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APPENDICES

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A. INTRODUCTION AND BACKGROUND

1.0 Introduction

Within the broader goal of increasing the percentage of people using public transit in Toronto, the City of Toronto and the Toronto Transit Commission (TTC) have conducted an Environmental Assessment (EA) study of ways to significantly improve the speed and reliability of transit service on Sheppard Avenue East, east of Don Mills Subway Station. This objective supports the City of Toronto Official Plan, which promotes measures to reduce car dependency and rush hour congestion by increasing trips made by transit, walking and cycling.

This EA study recommends that the bus service on Sheppard Avenue East be replaced with Light Rail Transit (LRT) - electrically powered “light rail” vehicles operating in reserved lanes in the centre of a widened Sheppard Avenue East - from Don Mills Subway Station to Meadowvale Road. This report provides a comprehensive summary of each step in the EA study, including the reasons for recommending the LRT technology on Sheppard Avenue East, the assessment of design alternatives, and an assessment of any impacts and ways that such impacts can be mitigated against.

1.1 Study Purpose

The principal problem bring addressed in this study is to identify the best way to make transit in the Sheppard East corridor a much more attractive travel option relative to the private auto. At the same time the study provides the opportunity to incorporate good urban design principles and support the City’s growth objectives of directing future growth to areas well-served by transit. The study must also respect other road users, adjacent properties, and the natural environment.

1.2 Study Area

The primary Study Area (shown in Figure 1-1) is along Sheppard Avenue East from Don Mills Road to Meadowvale Road, which is the routing for the main branch of the 85 Sheppard bus service. The study also included consideration of a potential connection to the Scarborough Centre area, given the significant level of existing, and planned, development in this area and the City’s official Plan policies for Centres.

1.3 Study Process: Municipal Class Environmental Assessment

An LRT on Sheppard Avenue East was proposed in the TTC’s Toronto Transit City Light Rail Plan. This type of facility requires an Environmental Assessment (EA) Study where the proponent – in this case the City of Toronto and the TTC – must explain, and review with the public, the reasons why this type of transportation facility is being proposed, as well as the rationale for the manner in which it will be designed. This process must identify any potential effects on the environment due to the project, as well as mitigation measures that may be put in place to minimize negative impacts.
This EA is being conducted as a Schedule ‘C’ project under the Municipal Class Environmental Assessment (EA). Schedule ‘C’ projects include the construction of new facilities and major expansions to existing facilities. They have the potential for significant environmental effects and must proceed under the full planning and documentation procedures specified in the Class EA, shown in Appendix 1 and summarized below:

- **Phase 1** – Identify the problem or opportunity that the study is to address
- **Phase 2** – Identify alternative solutions to address the problem or opportunity by taking into consideration the existing environment (Chapter 6), and establish the preferred solution taking into account public and review agency input (Chapter 8).
- **Phase 3** – Examine alternative methods/designs for implementing the preferred solution.
- **Phase 4** – Document, in an Environmental Study Report (ESR), a summary of the rationale, and the planning, design and consultation process of the project, and make documentation available for public and agency review.
- **Phase 5** – Complete contract drawings and documents, and proceed to construction and operation; monitor construction for adherence to environmental provisions and commitments.

*Public consultation is mandatory as part of Phases 2 and 3.

### 1.3.1 Class EA Approval Process

This Environmental Study Report (ESR) is required for the public record and provides an opportunity for the public to review the planning and decision-making process used to select the preferred alternative, details the impacts associated with the preferred alternative, outlines proposed measures to mitigate impacts on the environment, and identifies commitments to future work. At the end of the planning and decision-making process, the ESR is to be placed on the public record with the City of Toronto for a minimum 30-day review period. If there are any outstanding concerns that are not resolved during project planning, the person or party with the concern may make a written request to the Minister of the Environment (135 St. Clair Avenue West, Toronto, ON M4V 1P5) for a “Part II Order” within this 30-day review period. The “Part II Order” is a request that the project be subject to formal governmental review and approval under the Environmental Assessment Act. A copy of the “Part II Order” must be forwarded to the Minister of the Environment:

A copy of such request(s) must be forwarded to the City of Toronto at Metro Hall, 19th Floor, 55 John Street, Toronto, ON M5V 3C6, and the Toronto Transit Commission at 1900 Yonge Street, Toronto, ON M4S 1Z2.

If there are no outstanding concerns at the end of the 30-day review period, the project is considered to have met the requirements of the Class EA.

All comments and information regarding this study will be put on file and may be included in study documentation. Information collected will be used in accordance with the Freedom of Information and Protection of Privacy Act. With the exception of personal information, all comments will become part of the public record.

### 1.4 Study Organization

#### 1.4.1 Study Team

The study was conducted under the direction of the TTC and the City of Toronto as co-proponents, with overall project management provided by TTC Service Planning. City of Toronto staff representation on the Study Team included:

- Transportation Services;
- City Planning (Transportation, Community Planning and Urban Design);
- Technical Services;
- Urban Forestry Services; and
- Public Consultation Unit

A consultant team was formed to project-manage the technical work associated with the EA, including preparation of all presentation material for the public meetings and preparation of the EA document. Project management was provided by URS Canada with assistance from

- The Planning Partnership (urban design);
- LGL Limited (natural environment); and,
- SS Wilson Associates (noise and vibration)

TTC Engineering conducted the majority of the technical work related to connections of the new transit facility to Don Mills Subway Station.
2.0  Background and Planning Context

2.1  City of Toronto Official Plan

Transportation

The Toronto Official Plan calls for Toronto to continue to grow in a manner that is less dependent upon the private automobile. This can be achieved in part by directing new growth to areas well-served by public transit through more efficient use of the existing infrastructure and, wherever possible by making transit, cycling, and walking more attractive alternatives. Various transportation and planning studies have incorporated the concept of transit in dedicated rights-of-way (separated from other traffic) to allow transit to be fast, reliable, and support the City’s Official Plan objectives.

The Official Plan designates Higher Order Transit Corridors (Figure 2-1) and a Surface Transit Priority Network (Figure 2-2) that identify potential areas for future expansion of the transit system through greater separation from, and priority when travelling in, general traffic. These areas have the potential for reduced car dependency due to projected high population and employment densities.

Figure 2-1: Map 4 – Higher Order Transit Corridors (City of Toronto Official Plan)

Figure 2-2: Map 5 – Surface Transit Priority Network (City of Toronto Official Plan)

As seen in Figure 2-1, the Official Plan incorporates a higher order transit corridor between Yonge Street and Scarborough Centre; an EA was approved for a subway on this alignment and the section from Yonge Street to Don Mills Road has been constructed. As seen in Figure 2-2 Sheppard, west of McCowan Road, is part of the City’s “surface transit priority network” that includes treatments such as light rail vehicles or buses in reserved lanes. During the EA study, the Official Plan was amended to extend this designation on Sheppard to Meadowvale Road. City Council adopted the amendment as By-law 1010-2008 on September 25, 2008, and the amendment came into full effect following the statutory appeal period.

Designated Growth Areas

The Official Plan directs future growth to areas of the City that are well served by transit and the existing road network, and existing infrastructure. Areas that have the most potential of accommodating growth and redevelopment are the Downtown and Central Waterfront, the Centres, the Avenues, and the Employment Districts.

Avenues are important corridors along major streets where redevelopment and growth is encouraged. Reurbanization and growth on the Avenues is intended to create new housing and job opportunities as well as improvements to the pedestrian environment, making the area attractive to residents, workers, and visitors alike. Growth and redevelopment must be supported by high quality transit services that promote a safe pedestrian environment and efficient commutes by placing priority on buses, streetcars, and LRTs. Since Sheppard (to the west of McCowan Rd) is identified as an Avenue, there will be continued growth in the areas that have been designated in the Official Plan to accommodate such growth.

Lands designated as mixed-use areas along the Avenues have the opportunity to perform a ‘Main Street’ function and become meeting places for local neighbours and the wider community. By promoting alternative forms of travel, these areas become vibrant communities centred on the people and uses instead of automobiles.

By directing growth to areas such as Avenues, the Official Plan provides greater certainty for land owners, businesses, and residents about what type of growth can be anticipated, and where growth will occur.

Land Use Designations

Land Use Designations are among the Official Plan’s key implementation tools for achieving the growth forecasts over the next 25 years. Land Use Designations within the Sheppard East LRT Study Area are identified in Figure 3-2, and include:
Neighbourhoods

Neighbourhoods contain a full range of residential uses within lower scale buildings, as well as parks, schools, local institutions and small-scale stores and shops serving the needs of area residents. These areas are physically stable and will see minimal change.

Apartment Neighbourhoods

Similar to Neighbourhoods, Apartment Neighbourhoods are physically stable areas where significant growth is generally not anticipated. Apartment Neighbourhoods are distinguished from low-rise Neighbourhoods by the larger scale of buildings. Opportunities for sensitive infill in underutilized areas within Apartment Neighbourhoods will be considered.

Mixed-Use Areas

Mixed-Use Areas combine a broad array of residential uses, offices, retail and services, institutions, entertainment, recreation and cultural activities, and parks and open spaces. These areas are intended to absorb some of the anticipated increase in retail, office and service employment growth in the future. Development within Mixed-Use Areas within the Avenues is anticipated to be primarily residential in nature.

Employment Lands

Employment Areas are places of business and economic activity and consist of uses such as offices and manufacturing, but also include small scale stores and restaurants to serve area businesses and workers. Development is permitted within Employment Areas, and a number of large employment areas are situated within or in close proximity to this segment of Sheppard Ave. E. Employment uses within these areas are protected by both City of Toronto and Provincial policies.

Parks and Other Open Space Areas

Parks and Open Space Areas are the parks and open spaces, valleys, watercourses and ravines, portions of the waterfront, golf courses, and cemeteries that comprise the green open space network in Toronto.

Public Realm Objectives

The construction of an LRT presents an opportunity to transform Sheppard Avenue East into an identifiable street appreciated by all who live, work and visit the area. A great street is defined as much by the quality and character of its edges and the buildings that frame it, as by the design features of the street itself. Ensuring that all these defining elements come together in the right way will enhance the area’s image, generate investments, and encourage walking, cycling and transit use. Great streets come in many shapes and forms, but attributes they commonly share include:

- High quality design and architectural characteristics;
- High quality streetscapes;
- Inviting pedestrian environments; and,
- Complementary uses that frame and animate the street.

Accordingly, key urban design objectives for the transformation of Sheppard Avenue East include:

- **Balance** - The design should accommodate all modes of travel safely and effectively, enhancing sustainable mobility choices and supporting urban intensification in areas planned for change.
- **Walkable** - The design quality and experience on Sheppard Avenue East should not only accommodate, but also encourage pedestrian travel. Ensuring that the comfort, safety and convenience of pedestrians is a priority in the design of the corridor and land uses will enhance the walkability of the corridor.
- **Distinctive** - The transformation of Sheppard Avenue East should reinforce and build on existing local character and respect and enhance its distinct identity areas. This will help build civic pride by reinforcing the street’s quality, purpose and connectivity to the purpose and reinforcing the connectivity with existing adjacent neighbourhoods and the employment areas it serves.
- **Vibrant** - The construction of the LRT can serve as a catalyst for the transformation of automobile-oriented commercial strips and malls into vibrant mixed-use urban areas that are inviting to pedestrians, better integrated into the surrounding city, and meet the City’s broad sustainable objectives.
- **Beauty and Quality** - Getting the design and quality of implementation right is important to achieve a beautiful streetscaping and meet the other objectives including increased walkability, distinctive character, enhanced private investment and civic pride.

The City of Toronto Official Plan identifies the following Public Realm Policies:

Quality architectural, landscape and urban design and construction will be promoted by committing the funds necessary to create and maintain high quality public buildings, structures, streetscapes and parks that reflect the broad objectives of this Plan.

City streets area a significant public open space that serve pedestrians and vehicles, provide space for public utilities and services, trees and landscaping, building access, amenities such as view corridors, sky-view and sunlight, and are public gathering places. Streets will be designed to perform their diverse roles, balancing the spatial needs of existing and future users within the right-of-way. This includes pedestrians, people with mobility aids, transit, bicycles, automobiles, utilities and landscaping.

Sidewalks and boulevards will be designed to provide safe, attractive, interesting and comfortable spaces for pedestrians by:
Providing well designed and coordinated tree planting and landscaping, pedestrian-scale lighting, and quality street furnishings and decorative paving as part of street improvements; and,
Locating and designing utilities within streets, within buildings or underground, in a manner that will minimize negative impacts on the natural pedestrian and visual environment and enable the planting and growth of trees to maturity.

Design measures which promote pedestrian safety and security will be applied to streetscapes, parks, other public and private open spaces, and all new and renovated buildings.

### 2.2 Toronto Transit City Light Rail Transit Plan

In 2007, the TTC developed a plan that built upon the transit concepts in the Toronto Official Plan, the TTC Ridership Growth Strategy, Building a Transit City, and Mayor Miller’s “Transit City” Platform (2006), recommending a network of LRT lines throughout the City, including an LRT on Sheppard Avenue, extending at least as far as Morningside Avenue. The plan is premised on developing a widely-spaced network of electric light-rail lines, each on its own right-of-way. The lines reach across Toronto. In total, 120 km of new transit will be added over the entire city. By 2031, the new lines are projected to carry 175 million riders per year.

One of the seven corridors identified in the Toronto Transit City Plan – Light Rail is the Sheppard East Corridor. This 14-kilometre long corridor would extend rapid transit service east from Don Mills Station to northern Scarborough, Malvern, and, potentially, Durham Region. The light rail line would run east from Don Mills Station on the Sheppard Subway along Sheppard Avenue (see Figure 2.3), replacing two busy existing bus routes, and providing fast and frequent east-west service.

EA’s for the Don Mills LRT and the Scarborough Malvern LRT are underway at the time of writing this report. An EA study is also being conducted to updated the previously approved extension of the Scarborough Rapid Transit (SRT) line to Markham Road and Sheppard Avenue, and potentially beyond to Malvern Town Centre.

![Figure 2-3: Toronto Transit City Light Rail Plan](image)

### 2.3 City Bicycle Lane Network

In July 2001, Toronto Council adopted, in principle, the recommendations of the Toronto Bike Plan – Shifting Gears. The Bike Plan is a 10-year strategy to guide the development of new policies, programs and infrastructure to create a bicycle-friendly environment that encourages the future use of bicycles for everyday transportation and enjoyment. The two primary goals of the Bike Plan are to double the number of bike trips by 2011 and decrease the number of bicycle collisions and injuries. The Bike Plan recommends advancing cycling in the City across six broad fronts:

- Adopting bicycle-friendly street policies that give bicycles the same consideration as vehicles on the City’s street system;
- Developing a 1000 km bikeway network of off-road trails and on-road bike lanes and routes;
- Implementing enhanced safety and education programs;
- More extensive promotion of cycling for both recreational and everyday transportation purposes;
Better links with transit services to encourage “bike and ride” trips; and,

Ensuring the provision of adequate bicycle parking facilities.

To be effective in achieving the Bike Plan’s two primary goals, the six component points must be implemented together as part of a multi-faceted strategy. When implemented, the Toronto Bike Plan will ensure that all Toronto residents are within a 5-minute bike ride to the bikeway network.

2.4 Pedestrian Charter

The Pedestrian Charter (adopted by Council in 2002) outlines the need for pedestrian-friendly design. It emphasizes reducing the conflict between pedestrians and other users of the right-of-way, improving safety for pedestrians and allowing people to avoid reliance on cars and public transport. It also notes that better facilities for pedestrians will improve public transport use.

2.5 Additional Related Studies

Stouffville Corridor Planning Study (2002)

In March 2002, GO Transit retained Morrison Hershfield Limited to update the 1991 Stouffville Corridor Full Service Study that assessed feasibility and cost of double-tracking and upgrading the Stouffville Rail Corridor, which was deemed necessary for the implementation of full GO Service from Scarborough to Uxbridge. The abovementioned report is of direct relevance to Sheppard LRT EA as it also recommended grade-separating GO Service from regular traffic at 10 major crossings, which included Sheppard Avenue near the Agincourt GO Station. The Sheppard LRT EA recommends developing an underpass for regular road traffic on Sheppard Avenue East and separating it from the GO Transit tracks.

Sheppard Avenue East / CN Uxbridge Subdivision Transportation Improvements (1997)

In April 1997, Metro Toronto carried out an engineering feasibility study for possible transportation improvements in the vicinity of Sheppard Avenue East and the CN Uxbridge Subdivision. The study investigated various alternatives available to resolve the transportation problems in the area. The study recommended grade separating GO Service from road traffic on Sheppard Avenue East. This would eliminate train related delays and safety concerns at intersections with Sheppard Avenue East, and improves travel times for transit vehicles on Sheppard Avenue. The preferred design was to take Sheppard Avenue under the GO rail line.
B. EXISTING AND FUTURE CONDITIONS

3.0 Existing Conditions

The purpose of this section of the EA is to identify existing and future conditions within the Study Area, including the existing transportation planning context, transportation systems, natural environmental, socio-economic environment, existing and planned land use, and future transportation demands. This information served as a basis for the generation of transit solutions, the prediction of condition changes and travel demand, and the identification of environmental effects and protection measures.

The EA study began with a comprehensive inventory of existing and future conditions within the Study Area, and focused on transportation, natural and cultural heritage, as well as socio-economic issues.

3.1 Existing Transportation Systems

Figure 3-1 illustrates the transit services in the vicinity of the study area, overlaid on the associated road network.

3.1.1 Transit Services in the Study Area

### Existing TTC Routes

The principal bus services operating on Sheppard East corridor, in the study area, are the 85 Sheppard East bus route and the 190 Scarborough Centre Rocket. Since 2005, Don Mills Station has included a bus terminal for ten TTC bus routes and two York Region Viva bus routes.

The study area is well served by surface transit routes (Figure 3-1). There is currently bus service on Sheppard and all major intersecting north-south streets.

- 85 Sheppard East
- 167 Pharmacy North
- 24 Victoria Park
- 17 Birchmount
- 21 Brimley
- 131 Nugget
- 134 Progress
- 190 Scarborough City Centre Rocket
- 67 Pharmacy
- 43 Kennedy
- 129 McCowan North
- 132 Milner
- 133 Neilson
- 169 Huntingwood
- 224 Victoria Park North
- 68 Warden
- 57 Midland
- 130 Midfield
- 102 Markham
- 116 Morningide

York Region Transit and Viva bus rapid transit system serves the area with the following routes:

- Viva Green
- YRT 90 Leslie South

GO Transit provides rail service to the Study Area at the Agincourt Station on the Stouffville line, linking Uxbridge with Union Station.

A CP Rail Line crosses the Study Area. This corridor is a single north-south track located midblock between Midland Avenue and Brimley Road, which leads to the CP rail Toronto Yard bounded by McCowan Road to the west, Sheppard Avenue East to the south, Markham Road to the east, and Finch Avenue to the north.

Typical Usage of Transit

Table 3-1 lists ridership statistics for the bus routes along or crossing Sheppard Avenue East for 2007.

<table>
<thead>
<tr>
<th>Route #</th>
<th>Ridership*</th>
</tr>
</thead>
<tbody>
<tr>
<td>85</td>
<td>28 300</td>
</tr>
<tr>
<td>190</td>
<td>8 200</td>
</tr>
<tr>
<td>169</td>
<td>900</td>
</tr>
<tr>
<td>167</td>
<td>1 100</td>
</tr>
<tr>
<td>224</td>
<td>1 700</td>
</tr>
<tr>
<td>24</td>
<td>22 700</td>
</tr>
<tr>
<td>67</td>
<td>4 500</td>
</tr>
<tr>
<td>34</td>
<td>6 600</td>
</tr>
<tr>
<td>132</td>
<td>2 100</td>
</tr>
<tr>
<td>102</td>
<td>17 600</td>
</tr>
<tr>
<td>134</td>
<td>8 100</td>
</tr>
<tr>
<td>133</td>
<td>9 700</td>
</tr>
<tr>
<td>116</td>
<td>20 200</td>
</tr>
</tbody>
</table>

*Estimated daily usage

The two principal bus routes along Sheppard Avenue East in the study area are 85 Sheppard East and 190 Scarborough City Centre Rocket. As seen in Table 3-1, these two routes have a combined daily ridership of 36,500. During the peak hours, at the busiest points on the two lines, they carry a total of 1,100 people per hour in the peak direction. The greatest operating problem on these services is inconsistent travel-time – i.e. unreliability in the traffic conditions can change dramatically from day to day – for example, due to re-routing traffic caused by a problem on Highway 401.
Figure 3-1: Existing Transit Routes and Major Road Networks
3.1.2 Road Network

The existing road network consists of a grid pattern of arterial roads (Figure 3-1) within the City of Toronto, with Highway 404 crossing perpendicular to Sheppard Avenue east of Don Mills Road, and Highway 401 south of and parallel to Sheppard Avenue. The arterial roads and Highways 401 and 404 are typically subject to traffic congestion during rush hours, which also results in delays to bus services. Traffic congestion on Sheppard Avenue can become severe at times when there is a problem, for example an accident, on the nearby Highway 401 and motorists divert from the highway onto Sheppard Avenue.

The existing arterial road system in the Study Area is as follows:

<table>
<thead>
<tr>
<th>Arterial</th>
<th>Posted Speed (km/h)</th>
<th>Lanes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Victoria Park Ave</td>
<td>60</td>
<td>3N, 3S + 1 LT</td>
</tr>
<tr>
<td>Warden Ave</td>
<td>60</td>
<td>2N, 2S + 1 LT + 1 RT</td>
</tr>
<tr>
<td>Birchmount Rd</td>
<td>60</td>
<td>2N, 2S + 1 LT</td>
</tr>
<tr>
<td>Kennedy Rd</td>
<td>60</td>
<td>3N, 3S + 1 LT</td>
</tr>
<tr>
<td>Midland Ave</td>
<td>60 (s/s) and 50 (n/s)</td>
<td>2N, 2S + 1 LT</td>
</tr>
<tr>
<td>Brimley Rd</td>
<td>60 (s/s) and 50 (n/s)</td>
<td>2N, 2S + 1 LT + 1 RT</td>
</tr>
<tr>
<td>McCowan Rd</td>
<td>60</td>
<td>2N, 3S + 1 LT + 1 RT</td>
</tr>
<tr>
<td>Markham Rd</td>
<td>60</td>
<td>3N, 3S + 1 LT</td>
</tr>
<tr>
<td>Morningside Ave</td>
<td>60</td>
<td>2N, 2S + 1 LT + 1 RT</td>
</tr>
<tr>
<td>Meadowvale Rd</td>
<td>60</td>
<td>2N, 2S + 1 LT</td>
</tr>
</tbody>
</table>

The designated right-of-way on Sheppard Avenue East is 36 metres wide for most of the study area. West of Pharmacy Avenue, the road has six through lanes and a centre turn lane; East of Pharmacy Avenue, the road currently has four lanes, plus the turn lane. The City-owned right-of-way on Sheppard Avenue is less than the designated 36 metres on a short section of the roadway adjacent to Pharmacy Avenue and in the area roughly between Midland and Brimley.

At the east end of the study area, Sheppard Avenue was improved in 2004 to an urban cross-section with curb and gutter and sidewalks. The pavement was widened to four lanes plus a centre turn lane and bicycle lanes, between Kingston Road and Morningside Avenue.

From Morningside Avenue west to Neilsen Road Sheppard has a rural cross-section with gravel shoulders and four traffic lanes. Sidewalks are provided outside the ditches. Between Neilsen Road and Markham Road, Sheppard has an urban cross-section with four traffic lanes. From Markham Road west to Pharmacy Avenue the four lanes continue but a centre turn lane is added.

3.2 Assessment of Current Traffic Operations

Signalized intersections are the “pinch-points” for traffic flow and, therefore, their operation defines the level of traffic congestion (typically called the “level of service”) on that segment of the roadway.

A summary of the signalized intersection analysis is included in Appendix 2. The analysis shows that the most significantly congested section of Sheppard Avenue in the study area is between Don Mills Road and Brian Drive, where the volume of traffic in at least one of the peak hours (a.m. or p.m.) is equal to the capacity of the intersections to accommodate it. Other intersections where the current volume of traffic is roughly equal to the capacity of the intersection are:

<table>
<thead>
<tr>
<th>Intersections</th>
<th>Peak Hour</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pharmacy</td>
<td>P.M</td>
</tr>
<tr>
<td>Warden</td>
<td>P.M</td>
</tr>
<tr>
<td>Birchmount</td>
<td>A.M. and P.M.</td>
</tr>
<tr>
<td>Kennedy</td>
<td>P.M</td>
</tr>
<tr>
<td>Agincourt GO Station</td>
<td>P.M</td>
</tr>
<tr>
<td>Midland</td>
<td>A.M.</td>
</tr>
<tr>
<td>Markham</td>
<td>A.M. and P.M.</td>
</tr>
<tr>
<td>Neilsen</td>
<td>A.M.</td>
</tr>
<tr>
<td>Morningside</td>
<td>A.M. and P.M.</td>
</tr>
</tbody>
</table>

3.3 Natural Environment

LGL Ltd. prepared a Natural Heritage Report – Existing Conditions for this study. This report documents the results of the natural heritage investigation conducted in the spring and early summer of 2008, as well as potential impacts, impact analysis and a discussion of mitigation measures. Information is based on LGL field reconnaissance visits and secondary data sources. The following sections describe the existing conditions for vegetation and vegetation communities, fisheries and aquatic habitat, wildlife and wildlife habitat, and designated natural areas. For more details, a copy of this report is available in Appendix 3.
In the Sheppard Avenue study area, there are no evaluated wetlands, Areas of Natural and Scientific Interest (ANSIs) or Environmentally Significant Areas (ESAs). Natural vegetation parcels that are present are predominantly classed as cultural, exhibiting site conditions resulting from, or maintained by, cultural or human-based activities. The vegetation units along the Sheppard corridor are represented by: Cultural Meadows (CUM), Cultural Thickets (CUT), Cultural Woodlots (CUW) and Cultural Savannahs (CUS). A number of small, forested areas are also present however they are not within the zone of influence for this project.

Four small tributaries of Highland Creek cross under Sheppard Avenue. Similar to the vegetation communities, the aquatic communities associated with these watercourses are in a disturbed state. Only minimal bridgework will be required at these crossings and further degradation is not expected.

### 3.3.1 Vegetation and Vegetation Communities

The geographical extent, composition, structure and function of vegetation communities were identified through air photo interpretation and field investigations. Air photos were interpreted to determine the limits and characteristics of vegetation communities. A field investigation of natural/semi-natural vegetation was conducted within the study area by LGL Limited from May 23 – 27, 2008.

Vegetation communities were classified according to the Ecological Land Classification for Southern Ontario: First Approximation and Its Application (Lee et al. 1998). The community was sampled using a plotless method for the purpose of determining general composition and structure of the vegetation. Plant species status was reviewed for Ontario (Oldham 1999), Toronto and Region Conservation Authority (TRCA 2003a), City of Toronto (City of Toronto 2003), and the Greater Toronto Area (Varga et al. 2000). Vascular plant nomenclature follows Flora Ontario – Integrated Botanical Information System (FOIBIS), (Newmaster, 2005).

#### Vegetation Communities

The lands adjacent to Sheppard Avenue in the study area have largely been cleared of all original forest cover to accommodate residential, industrial and commercial land uses. This pattern of land use has resulted in the anthropogenic origin of almost all of the vegetation features found within the study limits. The natural cover areas that are present are generally found in isolated pockets adjacent to Sheppard Avenue; along the stream banks of the watercourses that cross Sheppard; or within the right-of-ways associated with linear corridors (CN rail and hydro lines) that cross the roadway. These culturally-influenced vegetation communities are represented by meadows, thickets, savannah, woodlands and small isolated forest parcels.

A total of thirteen ELC communities have been identified by LGL Limited within the study limits. These communities include: mixed forest (FOM4); deciduous forest (FOD2, FOD3-1, FOD4, FOD5-7, FOD5-8, FOD8); cultural meadow (CUM1-1); cultural thicket (CUT1); cultural savannah (CUS1); cultural woodland (CUW1); mixed swamp (SWM1-1); and, shallow marsh (MAS2-1). The above vegetation communities are secure globally and considered widespread and common in Ontario and the TRCA watershed (TRCA 2003b).

#### Flora

To date, a total of one-hundred and seventy-seven (177) vascular plant taxa have been recorded within the study area. Eighty-three taxa, or forty-seven percent (47%) of the recorded flora, are considered introduced and non-native to Ontario. Introduced species were almost entirely located within the existing right-of-way and in cultural communities.

#### Toronto’s Urban Forest

Trees in the City of Toronto bestow numerous benefits on the community and need to be allowed to grow to an age that allows the public to reap the benefits of trees. Often in the past, the benefits associated with trees have not been realized due to their premature death. In the United States and Canada, the average downtown tree only lives for 7-years. One of the primary reasons for this is the high volume of highly compacted soil inherent to modern-day development as found along the Sheppard corridor. The following is a non-exhaustive list of some of the social, ecological, and economic benefits directly associated with a healthy and robust urban forest that has been allowed to mature:

- **Health** – direct links between green-space, trees, and human health
- **Aesthetics** – improved aesthetics with trees and shrubs in the landscape
- **Recreation** – opportunities for hiking, biking, and other passive recreation activities
- **Metaphysical** – inherent metaphysical role of trees in society
- **Education** – opportunities for environmental education
- **Biodiversity** – healthy forests provide niches for a myriad of species and stabilize ecosystems
- **Wildlife** – enhanced habitats and ecosystem health
- **Storm-water Management** – urban trees retain water and delay pulses of storm-water runoff
- **Soil Conservation** – contribute organic matter to the soil and stabilize slopes preventing runoff
- **Microclimate** – shade in the summer and windscreens in the winter
- **Air Quality** – uptake of greenhouse gases (e.g. CO₂) as well as other harmful gases and particulates
- **Noise Pollution** – sonic buffering capabilities
- **Energy Consumption** – lower cooling/heating costs
- **Infrastructure** – unlike infrastructure which loses value with time, trees gain value as they age
- **Retail Districts** – increased willingness to spend in treed retail districts
- **Timber and Commodity Values** – lumber, maple syrup, mushrooms, fruits, flowers, etc.
The revitalization of the Sheppard Avenue corridor with the integration of the LRT provides an opportunity to improve the health of the urban forest in this area. This will be achieved in the development and implementation of a comprehensive tree planting strategy. This strategy will reflect the currently applicable City of Toronto by-laws and urban forestry policies. Efforts will be made to limit the impact on existing trees and mitigate impacts where existing trees are affected. Tree planting design will be a reflection of the higher-level objectives and mandates of Toronto Urban Forestry Services.

Tree By-Laws

The Sheppard corridor is situated in the City of Toronto and is therefore subject to all of the policies, by-laws, and higher level mandates that are inherent with development projects in the City. The following urban-forestry-related by-laws and policies can be specifically applied to the trees along the Sheppard corridor:

- City Street Tree By-law (Article II of Chapter 813)
- Tree Protection Specifications
- Private Tree By-law (Article III of Chapter 813)
- Arborist Report for Development Applications
- Municipal Code Chapter 184-FILLING and GRADING
- Ravine Protection

City of Toronto Urban Forestry Service’s management protocols are based on the ranking of each individual tree. All trees within the Sheppard corridor fall into one of the following five categories:

1) Trees with diameters of 30 cm or more situated on private property on the subject site.
2) Trees with diameters of 30 cm or more situated on private property, within 6 m of the subject site.
3) Trees of all diameters situated on City owned parkland within 6 m of the subject site.
4) Trees of all diameters situated within lands designated under City of Toronto Municipal Code, Chapter 658, Ravine Protection.
5) Trees of all diameters situated within the City road allowance adjacent to the subject site.

3.3.2 Fisheries and Aquatic Habitat

The study area is located within both the Highland Creek and Rouge River watersheds. Four watercourses are located within the study area: three are branches of Highland Creek and one is a tributary of Morningside Creek, itself a tributary of the Rouge River. These watercourses are under the jurisdiction of the Toronto and Region Conservation Authority (TRCA) and the Ministry of Natural Resources (MNR) Aurora District.

As part of this project, aquatic habitat investigations were conducted by LGL on July 8, 2008. The aquatic habitat investigation completed by LGL was done to document fish habitat conditions at watercourse road crossings within the study area.

In addition, a secondary source information review was undertaken to identify the fisheries resources and associated aquatic habitat within the study area. The secondary source review included correspondence with the TRCA regarding fish collection records in the study area.

Bendale Branch of Highland Creek

The Bendale Branch of Highland Creek flows in a southeasterly direction across Sheppard Avenue approximately 165 m east of Kennedy Road. The watercourse has been completely channelized with concrete both upstream and downstream of the crossing. It travels under Sheppard Avenue through a concrete bridge. The channel upstream is contained within vertical concrete walls and there is no floodplain present. Water flows as a thin sheet over bare concrete for 100 m upstream of the bridge. Small patches of gravel and sand have created small meanders of the channel through the area. Water depth is shallow (10 cm) throughout and morphology is mainly flats with small riffles over gravel deposits. No instream cover exists upstream of the bridge within approximately 95 m.

Bank vegetation is nearly absent except for a few small shrubs and herbs that overhang the walls.

Downstream (south) of Sheppard Avenue, the creek is contained within a trapezoidal concrete channel. The bottom of the channel is concrete and is 10 m wide with 4.5 m concrete “banks” proceeding up the slopes. Above the concrete, vegetated areas are dominated by grasses with some small trees. Sand/gravel deposits were more common downstream than upstream. In many places, grasses and small shrubs were growing from the cracks in the concrete or on the sand/gravel deposits. These areas provided some meanders to the otherwise straight channel and riffles and runs over sediment deposits and flats over bare concrete. Channel width varied from approximately 8.0 m downstream where sediment deposits occurred to the maximum width of 10.0 m over bare concrete. Depth was consistent at 10 cm. Bankfull width is approximately 14 m and bankfull depth is 2.0 m. Water temperature during the field investigation was 22.0°C at 10:00 when air temperature was 27°C. No barriers to fish pass were observed, other than the shallow sheet flow over bare concrete, were found within the area investigated.

No formal fish collection was undertaken at this location during the July 8, 2008 site visit and no fish were observed. Historic fisheries data provided by the TRCA indicate that seven species have been captured from this watercourse at five stations located upstream. These include warmwater baitfish and sportfish and coldwater sportfish.

Markham Branch of Highland Creek

The Markham Branch of Highland Creek flows in a southeasterly direction across Sheppard Avenue approximately 265 m east of the McCowan Road intersection. The watercourse has been completely channelized with concrete both upstream and downstream of the crossing. It travels
under Sheppard Avenue through a concrete bridge. Both the upstream and downstream channel was contained within a concrete trapezoidal channel. Water flowed in the centre of the channel through a small low-flow depression within the concrete. Upstream, no sediment deposits were observed and the channel consists of one long flat, approximately 3 m wide and 5-10 cm deep. No instream cover existed upstream of the bridge within the entire area investigated (>100 m). Bank vegetation consisted of grasses and scattered shrubs and small trees along the slopes leading up from the channel. No instream cover exists and the channel is completely exposed to the sun. Water temperature was measured at 28.9°C at 11:06 when air temperature was 27°C. A 1 m drop exists approximately 10 m upstream of the bridge, which is a barrier to fish passage.

Downstream (south) of Sheppard Avenue, the channel characteristics are similar to upstream. Channel width, depth and riparian characteristics are all similar. However, there were a few areas of sediment deposits noted. Bankfull width was approximately 14 m and bankfull depth was 1.5 m. Iron staining was noted in the entire area downstream of the 1 m drop mentioned above to approximately 30 m downstream of the bridge (total length exhibiting these characteristics was 75 m, including the area under the bridge). These appeared to be seeps and/or springs emanating from cracks or holes in the concrete channel. At one such hole just downstream of the 1 m drop, water temperature was measured at 11.5°C at 11:03 when air temperature was 27°C. Water temperature downstream of the bridge was measured at 18.5°C in the main channel at 11:00 when air temperature was 27°C. Thus, the groundwater inputs to the watercourse lowered the temperature by more than 10°C within approximately 50 m.

No formal fish collection was undertaken at this location during the July 8, 2008 site visit and no fish were observed. Historic fisheries data provided by the TRCA indicate that three species have been captured from this watercourse at one station located at the Sheppard Avenue crossing. These include warmwater baitfish only.

**Malvern Branch of Highland Creek**

The Malvern Branch of Highland Creek flows in a southeasterly direction across Sheppard Avenue approximately 780 m east of Markham Road. The watercourse has been completely channelized with gabions both upstream and downstream of the crossing. It travels under Sheppard Avenue through a concrete bridge. The upstream channel is contained within a trapezoidal channel formed by gabions. Substrates are cobble and boulder (rip-rap from gabions) with some silt and detritus overlaying. Much of the chainlink holding the gabions together appears to have degraded and much of it was not visible. The channel upstream consists of one long run which is approximately 7 m wide and 15-20 cm deep. The channel widens to approximately 10 m as it approaches the bridge. An outfall pipe exists on the northwest bank that discharges down a steep concrete ramp into the watercourse. A large pool has been scoured out at this location which appeared to be greater than 1 m deep. Instream cover consisted of boulders/cobbles and sparse submerged vegetation. Bank vegetation consisted of grasses and shrubs, in places dense and overhanging, which were growing along the slopes leading up from the channel. This vegetation appeared to be growing over gabions that have been silted over. These overhanging shrubs provided some shading to the watercourse.

**Malvern Branch of Highland Creek**

Downstream (south) of Sheppard Avenue, the channel bends to the southeast along a steep slope enforced by layered gabions. The gradient was steeper downstream and riffles were present. Substrates were similar to upstream and the channel was reinforced with gabions throughout. The riffles were approximately 6-7 m wide and less than 10 cm deep. A shallow run was present just downstream of the bridge. The stream is a riffle and was approximately 12 m wide and 20 cm deep. It contained some sparse submerged vegetation. Downstream of the riffle a small, deep pool existed (3 m wide by 150 cm deep) along the gabion wall. Erosion was occurring at this location. Instream cover was provided by boulders/cobbles, overhanging bank vegetation and some large woody debris. Dense shrubs lined the banks up to the base of the gabions. Above the gabions, large trees provided additional shading to the channel. Bankfull width was approximately 15 m and bankfull depth was 2.0 m. An area of groundwater upwelling was noted downstream of the crossing. Iron staining was noted and springs were observed coming up through the sandy substrates in a few areas. At one spring, water temperature was measured at 11.8°C at 11:51 when air temperature was 29°C. Water temperature downstream of the bridge at the riffle was measured at 18.5°C around the same time. Water temperature was also measured approximately 50 m upstream of the bridge and was 19.7°C at 12:19 when air temperature was 29°C.

No formal fish collection was undertaken at this location during the July 8, 2008 site visit and no fish were observed. Historic fisheries data provided by the TRCA indicate that four species have been captured from this watercourse at two stations located at and downstream of the Sheppard Avenue crossing. These include warmwater baitfish only.

**Tributary of Morningside Creek**

The Tributary of Morningside Creek flows in a northeasterly direction across Sheppard Avenue approximately 600 m east of Morningside Drive. This watercourse has been channelized and consisted of a shallow ditch in which either cattails (Typha sp), Phragmites or both were densely growing. No defined channel existed within the dense vegetation growth on either side of Sheppard Avenue. The watercourse travels in a northerly direction to Sheppard Avenue, then crosses at a northeasterly skew. On the north side of Sheppard Avenue, it bends to the northeast and parallels the road, travels under a driveway through a culvert, bends again to the north and travels to Morningside Creek located approximately 620 m north of the road. Water was present, but was not flowing. The mean wetted width was approximately 2 m with a mean depth of 10 cm. Substrate was entirely silt. Some submerged vegetation was present within the wingwalls on the upstream end of the culvert under Sheppard Avenue. Instream cover was provided entirely by vegetation growing within the wetted width of the channel. Water temperature was measured at 18.8°C at 13:00 when air temperature was 29°C at the upstream end of the Sheppard Avenue culvert. It was also measured at the upstream end of the driveway culvert on the north side of Sheppard Avenue and was 17.7°C at 12.45 when air temperature was 29°C.

No formal fish collection was undertaken at this location during the July 8, 2008 site visit and no fish were observed. Historic fisheries data available from the TRCA from this watercourse and it is not known whether this watercourse provides direct fish habitat or not.
### 3.3.3 Wildlife and Wildlife Habitat

Field investigations were conducted along Sheppard Avenue from Highway 404 to Meadowvale Road on June 19, 2008 to document wildlife and wildlife habitat and to characterize the nature, extent and significance of animal usage within the project limits. Direct observations, calls, tracks, scats, runways and scents were used to record the wildlife. The locations of wildlife corridors were recorded to determine areas of concern.

**Wildlife Habitat**

The existing land use along Sheppard Avenue is primarily industrial, commercial and residential. As a result, natural heritage features and available wildlife habitat is minimal. The wildlife habitat that is present is provided by isolated patches of cultural meadows, thickets and woodlots. Riparian, woody habitat is found on the downstream reach of the Malvern Branch tributary below Sheppard Avenue. In the eastern portion of the study area between Morningside Avenue and Meadowvale Road, there are some larger cultural meadow areas associated with the 230 kV transmission line and undeveloped land.

Without exception, all of the available wildlife habitat that is adjacent to Sheppard Avenue can best be characterized as being of poor quality, low structural diversity and low habitat diversity.

**Fauna**

In spite of the poor quality of habitat that is available along Sheppard Avenue, a reasonable diversity of bird species was observed. A total of 36 species are listed as occurring in the study area. The section of Sheppard Avenue where most of the observations were made was between Neilson and Meadowvale Roads. In this specific area, eight different ecosites provide small parcels of different habitat types which accounts for the reasonable bird diversity that was observed.

With the exception of four species; Red-shouldered Hawk (*Buteo lineatus*), Red-eyed Vireo (*Vireo olivaceus*), Rose-breasted Grosbeak (*Pheucticus ludovicianus*) and Indigo Bunting (*Passerina cyanea*), the birds that were seen are typical of an urban environment as they are tolerant of human disturbance.

Ten of the 15 mammal species that are listed as occurring in the study area were observed by LGL biologists during field investigations. Not enough evidence was found along Sheppard Avenue to indicate the presence of regular corridor usage north-south across Sheppard. Deer sign was seen along the hydro corridor on both sides of Sheppard Avenue, but similar to the rest of Sheppard, regular usage was not evident. A summary of wildlife documented for the study area is presented in Table 3 of the Natural Heritage Report.

### 3.3.4 Designated Natural Areas

Designated natural areas include areas identified for protection by the MNR, TRCA and upper and lower tier municipalities. There are no Provincially Significant Wetlands (PSWs), Areas of Natural and Scientific Interest (ANSIs) or Environmentally Significant/Sensitive Areas (ESAs) located in the study area.

The City of Toronto Official Plan identifies three tributaries of Highland Creek; the Bendale Branch, the Markham Branch and the Malvern Branch as a “Natural Heritage Areas” in the Land Use Schedules. The Bendale Branch is also designated as a “Special Policy Area”.

### 3.4 Existing Socio-Economic and Cultural Environments

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

#### 3.4.1 Community / Recreational / Institutional Facilities

The study area is well served by elementary schools (total of 20 within close proximity to Sheppard Avenue). In contrast, there are only two secondary schools located within the same area.

There are four community recreation centres including the Chinese Cultural Centre at Markham Road and Sheppard Avenue East. There are two public libraries within the study area that are located west of Kennedy Road and the third one located in the Community Centre at Progress and Sheppard. Also, there are several senior homes near Agincourt Mall area.

#### 3.4.2 Observed Existing Conditions

Figure 3-2 presents the land use and planning influences within the Study Area. The current land use structure within the Study Area consists mainly of low density and apartment neighbourhoods, mixed-use areas, and employment lands. There is a large concentration of mixed-use areas at Don Mills Road, from Birchmount to McCowan, and approaching Meadowvale Road. Key features include:

- Fairview Mall is a large employment area and local attraction, which is bounded by Sheppard Avenue, Don Mills Road, and Highway 404, and is connected to Don Mills Subway Station.
- Agincourt Mall is another large employment area, containing over 60 shops and services, located on the northwest corner of Kennedy Road and Sheppard Avenue.
- The Yorkland Road / Consumers Road Business Park, a stable industrial / employment area, which is bounded by Sheppard Avenue to the north and (deleted words that a reader doesn't know about yet)
- The Toronto Zoo and the Rouge Park are both located at the end of the study area, just outside of the corridor.
- There are four parks that front directly onto Sheppard Avenue East between Don Mills Road and Morningside Avenue. Three of the parks are located east of Markham Road. In addition, there are a number of open spaces associated with the creeks and hydro utility corridors that
intersect Sheppard Avenue. There are very few open spaces with frontage onto Sheppard Avenue within the study area boundaries.

From the demographic analysis undertaken for this Sheppard Corridor Study Phase 1, there are approximately 56,000 residents and 35,000 jobs along the Sheppard corridor between Don Mills Rd. and McCowan Rd. There are approximately 30,000 motorists using Sheppard Avenue East along this segment per day in both directions.

65% of the population along this segment of the Sheppard Avenue Corridor are immigrants, compared to 50% for the entire City of Toronto. Half of the number is recent immigrants (defined as arriving between 1991 and 2001). Chinese and Cantonese are the most popular languages other than English, followed by Tamil and Farsi. There are slightly more large households in the area than the city average.

- There is an above average percentage of residents residing in large apartment buildings and townhouses along this segment of Sheppard Avenue East. Low-rises and semi-detached houses are below the city average, showing a higher-density along the corridor. Most buildings (45%) were built in the 1970’s, followed by approximately 30% in the 1960’s. There is an almost even split between rented and owned dwellings.

### 3.4.3 Archaeology

A Stage 1 Archaeological Assessment was prepared by URS Canada Inc. to present the results of the Stage 1 background research and field review, and includes recommendations for further assessment within the study area. For further details and figures, a copy of this report is available in Appendix 4.

According to the OASD there are 15 previously registered sites located adjacent to the study area in a two-kilometre radius (Table 3-4); however, there are no archaeology sites registered within the boundaries of the study area.

<table>
<thead>
<tr>
<th>Site Name</th>
<th>Cultural Affiliation</th>
<th>Site Type</th>
<th>Researcher</th>
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<tr>
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<td>Historic, Euro-Canadian Mill</td>
<td>Mayer Pihl</td>
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<td>AkGs-35 Stone Manor</td>
<td>Pre-Contact</td>
<td>ASI, 2005</td>
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<td>AkGr-12 Wallace</td>
<td>Pre-Contact</td>
<td>Victor Konrad, 1971</td>
<td></td>
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<td>AkGr-13 Brimley</td>
<td>Archaic, Laurentian</td>
<td>Victor Konrad, 1960</td>
<td></td>
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<td>AkGr-14 Brooks</td>
<td>Pre-Contact</td>
<td>Victor Konrad, 1971</td>
<td></td>
</tr>
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<td>AkGr-18 Little’s Road</td>
<td>Pre-Contact</td>
<td>William A. Ross, 1973</td>
<td></td>
</tr>
<tr>
<td>AkGr-19 Malvern</td>
<td>Pre-Contact</td>
<td>William A. Ross, 1973</td>
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<td>AkGr-2 Elliot</td>
<td>Woodland, Iroquoian, Uren</td>
<td>Victor Konrad, 1972</td>
<td></td>
</tr>
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<td>AkGr-3 Sterling</td>
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<td>Historic, Euro-Canadian Mill</td>
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<td>Pre-Contact</td>
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<td>AkGr-60 199 C, Mid-Late</td>
<td>Homestead</td>
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<td>AkGr-8 Tam O’Shanter</td>
<td>Historic, Mississauga</td>
<td>Victor Konrad, 1972 and David Boyle, 1996</td>
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<td>Historic, Mississauga</td>
<td>Victor Konrad, 1972</td>
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<tr>
<td>AkGu-64 Zion Primitive Methodist Church</td>
<td>Historic, Euro-Canadian and Late Woodland</td>
<td>ASI, 1997</td>
<td></td>
</tr>
</tbody>
</table>

**Table 3-4: Registered Sites Within Two Kilometres of the Study Area**

![Figure 3-2: Land Use and Planning Influences within the Study Area](image-url)
The field assessment was conducted from west to east along Sheppard Avenue East, beginning at Don Mills Road. The proposed construction along Sheppard Avenue East is to only impact lands within 15 metres from the centre of the existing Sheppard Avenue East ROW. Between Don Mills Road and Brownspring Road the study area has been heavily disturbed by industrial, commercial, residential development and typical road construction, exhibiting ditching, grading and landscaping. The West Highland Creek, intersects the property between Kennedy Road and Midland Avenue, has been channelized and the banks have been disturbed. Due to the extent of previous disturbance, the study area between Don Mills Road and Brownspring Road does not exhibit archaeological potential.

On the north side of Sheppard Avenue East at the intersection of Brownspring Road there is an open area with new growth trees. The current fence and enclosed area may indicate a previous excavation. The mellow, stone-free soils and the diminished frost hazard near Lake Ontario were contributing factors to choice of settlement prior to the 1930’s (Chapman and Putnam 1984).

Several major drainages, including the Rouge, Humber and Don Rivers, cut across the plains, draining southward into Lake Ontario (Hoffman and Richards 1955: 23). The West Highland River, East Highland Creek, and a seasonal tributary of the Rouge River connect with the study area although all have now been physically altered for urbanization in the proposed corridor (Figure 5 of Stage 1 Archaeological Assessment report – Appendix 4). The east branch of the Don River flows less than two kilometres west of the study area. The Rouge River flows just north of the eastern portion of the study area.

Potable water is the single most important resource necessary for any extended human occupation or settlement. Therefore, due to the proximity of the watercourses, specifically the west Highland River and east Highland Creek with the other attached tributary that intersects the study area between Don Mills Road and Meadowvale Road it may be concluded that there is potential for the recovery of pre-contact archaeological remains and early settlement material within the study area depending on the degree of previous land disturbance.

Field Review

A field review was conducted on July 9, 2008 in order to confirm archaeological site potential and to determine the degree to which development and landscape alteration have affected that potential. Weather conditions during the recent field review were warm and sunny.
Between Progress Avenue and Brenyon Way there are no open or forested areas and the study area has been heavily disturbed by primarily residential development and previous Sheppard Avenue East development. Due to the extent of previous disturbance, the study area between Progress Avenue and Brenyon Way does not exhibit archaeological potential.

Between Brenyon Way and Morningside Avenue on the north side of Sheppard Avenue East there is an open area with single standing trees surrounded by a woodlot. It appears the forest surrounds the park area. The previous Sheppard Avenue road construction does not appear to be as extensive in this segment. This area should be subjected to a Stage 2 Assessment in order to determine the degree of disturbance if the Sheppard LRT construction extends beyond the disturbed Sheppard Avenue East ROW.

Between Morningside Avenue and Conlins Road the area has been disturbed primarily by industrial development and previous Sheppard Avenue East development. Due to the extent of previous disturbance, the study area between Morningside Avenue and Conlins Road does not exhibit archaeological potential.

The southwest corner and northwest corner of the intersection at Conlins Road and Sheppard Avenue East there are open areas. The southwest open area has tall grasses and is low-lying compared to the elevation of Sheppard Avenue East. The northwest side of the road may have retained some natural integrity. This open area has long grasses, disperse shrubbery and a gently rolling terrain. A seasonal creek of the Rouge River intersects this area. Both of these grassed lots should be subjected to a Stage 2 Assessment in order to determine the degree of disturbance if the Sheppard LRT construction extends beyond the disturbed Sheppard Avenue East ROW.

The segment between Conlins Road and Dean Park Road contains open property to the south of Sheppard Avenue East. The area is low-lying in sections and appears to be prone to seasonal flooding depicted by the flora present. The property has open areas with long grasses coupled with new growth trees. This area should be subjected to a Stage 2 Assessment in order to determine the degree of disturbance if the Sheppard LRT construction extends beyond the disturbed Sheppard Avenue East ROW.

The study area between Dean Park Road and Meadowvale Road has been disturbed by hydro, residential development and previous Sheppard Avenue East road construction. Due to the extent of previous disturbance, the study area between Dean Park Road and Meadowvale Road does not exhibit archaeological potential.

The northeast corner of Meadowvale Road and Sheppard Avenue East is a vacant property. It is directly south of the Rouge River and Park. The elevation of the lot appears to be level with Sheppard Avenue East. There are new growth trees and open grassed area. This area should be subjected to a Stage 2 Assessment in order to determine the degree of disturbance if the Sheppard LRT construction extends beyond the disturbed Sheppard Avenue East ROW.

Sheppard Avenue East follows the route of an early historic road. Much of the study area has been heavily disturbed by industrial, commercial and residential development and typical road construction, exhibiting ditching, grading and landscaping. Of particular interest is the Knox United Church located at Midland Avenue and Sheppard Avenue East. This property is a designated Ontario Heritage Property. The associated cemetery is located at the intersection where it has been documented that early settlers have been buried in that location. The grave shaft markers are close to the ROW limit and fall within the study area. Mitigative measures will be required to identify any unmarked graves if the Sheppard LRT construction were to extend beyond the previously disturbed Sheppard Avenue East ROW.

### 3.4.4 Built Heritage and Cultural Landscapes

A Built Heritage and Cultural Landscape Assessment was prepared by URS Canada Inc. to document the results of the Built Heritage and Cultural Landscape inventory for the entire study corridor and the impact assessment of proposed activities on above-ground cultural heritage resources over 40 years old. For more details, a copy of this report is available in Appendix 4.

A field assessment was conducted on May 30th, 2008. The Sheppard Avenue East study area is a multi-lane roadway with provisions for turning from the centre lane. The surrounding landscape is largely redeveloped consisting of industrial and commercial parks and residential subdivisions. The road has been substantially widened over the years to accommodate large volumes of traffic. The current road allowance passes close to the Knox United Church and Cemetery (formally Knox Presbyterian Church), which was constructed in 1848.

The Sheppard Avenue East roadway and adjacent lands have been substantially altered and maintain limited heritage character with the exception of the identified heritage properties (Table 3-5). The study area encompasses existing waterscapes, all of which have been channelized or supported with an embankment to accommodate the expansion of Sheppard Avenue East over time. Although the watercourses are present on historic maps, it is clear that the original course of these waterscapes have been altered. There are two railscapes within the study area operating historically and presently.

#### Table 3-5: Cultural Heritage Features Located within the Sheppard Avenue East Study Corridor

<table>
<thead>
<tr>
<th>Feature Reference for Appendix A</th>
<th>Address</th>
<th>Feature Type</th>
<th>Date of Construction</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>BHF 1</td>
<td>2569 Midland Avenue</td>
<td>Church</td>
<td>1872</td>
<td>Listed with the City of Toronto</td>
</tr>
<tr>
<td>CLU 1</td>
<td>2369 Midland Avenue</td>
<td>Cemetery</td>
<td>Pre-1900</td>
<td>Falls under the designation of BHF 1</td>
</tr>
<tr>
<td>BHF 2</td>
<td>4156 Sheppard Avenue East</td>
<td>Church</td>
<td>1925</td>
<td></td>
</tr>
</tbody>
</table>
Historic research reveals that the study corridor has origins in 19th century survey and settlement but that most of it has been greatly altered by late-20th century development. Nevertheless it is anticipated that a small number of cultural heritage resources would still remain adjacent to these routes and five built heritage features and one cultural landscape unit were identified, including two houses (BHF 3 and 5), three churches (BHF 1, 2 and 4) and a cemetery (CLU 1).

Contact with the City of Toronto reveals that the built heritage feature was part of the city’s Inventory of Heritage Properties. The Knox United Church was designated as a heritage property in 1979 under Part IV of the Ontario Heritage Act.

The remainder of the Sheppard Avenue East multi-lane roadway and adjacent lands have been substantially altered and, as a whole, retain minimal heritage character with the exception of the identified heritage properties.

### 3.4.5 Utilities / Pipelines

Two utility corridors, with a rail crossing between Midland Avenue and Brimley Road, and a hydro corridor crossing from Dean Park Road to Meadowvale Road.

### 4.0 Future Growth

#### 4.1 Designated Growth Areas – the Avenues Plan

Toronto’s Official Plan focuses on city-building and future growth will be directed towards designated areas for such growth within the Sheppard East (corridor) area, including a number of Employment Districts, the nearby Scarborough Centre, and the Avenue on the section of Sheppard Avenue East, west of McCowan Road identified as an Avenue. The City wants to ensure that any improved transit in this corridor supports its objectives for making the street more lively, more attractive, and more pedestrian-oriented. Improvements to the streetscape will support Toronto’s Climate Change and Clean and Beautiful City initiatives to make all of Toronto a more liveable and pleasant place to live and work.

Growth areas rely on an efficient transportation network to support the growing travel needs of residents and workers. The Official Plan identifies both Higher Order Transit Corridors and Surface transit Priority Networks that are potential areas for future investment and expansion of the transit system, including subways and LRT. These areas have the potential for reduced car dependency due to high population and employment densities — two factors that increase the viability of transit use.

The Scarborough Centre is an important area under the Official Plan, and Sheppard LRT study in particular. This area can be reached through ramps on McCowan Road, Progress Avenue, and Brimley Road. These roads have direct connections to Sheppard Avenue East and will thus be a point of convenience for Transit/LRT travelers. Furthermore, it is also a point of connection to TTC’s Scarborough RT line. Due to its clear and well-established significance, Scarborough Centre area is included in the Sheppard LRT EA study area.

The mixed-use areas within Avenues will perform a ‘Main Street’ function and become meeting places for local neighbours and the wider community. By promoting alternative forms of travel, these areas become vibrant communities centred on the people and uses instead of automobiles.

By directing growth to areas such as Avenues, the Official Plan provides greater certainty for land owners, businesses, and residents about what type of growth can be anticipated, and where growth will occur.

#### 4.2 Agincourt Secondary Plan Area

The Agincourt Secondary Plan Area focuses on lands in proximity to the Sheppard/Kennedy intersection and includes the Agincourt Mall lands and the lands historically identified as the South Agincourt Employment District which extends south to Highway 401.

The Agincourt Mall lands are planned to redevelop, over time, from a suburban shopping centre to a more intense, mixed use urban form. Recent development approvals, when built, will contribute to the gradual evolution of these lands as intended.
The current Secondary Plan Area boundaries and policies are influenced, in large part, by the planned extension of the Sheppard subway. Two future station locations and the preferred alignment for the subway are identified and protected in the Official Plan and the approved Sheppard Subway Environmental Assessment.

Existing Secondary Plan policies call for the review of the plan once the Sheppard Subway reaches Don Mills. Review of the plan commenced a number of years ago as required and preliminary transportation related findings of this review, together with the submission of significant development applications in the Corridor, became the catalyst for the commencement of the Sheppard Corridor Study (as discussed below).

Recent development applications confirm that the Agincourt Secondary Plan Area will capture a significant portion of the anticipated growth within the Sheppard Corridor.

For example, new mixed use, predominately residential development, has been approved on the former Toronto Sufferance Truck terminal lands. This approximately 6.8 hectare site will be redeveloped with 2,100, mainly high density, residential units along with eventual office development as part of Tridel’s Metrogate Community. This approval poses implications for adjacent lands, mainly to the north, and triggers the need to re-evaluate the planned vision for the immediate area.

Although the Agincourt Secondary Plan Area is still intended to be served by rapid transit in the long term, the recent shift in focus from a subway extension to a light rail transit facility on Sheppard Avenue warrants the need for a comprehensive review of existing plan policies. This review will be resumed once the transportation vision for the area has been confirmed.

### 4.3 Sheppard Corridor Study:

The Sheppard Corridor Study, which commenced in 2003, identified opportunities for development and transportation-related improvements within the Study Area which focused on the 7.5 km stretch of Sheppard Avenue East from Don Mills station to McCowan Road. This stretch was chosen as it generally corresponds with the Avenues overlay in the Official Plan.

Phase 1 of the study produced a Profile report which provided a comprehensive overview of the entire Study Area. The profile provided a detailed examination of existing land use, demographics and housing, economic conditions, and transportation and community services and facilities. Data and information for the profile came from a number of sources including, but not limited to, Census and Employment Survey data, the TTC, field analysis and traffic reports.

In terms of the transportation network, the profile work indicated that the Sheppard Subway provides a high degree of accessibility to the west end of the Corridor and enhanced bus service has been introduced throughout the Corridor to coincide with the subway opening. Transit ridership in the Corridor has increased since the subway opened. Maintaining the existing transportation network and improving connections to create a safer and more accessible transportation and road network is required in order to meet the needs of the existing and future Corridor residents and workers.

As part of Phase 2 of the study, opportunities for redevelopment were identified and modelling was initiated in order prepare population and employment estimates for the Corridor. Work on finalizing these estimates was proceeding and would have been used to determine recommendations for transit improvements on Sheppard Avenue and transportation related improvements within the Study Area.

The study approach was re-assessed when the TTC approved the Transit City Plan in 2007 and with the start of the Sheppard East LRT Environmental Assessment Study it was determined that efforts to determine future growth opportunities and implications would be better utilized as part of the Environmental Assessment process already underway. Priorities for future study areas within the Corridor, including the resumption of the Agincourt Secondary Plan review, were identified and may commence once related EA outcomes are available.

### 4.4 Active Development Applications

The Active Planning Applications table Appendix 5 offers a list of Active Development Applications within the study area.

### 4.5 Future Population and Employment

Figure 4-1 illustrates the population and employment increases projected for the areas in the Sheppard Avenue corridor.
Figure 4-1: Population, Employment and Future Transit Demand
5.0 Future Transit Demands

As part of Phase 1 of an EA, the constraints and opportunities to be addressed are identified. The principal problem that is being addressed in this EA study is that transit on Sheppard Avenue needs to be faster, and more reliable, relative to the private automobile so that more people will choose to take transit instead of their cars.

As transit speeds increase, a greater percentage of people use it, the appropriate transit solution must accommodate future transit demands.

It is anticipated that there will be considerable growth in the Sheppard corridor in the future, as lands re-develop. Based on the growth in population and employment projected for this corridor (as shown in Figure 4-2), and the information on travel patterns in this area collected in extensive City-wide travel surveys. City and TTC staff conducted a comprehensive modelling exercise to identify the increase in transit demand in this corridor with the increased developments expected in the future. Staff use transportation models to i) generate trips based on future population and employment, ii) determine the various origins and destinations of these future trips, based on extensive survey information of existing travel behaviour, iii) determine how many of these future trips will be taken on transit, and then, iv) assign these transit trips to the most likely transit route. Two alternatives were evaluated for comparison:

1) LRT or BRT – Using speeds reflective of Light Rail Transit (LRT) or Bus Rapid Transit (BRT) operating on Sheppard Avenue in reserved lanes, the modeling projected that the peak point peak direction ridership would be 3,000 persons per hour.

2) Subway – if a subway were constructed, the faster speeds would attract more transit riders to this service – some new riders and some existing riders who would switch from other, parallel routes. The modeling projected that the peak point demand would increase to 5,000 if a subway were constructed.

6.0 Urban Design

It is essential to ensure that any transportation-related modifications on Sheppard Avenue are integrated in a way that supports the broader urban design objectives for the corridor. The City’s urban design principles and objectives are summarized below to assist the staff in understanding the types of “future conditions” envisaged on Sheppard Avenue.

Beautiful, comfortable, safe and accessible streets, parks and public buildings are key shared asset of our civic life enhancing our economy, our social equity and quality of life. The transportation modifications would present an opportunity to support the City’s objectives to transform Sheppard Avenue East into an identifiable ‘great street’ appreciated by all who live, work and visit the area. A great street is defined as much by the quality and character of its edges and the buildings and landscaped open space that frame it, as by the design features of the street itself. Ensuring that all these defining elements come together in the right way so as to enhance the area’s image, generate investments, and encourage walking, cycling and transit use. Great streets come in many shapes and forms, but attributes they commonly share include:

- Distinguishing design or architectural characteristics;
- High quality streetscapes;
- Interesting and comfortable pedestrian environments; and,
- Appropriate land uses that frame and animate the street.

Detailed urban design including layout and selection of streetscaping elements and public art, are not subject to this EA approval, but will be developed as part of the detailed design stage. In the same way, changes to buildings and open spaces along the edges of Sheppard Avenue East will go through separate planning process. However, a clear understanding of the City’s urban design objectives for the street is essential, as part of this EA study, to ensure that transportation-related modifications to the street are designed in a manner that allows for integration of future design and planning work in a way that supports the broader urban design objectives in the Sheppard Avenue corridor.

Urban Design is the process of shaping changes to the total physical setting to enhance the liveability of the city and respect and enhance the existing character where appropriate. It is the art of making real places. It coordinates the design and configuration of streetscapes with parks and opens spaces, buildings, groups of buildings, to create great streets, vital and interesting neighbourhoods as part of the larger city. Urban Design deals with how a person’s experiences places and therefore requires one to think not only in ‘plan’ but also in three dimensions. This perspective is necessary to understand how it will feel to stand at a bus stop or transit platforms and walk on the sidewalks.
The Planning Partnership has developed plans in accordance with the Public Realm/Urban Design Objectives and Framework identified earlier in this report (Section 2.1). This framework has been used as part of the EA process and is intended to be used through the design development of the EA, in the development of a public art plan (examples of public art applied elsewhere are shown in Figure 6-1), as well as in further planning work that will where appropriate facilitate changes in development along the street edge.

**Figure 6-1: Examples of Public Art**

**Urban Design Framework**

The Urban Design Framework is consistent with the objectives for transforming Sheppard Avenue East into a ‘great street’.  

- **Protected Neighbourhoods and Employment Areas** – Consistent with Toronto’s Official Plan, existing stable Neighbourhoods and Employment Areas will be maintained. Furthermore, changes to the Sheppard Avenue East streetscape and new developments within Mixed-Use or Apartment Neighbourhoods should provide the appropriate transitions and/or buffers to the adjacent low-rise residential areas.

- **Distinct Identity Areas** – Building on existing and potential desirable characteristics along the corridor, ten potential Distinct Identity Areas have been indentified along Sheppard Avenue East. These areas consolidate current or potential commonly shared attributes to reinforce a unique identity through design treatments of the streetscape and/or built form and land use character.

- **Vibrant Urban Places** – Dependent on the level of accessibility, size, potential scale and adjacencies, significant mixed-use areas are categorized into a hierarchy of potential ‘Nodes’. This hierarchy corresponds to the appropriate intensity of uses and densities to enable the critical mass necessary for their local or broader community and commercial function (see Figure 6-2). They include:
  - **City Node** – locations with the greatest potential scale and intensity of uses and a destination for people from other parts of the city.
  - **Community Node** – locations with a significant role and function to the entire corridor, but with levels of intensity and scale that will vary according to each location.

- **Splendid Streetscapes and Public Spaces** – Fundamental to cultivating a transit-oriented Sheppard Avenue East, revitalization of the corridor and to reinforcing the other elements of the Urban Design Framework, is the improvement and expansion of the public realm. The public realm elements are:
  - **Urban Streetscape Character** – segments of the street that currently anticipate an intensity of fronting uses, where a more urban streetscape treatment including broad sidewalks, street trees and street furniture appropriate to a vibrant mixed use character should be considered.
  - **Landscaped Streetscape Character** – segments of the streets that are currently fronted by either landscaped open spaces, institutional uses with landscaped settings, or the rear orientation of low-rise residential lots, where a more landscaped treatment is appropriate.
  - **Pedestrian Priority Intersection** – key street or open space intersections with Sheppard Avenue East where significant current or potential pedestrian traffic have been identified. These are locations where adequate boulevard and potential setback space and exceptional design treatments should be considered to ensure their identity, as well as comfort, safety and convenience.
  - **Potential Public Space / Square** – potential green and/or paved focus areas and gathering places have been identified that can be considered in concert with redevelopment within certain Nodes currently deficient in public open spaces.
  - **Civic Gateway** – key visual or physical access points to the corridor have been identified where public art, signage and or enhanced landscaping should visually identify the entry/exit from the corridor area. These include bridges and overpasses as gateway opportunities.
  - **Comprehensive Gateway** – key visual or physical access points to the corridor that also correspond to potential development sites where public art, signage and landscaping should work in concert with built form massing and architecture to visually identify the corridor and/or a Distinct Identity Area.
Figure 6-2: Vibrant Urban Places
C. SELECTING THE PREFERRED SOLUTION AND DESIGN

This section summarizes the major milestones in Phases 2 and 3 of the Class EA study process:

- Phase 2 – identify and assess alternate solutions to the study problem and opportunities; recommend a preferred solution
- Phase 3 – identify and assess alternate designs for the preferred solution and develop a preferred design

7.0 Selecting the Preferred Transit Solution

As indicated in Section 1.1, the main problem being addressed in this EA study is that the existing 85 SHEPPARD EAST bus route operates in mixed traffic and does not offer enough incentive, from a travel time and reliability perspective, to be a sufficiently attractive alternative to the private automobile. In resolving this problem, there are opportunities to address other important City objectives in this corridor.

Therefore, the primary objective of this EA study is to find the best way of significantly improving the speed and reliability of the existing transit service on Sheppard Avenue East, between Don Mills Subway Station and Meadowvale Road, in a manner which:

1) Makes transit a much more attractive travel option relative to the private auto so that more people will choose to use transit instead of their cars
2) Is affordable;
3) Supports the City's growth objectives of a better variety and density of transit-oriented developments, particularly on that section west of McCowan Road which is designated in the Official Plan as an 'Avenue'; and
4) Gives appropriate consideration of other important City objectives such as good urban design, and an improved walking and cycling environment.

In addition, the recommended design must be developed in a manner that respects other road users, adjacent properties, and the natural environment.

7.1 Identifying Alternative Solutions

To attract more people to use public transit, it must be significantly faster, and more reliable when compared to using the private automobile. Hence, the 'Do Nothing' option, buses operating in mixed traffic – represents a continuation of current trends, with no significant infrastructure or operational improvements, and as such does not satisfy the principal objectives of this study. To achieve the study goals, transit must have a much greater degree of 'protection' from the delays associated with mixed traffic operation. Operating experience in Toronto has shown that reserved curb bus lanes do not provide an adequate level of 'protection' from traffic-related delays. These lanes are typically shared with right turning traffic and therefore still experience auto-related delays, and are associated with a high level of violations as through traffic often uses the bus lanes when congestion levels are high since these lanes are designated with paint and signs, with no physical separation between the transit lane and general traffic lanes. For these reasons, the "Do Nothing" alternative, and the option of curb bus lanes, as used in other parts of the city, were not carried forward for further consideration.

Based on transit operating experience in Toronto, when developing alternative transit solutions that separate traffic lanes from the effects of traffic, two specific criteria must be satisfied:

1) The lanes must be reserved for transit and not shared by any traffic; and
2) There must be some form of physical separation to ensure that motorists do not travel in the transit lanes illegally.

Given the above criteria, three alternative transit solutions were considered for the Sheppard East corridor:

1) **Subway / Elevated Rapid Transit (SRT)** – Electrically powered rail vehicles that operate on a fully exclusive right-of-way – such as the subway or the elevated Scarborough Rapid Transit (SRT) line. With no at-grade operation across any roadways, there is no influence from other traffic. These systems are capable of carrying high volumes of people.
2) **Light Rail Transit (LRT)** – Electrically powered vehicles that operate on a partially exclusive right-of-way (reserved lanes) with traffic crossings at signalized intersections.
3) **Bus Rapid Transit (BRT)** – Diesel or hybrid powered buses that operate on a partially exclusive right-of-way (reserved lanes) with traffic crossings at signalized intersections.
Note - This EA evaluation reflects the decision that all new light rail vehicles purchased for Toronto will be roughly twice as long as the traditional Toronto “streetcars” with level loading and a new fare system to allow loading via all doors.

7.2 Evaluation of Alternative Solutions

7.2.1 Elimination of Subway/SRT

The expected future travel demand on Sheppard Avenue is well below what would be required to justify the high costs of subway or elevated transit-ways. Based on the population and employment forecasts in the Sheppard area, the City and the TTC have projected that the transit demand in the Sheppard corridor will increase to 3,000 persons per hour in the peak direction at the busiest point on the line. This number would increase to 5,000 if a subway were constructed; the majority of the extra 2,000 people on a subway, relative to LRT, would re-route from other transit services to take advantage of the subway’s greater speed. Subway / Rapid Transit (SRT) technology is not justified if the peak hour demands are not approaching the range of 10,000 people per hour during peak hour in the busiest direction (as shown in Figure 7-1). Further, it is estimated that subways cost 82% more per kilometre than LRT ($222 million / km versus $40 million / km respectively, in 2007 dollars). As such, subway or elevated rapid transit was screened out and not carried forward as an alternative transit solution.

7.2.2 LRT versus BRT

The remaining alternatives, LRT and BRT, were evaluated based on four key factors:

1) **Air Quality** – Minimize air quality impacts on this already bustling community by utilizing sustainable technologies and achieving the City’s design objectives of a walkable, distinctive, and beautiful community;

2) **Capacity** – Accommodate the anticipated transit demand associated with future development;

3) **Land Use** – Must meet City’s Official Plan policies and principles and minimize impacts to the surrounding land use; and

4) **Cost** – Reduce operational and maintenance costs while simultaneously improving ridership.

The assessment of the LRT and BRT is explained below:

7.2.3 Light Rail Transit (LRT)

**Air Quality**

LRT vehicles are electrically powered and therefore do not produce emissions on the street.

**Capacity**

LRT has a much higher carrying capacity than BRT. The new Light Rail Vehicles that will be acquired for Toronto will comfortably carry an average of 130 people. A peak point demand of 3000 people per hour would require a vehicle about every 2 minutes, 40 seconds. Even in reserved lanes this frequency would likely be difficult to operate and avoid vehicle ‘bunching’, so when this demand is approached, the Light Rail Vehicles would be ‘coupled’ together and operated in pairs, so that the time between vehicles would be about 5 minutes, which makes for a more-manageable operation.

**Land Use**

LRT technology supports the City of Toronto’s Official Plan objectives with respect to creating transit-oriented development in the corridor and removing vehicles from the road. Based on a review of BRT and LRT experience in the U.S., a recent study by the Region of Waterloo concluded: “Rail transit...is recognised to be a planning tool that can support and encourage the development of more sustainable land use patterns. LRT, like subways, has been shown to influence land development in part because, being tied to tracks, it is both distinct and perceived to be permanent.” LRT would be more effective than BRT in supporting the City’s vision for the creation of a more urban ‘Avenue’, as is planned between Victoria Park and McCowan Road.
Cost

While it costs more to construct than BRT – roughly $40 Million per kilometre, LRT receives more leverage than BRT in operational costs. By carrying more passengers, LRT requires less staff for day-to-day operations. It is estimated that vehicle operators account for 60% to 75% of all operational costs of transit systems. Therefore, by reducing the number of operators needed, this cost can certainly be reduced. Furthermore, with new and upcoming signal upgrades and technological advancements in self-driven vehicles, perhaps this portion of operational costs will be reduced to a bare minimum or completely eliminated.

LRT outperforms BRT in lifespan of vehicles as well. According to Tennyson, buses generally last around 15 years, after which they either require major improvements or complete replacements. On the contrary, trains have records of operating smoothly for at least 35 to 40 years; thereby, being nearly 50% more efficient in the long run.

7.2.4 Bus Rapid Transit (BRT)

Air Quality

Diesel powered BRT results in emissions that could adversely impact air quality. However, some reduction in emissions is possible with hybrid electric technology.

Capacity

Buses are smaller than rail vehicles and are not “coupled” together to operate in pairs. As such, a local BRT service – one that services all stops - has less carrying capacity than LRT. High BRT capacities would only be feasible with by-pass lanes to allow some buses to operate express and pass one another at stops, and there is not sufficient space for a 3.5 metre by-pass lane in the Sheppard Avenue road Right-of-Way while providing a “comfortable” walking environment, bicycle lanes, four through lanes and left turn lanes for traffic. Furthermore, an additional widening of the Sheppard Avenue public right-of-way above the designated 36 metres to provide a bus by-pass lane is not in keeping with the urban design objectives for this area.

To illustrate this issue, assuming a standard 12 metre bus and the traffic forecast of 3,000 customers, approximately 60 buses are required, per hour, to serve this demand, based on typically leading standards. Even if the new articulated/double buses were purchased, it would only reduce the number of buses required to 30 per hour, which would result in buses operating so close together that it would lead to one catching up to another – creating “bunching”.

Land Use

While there is not sufficient study data to conclude a significant difference between BRT and LRT with respect to encouraging development, there is a ‘school of thought’ that suggests that BRT is not as effective at influencing sustainable land use patterns as is LRT because it is not fixed and is therefore not perceived as a permanent investment that would support development.
The option of obtaining the necessary approvals to widen Sheppard Avenue East to allow such an extra lane, and causing pedestrian crossings of this wide roadway to increase further, was not in keeping with the pedestrian objectives of this corridor.

LRT provides the best way by fulfilling forecast passenger requirements, and conforms very well to the City’s vision – a better integrated transit system, reduced car dependency on roads (thereby lowering emissions), growth in general infrastructure, and increased ridership – along this particular corridor. In addition to the capacity advantages, compared to BRT it is more comfortable for riders, quieter, and produces no emissions on the street.

7.3.1 New Vehicles* for the Sheppard East LRT

The recommended transit alternative for the Sheppard East corridor is Light Rail Transit (Figure 7-2). The light rail vehicles that will be used on Sheppard Avenue will have the following features:

- Larger capacity – about twice as long as standard streetcars in Toronto;
- Fully accessible – low-floor vehicles with level loading from on-street platforms;
- Loading on all doors – significantly reduces the time spent serving stops;
- Operator cabs on both ends – the vehicle can operate in either direction and not require a loop to turn around, reducing infrastructure and space need, as well as noise and vibrations; and
- Modern “European-style” design – attractive design will be conducive to the long-term goals for the corridor to be a distinct identity area with pleasing streetscapes and public spaces, making the community a distinctive, vibrant, and beautiful area.

Amsterdam, Netherlands Strasbourg, France

Figure 7-2: Examples of LRT Vehicles

*Note – the TTC recently began the process of acquiring new light rail vehicles to replace its aging streetcars, and for use on Transit City routes such as Sheppard Avenue East

TTC’s LRT cars have a varying length of approximately 27m to 30m and a width of 2.54m. Trainsets of 2 cars result in a train length of approximately 60m. The rated capacity for an LRT train is 130 passengers. Maximum operating speed is 60km/hr. Trains are powered by electrical power from overhead wires, which utilize a 750 VDC current. Train operations, both locomotive control and opening / closing of doors, are controlled by on-board staff. The movement of trains along the designated right-of-way will be regulated by three-staged traffic signals that give north-south traffic / pedestrians, east-west traffic including left turns and U-turns, and the LRT and east-west pedestrians separate chances to move through the intersection.

The track technology to be used is a combination of a continuously welded rail with a rubber sleeve that isolates the rail from the concrete. This elimination of rail joints combined with the isolating sleeve provides a smooth operation with limited noise and vibration that is no different than the noise levels of a busy street.

This recommendation completed the technical work associated with Phase 2 – the assessment of alternative solutions for the problem identified in the study. At this point in the project, the first round of public meetings was held to present this recommendation to the public and obtain their input. The results of the first public information sessions are summarised in Chapter 10.
8.0 Selecting the Preferred Design for the Sheppard LRT

The purpose of this section is to explain the various design alternatives that were considered for the Sheppard East LRT and the decisions that led to the recommended design. Key elements of the design discussed in this section are:

- **Recommended Alignment and Design of the LRT right-of-way** – this provides details on the location and configuration for the running structure;
- **Connections to Don Mills Subway Station** – this provides details on the alternatives considered for connecting the LRT to Don Mills Subway Station;
- **Ancillary Features** – this represents supporting elements that are required for the operation of the Undertaking;
- **Stations and Stop Location** – this provides details on the station elements, and stop locations and impacts;
- **Special Considerations at Midland Avenue** – this section provides details on the cemetery located on the northeast corner of Midland and Sheppard Avenue East and mitigation measures;
- **Agincourt GO Station** – this section provides details on the grade separation to be implemented at the GO Agincourt Station;
- **Left-Turning Lanes** – this section discusses the impacts to left-turning lanes and mitigation measures;
- **Pedestrian Bridges** – this provides details regarding the pedestrian bridges to be installed at all bridge crossings;
- **Urban Design** – this section discusses options for various midblocks and intersections; and
- **Implementation** – this section discusses matters relating to anticipated construction methodology and duration as well as capital cost estimates.

8.1 Recommended Alignment – LRT in the Centre of Sheppard Avenue

There are no parallel alignment opportunities in the Sheppard corridor such as nearby hydro right-of-way; as such, the alignment must be on Sheppard Avenue. In designing dedicated transit lanes, any crossings by other traffic must have a traffic signal to ensure everyone knows who has the right-of-way. On Sheppard Avenue, or any roadway where there are very frequent un-signalized intersections and driveways, the side of the road option is not feasible because they would all then have to be signalized.

Although various alternatives are available as possible means to introduce LRT along Sheppard Avenue East, such as mixed traffic, transit outside lane, dedicated transit north and south side, the dedicated transit median alternative was chosen as the preferred alignment. Physical separation from traffic lanes is necessary to ensure motorist compliance. After extensive discussions with Toronto Fire and EMS on previous streetcar right-of-way design studies, the preferred option is a 150 mm high median with slightly rounded corners to discourage autos but still allow emergency vehicles to get on/off the LRT right-of-way. This design requires all unsignalized intersections and driveways to be right-in/right-out. The LRT tracks will come down to the road level in advance of crossing signalised intersections – raised curb adjacent to the right-of-way at these locations. Left turn lanes at signalized intersections will allow for left turns. To mitigate the effects of no left turns mid-block, U-turns will be allowed as well from left-turn lanes.

The poles required to support the overhead electric power lines may be in the middle of the right-of-way, or at the side of the street; this is the subject of ongoing discussions with Toronto Fire representatives and a final decision will be made during detailed design.

8.2 Recommended Routing

Given the importance of developing a network of LRT lines throughout the City, the initial plans for the Sheppard LRT was that it extend as far east as Morningside to intersect with the Scarborough-Malvern line planned on that roadway. However, in light of the relatively high ridership projections determined through the transit forecasting exercise, (peak hour, peak direction ridership of 1,000 persons from Morningside to roughly midway to Meadowvale) it was decided that the LRT routing should continue as far east as Meadowvale Road.

Given the proximity of the Scarborough Centre area to Sheppard Avenue, and the future population and employment increases expected in that growth centre, it was initially intended to explore the merits of a separate branch of the Sheppard LRT line, operating to the Scarborough Centre area via McCowan Road, within this EA study. This assessment of an LRT branch via McCowan Road will continue, but as a separate EA exercise; it will be done in parallel with the separate EA study – currently underway – that is examining optional ways of extending rapid transit north from the SRT terminus at McCowan Station since the recommendations of that study could have an impact on the final conclusion with respect to a north-south LRT branch on McCowan Road.

8.3 Recommended Cross Section

Typically, the LRT right-of-way will be constructed as a 150mm high median, between traffic signals, but at intersections, the tracks must be constructed at the same level as the road, and 150mm curbs would be included at those locations to prevent motorists from driving onto the tracks at approaches and intersections.

To provide further clarity for the intended character for the different streetscaping treatments along the preferred LRT alignment for the Sheppard Avenue East corridor, two categories of streetscape character were identified – Urban Condition and Suburban Condition. Using the streetscape characters identified in the Urban Design Framework for the Sheppard Avenue East Corridor, another level of detail was provided by breaking down the Streetscape Character Typologies and distinguishing between a mid-block condition or an intersection condition. A more detailed analysis and design for both streetscape conditions will be provided at the detail design stage. The following provides a description of each of these Streetscape Character Typologies:
Urban Condition

An urban condition was chosen for those segments along the Sheppard Avenue East corridor identified as an Urban Streetscape Character in the Urban Design Framework. An urban condition should exist wherever uses front directly onto Sheppard Avenue East, and/or where a considerable amount of development is anticipated. The focus for segments classified as an Urban Condition will be on improving the pedestrian environment through widened sidewalks, and providing streetscaping where the 36 m right-of-way permits. The majority of Sheppard Avenue East that has been identified as an Avenue in the Toronto Official Plan is categorized as an urban condition. The following are the two types of situations that exist within an Urban Condition:

- **Urban Intersection** - The cross section (Figure 8-1) shows the prototypical intersection in an Urban Condition for the preferred design solution. The prototypical intersection along Sheppard Avenue East in an Urban Condition has a right-of-way width of approximately 36 metres. While the actual dimensions may be subject to some minor modifications during detailed design, the recommended design includes:
  - 7.00 metres for the dedicated LRT right-of-way and raised curb
  - 3.00 metre station platform;
  - 3.00 left turn lane for vehicles;
  - two travel lanes for vehicles in each direction at 3.30 metres for each lane;
  - 1.60 metres for a bicycle lane in either direction; and,
  - 3.30 metres remaining for sidewalk, split on either side of the street

It is expected that City staff will look for opportunities to ensure that new developments provide a setback from the front property line in order to provide for an extension of the boulevard and opportunities to provide a widened sidewalk.

- **Urban Mid-Block** - The cross section (not shown since identical to Suburban Midblock – Figure 8-3) shows the prototypical mid-block condition for segments of Sheppard Avenue East identified as an Urban Condition. The prototypical mid-block has a right-of-way of approximately 36 metres. Within the 36 metre right-of-way, the preferred design solution will include the following:
  - 7.38 metre LRT right-of-way;
  - two 3.30 metre vehicular travel lanes in both directions;
  - 1.80 metres for a dedicated bicycle lane; and,
  - 6.14 metres for the boulevard, which will include 2.50 metres for the sidewalk and 2.64 metres for landscaping.

It is to note that while TTC overhead poles are shown to be in the middle, in the designs below, they could potentially be placed to the side of road. The final decision is subjected to further discussions with Fire and Emergency/Medical Services personnel during detailed design.

Suburban Condition

Suburban Conditions correspond to segments of Sheppard Avenue East identified as a Landscape Streetscape Character in the Urban Design Framework. The Suburban Condition exists wherever an open space, institutional use, or the rear yards of low-rise residential uses front onto Sheppard Avenue East. Segments identified as a Suburban Condition are areas where minimal change is anticipated, and the focus will be on improving the public realm within the 36 m public right-of-way with streetscaping improvements such as tree planting and enhanced sidewalks. The following are the two types of situations that exist within a Suburban Condition:

- **Suburban Intersection** - The cross sections (Figure 8-2) shows the prototypical intersection for segments of Sheppard Avenue East in a Suburban Condition. The right-of-way width for a Suburban Intersection is 36.0 metres. Within the 36.0 metre right-of-way, the preferred design solution would typically include:
  - 7.00 metre LRT right-of-way, raised 150mm
  - 3.00 metre LRT station platform;
  - 3.00 metre left turn lane for vehicles;
  - two 3.30 metre vehicular travel lanes in both directions;
  - 1.60 metre bicycle lane; and,
  - 3.30 metres remaining for sidewalk, split on either side of the street

- **Suburban Mid-Block** - The cross section (Figure 8-3) shows the prototypical mid-block condition for segments of Sheppard Avenue East in a Suburban Condition. The right-of-way width in the Suburban mid-block condition is 36.0 metres. Within the right-of-way, the preferred design solution will include the following:
  - 7.38 metre LRT right-of-way;
  - two 3.30 metre vehicular travel lanes in both directions;
  - 1.80 metres for a dedicated bicycle lane; and,
  - 6.14 metres for the boulevard, which will include 2.50 metres for the sidewalk and 2.64 metres for landscaping.

In addition to the 36 metre right-of-way, the proposed design solution proposes that new development along segments of Sheppard Avenue East designated as an Urban Condition, should be required to provide a setback from the front lot line. This area should be an extension of the boulevard providing for a widened sidewalk.
Note that all dimensions are preliminary; they are subject to potential modifications/refinements during detailed design.
Figure 8-2: Typical Cross Sections for Suburban Midblocks and Intersections

Note that all dimensions are preliminary; they are subject to potential modifications/refinements during detailed design.
Figure 8-3: Typical Cross Sections for Suburban Midblocks and Intersections

Note that all dimensions are preliminary; they are subject to potential modifications/refinements during detailed design.
8.4 LRT Stop Locations

LRT stops are selected based on the right balance between good local access and high route speed. The higher the speed of travel, the longer the distance between stops. There were two general scenarios for stop distance for the Sheppard East LRT. Using the typical road network in the area west of McCowan as an example, the two options considered were:

1) **LRT stops every 800 metres** – design stops like a ‘surface subway’, stopping only at major intersections (which are 800 m apart on this sample section of Sheppard), with infrequent parallel bus service (e.g. every 20 minutes) servicing close bus stops in between. At LRT stops, customers transfer to centre LRT platform from side of road bus stop.

2) **LRT stops every 400 metres** – stopping at every major intersection, and once in between, with no infrequent parallel local bus service.

A micro-simulation developed for the Sheppard East LRT modelled LRT spacing at 1000 metres and 440 metres because the study includes sections west of Victoria Park and east of McCowan where major intersections are more widely spaced. The model resulted in a stop spacing of 800 metres requiring a route speed of 26-27 km and a stop spacing of 400 metres requiring a route speed of 22-23 km.

The 800-metre scenario was not selected because the full impact of the increased speed of the Surface Subway applies only to those walking directly to LRT stops. Those boarding local buses at bus stops in between LRT stops have a shorter walk, but a longer wait for service and a transfer to the LRT after a very short bus ride. Further, 800 metre spacing did not achieve as great a speed advantage as expected – while the LRT stopped less often, the time for customers to board took twice as long per stop (same number of passengers collecting at half the stops) and the LRT still had delays due to red lights at signalised intersections in between stops (though the model accounted for signal priority to reduce such delays).

The recommendation for Stop Spacing in the order of 400 to 500 metres, depending upon the pattern of development and cross-streets (with an expected average speed of 22 to 23 km/h), was considered to be the best balance between overall route speed and good local access. For purposes of comparison, during peak operating conditions, the average speed of the Bloor-Danforth subway line is 30 km/h, the 85 Sheppard East bus service is 17 km/h, and the 510 Spadina streetcar service is 14 km/h. In assessing the overall customer service provided in each scenario, City and TTC staff recommends LRT stop spacing ever 400-500 metres, with an average stop spacing of 460-to-480 metres, depending upon the additional stops that may be included during detailed design.

8.5 GO Transit Crossing – Proposed Grade Separation

Currently, the GO Transit Stouffville line is at the same level as Sheppard Avenue, causing traffic to stop at a rail crossing if a train is passing through. In order for the Sheppard East LRT to run efficiently, the LRT tracks will need to be separated from the GO Transit tracks (Figure 8-4). One option that was considered was having the road at grade and constructing the LRT in a tunnel under the GO rail line. However, GO Transit and the City are in the process of eliminating all at grade crossings on major arterials, where possible, and this project represents the appropriate opportunity to achieve that objective on Sheppard Avenue. Given the constraints of the GO rail line, the road and LRT must be constructed under the rail; the reverse is not feasible. Some alternate driveway locations are being considered in response to public input. The acceptable maximum grade on the LRT platform is 1%, which limits the location of the platform to either under the grade separation or before the slopes on the proposed road reaches 1%. As such, Sheppard Avenue, the LRT tracks, and the pedestrian sidewalk will be under the grade separation.

In a meeting with members of the condominium corporation from the residential buildings on the south side of the street, concern was expressed that the preliminary design shown in Figure 8-4 placed the new signalized driveway directly in front of the main entrance to one of the condominium complexes. In response, it was agreed that potential alternative locations for the driveway would be considered during detailed design.

Stops (and related commuter facilities) will be located at:

- Consumers Rd / Brian Dr
- Victoria Park Ave
- Pharmacy Avenue
- Palmdale Dr
- Warden Ave
- Bay Mills Rd / Aragon Ave
- Birchmount Rd
- Allanford Rd
- Kennedy Rd
- Agincourt GO Station
- Midland Ave
- Bramley Rd
- Brownspring Rd
- McCowan Rd
- 4725 Sheppard Ave E
- Shorting Rd
- Massie St
- Markham Rd
- Progress Ave / Malvern St (exact location to be confirmed based on location of Scarborough RT alignment)
- Washburn Way / Lapsley Rd
- Midblock between Washburn Way and Neilson Rd
- Neilson Rd
- Murison Blvd
- Brenyon Way / Breckon Gate
- Morningside Ave
- Rouge River Dr / Dean Park Rd
- Idagrove Gt
- Meadowvale Ave

* Additional stop locations between Morningside Avenue and Rouge River Drive will be considered during detailed design, based on further assessment and discussion with City Planning as to future development scenarios for this largely undeveloped area.