APPENDIX A – SCARBOROUGH-MALVERN LRT FEASIBILITY STUDY REPORT

TORONTO TRANSIT COMMISSION

TRANSIT CITY LIGHT RAIL - SCARBOROUGH MALVERN LRT
PHASE 1 - FEASIBILITY STUDY

FINAL REPORT

OCTOBER 2008

IBI GROUP ARUP

TABLE OF CONTENTS

LIST OF EXHIBITS

APPENDICES

EXECUTIVE SUMMARY

E.1 Introduction

The City of Toronto has undertaken a number of studies and initiatives pertaining to the cost-effective expansion of transit as a means of making Toronto a more liveable and environmentally sustainable city. These various studies and initiatives have been consolidated into one high-level plan for a light rail transit network in Toronto, referred to as the Toronto Transit City – Light Rail Plan. This Light Rail Plan, comprising of seven new light rail transit lines, was endorsed by the Toronto Transit Commission (TTC) in March 2007, and supported by the Province of Ontario in June 2007 as part of Move Ontario 2020, a strategic transit plan across the GTA and Hamilton. The subject of this report is a Feasibility Study for the Scarborough Malvern LRT (SMLRT), which is one of the seven proposed LRT lines in the Toronto Transit City – Light Rail Plan.

Two purposes were established for this Feasibility Study. The primary purpose is to develop a high-level functional design that will confirm the constructability of the project. The secondary purpose is to identify and assess alternative corridors between Kingston Road and the northern Scarborough communities and to identify various design issues and options for future considerations in the EA study. Section 2 describes the purpose of the Feasibility Study in detail.

The SMLRT is a 15 km long corridor that would link Kennedy Station with northern Scarborough communities. The preliminary light rail service concept, would run east from Kennedy Station on Eglinton Avenue, northeast on Kingston Road, and then north on Morningside Avenue to northern Scarborough communities. The SMLRT would potentially connect with the University of Toronto at Scarborough Campus (UTSC) and Centennial College's Ellesmere Road Campus. The study area and the associated exhibit are shown in Section 3. Section 4 provides the City of Toronto / TTC plans and polices to guide the SMLRT project and this Feasibility Study.

Section 5 provides the summary of the methodology with the associated tasks in order to complete this Feasibility Study. The major tasks have been summarized in the following report sections:

- Data Collection (Section 6);
- Design Criteria and Operational Plan Concept (Section 7);
- Existing Conditions (Section 8);
- Development and Assessment of Alternative Corridors (Section 9);
- Recommended SMLRT Corridors (Section 10);
- SMLRT Alignment and Issues Identification (Section 11);
- Summary of Key Issues (Section 12).

E.2 Development and Assessment of Alternative Corridors

As noted earlier, the objective of the SMLRT is to link Kennedy Station and northern Scarborough communities. The City of Toronto's Official Plan has designated both Eglinton Avenue and Kingston Road in the study area as part of the surface transit priority network. As a result, alternative corridors were not investigated for both Eglinton Avenue and Kingston Road. From the Kingston Road / Morningside Avenue intersection to northern Scarborough, there are two key areas that support high quality transit service: University of Toronto Scarborough Campus (UTSC) and Malvern Town Centre (MTC). Based on the established City planning policies and the overall project objectives, alternative corridors were identified, developed, and assessed between:

- Kingston Road / Morningside Avenue Intersection to University of Toronto Scarborough Campus and,
- University of Toronto Scarborough Campus to Malvern Town Centre.

Based on the investigation and documentation of the existing conditions (see Section 8), key issues, potential impacts, opportunities and constraints were identified. Screening criteria were identified to reflect the existing conditions and to be consistent with the project's objectives, in order to comparatively assess and differentiate the alternative corridors. The development and assessment of the alternatives are discussed in Section 9.

E.3 Recommended SMLRT Corridors

Based on the assessment of the alternative corridors, the recommendation is to connect Kennedy Subway Station with the Malvern Community in an LRT right-of-way utilizing the following corridors:

- from Kennedy Subway Station, east along Eglinton Avenue to Kingston Road, in the centre of the roadway;
- from the Kingston / Morningside Intersection, northeast on Kingston Road to Morningside Avenue, in the centre of the roadway;
- from the Kingston / Morningside Intersection, north on Morningside Avenue to Sheppard Avenue, via Ellesmere Road and Military Trail in order to provide transit service to the University of Toronto Scarborough Campus and,
- from the Morningside / Sheppard Intersection, west along the shared "interlaced" Sheppard East LRT alignment to Neilson Road, and north along Neilson Road to the Malvern Town Centre area, in the centre of the roadway.

E.4 SMLRT Alignments and Key Issues

In order to identify issues and confirm the constructability of the SMLRT, a 1:1000 functional design (i.e. plans and profiles) for a centre of the roadway alignment was developed. Potential locations for alternative alignments that were deemed appropriate for further investigation were also highlighted where opportunities were present that could potentially minimize impacts and costs, or could improve the transit service. LRT stop / platform locations and configuration were also identified based on the developed design criteria and TTC/City's input.

In terms of property requirements, Eglinton Avenue, Kingston Road, Sheppard Avenue and Neilson Road would have sufficient right-of-way widths to construct LRT, with the exception of some intersections areas in the above noted corridors that require additional property to accommodate additional lanes or daylighting triangles for providing the sufficient sight distance at the intersections. Along Morningside Avenue corridor, properties may be required along the corridor in various locations.

The existing bridges will require strengthening due to the additional loads from the trackwork, overhead pole, rail breakage forces and other items to accommodate the LRT trackwork. Morningside Avenue Bridge over Highland Creek would not have sufficient deck width to accommodate the addition of the LRT right-of-way, therefore alternatives structural alternative assessment/evaluation will be required in the EA stage with the consultation with the Toronto and Region Conservation Authority (TRCA).

The estimated construction cost of $275 million excludes the terminus station inter-connection segments at Kennedy Station and Malvern Town Centre, the segment along Sheppard Avenue, property acquisition costs, vehicle acquisition costs, and costs for engineering, management, and contingency.

In general, the SMLRT is a feasible project. The key issues include the number and location of platforms, extent of utility impacts, property impacts, future traffic operation requirements (especially at the signalized intersections), transit service operation requirements (for both bus or LRT) will require further study during the EA stage.

1. INTRODUCTION

The City of Toronto has undertaken a number of studies and initiatives pertaining to the cost-effective expansion of transit as a means of making Toronto a more liveable and environmentally sustainable city. These plans and initiatives include:

- City of Toronto's Official Plan (2002);
- TTC's Ridership Growth Strategy (2003);
- TTC's Building a Transit City (2004);
- Mayor Miller's "Transit City" Platform (2006).

These various studies and initiatives have been consolidated into one high-level plan for a light rail transit network in Toronto, referred to as the Toronto Transit City – Light Rail Plan, as shown in **Exhibit 1-1**.

Exhibit 1-1: Toronto Transit City Light Rail Plan

The plan calls for the implementation of seven new electric light rail lines across the City of Toronto, which would provide fast, reliable, environmentally-sustainable light rail transit services to all areas of Toronto, and particularly to areas which do not have higher order transit services today. Fundamental to the plan is the seamless interconnection of the proposed new lines with each other, and with the city's existing transit routes including the planned extensions of the University-Spadina Subway to York University and York Region, and the Scarborough RT to Sheppard Avenue and the Malvern community. The plan also provides the basis for the creation of a seamless Greater Toronto Area network of rail and bus rapid services.

The major objectives of the Toronto Transit City – Light Rail Plan are to provide:

- faster travel between the major areas of the City of Toronto, thereby offering a competitive travel times and less stressful alternative to private cars;
- reliable and frequent service in road space reserved for transit customers eliminating the delays caused by operation in mixed traffic;
- fully accessible design, so that people with all levels of mobility can use the service with confidence and ease;
- direct transit links to all areas that are currently far removed from higher order transit services, including the north, west, and eastern parts of Toronto;
- connections with the existing and proposed rapid transit system, thereby adding further travel opportunities and maximizing integration of the new lines into the overall rapid transit network;
- interconnections or connection opportunities to the Greater Toronto Area (GTA) regional transit network, including the City of Mississauga, York Region, and Durham Region;
- interconnection opportunities with GO Transit rail and bus network.

The Toronto Transit City – Light Rail Plan, comprising of seven new light rail transit lines, was endorsed by the TTC Commission in March 2007, and supported by the Province of Ontario in June 2007 as part of Move Ontario 2020, a strategic transit plan across the GTA and Hamilton.

The endorsed plan is a high-level strategy, addressing the stated objectives, and consistent with the studies and initiatives of the City, TTC and the Province. From this high level strategy, planning and design activities will be undertaken for each of the seven proposed light rail transit lines, including but not limited to: feasibility studies, environmental assessments, detailed investigations, and detail design. The subject of this report is a Feasibility Study for the Scarborough Malvern LRT (SMLRT), one of the seven proposed LRT lines.

The Scarborough Malvern LRT is a 15 km long corridor that would link Kennedy Station, including the Bloor-Danforth Subway, the Scarborough RT and the proposed Eglinton Crosstown LRT, with northern Scarborough communities. The preliminary light rail service concept, to be confirmed in this study, would run east from Kennedy Station on Eglinton Avenue, northeast on Kingston Road, and then north on Morningside Avenue or Military Trail to northern Scarborough communities. Benefits of the line would include provision of a new high quality light rail service along several busy existing transit routes, and a direct service to the University of Toronto at Scarborough Campus (UTSC) and Centennial College's Ellesmere Road Campus. In addition to the transit connections at Kennedy Station, the SMLRT presents connection opportunities with:

- a variety of TTC bus services;
- GO Transit rail stations (Kennedy, Eglinton, and Guildwood which includes a VIA Rail stop);
- GO Transit bus services at UTSC;
- Transit City's Sheppard East LRT;
- the proposed Scarborough RT extension, in the vicinity of Malvern Town Centre;
- longer-term interregional connections with transit lines to the north into York Region and to the east into Durham Region.

2. PURPOSE OF THE STUDY

The purpose of the Feasibility Study is to develop a high-level functional design that will confirm the constructability of the project, and identify opportunities, constraints, and areas that will require additional planning and design effort. Specifically, the study will:

- develop a functional design plan that presents the general track alignment in the road right-of-way, with stops generally provided at all major arterials, and at intermediate locations where are supportive of City and TTC objectives;
- identify for the developed functional design plan, the location of proposed stop platforms, areas of roadway modifications, potential property and access impacts, preliminary bridge requirements, and other areas requiring further detailed study;
- evaluate the feasibility of the alignment and identify issues/constraints that require further study;
- identify options for providing high quality passengers transfer between existing and proposed TTC service and other regional transit service;
- identify and evaluate alternatives alignment to Malvern Town Centre from Morningside/Ellesmere intersection;
- outline key drivers to successfully address the Transit City Light Rail Plan objectives and other issues that should be to be investigated in order to support recommendations in the environmental assessment study, such as right-of-way requirements, major structure modifications, major utility impacts, and potential traffic operational issues (i.e. emergency services, access to and from businesses, access restrictions to communities).

The preliminary LRT alignment concept consists of traveling east from Kennedy Station on Eglinton Avenue, northeast on Kingston Road, and then north on Morningside Avenue or Military Trail to northern Scarborough communities. Alternative corridors to the northern Scarborough communities from Kingston Road will be investigated. In addition, given the narrow right-of-ways along Morningside Avenue and Military Trail, various design issues and options will need to be identified for future consideration during the environmental assessment study.

Therefore, in addition to the primary purpose of developing a high-level functional design and confirming the feasibility of the project, the secondary purpose of the Feasibility Study includes:

- identification and assessment of alternative corridors between Kingston Road and the northern Scarborough communities, including the options to serve UTSC;
- identification of various design issues and options for future consideration during the EA study in order to minimize property requirements, maximize the potential for at-grade alignments, and to minimize costs.

It is understood that a number of other studies are underway which affect this project, and will require consideration when the recommendations become available at a later stage, including: inter-connection with other transit lines at Kennedy Station; location of storage and maintenance facility for the Scarborough Malvern LRT line; inter-connection with the Scarborough RT extension; and, interface details with the Sheppard East LRT.

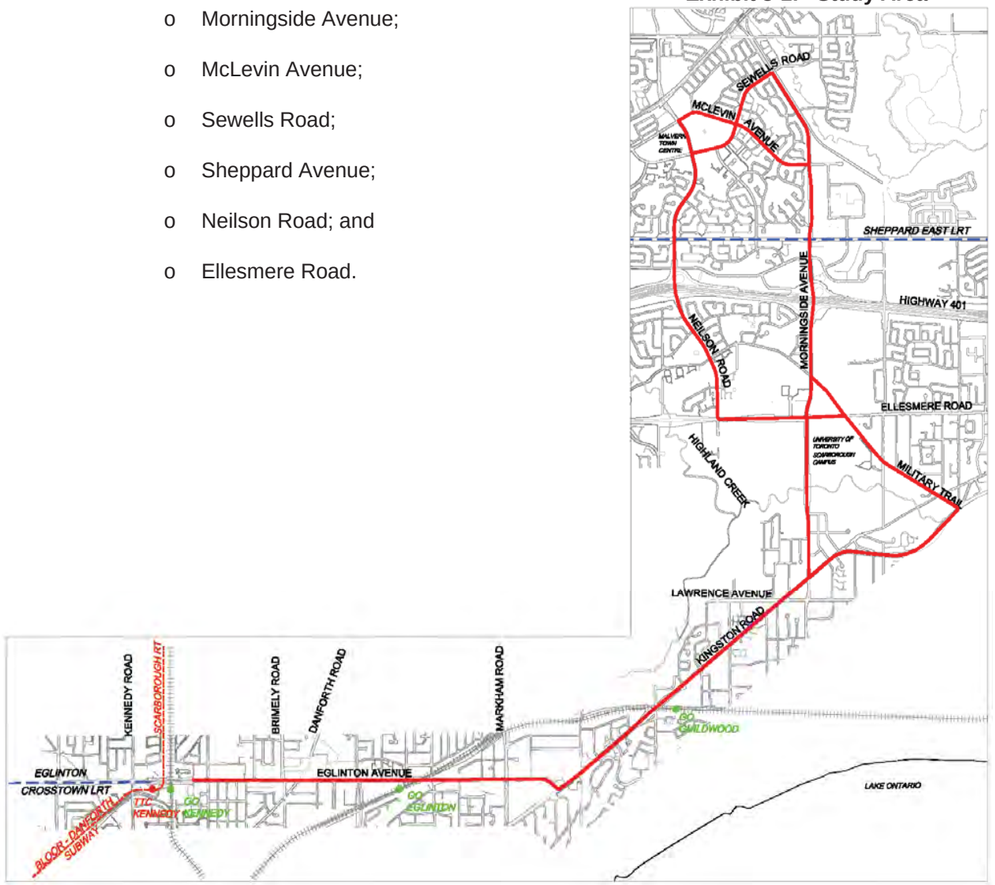
This report provides a summary of the methodology and assumptions for addressing both the above-stated primary and secondary purposes of the study.

3. STUDY AREA

The study area for the Scarborough-Malvern LRT Feasibility Study and Environmental Assessment, as shown on **Exhibit 3-1**, includes:

- Eglinton Avenue, from Kennedy Subway Station to Kingston Road;
- Kingston Road, from Eglinton Avenue to Military Trail;
- Morningside Avenue and Military Trail, from Kingston Road to University of Toronto Scarborough Campus (UTSC);
- various corridors in northern Scarborough from UTSC to the Malvern Community, including:
  - Morningside Avenue;
  - McLevin Avenue;
  - Sewells Road;
  - Sheppard Avenue;
  - Neilson Road; and
  - Ellesmere Road.

Exhibit 3-1: Study Area



4. STUDY BACKGROUND

The following City of Toronto and Toronto Transit Commission plans and policies guide this Feasibility Study, particularly in order to access and select the preferred SMLRT corridors (i.e. secondary purpose of the study):

- **City of Toronto's Official Plan -** The City's Official Plan supports continued growth in Toronto, but places greater emphasis on using available road space more efficiently to move people, rather than vehicles. Transit, walking and bicycle lanes in conjunction with providing a better variety and density of transit-oriented development are major cornerstones of the Official Plan.

  The Official Plan's Map 4 - Higher Order Transit Corridors, and Map 5 – Surface Transit Priority Network, identifies Eglinton Avenue and Kingston Road in our study area as part of the future transit network. The City's transportation network will be developed to support increased transit priority over vehicles on selected corridors, including those identified on Map 5. Transit priority measures may include: reserved or dedicated lanes for transit; and, limiting or removing on-street parking during part or all of the day (Policy – 2.2 3h).

- **City of Toronto's Bike Plan -** The City of Toronto's Bike Plan is a 10 year strategy that includes the implementation of infrastructure to create a bicycle friendly environment that encourages the future use of bicycles for everyday transportation and enjoyment. The bike plan map indicates that Kingston Road, Morningside Road, Sheppard Avenue and Neilson Road in our study area as part of the overall bike network.

- **TTC's Ridership Growth Strategy -** In support of the City's Official Plan, the TTC prepared a strategy that focuses on increasing service and improving the speed and reliability of the TTC, and identifies corridors for transit infrastructure investment. A key element of this strategy is transit in dedicated rights-of-way, separated from traffic.

- **Toronto Transit City LRT Plan ("Building a Transit City") -** In 2007, the TTC developed a plan, which built upon the transit concepts from previous studies, including the Ridership Growth Strategy and the City's Official Plan. The plan recommends a network of electric light rail lines, each on its own right-of-way throughout the City, including the Scarborough-Malvern LRT, extending from the Kennedy Subway Station to northern Scarborough. The LRT lines reach all across Toronto, all connecting with the City's existing and planned rapid transit routes. The intent is that no one should be disadvantaged getting around Toronto if they don't own a car. The plan focuses on linking land use and transportation planning policies to create an effective strategy for accommodating the City's future trip growth.

In summary, the Feasibility Study and the subsequent Transit Project and Environmental Assessment Study is for a high quality transit service between Kennedy Subway Station and northern Scarborough, in a manner that: is affordable; makes transit a more attractive travel option relative to the private auto; supports other City objectives such as good urban design, and creating a more attractive walking and cycling environment; respects other road users, adjacent properties, and the natural environment; and, supports the City's growth objectives of providing a better variety and density of transit-oriented developments.

5. METHODOLOGY AND LIMITATIONS

The methodology for the Feasibility Study adopted these 5 tasks:

- Data Collection;
- Design Criteria;
- Develop and Assess Alternative Corridors / Alignments;
- Identify Key Issues; and,
- Documentation.

The following summarizes the major sub-tasks that were undertaken for each task:

Data Collection

- Assemble background data and reports, network plans, base mapping, readily available environmental and design material, and relevant TTC planning and operational information, including summary characteristics and features of the proposed LRT vehicles (TTC Engineering Design Standards / Manuals / Directives, City of Toronto urban design guidelines, City of Toronto pedestrian and cycling plans, Toronto and Region Conservation Authority (TRCA) requirements, other completed studies and reports such as the Eglinton Crosstown LRT Feasibility Study / SRT reports / maintenance facilities studies / Sheppard East LRT data, aerial / topo / property mapping, vehicle and other LRT design criteria data, traffic volume data, etc.).
- Establish existing conditions for each corridor based on available secondary information.
- Confirm existing conditions through site investigations.
- Conduct external meetings with key stakeholders to identify issues and constraints / opportunities (i.e. TRCA and MTO).
- Prepare appropriate base mapping and graphics base for presentation / documentation purposes.
- Identify gaps in the information and / or deficiencies and suggest remedial action.

Design Criteria

- Establish design criteria and operations plan assumptions as the basis for developing alternatives, addressing all components that will have property or other major impacts.
- Document design criteria and operations plan assumptions in a draft technical memorandum.

Develop and Assess Alternative Corridors

- Develop a high-level functional design including both horizontal and vertical alignments with an at-grade alignment (generally in the centre of the road right-of-way) and stops at all major arterials (and others as determined by the TTC), based on the established design criteria and operations plan, that will confirm the constructability of the project and identify opportunities, constraints, and areas that will require extra design and engineering effort.

- Alternative corridors to be developed and assessed include:

    a. Eglinton Avenue - from Kennedy Station (interface with Eglinton Crosstown LRT will be led by others), easterly along Eglinton Avenue to Kingston Road;

    b. Kingston Road - from Eglinton Avenue, easterly along Kingston Road to Morningside Road;

    c. from Kingston / Morningside intersection to U of T campus:

        i) northerly along Morningside Road to Sheppard Avenue (including improved and high quality interface opportunities with the U of T campus);

        ii) easterly along Kingston Road to Military Trail, northerly along Military Trail to the U of T campus;

        iii) other opportunities that could provide a high quality interface with the U of T campus.

    d. from UTSC to the vicinity of Malvern Town Centre (northerly extensions from Malvern Town Centre should be investigated and not precluded):

        i) westerly along Ellesmere Road to Neilson Road, northerly along Neilson Road to Malvern Town Centre (investigate / co-ordinate alignment opportunities with the Sheppard East LRT and the SRT Extension);

        ii) westerly along Ellesmere Road / Military Trail to Morningside Road, northerly along Morningside Road to Sheppard Avenue, easterly along Sheppard Avenue to Neilson Road, northerly along Neilson Road to Malvern Town Centre (investigate / co-ordinate alignment opportunities with the Sheppard East LRT and the SRT Extension);

        iii) westerly along Ellesmere Road / Miltary Trail to Morningside Road, northerly along Morningside Road to McLevin Avenue, easterly along McLevin Avenue to Malvern Town Centre (investigate / co-ordinate alignment opportunities with the Sheppard East LRT and the SRT Extension);

        iv) westerly along Ellesmere Road / Miltary Trail to Morningside Road, northerly along Morningside Road to Sewells Road, easterly along Sewells Road to Malvern Town Centre (investigate / co-ordinate alignment opportunities with the Sheppard East LRT and the SRT Extension).

- Functional design to identify the general track alignment (including locations for crossovers, tail tracks, interlining / connecting requirements, and maintenance facility / yard access) and the proposed stop platforms, including associated areas of roadway modifications (including urban design and landscape opportunities and co-ordination with the City's pedestrian and cycling infrastructure plans), potential property impacts and access impacts, assessment of bridge / structure impacts, impacts on major utilities, environmental constraints, and other areas that require definition and further detailed study.

- High quality interfaces / connections with other transit facilities (i.e. Eglinton Crosstown LRT, Bloor-Danforth Subway, Sheppard East LRT, SRT, GO Transit, Durham BRT) and major destinations (i.e. U of T campus, Malvern Town Centre) will be emphasized, with alternatives developed and assessed. Terminus details to investigate, in addition to high quality transit connections, potential extension capabilities.

- For each corridor, develop or review interface with and impacts of potential locations for maintenance and storage facilities.

- For each corridor, develop / document construction costs.

Identify Key Issues

- Outline key issues, major impacts, opportunities and constraints for each developed corridor / alignment with considerations of natural environment, socio-economic environment and existing transportation system.

- Develop screening criteria and comparatively assess each corridor, consistent with the project's goals and objectives and primarily based on the needs of the TTC, transportation / technical / cost criteria, and major environmental impacts.

- In conjunction with the TTC, recommend the preferred corridor(s) to carry forward for detailed assessment during the environmental assessment.

- Document the key issues, opportunities and constraints for the recommended preferred corridor(s) that require to be addressed in the EA study, including but not limited, interface details with other transit lines, the implications of right-of-way restrictions, major structures being crossed, major geographical elements (i.e. railways), property impacts, areas of risk and impacts on existing structures, businesses and the public, access to and egress from existing streets and major entrances.

- Update construction cost for the recommended preferred corridor(s).

- Document the process including the identification of key issues, the development of the screening criteria, the assessment / recommendation of the preferred corridor(s), description of the preferred corridor(s) advantages and disadvantages, and estimated construction costs.

Documentation

- Prepare a draft Feasibility Report summarizing the recommended functional design, including identification of key issues that are to be addressed during the environmental assessment study and subsequent phases (i.e. detailed design), including interface issues with other transit lines, implications due to right-of-way restrictions, impact on major structure crossings, major geographical elements, rail lines, property impacts, areas of risk and impacts on existing structures, businesses and the public, including access to and from existing streets. Update construction cost estimate.

- Prepare functional design plans of the corridor at a suitable scale for presentation (1:1000).

- Incorporate comments from the TTC and finalize Feasibility Report, and the associated construction cost and functional design plans.

6. DATA COLLECTION

All project team disciplines initiated data collection activities in order to establish the existing conditions within the study area. For the purposes of the Feasibility Study, the following activities were deemed critical:

- Aerial mapping from the City of Toronto (2003 orthophotos);
- Topographic base mapping from the City of Toronto (2003 topographic details and contours);
- Property data mapping from the City of Toronto (2007);
- Municipal utility data / mapping from the City of Toronto (2007);
- Highland Creek watershed data, including floodplain mapping from the TRCA (2007);
- City of Toronto policies, including the Official Plan, urban design guidelines, cycling plan, etc.;
- Traffic volumes and signal timings from the City of Toronto;
- Bridge general arrangement drawings from the City of Toronto and the Ministry of Transportation; and,
- Draft Transit City Design Criteria and Operating Concepts (2008).

Site investigations were conducted to document and confirm the existing conditions, and to identify any gaps and / or deficiencies in the information. Meetings were held with key stakeholders (i.e. TRCA and MTO) to identify any issues and constraints, and to ensure constructability.

To be noted, there are limitations associated with the above data collection:

- Degree of accuracy for the topographic base mapping is within 30 cm;
- Aerial and topographic base mapping do not include recent construction and development since 2003, but most notably the re-configuration of the Highway 401 / Morningside Avenue interchange; and,
- Property data mapping should not be considered completely accurate, as easements and recent consolidations, severances or public right-of-way conveyances are likely not refelected.

7. DESIGN CRITERIA AND OPERATIONAL PLAN CONCEPTS

The Transit City – Light Rail Plan is introducing a new technology to the TTC and the City of Toronto, and as such, design criteria for its construction and operation are in the development stage. In addition, the LRT vehicles have not been acquired so the final design parameters are not available. It is understood that the TTC is presently adopting the existing streetcar vehicle dynamic profile, as the proposed Transit City vehicle specifications are to conform these parameters. The TTC have initiated a draft Transit City Design Criteria and Operating Concepts (2008) document, a “live” document intended to be updated as the Transit City program progresses. Further, the TTC and the City have developed typical cross-sections at mid-block and at stop locations, illustrating the desirable dimensions for the LRT right-of-way, roadway, bike lanes, boulevards, and sidewalks.

For the purposes of the feasibility (and the environmental assessment) study, a design criteria document was prepared consistent with the above information, but based on IBI Group’s experience on other projects and other local standards / policies, was supplemented to provide planning and design details for track alignments (horizontal, vertical, clearances), road alignment and cross-section requirements, platform requirements (side, centre, terminus), and special trackwork requirements.

For the purpose of the Feasibility Study, a SMLRT operations plan was assumed in order to identify potential issues. Major considerations were the preliminary forecast ridership provided for the various segment links, accessibility and connectivity with other transit services, and the desire to provide crossovers for service operations (scheduled, recovery, emergency) approximately 4 km apart. In conjunction with TTC Service Planning, the following LRT operations plan was assumed:

- Kennedy Station – terminal operations – requirements being addressed by another study;
- Eglinton / Kingston Intersection – service operations – provision of crossovers and storage tracks, preferably on the east side of the proposed stop (major factors include approximate 4 km distance from the Kennedy Station; significant forecast ridership increase at this location, including being the terminus for the Kingston Road proposed BRT and other local bus routes);
- Kingston / Morningside Intersection – service operations – provision of crossovers, preferably on the west side of the proposed stop (major factors include approximate 4 km distance from the Eglinton / Kingston Intersection; forecast ridership increase at this location, including being the terminus for a number of local bus routes);
- Morningside / Ellesmere Intersection – potential terminal operations for an interlaced Sheppard LRT service – provision of crossovers and storage tracks, preferably on the south side of the proposed stop (major factors include providing transit service to both Centennial College and University of Toronto);
- Ellesmere / Military Trail Intersection – service operations – provision of crossovers and storage tracks, preferably on the north side of the proposed stop (major factors include providing transit service to both Centennial College and University of Toronto, and low forecast ridership to the north);
- Morningside / Sheppard Intersection to Neilson / Sheppard Intersection – interlaced Sheppard LRT service – provision of special trackwork (details to be determined and co-ordinated); and,
- Malvern Town Centre – terminal operations – requirements being addressed by another study.

For planning purposes, TTC Service Planning has provided the following service and surface bus route adjustments:

- new 586 Scarborough LRT route from Kennedy Station to Malvern Town Centre, via Eglinton, Kingston Rd, Morningside, Ellesmere, and Neilson corridors (24 / 7 operations);
- 116 Morningside route would be eliminated;
- new 116 Beechgrove service would operate from Kingston Road and Lawrence Avenue to Beechgrove, via Lawrence, Beechgrove, Coronation, Manse, and Lawrence (AM peak service every 15 min);
- 86 Scarborough route would be shortened to operate between Sheppard Avenue (Toronto Zoo) and Kingston Road and Eglinton Avenue, via Meadowvale, Kingston, Morningside, Guildwood Parkway, and Kingston (AM peak service every 5 min).

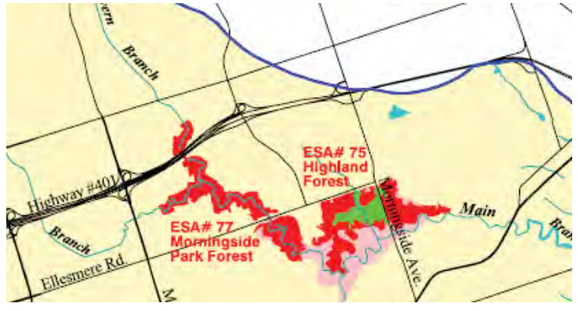
8. EXISTING CONDITIONS

Based on available secondary source information, meetings and discussion with key stakeholders (i.e. TRCA, MTO), preliminary site investigations, major features were identified including their sensitivity and significance. The key findings of the existing conditions are summarized in this section.

In addition, a windshield survey and base mapping investigation was undertaken for each potential corridor identified in the study area. The findings are presented in Appendix A – Existing Conditions, in 2 tables. The first table presents a summary for each major block in each corridor, including land use, road geometrics, and infrastructure characteristics, while the second table presents a photolog of each block and / or intersection.

Natural Environment

A Natural Heritage Existing Conditions Report has been prepared for the study area, based on available secondary source information, meetings and discussion with the TRCA, and site investigations, identifying major features, including their sensitivity and significance. Major features are located in the Highland Creek valley, including two from TRCA's own Environmentally Significant Area (ESA) system, and the one from the system for identifying Areas of Natural and Scientific Interest (ANSI) developed by the Ontario Ministry of Natural Resources.



The Highland Forest ESA (# 75) is located on both sides of Morningside Avenue south of Ellesmere Road. This site encompasses an extensive mature mixed forest on the valley slope, as well as the Highland Creek Swamp in the lowland area. Dominant trees include sugar maple, American beech, white ash, and red oak. The site also features the uncommon black maple and large specimens of red maple. Although a small amount of trampling and erosion has occurred in the slope forest, the herbaceous ground layer features a high diversity of native wildflowers, including white trillium, trout lily, jack in the pulpit, red baneberry, and two species of toothwort. The presence of red-backed salamanders is a further indication of forest quality. The nationally and provincially rare roughleaved goldenrod is also known to occur at this site. The swamp portion of the site supports such regionally uncommon plants as balsam fir, water avens, water pennywort and the two sedges. Unfortunately, a severe infestation of dog strangling vine is encroaching on the south end of that portion of the forest found on the east side of Morningside Avenue.

The Morningside Park Forest ESA (# 77) encompasses a large area on the east branch of Highland Creek stretching from just north of Highway 401 almost to the confluence of the creek south of Ellesmere Road. Eastern white cedar dominates much of the forest area, although mixed forest of sugar maple, white birch, and eastern hemlock is scattered throughout the valley. The ESA designation is based on the maturity and health of these forests, and the degree of tree regeneration. This site directly connects with the Highland Forest ESA to form the largest remaining forest block within the Highland Creek watershed.

The Ontario Ministry of Natural Resources' ANSI system identifies sites that have valuable features in terms of protection, natural heritage, scientific study, or education. There are two categories of ANSI: Life Science, and Earth Science. The single ANSI in the Highland Creek watershed encompasses the entire area of the Morningside Park ESA as well as adjacent lands, and is based on life science features, including the forested slope and the cedar-tamarack swamp located adjacent to Morningside Drive.

Based on initial meetings with the TRCA, these major environmental features do not present a constraint to the development of alternatives, and impacts would likely be avoidable, and / or minimized and mitigated.

Archaeological Resources

A Stage 1 archaeological assessment has been prepared, and no registered sites within the study area have been identified. However, areas in the vicinity of the Highland Creek valley would be considered as areas with high potential for archaeological resources, but would not present a constraint to the development of alternatives.

Built Heritage and Cultural Landscape Resources

A cultural heritage assessment was conducted for the corridors in the study area, with the following preliminary findings:

- 12 built heritage resources (listed on the City's Inventory of Heritage Properties) identified, primarily along the Eglinton and Kingston corridors;
- 8 cultural heritage landscapes (3 are listed on the City's Inventory of Heritage Properties) identified, primarily along the Eglinton and Kingston corridors; and,
- Other cultural landscapes identified include 2 cemeteries, 3 waterscapes, 2 railscapes, and 8 cultural heritage resources that are located in close proximity to the Eglinton and Kingston corridors.

These findings do not present any constraint to the development of alternative corridors.

Potential Environmental Contamination

A preliminary screening study was completed identifying properties within 200m of the corridors that have potential to contribute to environmental contamination. At this stage of the study, none of the sites identified present a constraint to the development of alternative corridors.

Noise Assessment

A preliminary noise assessment was completed identifying potential noise sensitive receivers along the potential corridors in the study area, including: schools and day care centres; hospitals and medical facilities; retirement and community facilities; residential areas with reverse frontages; and, residential and open space areas that may be potentially affected by the close proximity of the LRT alignment. Given the existing conditions and the potential mitigation available, the findings do not present any constraint to the development of alternative corridors.

9. DEVELOPMENT AND ASSESSMENT OF ALTERNATIVE CORRIDORS

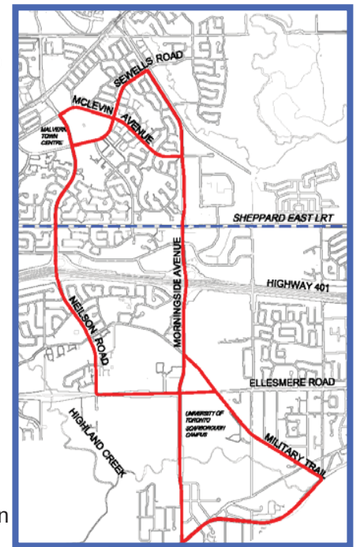
9.1 Objectives and Opportunities

The objective for the Scarborough-Malvern LRT (SMLRT) line is to provide a high quality transit service, connecting Kennedy Subway Station with northern Scarborough. The City of Toronto's Official Plan has designated both Eglinton Avenue and Kingston Road in the study area as part of the surface transit priority network. As a result, alternative corridors to Eglinton Avenue and Kingston Road were not investigated, as illustrated by the area bounded by green in Exhibit 9-1.

Opportunities for alternative corridors were investigated from the Kingston Road / Morningside Avenue intersection to northern Scarborough and the Malvern Community, as illustrated by the area bounded by blue in Exhibit 9-1. From the Kingston Road / Morningside Avenue intersection to northern Scarborough, there are two key areas that support high quality transit service:

- University of Toronto Scarborough Campus (UTSC) and Centennial College at Ellesmere Road Campus (CCEC) – these educational institutions generate significant all-day ridership with extensive planned expansion and development on UTSC property, north of Ellesmere Road;
- Malvern Town Centre (MTC) – existing and significant community and health care facilities, and potential to connect to the proposed SRT extension, thereby offering transit service accessibility opportunities.

Exhibit 9-1: Alternative Corridor Opportunities



Meetings have been held with UTSC senior officials to discuss their expansion and development plans, and although the plans are in early development stages, aggressive timelines are in place. Presently, the UTSC and CCEC have approximately 10,000 staff and students at peak attendance. The expansion and development plan envision potentially 30,000 staff and students, a major conference / hotel centre, and significant sports facilities, including a world-class 5,000+ seat aquatic centre that would be able to support a major sporting event, such as the Pam Am Games.

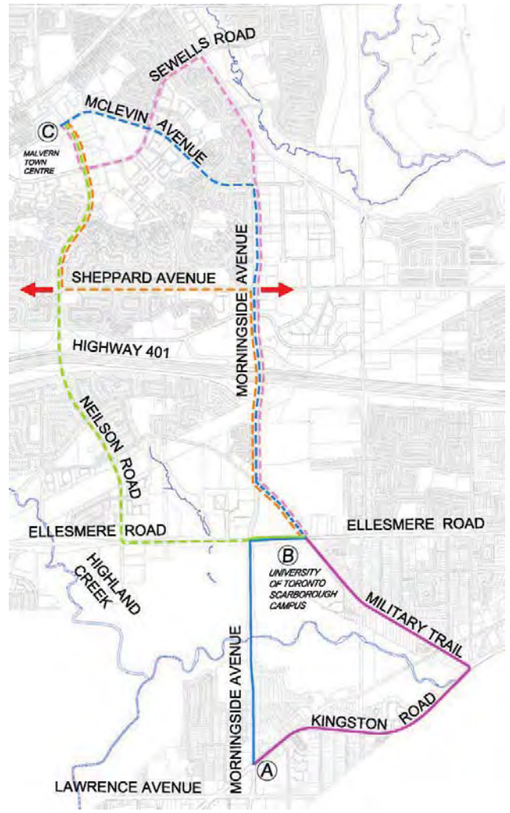
Additional consideration in the development and assessment of corridors is the proposed Sheppard East LRT (SELRT), which will extend easterly to Meadowvale Road. The SELRT provides both transit service accessibility opportunities, and the service connection to the likely location for the SMLRT and SELRT maintenance and storage facility, which is tentatively planned in the Sheppard Avenue and Conlins Road area.

9.2 Development of Alternative Corridors

Based on the established City planning policies and the overall project objectives, alternative corridors were identified, developed, and assessed between:

- Kingston Road / Morningside Avenue Intersection (Point A) to University of Toronto Scarborough Campus (Point B), as illustrated as by solid lines in Exhibit 9-2;
  - o North along Morningside Avenue to Ellesmere Road, and east along Ellesmere Road to UTSC (solid blue line);
  - o East along Kingston Road to Military Trail, and north along Military Trail to UTSC (solid magenta line);
- University of Toronto Scarborough Campus (Point B) to Malvern Town Centre (Point C), as illustrated by dashed lines in Exhibit 9-2;
  - o West along Ellesmere Road to Neilson Road, and north along Neilson Road to the vicinity of MTC (dashed green line);
  - o North along Military Trail and Morningside Road to McLevin Avenue, and west along McLevin Avenue to the vicinity of MTC (dashed blue line);
  - o North along Military Trail and Morningside Road to Sewells Road, and west along Sewells Road to the vicinity of MTC (dashed pink line);
  - o North along Military Trail and Morningside Road to Sheppard Avenue, interlace westerly with the Sheppard East LRT service to Neilson Road, and north along Neilson Road to the vicinity of MTC (dashed gold line).

Exhibit 9-2: Alternative Corridors



For each of the identified alternative corridors, 1:1000 functional design (i.e. plans and profiles) for a centre of the roadway alignment were developed applying the established design criteria. Platforms at proposed stop locations were placed at the major intersections, and at other potential ridership generators (i.e. UTSC). In addition, corresponding cross-sections were prepared at regular intervals or at critical locations, such as potential stop locations, existing narrow right-of-way, or at significant features (i.e. ESA natural features along Morningside Avenue in the Highland Creek valley. These plans and cross-sections were utilized as the basis for the assessment of the alternative corridors.

9.3 Assessment of Alternative Corridors

Based on the investigation and documentation of the existing conditions, key issues, potential impacts, opportunities and constraints were identified. Appropriate screening criteria were identified to reflect the existing conditions key issues, potential impacts and consistent with the project's objectives, in order to comparatively assess and differentiate the alternative corridors. The description and rationale of the identified screening criteria were documented, and summarized as follows:

- Transit Service
    - Quality of Connection at UTSC or Malvern Town Centre
    - Compatibility with Potential Routes to the Malvern Community (for the Kingston Road / Morningside Avenue Intersection to UTSC segment) or Compatibility with Potential Northerly Extension (for the UTSC to Malvern Town Centre segment)
    - Level of Transit Service (accessibility, potential ridership, alignment geometrics)
- Major Environmental Impacts
    - Potential Impact on Natural Areas
    - Potential Impact on Neighbourhoods / Businesses (Social Impact) during Construction
    - Potential Impact on Neighbourhoods / Businesses (Social Impact) during LRT Operation
    - Property Requirements
- Technical
    - Potential Impact on Traffic Operations and Access during Construction
    - Potential Impact on Traffic Operations and Access during LRT Operation
- Construction Cost
    - Property Acquisition Cost
    - Construction Cost (including consideration of major utility impacts)

For each corridor, the screening criteria were applied and findings documented in detail, including quantitative measurements whereever possible. A comparative assessment was then undertaken between the alternative corridors, identifying the differences, the corresponding degree of sensitivity and significance of the impact, and whether or not reasonable mitigation is available to reduce the impact. Finally, the recommendation for the preferred corridor, if all other criteria and assessment were considered comparatively equal, was based on the project's objectives of providing high quality transit service at an affordable cost.

Assessment of the Kingston Road / Morningside Avenue Intersection to UTSC Alternative Corridors

The 2 corridors under consideration between the Kingston Road / Morningside Avenue Intersection (Point A) and the University of Toronto Scarborough Campus (Point B) was the Morningside / Ellesmere corridor and the Kingston / Military Trail corridor.

Following the comparative assessment, the Morningside / Ellesmere corridor was recommended. A summary of the comparative assessment is presented in Exhibit 9-3. Key advantages of the recommended corridor are:

- significantly reduced property impacts;
- less impact to the local community, particularly traffic operations and access to properties;
- environmental impacts in the Highland Creek valley can be minimized and be mitigated; and,
- shorter and more direct route to UTSC and CCEC, presenting both lower construction costs and a higher quality of transit service.

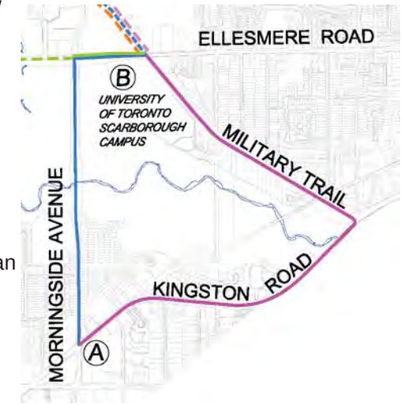


Exhibit 9-3: Alternative Corridor Assessment – Kingston Road / Morningside Avenue to UTSC

Screening Criteria	Alternative Corridors	
	Morningside / Ellesmere	Kingston / Military
Potential Impact on Traffic Operations and Access during Construction	High	Very High
Potential Impact on Traffic Operations and Access during LRT Operation	Moderate	Very High
Property Requirements	Moderate	Very High
Potential Impact on Neighbourhoods / Businesses (Social Impact) during Construction	Moderate	Very High
Potential Impact on Neighbourhoods / Businesses (Social Impact) during LRT Operation	Low	Very High
Potential Impact on Natural Areas	Moderate	Moderate
Construction Cost	Moderate	Very High
Property Acquisition Cost	Moderate	Very High
Quality of Connection at UTSC	Good	Very Good
Compatibility with Potential Routes to Malvern Community	Good	Very Good
Level of Transit Service for Riders	Good	Good
RECOMMENDATION	✓	

Assessment of the UTSC to Malvern Town Centre Alternative Corridors

The 4 corridors under consideration between the University of Toronto Scarborough Campus (Point B) and to the vicinity of the Malvern Town Centre (Point C) were:

- Ellesmere / Neilson;
- Military Trail / Morningside / McLevin;
- Military Trail / Morningside / Sewells;
- Military Trail / Morningside / Sheppard / Neilson corridor.

Following the comparative assessment, the Military Trail / Morningside / Sheppard / Neilson corridor was recommended. A summary of the comparative assessment is presented in Exhibit 9-4. Key advantages of the recommended corridor are:

- significantly reduced property impacts;
- less impact to the local community, particularly traffic operations and access to properties;
- crossing of Highway 401 less complicated and overall construction costs are lower; and,
- provides greater flexibility for the overall transit network.

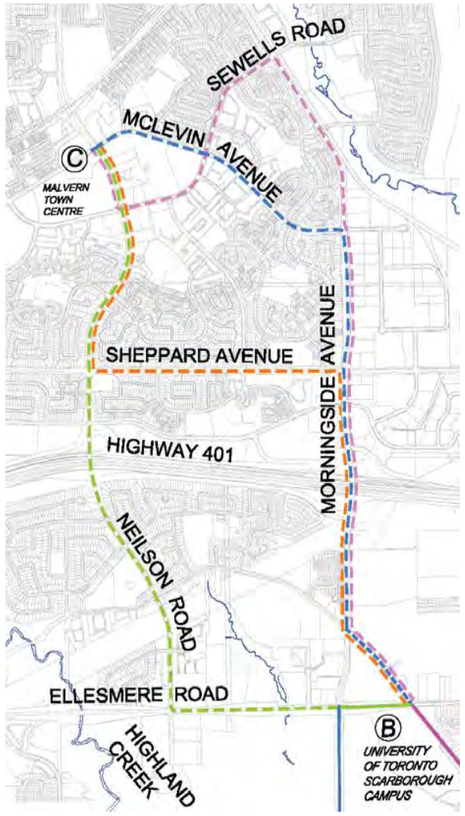


Exhibit 9-4: Alternative Corridor Assessment – UTSC to Malvern Town Centre

Screening Criteria	Alternative Corridors			
	Ellesmere / Neilson	Morningside / McLevin	Morningside / Sewells	Morningside / Sheppard / Neilson
Potential Impact on Traffic Operations and Access during Construction	Moderate	Moderate	Moderate	Moderate
Potential Impact on Traffic Operations and Access during LRT Operation	High	High	High	Moderate
Property Requirements	Very High	High	High	Low
Potential Impact on Neighbourhoods / Businesses (Social Impact) during Construction	High	High	High	Low
Potential Impact on Neighbourhoods / Businesses (Social Impact) during LRT Operation	Low	Low	Low	Low
Potential Impact on Natural Areas	Moderate	Moderate	Moderate	Low
Construction Cost	Very High	High	High	Moderate
Property Acquisition Cost	Very High	High	High	Low
Quality of Connection at MTC	Very Good	Very Good	Very Good	Very Good
Compatibility with Potential Northerly Extension	Very Good	Good	Moderate	Very Good
Level of Transit Service for Riders	Good	Moderate	Moderate	Good
RECOMMENDATION				✓

10. RECOMMENDED SMLRT CORRIDORS

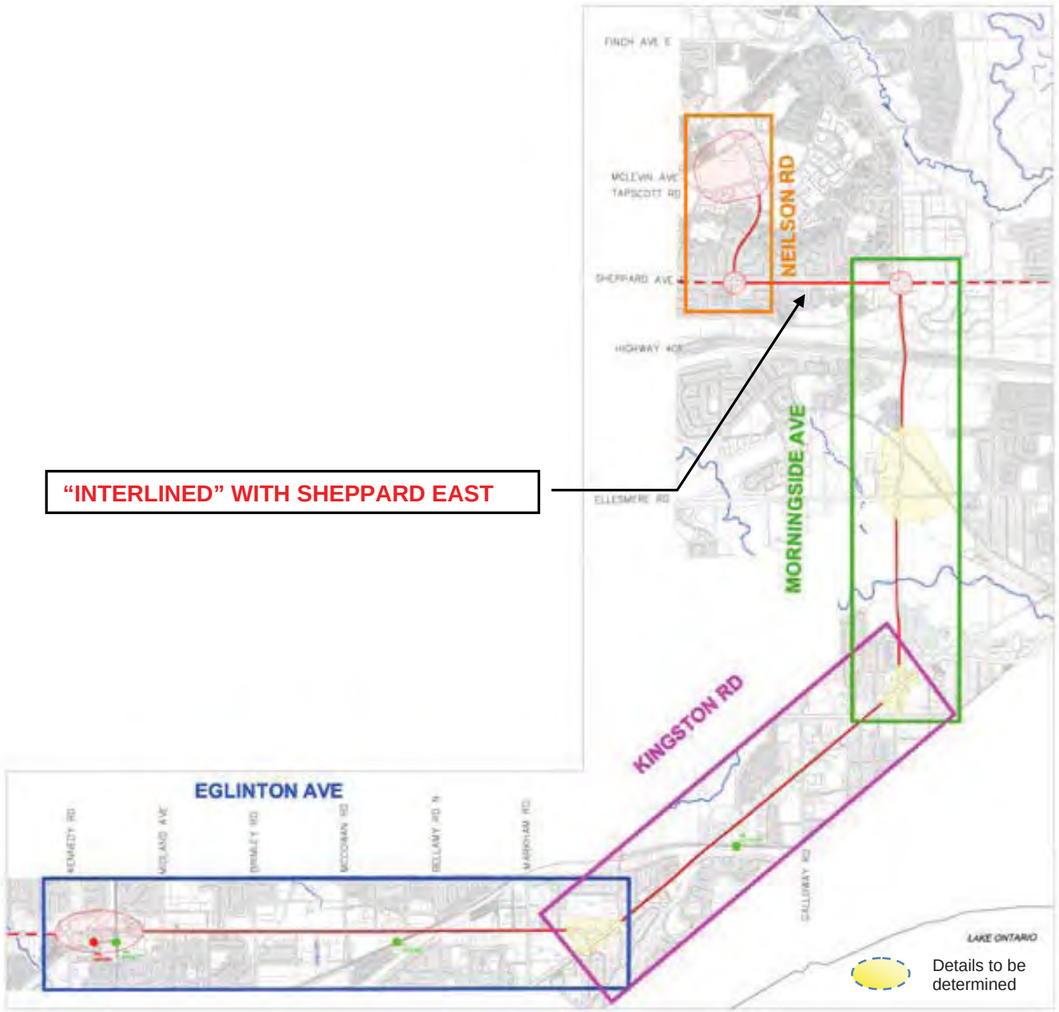
Based on the assessment of the alternative corridors, the recommendation is to connect Kennedy Subway Station with the Malvern Community in an LRT right-of-way utilizing the following corridors:

- From Kennedy Subway Station, east along Eglinton Avenue to Kingston Road, in the centre of the roadway;
- From the Kingston / Morningside Intersection, northeast on Kingston Road to Morningside Avenue, in the centre of the roadway;
- From the Kingston / Morningside Intersection, north on Morningside Avenue to Sheppard Avenue, via Ellesmere Road and Military Trail in order to transit provide service the University of Toronto Scarborough Campus (generally the alignment will be in the centre of the roadway, except alternative alignments will be investigated along Morningside Avenue and in the vicinity of UTSC, in order to minimize environmental impacts and to provide a high quality connection with the UTSC); and,
- From the Morningside / Sheppard Intersection, west along the shared “interlaced” Sheppard East LRT alignment to Neilson Road, and north along Neilson Road to the Malvern Town Centre area, in the centre of the roadway.

Exhibit 10.1 illustrates shows the recommended corridors for this study:

- Eglinton Avenue;
- Kingston Road;
- Morningside Avenue;
- Sheppard Avenue (part of the Sheppard East LRT EA study);
- Neilson Road.

Exhibit 10-1: Recommended Corridors



11. SMLRT ALIGNMENT AND ISSUE IDENTIFICATION

In order to identify issues and confirm the constructability of the SMLRT, a 1:1000 functional design (i.e. plans and profiles) for a centre of the roadway alignment was developed applying the established design criteria and typical cross-sections for each of the recommended corridors (refer to Appendix B and Appendix C). Potential locations for alternative alignments that were deemed appropriate for further investigation were also highlighted where opportunities were presented that could potentially minimize impacts and costs, or could improve the transit service. Tentative stop / platform locations and configuration were identified.

The typical cross-section includes a 7.4m LRT right-of-way, 3.3m platforms, 2 – 3.3m traffic lanes in each direction, 3.0m left (and right where required) turning lanes, 1.8m bike lanes (reduced to 1.6m at signalized intersections), and minimum 2.1m sidewalks.

Vertical profiles have not been detailed at this point given the limitations of the digital topographic mapping and that specific LRT details are not available (i.e. platform heights above top of rail, top of rail transition at signalized intersections). However, gradients were considered in the platform placement.

In addition, all existing signalized intersections were assumed to remain signalized, whether it had a proposed stop or not, with corresponding left turn lanes provided. Subject to detailed traffic analysis, existing right turn lanes were not re-instated, existing left turn lane lengths were used, and new signalized intersections were not added.

Platforms at proposed stop locations were placed at the major intersections, and at other potential transit ridership generators (i.e. GO Transit stations, UTSC), with the consideration of preliminary TTC and City of Toronto's input. In general, far side / side platforms were utilized, with left turn lanes placed in the shadow. Centre platforms were suggested at locations where the existing road profile exceeded acceptable gradients, were geometrically or physically difficult to implement in a reasonable manner, or at high transfer locations (i.e. to suit service operations at Eglinton / Kingston intersection and UTSC, local bus interfaces). Platforms assumed a 60m length with a 10m setback from the crosswalk as an allowance for the platform access ramp, top of rail to top of roadway transition, and for potential placement of raised islands to prevent left turning vehicles from encroaching the access ramp area.

In addition, corresponding cross-sections were prepared at regular intervals or at critical locations, such as potential stop locations, existing narrow rights-of-way, or at significant features (i.e. ESA natural features along Morningside Avenue in the Highland Creek valley. These plans and cross-sections were utilized as the basis for the assessment of the alternative corridors.

The following sections present and summarize additional detail with respect to:

- stop and platform locations;
- property and right-of-way requirements;
- structural impacts and requirements;
- utilities and power supply;
- issues and major constraints; and,
- order-of-magnitude cost.

11.1 Stop and Platform Locations

Initial stop locations were identified by TTC based on the following:

- Transit City overall customer service plan of providing LRT stop spacing in the 400m range, based on analysis and assessments to provide a balance between good local access and high route speed;
- placement at major signalized intersections and at other potential transit ridership generators, including the University of Toronto Scarborough Campus, Centennial College Ellesmere Road Campus, GO Transit stations, and local bus routes.

These initial stop locations were reviewed and assessed by:

- City of Toronto East District staff, providing local insight on existing conditions (land use, traffic operations, etc.) and proposed development opportunities;
- SMLRT Project Team, considering local conditions (proximity to adjacent intersections, roadway gradient, physical constraints such as overpass piers, etc.), and likely LRT service operation requirements (i.e. special trackwork for crossovers and storage tracks)

Exhibit 11-1identifies the recommended stop locations for the SMLRT, including key comments:

Exhibit 11-1: Recommended Stop Locations

Location	Recommendation	Original TTC	City of Toronto	Comments
Kennedy Subway Station	✓	✓	✓	• not part of this study, but co-ordination activities have been initiated and issues identified
Midland Avenue	✓	✓	✓	• recommendation of the Kennedy Station study may impact stop, alignment, property requirements, etc. • documentation in the final Environmental Project Report may have to include an envelope of alternative impacts, if the Kennedy Station recommendation is not finalized • assuming an at-grade alignment, far side / side platforms
Falmouth Avenue	✓	✓	✓	• far side / side platforms

Location	Recommendation	Original TTC	City of Toronto	Comments
Brimley Road		✓		• given that the Brimley north and south bus routes will likely continue to Kennedy Station, the Danforth bus route is a continuous north-south route, and the close proximity to the Danforth intersection, therefore a stop is not recommended
Danforth Road	✓	✓	✓	• far side / side platforms
Barbados Boulevard			✓	• given the local land use and existing local bus boarding volumes, TTC Service Planning has not recommended this location • to be noted, the preliminary traffic assessment has recommended that this intersection be signalized in order to provide access to this cul-de-sac with industrial / commercial land uses, and to provide U-turn opportunities along Eglinton Avenue, therefore a stop could be easily added
McCowan Road	✓	✓	✓	• far side / side platforms
Bellamy Road N / Eglinton GO	✓	✓	✓	• centre platform on the west side due to roadway gradient and CN Overpass pier constraints
Mason Road	✓	✓	✓	• far side / side platforms
Beachell Street			✓	• TTC Service Planning and the Project Team believe the resultant stop spacing between the three stations became considerably reduced (approx. 200m) and low local bus boarding volumes were not significant
Markham Road	✓	✓	✓	• far side / side platforms
Cedar Avenue		✓	✓	• placement of platforms right at the intersection would provide significantly reduced stop spacing of approx. 200m (see Kingston Road)
Kingston Road	✓	✓	✓	• given the requirement for special trackwork for service operations, and its desirable location, the Kingston stop has mover westerly towards Cedar Avenue (a walkway from the Cedar intersection is proposed) • centre platform due to the likely service operations and connection to local bus routes and the Kingston Road BRT
Scarborough Golf Club Road	✓	✓	✓	• originally to be deleted due to close proximity to Kingston stop • far side / side platforms
Guildwood Parkway	✓	✓	✓	• far side / side platforms
Livingston Road		✓		• poor pedestrian environment
Celeste Drive / Guildwood GO	✓	✓	✓	• far side / side platforms
Overture Road			✓	• within 200m from Celeste Drive, low local bus boarding volumes, and presently unsignalized (although the City has indicated that it may be signalized in the future)
Galloway Road	✓	✓	✓	• far side / side platforms
Poplar Road			✓	• within 200m from Lawrence Avenue and 150m from Galloway Road, and too short distance to introduce another signal
Lawrence Avenue	✓	✓	✓	• far side / side platforms
Morningside Avenue	✓	✓	✓	• west side / side platforms (due to turn in alignment)
Beath Street		✓	✓	• unsignalized intersection and immediately adjacent to West Hill C.I.
West Hill C.I.	✓			• platform details to be determined
Ellesmere Road	✓	✓	✓	• south side / centre platform to facilitate bus connection and turn in alignment
UTSC	✓		✓	• west side / centre platform to facilitate bus connection and turn in alignment
Military Trail	✓	✓	✓	• north side / side platforms
Cinemart Drive			✓	• proximity too close to Sheppard Avenue
Sheppard Avenue	✓	✓	✓	• platform locations to be co-ordinated with SELRT

Location	Recommendation	Original TTC	City of Toronto	Comments
Brenyon Way / Breckon Gate				• part of SELRT
Murison Boulevard				• part of SELRT
Neilson Road	✓	✓	✓	• platform locations to be co-ordinated with SELRT
Wickson Trail / Berner Trail	✓	✓	✓	• far side / side platforms
Sewells Road / Tapscott Road	✓	✓	✓	• far side / side platforms
Malvern Town Centre	✓	✓	✓	• not part of this study

The recommended stops from above were taken forward to the first round of Open Houses and there were no specific comments received from the public on stop locations (although stop spacing was a general comment). The number, location and layout of the stops / platforms will continue to be refined during the functional design phase taking into consideration various LRT design details as they become clarified, refinement of the LRT operations plan, and any future detailed traffic assessments.

11.2 Right-of-Way / Property Requirements

In general, the Eglinton Avenue, Kingston Road, Sheppard Avenue (part of the SELRT study), and Neilson Road have sufficient right-of-way widths to provide the proposed Transit City LRT typical section. Preliminary property requirements along these corridors include:

Along Eglinton Avenue

- potential property requirements at Midland Avenue, depending on alignment from Kennedy Station (part of another study);
- at southeast quadrant of Falmouth Avenue (full conveyance of the 36m right-of-way has not occurred along this strip mall frontage;
- at southwest and southeast quadrants of Brimley Road (require daylighting corners due to road widening);
- at southwest quadrant of Danforth Road (require daylighting corner due to road widening);
- along the frontage of the Guilwood GO Station (including potential reconfiguration of the passenger drop-off area), south side across from Bellamy Road;
- at southeast quadrant of Mason Road (require daylighting corner due to road widening);

Along Kingston Road

- at southeast quadrant of Guildwood GO Station entrance (require daylighting corner due to road widening);
- at northeast quadrant of Galloway Road (require daylighting corner due to road widening);
- at southwest quadrant of Morningside Road (require road widening due to the desire to having both platforms together on the same side (i.e. for local bus interface, LRT service adjustments);

Along Sheppard Avenue

- although part of another study, in order to provide combined and desired platform layouts and special trackwork for the SELRT and SMLRT inter-connections, additional property may be required at the Morningside Avenue and Neilson Road intersections;

Along Neilson Road

- no property requirements (although any inter-connections at Malvern Town Centre with the SRT have not been assessed).

Morningside Avenue

Along the Morningside Avenue corridor, which also includes Ellesmere Road and Military Trail in the vicinity of UTSC, there are a number of potential property requirements:

- between Kingston Road and the signalized intersection at West Hill C.I., the existing right-of-way ranges between 26m to 30m, with the City's Official Plan indicating a designated 30m right-of-way:
    - in order to minimize property requirements, a number of options will be examined for this corridor segment: with and without bike lanes, bike lanes re-routed thru the local community; reduction in the number of lanes; alternative intersection and platform configurations; underground alignment for a short distance;
- within the Highland Creek valley area, between the signalized intersection at West Hill C.I. to Ellesmere Road, alternative alignments will be investigated to minimize environmental and traffic / construction impacts and to provide improved transit and traffic operations by placing the alignment outside the roadway:
    - the alignment outside the road right-of-way would require property from the City of Toronto under the stewardship of the TRCA;
- along Military Trail between Ellesmere Road to Morningside Avenue, through the UTSC properties:
    - existing 20m right-of-way would require widening to a 36m right-of-way to facilitate the LRT right-of-way , including special trackwork, and to maintain existing access to the UTSC parking lots;
    - UTSC are planning a major expansion and of their campus, and based on meetings with senior UTSC officials, the proposed LRT alignment would be an extremely welcomed addition and component in their development proposals, and as such, property requirements should not be an issue.

The above preliminary identification of property requirements is subject to the completion of adjacent studies, assessment of alternative alignments along Morningside Avenue, detailed traffic and property access assessments (i.e. additional auxiliary lanes), a thorough investigation of utility impacts, and identification of substation locations.

11.3 Structural Requirements

Preliminary structural assessments, in terms of structural loading and geometric / physical fit, were conducted for each structure along the recommended corridors.

In general, the weight of the proposed LRT vehicle is slightly less than standard CHBDC vehicle loading, and the existing bridges will have adequate capacity to support the vehicular load due to the LRT vehicle. Strengthening of the bridges may however be required due to additional loads from the trackwork, overhead poles, rail breakage forces, and other items required to accommodate the LRT trackwork.

The additional surcharge due to the concrete infill slab for the LRT track may require strengthening of the existing structures if a concrete infill is adopted for the track bed. The increase in moment due to superimposed dead load and live load increases is approximately 35%, and the corresponding increase in shear is approximately 45%. The extent of overloading varies for each structure. It may be feasible to use a lightweight polymer infill with a unit weight in the order of 2 to 4 kN/m3, which may reduce or eliminate the need to strengthen the bridges. Another alternative would be to fix the rails directly to the concrete deck.

There are numerous detail design issues to be resolved, but from an alignment perspective, the existing bridge expansion joint detail on the LRT vertical alignment presents a major issue. Details to be resolved by TTC included: confirmation of the LRT load of 618 kN and the axle spacing; track infill details – including depth, width, and feasibility of using light-weight infill to reduce the weight of the track bed; pole arrangements and pole loads for the overhead wires; and, rail breakage forces, and other forces imposed on the structure to accommodate the LRT.

Rail expansion joints will preferable be located at the two ends of the structure, providing the grade at the joint location is generally flat. The effects of structure movement on the continuous welded rail, and rail breakage effects, will need to be accounted for during the detailed design process.

The findings of the structure geometric / physical fit are summarized below and preliminary structural general arrangement drawings are presented in Appendix D:

Eglinton Avenue East at Bellamy Road Subway Under CNR Tracks (based on Dwg. No. S435, General Arrangement received from the City of Toronto)

- Vertical and horizontal clearances appear to be sufficient (subject to the confirmation of the dynamic envelope requirement for a single LRT track, which may encroach onto the width of the bike lane);
- Approach grades are 5%, therefore the vertical curve design may affect the vertical clearance and the drainage requirements;
- Will require CNR review and approval.

Kingston Road Overpass at CNR (based on Dwg S626-1&27, General Arrangement from the City of Toronto)

- Horizontal clearances are sufficient;
- Will require CNR review and approval.

Morningside Avenue Bridge Over Highland Creek Bridge (based on Dwg S-656-17 from the City of Toronto)

- The bridge does not have sufficient deck width to accommodate 2 lanes of traffic each way and the new LRT designated right-of-way configuration. Preliminary investigations were carried out to assess the possibility accommodating the two lanes and LRT in each direction, and two alternative structural arrangements are feasible:
    - OPTION 1: Bridge substructure (piers, abutments) would be widened to support the additional girders for the deck widening;
    - OPTION 2: A new structure could be constructed adjacent to the existing bridge to accommodate the proposed LRT tracks (to be noted, the existing bridge would need to be widened to provide bike lanes, although this could be done by cantilevering the deck without any substructure widening);

Highway 401 / Morningside Avenue Underpass (based on Dwg. 8724-426 from MTO)

- The bridge has sufficient deck width to accommodate 2 lanes of traffic each way and the new LRT designated right-of-way configuration, but not with bike lanes (and assuming 2 lanes of traffic can be removed);
- MTO review and approval will be required

Eglinton Avenue East - CNR Overpass (Uxbridge Subdivision Mile 59.40)

Part of the SMLRT line, but not part of this study is the Eglinton Avenue East - CNR Overpass (Uxbridge Subdivision Mile 59.40) structure. This structure presents issues if to be utilized for the LRT right-of-way due to its approach grades of 5.2%, and its superstructure composition of a post-tensioned voided slab (i.e difficult to modify).

11.4 Utilities

For the purposes of this study, identification of major utilities was deemed significant in order to identify constraints and major costs implications. Based on review of the City provided utility mapping and a detailed site investigation, no major watermains (i.e. over 600mm), pipelines, or fibre optic lines were identified. There is a Hydro One corridor crossing Morningside Avenue just south of Highway 401, which presently provides no horizontal or vertical clearance issues.

Additional investigation and contacts with the individual utilities will be undertaken during the functional design phase.

11.5 Power Supply

During functional design of the preferred alignment, potential sites for placing substations will be identified for independent traction power substations, typically spaced at approximately 1.2 - 1.5 km for LRT at-grade alignments. Sites will consider compatible land uses, proximity to the alignment, urban design / aesthetics, and accessibility for maintenance and emergency services.

11.6 SMLRT Order-of-Magnitude Construction Cost

A SMLRT order-of-magnitude construction cost estimates was prepared on the basis of the high-level functional design provided in Appendix C. The estimated construction cost of $275 million excludes the terminus station inter-connection segments at Kennedy Station and Malvern Town Centre, the segment along Sheppard Avenue, property acquisition costs, vehicle acquisition costs, and costs for engineering, management, and contingency. Although the estimate was undertaken in a detailed manner, these costs are considered to be a high-level cost on the basis of the unit rate per metre calculations. Cost items include the following:

- Trackbed and trackwork;
- roadway reconstruction;
- structures (bridge strengthening and new bridge allowances);
- platforms, shelters and railings;
- streetscaping;
- power supply (catenary, poles and substations);
- utility relocation; and,
- signalization (vehicular & transit).

12. SUMMARY OF KEY ISSUES

The following are issues to be addressed in greater detail during the environmental assessment phase:

Eglinton Avenue Corridor

- Kennedy Station interface and resulting recommendation effect on SMLRT
    - EA process (i.e. potential of underground alignment, potential bridge replacement)
    - structure issues (approach gradient, potential for difficult structure modifications, etc.)
    - underground alignment impact at Midland Avenue (underground station requirements, property, etc.), , due to the development of preferred alignment between Midland Avenue and Kennedy Subway Station.
- general corridor issues
    - number and location of platforms / stops
    - confirmation of extent of utility impacts
    - detailed traffic assessments to determine auxiliary lane requirements, intersection signal modifications and turning restrictions, and access management issues (significant concerns associated with the Brimley / Danforth segment and the Eglinton / Kingston intersection due to the geometry in the areas)
    - skewed intersections, such as Danforth Road, require investigation with respect to all turning movements and the impact on the platform locations, access to the platforms from the long side, potential property issues, and the increased pedestrian time on signal timings
    - confirmation of various Transit City LRT design standards
- confirm whether the Midland and Brimley bus routes will use the LRT right-of-way to access Kennedy Station (access to the LRT right-of-way to be designed)
- confirm horizontal clearance for eastbound lanes at CNR subway structure for the inclusion of a bike lane (conflicting data)
- investigate the need to provide enhanced inter-connection with the Eglinton GO Station
- confirm property requirements at some intersections due to widening of the roadway and providing curb returns to the sideroad (i.e. provision of daylighting triangles)
- examine provision of a signalized intersection at Barbados Boulevard (presently an unsignalized cul-de-sac to an industrial / commercial area with likely larger trucks requiring access)
- Eglinton / Kingston intersection
    - confirm service operation requirements (i.e. crossovers, storage tracks, preferred layout)
    - ensure high quality interface with the Kingston Road transit improvements and TTC surface bus routes
    - ensure that the reconfigured road network and new signalized intersection operates well, particularly for the SMLRT line (i.e. minimal queuing as a result of making the turn)

Kingston Road Corridor

- general corridor issues
    - number and location of platforms / stops
    - confirmation of extent of utility impacts
    - detailed traffic assessments to determine auxiliary lane requirements, intersection signal modifications and turning restrictions, and access management issues (significant concerns associated with the Kingston / Morningside intersection)
    - skewed intersections along the entire corridor require investigation with respect to all turning movements and the impact on the platform locations, access to the platforms from the long side, potential property issues, and the increased pedestrian time on signal timings
- ensure structural capacity for LRT right-of-way at CNR overpass structure

- investigate the need to provide enhanced inter-connection with the Guildwood GO Station, and any associated impacts with the existing passenger drop-off area
- confirm property requirements at some intersections due to widening of the roadway and providing curb returns to the sideroad (i.e. provision of daylighting triangles)
- Kingston / Morningside intersection
    - confirm service operation requirements (i.e. crossovers, storage tracks, preferred layout)
    - ensure high quality interface with the Kingston Road transit improvements and TTC surface bus routes
    - traffic operations need to be assessed in detail, as there will be requirements for traffic operation restriction and / or property
    - ensure that the intersection operates well, particularly for the SMLRT line (i.e. minimal queuing as a result of making the turn)

Morningside Avenue Corridor

- general corridor issues
    - number and location of platforms / stops
    - confirmation of extent of utility impacts
    - detailed traffic assessments to determine auxiliary lane requirements, intersection signal modifications and turning restrictions, and access management issues (significant concerns associated with the Morningside / Sheppard intersection)
- ensure structural capacity for LRT right-of-way at Morningside over Highland Creek overpass structure, and review Highland Creek crossing options to optimize benefits and costs
- investigate alternative cross-sections and alignment between Kingston Road and West Hill C.I in order to avoid / minimize property requirements
- investigate alternative alignments between West Hill C.I and Ellesmere Road in order to minimize environmental, utility, and traffic impacts, and optimizing transit service
- investigate and co-ordinate alignment opportunities with the UTSC to ensure a high quality transit service
- examine and co-ordinate the opportunity of using the existing Morningside Avenue structure over Highway 401 with MTO (including other relevant MTO issues)
- confirm whether MTO will allow bike lanes over their structures
- does not have recent Highway 401 / Morningside Avenue aerial and topographic mapping for undertaking interchange modifications (i.e. addition of Cinemart Drive)
- Morningside / Sheppard intersection
    - confirm service operation and special trackwork requirements, and platform layout
    - traffic operations need to be assessed in detail, as there will be requirements for traffic operation restriction and / or property
    - ensure that the intersection operates well, particularly for the SMLRT and SELRT lines (i.e. minimal queuing as a result of making the turn)

Neilson Road Corridor

- general corridor issues
    - number and location of platforms / stops
    - confirmation of extent of utility impacts
    - detailed traffic assessments to determine auxiliary lane requirements, intersection signal modifications and turning restrictions, and access management issues (significant concerns associated with the Sheppard / Neilson intersection)
- Sheppard / Neilson intersection
    - confirm service operation and special trackwork requirements, and platform layout
    - traffic operations need to be assessed in detail, as there will be requirements for traffic operation restriction and / or property
    - ensure that the intersection operates well, particularly for the SMLRT and SELRT lines (i.e. minimal queuing as a result of making the turn)
- Scarborough RT interface and resulting recommendation effect on SMLRT

APPENDIX A – EXISTING CONDITIONS

TABLE 1 - Summary of Windshield Survey and Base Mapping Study

Block	Land use		Road Geometrics								Infrastructure				Other (ie: Natural, Cultural, Social features)
			# of through lanes	Turn Lanes		Median	approximate lane widths	# of curves	curve radii	ROW width	grade (direction taken from Kennedy Station to Malvern Town Centre)	Utilities	Structures	Man holes (in ROW only)	Drainage	
Common to all Options																
Eglinton Avenue East																
	Eastbound	Westbound		Eastbound TL	Westbound TL	Median (width)										
Kennedy-Midland	Commercial (Shoppers, No Frills, Dollarama, Pharma Plus) / Residential (apts) / TTC Kennedy Station	Commercial (retail strip) / Residential (apts) / TTC Kennedy Station	3 each way (outer lanes: HOV)	left turn lane at Midland	right turn lane and continuous left turn lane at Kennedy	raised median (Typ: 1.5m, widest at 3m near Midland)	3.8m, turn lanes ~2.5m	0	n/a	Typ: 36m, widens around LRT: from 70-100m west of tracks, 85m east of tracks	175m: +1.7%, 170m: +4.6%, over bridge:145m +2.5% at midpoint -2.5%, 135m -4.4%, 210m -0.9%	light poles eastbound and westbound, hydro lines westbound, hydro corridor crossing	north and south side access to Kennedy Station, bridge over tracks, north and south side access roads east of bridge	15 at Kennedy, 5 at ramps to Kennedy Station, 6 Midland	catchbasins both sides approx every 60m	
Midland-Commonwealth	Commercial (Tim Hortons)	Commercial (retail strip) / Residential (apts)	3 each way (outer lanes: HOV)	n/a	left turn lane at Midland	left turn lane, raised median at Midland (1.4m)	3.6m, turn lanes ~3m	0	n/a	Typ: 36m	105m: -1.9%	light poles centre (where raised median exists), eastbound and westbound, hydro lines westbound	n/a	1 mid block	catchbasins both sides approx every 60m	
Commonwealth-Huntington	Commercial (retail strip)	Commercial (retail strip)	3 each way (outer lanes: HOV)	n/a	n/a	left turn lane	total pavement width 26m with 3 lanes each way and median left turn lane	0	n/a	Typ: 36m	100m: -2.0%	light poles eastbound and westbound, hydro lines westbound	n/a	3 at Huntington	catchbasins both sides approx every 55m	
Huntington-Winter	Commercial (auto dealers)	Commercial (retail strip)	3 each way (outer lanes: HOV)	n/a	n/a	left turn lane	total pavement width 26m with 3 lanes each way and median left turn lane	0	n/a	Typ: 36m	105m: 0%	light poles eastbound and westbound, hydro lines westbound	n/a	1 at Winter	catchbasins both sides approx every 50m	
Winter-Gilder/Falmouth	Commercial (auto dealers)	Commercial (retail strip)	3 each way (outer lanes: HOV)	left turn lane at Gilder/Falmouth	n/a	left turn lane, raised median at Gilder (1.3m)	3.6m, turn lanes ~3m	0	n/a	Typ: 36m	100m: -1.3%	light poles centre (where raised median exists), eastbound and westbound, hydro lines westbound	n/a	5 at Gilder/Falmouth	catchbasins both sides approx every 50m	
Gilder/Falmouth-Bimbrok	Commercial (retail strip)	Commercial (retail strip)	3 each way (outer lanes: HOV)	n/a	left turn lane at Gilder/Falmouth	left turn lane, raised median at Gilder (1.2m)	total pavement width 26m with 3 lanes each way and median left turn lane	0	n/a	Typ: 33m, widens to 48m at Gilder, and to 45m at Bimbrok	95m: -1.7%	light poles centre (where raised median exists), eastbound and westbound, hydro lines westbound	n/a	4 at Bimbrok	catchbasins both sides approx every 50m	
Bimbrok-Brimley	Commercial (retail strip)	Commercial (Beer Store, BMO)	3 each way (outer lanes: HOV)	left turn lane at Brimley	n/a	left turn lane, raised median at Brimley (1.2m)	total pavement width 26m with 3 lanes each way and median left turn lane	0	n/a	Typ: 33m, short narrow area 30m near Bimbrok, widens to 45m at Brimbrok	190m: -0.1%, 140m: +0.7%	light poles centre (where raised median exists), eastbound and westbound, hydro lines westbound	n/a	3 mid block, 2 at Brimley	catchbasins both sides approx every 40m	
Brimley-Danforth	Commercial (No Frills)	Commercial (Shoppers)	3 each way (outer lanes: HOV)	left turn lane at Danforth	left turn lane at Brimley	narrow raised median separating left turn lanes (1.2m)	total pavement width 26m with 3 lanes each way and median left turn lane	0	n/a	Typ: 36m	165m: -0.6%	light poles centre (where raised median exists), eastbound and westbound, hydro lines westbound	n/a	1 at Danforth	catchbasins both sides approx every 37m	
Danforth-Oswego	Commercial (retail strip)	Residential (townhouses)	3 each way (outer lanes: HOV)	n/a	left turn lane at Danforth	left turn lane, raised median at Danforth (1.3m)	total pavement width 26m with 3 lanes each way and median left turn lane	0	n/a	Typ: 36m	195m: -1.5%	light poles centre (where raised median exists), eastbound and westbound, hydro lines westbound	n/a	2 mid block	catchbasins both sides approx every 55m	
Oswego-Barbados	Commercial (retail strip)	Residential (townhouses)	3 each way (outer lanes: HOV)	n/a	n/a	left turn lane	total pavement width 25m with 3 lanes each way and median left turn lane	0	n/a	Typ: 36m	195m: 0%	light poles eastbound and westbound, hydro lines westbound	n/a	1 mid block	catchbasins south side approx every 30m, doublecatch basins north side approx every 100m	
Barbados-McCowan	Residential (Senior's home)	Commercial (McDonalds, retail strip)	3 each way (outer lanes: HOV)	left turn lane at McCowan	n/a	left turn lane, raised median at McCowan intersection (1.3m)	total pavement width 25m with 3 lanes each way and median left turn lane	0	n/a	Typ: 36m	265m: +0.1%	light poles centre (where raised median exists), eastbound and westbound, hydro lines westbound	n/a	1 mid block, 3 at McCowan	catchbasins both sides approx every 37m, with 1 double catchbasin on the south side	north side, vacant lot
McCowan-Torrance	Commercial (Home Depot)	Commercial (retail strip)	3 each way (outer lanes: HOV)	left turn lane at Torrance	left turn lane at McCowan	left turn lane, raised median at McCowan and Torrance (1.5m approx.)	total pavement width 25m with 3 lanes each way and median left turn lane	0	n/a	Typ: 36m	250m: +1.1%	light poles centre (where raised median exists), eastbound and westbound, hydro lines westbound	n/a	1 mid block, 2 at Torrance	catchbasins both sides approx every 38m	
Torrance-Bellamy	Commecial / GO Station / Vacant lot	Commercial	3 each way (outer lanes: HOV)	left turn lane at Bellamy	left turn lane at Torrance	left turn lane, raised median at Torrance and at Bellamy (1.5m approx)	total pavement width 25m with 3 lanes each way and median left turn lane	0	n/a	Typ: 36m	290m: -0.7%	light poles centre (where raised median exists), eastbound and westbound, hydro lines westbound	n/a	3 mid block	catchbasins both sides approx every 40m	greenspace/vacant lot eastbound side
Bellamy-Mason	Commercial / Residential (apts)	Commercial / GO Station Parking / Toronto EMS	3 each way (outer lanes: HOV)	left turn lane at Mason	left and right turn lanes at Bellamy	raised median most of the block except right before Mason (2.3m)	4.0m , turn lanes 2.1m	0	n/a	Typ: 36m, varying widths under bridge narrowest is 20m	165m: -3.6%, 220m: +4.0%, 190m: +0.5%	light poles centre, eastbound and westbound, hydro lines westbound	overhead bridge with train tracks (GO Train)	none	catchbasins both sides approx every 60m	
Mason-Beachell	Commercial/ Residential (apts)	Commercial (retail strip)	3 each way (outer lanes: HOV)	left turn lane at Beachell	left turn lane at Mason	left turn lane, raised median at Mason (1.3m)	total pavement width 25m with 3 lanes each way and median left turn lane	0	n/a	Typ: 36m	125m: 0%, 125m: -1.9%	light poles eastbound and westbound, hydro lines westbound	n/a	2 mid block, 1 at Beachell	catchbasins both sides approx every 40m	
Beachell-Centre	Residential (apts)	Commercial (retail strip)	3 each way (outer lanes: HOV)	n/a	left turn lane at Beachell	left turn lane	total pavement width 25m with 3 lanes each way and median left turn lane	0	n/a	Typ: 36m	135m: -1.3%	light poles eastbound and westbound, hydro lines westbound	n/a	2 at Centre	catchbasins north side only approx every 40m	

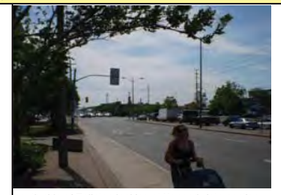
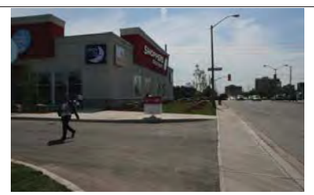
Centre-Markham	Residential (apts)	Commercial (retail strip)	3 each way (outer lanes: HOV)	left turn lane at Markham	n/a	left turn lane, raised median at Markham (1.1m)	total pavement width 26m with 3 lanes each way and median left turn lane	0	n/a	Typ: 36m	135m: -0.9%	light poles centre (where raised median exists), eastbound and westbound, hydro lines westbound	n/a	3 mid block, 3 at Markham	catchbasins north side approx 45m apart, only one on south side at Markham	
Markham-Cedar	Commercial (Dominion / RioCan Complex)	Commercial (retail strip)	3 each way	left turn lane and continuous right turn land at Cedar	left turn lane at Markham	left turn lane, raised median at both intersections (1.2m)	total pavement width 25m with 3 lanes each way and median left turn lane	0	n/a	Typ: 36m approx	275m: -1.6%	light poles centre (where raised median exists), eastbound and westbound, hydro lines westbound	n/a	5 mid block, 7 at Cedar	catchbasins both sides approx every 45m, not very regular	
Cedar-Kingston	Residential (apts)	Residential (apts) / Greenspace	3 transition to 2 eastbound, 2 westbound	two left turning lanes at Kingston	left turn lane at Cedar	raised median from Cedar until end of curve (2.3m on curve), raised median at Kingston Road (2.1m)	4.0m, turn lane 3.6m	1 - from E to SE	95m	Typ: 36m approx	225m: +1.3%, 150m: -0.3%	light poles centre (where raised median exists), eastbound and westbound, hydro lines westbound	n/a	4 mid block	catchbasins both sides approx every 45m, 2 in median	small greenspace on westbound side near Kingston intersection
Kingston Road																
	Northbound	Southbound		Northbound	Southbound											
Eglinton-Scarborough Golf Club	Residential (townhouses)	Commercial/ Residential (apts)	3 each way	left turn lane at Scarborough Golf Club	right turn lane at Eglinton	raised median through entire block (4.0m)	3.8m, turn lanes 3.2m	0	n/a	Typ: 39m approx	145m: +2.5%, 160m 0%	light poles centre (where raised median exists) and northbound, hydro lines northbound and southbound	n/a	1 mid block, 1 at Scarborough Golf Club	catchbasins both sides approx every 50m	small greenspace on southbound side near Eglinton intersection
Scarborough Golf Club-Saunders	Residential (townhouses) / Institutional (church)	Commercial (Esso)	3 each way	left turn lane at Saunders	left turn lane at Scarborough Golf Club	raised median through entire block (4.5m)	3.8m, turn lanes 3.2m	0	n/a	Typ: 39m approx	250m: -2.4%	light poles centre (where raised median exists) and northbound, hydro lines northbound	n/a	2 mid block, 7 at Saunders	catchbasins both sides approx every 45m	
Saunders-Guildwood/Cromwell	Residential	Residential	3 each way	left and right turn lanes at Guildwood	left hand turn lane at Saunders	raised median through entire block (4.4m)	3.8m, turn lanes 2.7m	0	n/a	Typ: 38m	250m: -1.2%	light poles centre, hydro lines southbound	n/a	4 mid block, 2 at Guildwood/Cromwell	catchbasins north side approx 45m apart including 1 double catchbasin, only one on south side at Saunders	
Guildwood/Cromwell-Westlake	Residential (apts)	Residential	3 each way	right turn lane for Westlake, left turn at Dale prevented by raised median	left turn lane at Guildwood/Cromwell	raised median through entire block (3.5m)	3.8m, turn lanes 3.5m	0	n/a	Typ: 41m	300m: -2.0%	light poles centre, hydro lines northbound	n/a	1 mid block, 3 at Dale Ave	1 catchbasin at Dale Ave entrance	
Westlake-Celeste	GO Station	Residential	3 each way	left turn lane at Celeste	n/a	raised median through entire block (Typ: 1.7m, widest 4.2m,)	3.7m, turn lane 3.5m	0	n/a	Typ: 45m (also narrowest) widens at bridge	315m: -0.3%, 365m: -3.4%	light poles centre near Celeste intersection, northbound and southbound whole section, hydro lines northbound off the ROW	bridge over train tracks (GO Train)	3 at Celeste	double catchbasins just past Westlake, no catchbasins on bridge, otherwise catchbasins both sides approx 40m apart before bridge, 47m apart after bridge	small greenspace south of bridge
Celeste-Payzac	Commercial	Residential (townhouses)	3 each way	left turn lane at Payzac	left turn lane at Celeste	raised median through entire block (4.3m)	3.8m, turn lanes: at Celeste 2.4m, at Payzac 3.3m	0	n/a	38m on Celeste side, 37m on Payzac side	250m: +0.2%	light poles centre, hydro lines southbound	n/a	5 at Payzac	2 catchbasins (1 double) on north side near Celeste, 2 catchbasins on south side, 1 mid block and 1 near Galloway	
Payzac-Galloway	Commercial/ Residential (apts)	Commercial / Residential (new build townhouses)	3 each way	left turn lane at Galloway	left turn lane at Payzac	raised median through entire block (4.3m)	3.8m, turn lanes: at Payzac 3.4m, at Galloway 2.7m	0	n/a	Typ: 36m	415m: -0.8%	light poles centre, hydro lines southbound	n/a	7 mid block	catchbasins both sides approx every 45m	
Galloway-Poplar	Commercial/ Residential	Commercial	3 each way	n/a	left turn lane at Galloway	raised median, with left turn lane for both directions halfway through block (4.1m)	3.8m, turn lane 3.2m	0	n/a	Typ: 37m	525m: -0.4%	light poles centre, hydro lines southbound	n/a	7 mid block, 6 at Poplar	catchbasins both sides approx every 45m	
Poplar-Lawrence	Commercial	Commercial (gas station)	3 each way	n/a	left turn lane at Poplar	raised median through entire block (4.3m)	3.8m, turn lane 3.2m	0	n/a	Typ: 36m	220m: -0.4%	light poles centre, hydro lines southbound	n/a	2 mid block, 13 at Lawrence	catchbasins both sides approx every 40m	
Lawrence-Falaise	Commercial (McDonald's)	Commercial	3 each way	left turn lane to Falaise	n/a	raised median through entire block (4.2m at Lawrence, 1.3m at Falaise)	3.8m, turn lane 3.4m	0	n/a	Typ: 36m	125m: -0.4%	light poles centre, hydro lines southbound	n/a	4 mid block, 3 at Falaise	2 catcbasins 28m apart on north side, 2 catch basins 38m apart on south side	
Falaise-Morningside	Commercial (No Frills)	Residential (apts)	3 each way	left turn lane at Morningside	n/a	raised median through entire block (Typ: 4.6m)	3.8m, turn lane 3.0m	0	n/a	Typ: 36m	270m: -0.2%	light poles centre, hydro lines southbound	n/a	8 mid block, 10 at Morningside	catchbasins both sides approx every 40m	
Option A - Morningside																
Morningside Avenue																
	Northbound	Southbound		Northbound	Southbound	Middle										
Kingston-Tefft	Commercial/ Institutional	Residential	2 each way	n/a	left turn lane at Kingston	raised median at Kingston (1.1m)	3.7m, turn lane 3.7m	0	n/a	narrowest midblock 26m, at Kingston 31m, at Tefft 28m	240m: +0.5%	light poles northbound and southbound, eletrical northbound	n/a	6 mid block, 1 at Tefft	catchbasins on both sides, distances range from 50-70m apart	
Tefft-Warnsworth	Residential	Residential	2 each way	n/a	n/a	n/a	3.7m	0	n/a	Typ 26m	175m: +0.6%	light poles northbound and southbound, hydro lines northbound	n/a	2 mid block, 6 at Warnsworth	1 catchbasin on east side , 2 catchbasins on west side 50m apart	
Warnsworth-Beath	Residential	Residential	2 each way	n/a	n/a	n/a	3.7m	0	n/a	Typ 26m	60m: -0.5%	light poles/hydro lines northbound and southbound (hydro lines crossing over)	n/a	2 at Beath	1 catch basin on each side near Warnsworth and Beath respectively	
Beath-Fairwood (no intersection)	Residential	Institutional (West Hill Collegiate Institute)	2 each way	signalled intersection mid-block at school entrance, left turn lane at school	signalled intersection mid-block at school entrance	n/a	3.7m	0	n/a	Typ 26m, at Fairwood widens to 38m	200m: -1%	light poles northbound and southbound, hydro lines northbound	n/a	6 mid block	2 catchbasins on east side 45m apart, 2 catchbasins on west side 140m apart	
Fairwood-Ellesmere	Parkland	Parkland (Morningside Service Yard)	2 each way	two left turn lanes mid block for turnoffs just north and south of river, left and right turn lanes at Ellesmere	n/a	raised median at Ellesmere (1.7m)	3.7m, turn lanes 2.8m	0	n/a	Typ: 50m, over bridge 71m	500m: -4.8%, 300m: +1.3%, 235m: +4%	light poles northbound, hydro lines northbound and southbound	bridge over Highland Creek	7 mid block, 6 at Ellesmere	no catchbasins on bridge, otherwise approx every 70m	Ellesmere Ravine Park on either side at north end of block, Morningside Park on west side mid block, bridge over Highland Creek

Ellesmere-Military Trail	Institutional (HP Centennial Technical College)	Commercial (gas station) / Residential (apts)	2 each way	left turn lane at Military Trail starting midblock, right turn lane at Military Trail	left turn lanes at U of T entrance and Ellesmere, right turn lane at Ellesmere	raised medians at Ellesmere (1.6m) and Military trail (1.6m), triangular raised median at Military Trail right turn lane	3.8m, turn lanes: at Ellesmere 2.8m, at Miltary 3.8m	2, slightly east then slightly west	right curve ~510m, left curve 425m	Typ: 36m	460m: +4.6%	light poles northbound, hydro lines northbound	n/a	2 mid block, 9 at Military Trail	catchbasins both sides approx every 55m	small greenspace on Northbound side at Military Trail
Military Trail-Tams	Greenspace (Sports field)	Commercial/ Residential (no access to residential)	2 each way	n/a	left and right turn lanes at Military Trail	raised median at Military Trail (1.4m)	3.8m, turn lanes 2.8m	0	n/a	Typ: 36m	310m: +1.1%	light poles at Military Trail intesection and southbound, hydro lines southbound	n/a	none	catchbasins both sides approx every 75m	Military Trail Park on northbound side
Tams-401	Industrial/ Undeveloped	Commercial/ Undeveloped	3 each way	right on-ramp for 401 eastbound, intersection with 401 off-ramp from eastbound lane	left on-ramp for 401 eastbound, intersection with 401 off-ramp from eastbound lane	raised median through entire block (1.6m)	3.7m	2, slightly east then slightly west	right curve ~1040m, left curve ~790m	Typ: 36m, narrowest point 29m mid block	130m: +0.3%, 375m: +2.9%	hydro corridor crossing ROW just north of entrance to industrial site, light poles northbound and southbound	bridge over 401	3 mid block	irregular, 3 catchbasins in median (1 double), 6 catchbasins on east side (1 double) ranging 30-60m apart, 4 catchbasins on west side ranging 35-180m apart	greenspace on either side just south of 401, under power lines
401-Milner	Commercial (Smart Centre)	Commercial (Walmart)	3 each way	right on-ramp for 401 westbound, intersection with service road and 401 off-ramp from westbound lane, left turn lanes at Milner, existing right lane must turn right	left on-ramp for 401 westbound, intersection with service road and 401 off-ramp from westbound lane	raised median through entire block (1.1m)	3.7m	2, slightly west then slightly east	left curve ~790m right curve ~1540m	Typ: 39m	190m: -2.9%, 265m 0%	light poles northbound and southbound, hydro lines southbound only near Milner	bridge over 401	none	catchbasins both sides and median approx every 40m though irregular around ramps	small greenspaces between 401 ramps
Milner-Sheppard	Commercial (new Smart Centre development, with Medical centre, Esso)	Commercial (Sobey's)	northbound 2, southbound 2 turning into 3	left turn lane at commercial entrance, left and right turn lanes at Sheppard	left turn lane at Milner	raised medians at Milner (1.3m) and Sheppard (1.3m)	pavement width 23.5m, 5 lanes and median markings	0	n/a	at Milner 31m, at Sheppard 36m	190m: -0.8%	light poles northbound and southbound, hydro lines southbound	n/a	4 at Sheppard	irregular, 2 on east side mid block 40m apart, 3 on west side (2 50m apart near Milner and 1 at Sheppard)	vacant lot northbound side, just north of Milner
Sheppard-Casebridge/McLevin	Commercial (retail strip)	Residential (no access)	2 each way	right and left turn lanes at Casebridge/ McLevin	right and left turn lanes at Sheppard	raised medians at Sheppard (1.5m) and Casebridge/ McLevin (3.3m)	3.7m turn lanes: at Sheppard 3.4m, at McLevin 3.2m	3, slightly east and two curves slightly west	south right curve 335m, south left curve 340m, north left curve ~560m,	Typ: 44m, narrowest point near Sheppard 37m, at McLevin 36m	125m: +0.2%, 110m: +2.8%, 110m: 0%, 190m: -3.1%, 270m: -0.6%	light poles northbound and southbound, hydro lines southbound	n/a	3 mid block, 5 at Casebridge/McLevin	catchbasins both sides approx every 60m	narrow strip of greenspace at the rear of residential properties southbound side
McLevin Avenue																
	Eastbound	Westbound		Eastbound	Westbound	Middle										
Morningside-Fawcett/John Tabor	Residential (no access)	Residential (no access)	2 each way	left turn lane at Morningside	n/a	n/a	3.1m, at Morningside total pavement width 16m, 1 lane each direction, eastbound lane has left and right turn	1, from SW to NW	right curve ~240m	Typ: 26m	315m: +1.2%	light poles eastbound and westbound	n/a	none	catchbasins both sides approx every 60m	narrow strip of greenspace at the rear of residential properties both sides
Fawcett/John Tabor-Sewells	Residential (access to small sidestreets not direct)	Residential (access only on western half of block, remainder to small side streets)	2 each way	n/a	right turn lane at Sewells	n/a	3.1m, right turn lane 4.0m	1, from NW to W	left curve ~400m	Typ: 27m	650m: +1.2%	light poles eastbound and westbound	n/a	2 mid block	catchbasins both sides approx every 60m	narrow strip of greenspace at the rear of residential properties both sides near Fawcett/John Tabor side
Sewells/Hupfield	Institutional (?)	Residential	2 each way	right turn lane at Sewells	n/a	n/a	3.1m, right turn lane 3.5m	1, from W to SW	left curve 155m (con't on next block)	Typ: 26m	285m: +0.3%, 110m: +1.4%	light poles eastbound and westbound	n/a	2 mid block	catchbasins both sides approx every 60-75m	McLevin Woods Park on south side
Hupfield/Neilson	Commercial	Residential	2 each way	right turn lane at Neilson	n/a	n/a	3.1m, right turn lane 3.6m	1, from W to SW	left curve 155m (con't from previous block)	Typ: 26m	190m: +2.6%	light poles eastbound and westbound	n/a	3 at Neilson	catchbasins both sides approx every 65m	
Neilson/Pinery	Commercial (Malvern Town Centre)	Residential	2 each way	right turn lane at Neilson	n/a	n/a	3.2m, right turn lane 3.4m	0	n/a	Typ: 26m	245m: -0.3%	light poles eastbound and westbound	n/a	none	catchbasins both sides approx every 65m	
Option B - Military Trail																
Kinston Road																
	Eastbound	Westbound		Eastbound	Westbound	Middle										
Morningside-Collinsgrove	Commercial	Commercial/ Institutional (West Hill Public School)	3 each way	n/a	left turn lane at Morningside	raised median through entire block (4.2m)	3.9m, turn lane 2.9m	0	n/a	Typ: 36m	275m: 0%	light poles centre, hydro lines westbound	n/a	8 mid block, 2 at Collinsgrove	catchbasins both sides approx every 45m	greenspace part of a school property
Collinsgrove-Old Kingston	Commercial	Commercial	3 each way	left turn lane at Old Kingston	n/a	raised median through most of block (4.4m)	3.9m, turn lane 2.7m	1, from NE to ENE	right curve ~485m (con't on next block)	Typ: 31m, widens at Old Kingston	215m: +0.3%	light poles eastbound up to centre raised median, then light poles on centre raised median, hydro lines westbound	n/a	6 mid block	catchbasins eastbound side and median approx every 45m	
Old Kingston-West Hill	Residential	Commercial	3 each way	left turn lane at West Hill	n/a	raised median through entire block (3.9m)	3.9m, turn lane 2.5m	1, slightly east	right curve ~485m (con't from previous block)	Typ: 43m	115m: -1.3%	light poles centre, hydro lines westbound	n/a	2 mid block, 2 at West Hill	catchbasins eastbound side and median approx every 45m	
West Hill-Orchard Park	Residential	Commercial	3 each way	left turn lane at Orchard park	left turn lane at West Hill	raised median through entire block (4.6m)	3.8m, turn lanes 3.1m	0	n/a	Typ: 43m	205m: -1.6%	light poles centre, hydro lines westbound	n/a	2 mid block, 3 at Orchard Park	catchbasins eastbound side every 90m, westbound side approx every 50m	

Orchard Park-Manse	Residential	Commercial	3 each way	left turn lane at Manse	left turn lane at Orchard Park	raised median separating left turn lanes (1.3m)	total pavement width 27m with 3 lanes each way and left turn lane	0	n/a	Typ: 43m	110m: -0.9%	light poles centre, hydro lines westbound	n/a	1 mid block, 8 at Manse	irregular, 1 on eastbound side, 3 on westbound side	
Manse-Beechgrove	Commercial/Residential	Commercial	3 each way	left turn lane at Beechgrove	left turn lane at Manse	raised median through entire block (4.3m)	total pavement width 27m with 3 lanes each way and left turn lane/median	1, slightly north	left curve ~485m (con't on next block)	Typ: 48m approx	TBD	light poles centre, hydro lines eastbound and westbound	n/a	4 midblock, 2 at Beechgrove approx	TBD	
Beechgrove-Miliary Trail/Lawson	Commercial at Beechgrove, then undeveloped river area	Commercial at Beechgrove, then undeveloped river area	3 each way	left turn lane at Toronto Gateway Inn, right turn lane at Lawson	left turn lane at Beechgrove, collector lane for Kingston, Morrish, Military	raised median along entire length except bridge	total pavement width 36m with 3 lanes each way and median	1, slightly north	left curve ~485m (con't from previous block)	Typ: 48m approx	TBD	light poles centre, hydro lines eastbound and westbound	bridge over Highland Creek	TBD	TBD	Highland Creek ravine area
Military Trail																
	Eastbound	Westbound		Eastbound	Westbound	Middle										
Kingston-Old Kingston	Commercial	Commercial	1 each way	right turn only onto Kingston	left turn lane at Old Kingston, right turn channel to Old Kingston	crescent shaped raised median at Kingston, triangular raised median at Old Kingston	6.2m, lane widths narrow at Old Kingston (total pavement width 12.7m)	0	n/a	Typ: 20m, at Old Kingston 23m	230m: +1.3%	light poles westbound, hydro lines eastbound	n/a	1 at Kingston, 8 at Old Kingston	1 double catchbasin at Kingston, 2 catchbasins in triangular raised median at Old Kingston	
Old Kingston-Bobmar	Residential	Residential	1 each way	left turn lane at Old Kingston	left turn lane at Scenic Hill	n/a	4.8m, turn lanes 3.9m	0	n/a	Typ: 23m, narrowest at Bobmar 20m	370m: +1.1%	light poles/hydro lines eastbound	n/a	4 mid block, 6 at Bobmar	irregular, 3 on each side 85-100m apart	
Bobmar-Gladys	Residential	Institutional (Highland Creek Public School)	1 each way	n/a	n/a	n/a	4.8m	0	n/a	Typ: 20m	180m: +0.8%	light poles/hydro lines westbound	n/a	5 at Gladys	catchbasins both sides approx every 85m	
Gladys-Conlins/Lash	Residential	Residential	1 each way	n/a	n/a	n/a	4.8m	1, slightly north	right curve ~320m	Typ: 23m, narrowest near Conlins 20m	180m: +0.5%	light poles/hydro lines westbound	n/a	8 at Conlins/Lash	2 catchbasins westbound side only 90m apart	
Conlins/Lash-Ellesmere	Residential/ Institutional (U of T)	Residential	1 each way	n/a	left turn lane at U of T entrance, two lanes at approach to Ellesmere	triangular raised median at Ellesmere	4.9m, turn lanes 3.0m	0	n/a	Typ: 23m	310m: +0.8%, 325m: +1.1%	light poles/hydro lines westbound	n/a	9 mid block, 7 at Ellesmere	irregular but generally catchbasins on both sides approx every 65m	
Ellesmere-Morningside	Institutional (U of T parking area)	Institutional (U of T parking area)	1 each way	left and right turn lane at Morningside	left turn lane at Ellesmere	left turn lane, triangular raised medians at Ellesmere and Morningside	total pavement width 12.7m with 1 lane each way and median left turn lane	1, slightly west	left bend ~640m	Typ: 23m	555m: +0.8%	light poles/hydro lines westbound	n/a	9 mid block, 6 at Morningside	irregular, catchbasins range from 70-90m apart on both sides, 2 double catchbasins near Morningside	greenspace on eastbound and westbound side near Morningside
Morningside-Bonspiel	Commercial/ Residential	Commercial/ Residential	1 each way	left turn lane at Morningside	n/a	triangular raised median at Morningside	4.9m, lane widths narrow at Morningside for left turn lane	0	n/a	Typ: 23m	320m: +3.3%	light poles eastbound	n/a	4 mid block	irregular, 2 double catchbasins at Morningside, 1 double catchbasin midblock, remainder approx 55m apart	
Bonspiel-Cindy Nicholas	Institutional (Military Trail Public School)	Institutional (Military Trail Public School)	1 each way	n/a	n/a	n/a	5m	1, from NW to W	left bend ~250m	Typ: 23m	80m: +2.7%, 340m: +0.4%	light poles eastbound, hydro corridor crossing on both sides near Cindy Nicholas	n/a	none	irregular, 2 double catchbasins mid block, remainder approx 70m apart	greenspace under powerlines
Cindy Nicholas-Dartmoor	Residential	Residential	1 each way	n/a	n/a	n/a	5m	1, slightly south	left curve ~200m (con't on next block)	Typ: 23m	135m: -2.1%	light poles eastbound	n/a	none	1 catchbasin on eastbound side, 3 catchbasins on wesbound side irregular spacing	
Dartmoor-Skyridge	Residental/ Undeveloped greenspace	Undeveloped	1 each way	n/a	n/a	n/a	5m	1, from W to SW	left curve ~200m (con't from previous block)	Typ: 23m, widens at Brooks Road Park	70m: -2.0%, 80m: +2.0%	light poles eastbound	n/a	none	2 double catchbasins mid block	Brooks Road Park on either side
Skyridge-Neilson	Residential	Residential	1 each way	n/a	n/a	n/a	5m	0	n/a	Typ: 23m	240m: +1.2%	light poles eastbound	n/a	3 mid block, 3 at Neilson	catchbasins both sides approx every 70-75m	
Option C - Nielson Road																
Ellesmere Road																
	Eastbound	Westbound		Eastbound	Westbound	Middle										
Military Trail-Morningside	Resdential (no access)/ Undeveloped	Institutional (U of T)	2 each way	n/a	right and left turn lanes at Morningside	raised median at Morningside (1.3m)	3.7m, turn lanes 3.2m	0	n/a	narrowest at Military 36m, widens to 70m at Morningside	425m: -3.8%	light poles eastbound and westbound, hydro lines eastbound	n/a	8 mid block, 4 at Morningside	catchbasins both sides approx every 70-75m, 2 double catchbasins at Morningside	greenspace on south side, most of block
Morningside-Neilson	Residential (Seven Oaks Home for the Aged) / Institutional (hospital, healthcare centre) / Greenspace	Commercial/ Residential/ Greenspace	2 each way	left turn lane at entrance to residential area and at Morningside	left turn lane at Neilson	raised medians at Morningside (1.4m) and Neilson (2.3m)	3.7m, turn lanes 2.9m	0	n/a	near Morningside 58m, widens midblock at Ellesmere Ravine park, narrows at Neilson to 37m	985m: +3.6%	light poles eastbound and westbound, hydro lines eastbound	n/a	8 mid block, 1 at Neilson	catchbasins both sides approx every 65-75m	Ellesmere Ravine Park on either side
Neilson Road																
	Northbound	Southbound		Northbound	Southbound	Middle										
Ellesmere-Livonia	Commercial/ Residential (no access)	Residential (access only to a smaller side street)	2 each way	left turn lane at Livonia	left and right turn lane at Ellesmere	left turn lane	total pavement width 15.5m, 2 lanes each way and median left turn lane	0	n/a	Typ: 26m	345m: -0.6%	light poles northbound and southbound, no overhead hydro lines	n/a	5 mid block, 1 at Ellesmere, 3 at Livonia	catchbasins both sides approx every 50-60m	
Livonia-Military Trail	Residential (no access) /Undeveloped	Residential (no access) /Undeveloped	2 each way	left turn lane at Military Trail	left turn lane at Livonia	n/a	3.7m, lane widths narrow at Livonia and Military for left turn lanes	1, from N to NE	left curve 380m	Typ: 26m	45m: -2.2%, 265m: +0.9%	light poles northbound and southbound, hydro corridor crossing	n/a	2 mid block, 3 at Military Trail	catchbasins both sides approx every 60m	greenspace under power lines

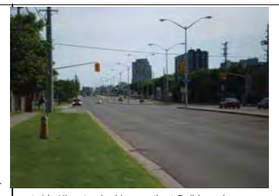
Military Trail-Keeler	Residential (no access)	Parkland (Seven Oaks Park)	2 each way	left turn lane at Keeler	left turn lane at Military Trail	n/a	3.7m, lane widths narrow at Military and Keeler for left turn lanes	1, slightly west	left bend ~370m	Typ: 27m	345m: +1.9%	light poles northbound and southbound, no overhead hydro lines	n/a	1 mid block	catchbasins both sides approx every 45-55m	Seven Oaks Park on west side
Keeler-Oak Meadows	Residential (no access)	Residential (no access)	2 each way	n/a	left turn lane at Keeler	n/a	3.7m, lane width narrows at Keeler for left turn lane	1, slightly north	right curve ~390m (con't on next two blocks)	Typ: 27m	200m: +1.9%	light poles northbound and southbound, no overhead hydro lines	n/a	1 mid block, 1 at Oak Meadows	catchbasins both sides approx every 60m	
Oak Meadows-401	Residential (no access)	Residential (no access)	2 northbound, 3 to 2 southbound	intersection at on and off-ramps to the 401 eastbound	intersection at on and off-ramps to the 401 eastbound	raised median through most of block (1.9-5.1m)	3.9m	1, slightly north	right curve ~390m (con't from previous block)	narrowest at Oak Meadow 28m, varies over 401	315m: +2.3%	light poles northbound and southbound, no overhead hydro lines	bridge over 401	none	no catchbasins on bridge, otherwise catchbasins on both sides approx every 75m	small greenspaces between the 401 ramps
401-Milner (no intersection)	Undeveloped	Undeveloped	2 northbound, 2 to 3 southbound	right turn on-ramp to 401 westbound, intersection with off-ramp from 401 westbound	right turn on-ramp to 401 westbound, intersection with off-ramp from 401 westbound	raised median through most of block (1.3m)	3.9m	1, slightly north	right curve ~390m (con't from previous two blocks)	narrowest at Milner 121m, varies over 401	225m: -0.9%	light poles northbound and southbound, no overhead hydro lines	bridge over 401 and bridge over Milner	2 mid block	none	
Milner (no intersection) - Sheppard	Residential (no access)/ Institutional (Malvern Christian Assemby)	Residential (no access)	2 northbound, 2 to 3 southbound	right and left turn lanes at Sheppard	left turn lane at entrance to church	raised median through most of block (4.7m)	3.9m	0	n/a	narrowest at Sheppard 36m, widens to 75m at Milner	320m: -0.9%	light poles northbound and southbound, no overhead hydro lines	bridge over Milner	3 mid block	irregular, catchbasins on both sides approx every 60-70m, with 2 double catchbasins mid block	narrow greenspace at back of residential lots on east side
Sheppard-Wickson/Berner	Residential (no access)	Residential (no access)	2 each way	right and left turn lanes at Wickson/Berner	right and left turn lanes at Sheppard	raised median through the entire block, concrete at either end, grass in remainder (4.4m)	3.9m, turn lanes: at Sheppard 3.2m, at Wickson 2.9m	1, from NW to NE	right curve 370m	Typ: 37m	455m: +0.6%	light poles northbound and southbound, no overhead hydro lines	n/a	4 at Wickson/Berner	catchbasins both sides approx every 40-50m	
Wickson/Berner-Silverbell	Residential (no access)	Residential (no access)	2 each way	n/a	left and right turn lanes at Wickson/Berner	raised median through the entire block, concrete at either end, grass in remainder (4.4m)	3.9m, turn lanes 2.8m	1, slightly north	left curve 365m (con't on next block)	Typ: 37m	245m: +1.6%	light poles northbound and southbound, centre near Silver Bell, no overhead hydro lines	n/a	1 at Silverbell	catchbasins both sides approx every 50m	
Silver Bell-Tapscott	Residential (apartments)	Residential (apartments)	2 each way	left and right turn lanes at Tapscott	n/a	raised median through the entire block, concrete at either end, grass in remainder (4.2m)	4.0m, lane width narrows at Tapscott for turn lanes	1, from N to NW	left curve 365m (con't from previous block)	Typ: 37m	280m: +0.4%	light poles northbound and southbound, centre near Silver Bell, no overhead hydro lines	n/a	2 at Tapscott	catchbasins both sides approx every 45-55m	
Tapscott-McLevin	Commercial /Institutional (childcare) / Residential (senior's home)	Commercial (Malvern Town Centre)	2 each way	left and right turn lanes at McLevin, intersection midblock	left and right turn lanes at Tapscott	raised medians at Tapscott (1.5m) and McLevin (1.5m), grass raised medians near centre of block at intersection (3.1m)	4.1m, turn lanes 2.8m	1, slightly west	left curve 400m	Typ: 28m	385m: -1.5%	light poles northbound and southbound, no overhead hydro lines	n/a	4 at McLevin	catchbasins both sides approx every 50-60m	McLevin Woods Park on the southbound side at McLevin
Option D - Sheppard Avenue																
Sheppard Avenue																
	Eastbound	Westbound		Eastbound	Westbound	Middle										
Morningside-Brenyon/Breckon	Residential	Commercial/ Residential	2 each way	left turn lane at Brenyon	left and right turn lane at Morningside	n/a	3.9m, turn lanes 2.6m	0	n/a	Typ: 37m	335m: +3.7%, 250m: +0.4%	light poles northbound and southbound, hydro lines: eastbound	n/a	3 at Sheppard	catchbasins both sides approx every 110-120m	
Brenyon/Breckon-Murison	Residential	Residential	2 each way	left turn lane at Murison	left turn lane at Brenyon	n/a	4.1m, turn lanes 3.6m	0	n/a	Typ: 37m	140m: +2.5%, 365m: -0.3%	light poles northbound and southbound, hydro lines: eastbound	n/a	none	catchbasins on south side approx every 115m	
Murison-Neilson	Residential	Residential/ Institutional	2 each way	left and right turn lane at Neilson	n/a	raised median at Neilson (1.5m)	4.2m, turn lanes 3.1m	0	n/a	Typ: 37m	395m: +0.2%	light poles northbound and southbound, hydro lines: eastbound	n/a	none	catchbasins both sides approx every 45m	

TABLE 2 - Photos from Windshield Survey June 12 & 13 2008

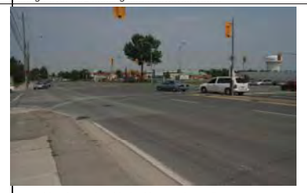
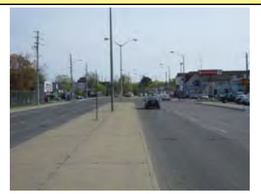
Common to all Options			
Eglinton Avenue East			
Kennedy-Midland	 south side of Eglinton looking at Kennedy intersection	 south side Eglinton looking east at bridge over station	 overpass over Kennedy Station
Midland-Commonwealth	 SE corner of Eglinton and Midland	 south side Eglinton looking east to Commonwealth	
Commonwealth-Huntington	 south side Eginton looking east at Commonwealth	 south side Eginton looking east at Huntington	
Huntington-Winter	 south side of Eglinton looking east at Winter	 south side of Eglinton looking west at Winter	
Winter-Gilder/Falmouth	 south side Eglinton looking west at Falmouth	 south side Eglinton looking east at Falmouth	
Brimley-Danforth	 south side Eglinton looking east at Danforth	 No Frills on north side of Eglinton	 Shopper's on south side of Eglinton

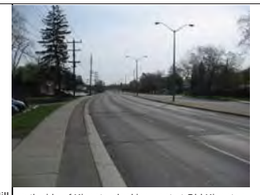
Danforth-Oswego	 townhouses on north side of Eglinton east of Danforth	
Oswego-Barbados	 south side Eglinton at Oswego looking east	 south side Eglinton at Barbados looking west
Barbados-McCowan	 south side of Eglinton looking east at Barbados	
McCowan-Torrance	 north side Eglinton looking west at McCowan	
Torrance-Bellamy	 north side Eglinton looking east to Bellamy	 vacant lot on south side of Eglinton west of GO station
		 south side of Eglinton at entrance to GO station
Bellamy-Mason	 south side Eglinton looking east under rail bridge	 south side Eglinton looking east to Mason
		 EMS facilities on north side of Eglinton

Mason-Beachell	 south side Eglinton looking east at Beachell		
Centre-Markham	 south side Eglinton looking east at Markham		
Cedar-Kingston	 south side Eglinton looking west at Cedar	 south side Eglinton looking at Kingston	 vertical and horizontal curve on Eglinton
Kingston Road			
Eglinton-Scarborough Golf Club	 south side Kingston looking east to SGC		
Scarborough Golf Club Saunders	 Church at SE corner of SGC and Kingston	 east side of Kingston looking north from SGC	
Saunders-Guildwood/Cromwell	 east side Kingston looking north to Guildwood		

Guildwood/Cromwell-Dale/Livingston	 east side Kingston looking south at Guildwood	 east side Kingston looking north at Livingston	 east side of Kingston at turnoff to Livingston
Dale/Livingston-Celeste	 west side Kingston looking south from Celeste	 centre of Kingston looking north from Livingston	
Celeste-Payzac	 east side Kingston looking north from Celeste	 east side Kingston looking south from Payzac	
Payzac-Galloway	 new townhouses being built on west side Kingston	 east side Kingston looking north at Galloway	
Galloway-Poplar	 east side Kingston looking south at Poplar	 east side Kingston looking north at Poplar	
Poplar-Lawrence	 east side Kingston looking north at Lawrence	 east side Kingston looking south at Lawrence	

Option A - Morningsside	
Morningside Avenue	
Kingston-Tefft	 east side Morningside looking south to Tefft
Tefft-Warnsworth	 east side Morningside looking north from Tefft
Beath-Fairwood (no intersection)	 West Hill Collegiate on west side of Morningside
Fairwood-Ellesmere	 east side of Morningside looking north from Fairwood  utilities along east side of Morningside bridge
Ellesmere-Military Trail	 west side Morningside looking south from Ellesmere  west side of Morningside looking south from Military Trail
Military Trail-Tams	 west side Morningside looking north from Military Trail

Tams-401	 bridge over 401 looking south towards Tams
401-Milner	 west side of Morningside looking north to Milner
Milner-Sheppard	 west side of Morningside looking south to Milner
Sheppard-Casebridge/McLevin	 west side of Morningside looking north to McLevin
Option B - McLevin	
Kinston Road	
Morningside-Collinsgrove	 south side of Kingston looking east from Morningside  north side of Kingston looking east from Morningside  middle of Kingston looking east start of straight section  middle of Kingston looking east end of straight section  middle of Kingston looking west
Collinsgrove-Old Kingston	 middle of Kingston looking east at Collinsgrove  north side of Kingston looking east to Fairwood  north side of Kingston looking east at Old Kingston  north side of Kingston looking west at Old Kingston

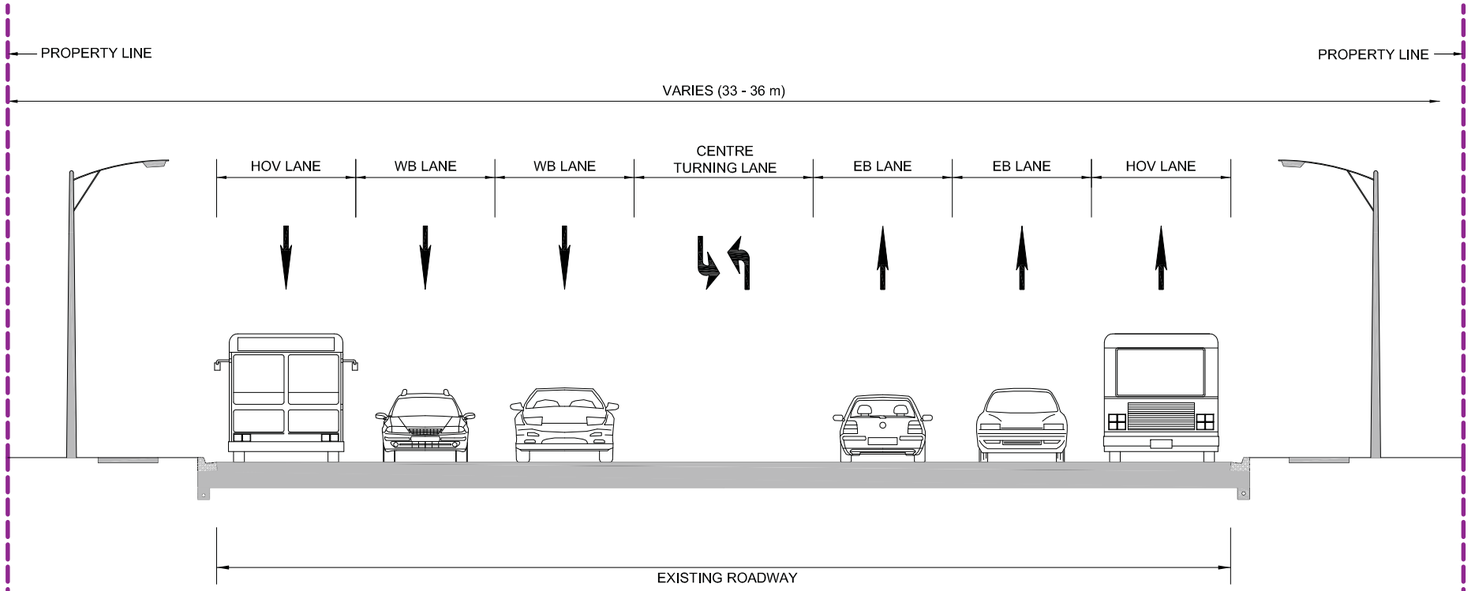
Old Kingston-West Hill	 north side of Kingston looking east at Old Kingston							
West Hill-Orchard Park	 middle of Kingston looking west to West Hill	 middle of Kingston looking east to Orchard Park	 south side of Kingston looking at Orchard Partk					
Orchard Park-Manse	 south side of Kingston looking east at Manse	 south side of Kingston looking west at Manse						
Manse-Beechgrove	 south side of Kingston looking east near Manse	 south side of Kingston looking west near Manse	 middle of Kingston looking east mid block	 middle of Kingston looking east mid block 2	 middle of Kingston looking east at Beechgrove	 middle of Kingston looking west at Beechgrove		
Beechgrove-Miliary Trail/Lawson	 Middle of Kingston looking west to Beechgrove	 middle of Kingston looking east before bridge	 middle of Kingston looking east on bridge	 middle of Kingston looking west on bridge	 middle of Kingston between bridges	 north side of Kingston bridge looking west	 north side of Kingston bridge looking east	
Military Trail								
Kingston-Old Kingston	 turn off from Kingston to Military	 turnoff from Kingston to Military 2	 turn off from Kingston to Military 3	 Military looking north-west	 Military looking north-west at Old Kingston	 Military looking south-east at Old Kingston	 Military looking south-east	

Old Kingston-Bobmar	 Military looking north-west at Scenic Hill	 Military looking south-east at Scenic Hill	 Military looking north-west mid block	 Military looking north-west at Bobmar	 Military looking south-east from Bobmar	 Military looking south-east from Bobmar 2
Bobmar-Gladys	 Military looking north-west from Bobmar	 Military looking south-east from Gladys				
Gladys-Conlins/Lash	 Military looking north-west from Gladys	 Military looking north-west at curve	 Military looking north-west at Conlins	 Military looking south-east at Conlins		
Conlins/Lash-Ellesmere	 Military looking north-west mid block	 Military looking south-east mid block	 Military Entrance to UofT	 Military Exit at Uof T	 Military looking south-east between entrance and exit	 Military looking north-west at exit
Conlins/Lash-Ellesmere	 Military looking south-east at main entrance	 Military looking north-west at main entrance	 Military looking north-west at Ellesmere	 right turn from Military to Ellesmere	 intersection of Military and Ellesmere from south-east side	
Ellesmere-Morningside	 west side Military Trail looking south at Ellesmere					

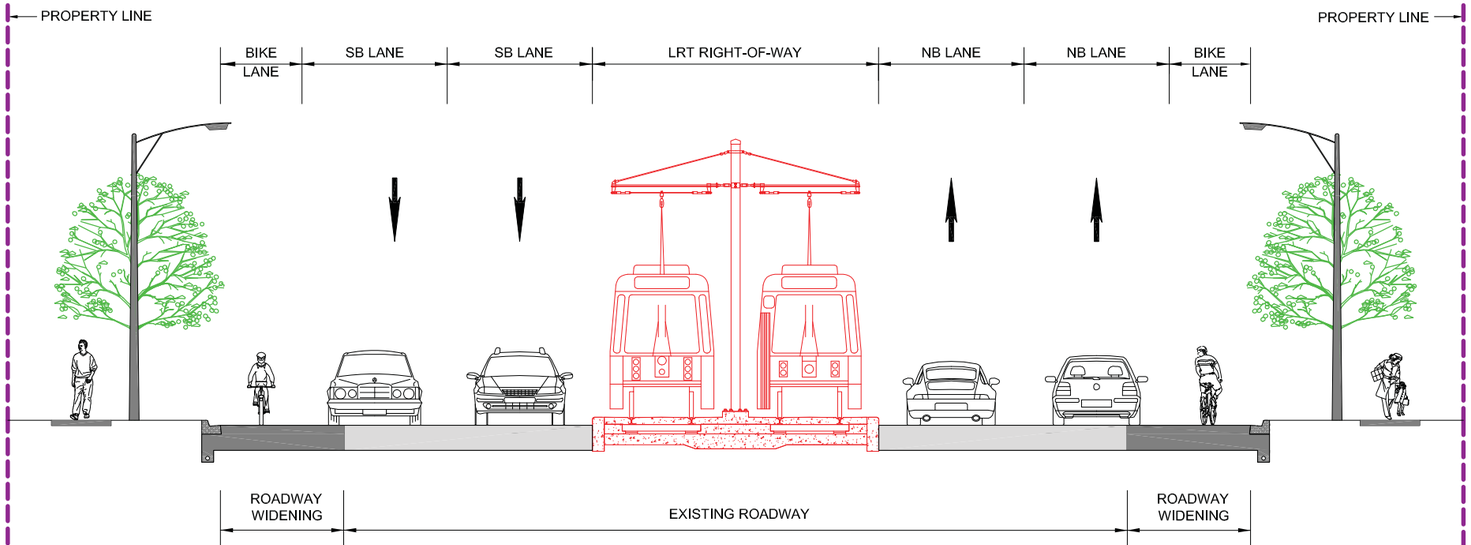
Option C - Malvern Town Centre	
Ellesmere Road	
Military Trail-Morningside	 south side Ellesmere looking west at Morningside
Morningside-Neilson	 south side Ellesmere looking west towards Neilson
Neilson Road	
Keeler-Oak Meadows	 west side Neilson looking south from Oak Meadow
Oak Meadows-401	 west side Neilson looking north to 401  looking north on bridge over 401
401-Milner (no intersection)	 east side Neilson looking North on 401 bridge  overpass at Milner
Sheppard-Wickson/Berner	 middle of Neilson looking south to Sheppard  middle of Neilson looking north to Wickson

Tapscott-McLevin	 west side Neilson looking north	 Neilson and Tapscott intersection	 Malvern Town Centre from SE corner	 east side of Malvern Town Centre on Neilson
Option D - Sheppard Avenue				
Sheppard Avenue				
Morningside-Brenyon/Breckon	 north side Sheppard looking west to Morningside	 north side Sheppard looking east to Brenyon		
Brenyon/Breckon-Neilson	 north side of Sheppard looking west towards Murison			

APPENDIX B – EXISTING AND PROPOSED TYPICAL CROSS-SECTIONS



EXISTING CONDITIONS



PROPOSED TYPICAL MID-BLOCK SECTION

NOTE: ALL SIGNALIZED INTERSECTIONS WILL REMAIN.

BLDG. REF. No.

FILE

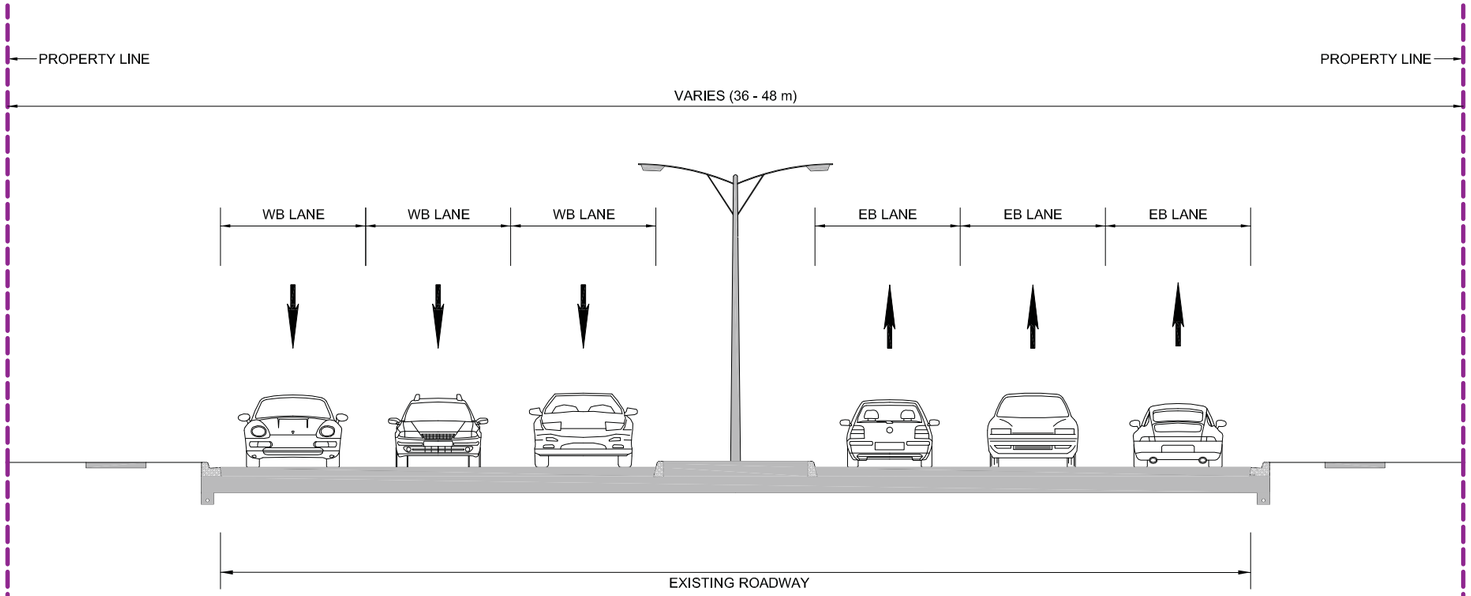
SHEET No.

DRAWING No.

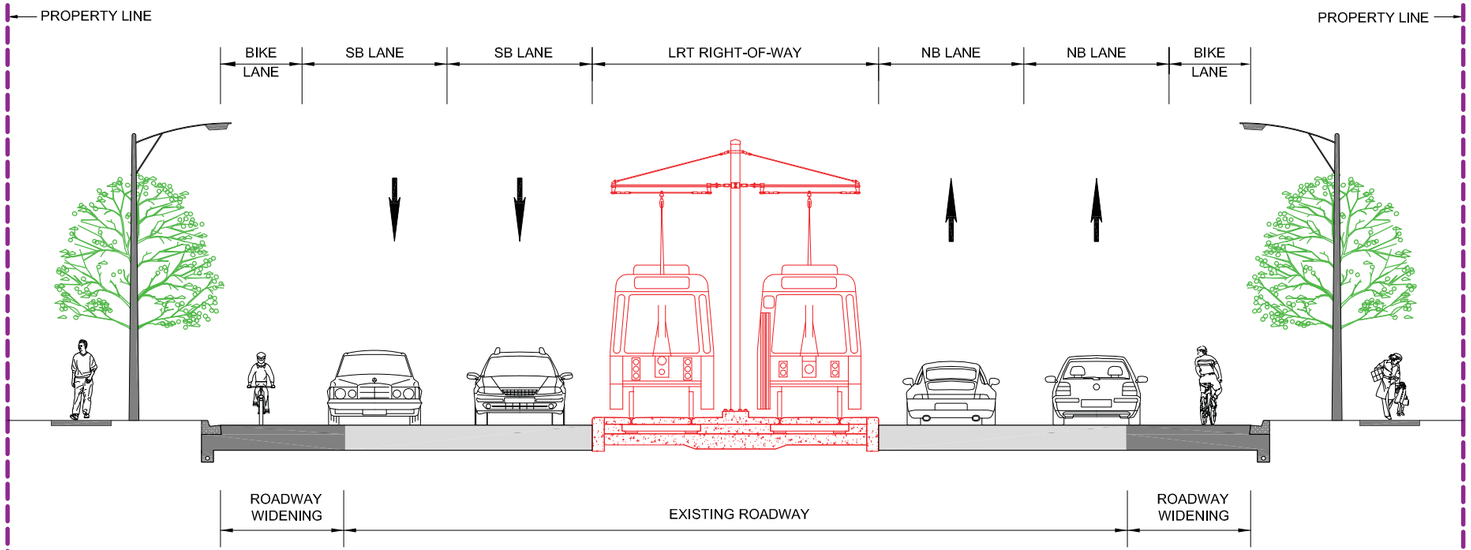
SCARBOROUGH MALVERN LRT - FEASIBILITY STUDY

EGLINTON AVENUE - TYPICAL CROSS-SECTION

TORONTO TRANSIT COMMISSION
ENGINEERING DEPARTMENT



EXISTING CONDITIONS



PROPOSED TYPICAL MID-BLOCK SECTION

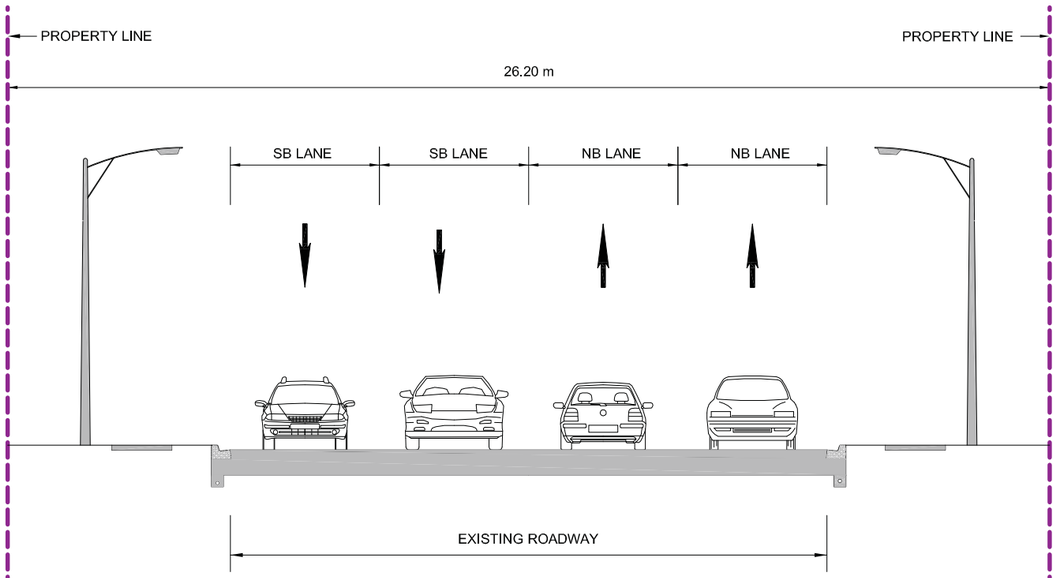
NOTE: ALL SIGNALIZED INTERSECTIONS WILL REMAIN.

SCARBOROUGH MALVERN LRT - FEASIBILITY STUDY

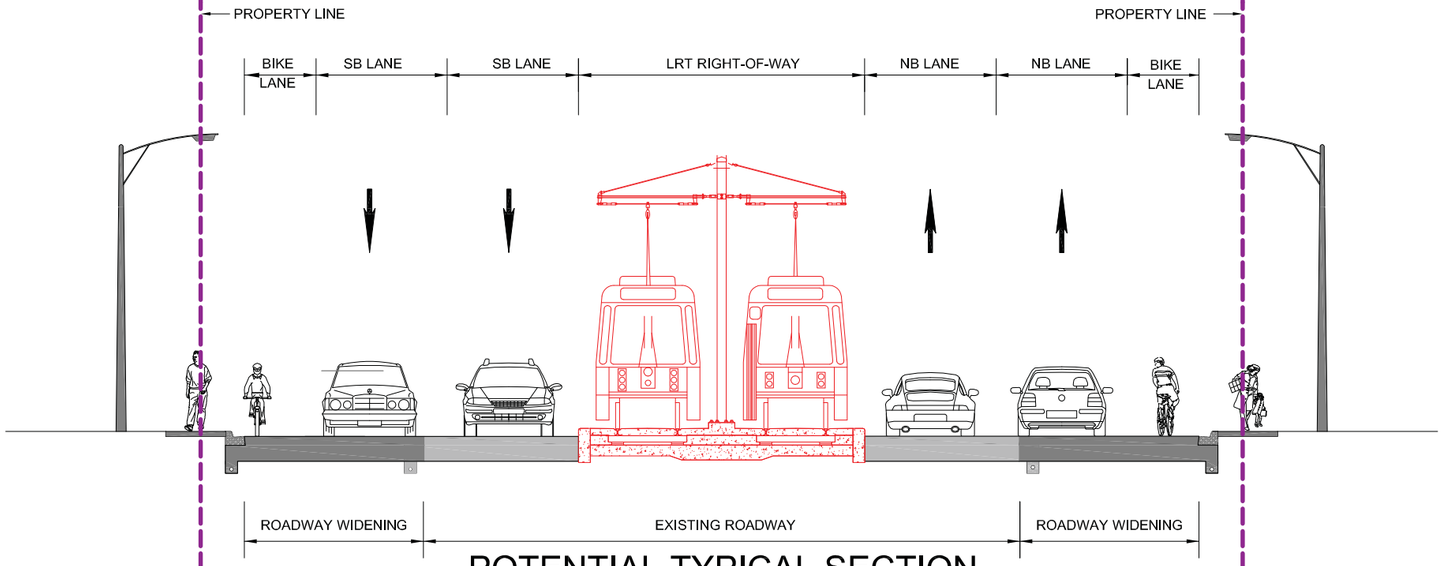
KINGSTON ROAD - TYPICAL CROSS-SECTION

TORONTO TRANSIT COMMISSION
ENGINEERING DEPARTMENT

DRAWING No. ---------- SHEET No. ---------- FILE ---------- BLDG. REF. No.



EXISTING CONDITIONS
SOUTH OF WEST HILL COLLEGIATE



POTENTIAL TYPICAL SECTION
SOUTH OF WEST HILL COLLEGIATE

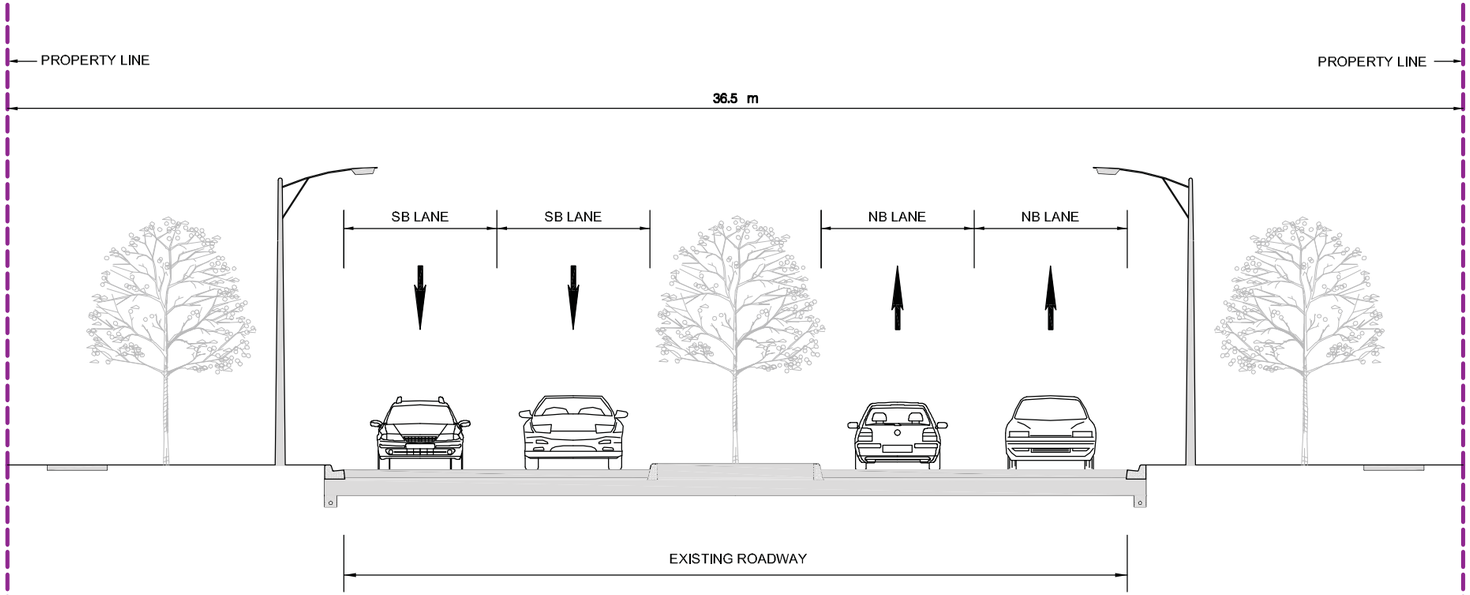
NOTE: ALL SIGNALIZED INTERSECTIONS WILL REMAIN.

DRAWING No. _____ SHEET No. _____ FILE _____ BLDG. REF. No.

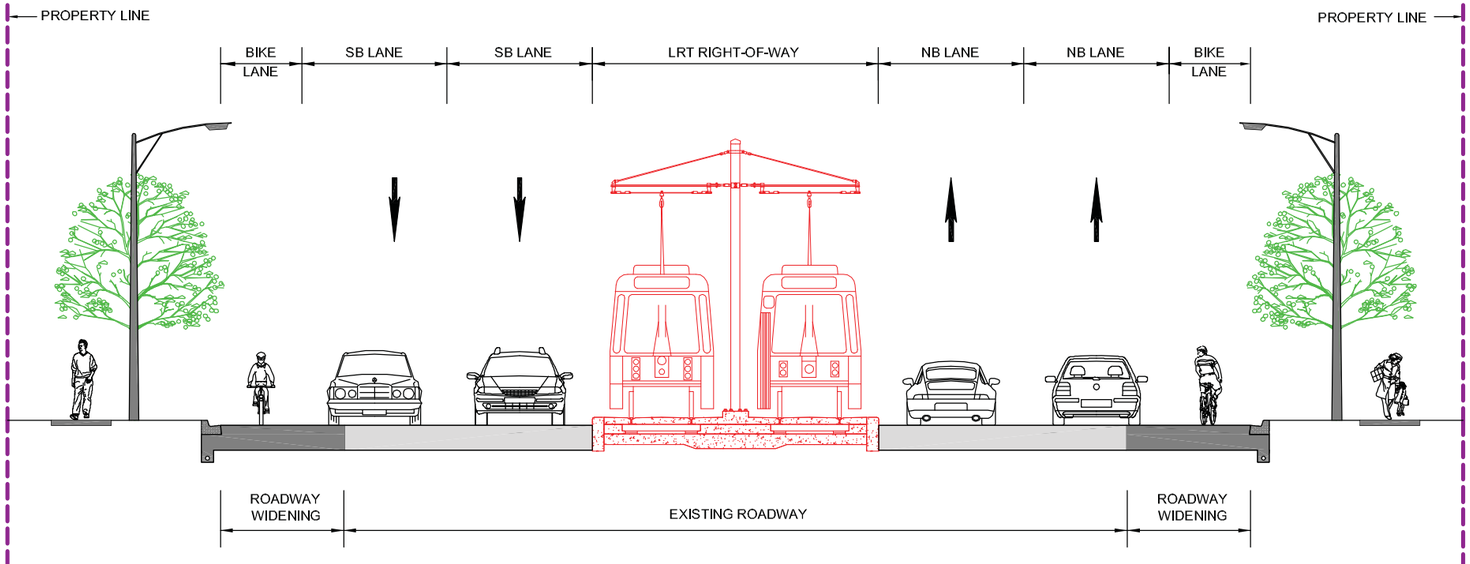
SCARBOROUGH MALVERN LRT - FEASIBILITY STUDY

MORNINGSIDE AVENUE - TYPICAL CROSS-SECTION

TORONTO TRANSIT COMMISSION
ENGINEERING DEPARTMENT



EXISTING CONDITIONS



PROPOSED TYPICAL MID-BLOCK SECTION

NOTE: ALL SIGNALIZED INTERSECTIONS WILL REMAIN.

SCARBOROUGH MALVERN LRT - FEASIBILITY STUDY

NEILSON ROAD - TYPICAL CROSS-SECTION

TORONTO TRANSIT COMMISSION
ENGINEERING DEPARTMENT

DRAWING No. _____ SHEET No. _____ FILE _____ BLDG. REF. No.

APPENDIX C – PLAN AND PROFILE DRAWINGS

(SUPERCEDED BY ENVIRONMENTAL PROJECT REPORT – DESIGN PLATES)

APPENDIX D – STRUCTURAL GENERAL ARRANGEMENT DRAWINGS

(SUPERCEDED BY ENVIRONMENTAL PROJECT REPORT: APPENDIX D – STRUCTURAL REPORT)