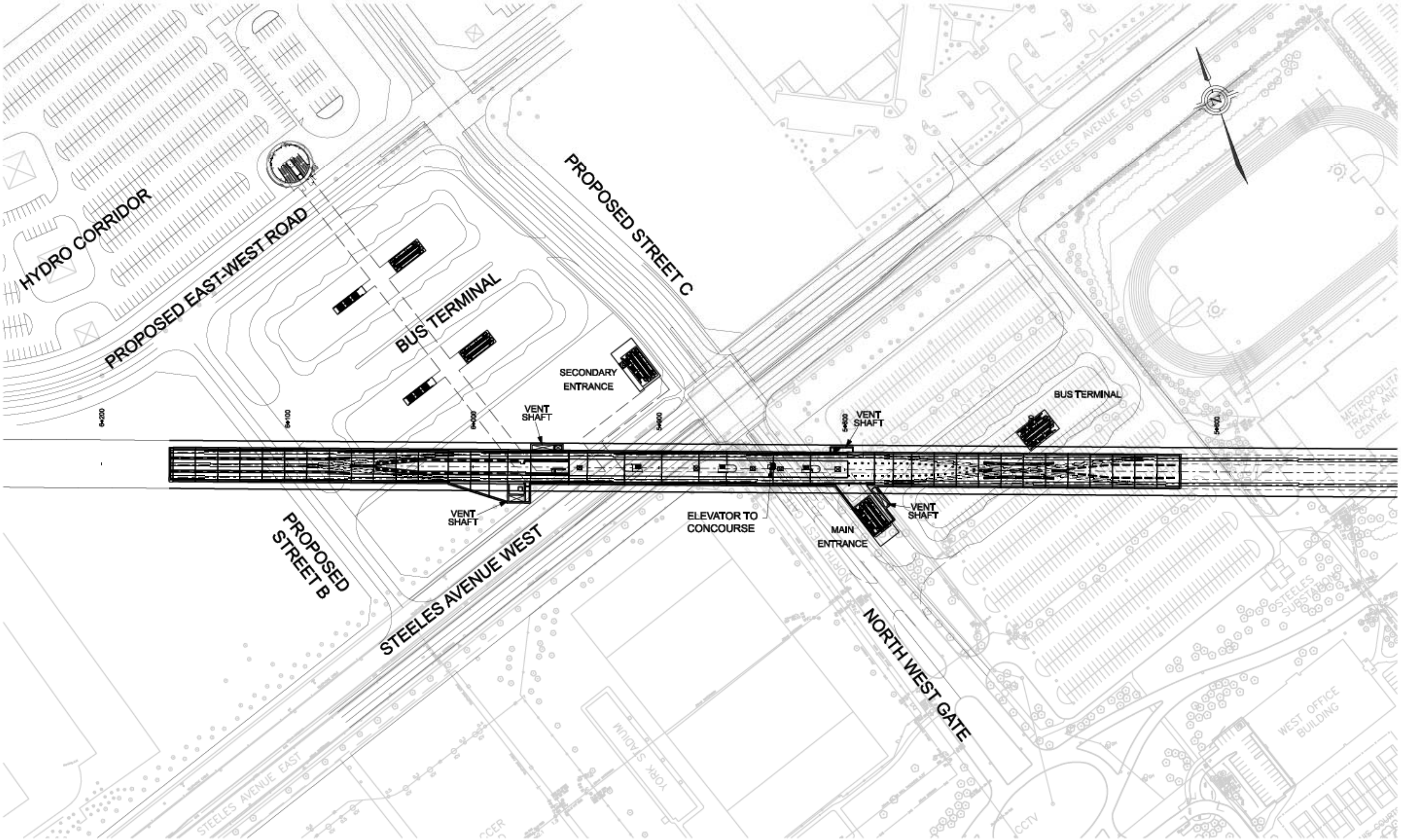
TORONTO

URS

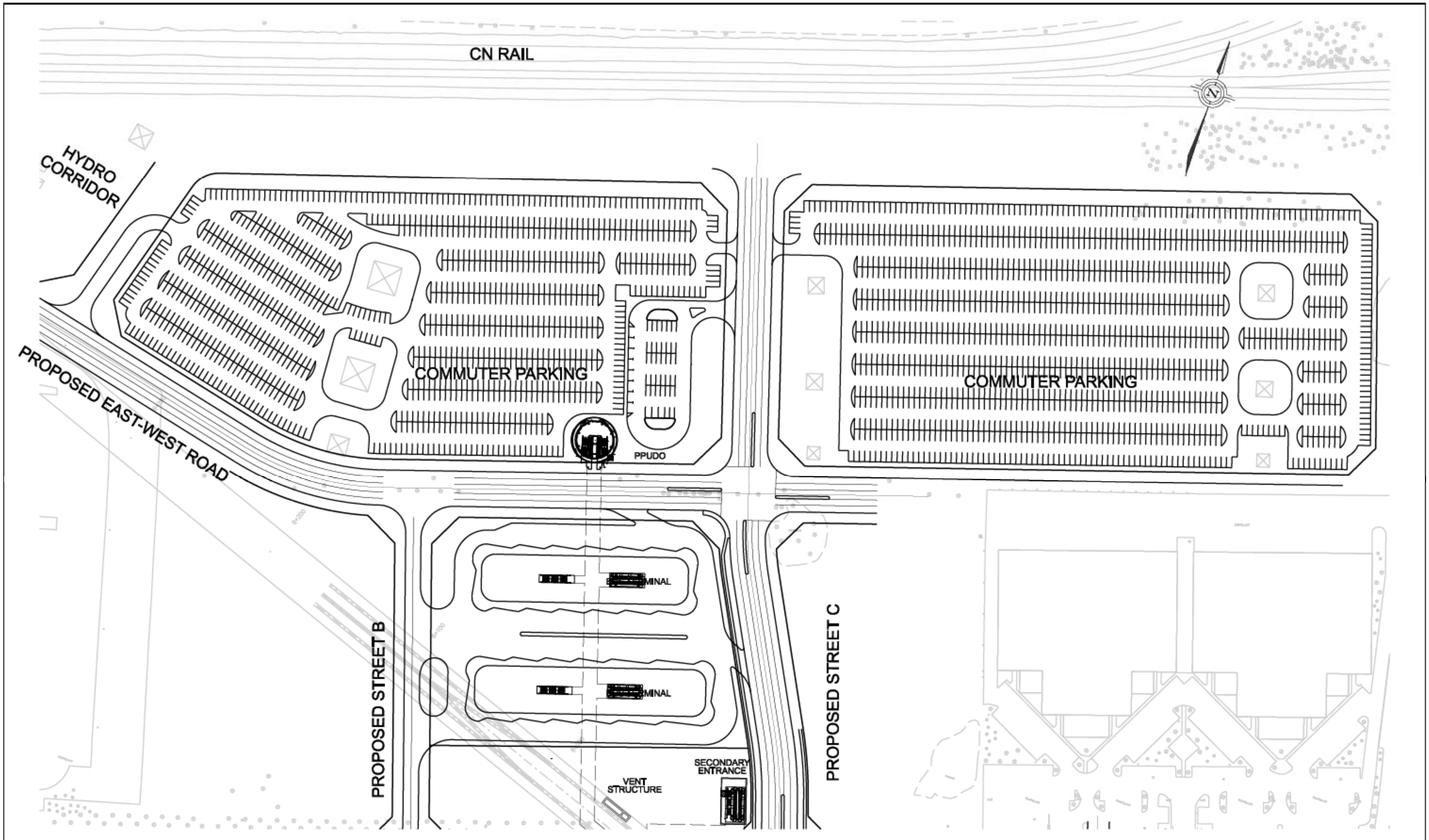
SPADINA SUBWAY EXTENSION ENVIRONMENTAL ASSESSMENT

STEELES WEST STATION
CONCOURSE LEVEL

SCALE	HORZ. 0 10 20 30 40m
DATE	JANUARY 2006
EXHIBIT	DWG. NO. 0317-A-11



SPADINA SUBWAY EXTENSION ENVIRONMENTAL ASSESSMENT	SCALE	
STEELES WEST STATION PLATFORM LEVEL	DATE	JANUARY 2006
	EXHIBIT	DWG. NO. 0317-A-12



TORONTO

URS

SPADINA SUBWAY EXTENSION ENVIRONMENTAL ASSESSMENT

STEELES WEST STATION
SURFACE FACILITIES

SCALE	HORZ. 0 10 20 30 40m
DATE	JANUARY 2006
EXHIBIT	DWG. NO. 0317-A-13

Effects of the Undertaking on the Environment

8.0 Phase Three – Detailed Assessment of the Effects of the Undertaking

8.1. Introduction

This section of the EA:

1) Describes the environment that will be affected or might reasonably be affected;
2) Describes the potential effects;
3) Describes mitigation measures (to minimize, manage, prevent and avoid environmental effects); and
4) Proposes monitoring and contingency measures for the Undertaking described in section 7.0 (if required).

In accordance with the Environmental Assessment Act, this section also evaluates the advantages and disadvantages to the environment.

8.1.1. Interactions Between the Undertaking and the Environment

As a further refinement to Table 6 from the EA ToR, the environmental components that may be affected by various components of the Undertaking were identified using an interactions matrix. The interactions matrix is designed to scope the types and level of significance of environmental effects that may be encountered for this project and the level of detail that may be necessary to address those environmental effects.

The environmental effects of the Undertaking can be classified under three categories:

1) **Displacement of Existing Features by Subway Facilities** – These include existing features with the Study Area which will be directly affected by the introduction of the subway tunnels, stations, commuter facilities and ancillary facilities;
2) **Construction Impacts** – These are short-term potential impacts resulting from construction activities; and
3) **Operational Impacts** – These are ongoing, long-term effects arising from the operation and maintenance of the Spadina Subway Extension.

The level of interaction between an activity/component and an area of potential environmental effect includes: none, weak, moderate and strong. These terms were defined as follows:

1) None = no probability of an interaction or the interaction has no significance to society. As a result, no additional discussion and documentation is required in support of this EA.
2) Weak = a low probability of an interaction or the interaction has low significance to society. A general discussion is provided in this section, but given the anticipated low probability and/or significance, no additional commitments or follow up actions are required.
3) Moderate = a moderate probability of an interaction or the interaction has moderate significance to society. A more detailed discussion accompanied with supporting supplemental analysis and possible mitigating measures and commitments.
4) Strong = a high probability of an interaction or the interaction has a high level of significance to society. These issues are usually regulated or closely monitored by government agencies and will required detailed analysis to quantify the potential impact and the anticipated effect of mitigation measures. Future commitments for elements with strong interactions are addressed by this project.

The interactions matrix helped to establish the scope of the environmental assessment and reveal which project components have a significant interaction with environmental components. The interactions matrix is presented in Table 8-1. The subsequent sections will discuss

For each of the environmental effects identified in Table 8-1, the following sections:

5) Describe the effects,
6) Identify mitigation measures,
7) Describe the monitoring program, and
8) Recommend contingency measures, as required.

Notes for Table 8-1:

1) Level of Interaction: "-" = None "W" = Weak "M" = Moderate "S" = Strong
2) Ecological Landscapes is a feature of the environment that is considered not applicable based on the conditions present within the Study Area.
3) Impacts to residences are indirect - refer to noise, vibation and air quality.
4) For Impacts to community / recreational / institutional, refer to buildings and property, noise and vibration.
5) For impacts to human health and safety, refer to air quality, automobile and transit service, pedestrian and cyclist movements.
6) Dust, mud and litter are addressed in air quality, soil and aesthetics.
7) For impacts to Land use, refer to business disruption, aesthetics and buildings and property - also see net benefits.
8) Method of Construction for Displacement of Existing Features is provided for reference only. Construction related impacts are discussed in "Construction".
9) C&C - Cut and Cover Construction.
10) T - Tunneling by Earth Pressure Balanced Tunnel Boring Machines.
11) Operational impacts to rail associated with the possible GO station are not considered by this EA, since a new GO Rail station will be the subject of a separate Environmental Assessment by GO Transit.

Table 8-1: Interactions Matrix

	Environmental Features / Facilities/Activities	Natural Environment: Soils (subsection 1)	Groundwater (subsection 2)	Surface Water (subsection 3)	Communities/Ecosystems (subsection 4)	Populations/Species (subsection 5)	Air Quality (subsection67)	Emissions: Noise (subsection 7)	Vibration (subsection 8)	Electromagnetic Interference (EMI) (subsection 9)	Stray Current (subsection 10)	Socio-Economic: Utilities (subsection 11)	Buildings and Property (subsection 12)	Business Disruption (subsection 13)	Aesthetics (subsection 14)	Human Health and Safety (subsection 15)	Culture: Archaeology (subsection 16)	Cultural Heritage (subsection 17)	Transportation: Automobile Traffic and Transit Service (subsection 18)	Pedestrians and Cyclists (subsection 19)	Rail (subsection 20)*
8.2 Displacement of Existing Features	Downsview Station to Parc Downsview Park (T)	-	W	-	-	-	-	-	-	-	-	-	S	-	-	-	-	-	-	-	-
	Sheppard Avenue to Sheppard West Station (C&C)	-	W	-	-	-	-	-	-	-	-	-	S	-	-	-	W	-	-	-	-
	Sheppard West Station (Platform, Concourse, Entrances) (C&C)	-	W	-	M	W	-	-	-	-	-	-	S	-	M	-	W	-	-	-	-
	Sheppard West Station to Finch West Station (T)	-	W	-	-	-	-	-	-	-	-	-	S	-	-	-	-	-	-	-	-
	Crossover South of Finch West Station (C&C)	-	W	-	-	-	-	-	-	-	-	-	S	-	-	-	-	-	-	-	-
	Finch West Station (Platform, Concourse, Entrances) (C&C)	-	W	-	-	-	-	-	-	-	-	-	S	-	M	-	-	-	-	-	-
	Finch West Station - Parking Lot	-	W	S	M	M	-	-	-	-	-	-	S	-	S	-	W	-	-	-	-
	Finch West Station - Bus Terminal	-	W	S	-	-	-	-	-	-	-	-	S	-	S	-	-	-	-	-	-
	Finch West Station - PPUDO	-	W	S	-	M	-	-	-	-	-	-	S	-	S	-	W	-	-	-	-
	Finch West Station to York University Station (T)	-	W	-	-	-	-	-	-	-	-	-	S	-	-	-	-	-	-	-	-
	York University Station (Platform, Concourse, Entrances) (C&C)	-	W	-	-	-	-	-	-	-	-	-	S	-	M	-	-	W	-	-	-
	York University Station to Steeles West Station (T)	-	W	-	-	-	-	-	-	-	-	-	S	-	-	-	-	-	-	-	-
	Crossover South of Steeles West Station (C&C)	-	W	-	-	-	-	-	-	-	-	-	S	-	-	-	-	-	-	-	-
	Steeles West Station (Platform, Concourse, Entrances) (C&C)	-	W	-	-	-	-	-	-	-	-	-	S	-	M	-	W	-	-	-	-
	Steeles West Station - Parking Lots	-	W	S	M	M	-	-	-	-	-	-	S	-	S	-	W	-	-	-	-
	Steeles West Station - Bus Terminal	-	W	S	M	M	-	-	-	-	-	-	S	-	S	-	W	-	-	-	-
	Steeles West Station - PPUDO	-	W	S	-	M	-	-	-	-	-	-	S	-	S	-	W	-	-	-	-
	Tailtrack North of Steeles West Station (C&C)	-	W	-	-	-	-	-	-	-	-	-	S	-	-	-	W	-	-	-	-
	Emergency Exit Buildings	-	W	-	-	-	-	-	-	-	-	-	S	-	M	-	-	-	-	-	-
	Ventilation Shafts	-	W	-	-	-	-	-	-	-	-	-	S	-	M	-	-	-	-	-	-
8.3 Construction Impacts	Building Demolition	-	-	S	-	-	W	M	M	-	-	W	S	S	M	S	-	W	-	-	-
	Contaminated Site Clean up	S	W	S	-	-	W	-	-	-	-	-	-	-	-	S	-	-	-	-	-
	Surface Utility Relocation	-	-	-	-	-	-	-	-	-	-	S	W	W	-	-	-	-	W	W	-
	Subsurface Utility Relocation	W	-	-	-	-	-	-	-	-	-	S	W	W	-	-	-	-	W	W	-
	Cut-and-cover Construction	W	M	-	M	M	W	S	S	-	-	-	M	W	M	W	W	-	S	S	S
	Tunnelling	W	M	-	-	-	-	-	W	-	-	S	W	-	M	W	-	-	-	-	-
	Soil Removal and Disposal	S	-	-	-	-	W	-	-	-	-	-	-	-	M	-	W	-	-	-	-
	Dewatering	S	M	-	S	S	-	-	-	-	-	S	-	-	-	-	-	-	-	-	-
	Unwatering - (surface water)	-	-	S	W	W	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Reinforcement of Existing Buildings	W	-	-	-	-	-	-	S	-	-	-	S	W	-	W	-	W	-	-	-
	Erosion and Sedimentation Control	W	-	S	-	-	-	-	-	-	-	-	-	-	M	-	-	-	-	-	-
	Heavy Equipment Operations and Maintenance	-	W	W	-	-	W	S	M	-	-	-	-	-	M	W	-	-	-	-	-
	Traffic Management	-	-	-	-	-	W	-	-	-	-	-	-	W	-	W	-	-	S	S	-
	Material Import/Storage/Stockpiling	-	-	-	-	-	-	-	-	-	-	-	S	W	M	-	-	-	W	W	-
8.4 Operations and Maintenance	Subway Operations	-	-	-	-	-	-	M	W	M	M	-	-	-	-	-	-	-	-	-	-
	Track and Structure Maintenance	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Stormwater Management	-	-	S	W	W	-	-	-	-	-	-	-	-	W	-	-	-	-	-	-
	Bus Operations	-	-	-	-	-	S	S	M	-	-	-	-	W	-	-	-	-	M	W	-
	Parking and PPUDO	-	-	-	-	-	S	S	-	-	-	-	-	W	-	-	-	-	S	W	-
	Station Maintenance (Cleaning, Deliveries, State of Good Repair)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	M	-	-	-	-	-
	Testing of Emergency Equipment	-	-	-	-	-	-	S	-	-	-	-	-	-	-	-	-	-	-	-	-

8.2. Displacement of Existing Features

This section discusses the permanent displacement impacts associated with the built form (i.e. tunnels, station entrances, parking lots, etc.) of the Undertaking. Impacts that are temporary and occur only during construction are discussed in detail in section 8.3. The operations and maintenance of the Undertaking (i.e. subway trains operating along this extension, the feeder bus network at Finch West Station and Steeles West Station, associated automobile traffic for the commuter parking and PPUDO) are discussed in detail in section 8.4.

8.2.1. Soils

There are no permanent displacement impacts associated with the Undertaking. All impacts are transient and relate to the construction of the Undertaking (see subsection 8.3.1 for details).

8.2.2. Groundwater

As geodrains and other permanent dewatering systems are not used around the running structure no long-term effect on ground water is anticipated. There are no permanent displacement impacts associated with the Undertaking. All impacts are transient and relate to the construction of the Undertaking (see 8.3.2 for details).

8.2.3. Surface Water

The proposed subway extension alignment generally follows the divide between the Black Creek subwatershed and the West Don River subwatershed. As a result, surface water is generally conveyed away from each of the proposed station locations.

With the exception of Finch West Station and Steeles West Station, where commuter parking lots and bus terminals are proposed, increases in impervious area resulting from the undertaking consist mainly of entrance buildings. In the vicinity of Steeles West Station, the proposed York Region Inter-regional Transit Terminal and commuter parking, including the proposed roads that will provide access to them, are addressed as part of York Region's Highway 7 Corridor and Vaughan North-South Link Public Transit EA. The proposed GO Transit platform at Sheppard West Station will be addressed under a separate GO Transit Environmental Assessment. Table 8-2 provides a summary of these increased impervious areas:

Table 8-2: Increased Impervious Areas Resulting from the Undertaking

Location	Proposed Facility	New Impervious Area (ha)
Sheppard West Station	Entrances	0.2
Finch West Station	Commuter Parking Lot	2.3
	Passenger Pick-up/Drop-off	0.3
	Bus Terminal / Roads / Entrances	1.2
York University Station	Entrances	0.1
Steeles West Station	East Commuter Parking Lot	5.2
	West Commuter Parking Lot[10]	4.9
	Inter-Regional Bus Terminal and Entrances	2.1

The placement of these permanent facilities with impervious areas may affect the drainage characteristics of the subwatersheds. Other permanent facilities include the proposed GO Station Platform at Sheppard West Station (addressed under a separate GO Transit EA) and the proposed bus terminal on York University lands south of Steeles (to be located on an existing paved area).

Mitigation

Design criteria have been established by the City of Toronto in accordance with the Wet Weather Flow Management Policy (August 2003) and Sewer Use By-law (available on the City of Toronto's website and interim objectives to address water balance, water quality and water quantity. TTC's Design Standards, Volume 1 has also established criteria to address both surface water quantity and quality.

To offset these potential impacts, lot level conveyance controls will be implemented to reduce peak run-off rates. The proposed approach to Stormwater Management is summarized in Table 8-3 and described in detail in the supporting Stormwater Management Report (see Appendix O).

[10] A portion of this lot and all associated road improvements are addressed in the Highway 7 Corridor and North-South Transit Connection in Vaughan EA" by York Region.

Table 8-3: Stormwater Management for Subway Stations

Station	Recommended Design		
	Quantity Control	Quality Control	Water Balance
Sheppard West	Roof Control Drains on all above ground buildings.	Not Required.	City of Toronto's Water Balance Requirements
Finch West	Roof Control Drains on all above ground buildings. Lot level conveyance controls including parking lot storage.	Oil / grit separators for PPUDO, commuter parking lots and bus terminals, as part of a "treatment train" approach to stormwater management.	City of Toronto's Water Balance Requirements
York University	Roof Control Drains on all above ground buildings. Incorporate into York University's Storm water Management Master Plan.	Not Required.	City of Toronto's Water Balance Requirements
Steeles West	Roof Control Drains on all above ground buildings. Incorporate into future Master Stormwater Management Plan as per draft OPA 620.	Incorporate into future Master SWM Plan as per draft OPA 620. Interim SWM Plan proposes Oil / grit separators for PPUDO, commuter parking lots and bus terminals, as part of a "treatment train" approach to stormwater management	City of Toronto's Water Balance Requirements

Quality control has not been considered for the proposed Sheppard West and York University stations due to the absence of pollution sources (i.e. no paved areas) at these sites.

Monitoring

The City of Toronto operates and maintains a network of rainfall gauges. The information is used to determine sewer sizes and the influence/impact of storms of various sizes on the existing sewer system and on streams (floods).

The City collects and analyses water samples from sewers, at sewer outfalls, in stream and at the lakefront for a variety of management reasons. For example, lake water sample results are used to determine the suitability of the water for swimming; sample results from sewers and at sewer outlets are used to determine, trace and to correct the discharge of prohibited pollutants to its sewer systems.

8.2.4. Communities/Ecosystems

An ecological community is an assemblage of species at a particular time and place. An ecosystem is all of the organisms in a given place in interaction with their non-living environment.

Environmental Effects

The alignment and station locations recommended for the Spadina Subway Extension avoid most of the communities/ecosystems located within the Study Area. However, a number of terrestrial communities/ecosystems will be displaced by subway facilities. All vegetation communities located within the Study Area are considered widespread and common in Ontario and secure globally and locally. No aquatic communities/ecosystems will be displaced by subway facilities.

In areas of cut-and-cover construction, open excavation and ground disturbance cultural meadow (CUM1-1) vegetation communities/ecosystems will be displaced. Displacement will occur in four locations:

1) The Dry-Moist Old Field Meadow (CUM1-1)/Agricultural (AGR) community located on the north side of Steeles Avenue between Jane Street and Keele Street;
2) The Dry-Moist Old Field Meadow (CUM1-1) community located west of Keele Street in the vicinity of Murray Ross Parkway;
3) The Dry-Moist Old Field Meadow (CUM1-1)/Reed-canary Grass Mineral Meadow Marsh (MAM2-2) community located east of Keele Street in the vicinity of Murray Ross Parkway; and,
4) The Dry-Moist Old Field Meadow (CUM1-1) community located south of Sheppard Avenue between Keele Street and Dufferin Street (Parc Downsview Park).

A summary of the potential removals of vegetation communities located within footprint areas of subway facilities is presented in Table 8-4. These predominantly cultural meadow communities are in an early stage of ecological succession, have been disturbed extensively in the past (or continue to be disturbed) and have low wildlife habitat capability. As a result, the loss of these vegetation communities will have no significant adverse environmental effects.

Table 8-4: Summary of Vegetation Removals, Mitigation Measures and Net Environmental Effects

ELC Community	Location (s)	Site Specific Impacts	Proposed Mitigation	Net Environmental Effect
CUM1-1/ AGR	• North side of Steeles Avenue midway between Jane Street and Keele Street for the Steeles West Station box and parking facilities	• Removal of approximately 11.9 ha of CUM1-1/AGR	• Incorporate vegetation communities into site design, where practical • Delineate work zone using construction fencing/tree protection barrier • Restore disturbed areas with native species, where practical • Transplant suitable plant material into nearby protected areas	• Loss of approximately 11.9 ha of CUM1-1 / AGR on site • Little opportunity to restore vegetation on site • Opportunities for restoration in hydro corridor
CUM1-1	• West side of Keele Street south of Murray Ross Parkway for the Finch West Station parking facilities	• Removal of approximately 0.16 ha of CUM1-1	• Incorporate vegetation communities into site design, where practical • Delineate work zone using construction fencing/tree protection barrier • Restore disturbed areas with native species, where practical • Transplant suitable plant material into nearby protected areas	• Loss of approximately 0.16 ha of CUM1-1 on site • Little opportunity to restore vegetation on site • Opportunities for restoration in hydro corridor
CUM1-1/ MAM2-2	• East side of Keele Street south of the eastern terminus of Murray Ross Parkway for the Finch West Station parking facilities	• Removal of approximately 1.7 ha of CUM1-1/ MAM2-2	• Incorporate vegetation communities into site design, where practical • Delineate work zone using construction fencing/tree protection barrier • Restore disturbed areas with native species, where practical • Transplant suitable plant material into nearby protected areas	• Loss of approximately 1.7 ha of CUM1-1/ MAM2-2 • Little opportunity to restore vegetation on site • Opportunities for restoration in hydro corridor
CUM1-1	• South side of Sheppard Avenue midway between Keele Street and Dufferin Street for the Sheppard West Station box and cut-and-cover tunnel construction on Parc Downsview Park lands	• Removal of approximately 2.33 ha of CUM1-1	• Incorporate vegetation communities into site design, where practical • Delineate work zone using construction fencing/tree protection barrier • Restore disturbed areas with native species, where practical • Transplant suitable plant material into nearby protected areas	• Loss of approximately 2.33 ha of CUM1-1 on site • Opportunities for restoration of approximately 1.50 ha on site in areas of cut-and-cover construction • Other opportunities for restoration within Parc Downsview Park

Mitigation

Given the area, type, significance and sensitivity of vegetation communities/ecosystems to be displaced by the Spadina Subway Extension, mitigation measures are limited. During design, efforts will be made to incorporate vegetation communities/ecosystems into subway design to the extent possible. In areas where no vegetation removals are required, construction fencing will be used to isolate the work area. Suitable plant material located in areas to be cleared will be transplanted to nearby protected areas. Following construction of the subway tunnel in areas of cut-and-cover construction, soil will be placed over the subway tunnel and vegetation should be restored through induced or natural regeneration. Restoration plans to be prepared during detail design should follow a net gain approach.

Monitoring

In the event that works must be undertaken within vegetation communities/ecosystems, TTC will monitor the health of the trees during construction. Vegetation communities that have been restored will be monitored for one year following construction to ensure the survival of vegetation.

Contingency

If it is determined that tree health is failing or has failed, then the tree (or shrub) will be replaced with the identical species and growth.

8.2.5. Populations/Species

A population is a group of individuals of the same species located in a particular time and place. Species are a group of related plants or animals all sharing common attributes.

Environmental Effects

Ornamental and naturally occurring vegetation is located along City streets and on private land within the Study Area. This vegetation provides habitat for birds and small mammals, shade, soil stabilization, aesthetic appeal and carbon cycling through respiration. In areas of cut-and-cover construction (see section 7.0 for details), ornamental and regenerating vegetation may be displaced. An inventory of trees and shrubs was conducted in areas to be displaced by subway facilities. Based on this inventory, it is estimated that approximately 1400 trees and shrubs will be lost including 708 trees with a dbh greater than 10 cm, 240 tree saplings and 452 shrubs. These trees and shrubs will be lost primarily at Sheppard West Station, Finch West Station and Steeles West Station.

Two species of conservation concern are located in areas of vegetation removals. One Red Cedar (***Juniperus virginiana***) is planted and not naturally occurring in the Study Area. The red cedar has a dbh of 2 cm and is located within the Dry-Moist Old Field Meadow Type (CUM1-1) community along the Finch hydro corridor. Red cedar is uncommon in the Greater Toronto Area and is rare in the City of Toronto. As this specimen is likely planted, its significance is diminished. Dudley's rush (***Juncus dudleyi***) occurs in a dense population scattered throughout the Dry-Moist Old Field Meadow Type (CUM1-1) and Reed-Canary Grass Mineral Meadow Marsh Type (MAM2-2) communities along the Finch hydro corridor in the vicinity of Keele Street. Dudley's rush is uncommon in the City of Toronto.

No wildlife species of management concern beyond the local (municipal jurisdiction) level were noted during field investigations. Ten breeding bird species observed in the Study Area have been identified by Bird Studies Canada (BSC) as species of conservation priority. In addition, three species of birds (Eastern Wood-pewee, Black-capped Chickadee and Eastern Meadowlark) have been identified by TRCA as species of concern within the City of Toronto. The ecology of these species is described in the Natural Heritage Report (see Appendix E). These bird species are distributed widely, and are encountered commonly, in a range of habitats in the GTA and throughout their Ontario range. However, these species should be protected from harm during site clearing activities.

The "incidental take" of migratory birds and the disturbance, destruction or taking of the nest of a migratory bird are prohibited under the ***Migratory Birds Convention Act***. "Incidental take" is the killing or harming of migratory birds due to actions such as construction.

Mitigation

The City of Toronto's Parks and Recreation Division regularly updates and verifies the type, ownership, condition and status of all street trees. It also sets out schedules for replacement of damaged, dying or dead trees, usually during the following growing season. TTC will work closely with the City of Toronto's Urban Forestry staff, the City of Vaughan's Parks and Recreation Division and TRCA to ensure that current standards for tree plantings, including species and sizes are applied.

TTC will monitor the health of the trees during construction. Once all construction activities are complete, this monitoring program will continue into the following growing season. For vegetation that need not be removed to facilitate the construction of permanent works, TTC will avoid disturbing soil within the drip line of trees and shrubs. Areas that are not required for subway construction will be isolated from the work area using construction fencing.

In accordance with TTC's Design Standards, TTC will preserve existing landforms and vegetation wherever possible and will encourage naturalization in suitable low use areas to minimize the need for landscape maintenance. TTC will investigate opportunities during detail design to transplant species of conservation concern into secure areas prior to site clearing. Suitable plant material will also be identified for transplanting to nearby protected areas. While the red cedar specimen can be transplanted readily, Dudley's rush would require stripping off the turf layer, moving the turf layer to a suitable location and laying the turf layer down. The turf layer would also contain invasive/exotic species that should not be transplanted. As a result, transplanting Dudley's rush may not be practical.

TTC will implement construction timing restrictions to avoid nesting/breeding periods for wildlife, including migratory birds. As a result, wildlife habitat will not be removed from April 1 to July 31, where possible. If vegetation clearing is required during the nesting season, TTC will retain a qualified avian biologist to conduct a nesting survey. If active nests are found, TTC will prepare a site-specific mitigation plan in consultation with the Canadian Wildlife Service. Prior to vegetation clearing, wildlife capture/relocation and dispersal techniques will be used to protect wildlife from physical harm. As a result, the subway extension will have no significant adverse effects on wildlife species/populations.

Monitoring

TTC will monitor the health of the trees planted during construction. Once all construction activities are complete, this monitoring program will continue into the following growing season.

Contingency

If it is determined that tree health is failing or has failed due to construction activities, then the tree (or shrub) will be replaced with the identical species and growth.

8.2.6. Air Quality

There are no permanent displacement impacts associated with the Undertaking. There are transient impacts that relate to the construction of the Undertaking and localized impacts associated with the vehicular activity that will be associated with bus and automobile operations at Finch West Station and Steeles West Station (see subsections 8.3.6 and 8.4.6 for relevant discussions on both).

8.2.7. Noise

There are no permanent displacement impacts associated with the Undertaking. There are transient impacts that relate to the construction of the Undertaking and localized impacts associated with the vehicular activity that will be associated with bus and automobile operations at Finch West Station and Steeles West Station. (See subsections 8.3.7 and 8.4.7 for relevant discussions on both).

8.2.8. Vibration

There are no permanent displacement impacts associated with the Undertaking. There are transient impacts that relate to the construction of the Undertaking and localized impacts associated with the vehicular activity for the operation of the subway, buses and automobiles (see subsections 8.3.8 and 8.4.8 for relevant discussions on both).

8.2.9. Electromagnetic Interference (EMI)

There are no permanent displacement impacts associated with the Undertaking. There are localized impacts associated with the operation of the subway (see section 8.4.9).

8.2.10. Stray Current

There are no permanent displacement impacts associated with the Undertaking. There are transient impacts that relate to the operation of the subway (see section 8.4.10).

8.2.11. Utilities

Environmental Effects

Underground utilities greater than 1000 mm in diameter have been noted and indicated on the plan and profile drawings. Of note are three watermains in the vicinity of Keele Street: the 1350 diameter watermain under centre of Keele Street, the 1050 mm diameter water main along the east side of Keele Street north of Finch Avenue, and the 1800 mm diameter watermain located at the intersection of Keele Street and Murray Ross Parkway. Also, storm sewer systems located underneath Finch Avenue and Steeles Avenue will be affected by the respective subway stations. In addition, there are numerous smaller underground and aboveground utilities within all existing road right of ways that are in conflict with the Undertaking.

Within York University two large storm sewers outletting into Black Creek (via Stong Pond), which will require realignment. Also a sanitary sewer within the York University lands will require relocation. Remaining utilities in the vicinity of Downsview Station are smaller in nature. The Study Area also includes the crossing of two hydro corridors. Oil pipelines are present within these corridors.

In response to a motion passed as part of the November 28, 2005 Toronto Transit Commission during the design phase will consult with Toronto Water and Technical Services to coordinate the City's plans for the construction of a new sanitary sewer along Keele Street, from Sheppard Avenue to Grandravine (a Schedule A project under the Municipal Class EA Process).

Within the Hydro corridors, there are overhead high voltage transmission lines. The Undertaking is sufficiently offset from the associated towers and therefore no impact is anticipated. Also, within the Finch hydro corridor, there are six (6) high pressure oil pipelines.

Mitigation

By tunnelling the majority of the Undertaking that is within road rights of way and York University lands, impacts are largely avoided. This includes all Ontario Hydro high voltage transmission lines and the oil pipelines in the Finch Hydro Corridor.

For project elements that are to be constructed by cut-and-cover, two approaches will be used:

1) For small utilities that are not in direct conflict with the permanent works, temporary support through the construction site is possible; and
2) For utilities that will be in direct conflict with the permanent works or for large utilities that cannot be temporarily braced, these utilities will be relocated.

For all utilities that will be relocated, relocation plans and construction activities will be undertaken in accordance with the ***Road Rights of Way Act a***nd with the City's Requirements for the Installation of Services within the City of Toronto Road Allowance (latest edition). The net effect will be the retention of all services within the area (i.e. no permanent displacement of affected utilities).

8.2.12. Buildings and Property

Environmental Effects

Approximately 40% of the subway alignment utilizes the municipal road allowance. However, certain sections of the alignment cross under private property. In addition, portions of private holdings will need to be acquired along the proposed alignment to accommodate bus terminals, station entrances and emergency exit buildings.

There are three basic types of property acquisition necessary in order to obtain the parcel of land required to construct the system:

1) Full Taking – an entire piece of privately owned property including air rights. This is required where a surface facility, such as a bus terminal, will occupy all of the affect property.
2) Partial Taking – a portion of privately owned property. This would occur in an instance where a surface feature (such as an Emergency Exit Building) occupies only a small portion of the overall property. The lands required by TTC would be severed from the remaining property.
3) Subsurface Easement – an underground corridor through a property, which does not preclude the construction of buildings and structures over and adjacent to such easement. This would apply for all tunnelled sections of the subway extension.

At present, Table 8-5 illustrates the property acquisition requirements have been identified:

Table 8-5: Property Acquisition Requirements

Address	Full Taking	Partial Taking	Subsurface Easement
11-15 Kodiak Crescent	N/A	N/A	Tunnel
23 Kodiak Crescent	N/A	N/A	Tunnel
40 Kodiak Crescent	N/A	N/A	Tunnel
44-44A Kodiak Crescent	N/A	N/A	Tunnel
1150 Sheppard Avenue W	N/A	N/A	Tunnel
1170 Sheppard Avenue W	N/A	EEB	Tunnel
Parc Downsview Park	N/A	Sheppard West Subway Station, EEB	Tunnel/ Cut-and-Cover
3645 Keele Street	N/A	N/A	Tunnel
3655 Keele Street	N/A	N/A	Tunnel
3675-3677 Keele Street	N/A	N/A	Tunnel
3685 Keele Street	N/A	EEB	Tunnel
3695 Keele Street	N/A	N/A	Tunnel
3701 Keele Street	N/A	N/A	Tunnel
3711 Keele Street	N/A	N/A	Tunnel
3933 Keele Street	N/A	Finch West Station Entrance	N/A
3939 Keele Street	N/A	Finch West Bus Terminal	N/A
3940 Keele Street	N/A	Finch West Station Entrance	N/A
3941 Keele Street	Finch West Bus Terminal	N/A	N/A
3955 Keele Street	Finch West Bus Terminal	N/A	N/A
3965 Keele Street	Finch West Bus Terminal	N/A	N/A
77 Street Regis Crescent	N/A	N/A	Tunnel
1280 Finch Avenue W	N/A	Finch West Bus Terminal	N/A
1290 Finch Avenue W	N/A	Finch West Bus Terminal	N/A
1300 Finch Avenue W	N/A	Finch West Bus Terminal	N/A
Imperial Oil Driveway	N/A	Bus Terminal	N/A
Shell Driveway	N/A	Commuter Parking	N/A
1 Four Winds Drive	N/A	Finch West Station Entrance	N/A
York University	N/A	Bus Terminal, Subway Station, EEB	Tunnel
2900 Steeles Avenue W	N/A	Bus Terminal	Cut-and-Cover
Hydro One	N/A	PPUDO, Commuter Parking	N/A

- Construction of parking lots on the Hydro right-of-way (Finch West/Steeles West Station) will likely have to be negotiated in the form of a long-term lease with Hydro One Inc. and ORC (Steeles West Station only).
- All of the subsurface easements, which are primarily required for the underground tunnels, will have to be acquired on a permanent basis.

The right of way under the CN Newmarket SD will be addressed through a crossing agreement between CN Rail and the City of Toronto.

The property required to implement the proposed road network and a portion of the bus terminal on the north side of Steeles Avenue is already addressed in the “Highway 7 Corridor and North-South Vaughan Public Transit Improvement EA” already filed by York Region.

All property acquisition required for the Undertaking will be conducted by the City of Toronto on behalf of the Toronto Transit Commission. For properties in York Region / City of Vaughan, acquisition will be coordinated with these municipalities.

All property needs identified in this EA are for the permanent works associated with the Undertaking. Given the preliminary nature of the design, no temporary needs have been identified. However, heavy equipment maintenance, storage / material lay-down areas and temporary easements for elements like temporary road diversions or temporary replacement parking are a requirement of subway construction. These needs will be identified during the design phase.

Mitigation

In acquiring property, the City of Toronto balances community need with the rights of the individual. The City’s objective is to ensure that individual rights are respected and protected, and to provide fair compensation within the framework of the Expropriations Act for any property acquired or affected by civic projects. The acquisition process emphasizes negotiation and the achievement of a mutually satisfactory agreement between the City and the owner. Only when negotiation has not produced an agreement, and property is required for construction to begin, will the City of Toronto initiate expropriation.

The steps in the process are as follows:

1) The City contacts the owner to indicate its interest in the property and to identify issues and concerns.
2) The City conducts surveys, appraisals, and other property-related assessments.
3) An offering price is discussed. If a tentative agreement is reached, an Offer to Sell is signed by the owner. The Offer is then sent to City of Toronto Council for approval and acceptance.
4) If discussions do not result in an agreement, the City initiates expropriation procedures. If time to construct is critical, the expropriation process may be initiated while negotiations are occurring.
5) If expropriation is pursued, the owner has a right to an independent inquiry called a Hearing of Necessity, which determines whether the City's property requirements are fair, sound and reasonably necessary.
6) The City approves the settlement and/or expropriation, and acquires the property.
7) If expropriated, the owner has the right to have compensation payable referred for arbitration to the Ontario Municipal Board.

The objective of the Expropriations Act is to put tenants and property owners in the same position they were in prior to the beginning of the civic project directly affecting their properties. Compensation is determined having regard for the Expropriations Act by experienced, qualified appraisers and other experts. Compensation is generally based on three factors:

1) Market Value: Market value is defined as "the amount that the land will be expected to realize if sold on the open market by a willing seller to a willing buyer". The date of expropriation is usually determined as the date to determine market value.
2) Damages Attributable to Disturbance: These damages refer to the economic loss suffered by an owner as a result of having to vacate expropriated property. This can include moving costs, temporary accommodation, redundant furnishings, or loss of business revenues and profitability. Compensation for damages of this type is determined after expropriation.
3) Damages for Injurious Affection: Injurious affection is sometimes referred to as "consequential damages." It has very precise and limited applications according to the law and can include items such as reduced market value and increased business operating expenses. Injurious affection is usually determined after expropriation.

The total property acquisition process and result compensation is intended to leave the affected owner “whole” and thereby mitigating the negative impact. Because the Ontario Realty Corporation and Parc Downsview Park (federal Crown Corporation) represent higher order levels of government, the City of Toronto does not have the authority to expropriate lands in the Hydro Corridors and Downsview Park.

8.2.13. Business Disruption

The issue of business disruption for those businesses that will be permanently displaced is discussed in 8.2.12 Buildings and Property. All business disruption impacts are transient and relate to the construction of the Undertaking (see 8.3.13 for details).

8.2.14. Aesthetics

Environmental Effects

Transit facilities will alter the visual setting of communities within which they are located. The changes brought about by the construction of a station, ventilation shafts and ancillary structures can either enhance or impair the visual setting of a community.

Mitigation

Particular attention will be paid to station layout and Emergency Exit Buildings during the design phase to ensure that the stations themselves will not intrude on residential or commercial areas from either a mass or architectural perspective. All plans are subject to local municipal approvals. Aesthetic impact of the stations will be dealt with in conjunction with adjacent development at the design phase.

Monitoring

Site Plan Approval is a form of development control authorized under section 40 of the ***Planning Act*** and implemented through the Cities of Toronto and Vaughan. This means the Cities have the authority to influence the design of certain types of development in addition to meeting requirements of the Cities Zoning By-laws and the Ontario Building Code.

Furthermore, the Site Plan Approval process is a public process, which means businesses and residents in the immediate area of the proposed works will be provided an opportunity to review and comment on the plans. The Site Planning process will apply for all amenities that will be visible (i.e. underground structures, including tunnelling will not be subject to this process). The Site Plan Approval process will provide information on:

1) The overall site layout;
2) Grading and servicing plan;
3) The details of any landscaping; and
4) Elevation and floor plans for buildings.

TTC will undertake additional public consultation during the design phase of the Stations and Emergency Exit Buildings, which will allow the public and key stakeholders to provide additional input into the design of these surface features.

8.2.15. Human Health and Safety

There are no permanent displacement impacts associated with the Undertaking. All impacts are transient and relate to the construction of the Undertaking. (See section 8.3.15).

8.2.16. Archaeology

Environmental Effects

The Stage 1 archaeological assessment for the Spadina Subway Extension Environmental Assessment determined that 15 archaeological sites have been registered within the Study Area. Additionally, a review of the general physiography and local nineteenth century land uses of the Study Area suggested that it exhibits archaeological site potential. Field reviews were conducted by archaeologists from ASI, and these focused on the alternative and recommended alignment. Although the alignment and stations mostly traverse an urban landscape and pass beneath buildings, roads, and parking lots, there are sections where the affected lands are undisturbed, including:

1) The Parc Downsview Park lands, including the site for Sheppard West Station;
2) Currently undeveloped lands within York University, including the various woodlots and lands south of The Pond Road; and
3) Lands currently undisturbed north of Steeles (in the general vicinity of Steeles West Station).

For these areas, there is a possibility of archaeological remains that could be displaced as a result of the Undertaking.

Mitigation

Disturbance to archaeological resources will only occur where construction activities disrupt the surface within the above identified areas. Since the subway will be tunneled under the identified York University Lands, the following recommendations are made:

1) A Stage 2 archaeological assessment of the preferred alignment should be conducted in accordance with the Ministry of Culture's Stage 1-3 Archaeological Assessment Technical Guidelines (1993), in order to identify any archaeological remains that may be present within the preferred alignment. ***However, this assessment will only be required on those sections identified during design that contain known sites or archaeological site potential and where construction activities will disturb the surface.***

   It should be noted that this recommendation is subject to Ministry of Culture (MCL) approval, and MCL considers it to be an offence to alter any archaeological site without MCL concurrence. No grading or other activities that may result in the destruction or disturbance of an archaeological site are permitted until notice of MCL approval has been received.

2) Otherwise, and with this exception, no additional archaeological assessment will be required, and the Undertaking can be considered clear of further archaeological concern.

Contingency

If cultural heritage resources (such as archaeological sites, artefacts, building and structural remains, and/or human burials) are discovered during excavation, the following procedures will apply[11]:

1) Work shall be suspended until an assessment has been completed by the Ministry of Culture; and
2) TTC shall perform required measures to mitigate negative impacts on found resources as required by the Ministry of Culture.

In addition, if human burials are encountered, the Registrar/Deputy Registrar of the Cemeteries Regulation Unit of the Ministry of Consumer and Business Services will also be notified.

8.2.17. Cultural Heritage

Based on available information a total of eleven (11) previously identified heritage resources and resource collections were found within the Study Area (Table 1). They include six (6) cultural landscapes and five (5) built heritage features. No further properties were identified during a field review of the area of focussed analysis.

Significant amongst the identified properties are the Beechwood Cemetery in the City of Vaughan (CLU 1), the Elia Episcopal Church and Cemetery (CLU 2, designated under Part IV of the Ontario Heritage Act), and both the north and south sites of Black Creek Pioneer Village in the City of Toronto (CLU 5 and 6, with five designated structures under the Ontario Heritage Act at 760 and 7100 Jane Street).

[11] Toronto Transit Commission Master Specification 05-06-28 – Section 02230, subsection 1.2.2

Although of relatively recent construction, several buildings associated with the original York University Campus have been listed on the City of Toronto's inventory of heritage properties. They include:

1) Winter's College (1967),
2) Staecie Science Library (1966),
3) Scott Library (1970),
4) Ross Building (1970),
5) Atkinson College (1966),
6) Tait McKenzie Physical Education (1966),
7) Petrie Sciences (1968),
8) Founder's College (1965),
9) Osgoode Hall Law School (1968),
10) McLaughlin College (1969),
11) Farquarson Life Sciences Building (1970)
12) Vanier College (1967),
13) Lecture Hall One (1966);
14) Behaviourial Sciences Building (1968); and
15) Vanier College (1969).

At present, none of the above heritage features are directly impacted by the Undertaking.

8.2.18. Automobile Traffic and Transit Service

There are no permanent displacement impacts associated with the Undertaking. There are transient impacts that relate to the construction of the Undertaking and localized impacts associated with bus and automobile activity for Finch West Station and Steeles West Station (see section 8.4 Operation and Maintenance).

8.2.19. Pedestrians and Cyclists

There are no permanent displacement impacts associated with the Undertaking. All impacts are transient and relate to the construction of the Undertaking (see 8.3.19 for details).

8.2.20. Rail

There are no permanent displacement impacts associated with the Undertaking. All impacts are transient and relate to the construction of the Undertaking. (Note: impacts to the rail activity on the CN Newmarket Subdivision / GO Bradford Rail Line associated with the construction of a new GO platform to allow transfers between TTC and GO will be the subject of a future EA by GO Transit).

8.3. Construction Impacts

The following discussion focuses on the major project elements and construction techniques that were described in section 7.0 and can be summarized as:

1) Cut-and-Cover – this includes all special track-work (crossovers south of Finch West and Steeles West Stations as well as tailtracks north of Steeles West Station), the alignment through Parc Downsview Park, each of the four stations and connection to and reworking of the northerly portion of the Downsview Station tailtracks; and
2) Tunnelling – the balance of the running structure that is not addressed by item 1 above.

Although construction related impacts might occur during the construction of surface features such as station facilities (including the bus terminals, PPUDO's and Commuter Parking) and EEB's, the environmental effects of these facilities extend beyond the construction stage and represent permanent environmental impacts. These affects have been discussed in section 8.2.

8.3.1. Soils

Environmental Effects

A comprehensive geotechnical and geo-environmental investigation program will be undertaken in the design phase. Subsequent engineering evaluations will be completed to assess the potential for adverse ground and surface feature displacements during construction. These investigations and analyses will result in preparation and implementation of design and construction strategies focused on limiting such adverse effects.

This project will generate a significant volume of surplus excavated material. In response, TTC will prepare and implement a comprehensive Soil and Groundwater Management Strategy, which will be consistent with past TTC projects and applicable legislation and regulations (Municipal, Provincial, and Federal).

Mitigation

Mitigation of ground and surface feature displacements will be achieved through both design and construction planning. Design will include, where warranted, proactive planning for additional ground stabilization (e.g. grouting or groundwater cut-off techniques), alternative structure or facility support (e.g. temporary utility bridges, structure underpinning), or selection of alternative construction methods so as to minimize the influence of construction on surface features (e.g. stiff excavation support systems). It is anticipated that groundwater extraction (dewatering) will have limited effects on ground subsidence based on early studies and past experience in the area. Proactive and frequent monitoring of surface features will be carried out prior to and during construction so that if displacements are observed that indicate trends toward adverse effects, response action and alternative construction plans can be implemented to avoid or minimize any adverse consequent effects.

A Soil and Groundwater Management Strategy will be developed such that the management of contaminated soils is conducted in accordance with environmental legislation, regulations and guidelines. Monitoring of excavated soil materials will be carried out in general accordance with the applicable recommendation outlined in the Ministry of the Environment (MOE) document ***Protocol for Analytical Methods Used in the Assessment of Properties Under Part XV.1 of the Environmental Protection Act*** (dated March 9, 2004). The contractor will also be required to conform to all Provincial and Local legislation, regulations, codes and requirements in the treatment, handling and disposal of soil and rock material, whether contaminated or clean, to other construction sites as fill materials or to regulated disposal facilities material.

For soils, which do not meet all of the MOE standards, handling and disposal requirements will be determined based on Toxicity Characteristic Leaching Procedure. Analytical results will be evaluated and compared with the applicable generic standards, as provided in ***Soil, Groundwater and Sediment Standards for Use Under Part XV.1*** of the Environmental Protection Act (EPA) (dated March 9, 2004). The standards are referenced in Ontario Regulation 153/04 (the Record of Site Condition Regulation), (O.Reg. 153/04) under the EPA.

Monitoring

This baseline monitoring will be undertaken in accordance with the Ontario Environmental Protection Act and will be documented in the Geotechnical Baseline Report, which will provide the necessary information for the handling and disposing of excess soil. The disposal of contaminated materials will be directed to an MOE approved soil treatment site or waste disposal site. The monitoring of these facilities is the jurisdiction of the Ministry of the Environment of Ontario.

Prior to construction, TTC will require the contractor to submit the name, location and type of licence of the designated soil disposal sites (as issued by MOE)

8.3.2. Groundwater

Environmental Effects

The Study Area is located between the valleys of the West Don River and Black Creek. The hydrogeology within the glacial deposits of the area can be relatively complex. The lower permeability glacial till layers tend to impede groundwater flow whereas the interstadial deposits of silt and sand serve as local shallow aquifers. Granular layers exhibit a pressure head elevation above the interface of the granular and low-permeability units (see Appendix D for details). Hydrostatic conditions (i.e. a single groundwater table) should not be assumed for any location within the Study Area.

Available geotechnical data suggests that the Upper Sand/Silt deposits are close to the surface and more extensive in the western limits of the Study Area. Based on mapping of groundwater discharge areas, and drain towards the valley of Black Creek. The detailed subsurface information and experience with other projects in the area suggest that though Upper Sand/Silt deposits may be hydraulically connected, they may also be interrupted by the overlying Upper Till deposits or lenses of cohesive materials within the Upper Sand/Silt deposits.

A Phase One subsurface investigation, which includes assessing local hydraulic conductivity, was undertaken along the preferred alignment to confirm the generally anticipated subsurface geotechnical and hydrogeologic conditions. Potential impacts to aquifers and recharge/discharge areas may result due to temporary dewatering activities or permanent changes to subsurface drainage patterns.

Mitigation

Mitigation of the need for temporary dewatering will include the use of earth pressure balance tunnelling methods and use of pre-cast segmental concrete linings with sealing gaskets to limit both short and long-term inflow of water into the temporary and permanent works where warranted. At cut-and-cover sections (e.g. stations or other special trackwork areas), temporary dewatering may also be limited through use of continuous excavation support wall systems to form barriers to groundwater flow into excavations where warranted.

Design of temporary and permanent works will be carried out to minimize permanent changes to subsurface groundwater flow patterns. Permanent tunnel linings will be designed to include watertight gaskets along all joints. During installation, the linings will also include cast-in-place grout between the excavated ground and lining to further limit the potential for groundwater ingress. Permanent cut-and-cover structures will also be designed to limit changes to groundwater levels or flow patterns. Such structures will be designed with waterproofing around all joints and include other leak prevention systems as warranted to limit ingress of groundwater. In addition, where contaminated groundwater is suspected to occur, measures will be implemented during excavation, temporary dewatering, and construction of the permanent works to create permanent barriers to migration of any encountered subsurface contaminants. Mitigation will include geotechnical and geo-environmental investigations, the preparation and implementation of a Soil and Groundwater Management Strategy, and the management of contaminated soils and groundwater in accordance with environmental legislation, regulations and guidelines.

Based on the dewatering assessment for Finch West Station and Steeles West Station, it was determined that conventional cut-and-cover construction at these two station locations will result in a groundwater taking that will exceed 50,000 l/day. However, it may be possible to minimize dewatering by use of a low-permeability excavation support system, such as secant pile walls as the water-bearing strata are partially between the ground surface and base of the excavation. Investigations, including pump tests should assist in defining conditions sufficiently deep below the base of the excavation to confirm whether or not water-bearing strata below the excavations might influence dewatering needs for construction. The need for dewatering and the potential flow quantities will be identified during the design phase. In the event that dewatering will exceed 50,000 l/day, a Permit to Take Water will be secured from MOE, with input from TRCA (for environmental effects – see section 8.3.4).

Monitoring

Most cut-and-cover operations for the construction of stations will require dewatering to reduce groundwater pressure and lower groundwater levels to allow for construction on stable undisturbed and substantially dry subgrade. To avoid adverse effects such as settlement of buildings or harmful alteration, disruption or destruction of natural habitat, two types of monitoring are employed:

1) Amount of Total Suspended Solids in the Dewatering Effluent – Unless required to be more stringent by the geotechnical engineer during design, is limited to 5 parts per million Total Suspended Solids. This monitoring is undertaken 12 hours after the commencement of pumping.

2) Ground Water Monitoring Wells (piezometers) - The measurement of groundwater levels are taken from piezometers generally situated within areas of excavation. As part of the baseline monitoring, a minimum of 2 sets of readings prior to the start of dewatering will be taken. The monitoring of water levels will be conducted on a daily basis while dewatering systems remain in operation. The monitoring program will include review and alert levels. If instrument readings exceed “review” levels, TTC and its contractor will jointly assess the necessity of altering the method, rate or sequence of construction. At “alert” groundwater levels, TTC can order construction operations to cease until the necessary mitigation measures are undertaken.

3) An Environmental Monitoring Plan - which will detail monitoring and mitigation measure for issues relating to fish, wetland and forest (see section 8.3.4) resources.

Recognizing the urban environment within which this project occurs, the disposal of groundwater will be to an existing storm or sanitary sewer and will be arranged by the contractor. The conditions and resulting monitoring and reporting requirements will be the subject of a water disposal permit with the City of Toronto and monitoring will include sampling and analysis carried out in accordance with the procedures, modified or validated by the City, as set out in the City document entitled “Quality System, Analytical Methods Manual,” as it may be amended from time to time. [Amended 2002-10-31 by By-law No. 855-2002]

8.3.3. Surface Water

Environmental Effects

During construction activities there is a potential for sediment-laden stormwater to enter watercourses including the Black Creek and the G. Ross Lord Reservoir, resulting in erosion and sedimentation.

Mitigation

Governmental documentation related to erosion control and sedimentation exists in the following four forms: legislation, guidelines and by-laws. Guidelines used within TRCA's jurisdiction include the most current editions the following:

1) MNR Technical Guideline: Erosion and Sediment Control (ESC),
2) GTA CA's Erosion and Sediment Control Guidelines for Urban Construction,
3) City of Toronto Sewer Use By-Law, and
4) MTO Drainage Management Manual (1995-1997).

Mitigation will be addressed in contract documents according to TRCA's Erosion and Sedimentation guidelines which explains the design, function, installation procedure, maintenance procedure, and removal procedure for each of the following ESC measures including, but not limited to sediment traps, interceptor swales/dykes, sediment control fences, straw bales, sodding etc.

Monitoring

Prior to construction, the contractor is required to submit comprehensive environmental controls and methods plan to address, among other elements, effluent (water) control. The effectiveness of this plan is monitored during a demonstration of the process that is undertaken before the Work can commence on site. A representative of TTC will undertake monitoring of plan compliance.

The construction process will result in exposed soil in areas such as the Hydro corridors during the construction of the commuter parking lots or the Downsview lands during the open cut construction of the running structure. Sediment and erosion control measures will be inspected regularly by TTC to ensure that these measures are maintained in proper working order until all areas are fully stabilized.

8.3.4. Communities/Ecosystems

Environmental Effects

The subway extension will be tunnelled under two woodlots located at York University: Boynton Woods, a Dry-Fresh Sugar Maple-Hardwood Deciduous Forest (FOD6-5); and Boyer Woods, a Dry-Fresh Deciduous Forest (FOD4). Groundwater drawdown associated with tunnelling activities may upset the water balance in the York University woodlots by creating a water deficit, or drought conditions. A temporary water deficit may result in inhibited growth and wilting of vegetation. A prolonged water deficit may lead to mortality or changes in the composition, structure or function of the woodlot. The relationship between the forest ecosystem water balance and the ability of vegetation to regulate any differences in water potential is influenced by the physical features of the site (topography, soils), the characteristics of the forest community (species composition, seral stage), moisture inputs (rain, snow) during the dewatering period, and the rate and duration of water table is drawn down caused by the dewatering process.

The subway tunnel in the vicinity of the York University woodlots will be approximately 15 m below ground level, a sufficient depth to avoid all root structures as well as the surface drainage regime. The subway tunnels will also be lined, so there will be no long-term loss of groundwater to the tunnels or migration laterally along the tunnel. The tunnel boring machine will advance at a rate of approximately 15 m per day. As a result, tunneling will only occur in the vicinity of the woodlots for several weeks. TTC proposes to use earth pressure balance (EPB) tunnelling technology so that the face of the TBM remains pressurized at all times and no dewatering will be required. Given the depth of the tunnel, the short duration of tunnelling activities in the vicinity of the woodlots and the use of an earth pressure balanced tunnel boring machine (TBM), potential effects on the York University woodlots as a result of tunnelling activities are considered negligible.

Groundwater drawdown may be required at Finch West Station, York University Station and Steeles West Station for cut-and-cover construction of the subway station. The zone of influence for groundwater drawdown at the subway stations will be confirmed through pumping tests and interpretation of groundwater conditions. If it is determined through further investigation that the York University woodlots are located within the zone of influence for groundwater drawdown, an Environmental Management Plan will be prepared detailing monitoring requirements, triggers/thresholds and contingency measures.

Mitigation

Potential impacts on the York University woodlots will be mitigated through the use of an earth pressure balance TBM.

Monitoring

The use of an earth pressure balance TBM will avoid any adverse environmental effects on the Boynton and Boyer woodlots. As a precaution, a monitoring program is proposed at these two woodlots to confirm the accuracy of impact predictions and to respond to any unforeseen events. The monitoring program includes the use of visual inspection of vegetation health during tunneling activities to determine evidence of stress on vegetation and soil moisture measurements prior to, during and following tunnelling activities to measure for drought conditions. Monitoring will also include measurement of groundwater levels (see section 8.3.2). In the vicinity of the woodlots, the monitoring program will be implemented one year prior to tunnelling, during tunnelling, and for one year following completion of the tunnelling contract. The monitoring period may be reduced or extended based on the results of monitoring. TTC will discuss opportunities for a collaborative monitoring program with York University.

Contingency

If it is determined that tunnelling activities are having an adverse effect on the York University woodlots, a corrective course of action will be taken. The appropriate course of action will be determined at that time in response to the specific observed effects. TTC will consult with York University and the TRCA prior to implementing any contingency measures.

8.3.5. Populations/Species

Potential effects of construction activities on populations/species are discussed in section 8.2.5.

8.3.6. Air Quality

Environmental Effects

The impact from construction will be largely due to dust (suspended particulate matter (SPM) and dust fall) emissions caused by cut-and-cover activities. These emissions could affect residential and commercial locations as well as pedestrian areas. For this reason, dust levels must meet the provincial standards at the edge of the construction sites to minimize the impacts to neighbouring developments and pedestrian areas.

Based on the results of qualitative and quantitative studies conducted by others, there is the potential for uncontrolled emissions of dust from construction sites to result in off-site concentration of SPM and dust fall exceeding the MOE standards. To promote compliance with MOE's criteria, the Toronto Transit Commission Master Specifications requires that contractors submit a comprehensive Environmental Control and Methods Plan to address, among other elements, dust control.

Mitigation

Construction Borne Particulate Matter at Open Construction Sites - Dust and debris will be controlled through the use of standard techniques within the construction industry. These measures will include, but not be limited to, the following:

1) Develop a comprehensive environmental Controls And Methods Plan of the whole process of dust control;
2) Cover or wet down dry materials to prevent blowing dust and debris;
3) Prevent dust from blowing across the Site and from leaving the Site, in particular frequently wet paved and unpaved temporary roads and excavated areas;
4) Comply with provincial ordinances and Engineer's requirements regarding minimizing of dust and airborne pollution;
5) Wash down the streets within the Work Site on a weekly basis and as additionally directed by the Engineer;
6) Securely cover excavated material being removed from the Site and all fill materials being delivered to the Site to prevent blowing of dust or fines into the streets and haul routes; and
7) Application of calcium chloride shall be kept to minimum and shall be restricted to vehicle right-of-way. In close proximity to watercourses, frequent applications of water shall be preferred method. Obtain the Engineer's approval before chemicals for dust control are used.

Construction Borne Particulate Matter within Existing Buildings – In instances where works are necessary to connect new works to existing buildings and stations the contractor will be required to demonstrate the effectiveness of the whole process of dust control, effluent (water) control and clean up within 30 calendar days of the date of Notification of Award and before the Work commences on Site. In order to ensure conformity with the Specifications and the Environmental Controls and Methods Plan, if any part of the Contractor's proposed method of construction fails to meet the requirements of the Specifications or Environmental Controls and Methods Plan during the demonstration, a second demonstration may be requested to test the suitability of any modified procedure.

These mitigation measures may not completely eliminate dust emissions from construction and demolition activities; however, the measure should reduce emissions to a level that minimize impacts of dust on the areas surrounding the construction site.

Monitoring

During the demonstration and throughout the Work, air monitoring of crystalline silica, total dust and other contaminants (as applicable) should be conducted as a check on the effectiveness on dust control measures. In particular, Air quality monitoring should be conducted prior to, during or following construction as follows:

1) When construction and/or demolition activities are likely to cause dust emission, air monitoring must be conducted prior to beginning activities to establish a baseline value for the quantity of SPM in the air. During construction and/or demolition operations where dust is being created, air quality monitoring must be conducted to establish the level of particulate matter in the air. Following construction and/or demolition operations where dust was created, confirmatory tests must be conducted to quantify the level of particulate matter in the air.

2) Construction Borne Particulate Matter within Existing Buildings – In instances where works are necessary to connect new works to existing buildings and station (e.g. tying into the existing subway at Downsview Station) and activities, such as sawcutting are required. Monitoring for airborne contaminants such as crystalline silica will be required to show that these contaminants are below their respective time weighted average exposure values as indicated in Regulation 833.

8.3.7. Noise

Environmental Effects

The primary source of noise during construction will result from the general construction and vehicular activities associated with cut-and-cover excavation.

Tunnelling operations are a moving activity, with TBM's advancing through the ground as a rate of 10 metres to 15 metres per day. The presence of high ambient noise from nearby major roadways, like Keele Street and noise generated internal to many buildings will influence the degree of human audibility of the ground-borne noise due to TBM's. Therefore, tunnelling will not produce any audible "environmental" noise at street level. The areas of impact for tunnelling will occur at access shafts. At these access shafts, the noise impacts are the same as cut-and-cover operations (see above).

It is recognized that the control of noise and vibration during construction is important to minimize impact on the neighbouring community.

Mitigation

To achieve control, the construction contract documents will include a complete set of criteria for maximum allowable construction noise (and vibration) control, including:

1) Shields or other physical barriers to restrict the transmission of noise;
2) Soundproof housings or enclosures for noise producing machinery such as compressors, pumps, motors or generators;
3) Efficient intake and exhaust silencers on air equipment;
4) Efficient intake and exhaust mufflers on internal combustion engines;
5) Sound deadening lining material on hoppers and storage bins;
6) Conducting truck loading, unloading and hauling operations so that noise is kept to a minimum;
7) The use of electric rather than internal combustion power where possible; and
8) The placement of stationary noise producing equipment at a maximum distance from public areas.

Monitoring

Noise levels for nearby sensitive uses (such as residential or institutional) will have specified monitoring locations and maximum noise levels. These levels and construction activities that may generate exceedences will be defined prior to construction. The monitoring program will include review and alert levels. If instrument readings exceed "review" levels, TTC and its contractor will jointly assess the necessity of altering the method, rate or sequence of construction. At "alert" levels, TTC can order construction operations to cease until the necessary mitigation measures are undertaken.

Contingency

In the event that instrument readings reach "alert" levels, (as to be defined on a structure-specific basis in the construction contract documents), TTC site supervisory staff will order construction operations to cease and take necessary actions to mitigate unacceptable movements, including, but not limited to alternative construction methods or construction equipment.

8.3.8. Vibration

Environmental Effects

Tunnelling operations are a moving activity, with TBM's advancing through the ground as a rate of 10 metres to 15 metres per day, with the only interaction with the surface occurring at a depth of 10 metres or greater. Therefore TBM produce steady state variations in the vibration levels that rise, remain steady and then subside over a period of days for any given location. The presence of ambient vibration from internal building activities and nearby major roadways will influence the degree of human perception of the ground-borne vibration due to TBM's.

Vibration resulting from vibratory compaction will be perceptible to humans but can also adversely affect the structural integrity of utilities and buildings. These activities usually occur over a short period and are intermittent in nature.

In accordance with TTC Design Standards, pile driving is not permitted. However, vibration impacts due to other construction activities will occur.

Mitigation

Construction techniques can be altered to mitigate vibration related issues. However, modifying construction techniques requires a thorough investigation to ensure that the durability of the construction is not compromised (e.g. granular placement without the use of vibratory rollers can reduce the compaction which can lead to settlement). Restrictions or specified construction methods will be reviewed during the design and construction stage.

Monitoring

Vibration resulting from construction will be monitored using seismographs. Vibration will be monitored at locations at various distances from work operations and at critical structural or utility locations. As part of the baseline monitoring, a minimum of 3 consistent sets of readings will be taken prior to the start of work. TTC will then continuously monitor ambient vibration levels during construction. The monitoring program will include review and alert levels. If instrument readings exceed "review" levels, TTC and its contractor will jointly assess the necessity of altering the method, rate or sequence of construction. At "alert" levels, TTC can order construction operations to cease until the necessary mitigation measures are undertaken.

Similarly, vibration during the tunnelling process will require monitoring.

Contingency

In the event that alert levels are achieved, TTC will confer with contractor to develop an appropriate mitigation strategy.

8.3.9. Electromagnetic Interference (EMI)

There are no permanent displacement impacts associated with the Undertaking, no transient impacts that relate to the construction of the Undertaking. Localized impacts associated with the operation of the subway are discussed in section 8.4.9.

8.3.10. Stray Current

There are no transient impacts that relate to the construction of the Undertaking. Localized impacts associated with the operation of the subway are discussed in section 8.4.10.

8.3.11. Utilities

As discussed in section 8.2.11, the approach to utilities that will be determined during the design phase will focus on relocation in advance of the main construction contracts or as part of these contracts. The end result will be no loss or disruption in utility service in accordance with each of the associated service provider's standards.

Although accidental disruptions in service can occur, the likelihood of damage during construction is minimized through detailed utility location plans undertaken during both design and construction phases.

8.3.12. Buildings and Property

Environmental Effects

The types of impacts that can potentially occur during construction include vibration and ground settlement. Under certain conditions, physical damage to buildings and property can occur as a result of construction activity.

Monitoring

Prior to the commencement of construction operations, separate instrumentation readings will be taken to provide a pre-condition survey for all buildings to assess current conditions.

Monitoring during construction will include ground settlement measurements, inclinometers and surface monitoring points for structures. Monitoring is undertaken on a weekly basis during active excavation. This monitoring schedule is reduced to every three months for up to a year following backfilling.

The monitoring program will include review and alert levels. If instrument readings exceed "review" levels, TTC and its contractor will jointly assess the necessity of altering the method, rate or sequence of construction. At "alert" levels, TTC can order construction operations to cease until the necessary mitigation measures are undertaken

Following construction, TTC and its contractors will arrange for a joint post-construction inspection of buildings/structures and utilities with the respective owners. The results of these surveys will be compared with the pre-construction surveys.

TTC will monitor horizontal and vertical movements and tilt of adjacent structures and utilities on a daily basis during active excavation or backfilling. In the event that instrument readings reach "alert" levels, (as to be defined on a structure-specific basis in the construction contract documents), TTC site supervisory staff will order construction operations to cease and take necessary actions to mitigate unacceptable movements, including, but not limited to alternative construction methods or construction equipment and/or additional support/protection measures.

Contingency

In the event that a property owner submits a claim for property damage, TTC will conduct further investigations and, if appropriate, will negotiate a settlement.

8.3.13. Business Disruption

Environmental Effects

The impacts to local businesses can primarily to changes in vehicle and pedestrian movement patterns, but may also include the following:

1) Reduced visibility of storefronts and signs;
2) Reduced on-street parking;
3) Less convenient access and disruption to (including closures to) off-street parking facilities; and
4) Patron inconvenience, as the academic programs as York University, due to temporary construction debris, noise and dust.

Although a number of businesses will be directly impacted either by tunnelling activities, or general construction activities, the impacts to local businesses will be addressed indirectly through the mitigation efforts noted in other sections of this report (traffic, pedestrian, noise and dust etc.).

8.3.14. Aesthetics

Dust is a concern with any form of construction and especially with the cut-and-cover method of construction. Dust sources at cut-and-cover (or tunneling access locations) construction sites (dust, mud and litter) are discussed in section 8.3.6. In addition, construction sites will be hoarded to minimize visual intrusion of the construction activity.

8.3.15. Human Health and Safety

Environmental Effects

Local employees and residents as well as Project construction workers will potentially be affected by construction-related noise, vibration and dust. Another important issue is the health and safety of construction workers.

Mitigation

Noise, vibration and dust impacts and proposed mitigation methods are described in previous sections.

Monitoring

As described in sections 8.3.6, 8.3.7 and 8.3.8, TTC and its contractor will monitor noise, vibration and dust effects during construction. In addition, TTC supervisory staff will monitor contactor compliance with applicable legislation and regulations. TTC's safety policies for staff and standard specifications for construction contracts require full compliance with the following Acts and Regulations:

1) The Ontario Occupational Health and Safety Act,
2) The Ontario Regulations for Construction Projects,
3) Workplace Hazardous Materials Information System (WHMIS) Regulations,
4) The Canadian Environmental Protection Act and regulations, and
5) All other legislation, regulations and standards as applicable.

In addition, for any buildings demolition a Designated Substance Survey will be undertaken in accordance with the requirements of section 30 of the Ontario Occupational Health and Safety Act (OHSA). The purpose of the Survey will be to determine the presence of building products or equipment containing biological, chemical or physical agents termed Designated Substances under the OHSA or PCB's and to recommend actions for management during demolition and reconstruction of the existing Subway Station. The Survey findings will be included in the contract documents for the Project. In addition, the Contractor shall be required to complete the contract in compliance with all applicable regulations, including the Ontario Occupational Health and Safety Act (OHSA) and the Export and Import of Hazardous Waste Regulations and the Storage of PCB Material Regulations (under the Canadian Environmental Protection Act).

Contingency

During the course of construction, there is a risk of spills or discharges of pollutants or contaminants by the Contractor. The following contingency plan will be put in place:

1) Names and telephone numbers of persons in local municipalities and MOE to be notified forthwith of a spill;
2) Names and Telephone numbers of representatives of fire, police and health departments of local municipalities who are responsible to respond to emergency situations;
3) Names and telephone numbers of companies experienced in control and clean up of hazardous materials that will be called in an emergency involving a spill;
4) Contingency plan shall include provisions for hazardous or unknown materials (e.g. puncturing an drain during excavation);
5) Containment and control of spill and clean up procedures are to be initiated immediately to mitigate environmental damage, while awaiting additional assistance;
6) Ensure materials and products are on site with which temporary repairs can be made to broken pipelines or other services so emission of pollutants can be controlled and stopped.

8.3.16. Archaeology

As discussed in section 8.2.16, no impacts to archaeological remains are anticipated with this project. section 8.2.16 also discusses the contingency measures that will be in place in the event that remains are discovered during construction.

8.3.17. Cultural Heritage

As discussed in section 8.2.17, the only cultural heritage features in the vicinity of the Undertaking are within York University and comprise buildings. The effects, mitigation, monitoring and contingencies as described in section 8.3.17 will apply.

8.3.18. Automobile Traffic and Transit Service

Environmental Effects

Although the recommended alignment follows the road allowance for considerable distances, the potential disruption is limited due to the tunnelling construction method for the line sections. However, cut-and-cover construction will be used for stations and special trackwork areas. For Finch West Station, York University Station and Steeles West Station, plus all special trackwork areas, cut-and-cover works will directly impact:

1) Major parking facilities on York University lands;
2) Driveways and private roads for adjacent properties;
3) Existing transit service, including all routes currently using Allen Road, Keele Street, Finch Avenue and Steeles Avenue, plus all transit services using the Common at York University;
4) Traffic, including both vehicular and pedestrian/cyclist movements; and
5) Special event plans, such as major tennis events at the Rexall Centre.

Although temporary in nature, the construction activities that cause these types of impacts will occur over several months and therefore warrant special consideration.

Mitigation

During the design phase, TTC will work with the City of Toronto and York University (for private roads within campus) to develop traffic management plans. The objective of these plans will be to maintain the free passage of vehicles and pedestrians at all times for all streets, driveways and property entrances. The plan developed during the design phase will be provided to the contractor as a guide. In the event that the contractor elects to deviate from this plan, the contractor will be required to prepare and submit a detailed and comprehensive Traffic Management Plan, for review by TTC and Toronto Transportation.

TTC will arrange for the City of Toronto to conduct post-construction traffic count following road restoration.

8.3.19. Pedestrians and Cyclists

The impacts and mitigation measures described in section 8.3.18 above will also apply for pedestrians and cyclists. This work will be carried out in a manner as to ensure the least interference with pedestrians, cyclists and vehicular traffic and shall include fencing and lighting as required providing a safe environment.

8.3.20. Rail

The Undertaking will pass under the CN's Newmarket Subdivision / GO Bradford line. This corridor comprises a single north-south track and one siding. Rail traffic on this corridor is limited to light industrial traffic (one or two transfer movements daily) and 8 GO Trains. The preservation of operations along this line is important for both commuter rail operations as well as local industries. Disruption to service and deflections in the tracks due to settlement is not acceptable.

Mitigation

As described in section 7.0, the running structure is contemplated to be installed under the rail corridor by mining or other approved method. The final method of construction will be determined in consultation with CN Rail following further geotechnical investigations and preliminary engineering by TTC and will be developed to satisfy their performance-based requirements. The following monitoring program provides an anticipated scope based on previous interactions between CN and TTC subway construction.

Monitoring

Monitoring during construction will include ground settlement measurements. Monitoring is undertaken on a hourly basis during active excavation, becoming weekly after tunnel liner installation and quarterly for a period of one year, commencing 3 months after the tunnel liners are installed. This monitoring schedule is reduced to every three months for up to a year following backfilling.

The monitoring program will include review and alert levels. If instrument readings exceed “review” levels, TTC and its contractor will jointly assess the necessity of altering the method, rate or sequence of construction. At “alert” groundwater levels, TTC can order construction operations to cease until the necessary mitigation measures are undertaken.

8.4. Operations and Maintenance Impacts

8.4.1. Soils

There are no permanent issues resulting from the operations and maintenance associated with the Undertaking. All impacts are transient and relate to the construction of the Undertaking.

8.4.2. Groundwater

There are no permanent issues resulting from the operations and maintenance associated with the Undertaking. All impacts are transient and relate to the construction of the Undertaking (see section 8.3.2)

8.4.3. Surface Water

As discussed in section 8.2.3, stormwater quality measures will be implemented for each of the stations and their associated ancillary features (e.g. parking lots). As identified in the appended stormwater management report, oil grit separators as part of a treatment train will provide quality treatment. The maintenance of these structures will be subject to the associated manufacturers' specifications. This will be confirmed during the design and construction stage and will be documented in an operations and maintenance manual that is prepared at the completion of construction.

8.4.4. Communities/Ecosystems

There are no permanent issues resulting from the operations and maintenance associated with the Undertaking. Impacts to communities and ecosystems are transient and are discussed in section 8.2.4.

8.4.5. Populations/Species

There are no permanent issues resulting from the operations and maintenance associated with the Undertaking. Impacts to populations and species are transient and are discussed in section 8.2.5.

8.4.6. Air Quality

Environmental Effects

To protect human health and the environment, the MOE has established maximum allowable exposure limits for NO2, CO, SPM and dust fall. The criteria for NO_2, CO, dust fall and SPM are specified in the recently enacted Ontario Regulation (O.Reg. 419/05) and/or in the Ontario Ambient Air Quality Criteria (AAQC). Currently, no provincial standard or criterion is available for PM2.5 or NO. Recognition of health impacts from PM2.5 has resulted in the enactment of Canada-wide standards for this size fraction that will take effect in 2010. PM2.5 emanating from vehicle exhaust may have more serious health effects than ordinary dust because of both the size and chemical composition.

When the Spadina Subway Extension commences operations, trips currently made by automobile or bus can be made by electrically powered rail service instead, hence the impact of the Spadina subway extension on air quality on a regional scale will be positive. In support of this statement, a new report from the Victoria Transport Policy Institute in Canada, that evaluated rail transit benefits based on a comprehensive analysis of transport system, found that cities with larger, well-established rail transit systems have among other benefits, lower average per capita vehicle mileage, lower consumer transportation expenditures and, as a result, have an overall lower impact on air quality.

Existing air quality levels are a direct result of the existing vehicular activity and other air polluting activities in the area. The existing ambient air quality conditions for the Study Area are based on the most recent (2003) measurements from the closest monitoring stations to the project area for which data was available. Given the proposed facilities, Finch West Station and Steele West Station will result in some small localized increases in vehicular activity. Therefore, as part of this EA, an investigation of potential impacts on air quality has been conducted to evaluate and quantify where possible, these impacts at the following locations:

1) Finch/Keele area in the vicinity of Finch West Station; and
2) Jane/Steeles and Keele/Steeles area in the vicinity of Steeles West Station.

The effects of the Undertaking on the atmospheric environment were predicted using mathematical modelling techniques for vehicular emissions at intersections using fleet-averaged emission factors and compared to applicable criteria and are contained in the air quality investigations report that is appended to this document.

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Table 8-6: Anticipated Concentrations of Air Pollutants at Stations (1 hr criteria)

	Levels relative to the Ontario Ambient Air Quality Criteria			
	Finch West Station	Steeles West Station		
	Terminal[12]	Steeles / Keele Intersection	Steeles / Jane Intersection	Terminal[13]
Carbon monoxide (CO)	17%	24%	18%	14%
Nitrogen Oxides (NOx)	58%	75%	60%	70%
Suspended Particulate Matter	N/A	N/A	N/A	N/A

Table 8-7: Anticipated Concentrations of Air Pollutants at Stations (8 hr criteria)

	Levels relative to the Ontario Ambient Air Quality Criteria			
	Finch West Station	Steeles West Station		
	Terminal[14]	Steeles / Keele Intersection	Steeles / Jane Intersection	Terminal[15]
Carbon monoxide (CO)	29%	41%	30%	24%
Nitrogen Oxides (NOx)	N/A	N/A	N/A	N/A
Suspended Particulate Matter	N/A	N/A	N/A	N/A

Table 8-8: Anticipated Concentrations of Air Pollutants at Stations (24 hr criteria)

	Levels relative to the Ontario Ambient Air Quality Criteria			
	Finch West Station	Steeles West Station		
	Terminal[16]	Steeles / Keele Intersection	Steeles / Jane Intersection	Terminal[17]
Carbon monoxide (CO)	N/A	N/A	N/A	N/A
Nitrogen Oxides (NOx)	69%	83%	71%	79%
Suspended Particulate Matter	64%	67%	65%	64%

As summarized in the tables below, results obtained from modelling techniques predict no exceedences in air quality standards and therefore no mitigation is required. Detailed calculations are contained in Appendix H.

[12] Includes bus terminal PPUDO and Commuter Parking, intersections at Finch/Keele and Fourwinds Drive/Keele
[13] Includes bus terminal PPUDO and Commuter Parking
[14] Includes bus terminal PPUDO and Commuter Parking
[15] Includes bus terminal PPUDO and Commuter Parking
[16] Includes bus terminal PPUDO and Commuter Parking
[17] Includes bus terminal PPUDO and Commuter Parking

8.4.7. Noise

Environmental Effects

Wayside noise criteria provide a basis for assessing impact and determining the type and extent of mitigation measures necessary to minimize any general community annoyance. For the Undertaking, the applicable criteria are documented in the MOE/TTC Protocol Noise and Vibration Assessment guidelines and in MOE's Publication NPC-205. These guidelines consider the excess / change in noise (measured in dBA) on existing noise sensitive receptors in order to determine impact and mitigation. As documented in Appendix I, predicted levels of noise (and vibration) are compared against ambient levels measured in the field. The potential sources of environmental noise and the resulting sound levels are:

1) **Subway Noise Emitted Through Ventilation Shafts** – Since the subway is entirely underground, there should be no air-borne noise impacts[18]. While the ambient noise due to traffic is the dominant source of noise, the noise due to the subway may occasionally be audible through the proposed ventilation shafts. In addition, ventilation fans for stations are run and tested on an ongoing basis. Of all the ventilation shaft locations, only two associated with Finch West Station are located in a noise-sensitive area (see Table 8-9).
2) **Bus Terminals** – The dominant source of noise for the proposed bus terminals at Finch West Station and Steeles West Station originates from the bus operations. However, other vehicular activities including changes in local traffic patterns around the aforementioned stations and use of the PPUDO and commuter parking all can contribute to changes in local noise levels.
3) **Electrical Substations** – Due to transformer noise contained within substations, noise levels a 1 metre is predicted at 68 dBA. Generally, this noise will be imperceptible over ambient traffic noise. However, at night, when traffic subsides, the sound level may be audible. Based on the preliminary location of each of the substations, no noise sensitive uses will be impacted by this feature.

In order to quantify the noise impact for Finch West Station and Steeles West Station, the two closest noise receptors for each station were identified. As summarized in Table 8-9 only 1300 Finch Avenue West experiences a significant (> 5dBA change) increase in noise level.

[18] p.22 Noise and Vibration Impact Study, S.S. Wilson (Appendix I)

Table 8-9: Assessment of Noise Impacts

	Address of Noise Sensitive Receptor Considered	Type of Use	Predicted Noise Sound Level		
			From Station	Ambient (Background)	Excess / Significance
Finch West Station	1300 Finch Avenue West	Commercial	76 dBA	66 dBA	+10 dBA
	1 Four Winds Drive	Residential	64 dBA	68 dBA	N/A
Steeles West Station	Toronto Track and Field Centre	Institutional	63 dBA	63 dBA	N/A
	2740 Steeles Avenue West	Commercial	62 dBA	65 dBA	N/A

An assessment in the reduction of noise levels associated with removing the existing bus terminal activity in the Common at York University was not undertaken. However, given the number of buses operating within the Common in close proximity to several University buildings, a net benefit (i.e. reduction) to noise levels is anticipated.

Mitigation

For the noise impacts identified above, the following mitigation is proposed.

1) Vent Shafts – shafts can be treated to lower noise to acceptable levels the issue of noise mitigation will be addressed as part of the design phase.
2) Bus Terminals – In order to control the Finch West bus terminal noise impact on the adjacent retail/commercial building to the east, one possible solution could be a sound barrier wall along the east perimeter of the station is required. To prevent the effect of acoustic reflection to the residential building on the west side of Keele (1 Four Winds Drive), the west face of the acoustic wall shall be treated with sound absorptive material. The final need and mitigation will be confirmed during the design phase.
3) Electrical Substations - The use of sound barriers, equipment orientation and distance set back can mitigate this issue.

8.4.8. Vibration

Environmental Effects

As can be observed on older sections of TTC's existing subway (i.e. the Yonge Subway in downtown Toronto) subway operations can generate ground-borne vibration. Although this vibration is perceptible to humans and it does not result in damage to property. In order to reduce the production of ground-borne vibration, TTC has developed special track installation systems:

1) Double Tie System – used for sections of straight track, this design is expected to reduce ground-borne sound and vibration levels by 12 to 14 dB

2) Continuous Floating Slab – used for sections of special track work, this design is expected to reduce ground-borne sound and vibration level by 14 to 20 dB.

During this EA, data measurements were conducted along newer sections of the existing subway where the double tie technology is already in place. This included measurements along the Sheppard Subway, Bloor-Danforth Subway and the Yonge and Spadina Subways. This empirical data confirmed previous estimates and revealed that subway train vibration is several orders of magnitude below the vibration levels, which causes physical damage to buildings and property. The double tie technology will be used on all track work for this project.

Notwithstanding the success of TTC's track installation system in mitigating ground borne vibration, a total of 27 stakeholders expressed concern over vibration impacts given their unique circumstances and requested site-specific inspections and measurements of their ambient noise and vibration levels so that their sensitivity to vibration could be determined. As listed in Table 8-10, SS Wilson Associates identified the following as potential noise/vibration sensitive uses.

Table 8-10:Vibration Sensitive Uses Adjacent to the Undertaking

Address	Name	Nature of **Business**	**Reason for Sensitivity to Noise/Vibration**	**Distance from Undertaking[19]**
30 St. Regis Crescent N.	Incredible Printing	Printing Plant (industrial)	Machines sensitive to vibration	98 m
3811 Keele Street	Sunoco Gas Station	Service Station (commercial)	Underground fuel tanks	22 m
3720 Keele Street	Sunoco Gas Station	Service Station (commercial)	Underground fuel tanks	41 m
333 Rimrock Road	Canadian Custom Packing Company	Chemical Plant (industrial)	Laboratories with sensitive scales	126 m
156 St. Regis Crescent South	The Forever Group	Car Wash Products (commercial)	Computer/Server Room	255 m
4000 Chesswood Drive	Chesswood Arena	Indoor hockey (commercial)	Hockey ice surface	246 m
3725 Keele Street	DeMarco Funeral Home	Funeral Home (institutional)	Chapel/Visitation Rooms	28 m
41 Toro Road	Arbor Tools Ltd.	Mechanical Shop (industrial)	Precision tools with small tolerances	248 m
30 Tangiers Road	CAW Local 112	Union Office (commercial)	Meeting Halls/Rooms and Computers	176 m
53 Bakersfield Street	Spring Air Canada	Mattress manufacturing Plant (industrial/ commercial	Computers/servers and precision machinery	361 m
250-330 Rimrock Road	John Vince Foods	Food Packing & Distribution Plant (industrial)	Infra-red scanning devices and multiple storage racks	247 m
14 Toro Road International	Glass and Mirror Co. Ltd.	Retail Outlet (commercial)	Stored large sheets of glass	106 m
39 Kodiak Crescent	Tectrol Inc.	Computer Components Manufacturing Plant (industrial)	Precision machinery	70 m
1 Whitehorse Road	The Music Lab	Repair Shop of Musical Instruments (commercial)	Not at the present time	40 m
York University	Lumbers	Educational (institutional)	Lecture Halls and laboratories including electron microscopes	65 m
York University	Stedman Lecture Halls	Educational (institutional)	Lecture Halls	48 m
York University	Seymour Schulich Building	Educational (institutional)	Lecture Halls	0 m
York University	Seneca @ York Educational	(institutional)	Lecture Halls & Test Centre	172 m
York University	Winters Residence	Student Accommodation (residential)	Sleeping quarters and study rooms	154 m
York University	Farquharson Life Sciences	Educational (institutional)	Lecture Halls & Electron Microscopes	79 m

Including the above twenty locations, a total of 58 possible vibration receptor locations were analysed for possible vibration levels above current ambient conditions. As documented in detail in Appendix I, no vibration impacts are expected to occur due to the use of the double tie technology.

Mitigation

As stated previously, TTC utilizes both double tie and floating slab installations for all track work in order to mitigate ground-borne vibration adverse impacts.

[19] measured from centreline of running structure to closest point for building

8.4.9. Electromagnetic Interference (EMI)

Environmental Effects

The most common concern with respect to EMI is the adverse effect that it will have on computing devices including: microprocessor based patient diagnostic, monitoring, and therapeutic equipment. Based on recent tests undertaken by the Bay Area Rapid Transit (BART) system, examples of Electro Magnetic Frequency (EMF) intensities from human activities include the following[20]:

1) Earth's static magnetic field varies from 300 mG (30 μT) at the equator to over 600 mG (60 μT) at the magnetic poles,
2) Overhead power transmission line: 32 to 57 mG (range of exposure to utility workers),
3) Household appliances: 8 to 165 mG (at a distance of 27 cm, or 12 inches),
4) Computer video display: 2 to 4 mG (at 35 cm, or 16 inches), and
5) Rail vehicle (electrically powered): 400 mG (at 110 cm, or 43 inches from the vehicle floor) to 1,500 mG (at floor level) 1.

Recognizing that TTC and BART operate similar systems at similar power requirements (600 VDC), the measurements taken on the BART system can be applied to the proposed Spadina Subway Extension in order to identify potential EMI sensitive uses. The results of the modelling undertaken for the BART system showed that the fields do not extend beyond 10.0 to 15.0 metres from the centre of the two tracks at track level. Because the Spadina Subway Extension track level will be typically lower than 15 metres below the surface, the operation of the Subway will have no effect on existing uses in the Study Area. Therefore no mitigation is required.

8.4.10. Stray Current

Environmental Effects

Stray current corrosion, which is a form of electrolytic corrosion, occurs on buried metallic structures and differs from other forms of corrosion damage in that the current, which causes the corrosion, has a source external to the affected structure. Stray current is caused by a portion of the negative return current which leaks into the ground and returns to the traction power substation through parallel paths provided by the ground and by any other metallic structures. For a non-metallic structure, such as plastic or concrete pipe and plastic coated cables, stray current is a non-issue.

The pipeline companies that operate within the Finch Hydro Corridor have expressed concern that their pipelines are sensitive to stray current.

[20] Silicon Valley Rapid Transit Corridor Final EIR (Earthtech 2003)

Mitigation

In order to minimize uncontrolled stray currents a number of measures shall be used in connection with measures applied to the traction power return system:

1) Low linear rail resistance;
2) High rail-to-earth resistance, including insulated trackwork mounted fittings and appurtenances;
3) Good rail bonding, both longitudinal and track cross-bonding;
4) Parallel connected negative reinforcing feeder cables, insulated and cross-bonded to the return rails;
5) Good water drainage;
6) Structural steel-work and reinforcing isolation/separation;
7) Utility structures to be electrically insulated, bonded, coated and cathodically protected as required; and
8) Reduced substation spacing.

The subway traction power distribution system shall be ungrounded and shall have no direct connection to earth.

The running rails shall be insulated from earth with the use of insulating pads and hardware, and by the isolation of all rail associated metal ware from earth. The negative running rails shall be connected to the AC ground system through a floating negative automatic grounding switch (FNAGS). The FNAGS operates (and alarms) only on an abnormally high return rail to ground voltage.

The insulating pads under the rails shall have the following provisions:

1) Be capable of shedding water;
2) Resist the accumulation of airborne dirt;
3) Discourage DC current tracking over the surfaces of the insulation;
4) Have a high surface finish; and
5) Have high insulation levels from earth when installed and maintain an insulation level of at least 300 Ohms - km per rail during the design life.

Monitoring

Similar to other locations where TTC's subway crosses a high-pressure steel pipeline, the following monitoring program will be put in place:

1) Prior to construction, a baseline survey for stray current corrosion control is undertaken and reported to the pipelines;
2) During construction, stray current test equipment is installed in the immediate vicinity of the pipelines;
3) Upon completion of the work, stray currents will be monitored as often as is prudently required; and

4) All data will be shared between the pipelines and TTC.

8.4.11. Utilities

There are no permanent issues resulting from the operations and maintenance associated with the Undertaking. All impacts are transient and relate to the construction of the Undertaking (see section 8.2.11). (Also, see section 8.4.10 for stray current impacts to metallic utilities steel / ductile iron pipes).

8.4.12. Buildings and Property

There are no permanent issues resulting from the operations and maintenance associated with the Undertaking. Impacts to buildings and property are either permanent displacements (8.2.12) or are transient and relate to construction (as described in section 8.3.12).

8.4.13. Business Disruption

There are no permanent issues resulting from the operations and maintenance associated with the Undertaking. Business disruption is construction related and is described in section 8.2.13.

8.4.14. Aesthetics

There are no permanent issues resulting from the operations and maintenance associated with the Undertaking. Impacts to aesthetics are described in section 8.2.14.

8.4.15. Human Health and Safety

The possibility of accidental spills is always present in association with the operation and maintenance of any facility, including transit systems. The contingency measures in place during construction (see 8.3.15) are also in place for the operation of the system.

8.4.16. Archaeology

There are no permanent issues resulting from the operations and maintenance associated with the Undertaking. All impacts are transient and relate to the construction of the Undertaking (see section 8.2.16)

8.4.17. Cultural Heritage

There are no permanent issues resulting from the operations and maintenance associated with the Undertaking. All impacts are transient and relate to the construction of the Undertaking (see section 8.2.17)

8.4.18. Automobile Traffic and Transit Service

Environmental Effects

As discussed in section 8.5 the Spadina Subway Extension will provide significant transportation capacity to the northwest part of Toronto and therefore the overall effects on automobile traffic (and congestion) and transit service speed and reliability will be positive. The inclusion of surface facilities at the Finch West Station and Steeles West Station has the potential for localized negative impacts.

As discussed in section 7.0, traffic impact studies for both stations were undertaken which confirm that the local road network (including already planned road improvements) can support the proposed stations.

Monitoring

Traffic volumes on public roads and transit schedules are part of the City of Toronto's and TTC normal operating procedures. This will allow for either agency to identify future issues and develop corrective actions. Furthermore, as development proceeds around each station, the City of Toronto and the City of Vaughan will ensure the continued functioning of the road network, through the use of supporting traffic impact studies.

8.4.19. Pedestrians and Cyclists

As described in section 7, pedestrian and cyclist amenities will be included in the stations. These will be developed (through the site plan process) to enhance current amenities in order to achieve an equal or better level of service for both travel modes.

8.4.20. Rail

There are no permanent issues resulting from the operations and maintenance associated with the Undertaking. All impacts are transient and relate to the construction of the Undertaking (see section 8.3.20)

8.5. Summary

The preliminary monitoring and contingency plans for the Spadina Subway Extension are considered preliminary, dynamic and subject to refinements during design in consultation with regulatory agencies and the public. The specific monitoring requirements of any environmental permits/approvals/exemptions secured during design will be incorporated into the monitoring and contingency plan at that time. The details of the monitoring and contingency plan will be incorporated into provisions included in the construction contracts package.

8.6. Effects of the Environment on the Undertaking

Groundwater Infiltration

The subway design incorporates several features to manage groundwater infiltration. First, the subway tunnel is lined with concrete to greatly reduce groundwater infiltration. Second, the subway tunnel is designed with a minor grade to promote positive drainage.

Adverse Weather

Adverse weather conditions, including high winds and heavy precipitation, can affect construction activities and create hazardous conditions at the construction site. The contract documents will require the contractor to design, install, operate and maintain the dewatering system according to a range of criteria. Specifically, the contractor is required to dispose of precipitation and drainage water and to keep the excavation dry. The contractor will also be required to use good housekeeping practices at the site to ensure that construction materials are properly stored, installed and disposed of so they will not put workers at risk.

8.7. Summary of the Advantages / Disadvantages to the Environment of the Undertaking

Table 8-11 provides a summary of advantages and disadvantages to the environment of the Undertaking.

8.7.1. Do Nothing

The “Do Nothing” alternative assumes that the status quo is maintained and that the Undertaking is not built. The “Do Nothing” alternative provides a benchmark to measure the advantages and disadvantages of proceeding with the proposed undertaking.

8.7.2. 1994 EA Approved Undertaking

The 1994 EA Approved Undertaking is the first phase of a two-phase loop connecting the Spadina Subway line to the Yonge Subway line along Steeles Avenue via York University. The first phase includes the section from Downsview Station to York University with stations located at the Finch Avenue/CNR Newmarket Subdivision (GO Bradford Line) junction, the Keele Street/Finch Hydro Corridor junction and east of the York University Common.

8.7.3. The Undertaking

The Undertaking comprises the construction, operation and maintenance of the extension of the Spadina Subway from Downsview Station to Steeles Avenue. The total length of underground alignment is 6.2 km long and includes four new stations:

1) Sheppard West Station – on Parc Downsview Park lands, south of Sheppard Avenue and west of the GO Bradford Rail Line;
2) Finch West Station – on Keele Street, immediately north of Finch Avenue, including a bus terminal, PPUDO, commuter parking and extensions to Murray Ross Parkway and Tangiers Road;
3) York University Station – within the Common of York University’s Keele Street campus; and
4) Steeles West Station – diagonally centred on the Steeles Avenue and Northwest Gate intersection including bus terminals for TTC, GO and YRT, PPUDO and commuter parking.

The undertaking also includes all ancillary features including substations, emergency exit buildings, ventilation shafts and station entrances.

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Table 8-11:Advantages and Disadvantages to the Environment of the Do Nothing, the 1994 EA Approved Undertaking and the Proposed Undertaking

	Advantages	Disadvantages
Do Nothing	• No disruption from construction activities.	• No alleviation of existing traffic congestion. • Future increase in traffic volumes resulting in increased traffic congestion and air emissions. • No improvement of TTC transit service to York University. • Little opportunity for transit-supportive development.
1994 EA Approved Undertaking	• Provides subway service to the CNR/Finch, Finch/Hydro corridor and York University areas. • Major improvement in public transit service to York University. • Increases development potential at York University. • Reduced reliance on the automobile. • Reduced vehicle emissions. • Creation of employment opportunities and households from increased development activity.	• Capital Cost. • Disruption from construction activities. • No subway service to Parc Downsview Park lands. • Some localized increases in ambient noise levels and pollution (bus terminals). • Significant impacts on the sensitive Dufferin Creek valleylands. • Major bus terminal at York University. • Does not provide future subway service to the Vaughan Corporate Centre.
New Undertaking	• Reduces reliance on the automobile. • Reduced vehicle emissions. • Supports land use planning objectives of the City of Toronto, York Region and the City of Vaughan. • Provides subway service to the Parc Downsview Park, Keele/Finch area, York University Common and a new inter-regional transit terminal at Steeles Avenue. • Provides for future subway service to the Vaughan Corporate Centre. • Improvements to interregional connections between the TTC subway, GO Transit, York Region Transit and TTC buses. • No crossing of sensitive Dufferin Creek valleylands. • Reduced vehicle emissions. • Creation of employment opportunities and households from increased development activity. • No impacts on the sensitive Dufferin Creek valleylands. • No bus terminal at York University. • York University Station located at a central location on campus.	• Capital Cost. • Disruption from construction activities. • Some localized increases in ambient noise levels and pollution (bus terminals).
Conclusion	The advantages of the New Undertaking to the environment outweigh the disadvantages of the Proposed Undertaking to the environment when compared with the “Do Nothing” alternative. The Proposed Undertaking also presents significant advantages over the 1994 EA Approved Undertaking.	

9.0 COMMITMENTS TO FUTURE WORK

During this EA, TTC and the City of Toronto have worked closely with key stakeholder agencies to address and resolve any issues or concerns. In addition, the TTC's and City of Toronto's commitments to future work are listed below.

9.1. Permits and Approvals

TTC will secure necessary permits and approvals for the implementation of the Spadina Subway Extension Project, including, but not limited to:

1) Planning approvals (including Site Plan Approval) for above-grade structures and facilities (through City of Vaughan and City of Toronto). This will include updates to the supporting traffic impact studies for Finch West Station and Steeles West Station;
2) Building permits for the stations, Emergency Exit Buildings or other ancillary features (through City of Vaughan and City of Toronto);
3) Permit to Take Water from the Ministry of the Environment if dewatering exceeds 50,000 litres per day;
4) Stormwater management, in accordance with City of Toronto (south of Steeles Avenue), City of Vaughan (north of Steeles Avenue), TRCA and MOE requirements;
5) Sewer discharge approvals, in accordance with City of Toronto, City of Vaughan and York Region requirements;
6) Railway Crossing Agreement (CN Newmarket Sub-Division);
7) Pipeline Crossing Agreements (Pipelines within Finch hydro corridor); and
8) Hydro One Agreements to allow for the use of the Steeles and Finch Hydro Corridors for transit-related purposes.

9.2. Property Acquisition

The City of Toronto and TTC will:

1) Proceed with a Property Protection Study during the early stages of the design of the Spadina Subway Extension;
2) Continue property negotiations with York University for property required for the Project;
3) Initiate discussions with Parc Downsview Park, in accordance with direction received by Toronto City Council at its September 30, 2005 meeting;
4) Continue discussions with Toronto Fire Services for proposed relocation of Station #141;
5) For all other properties required within the City of Toronto (including temporary easements to facilitate construction), the City of Toronto will acquire property by negotiation or expropriation as required;
6) For properties required for the Undertaking within the City of Vaughan (i.e. north of Steeles Avenue), the City of Toronto will co-ordinate property acquisition activities with the City of Vaughan and York Region.

9.3. Steeles West Station Development

The bus terminal facilities shown represent the anticipated spatial requirements for intermodal transfers at Steeles West Station. This inter-regional node presents an excellent opportunity to maximize the benefits of government policies promoting compatible transit infrastructure and land use. It is understood that the extent of land, north of Steeles Avenue designated for an integrated and/or adjacent transit-supportive development with Steeles West Station, will be identified by the City of Vaughan and York Region.

The City of Toronto, City of Vaughan, York Region, TTC, GO Transit and York University will work closely during the York University Secondary Plan Update, the City of Vaughan Official Plan Amendment 620, and the Steeles West Station Site plan approval process to optimize the interface and integration of the Steeles West Station bus terminals with transit supportive development.

For Steeles West Station, TTC and the City of Toronto will conduct further discussions with GO Transit, Brampton Transit, York Region and the City of Vaughan to determine the roles and responsibilities of each agency for the design, construction, operation and maintenance of the terminal facilities (including bus terminals, commuter parking, station entrances and passenger pick-up and drop-off).

9.4. Construction Issues

TTC will conduct further research and analysis for the construction of the Spadina Subway Extension, including, but not limited to the following activities:

1) Include noise, vibration and air quality monitoring and mitigation measures and construction site maintenance/upkeep requirements in construction contract documents;
2) Develop traffic, transit and pedestrian management strategies to be included in construction contract documents;
3) Prepare and implement tree and streetscape protection and restoration plans;
4) Undertake Designated Substances Surveys for any buildings or structures which require demolition and to reflect the findings in construction contract documents;
5) Develop procedures for disposal of excavated materials, including contaminated soils, in accordance with Ministry of the Environment requirements;
6) Prepare and implement a groundwater management strategy,
7) Prepare an erosion and sediment control plan, which complies with prevailing TRCA and City of Toronto water guidelines and requirements;
8) Prepare an Environmental Management Plan including monitoring, triggers and contingencies in the event that further groundwater investigations indicate a potential adverse effect on the York University woodlots or other sensitive environmental features;

9) Arrange for a Stage 2 archaeological assessment to be conducted at areas where ground disturbance will occur during construction, and which have archaeological potential;
10) Undertake buildings, structures, and railway protection and monitoring, and condition surveys; and
11) Undertake stray current protection and monitoring for pipelines and other utilities.

9.5. Consultation

The TTC/City will consult with the public, property owners and stakeholder agencies (including City of Vaughan, York Region, as well as Toronto and York Region Police, Fire and other emergency service providers) during the design of the Spadina Subway Extension alignment, stations and related commuter and ancillary facilities.

9.6. Noise and Vibration Protocols

TTC will conduct a noise and vibration study, in accordance with the protocols established with the Ministry of the Environment for the recent Sheppard Subway project. Specifically, this will include additional base line noise and vibration surveys (as required), similar to those already undertaken as part of this EA. Post construction measurement will be undertaken to confirm "no adverse impact" as predicted in the noise and vibration impact analysis undertaken as part of this EA (see Appendix I for details).

9.7. Planning Initiatives

The City of Toronto will take a leadership role in planning initiatives, which support the Spadina Subway Extension, as listed below:

1) For the Parc Downsview Park lands, the City and TTC will work co-operatively with Parc Downsview Park, taking into consideration the proposed subway alignment, Sheppard West Station, the possible future GO Bradford Rail Line Station and Parc Downsview Park's emerging development plans;
2) The City of Toronto will initiate a planning study for the vicinity of the proposed Finch West Station, as recommended in the City's 2001 Keele Street Study;
3) The City of Toronto and York University will continue to update the York University Secondary Plan, which shall include provisions for the subway alignment, York University Station, Steeles West Station (including related commuter facilities) and related transit-supportive development;
4) TTC will enter into development agreements with York University for the potential integration of station entrances into existing buildings; and
5) The City of Toronto and TTC will work with York Region and the City of Vaughan, through the approval and implementation of current planning processes (Official Plan Amendment 620) and subsequent processes, to stimulate transit supportive development, which incorporates and integrates the Spadina Subway Extension alignment, including Steeles West Station and related commuter facilities into development plans north of Steeles Avenue.

9.8. Sustainable Development

As part of a separate environmental initiative, the Toronto Transit Commission is currently developing a new sustainable development directive, which will guide all TTC projects including this subway extension.

9.9. Canadian Environmental Assessment Act "Triggers" Monitoring

TTC will continue to monitor the Project for potential CEAA "triggers", and, in the event that the CEA Act applies to the Project, TTC will prepare an Environmental Screening Report.

At the conclusion of this EA, no CEAA requirements have been triggered. However, potential CEAA triggers to be monitored are as follows:

1) Possible federal project funding – It is anticipated that federal funding will be received for a portion of the capital costs of the project. However, no federal funding has been received to date.
2) Potential use of federally owned lands - The recommended alignment from Downsview station to the Finch West Station passes partially through federal lands owned by the Department of National Defence. The affected lands are proposed to be transferred to the agent Crown Corporation, Parc Downsview Park (PDP), which is not subject to CEAA.
3) Potential involvement of Canadian Transportation Agency – The recommended alignment will pass under the CN Newmarket Subdivision rail line and as such, approvals and permits for the construction and permanent operation of the subway tunnels must be obtained from CN Rail. In the event that an agreement cannot be reached between CN Rail and TTC, the crossing would require the intervention of the Canadian Transportation Agency (CTA) for a federal order. The involvement of CTA would trigger CEAA.
4) Potential crossing under federally regulated pipelines – The project includes the construction and operation of subway tunnels under National Energy Board (NEB) regulated pipelines including: Enbridge Pipelines and Trans-Northern Pipelines. Discussions have been initiated with the pipeline companies to ensure that any crossings will be undertaken in accordance with their requirements. In the event that an agreement cannot be reached between the pipeline companies and TTC, the crossing would require the intervention of the NEB for a federal order. The involvement of the NEB would trigger CEAA.

The Undertaking is not located within close proximity to any water body and will not require any approvals or authorizations under the ***Navigable Waters Protection Act*** or the ***Fisheries Act***.

TTC will continue to monitor the project for potential federal triggers and will consult with the CEA Agency and other stakeholders during design.

9.10. Environmental Assessment Amending Procedure

This EA describes the EA conducted for the design, construction and operation of the Spadina Subway Extension from Downsview Station to Steeles Avenue via York University and Parc Downsview Park. The

Undertaking includes an underground subway with stations located at the Sheppard Avenue/GO Bradford Line junction, the Keele Street/Finch Avenue intersection, the York University Common and the Steeles Avenue/Northwest Gate intersection. Ancillary facilities, such as bus terminals, passenger pick up and drop off, commuter parking, station entrances, cross-over and storage tracks, emergency exit buildings, ventilation shafts, etc. are components of the proposed undertaking. The concepts presented in this EA illustrates the intended concept for the undertaking for EA purposes; however, changes to these concepts may occur during design and construction.

The purpose of this section is to describe the procedures that will be followed to address changes to the Undertaking once it has been approved by the Ministry of the Environment. The limit for which refinements of the Undertaking will be considered consistent with the approvals contained within this document have generally been set by Route 1. This is predicated on:

1) The widespread support for Route 1 as the recommended Route and General Station Locations; and
2) The similar type and extent of environmental effects that may be realized with any alignment and station concept within Route 1.

The limits of this EA are further refined and reinforced based on the alignments and station concepts considered in Phase Two of the EA, which were reviewed by the public and external agencies during the third round of public consultation. As a result, the public and external agencies have had an opportunity to review these alternatives and potential changes to these alternatives can be reasonably foreseen.

9.10.1. EA Amendment Required

Therefore, the specific scenarios that would trigger the preparation of an EA amendment include (see Figure 9-1):

1) A new alignment that is located beyond the shaded areas delineated in Figure 9.1;
2) A Finch West Station (Figure 9-2), including the bus terminal that is located beyond the areas identified for occupation by Options 1, 2 3, 4 and 5. This area can be described as the area bound by a north-south line approximately 30 m west of Keele Street, the Hydro Corridor west of Keele Street (to Columbia Gate), Murray Ross Parkway, the Hydro Corridor east of Keele Street (to the future extension of Tangiers Road), Tangiers Road and an east-west line located approximately 150 metres south of Finch Avenue between Tangiers Road and Keele Street;
3) A Steeles West Station (Figure 9-3) bus terminal that is located beyond the areas identified for occupation by Options 1A, 1B, 2 and 3 (i.e. including all four quadrants surrounding the Steeles Avenue / Northwest Gate intersection);
4) A commuter parking facility associated with Finch West Station that is located beyond the Finch hydro corridor;
5) A commuter parking facility associated with Steeles West Station that is located beyond the Steeles hydro corridor;
6) A construction method/location that is different from the construction method/location described in this EA. This scenario is limited to the location of major construction methods including open cut, cut-and-cover, mining and tunnelling and will only be triggered if the construction method results in greater adverse environmental effects than what was originally proposed, and
7) A change in the alignment's vertical profile that results in greater adverse environmental effects.

The TTC will notify the Director of the MOE EA Approvals Branch of the intended change. Modification will take the form of an EA Addendum Report, which will be filed with the original EA Study. The EA Addendum will be released for at least a 30-day public review period.

Any changes proposed within the areas identified for occupation by the alignment and station concept alternatives identified in Phase II are considered minor refinements that would be handled without a formal approval requested from the MOE EA Branch. These minor refinements will be addressed through the site plan approval mechanisms covered in the ***Planning Act***; through the permitting and approvals requirements of the affected agencies; and through negotiations with affected landowners. Affected public or external agencies will be consulted and advised throughout the planning, approvals and design processes.

9.10.2. EA Amendment Not Required

Changes to proposed surface facilities may result due to changing local conditions or service requirements (e.g. the number of required bus bays). Provided that these minor variations continue to affect only those listed within this EA, property negotiations and the Site Plan Approval process listed above is considered sufficient.

In the event that a change will affect a property owner not previously identified, TTC will undertake an analysis and evaluation consistent with the decision-making processes contained within this EA in order to confirm that the proposed changes have fewer impacts or greater benefits than the Undertaking. This analysis will be discussed in consultation with all potentially affected property owners and key stakeholders prior to finalizing the alignment change.

Subway Alignment

During the design phase, it may be necessary to adjust the horizontal or vertical subway alignment in response to geotechnical conditions (changes to the vertical alignment are discussed above). Changes in horizontal alignment can result in two possible issues:

1) A change in the findings of the noise and vibration analysis contained within this EA. Therefore, TTC will update the noise and vibration analysis contained in the EA and in the event that a new adverse effect is predicted, the affected property owner will be consulted prior to finalizing the alignment change.
2) A change in the property requirements. This can either be a change in the amount of property required from the already identified list of affected owners or affecting new properties. For the former, consultation for this change is considered part of the ongoing property negotiations. For the latter, the affected property owner will be consulted prior to finalizing the alignment change.

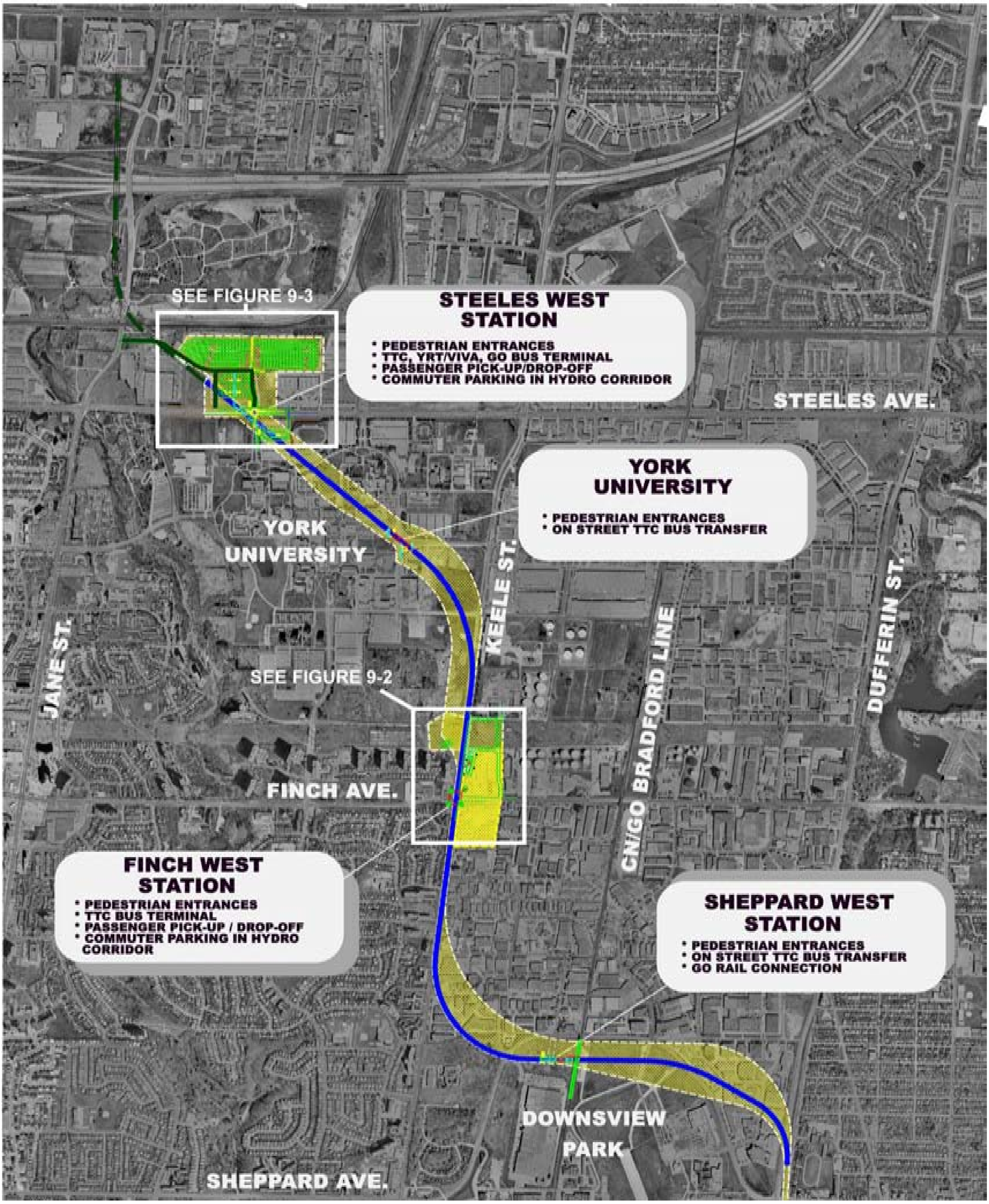
Station Entrances

All stations are equipped with more than one station entrance. The size and location of these amenities directly relates to the anticipated demand and the availability of property. The relationship between the entrance and the fare paid zone within the station will affect the type of station entrance. Similarly, as planning initiatives are put in place to encourage transit-supportive development adjacent to the stations, there may be future opportunities to integrate these entrances into proposed development.

The possibility of changes to the entrances during the design phase has been communicated to the public and key stakeholders. These changes are considered to be minor in nature and will be planned and communicated through the Site Plan process.

Emergency Exit Buildings / Emergency Service Buildings

The need for Emergency Service Buildings (instead of Emergency Exit Buildings) and their location will be determined during the design of the Spadina Subway Extension. Although minor in size, these buildings will be subject to Site Plan Approval.

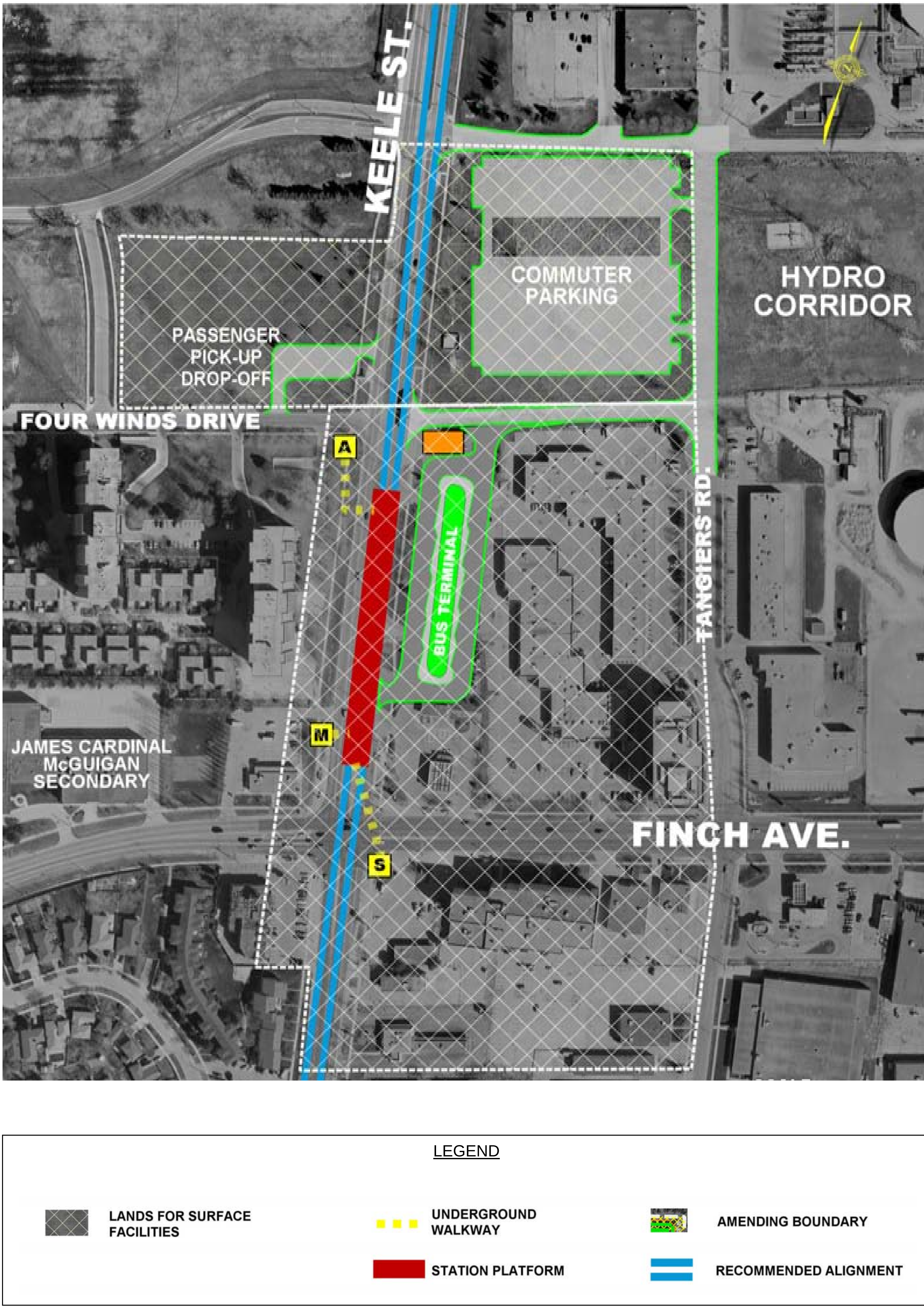


LEGEND

- LANDS FOR SUBSURFACE EASEMENT
- SUBJECT TO YORK REGION EA AMENDING PROCEDURES
- RECOMMENDED ALIGNMENT
- AMENDING BOUNDARY

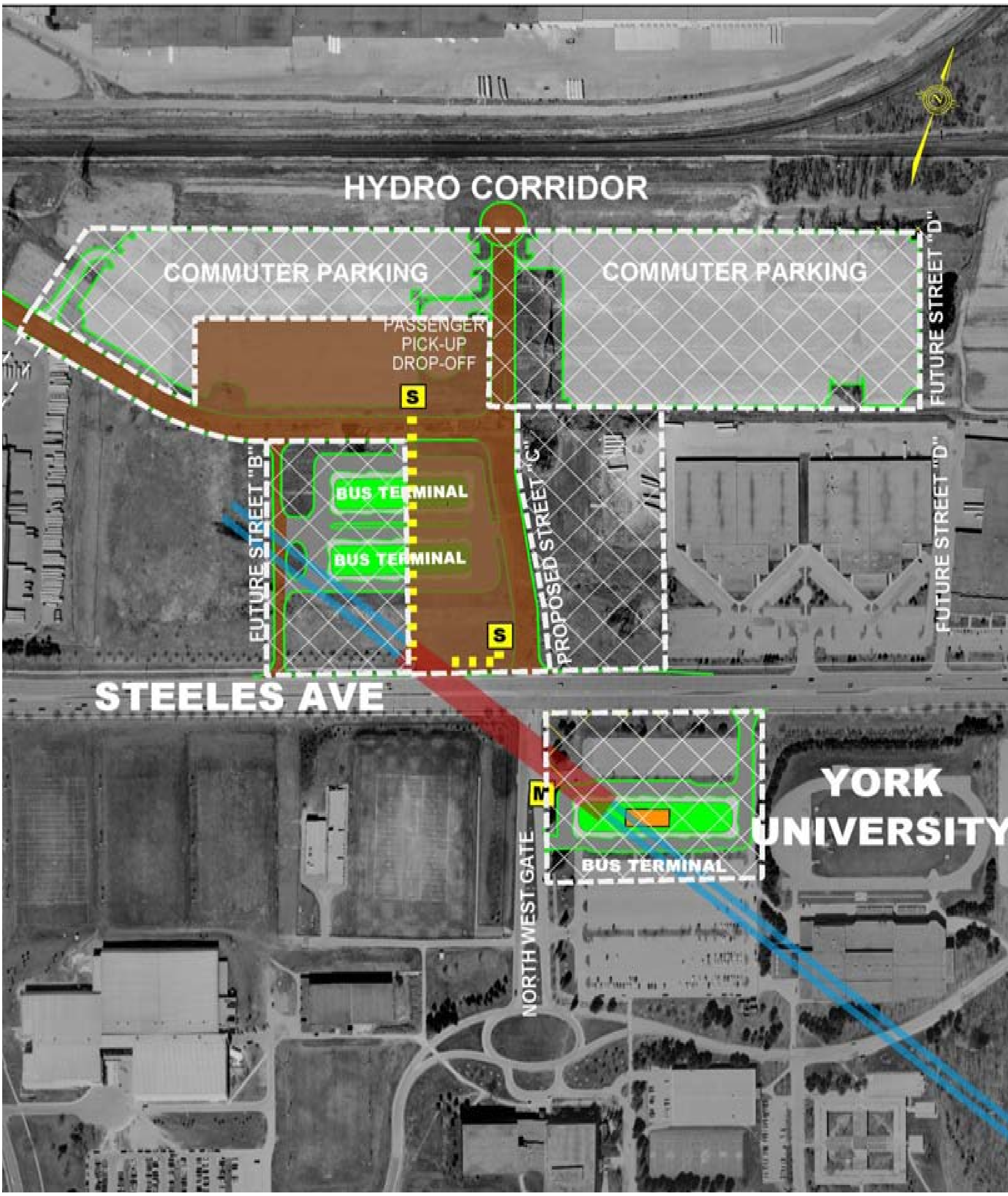
Note: Modifications to any works associated with the undertaking that fall outside the defined boundary will require an amendment.

Figure 9-1: EA Amending Scope



Note: Modifications to any works associated with the undertaking that fall outside the defined boundary will require an amendment.

Figure 9-2: EA Amending Scope
Finch West Station



LEGEND

- SUBJECT TO YORK REGION EA AMENDING PROCEDURES
- LANDS FOR SURFACE FACILITIES
- UNDERGROUND WALKWAY
- STATION PLATFORM
- AMENDING BOUNDARY
- RECOMMENDED ALIGNMENT

Note: Modifications to any works associated with the undertaking that fall outside the defined boundary will require an amendment.

Figure 9-3: EA Amending Scope
Steeles West Station

Commitments to Future Work

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ABBREVIATIONS

1994 EA	***1994 Environmental Assessment*** – refers to the Yonge-Spadina Loop Environmental Assessment, which was approved by the Ministry of Environment in 1994.
ANSI	***Areas of Natural and Scientific Interest*** – refers to areas of land and water containing natural landscapes or features that have been identified by the Province as having life science, or earth science values related to protection, scientific study, or education.
AAQC	***Ambient Air Quality Criteria***
ATC	***Automatic Train Control***
BRT	***Bus Rapid Transit*** – refers to buses operating in an exclusive right-of-way to achieve improved speed, reliability and capacity by avoiding road traffic congestion.
CEAA	***Canadian Environmental Assessment Act*** (CEAA)
CN	***Canadian National (Railway)***
dBA	"A" weighted decibels, which corresponds to subjective perception of noise levels.
EA	***Environmental Assessment***
EA Act	Environmental Assessment Act of the Government of Ontario
ESA	***Environmentally Significant/Sensitive Area*** refers to natural areas within the Province that contain significant natural features that have been identified as exhibiting rare and/or endangered species, unique landforms, vital ecological functions, unusual wildlife, diversity or habitat or wildlife movement corridors.
EMI	***Electro Magnetic Interference***
FSI	***Floor Space Index -*** an expression of building density. An FSI of 2.0 would indicate a gross (building) floor area of two times the site area.
GO	***Government of Ontario*** (rail and bus transit commuter service)
GTA	***Greater Toronto Area*** – refers to areas under the jurisdiction of the City of Toronto, Durham Region, York Region and Peel Region.
HOV	***High Occupancy Vehicle***
LOS	***Level of Service -*** a letter scale assigned as a quantitative measure of traffic flow on roadway. It is dependant upon the vehicle delay and vehicle queue lengths. The scale ranges from "A", where no delay is experienced, to "F", where saturation has occurred, with vehicle demand exceeding the available capacity of the roadway.
LRT	***Light Rail Transit*** - which uses electrically powered steel-wheel vehicles operated in various degrees of right-of-way (ROW) from Protected ROW to Private ROW. In the context of this study, LRT excludes streetcar (i.e., streetcar with no right-of-way).
MNR	***The Ministry of Natural Resources of Ontario***
MOE	***The Ministry of the Environment of Ontario***
MTO	***The Ministry of Transportation of Ontario***
OPA	***Official Plan Amendment***
PHF	Peak Hour Factor: ratio of peak hour (ridership) volume to 3-hour peak period volume (e.g. 0.60 for subway trips in downtown, or 0.55 for other subway trips, 0.40 for auto trips).
PPUDO	***Passenger Pick Up / Drop Off***
PSW	***Provincially Significant Wetlands***
RGS	***Ridership Growth Strategy*** (2003) – refers to a TTC study that contains results of TTC's transportation research and data, as well as provides a comprehensive approach to transit service improvements.
ROW	***right-of-way***

RT	***Rapid Transit***
RTES	***Rapid Transit Expansion Study*** – refers to a TTC study conducted in August 2001 to examine the need and priorities of expanding the GTA's rapid transit system to meet the growing employment and residential populating within the Greater Toronto Area.
TAC	***Technical Advisory Committee***
ToR	***Terms of Reference –*** refers to the terms of reference of the Spadina Subway Extension EA
TRCA	***Toronto and Region Conservation Authority***
TSP	***Total Suspended Particulate Matter***
TTC	***Toronto Transit Commission***
TTPC	***Technical Transportation Planning Committee***
TTS	***Transportation Tomorrow Survey***
York Region	***The Regional Municipality of York***
YRT	***York Region Transit***

GLOSSARY

“A” weighted decibel; dBA

A nationally and internationally standardized frequency weighting applied to the sound level (measured in decibels) spectrum to approximate the sensitivity of the human hearing mechanism as a function of frequency (pitch).

Alignment

Refers to the specific horizontal and vertical geometric configuration of the subway tracks. An alignment appears as a line on a map.

Ambient/ Background Sound Level

The all-encompassing noise associated with a given environment and comprises a composite of sounds from many sources, other than the source of interest, near and far. In the context of this document, the ambient or existing noise level is the noise level, which exists at a receptor as a result of existing traffic conditions without the addition of noise generated by the proposed undertaking or the new source of noise.

Bus Bays

Off-street areas for loading and unloading passengers within the bus circulation portion of a transit station.

Bus Rapid Transit

Buses operating in an exclusive right-of-way to achieve improved speed, reliability and capacity by avoiding road traffic congestion.

Bus Terminals

Off-street structures for loading and unloading bus passengers.

Crossover Tracks

Special track work that allows trains to switch or “cross over” from one set of tracks to another.

Density

In reference to land use, density refers to the average number of persons within an area. Single-family homes within a subdivision are considered low density, where as multi-storey buildings is considered high density.

Double Tie Track bed System

A floating slab track system, which has the tracks fastened to a concrete slab that is isolated from the tunnel structure by special neoprene rubber pads. TTC has successfully used this system to significantly reduce the potential of ground-transmitted noise and vibration with the passing of a subway train.

Easements

Right to enter subject property for specific reasons.

Electro Magnetic Interference (EMI)

Interference to the operation of electronic equipment caused by currents induced by external electromagnetic fields. These electric and magnetic fields (EMF) are created whenever electricity is generated, used or transported.

Elevation

The vertical distance of a point above mean sea level or above another datum.

Environment

Environment as defined in the Ontario Environmental Assessment Act means:

i) Air land or water;
ii) Plant and animal life, including human life;
iii) The social, economic and cultural conditions that influence the life of humans or a community;
iv) Any building, structure, machine or other device or thing made by humans;
v) Any solid, liquid, gas, odour, heat, sound, vibration or radiation resulting directly or indirectly from human activities; or
vi) Any part or combination of the foregoing and the interrelationships between any two or more of them, in or of Ontario.

Environmental Assessment (EA)

A decision-making process used to determine the advantages and disadvantages to the environment of proceeding with a proposed project. Under the Ontario Environmental Assessment Act, the Spadina Subway Extension is required to undergo an Environmental Assessment before a decision is made on whether or not the project should proceed.

For more information about environmental assessments and the process, visit the Ontario Ministry of the Environment web site at: http://www.ene.gov.on.ca

Erosion
A slow wearing away of the surface by natural action of wind or water.

Evaluation Criteria
Principle or standard on which a judgment or decision may be based.

Excavation
The act of taking out material.

Expropriation
The acquisition of property in accordance with the ***Expropriations Act*** of Ontario.

Flood plain
Normally dry land areas that are adjacent to a natural stream or watercourse and that are temporarily inundated during floods.

Footing
Portions of the foundation of a structure that transmits loads directly to the soil

Geotechnical engineering
The application of scientific methods of engineering principles to the acquisition, interpretation and evaluation of subsurface data to predict the behaviour of the materials of the earth's crust. It encompasses the fields of soil mechanics, rock mechanics, geological engineering, geophysics and related fields, such as pavement design.

Glacial Tills
Ice transported soils, sand, gravel and boulders in various rations.

Grade
The profile of the centre of the running structure for the subway (or a roadway), or its rate of ascent or descent

Grade Separation
Bridge separating two linear facilities at cross points. This is most commonly used in discussing crossings of road and rail.

Ground water
Free water contained in the zone below the water table. The source of water in wells, springs, etc.

Headway
The time separation between two vehicles, both traveling in the same direction (on long vehicles such as a subway, this is measured from the time the head of the first vehicle passes a fixed point to the time the second vehicle passes the same fixed point).

Herbaceous
Vegetation that is non-woody.

Higher Order Transit Corridor
Term used in the City of Toronto Official Plan, which refers to existing or future transportation routes warranting improved transit priority and capacity. Includes busways, Light Rapid Transit and subways.

Horizontal curve
A circular curve or transitional by means of which an alignment can change direction to the right or left.

Impervious
Resistant to the penetration of a liquid or gas.

"In force" planning document:
An "in force" planning document is an Official Plan or By-law that has received the required municipal and/or provincial approvals to make it applicable under Sections 16 or 34 of the Planning Act.

Indicator
Characteristic or attribute, which can be measured, (i.e. data).

Infiltration
The flow of a fluid into a substance through pores or small openings, most commonly used when discussing surface water and soils.

Intersection
The area common to two ore more roads come together at an angle.

Landscaping
Enhancing the natural features of the land through the design and use of vegetation and other materials.

Link
A connection between points within a transportation system.

Concourse
The level within a station that is located between the street level and the platform level.

Mitigation
Action necessary to prevent, change or remedy potential adverse effects.

Mixed Traffic
Transit vehicles sharing the roadway with automobiles and commercial vehicles.

Modal Split
Percent of trips made by one means of transportation. Transit mode split would refer to the percentage of the total trips that are made by transit.

Mode
Means of transportation

Net Effects
Advantages / disadvantages remaining after mitigation or enhancement has been addressed.

Network
Interconnected / interrelated transportation system

Node
A concentration of land uses and related buildings

Noise
Defined as any unwanted sound.

Noise barrier
A barrier of earth, stone, concrete or wood to reduce the noise level on abutting property.

Noise level
The sound level obtained through the use of A-weighting according to ANSI Standard 1.4. The unit of measure is the decibel (dB), commonly referred to as DBA when A-weighting is used.

Official Plan
An Official Plan is a long-term policy document, which governs development and land use activities of a municipality that has been implemented in accordance with the ***Planning Act***.

Off-Street
Transit operation occurring within the station area, off a road right-of-way

On-Street
Transit operation occurring within a road right-of-way

Open Channel
A natural or manmade path in which water flows with a free surface.

Overburden
The mass of soil that overlies a source of rock, gravel or other road material. This material is removed before the materials are quarried to avoid contamination.

Overland Flow
The flow or rainwater or snowmelt over the land surface toward stream channels. After it enters a stream, it becomes runoff.

Paid Fare Zone
The area within a subway station where only those passengers that have paid the appropriate transit fare are allowed.

Peak Hour
Maximum hour of travel demand during a weekday

Peak Period
Defined period of maximum travel demand, generally the three-hour period during a weekday

pH
A scale of numbers from 0 to 14 that indicate the acidity or alkalinity of a solution. Numbers below 7 indicate acidity and numbers above 7 indicate alkalinity.

Platform
The area of the station which passengers use to enter and exit subway vehicles.

Pollution
Contamination of any component of the total environment by harmful substances, sounds, smells or sights degrading or injurious to humans and other living organisms.

Profile
A longitudinal section of the subway (or road).

Rapid Transit
Rail or bus transit service operating completely separates from all modes of transportation in an exclusive right-of-way.

Right-Of-Way
Land generally publicly owned, acquired for and devoted to transportation purposes, predominantly roads.

Route
General corridor between Downsview Station and Steeles Avenue, linking general subway station locations. These will be developed in Phase One and evaluated in Phase Two of the Environmental Assessment.

Runoff
That part of the precipitation that appears in the surface streams. It is the same as stream flow unaffected by artificial diversions, storage or other works of man in or on the stream channels.

Screenline
Definable boundary section across which trip volumes are measured or estimated.

Sediment
Fragmentary material that originates from weathering of rocks and is transported by suspended in or deposited by water.

Skew Angle
The complement of the acute angle between two centrelines that cross.

Slope
Any ground whose surface makes an angle with the plane of the horizon.

Soil
Sediment or other unconsolidated accumulation of solid particles produced by the natural physical and chemical disintegration of rocks and which may or may not contain organic matter.

Soil Classification
The arrangement of soils into classes according to their physical properties.

Soil Stabilization
Measures taken to eliminate or minimize the erosion of soil, or to improve its supporting capacity.

Spadina Subway
Refers to St. George Station to Downsview Station section of the Yonge-University-Spadina Subway.

Station Facilities
Associated station facilities including bus terminals, passenger pick-up / drop-off, commuter parking, pedestrian entrances, taxi stands and bicycle racks.

Storm Drain
A system of catch basins and underground pipes designed to collect, concentrate and convey water to an outfall, which is usually a nearby watercourse.

Stream
A general term for a body of flowing water.

Streetscape
Visual appearance of a street and its components, comprising both hard (e.g. concrete, paving stones, asphalt, lighting and furniture) and soft (e.g. grass, trees and shrubs) landscaping.

Subway
An electric railway, with the capacity for a heavy volume of passengers, operating completely separate from all modes of transportation in an exclusive right-of-way.

Subway Station
A passenger facility on a subway, which provides access to subway, trains. A subway station always includes pedestrian entrances and may also include other commuter facilities, such as parking and bus terminals.

Superelevation
The elevation of the outside edge of a curve to partially offset the centrifugal force generated when a vehicle rounds the curve.

Time of Concentration
The time required for water to flow from the farthest point on the watershed to the gauging station.

Traffic Control Devices
Signs, signals, markings and devices placed or erected for the purpose of regulating, warning or guiding traffic.

Traffic Island
An island provided in the roadway to separate or direct streams of traffic; includes both divisional and channelizing islands.

Traffic Lane
That portion of the traveled way for the movement of a single line of vehicles.

Traffic Volume

The number of vehicles passing a given point during a specific period of time.

Undertaking

Proposed facility (transit line, new road, road widening, etc.)

Unpaid Fare Zone

Area in a subway station between the entrance and the fare collection.

Vaughan Corporate Centre

Vaughan Corporate Centre is a 900 hectare site along the Highway 7 corridor, just each of Highway 400, which is the planned future downtown of the City of Vaughan. Once developed, the Corporate Centre will include business offices, residences, entertainment and cultural facilities, and pedestrian shopping areas. In the long term, the Corporate Centre will include 1,500 to 2,000 dwelling units and support 30,000 jobs.

Vibration

A temporal and spatial oscillation of displacement, velocity or acceleration in a solid medium

Water Table

The top of the zone of permanent soil saturation. The water table may rise or fall seasonally, or it may be drawn down by removal of water.

Watershed

The divide separating one drainage basin from another.