4.2 Description of the Recommended Transit Project

The purpose of this section is to define the recommended Transit Project, which is comprised of the construction, operation and maintenance of the extension of the Yonge Subway from the existing Finch Station to Richmond Hill Centre near Yonge Street / Highway 7.

Recommendations include the following elements:

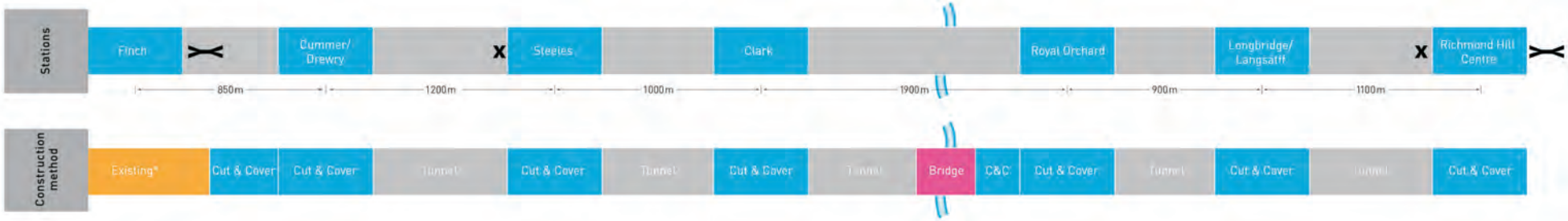
- Subway Running Structure – This provides details on the location and configuration for the running structure that connects each of the six stations
- Ancillary Features – This represents supporting elements that are required for the operation of the subway;
- Stations – This describes the amenities found at each of the six stations; and
- Implementation – This section discusses matters relating to anticipated construction methodology and duration as well as capital cost estimates for the Transit Project and supporting infrastructure.

The total length of the recommended alignment is 6.8 km long and includes six new stations:

- Cummer / Drewry Station;
- Steeles Station;
- Clark Station;
- Royal Orchard Station;
- Langstaff / Longbridge Station; and
- Richmond Hill Centre Station.

It is noted that a key consideration of the Transit Project is that it does not preclude a potential future extension of the subway extension north of the Richmond Hill Centre terminal station.

The Recommended Transit Project is summarized in Exhibit 4-16. Stations, construction methods, facilities, and key screening criteria are noted. Preliminary alignment engineering plates are provided as Appendix A.



Screening criteria

Existing densities			80		85		110		80		30		40
Projected densities†			110 - 120		280 - 520		145 - 180		100 - 130		144 - 266		295 - 550
Transportation connection			✓		✓						✓		✓
Natural environment			✓		✓		✓		✓		✓		✓
Cultural environment			✓		✓		✓		✓		✓		✓

Tail track:
Cross track: X

* Some reconstruction of existing tail tracks will be required
** 4-bay after Finch LRT is completed
† Persons and jobs per hectare

Not to scale

4.2.1 Subway Running Structure

The Transit Project will have a total length of 6.8 km from the end of the existing tail track at the north end of existing Finch Station, the current terminus of the Yonge Subway Line, to the north end of the tail track to be located north of the proposed Richmond Hill Centre Station (RHC), north of Highway 7. The entire alignment will be underground, with the exception of the proposed East Don River bridge crossing.

The subway running structure and station platforms are primarily located within the Yonge Street right-of-way from Finch Station to the north end of the Langstaff/Longbridge Station, at Langstaff Road. Immediately north of the Langstaff/Longbridge Station, the alignment turns north-east to cross under Highway 407 and Highway 7, the Hydro One Corridor (just east of the Richmond Hill stormwater management pond), the municipal utility corridor, property owners, High Tech Road, and terminates in the transit corridor and private property on the west side of the CN Bala / Richmond Hill GO Line. The Richmond Hill Centre Station (terminus station) is located on the Yonge Bayview Holding Inc. properties and across High Tech Road to the properties immediately north. The north end of the tail track terminates in the transit corridor line as well as private property on the west side of the CN Bala / Richmond Hill GO Line.

The recommended geometric alignment is illustrated in Appendix A, Preliminary Alignment Engineering Plates, and is summarized below.

4.2.1.1 Horizontal Alignment

The horizontal alignment of the proposed Transit Project was developed following existing TTC design standards. The alignment includes 9 horizontal curves as depicted in the alignment plates in Appendix A.

4.2.1.2 Vertical Alignment

The vertical alignment was developed following existing TTC design standards for subways. Minimum and maximum design parameters used on the vertical alignment are:

1) Minimum gradient at stations and special track structures — 0.3%

2) Maximum gradient along rest of running structure — 3.5%

3) Minimum length of vertical curve — LVC = 60 m

Sight line for signalling will be confirmed during design of the Transit Project.

4.2.1.3 Subway and Track Technology

The latest TTC subway cars have a length of approximately 22.8 m and a width of 3.1 m. The train sets are composed of six cars, resulting in a train length of approximately 138 m

and a maximum operating speed of 80 km/h. Trains are powered by electric motors, which utilize 600VDC. Current train operations, both locomotive control and opening/closing car doors, are manually controlled by on-board staff. Wayside signalling regulates the movement of trains along the line. Since this is an extension of the existing TTC Subway system, the current technology and operational requirements on the existing line will govern the operation of this project. As the TTC is currently upgrading the existing signalling system to ATO/ATC, the extension will include the implementation of this new system which will allow closer spacing of trains in response to increased ridership.

The track technology to be used is a combination of floating concrete slabs and double ties, which are designed to minimize the noise and vibration effects of subway operations to an acceptable level. The double tie trackbed system is designed to reduce vibration levels in the frequency range 30 Hz to 120 Hz by 14-16 dB in the box structure and by 12-15 dB in the tunnel structure. Sections of the TTC Sheppard Subway were built using such technology and have achieved the desired results.

4.2.1.4 Future Alignment Refinements

The alignment, as illustrated in this report, is preliminary in nature. Refinements in the horizontal and/or vertical alignment will continue in detailed design and may be undertaken to:

- Improve operating characteristics and reduce operating costs;
- Reduce future maintenance requirements;
- Minimize effects to properties;
- Reduce construction related effects; and
- Reduce capital costs.

4.2.2 Ancillary Features

4.2.2.1 Subway Operational Needs

In support of the subway operations, "special track work areas" are identified based on the following subway operations requirements:

- Locations where provision for switching trains between northbound and southbound tracks have been identified at Steeles Station and Richmond Hill Centre. These locations have been included to provide reliable service or in emergency situations. These locations would require the installation of double cross-over tracks south of each station;
- Storage and turn back of trains north of Finch Station, requiring the installation of additional centre track and two single cross-over tracks north of the existing Finch tail tracks ; and
- Tail track structure north of Richmond Hill Centre Station platform to allow full operating speed into Richmond Hill Centre Station as well as to provide for storage of trains.

4.2.2.2 Electrical Substations

Electrical power is required to operate lights, equipment and safety systems associated with the stations. Electrical power is also required to power the trains themselves (referred to as traction power). The connections between subway and the power distribution grid occur in a facility that is referred to as an electrical substation. These substations contain transformers, switches and circuit panels to support the systems listed above. Substations can be constructed at-grade, below grade or a combination of the two. Exhibit 4-17 illustrates an existing substation that is split above grade / below grade.

To meet the traction power requirements for the subway system, substations are typically 2.0 km apart but cannot exceed 2.5 km in spacing. Since subway stations require power for lights and equipment, TTC usually locates the electrical substations at or near subway stations.

Since the Transit Project is approximately 6.8 km long, it will require a minimum of four substations, which will be located near Steeles Station, Clark Station, Royal Orchard Station and Richmond Hill Centre Station. Although conceptually identified on the station layout drawings, the final location and configuration of electrical substations will be refined during detailed design. Electrical connections between the substations and the existing electrical grid will be determined during detailed design as well.

Exhibit 4-17: Typical Electrical Substation – Above Grade Portion (Don Mills Station, Sheppard Subway)

Aerial view of Don Mills Station substation showing substation enclosure

4.2.2.3 Emergency Exit Buildings (EEB)

In accordance with NFPA130, emergency egress from the subway tunnel shall be provided throughout the underground system so that the distance to an exit shall not be greater than 381 metres. Therefore the maximum distance from emergency exit to emergency exit or emergency exit to station shall be 762 metres. These structures extend from the underground tunnels to the surface and are designed to provide an emergency exit for passengers and emergency services personnel. They can also provide emergency ventilation and secondary power sources.

The below grade portion of the structures consist of a central vertical access/egress shaft leading from the subway tunnel to the surface. At grade, the structure typically comprises a one-storey building about 3 metres high and 10 square-metres in area, as shown in Exhibit 4-18.

Exhibit 4-18 identifies the preliminary locations of the required Emergency Exit Buildings (EEB). These locations are based on TTC's life safety requirements of providing an exit at a maximum interval of 762 m. The proposed locations are:

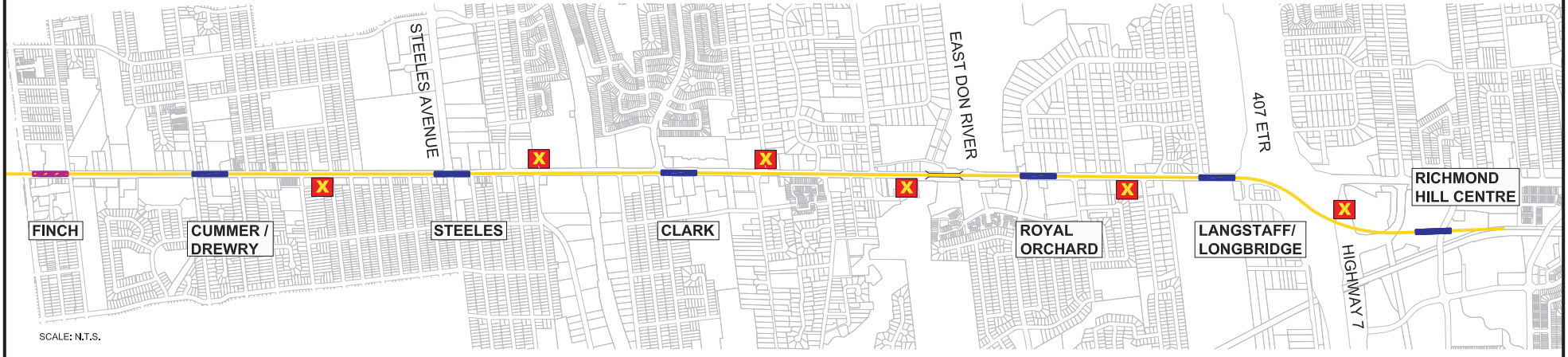
- Private property on the east side of Yonge Street between Centre Avenue and Newton Drive;
- Private property on the west side of Yonge Street between Doncaster Avenue and the CN rail corridor (7200 Yonge Street);
- Within municipal right-of-way on the west side of Yonge Street opposite Arnold Avenue;
- Within municipal right-of-way on the east side of Yonge Street between Centre Street and the proposed East Don River Bridge;
- Private property on the east side of Yonge Street between Uplands Avenue and Kirk Drive (8199 Yonge Street); and
- Within municipal right-of-way on the north side of Highway 7 west of Garden Avenue.

4.2.3 Subway Stations

The six stations along the Transit Project, including their respective layouts and facilities, are described in detail in Section 4.1.4, Station Layout Concepts and Appendix E, Station Layout Concepts.

4.2.4 Property Requirements

Directly affected property will be acquired through the appropriate property acquisition process and compensation where appropriate for property owners will be based on fair market value. Property requirements will continue to be examined and refined as part of the detailed design phase. The property acquisition and mitigation process is discussed in Section 5.2.2.



LEGEND

- EXISTING SUBWAY STATION
- SUBWAY STATION
- SUBWAY LINE
- EMERGENCY EXIT

Example of an Emergency Exit Building from Sheppard Subway

Yonge Subway Extension - Finch Station to Richmond Hill Centre
Transit Project Assessment

VIVA York Region TORONTO

PRELIMINARY EMERGENCY EXIT BUILDING LOCATIONS

EXHIBIT

4-18