Intermodal Connectivity at Gateway Hubs

Rebecca Nelson

Final Report Prepared for the Metrolinx Rob MacIsaac Fellowship Program
Academic Supervisor: Paul Hess, University of Toronto
Metrolinx Advisor: Jana Neumann, Planning and Development

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Acknowledgements

The Rob MacIsaac Fellowship Program was created in 2011 to honour the first Chair of Metrolinx, Mr. Rob MacIsaac. Since its creation, the program has given university students studying in the Greater Toronto and Hamilton Area (GTHA) the opportunity to expand upon their studies and to benefit from practical work experience. The Fellowship Program consists of two parts: a research term occurring in the winter semester, and an internship during the summer months. This report presents research completed for the research term of the 2018 Fellowship Program on intermodal connectivity at Gateway Hubs, defined by Metrolinx as major transit stations with two or more converging (existing or planned) rapid transit lines (2015a; 2015b).

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Rebecca Nelson

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Contents

Appendicies

Appendix A: Site Visit Audit
Appendix B1: Dundas West-Bloor Gateway Hub Intermodal Connectivity Audit
Appendix B2: Kennedy Gateway Hub Intermodal Connectivity Audit
Appendix C: Sharing Circle Questions
Appendix D1: Dundas West-Bloor Gateway Hub Intermodal Connectivity Audit Responses
Appendix D2: Kennedy Gateway Hub Intermodal Connectivity Audit Responses
Appendix E1: Dundas West-Bloor Gateway Hub Sharing Circle Summary
Appendix E2: Kennedy Gateway Hub Sharing Circle Summary
Appendix F: Assigning Priority Levels for Intermodal Mobility Hub Studies

1.0 INTRODUCTION

1.1 Context

Intermodal transit stations are important locations in the regional transit network where two or more transit lines connect, and where high volumes of passenger transfers take place. Metrolinx's Mobility Hub Guidelines (2011) define these places as Gateway Hubs.

This study was undertaken to evaluate intermodal connectivity for pedestrians in the winter at two Gateway Hubs in the City of Toronto: Dundas West-Bloor and Kennedy.

Improving intermodal connectivity at Gateway Hubs supports Metrolinx's mission to deliver and build mobility solutions for the region. More specifically, this study relates to Strategy 3 in Metrolinx's 2041 Regional Transportation Plan (RTP): Optimize the Transportation System. A priority action of Strategy 3 is to "set consistent high-quality standards for the traveler experience", which includes transit user safety, convenience of using the transit system, providing universal access to stations, and embedding design excellence in transportation planning, such as accessible station access and wayfinding[1]. All of these factors affect the pedestrian environment, and how efficient and enjoyable transit transfers can be. Good station design will become increasingly important as ridership on the regional transit system grows, particularly under the GO Expansion program, which will provide frequent, all day, bidirectional transit on much of the GO rail network by 2025.

More broadly, improving infrastructure for sustainable transportation modes, including public transit, supports a better quality of life for its users, and helps mitigate the negative environmental, health, safety, and economic impacts associated with auto-dependent environments (Bertram & Rehdanz, 2015; Morar, Raoslav, Spiridon, & Păcurar, 2014; Newman & Kenworthy, 2015; Gurin, 2003; Wegener & Greene, 2002; IBI Group, 2002).

1.2 Study Overview

The study had four main objectives:

(i) To identify barriers to equitable pedestrian accessibility between transportation modes at two Gateway Hubs (Dundas West-Bloor and Kennedy) with a focus on winter conditions;
(ii) To position these barriers within the existing and emerging policy framework;
(iii) To determine opportunities to reduce these barriers and improve intermodal connectivity at the two Gateway Hubs; and,
(iv) To relate these findings to broader recommendations for intermodal mobility hubs across the Greater Toronto and Hamilton Area (GTHA).

The study included four methods:

(i) A site visit audit (to evaluate quantitative Gateway Hub and transfer route characteristics);
(ii) An intermodal connectivity audit (with participants to evaluate qualitative Gateway Hub and transfer route characteristics);
(iii) A sharing circle (with participants to provide more detail on the quality of the pedestrian environment between rapid transit modes); and,
(iv) Interviews with representatives from Metrolinx and the Toronto Transit Commission (TTC).

This research is innovative because little information is available on intermodal

[1] **Wayfinding is defined in the 2041 RTP as "an orientation system […] that enables travellers to choose a preferred route, monitor their journey, and recognize when they have arrived" (Metrolinx, 2018c). A wayfinding system consists of mapping, graphics, schedules and timetables, directional signage, digital and real time information, network and line diagrams, and terminology and naming conventions (Metrolinx, 2018d).**

pedestrian connections specifically focusing on winter conditions and the equitable accessibility of different public transportation modes. Additionally, this research is at a smaller scale than previous studies at both Gateway Hubs, as its focus is on the transfer area between transit modes, and not the surrounding station area.

1.3 Report Outline

The remainder of this report is structured as follows:

2.0 Methodology explains each method in more detail, and describes the participant recruitment process.

3.0 Study Area describes the criteria used in selecting the two Gateway Hubs for this study: Dundas West-Bloor and Kennedy. Additionally, a profile of each Gateway Hub, including the transit modes intersecting each Gateway Hub, the population and travel characteristics of the surrounding area, and an overview of previous studies of each Gateway Hub is provided.

4.0 Findings presents findings from the site visit audits, intermodal connectivity audits, and sharing circles grouped in four themes: (i) wayfinding; (ii) pedestrian route; (iii) public realm and amentities; and (iv) winter conditions.

5.0 Discussion provides a discussion of the findings within the existing and emerging policy context.

6.0 Recommendations focus on how to improve the winter intermodal connectivity of Gateway Hubs at a region-wide scale.

2.0 METHODOLOGY

2.1 Site Selection

While both of the Gateway Hubs included in this study have been studied in the past, they have been examined at a larger scale, and previous studies focused more on the surrounding environment of both stations. This study specifically evaluates the transfer area between the three rapid transit modes at each Hub. As a result, this study is meant to be specific in terms of its recommendations for improvements of the features along the transfer route and within transit stations.

Dundas West-Bloor and Kennedy Gateway Hubs were chosen for this study for the following reasons:

1. These two Gateway Hubs have at least two intersecting existing (vs planned) rapid transit modes.
2. This research focuses on Gateway Hubs with at least two types of unique rapid transit modes, not only to evaluate the connectivity between different transit lines, but between different types of transit, and different transit agencies. These factors result in more choices for the transit user. While these modal and route choices are important for a comprehensive transit network, the transfer between different modes and agencies may be confusing, unsafe, and inaccessible for riders.
3. Neither of these stations currently has construction occurring within the transfer area. While it is important to assess how the construction process affects transit riders, this is not the focus of the study.

A few Gateway Hubs in the City of Toronto meet these criteria. Site visits at four stations (Kipling, Dundas West-Bloor, Main Street, and Kennedy) and consultation with Metrolinx informed the selection of Dundas West-Bloor and Kennedy, as Gateway Hubs that would benefit from further research. **Figure 1** shows

Figure 1: Mobility Hubs in the Greater Toronto and Hamilton Area (GTHA): Toronto, York Region, and Peel Region (Metrolinx, 2011)

all Gateway Hubs in the GTHA, and identifies the selected Gateway Hubs for this study with red circles.

2.2 Research Methods

The following section describes the four methods used to evaluate the intermodal connectivity at the Dundas West-Bloor and Kennedy Gateway Hubs:

(i) A site visit audit;
(ii) An intermodal connectivity audit;
(iii) A sharing circle; and,
(iv) Interviews.

2.2.1 Site Visit Audit

The site visit audit was completed during preliminary site visits of each station. This audit identified the transfer routes between all rapid transit modes, and informed the creation of maps and station floor plans to show where staircases, escalators, and elevators are located, as well as certain amenities such as maps, benches, and garbage bins. Site visit audits at Dundas West-Bloor and Kennedy Gateway Hubs were conducted on Tuesday March 20, 2018 for the duration of three hours and one hour, respectively.

The audit tool records the quantitative characteristics of each station including the following, among others:

- Route distance;
- Number of staircases or escalators needed to complete the transfer;
- If a parking lot was crossed;
- The number of transit shelters;
- The presence of maps and schedules; and,
- The time allotted at crossings with a signalized intersection.

For the complete audit tool, please see Appendix A.

Visualizing and digitizing the built environment are significant complementary tools for public understanding of the pedestrian environment (Scholsherg, & Brown, 2004) and to engage stakeholders and decision makers to see where improvements to the environment should be made (Moura, Cambra, & Conçalves, 2017). The maps and floor plans created from the site visit audits were used in the intermodal connectivity audit with participants, to determine where improvements can be made along the transfer route. These maps and floor plans were useful tools to translate qualitative values from both types of audits and the sharing circles into quantifiable and visual values, as found in Section 4.

2.2.2 Intermodal Connectivity Audit

The two primary methods, intermodal connectivity audits and sharing circles, were completed in sequence with nine participants, (n=4 for Dundas West-Bloor station, and n=5 for Kennedy station). The intermodal connectivity audit differs from the site visit audit in that it seeks more qualitative responses. The intermodal connectivity audit[2] created for this study was adapted from the Pedestrian Environment Data Scan (PEDS) survey (Clifton & Rodríguez, 2004) and a walkability audit previously completed for an honours thesis in two Ottawa neighbourhoods (led by the Healthy Transportation Coalition) (Nelson, 2016). Several methods have been used in previous studies to evaluate the pedestrian environment; however, direct observation (i.e. in the form of an audit) is preferable since this method does not rely on user memory, which is prone to inaccuracy (Kim, 2015). Further, audits conducted in person are valuable to measure the pedestrian environment (Moudon and Lee, 2003) because transfers are affected by factors at a micro-scale.

The audit has four main categories for evaluation:

(i) Transit and area information;
(ii) Station amenities;
(iii) Pedestrian route; and,
(iv) Intersections along the transfer route.

The intermodal connectivity audit at Dundas West-Bloor station was conducted on Thursday March 24, 2018 for the duration of two hours. During the audit, it was below five degrees Celsius, and at times with heavy rain. Two intermodal connectivity audits were conducted at Kennedy station on separate days, to accommodate participants' schedules.

The first audit took place on Saturday March 27, 2018 and the second audit took place on Friday April 6, 2018 for one hour each. Both were chilly days with temperatures below five degrees Celsius, and some light rain on April 6, 2018. The complete audit tool can be found in Appendix B.

2.2.3 Sharing Circles

Sharing circles occurred following the intermodal connectivity audit, with the same participants. This method allowed the participants to elaborate on their responses in the audit and build upon each other's comments to create a complete image of the transfer experience. The sharing circle took a semi-structured format, with prepared questions to

[2] Intermodal connectivity refers to the connection between different transit modes. "Walkability audits" are commonly used to evaluate the pedestrian environment; however, using the term walkability audit for this study is problematic for two reasons. First, the term "walkability" is exclusionary because it only includes pedestrians who walk. This study considers the experiences of all transit riders, whether they are walking, or using a mobility device such as a wheelchair. Second, a walkability audit does not specify the type of environment studied. This research specifically evaluates the transfer area between rapid transit modes. Therefore, for this study the term intermodal connectivity audit is used, which refers to the pedestrian environment of a transfer route between two or more rapid transit modes and unique transit agencies.

guide the conversation. A list ofthese questions can be found in Appendix C.

The Sharing Circle for Dundas West-Bloor station took place over Google Hangout on Thursday April 5, 2018 for one hour. As the intermodal connectivity audit took longer to complete than expected, the sharing circle was scheduled for another day when all participants could partake in the conversation. The sharing circles for Kennedy station took place directly following the intermodal connectivity audits, for one hour each at a nearby community centre.

2.2.4 Interviews

Interviews were completed with a total of seven participants from Metrolinx and the TTC. The interviews were unstructured and completed during the month of May 2018 for one hour each. The purpose of these interviews was to gain a better understanding of the policies, guidelines, standards, and initiatives that already exist, or are under development, to address aspects of intermodal connectivity at Gateway Hubs.

2.2.5 Participants

Participants for the intermodal connectivity audit and sharing circles were recruited through committees under the TTC, and Metrolinx, as well the University of Toronto Transportation Research Institute (UTTRI). As mentioned, a total of nine people participated in the study, four evaluated the transfer at the Dundas West-Bloor Gateway Hub, and five evaluated the transfer at Kennedy station. Overall, five females and four males participated, ranging from 23 years to 35 years of age, and from different ethnic backgrounds including Caucasian, East Asian, South Asian, and North African. One person in a power-wheelchair participated in the study at each Gateway Hub, and all other participants were able-bodied. Including diverse participants is important to this study, as factors like gender and physical ability contribute to one's pedestrian experience (Moura, Cambra, & Conçalves, 2017). However, due to the sensitivity of information, socio-demographic data like income and occupation were not collected from participants. While this smaller sample size is not a complete representation of pedestrian experiences completing transfers at these two Gateway Hubs, this study evaluates the pedestrian environment in detail, which can act as a guide to frame future studies. As compensation for their time to complete the study, participants received a pre-loaded fifty-dollar PRESTO card, provided by Metrolinx in support of this research.

Seven representatives from Metrolinx and the TTC participated in interviews, and were recruited through a purposive sampling approach. The specific departments of interviewees are not listed to maintain their requests for anonymity.

3.0 STUDY AREAS: GATEWAY HUB PROFILES

3.1 Dundas West-Bloor Gateway Hub Profile

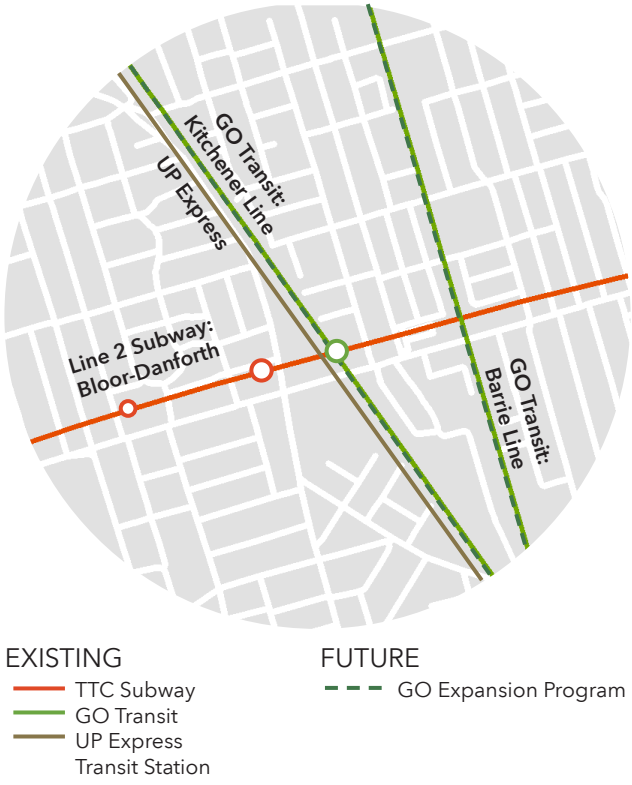


Figure 2: Existing and Proposed Transit at Dundas West-Bloor Gateway Hub (Adapted from Metrolinx, 2015a)

3.1.1 Transit

Dundas West-Bloor station serves three rapid transit modes in addition to TTC buses and streetcars **(Figure 2)**:

- The Line 2 Bloor-Danforth TTC subway;
- The Kitchener GO train; and,
- The UP Express train.

The Kitchener GO rail line is part of the GO Expansion program, with increased service planned by 2025. Currently, two transfer routes exist between the Dundas West TTC station and the Bloor GO Transit/UP Express stations **(Figure 3)**.

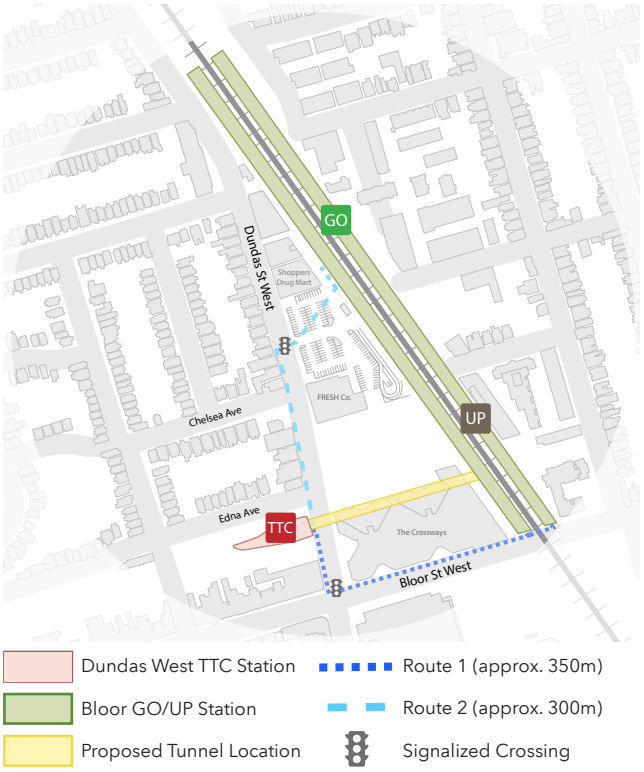


Figure 3: Transfer routes between Bloor GO Transit/UP Express and Dundas West TTC stations

Recently, Metrolinx announced plans to construct a tunnel between the TTC station and the GO Transit/UP Express station to provide a more connected and seamless transfer between the three transit modes (Benzie, 2017). The tunnel will provide a connection between the existing northern access tunnel from Bloor GO/UP station directly to the Dundas West TTC subway platform level. The tunnel will run underneath "The Crossways" building, a two-tower apartment complex at Dundas Street West and Bloor Street **(Figure 3)**.

As shown in **Figure 4**, the connection will be made from Bloor GO/UP station to Dundas West TTC station by taking two separate flights of stairs or two elevators from the Bloor GO/UP tunnel to the TTC subway platform. In between these levels will be the concourse with turnstiles for riders entering or exiting the paid fare zone. The stairs to connect the subway to GO Transit and UP Express have already been built over 25 years earlier in anticipation ofthis project; however, the elevators are not yet built.

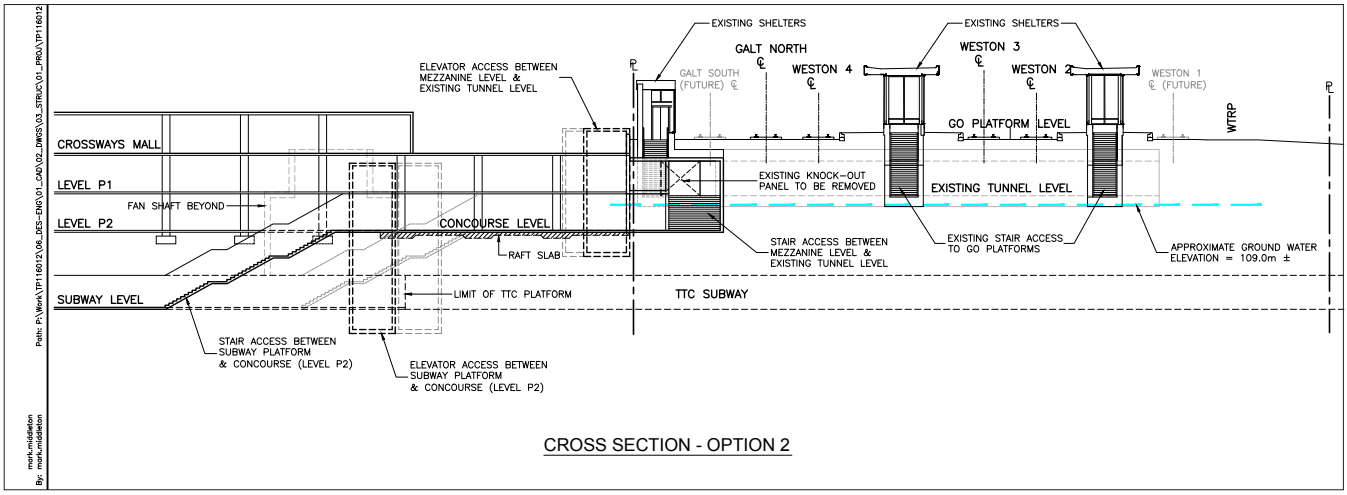


Figure 4: Cross section of the planned tunnel between Bloor and Dundas West stations (Amec Foster Wheeler, 2016)

Anticipating GO Expansion on the Kitchener GO line, the existing northern Bloor GO station tunnel will be extended to the east to encompass the new rail track. This tunnel will provide an exceptional improvement to the existing transfer between Dundas West and Bloor stations, which is documented in this report.

3.1.2 Population and Travel Characteristics

18,400 people live in the Dundas West-Bloor mobility hub with a population density of 92 people per hectare, compared to the average in the GTHA of 8 people per hectare (Metrolinx, 2015b). Households in the mobility hub have an average of 1.2 residents and 0.9 cars, where nearly 60% of residents drive to work in the morning peak period, and 24% use public transit (Metrolinx, 2015b). The station area has a Walkscore of 93, classified as "walker's paradise" (Walkscore, 2018a). In terms of GO station access:

- 63% of GO station users walk to the station in the morning;
- 16% take public transit; and,
- 10% arrive at the station by motor vehicle (5% drive themselves, and 5% are dropped-off at the station) (Metrolinx, 2015b).

No information is available on the access mode shares for the TTC or UP Express.

3.1.3 Previous Studies

In a 2011 mobility hub study, several strengths and weaknesses were identified at and surrounding the Dundas West-Bloor Gateway Hub (see Brook McIlroy Inc., 2011). Some strengths of the station include convenient access to a variety of transit modes, a strong retail fabric, and a diverse community. The study identified the following weaknesses: a lack of efficient, weather protected connections between transit modes, poor pedestrian circulation, an uninviting pedestrian realm with a poor quality streetscape, and a lack of open space. Brook McIlroy Inc. (2011) made several recommendations to improve the quality of the station and its pedestrian environment, including the following:

- Widened sidewalks;
- Improved crossings to enhance circulation;
- Better weather protection;
- A stronger station presence at the street level; and,
- A tunnel connection from Dundas West to Bloor station entrance.

3.2 Kennedy Gateway Hub Profile

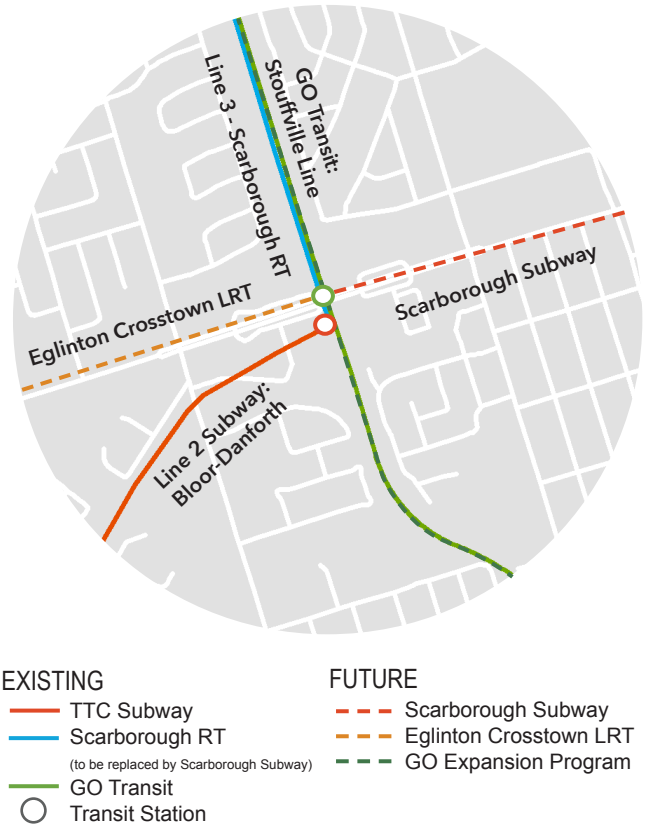


Figure 5: Existing and Proposed Transit Influencing Kennedy Gateway Hub (Adapted from Metrolinx, 2015c)

3.2.1 Transit

Kennedy station serves three rapid transit modes, in addition to TTC buses **(Figure 5)**:

- The Line 2 Bloor-Danforth TTC subway;
- The Stouffville GO train; and,
- The Scarborough Rapid Transit (SRT) train.

The existing station facilities include public washrooms (TTC Station), a passenger pick-up and drop-off area (TTC Station), several commuter parking lots, and a bicycle rack (GO Station) (Metrolinx, 2015c). Current plans are to replace the Scarborough RT with a new Scarborough subway, which will extend one stop from Kennedy Station to Scarborough Town Centre.

Additionally, Kennedy station will become the terminal stop at the eastern end of the Eglinton Crosstown light rail transit (LRT), or ECLRT, which extends westwards to Mount Dennis. The new ECLRT Kennedy station will be located south of Eglinton Avenue East **(Figure 6)**. The primary entrance and its associated urban plaza will serve the passengers arriving by LRT, subway, Scarborough RT and buses. The entrance building will include an indoor bicycle parking facility. The secondary entrance, located east of the GO rail corridor will be combined with a new GO Transit station building. A GO Transit passenger pick-up and drop-off will be located adjacent to the entrance and accessible via the urban plaza. An underground unpaid fare zone will link the primary and secondary entrances. New GO Transit platforms on both sides of the rail corridor will extend an integrated passenger experience from the ECLRT to regional commuter rail. The existing south and east TTC entrances will be maintained as tertiary and quaternary entrances providing access and interconnectivity between ECLRT, TTC and GO Transit facilities.

3.2.2 Population and Travel Characteristics

14,700 people live in the Kennedy mobility hub area, with a population density of 73 people per hectare (Metrolinx 2015b). Households within the mobility hub have an average of 2.8 residents and 1 car each, and 68% of residents drive during their morning commutes, while 22% take public transit (Metrolinx, 2015c). The area surrounding the station has a WalkScore of 48, classified as “car dependent” (WalkScore, 2018b). In terms of GO station access:

- 43% of GO station users walk to the station during morning peak hours;
- 14% take public transit; and,
- 43% use a car (18% drive themselves to the station, 21% are dropped off, and 4% carpool) (Metrolinx, 2015c).

No information is available on the access mode shares for the TTC.

1 Main Entrance

2 Passenger Pick Up & Drop Off

3 New East & West GO Platforms

4 New GO Transit Passenger Pick Up & Drop Off

5 Secondary Entrance (New GO Transit Ticketing Building)

Figure 6: Eglinton Crosstown LRT Kennedy Station Aerial view (Adapted from TTC, 2018a)

3.2.3 Previous Studies

A mobility hub study for Kennedy Station was conducted by Metrolinx in 2013. This study identified several areas for improvement and opportunities for Kennedy station within the primary zone (i.e. within 250m of the station):

- Improving pedestrian and cyclist access;
- Pedestrianizing existing parking areas;
- Providing bicycle parking;
- Retaining non-fare paid connections across the GO corridor;
- Allowing transit riders to retain on-fare-paid connections across the GO transit corridor;
- Adding features to announce the station to pedestrians passing by; and,
- Enhancing the aesthetics of the environment surrounding the station (Metrolinx, 2013).

4.0 FINDINGS

This section presents the findings from the site visit audits, intermodal connectivity audits, and sharing circles conducted for each study area. For each Gateway Hub, the site visit audit is presented first, followed by an overview of four key themes identified in the intermodal connectivity audit(s) and sharing circles, including the following:

(i) Wayfinding;
(ii) Pedestrian route;
(iii) Public realm and amenities; and,
(iv) Winter conditions

For detailed findings, please see Appendices D-E.

4.1 Dundas West-Bloor Gateway Hub

4.1.1 Transfer Routes

The Dundas West-Bloor Gateway Hub includes two main transfer routes between the GO Train and UP Express station and the TTC subway station:

- Route 1: Along Bloor Street West; and,
- Route 2: Through a commercial plaza and across Dundas Street West **(Figure 7)**.

These two routes and the broader transfer area were the focus for the site visit and intermodal connectivity audits.

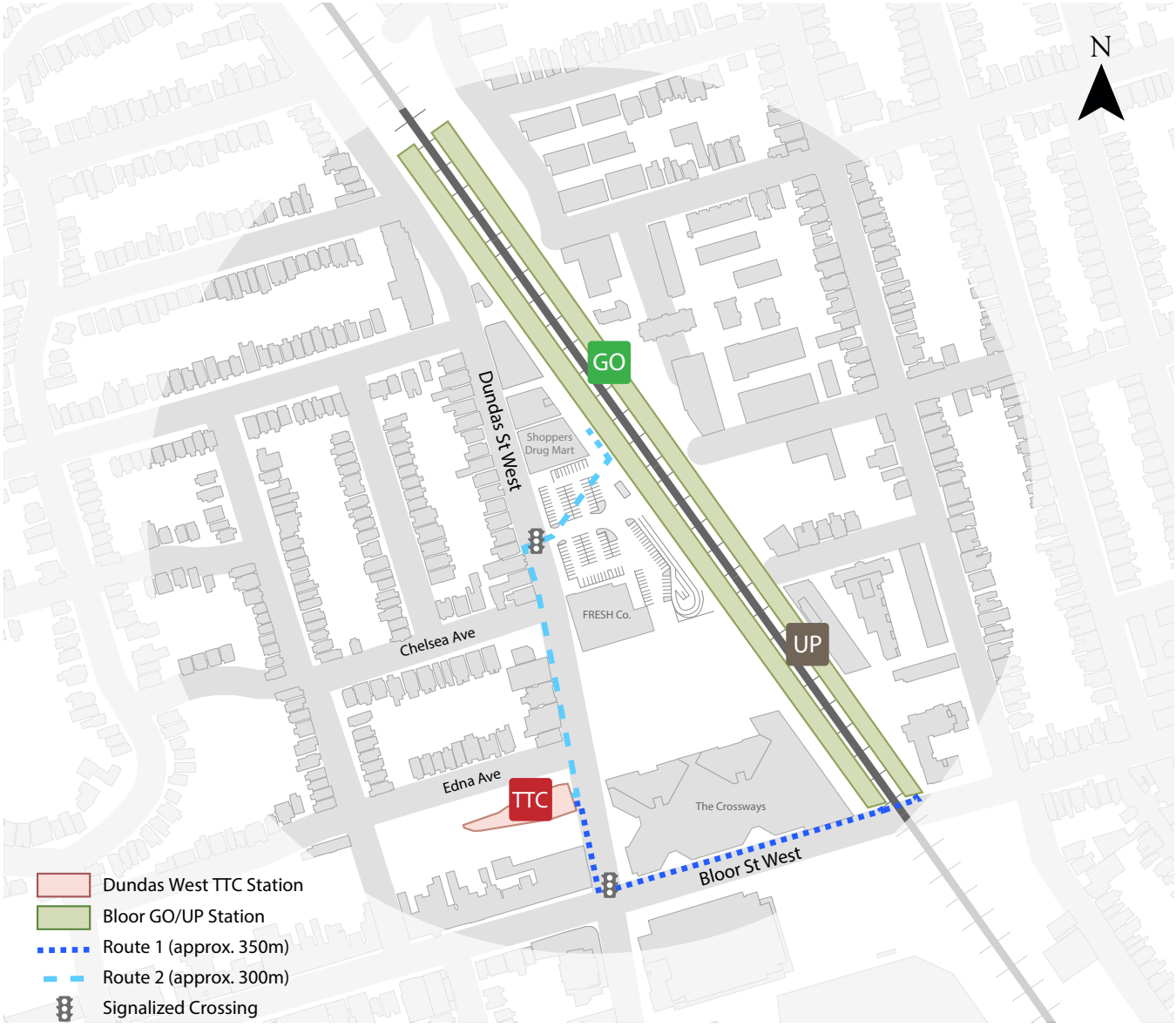


Figure 7: Transfer Routes Between the Dundas West TTC Station and the Bloor GO Transit and UP Express Station

4.1.2 Site Visit Audit

Table 1: Dundas West-Bloor Gateway Hub Site Visit Audit Findings

Route Characteristics

Number of Staircases (or Escalators) to Complete the Transfer	Route 1: 3 Route 2: 3
Elevators or Ramps Provided Where Stairs Required	Always
Number of Parking Lots Crossed	Route 1: 0 Route 2: 1
Pathways Provided Through Parking Lots	Route 1: N/A Route 2: 0
Pick-up and Drop-off Zones Crossed	No
Driveways Used by Buses or Streetcars Crossed	Route 1: 1 (Dundas St W) Route 2: 1 (Edna Ave)

Intersections

Number of Street Crossings	Route 1: 1 (Dundas & Bloor) Route 2: 3 (Dundas; Chelsea; Edna)
Curb Cuts at Street Crossings	Always
Number of Signalized Street Crossings	Route 1: Dundas & Bloor Route 2: Dundas
Length of Pedestrian Crossing Lights	Dundas & Bloor: 26 seconds Dundas: 19 seconds

Station Characteristics

	Dundas West TTC Station	Bloor GO and UP Express Station
Number of Station Entrances	1	2
Number of Accessible Station Entrances	1	2
Number of Rapid Transit Modes	1	2
Number of Transit Shelters for Rapid Transit	1*	9
Canopy Cover	Yes	Yes
Heated Waiting Area	Yes	Yes
Public Toilets	No	1
Accessible Toilets	No	1
Garbage Bins	11	12

*this "transfer shelter" is the subway platform, within the station building

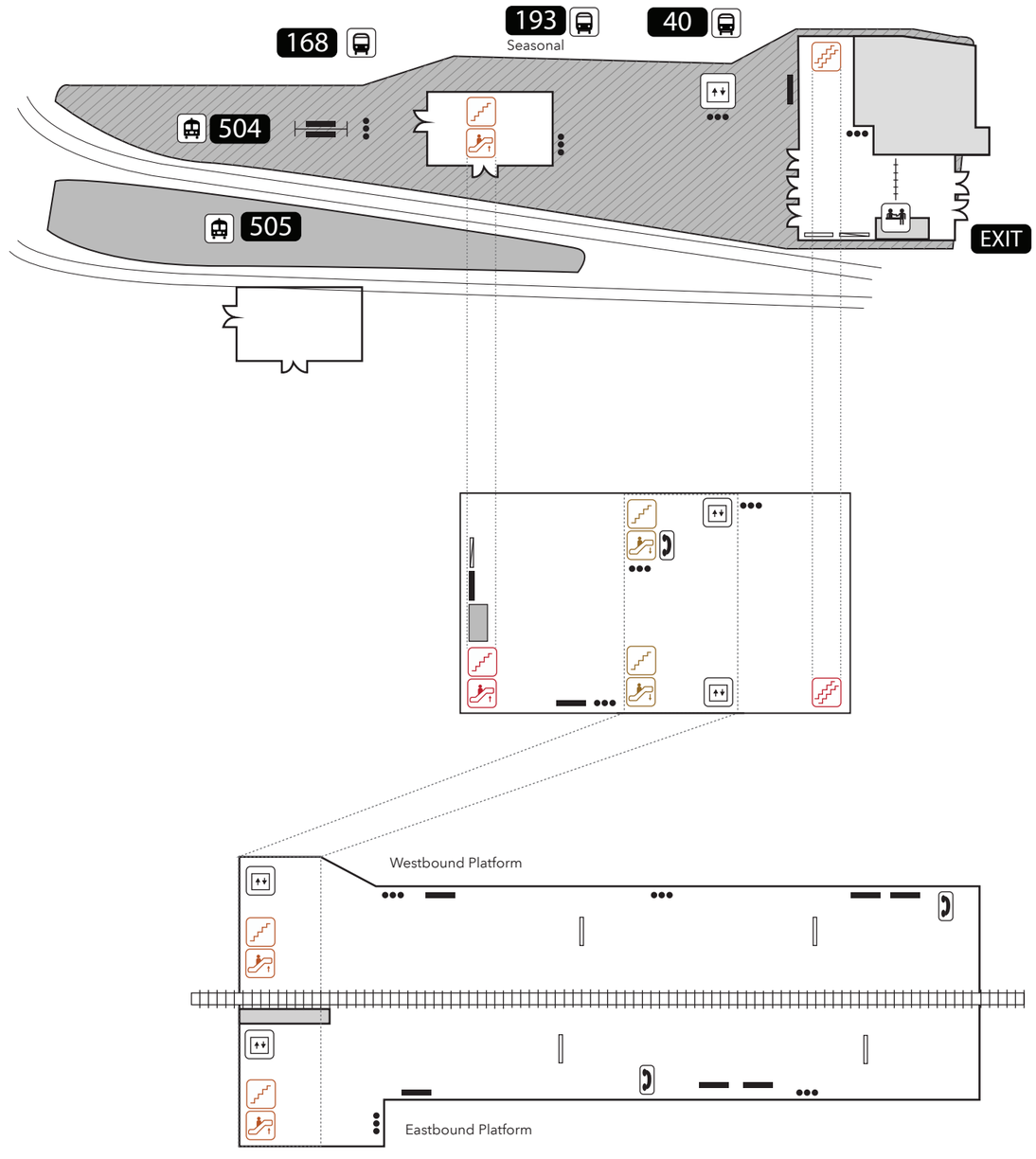
Pedestrian Signage

	Dundas West TTC Station	Bloor GO and UP Express Station
Signs visible at station entrances indicating the station name, agencies, and modes served	Yes	Yes
Static transit schedules posted at transit stops or in the station area	No	No
Maps of the station area and transit connections posted within station areas	2	4
Real time information available stating the arrival of the next rapid transit vehicle	4	3

Ground Floor
TTC Buses
& Streetcars

Concourse

Underground
Platform
TTC Subway



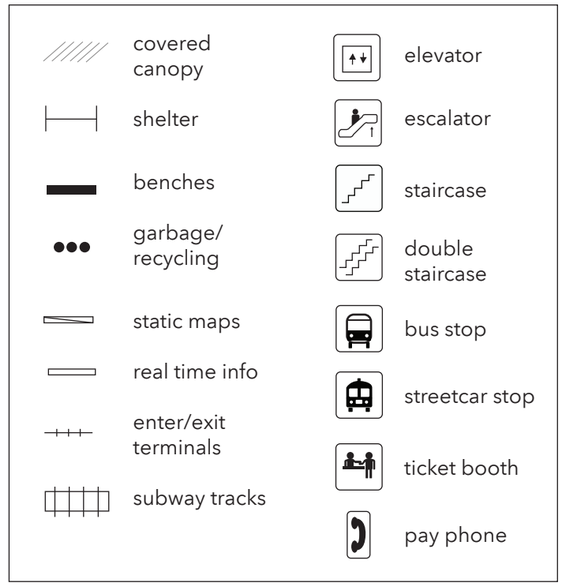


Figure 8: Dundas West TTC Station Floor Plan (Adapted from TTC (a))

Ground Floor
Platform Level

Underground
Tunnel Level

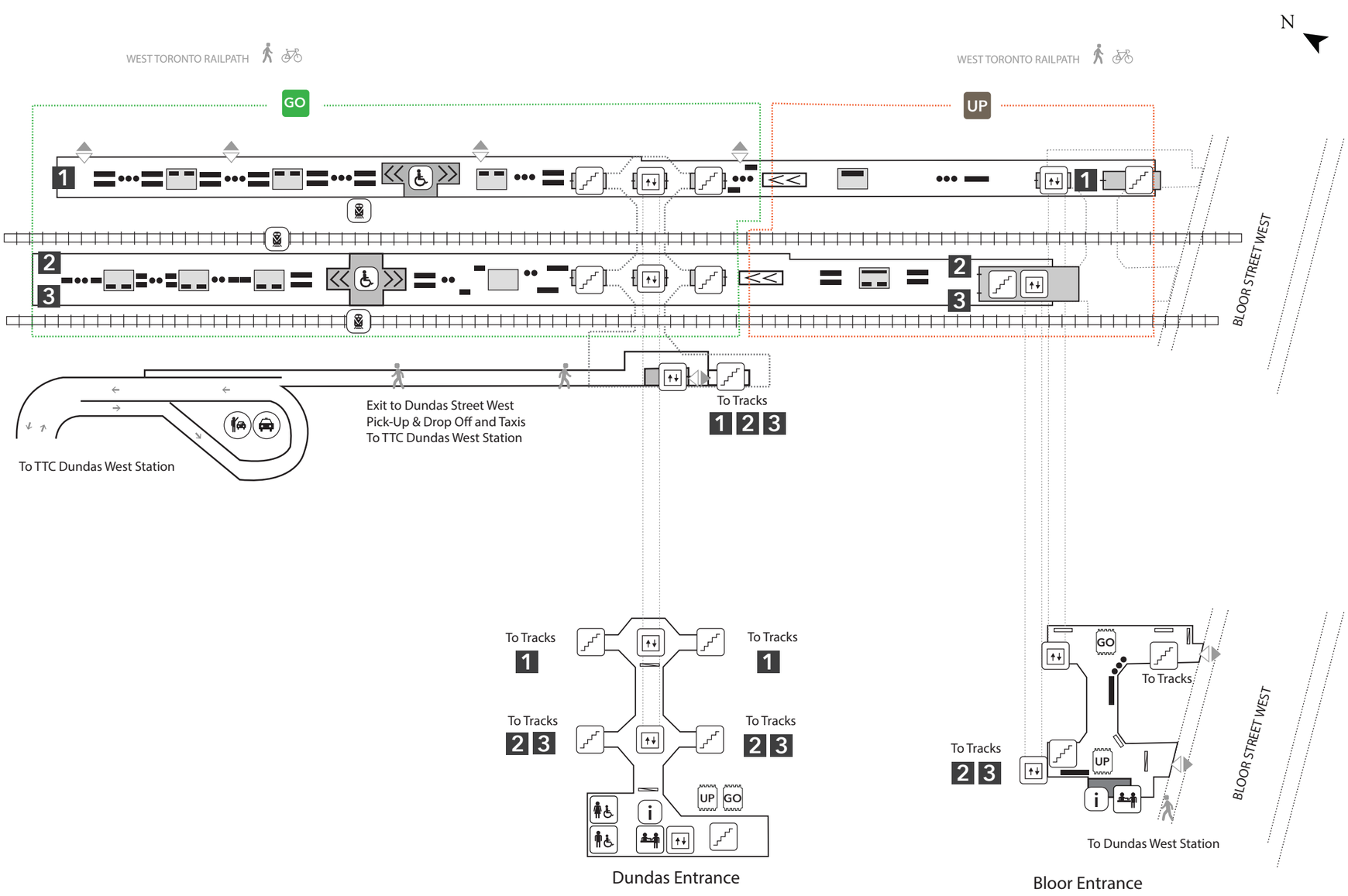


Figure 9: Bloor GO Train and UP Express Rail Station Floor Plan (Adapted from Union Pearson Express)

4.1.3 Intermodal Connectivity Audit and Sharing Circle Key Themes

(i) Wayfinding

Both transfer routes between the Dundas West TTC station and the Bloor GO train and UP Express station are confusing for transit riders: wayfinding tools are inconsistent, too small, and too few.

Signage: Wayfinding signage is not provided to indicate the transfer route between the Bloor GO Transit/UP Express and Dundas West TTC stations **(Figure 10, number 4)**. For example, when exiting the Dundas West TTC station on Route 1, signs for Bloor GO Transit/UP Express station do not always include both GO Transit and UP Express logos. Additionally, there is a lack of signs indicating where different transit modes can be found within the Dundas West TTC station **(Figure 11, number 8)**. On Bloor GO station platforms, the distinction between waiting areas for the GO train and UP Express is not clear. Other examples of specific areas lacking clear signage for wayfinding are presented in **Figures 10-12**.

Maps: Maps showing the area surrounding the station are available at both stations, they are difficult to locate, especially in the Dundas West TTC station. Participants suggested enlarging existing maps and providing maps on rapid transit platforms **(Figure 11, number 7 and Figure 12, number 7)**.

Real time information: While both stations have real time information on the departure of the next rapid transit vehicle, real time information screens are not always easily located. Participants suggested locating real time information on large screens at entrances so it is the first thing riders see when entering the station **(Figure 11, number 2 and 5; Figure 12, number 11)**.

Staff: Persons on staff to help transit riders with directions would improve the transfer experience. This would be especially true for UP Express riders who are likely to be tourists.

(ii) Pedestrian Route

Neither transfer route was direct, well connected, safe, or convenient.

Transfer Routes: Route 1 is approximately 350 metres with one street crossing, and Route 2 is approximately 300 metres with three street crossings. The transfer for both routes would be more direct if it was within an enclosed area so transit users have a clear pathway between stations (i.e. the tunnel that is currently in development). On Route 2, there is no pedestrian pathway to cross the parking lot; creating a separate pedestrian pathway would provide better connectivity.

Crossings & Intersections: Along both routes, streetcar tracks are crossed without traffic lights or on-street markings such as different pavement colours, painted lines, or bollards. On Route 1, the signalized intersection at Dundas Street West and Bloor Street West needs a longer crossing time, to accommodate high pedestrian traffic. Suggested improvements for the transfer at Dundas West-Bloor Gateway Hub include prioritizing pedestrian needs at street crossings and implementing wider sidewalks to increase pedestrian safety.

Elevators: Inside the stations, elevators are conveniently located where there are stairs, but not enough information exists to indicate alternative routes if the elevator is out of order.

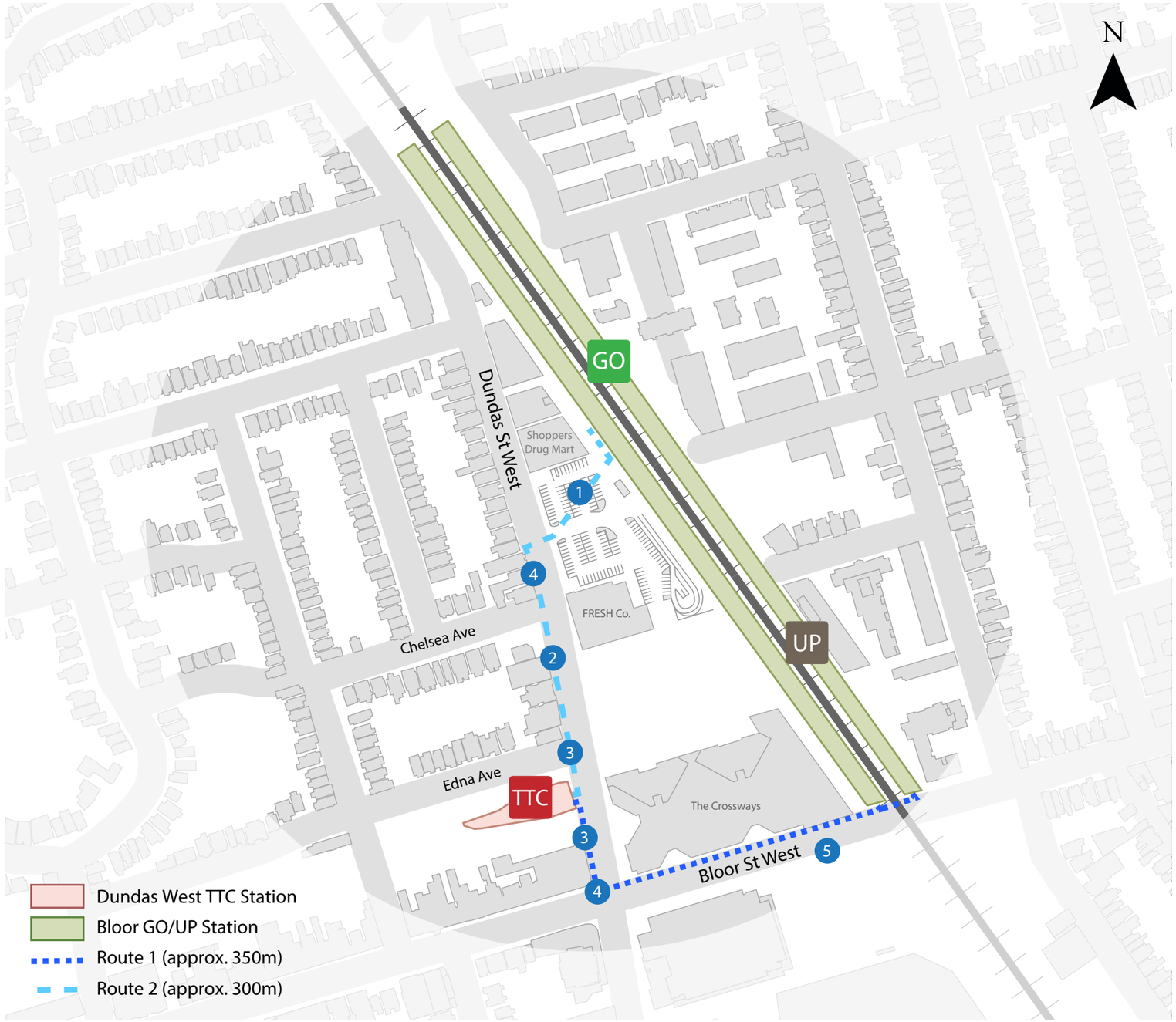
(iii) Public realm and amenities

Neither transfer route was enjoyable for participants. Suggestions for improving the transit route included providing more benches and garbage bins at transit platforms, as well as along the transfer route. The transfer route would also benefit from smoother sidewalks and more trees to provide shade and a pleasant environment. Additionally, water fountains and all-day access to public washrooms would

result in a more enjoyable transfer.

(iv) Winter conditions
Both the Dundas West and Bloor stations have transit shelters, with some heating. The Dundas West TTC station would benefit from more enclosed shelters under the canopy on the ground floor, for transit riders waiting for the buses and streetcars. The main entrance and lower levels of Dundas West station should also be heated during the winter. While the Bloor station has heated shelters on the GO train and UP Express platforms, heating functions are user-controlled and not always responsive. A suggested improvement was to provide a signal (such as a green light) to indicate when the heat function is operating, since it is not immediately obvious.

Figures 10-12 in the following pages identify specific improvement areas derived directly from the intermodal connectivity audit and the sharing circle. These improvements are depicted with numbers on the map or floor plan, and described the detail on the same or adjacent page.



1 No pedestrian pathway is present through the parking lot for transfer Route 2.

2 Sidewalks are too narrow along Dundas Street West for transfer Route 2.

3 Streetcar crossing is not indicated with distinct pavement, painted lines, or a signal.

4 Lack of signage that is clear and visible.

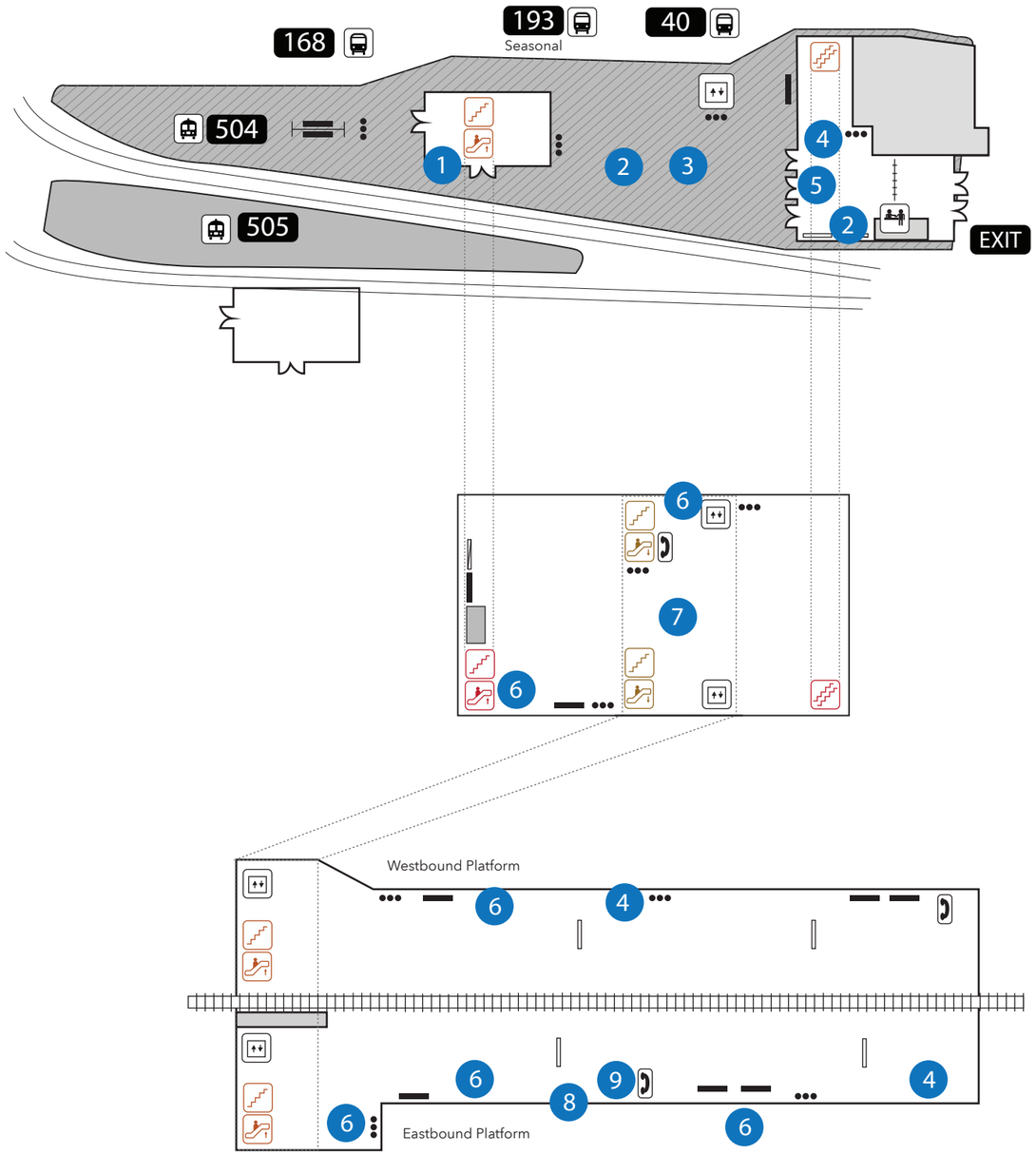
5 Lack of trees along the transfer routes.

Figure 10: Pedestrian Environment Improvement Areas Along the Transfer Route

Ground Floor
TTC Buses
& Streetcars

Concourse

Underground
Platform
TTC Subway



1 Add wayfinding signs to locate bus and streetcar stops, and the station exit.

2 Add a large screen with real time information, visible from the entrance.

3 Add benches under a transit shelter.

4 Add a bench along the wall for a waiting area inside the station entrance.

5 Add real time information for all transit modes (including the subway) over the doors leading to the bus and streetcar waiting area.

6 Add a large map of the surrounding area.

7 Inside navigation on the middle floor/concourse is poor. Add signs and other wayfinding tools.

8 Enlarge text for the time of the next subway train. The advertisements on these screens detour from the real time information.

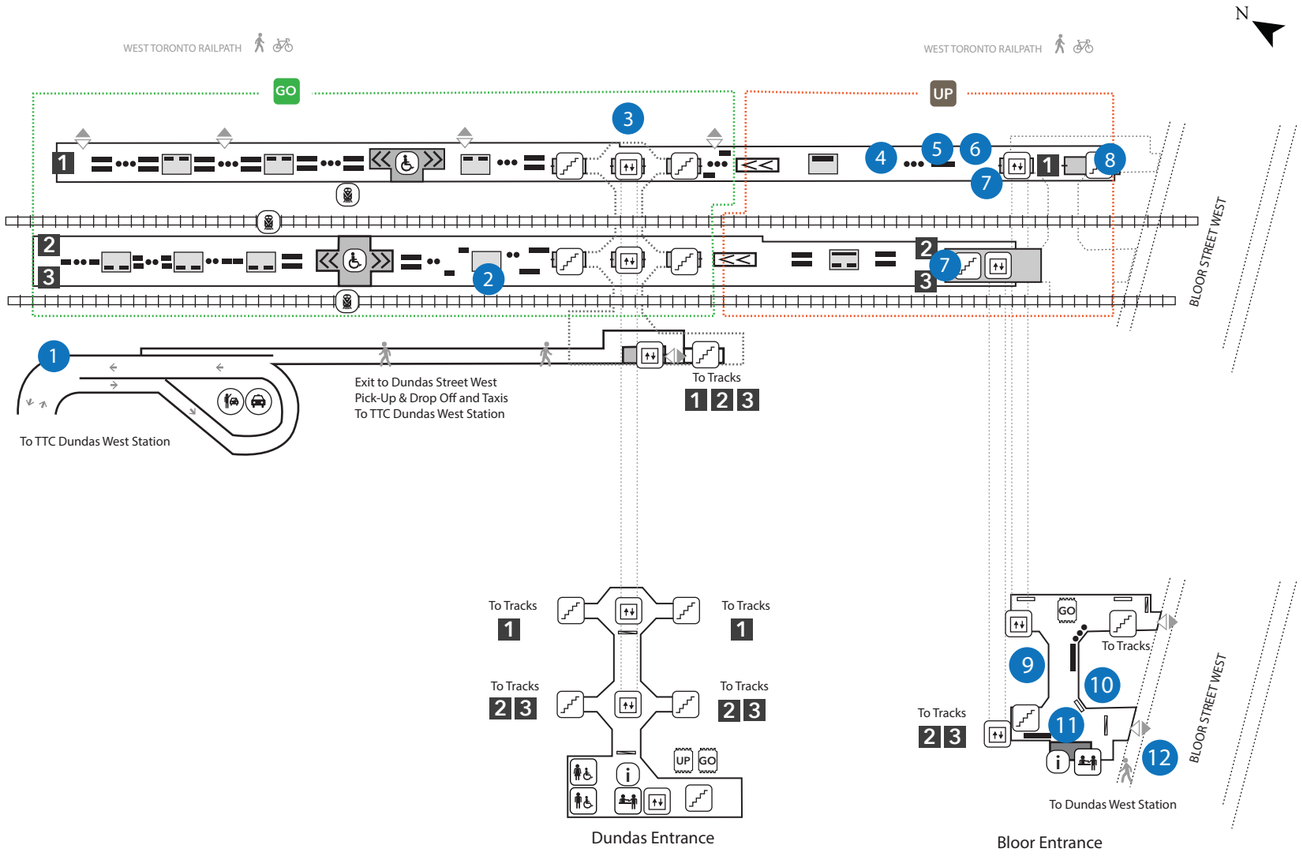
9 Add garbage bins.

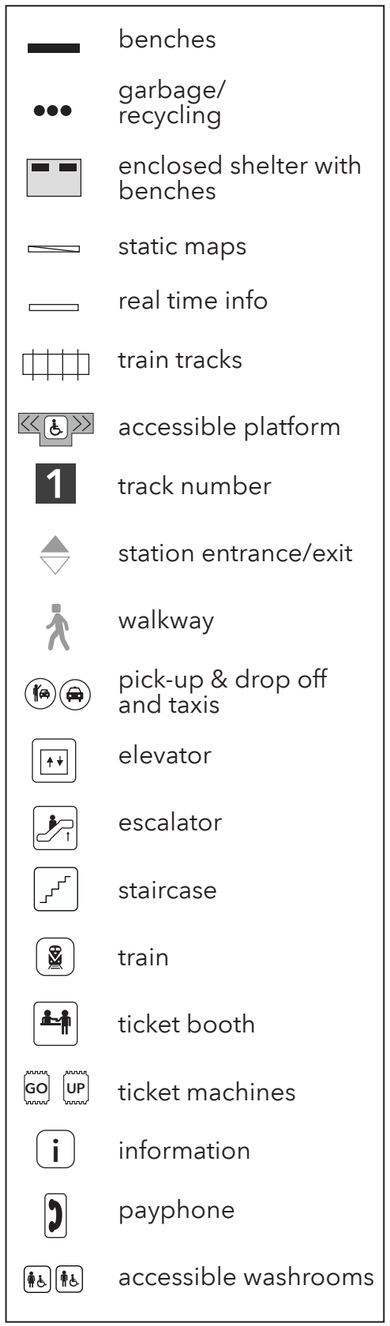
- covered canopy
- shelter
- benches
- garbage/ recycling
- static maps
- real time info
- enter/exit terminals
- subway tracks
- elevator
- escalator
- staircase
- double staircase
- bus stop
- streetcar stop
- ticket booth
- pay phone

Figure 11: Pedestrian Environment Improvement Areas in Dundas West TTC Station

Ground Floor Platform Level

Underground Tunnel Level





1. Add a pedestrian pathway for transit users exiting the station on Route 2.
2. Add benches inside the transit shelter, and a help button in case of emergency.
3. Emergency button should have clearer instructions for its use. Emergency and elevator buttons should have braille.
4. Real time information screens should indicate when no trains are scheduled.
5. Add another bench facing the rail path.
6. Ensure the GO Train and UP Express sign is at eye-level.
7. Add a map of the surrounding environment.
8. Expand the enclosed stair building to add seating.
9. Repair the gap in the cement floor.
10. Add garbage bins.
11. Relocate real time information screen so it is visible from the entrance.
12. Reposition and enlarge entrance sign so it is more visible from outside.

Figure 12: Pedestrian Environment Improvement Areas in Bloor GO Train and UP Express Rail Station Floor Plan (Adapted from Union Pearson Express)

4.2 Kennedy Gateway Hub Transfer Routes

4.2.1 Transfer Routes

The Kennedy Gateway Hub includes transfer routes within Kennedy station, between three rapid transit modes:

- Scarborough RT – Subway
- Scarborough RT – GO Transit
- GO Transit – Subway

Figure 13 below shows the area surrounding Kennedy Station and **Figure 14** shows where the transit modes listed above are located within the station. The transfer area within Kennedy station is the focus for the site visit and intermodal connectivity audits, which are documented on the subsequent pages.

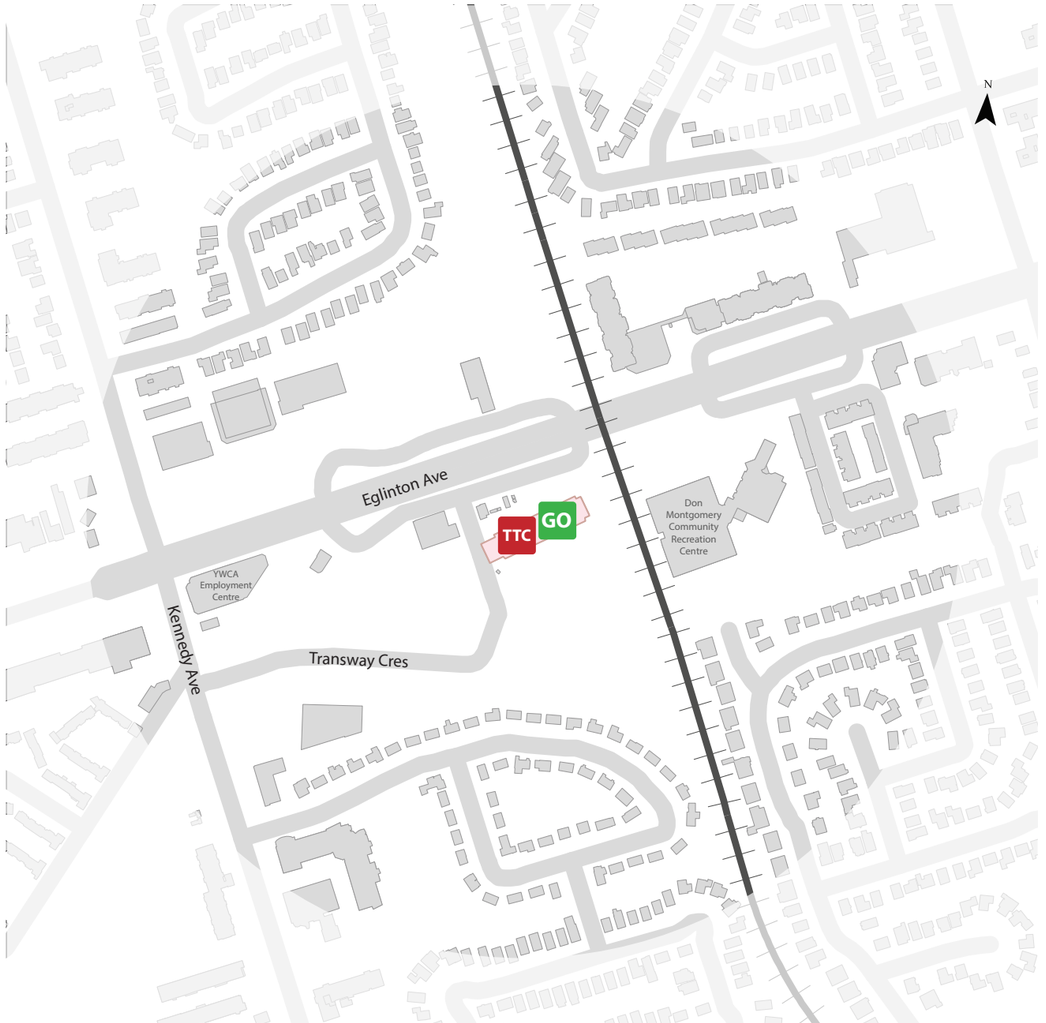


Figure 13: Area Surrounding Kennedy Station

4.2.2 Site Visit Audit

Table 2: Kennedy Gateway Hub Site Visit Audit Findings

Route Characteristics

Number of Staircases (or Escalators) to Complete the Transfer	Scarborough RT - Subway: 3 Scarborough RT - GO Train: 3 GO Train - Subway: 2
Elevators or Ramps Provided Where Stairs Required	Sometimes
Parking Lot Crossed	None
Pick-up and Drop-off Zones Crossed	None
Driveways Used by Buses or Streetcars Crossed	None

Station Characteristics

Number of Station Entrances	3
Number of Accessible Station Entrances	2
Number of Rapid Transit Modes	3
Number of Transit Shelters	Scarborough RT: 1 (within station) GO Platform: 5 Subway: 1 (within station)
Canopy Cover	All: Yes
Heated Waiting Area	All: No
Public Toilets	1 (1 M, 1 W)
Accessible Toilets	1 (1 M, 1 W)
Garbage Bins	Scarborough RT: 5 Concourse: 1 GO Platform: 4 Subway: 5

Pedestrian Signage

Signs visible at station entrances indicating the station name, agencies, and modes served	Yes
Static transit schedules posted at transit stops or in the station area	Yes
Maps of the station area and transit connections posted within station areas	2
Real time information available stating the arrival of the next rapid transit vehicle	Scarborough RT: 0 GO Platform: 0 Subway: 2

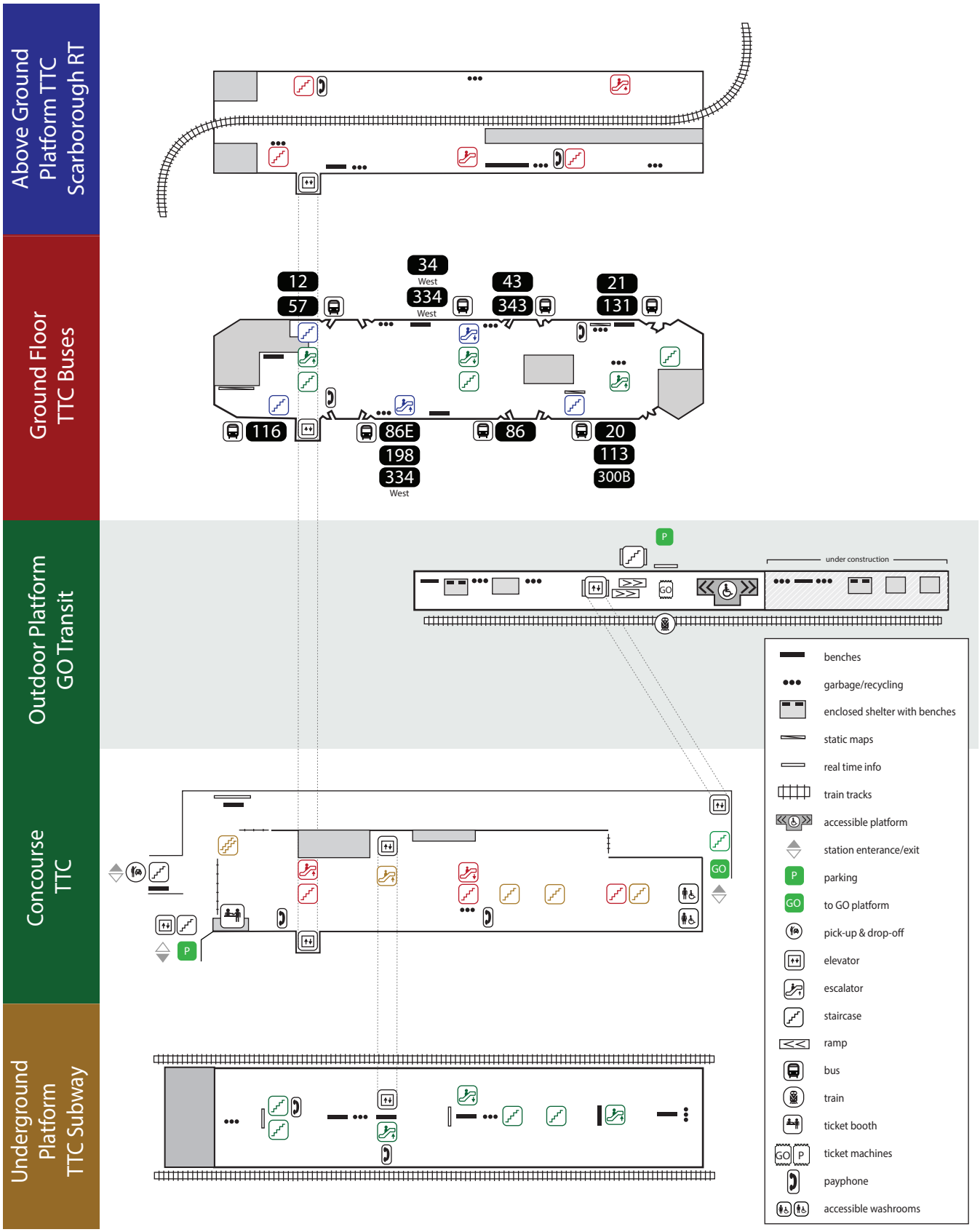


Figure 14: Kennedy Station Floor Plan (Adapted from TTC (b))

4.2.3 Intermodal Connectivity Audit and Sharing Circle Key Themes

(i) Wayfinding

Participants found the transfer route between the Scarborough RT, the subway, and the GO train confusing overall, as the pedestrian route was poorly marked.

Signage: Participants recommended that signs with arrows to indicate where transit riders can access other floors and transit modes should be placed more frequently to decrease confusion. More signs should also be placed to locate elevators, since existing elevator signs are only visible when directly in front of the elevator itself. Coloured lines and arrows on the floor would improve wayfinding between transit modes by leading transit users to stairs, escalators, elevators, and hallways necessary to transfer between transit modes. In particular, participants noted that the GO train was the most difficult transit mode to locate when relying on the few signs visible to them. Also within the station, signage to locate bathrooms should be placed at all floor levels.

Maps: Maps of the surrounding area are available within Kennedy station, but not on rapid transit platforms. Participants would like maps on platforms so transit riders exiting their train can find their way out of the station to their destination.

Real time information: Real time information is available on subway and GO train platforms, but not on the Scarborough RT platform. On the subway platform, reducing the glare from the platform lighting and increasing the text size would improve the communication of real time information. On the GO train platform, real time information is provided at a kiosk, but participants found it difficult to interpret since it did not explicitly state that service was not running at that time. Overall, participants would like to see real time information available on all rapid transit platforms that is easy to see and interpret.

Staff: More staff to ask for directions and to identify accessible elevators would help transit riders navigate Kennedy station.

(ii) Pedestrian Route

The transfer route between rapid transit modes at Kennedy Gateway Hub is not direct, well connected, or convenient.

Station design – stairs and escalators: Currently the transfer route is indirect and inconvenient because of poor connectivity between each level within the station. For example, where stairs lead to one platform, no staircases leading to the next platform are nearby **(Figure 15; Figure 16, number 14)**. In this instance, the transfer could be improved if stairs led from the subway level up to the concourse and bus level, and if the escalator path extended from the concourse level to the bus level. These improvements would ensure those using an escalator (for example) during their transfer can continue to use an escalator until they reach their destination.

Figure 15 illustrates this further: the blue rectangle outlines the area of focus where the existing infrastructure leads to a confusing transfer experience. Within this rectangle is a red staircase connecting the ground floor (TTC buses) to the concourse level. Someone descending this staircase would face arrive at the concourse facing in the direction of the blue arrow on the left. Also within the blue rectangle is a yellow escalator, which comes up to the concourse from the underground subway platform. Someone using this escalator would face in the direction of the blue arrow on the right, towards the red staircase.

Riders this escalator can continue ascend to the next level using the staircase; however, those wanting to use an escalator for their whole transfer are unaware of the existing (red) escalator behind them. In the other

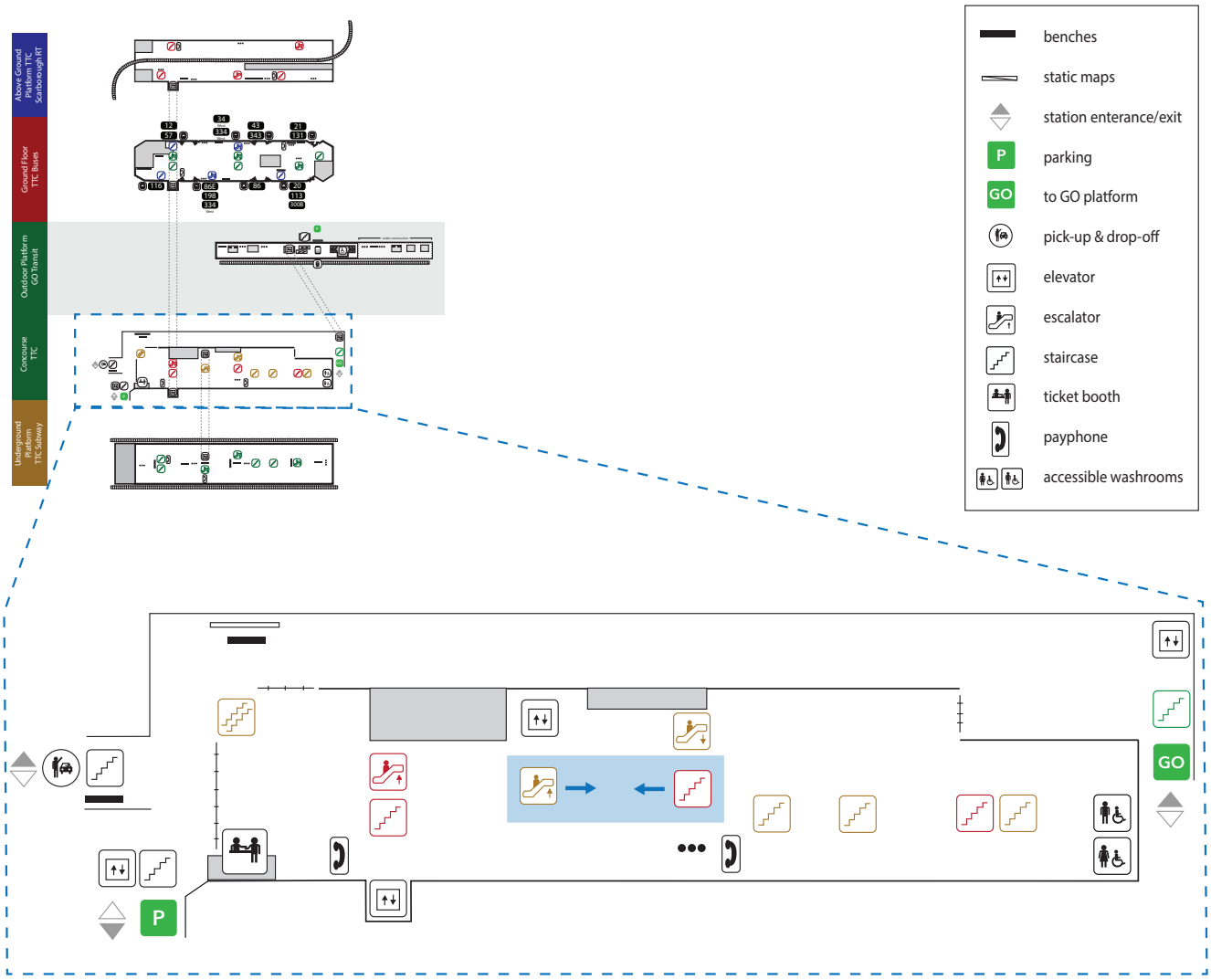


Figure 15: Kennedy Station Floor Plan of the Concourse Level (Adapted from TTC (b)).

direction, if a rider was using the red staircase to descend to the concourse, they are met with an escalator coming up to the concourse. This would cause the rider to wonder how they can reach the subway, as the yellow staircase to the right is not in their line of vision. The transfer can become more intuitive with the placement of the same type of infrastructure within the line of vision of the existing infrastructure.

Station design – elevators: Similar to stairs and escalators, participants recommended connections should be improved between elevators. Currently, two elevators are needed to complete a transfer between the subway and the bus or Scarborough RT platforms. The transfer would be improved if only one elevator was needed, to increase efficiency and decrease confusion that occurs when transferring between elevators. Additionally, at least two elevators should be present to access each platform for assured accessibility. For example, on the Scarborough RT platform, only one side of the platform has an elevator. If someone with a mobility device was to unknowingly exit the train on the side where no elevator is available, they would need to wait for the next train to cross the platform and exit the station **(Figure 16, number**

2). Further, if the single existing elevator is out of order, riders with mobility devices would need to board the train again to reach the next nearest accessible TTC station and then take a bus to Kennedy station, increasing their travel time. Additional elevators would also address capacity issues. For example, one of the participants in a wheelchair was completing the transfer and they needed to wait for three elevators to pass before boarding, since the previous elevators were at capacity.

PRESTO: No PRESTO loading stations are currently available within the Kennedy TTC station, and would be useful on all station floor levels for riders to reload their PRESTO cards at their convenience.

(iii) Public realm and amenities

Along the transfer route, participants recommended several built environment and pedestrian amenities that could be improved to provide a better the pedestrian experience. On the GO platform, the ramp from the elevator is too narrow and uneven, making it difficult for wheelchair and other mobility device users to comfortably access the GO platform **(Figure 16, number 6)**. More seating and garbage bins should be provided the within Kennedy TTC station, for those waiting for company or for the next train.

Participants did not believe the transfer between transit modes at Kennedy Gateway Hub was enjoyable as the station was poorly lit, and lacks vibrancy. Better internal lighting, more natural lighting, and artwork would help transit riders view Kennedy station as an attractive transit hub.

(iv) Winter Conditions

Kennedy station is not heated, resulting in a cold transfer experience for participants. Within the station, staircases act as wind tunnels, circulating cold air from the ground floor to the rest of the station floors. Those using wheelchairs are especially susceptible to winter temperatures since they are sitting and do not have the opportunity to walk around while waiting for transit.

Figure 16 on the next page identifies areas of improvement within Kennedy station. These suggestions are derived from the intermodal connectivity audit and sharing circles, as suggested by participants.

4.3 Evaluating the Intermodal Connectivity Audit and Sharing Circles

Participants found the intermodal connectivity audit tool thorough. However, some suggestions include the following: adding a table of contents to the first page, using more consistent language (i.e. pathway instead of sidewalk, walkway, and pathway), and separating questions by transit mode. It was also suggested to have written instructions for each survey section, so auditors know when to complete each section (e.g. "After completing section one and two on Transit and Area Information, and Amenities, wait to complete section three on the Transfer Route until the whole transfer has been completed"). Overall, participants found the maps and floor plans useful and easy to read, and expressed that the audit was clear and consistent in what it was asking.

The sharing circles were valuable to ensure time for participants to ask questions about the intermodal connectivity audit, and to elaborate on their experiences, especially transfer characteristics not addressed in the audit. Participants also enjoyed taking part in the sharing circles, as it allowed for a more open conversation. In all, the sharing circles were a great pairing with both the site visit and the intermodal connectivity audits to gain an in depth understanding of the transfer experience.

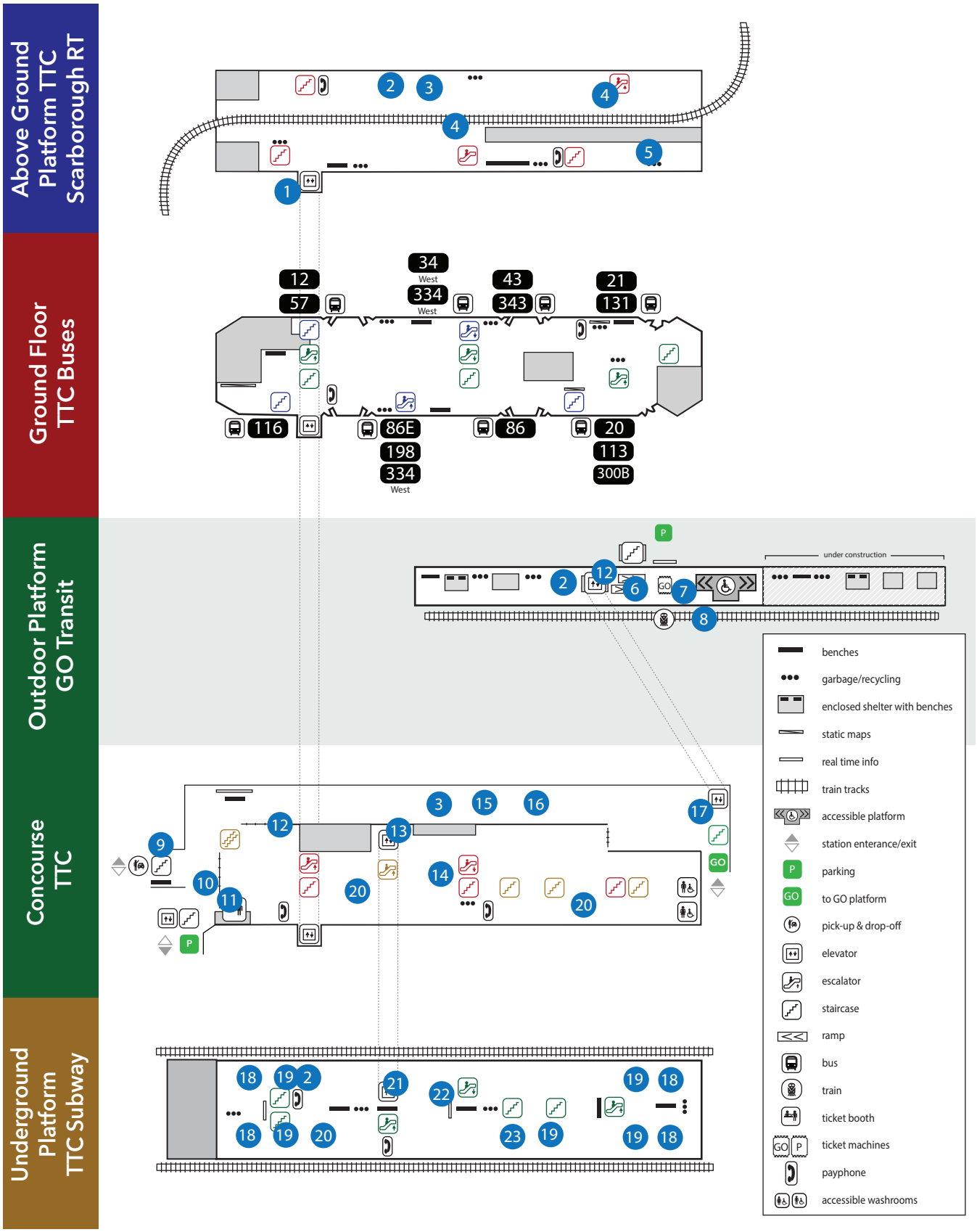


Figure 16: Pedestrian Environment Improvement Areas in Kennedy Station

1. Elevator buttons are not intiutive (e.g. what is the concourse?) Buttons should state the transit mode accessible by each floor.
2. Add an elevator so at least two elevators are available per building level, and at least one elevator is present on each side of the rail tracks.
3. Add benches.
4. Add garbage bins.
5. Relocate garbage bins so they are more accessible along the transfer route.
6. Ramp is bumpy and too narrow.
7. Ticket machines do not show the ticket price.
8. Loading ramp from GO train doors is not attached to the boarding platform, and can easily fall into the tracks.
9. Add an elevator here, or add a sign to instruct elevator users to the alternative route at the pick-up and drop-off zone.
10. Add PRESTO reload machine.
11. Lower PRESTO tap on accessible station terminal so it is within comfortable reach for someone in a wheelchair.
12. Add PRESTO tap for wheelchair, or other mobilty device users to be able to enter the station at this terminal.
13. Elevator button hard to reach.
14. Ensure infrastructure is aligned so that transit riders can efficiently find the route to the next transit mode. In this location, stairs lead to an open concourse without sign of the saircase a few steps behind.
15. Improve lighting.
16. Add more wayfinging signs along the hallway for the GO train platform exit, including signs for the elevator.
17. Clean elevator.
18. Add signs for stairs to direct transit riders to the nearest exit.
19. Add real time information screens closer to the subway tracks, in visible range from transit users waiting for the subway.
20. Add wayfinding signs, especially to locate the GO Transit platform.
21. Use a different font for elevator signs (illegible from far away).
22. Ensure real time information signs show next train times in a larger font, visible from further down the platform. Reduce glare from platform lighting.
23. Decrease the ability for stairwells to act as a wind tunnel.

5.0 DISCUSSION

This section discusses the existing and emerging policy context including initiatives from the City of Toronto, the TTC, and Metrolinx, with objectives that can improve intermodal connectivity in relation to the key themes from the findings section of this report. These policies and initiatives were analyzed to identify opportunities to implement their objectives, and to identify other ways in which transit transfers can be improved.

5.1 Existing and Emerging Policy Framework

Four main themes of policies and initiatives are explored in this section, relative to the aforementioned barriers listed in 4.0 Findings, which include:

- Wayfinding;
- Station design (to address the pedestrian route, and the public realm and amenities);
- Accessibility (to address the pedestrian route); and,
- Winter conditions.

All policies and initiatives are explained under these four themes.

5.1.1 Wayfinding

Both the TTC and Metrolinx have developed their own wayfinding standards.

TTC Signage Manual and Standards—
The TTC's Signage Manual and Standards (2014) provides basic objectives of wayfinding signage that anticipate multi-modal journeys, support connections with other GTHA transit agencies, progressively disclose information, and incorporate accessibility in planning, among others. This manual is updated annually and while the most recent document is not public, TTC has shared the manual with other transit agencies in the GTHA to inform thier wayfinding practices. The TTC also has an nintermodal-specific wayfinding system guide (2018b), which applies principles of the Signage Manual and Standards with specific guidelines on signage design and placement. One important aspect from this guide is to ensure maps and station information are available on both sides of the fare line.

Metrolinx Wayfinding Harmonization—
Metrolinx has initiated a wayfinding harmonization initiative in response to the expanding transit network in the GTHA. The initiative involves all GTHA transit agencies, with the goal to resolve wayfinding inconsistencies between operators.

A Wayfinding Design Standard Manual (2018d) was developed with a "customer first" design, assuming no previous knowledge of the transit system and is also compliant with AODA guidelines. The manual details:

- A suggested wayfinding planning process;
- Movement planning;
- Sequence planning;
- Messaging and placement;
- Coordination with operators; and,
- other specific standards.

Similar to the TTC manual, the Wayfinding Design Standard recognizes the importance of progressive disclosure. For example, maps of surrounding areas are only provided at station entrances and exits; this is where transit users decide how to reach their destination. Maps are therefore not present at station platforms, since transit users need to first identify where the station exit is located.

This manual is a guide for the current phase of the wayfinding harmonization initiative, which includes pilot projects at seven selected stations where additional wayfinding tools are being placed within the stations to help transit users navigate to their destination, or the transit service they need. One of the seven pilot projects is taking place at Bloor GO Transit/UP Express station, one of the study areas. Here, two wayfinding maps will be placed in the

tunnel entrances, as shown in **Figure 17**.

5.1.2 Station Design

Metrolinx has several station design guidelines including Mobility Hub Guidelines (2011), GO Design Requirements Manual (DRM) (2017b), and GO Design Excellence Guidelines (GODEG) (2018b).

Metrolinx Mobility Hub Guidelines—
The Mobility Hub Guidelines were developed to inform the development and planning of mobility hubs in the GTHA. The Guidelines address factors that create successful mobility hubs such as transit station design, wayfinding, and station circulation and access, as well as how these guidelines can be funded and implemented. Three objectives of the Mobility Hub Guidelines relate to the themes of this report:

Objective 2: Safe and efficient movement of people
- Conduct walkability studies along priority corridors to identify barriers to station access and adequacy of pedestrian amenities
- Maximize safety and security by retrofitting the pedestrian environment to meet or exceed accessibility guidelines

Objective 3: A well-designed transit station
- Create safe and convenient accessible pedestrian connections to regional and local transit services
- Develop wayfinding signage for efficient navigation of the transit station and transit area

Objective 6: An attractive public realm
- Promote the use of transit by improving the sense of place and walkable area around the station
- Implement trees, street furniture, and public art to improve the pedestrian experience
- Plan for weather protection that is incorporated into street and station design (Metrolinx, 2011)

Metrolinx Design Requirements Manual (DRM)— The DRM is a technical document that outlines the infrastructural and design requirements at GO stations, terminals, and facilities. The DRM applies to new construction, retrofits, and state of good repair works. The guiding principles of the DRM include the following:
- Universal Access;
- Customer Service;
- Sustainable Design; and,
- Integrated Design.

One specific objective of the DRM is to implement wayfinding to ensure an easy and efficient transit journey. Another objective of the DRM is to provide a continuous accessible route where there is opportunity for direct access. Relatedly, under the DRM, redundant access, such as a secondary elevator, should be provided for an alternative accessible route to reach all transit modes (Metrolinx, 2017b).

Metrolinx GO Design Excellence Guidelines (GO DEG)— The GODEG is an internal document outlining the design principles for GO stations and sites. The core design principles in the GODEG include:
- Responsive placemaking;
- Design for everyone;
- Legible and consistent design identity;
- Clean and simple design;
- Enduring and practical design; and,
- Sustainable design and climate resiliency (Metrolinx, 2018b).

In particular, these guidelines require accessible universal design with clear circulation paths, and staff available to aid transit riders at the station. Additionally, these guidelines create incentive for transit stations to be seen as transit hubs, by integrating art, celebrating locality and heritage, and through the engagement of community members and municipal stakeholders in station design.

Other relevant design-related guidelines include specifications for GO Shelter Designs (Metrolinx, 2016b) and the Accessible Design Guidelines (Metrolinx, 2015a). The GO Shelter Designs document includes specifications concerning heating within enclosed platform shelters, in addition to the materials used and maintenance of shelters (Metrolinx, 2016b). The Accessible Design Guidelines build upon design excellence principles with guidelines to ensure transit services are accessible for all its users (2015a). Other initiatives concerning accessibility are described in the next section (5.1.3).

5.1.3 Accessibility

The Accessibility for Ontarians with Disabilities Act (AODA) came into effect in 2005. The AODA applies to public, private, and non-profit sectors in Ontario, including the City of Toronto, Metrolinx, and the TTC. In accordance with the AODA standards, all three aforementioned organizations consult with people with disabilities and others to publish an annual accessibility plan, accompanied by a multi-year accessibility plan (revisited every five years). These documents are meant to demonstrate each organization's compliance with the legislated AODA standards

Some of the clauses relevant to intermodal connectivity include accessibility training (clause 36), service disruptions (clause 50), and general duties of municipalities (clause 78). These sections require municipalities to conduct employee accessibility training, make accessible arrangements to transfer people with disabilities when a route is changed, and consult with the municipal advisory committee, the public, and other persons with disabilities when developing accessible design criteria (City of Toronto, 2012).

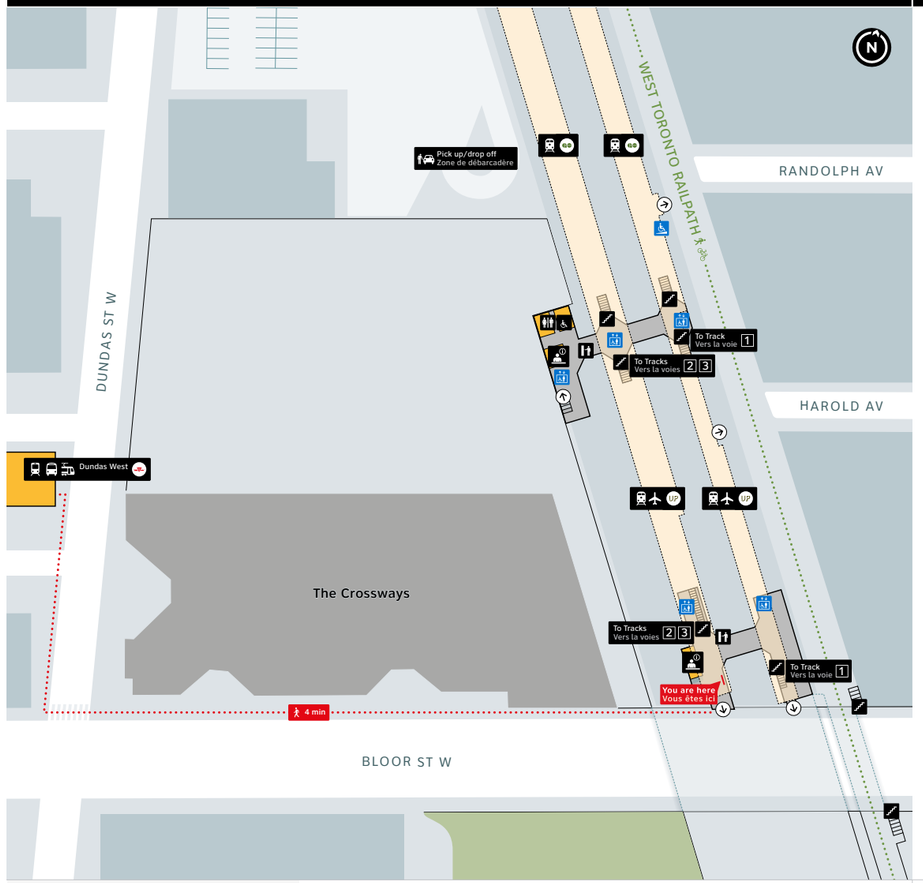
Both Metrolinx and the TTC evaluate their progress towards achieving AODA standards in their Accessibility Plan Status Update reports (Metrolinx, 2016a; Metrolinx, 2017a; TTC, 2018c), as detailed below.

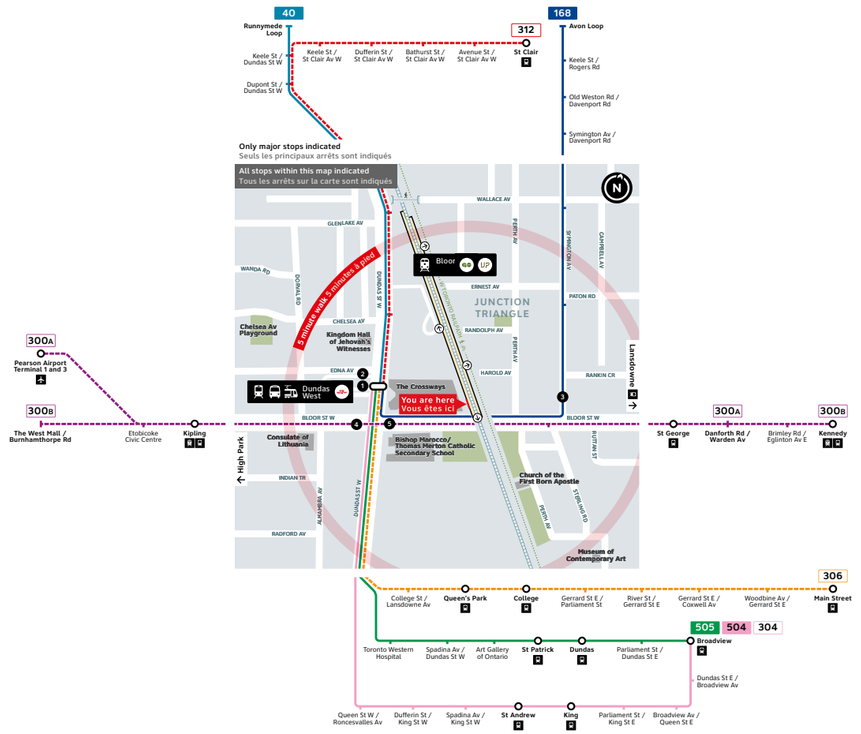
Metrolinx Accessibility Plan Status—
Select objectives from the Metrolinx Accessibility Plan Status include the following:
Implement accessibility enhancements at selected stations (including Bloor);
Install lower PRESTO reader at accessible fare gates in TTC subway stations;
Improve customer service with accessibility enhancements for the GO website;
Work with municipal partners across the GTHA to help ensure seamless cross-boundary travel experience (i.e. intermodal connectivity); and,
Include the Accessibility Advisory Committee (AAC) members in Metrolinx's Design Review Panel to provide more detailed input on station designs (Metrolinx, 2016a; Metrolinx 2017a).

TTC Accessibility Plan Status— Select objectives from the TTC Accessibility Plan Status include the following:
- Complete accessibility retrofits at selected stations;
- Create new accessible station entrances where opportunities arise;
- Collaborate with Metrolinx to ensure all major transfer points between both agencies are accessible (including consultation with the TTC's Advisory Committee on Accessible Transit (ACAT) at Kennedy station, among others, to review its station design in anticipation of the ECLRT);
- Implement escalator and elevator real-time monitoring system;
- Guarantee consistency in accessibility signage at elevators; and,
- Ensure all PRESTO devices are accessible (TTC, 2018c).

Bloor Station map
Carte de la gare de Bloor

Buses and streetcars
Autobus et tramways





Legend Légende

- Trains
- Airport Train — Liaison air-rail
- Subway — Métro
- Buses — Autobus
- Streetcars — Tramways
- For GO Trains — Pour les trains de GO
- For UP Express — Pour UP Express
- Exit — Sortie
- Stairs — Escaliers
- Elevator — Ascenseur
- Customer service — Service à la clientèle
- Ticket machine — Distributeur de billets
- Washrooms — Toilettes
- Pick up/drop off — Zone de débarcadère
- Parking — Stationnement

Local bus services — Services d'autobus locaux

ROUTE NAME / NOM DU TRAJET	DIRECTION	STOP / ARRÊT
40 Junction	Northbound Vers le nord	1
168 Symington	Northbound Vers le nord	1 3
300A Bloor-Danforth Night bus service / Service d'autobus de nuit	Westbound Vers l'ouest	5
300B	Eastbound Vers l'est	4
312 St Clair–Junction Night bus service / Service d'autobus de nuit	Northbound Vers le nord	2

Local streetcar services — Services de tramway locaux

ROUTE NAME / NOM DU TRAJET	DIRECTION	STOP / ARRÊT
504 King	Eastbound Vers l'est	1
304 King Night bus service / Service d'autobus de nuit	Eastbound Vers l'est	2
505 Dundas	Eastbound Vers l'est	1
306 Carlton Night bus service / Service d'autobus de nuit	Eastbound Vers l'est	2

Diagram is not to scale. Information correct at time of going to print 2018-04-25.
Le diagramme n'est pas à l'échelle. Information correcte au moment de l'impression 2018-04-25.

Legend Légende

- 0 Route number — Numéro du trajet
- Interchange — Correspondance
- Bus/streetcar stop — Arrêt d'autobus/de tramway
- Terminus
- Regular service — Service habituel
- Special service — See schedule for information / Service spécial / Voir l'horaire pour de plus amples renseignements
- 2 Bus/streetcar stop location — Emplacement d'arrêt d'autobus/de tramway
- Connection to Trains — Correspondance avec le service ferroviaire
- Connection to Subway — Correspondance avec le métro
- Airport — Aéroport
- Exit — Sortie

All buses are step-free. Not all stations and stops are step-free. Check with operator or visit www.triplinx.ca before travelling.
Tous les autobus offrent l'accès facile. Certains arrêts et stations n'offrent pas l'accès facile. Veuillez vérifier auprès de l'exploitant ou visiter www.triplinx.ca avant de vous déplacer.

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METROLINX

Figure 17: Wayfinding maps for the Bloor station pilot project of Metrolinx's Wayfinding Harmonization initiative. Left: Map of the transfer route from Bloor station to the Dundas West (TTC) station. Note that this map excludes Route 2, which leads transit users through a parking lot without a pedestrian pathway leading from the northern tunnel at Bloor station (see Figure 7 for details). Right: Map of the area surrounding Bloor station in a 5-minute walk radius, including Dundas West station, and the transit lines accessible from this area.

Other documents address accessibility, such as Metrolinx's DRM and Mobility Hub Guidelines (Metrolinx, 2011; Metrolinx, 2017b), through objectives to implement accessible wayfinding features, a barrier-free route, accessible washrooms, and to create an accessible, clear, and direct transfer between transit modes.

5.1.4 Winter Conditions

Metrolinx considers winter conditions in several of its guiding documents and policies. The GO Design Excellence Guidelines (GODEG) ensures building designs provide protection from winter winds and allow for maximum solar exposure to reduce energy consumption and operating costs associated with heating stations (Metrolinx 2018b). The Design Requirements Manual (DRM) considers shelter, heating, and snow melt at stations. Canopies and shelters are required on all rail platforms and the most efficient source heating should be used at stations (Metrolinx, 2017b). Full snowmelt is required on all new rail platforms and ramps, and snow storage is considered in station landscaping designs (Metrolinx, 2017b). Finally, the Mobility Hub Guidelines promote weather protection to be incorporated in the areas surrounding stations, in street and station designs (Metrolinx, 2011).

While these three documents consider current operations during the winter season, one of Metrolinx's goals is to improve climate resiliency under Strategy 5 of the 2041 RTP: to prepare for an uncertain future (Metrolinx, 2018c). This includes the following initiatives to design new infrastructure, and strengthen existing infrastructure to resist extreme weather:

- Vulnerability assessment pilot project;
- Asset management;
- Design practices;
- Emergency response planning and preparedness; and,
- Regional and strategic planning.

Relatedly, the Planning for Resiliency report (Metrolinx, 2017d) explores how a changing climate will introduce new winter season conditions such as more extreme rainfall days, which may lead to more frequent flooding. To prepare for differing winter weather events, Metrolinx has conducted several initiatives including a vulnerability assessment pilot project, implementing resiliency and adaptation principles into its design guidelines, and establishing emergency response planning and preparedness principles.

5.2 Opportunities to Improve Intermodal Connectivity

This section analyses how the existing and emerging policies and initiatives, as well as planned station upgrades, will address the barriers to intermodal connectivity as described in the four key themes, and where opportunities for further improvement exist.

5.2.1 Wayfinding

Findings from the intermodal connectivity audits and sharing circles identified the placement and frequency of signage, maps, and real time information, in addition to a lack of informational staff as the main wayfinding barriers to intermodal connectivity. The existing and emerging wayfinding policies and initiatives identified in Section 5.1.1 provide an excellent basis to overcome barriers to intermodal wayfinding, as presented in **Table 3.**

In particular, the Wayfinding Design Standard (2018d) and Metrolinx's Wayfinding Harmonization initiative create an opportunity to improve wayfinding regionally, thereby improving intermodal connectivity and resolving many of the identified barriers. Although real time information is considered a part of wayfinding in the Metrolinx Wayfinding Design Standards (2018d), the main gap in policy for wayfinding concerns the design of real time information screens. Real time information should either be implemented

into the existing standards, or specific real time information standards should be developed to improve its legible and intuitive design.

Planned upgrades at both Gateway Hub study areas will affect the transfer experience. The tunnel at Dundas West-Bloor will resolve many wayfinding barriers by creating a more direct transfer at this Gateway Hub. The construction of the ECLRT at Kennedy station will expand the transfer area from one building to three. This creates a larger transfer area, but the implementation of tunnels will mitigate any potential wayfinding barriers occurring outdoors. While not necessarily included in the station plans, changes at both study areas provide an opportunity to implement wayfinding harmonization principles, ensuring the new transfer routes are intuitive and result in an efficient transfer for transit users.

Additional Considerations— Additional wayfinding considerations include the inclusivity of wayfinding practices: a gap in the wayfinding guidelines as well as this study's scope is how wayfinding is experienced differently for people who are blind or visually impaired. Many wayfinding principles are visual, and do not consider how station infrastructure such as walls along the platform, different floor materials, and pillars or poles, can act as wayfinding guides for the visually impaired (ADOA Alliance, 2018). This is one example of how wayfinding practices should consider the needs of transit users with varying abilities. The wayfinding guides should be adapted in consultation with Metrolinx's AAC to ensure their principles address the needs of all transit users.

5.2.2 Pedestrian Route

Barriers to intermodal connectivity along the pedestrian route include a lack of designated pedestrian pathways and safe street crossings for the outdoor transfer area, and poor connectivity due to the lack of intuitive placement of elevators, escalators, anzd stairs inside stations. Many of the design guidelines presented in 5.1.2 address these barriers, as shown in **Table 4**.

The main policy gap is the alignment of similar infrastructure (e.g. escalators with escalators) to create a more intuitive transfer experience. This gap should be addressed in both the DRM (Metrolinx, 2017b) and GODEG (Metrolinx, 2018b), as well as the Accessible Design Guidelines (Metrolinx, 2015a).

Table 3: Wayfinding policy review and gaps

Main Improvement Areas	Policies Addressing Improvement Areas	Policy Gaps
Lack of maps showing transfer route	MX Wayfinding Design Standards (9.3)	n/a
Poor and too few wayfinding signage along transfer route (inside station)	TTC Signage Manual and Standards (3.1.1) TTC Intermodal Stations Wayfinding System MX Wayfinding Design Standards (7.2, 7.3, 8.1) MX Mobility Hub Guidelines (3.5.1) MX Design Requirements Manual (C.1, C.3)	n/a
Poor and too few wayfinding signage along transfer route (outside station)	Mobility Hub Guidelines (2.4.2, 2.4.3)	n/a
Real time information not directly visible or legible from station entrance	Mobility Hub Guidelines (1.1.5)	n/a
Real time information not directly visible or legible on transit platform	MX Wayfinding Design Standards (8.1.5, 8.1.7)	Policies cover the placement of signage, but not the design of real time information screens
Lack of staff to help riders with transfers	MX GO Design Excellence Guidelines (2.5)	n/a

Table 4: Pedestrian route policy review and gaps

Main Improvement Areas	Policies Addressing Improvement Areas	Policy Gaps
Unmarked pedestrian pathway and unclear streetcar track crossing	MX Mobility Hub Guidelines (2.4.3, 2.4.5)	n/a
Too short intersection crossing		Intersection crossing times are under municipal jurisdiction
Poor connectivity between elevators, escalators, and stairs	MX Mobility Hub Guidelines (1.1.4)	Connectivity of vertical circulation is addressed broadly, but the specific alignment of infrastructure is not detailed
Lack of accessible redundancy	MX Mobility Hub Guidelines (1.1.4) MX Design Requirements Manual (D.1, D.2) MX Accessible Design Guidelines (13)	n/a

The planned improvements at Dundas West-Bloor and Kennedy Gateway Hubs will address the key intermodal transfer barriers identified by intermodal connectivity audit and sharing circle participants. At the Dundas West-Bloor Gateway Hub, the future tunnel connection will completely bypass the outdoor transfer resulting in a more direct and intuitive route. The tunnel will also improve safety by minimizing and avoiding street level hazards, such as crossing streetcar tracks, parking lots, and busy car-centric intersections, which were identified by participants to be safety concerns. At Kennedy station, the transfer between modes will also occur through a pedestrian tunnel, with the same advantages as Dundas West-Bloor **(Figure 18)**.

Planned improvements at both Gateway Hubs consider better connectivity for accessibility needs. The tunnel at the Dundas West-Bloor Gateway Hub will be completely accessible and will provide a more direct transfer route between transit modes. The tunnel will also create complete redundancy for the rapid transit transfers, as two elevators will connect to the subway platform from either end of the platform (one from the existing Dundas West station, and another from the future tunnel leading to the existing Bloor station). However, as the existing Dundas West TTC station will not be altered during tunnel construction, redundancy to reach the concourse and the ground floor (the streetcar and bus bay) will not be achieved. The future ECLRT building entrances at Kennedy station are accessible,

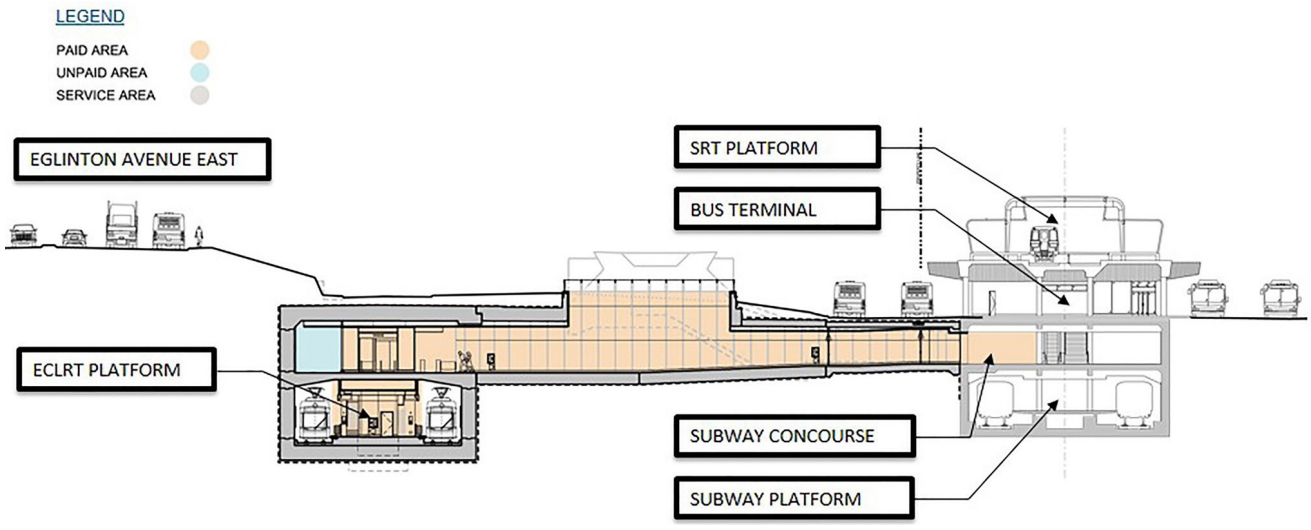

Figure 18: Eglinton Crosstown LRT and TTC Kennedy Transit Station Kennedy Cross-section looking east (TTC, 2018a)

and will provide a few routes to access the LRT platform.

While both plans incorporate redundancy into their design features, complete redundancy will not be achieved for the whole transfer route. Therefore, if the one accessible route provided is out of service (e.g. an elevator is broken), people who require this route are unable to access their desired transit mode.

Additional Considerations— Metrolinx and other transit partners across the GTHA are considering fare integration (see Steer Davies Gleave, 2017) to make crossing municipal boundaries simpler for transit riders. Depending on the fare integration concept chosen, this could have an impact on how stations need to be designed, and how transit users transfer between transit modes. For example, in the Dundas West-Bloor tunnel plans **(Figure 4)**, the fare-free zone on the concourse level would be unnecessary with fare integration where riders do not need to cross fare lines. Eliminating fare terminals at this level creates an opportunity for a more convenient and accessible transfer, by simplifying the transfer route. While fare integration is still in development, it should be considered when discussing transfers and station plans.

5.2.3 Public Realm and Amenities

Participants from the intermodal connectivity audit and the sharing circles identified the need to improve station aesthetics and amenities such as benches, garbage bins, and trees as areas to contribute to the public realm. The majority of these barriers are addressed in Metrolinx's policies, as presented in **Table 5**.

In addition to the specific policies addressing the barriers presented in **Table 5**, design guidelines include initiatives to improve the public realm and amenities at stations. Under the Mobility Hub Guidelines (Metrolinx, 2011), walkability studies should be conducted to assess the adequacy of pedestrian amenities. The GO DEG addresses other factors to improve the public realm as it seeks to create unique stations that attract transit users in designing stations through community engagement and valuing the locality and history of the surrounding station area.

Specific to the study areas, the Dundas West-Bloor tunnel connection follows Metrolinx's Design Excellence requirements, as it incorporates natural lighting from the platform level "lightboxes" on the Bloor platform. While the tunnel will not be completely lit by natural lighting, this feature responds to some of participants' desires in this study.

At Kennedy Station, ECLRT designs include natural lighting, integrated artwork, and an outdoor urban plaza with seating areas and bicycle parking **(Figures 20 and 21)**. Surrounding the station is a multi-use pathway to connect pedestrians and cyclists in the surrounding area to Kennedy Gateway Hub. These design features and future development will lead to an impactful impression of Kennedy station as a transit hub.

Table 5: Public realm and amenities policy review and gaps

Main Improvement Areas	Policies Addressing Improvement Areas	Policy Gaps
Inadequate number of station amenities on station platforms (benches, garbage bins, washrooms)	MX Design Requirements Manual (B.1, F.4)	Location of amenities are outlined, but not the required quantity per location
Inadequate number of station amenities along transfer routes (benches, garbage bins, trees)	MX Mobility Hub Guidelines (2.4.3)	n/a
Poor public realm (lack of natural lighting, trees and integrated art)	MX Mobility Hub Guidelines (1.1.5, 3.1, 6.1) MX Design Requirements Manual (B.4) MX GO Design Excellence Guidelines (2.4)	n/a

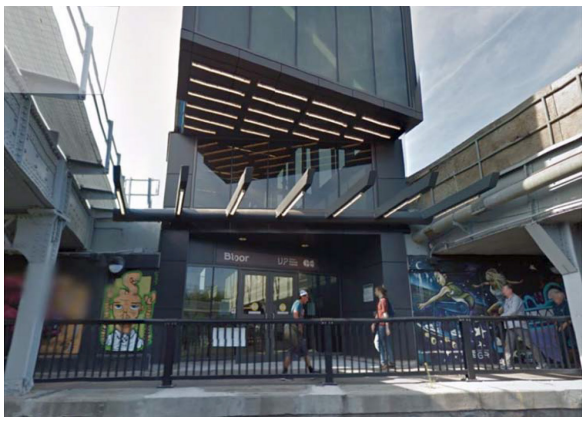

Figure 19: Photo of the existing Bloor station "lightboxes" on the GO Transit and UP Express platform, from street level (Amec Foster Wheeler, 2016)

Figure 20: Eglinton Crosstown LRT Kennedy Station Main Entrance Plaza (Metrolinx, 2018a)

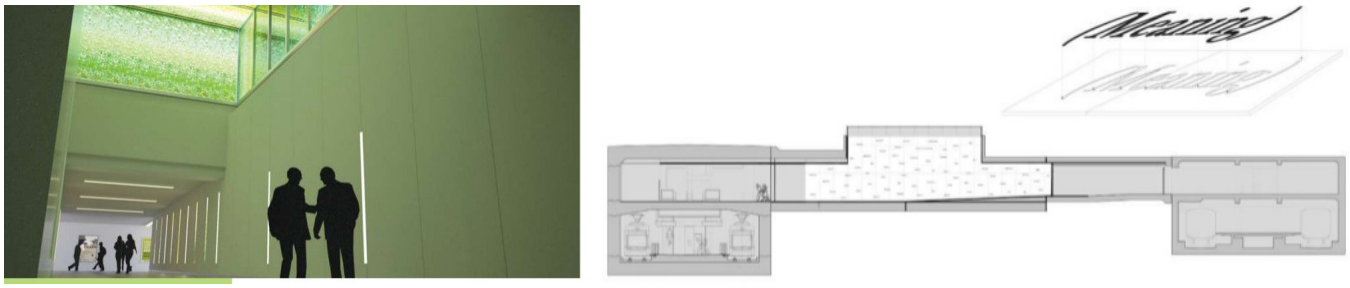

Figure 21: Eglinton Crosstown LRT Kennedy Station Integrated Art Renderings. Left: "Reorganization of One Hedge" by Dagmara Genda. Right: "Locations of Meaning" by Joseph Kosuth (Metrolinx, 2018a).

5.2.4 Winter Conditions

The main winter condition barriers identified in the findings section of this report are a lack of enclosed shelters, heated waiting areas, and the poor mitigation of wind tunnels. A couple policies address these barriers broadly, as shown in **Table 6**.

There are several policy gaps concerning winter season barriers. While mentioned in policies, user controlled heating features and station heating barriers are not adequately addressed. Resolving these barriers should be incorporated into their respective policies. Additionally, mitigation of wind tunnels should be included as a part of the DRM to reduce the circulation of cold air within stations (Metrolinx, 2017b).

Table 6: Winter conditions policy review and gaps

Main Improvement Areas	Policies Addressing Improvement Areas	Policy Gaps
Lack of intuitive user controlled heating features for enclosed platform shelters	MX GO Shelter Designs (2.2.3.5)	Policies align with current user controlled heating features, but do not improve intuitiveness
Poor mitigation of wind tunnels circulating cold winter temperatures within stations		Wind tunnel mitigation not addressed in current standards or policies
Station buildings not sufficiently heated	MX GO Design Excellence Guidelines (4.6.1, 5.3)	Policies consider the protection of transit users from winter conditions, but heating will not be resolved aside from better station insulation

Neither the Dundas West-Bloor tunnel, nor the future ECLRT buildings will be heated as it is against station design policy to heat stations (excluding enclosed platform transit shelters), to conserve energy. However, both structures will provide weather protection from winter conditions and ventilation in accordance with the GODEG (Metrolinx, 2018b). Other station improvements such as better insulation and air circulation should also be considered in station retrofits and the construction of new stations to protect transit users from cold winter temperatures.

5.2.5 Summary

The existing and emerging policies and initiatives discussed in this section satisfy many aspects of the four key themes from the findings (Section 4). The main challenge in using these tools to improve intermodal connectivity is their implementation: several of these policies and initiatives are still in development and cannot be implemented immediately, while others cannot be implemented at study areas without major reconstruction. Some recommendations for how barriers to intermodal connectivity can be resolved are provided in Section 6.

6.0 RECOMMENDATIONS

This section builds on the findings and discussion sections, and outlines recommendations to reduce barriers and improve winter season intermodal connectivity at all intermodal mobility hubs in the GTHA. A four-phase process is recommended to ensure intermodal transfers are direct, well connected, safe, convenient, and enjoyable:

- **Phase 1:** Implement improvements identified in the study areas (Dundas West-Bloor and Kenndy);
- **Phase 2:** Conduct intermodal connectivity audits at all intermodal mobility hubs;
- **Phase 3:** Implement best practices in retrofits and future station design; and,
- **Phase 4:** Continue periodic monitoring and evaluation of intermodal stations and policies, standards, and initiatives.

Phase 1: Implement improvements identified in the study areas

The first phase is to evaluate the specific findings from the Dundas West-Bloor and Kennedy Gateway Hubs to identify which improvements can be addressed in upcoming station works, either as part of the GO Transit Expansion program or state of good repair.

Recommendations

1. a) Responsibility: Any required changes should be addressed either by the owner of the facility and/or building (i.e. TTC or Metrolinx), or the municipality for off-site improvements (i.e. City of Toronto).

1. b) Upcoming Station Works: Barriers identified in Section 4 and 5 (Findings and Discussion) should be evaluated to determine if they can be addressed in upcoming station works through the GO

Transit Expansion program, or through state of good repair. Some examples of these barriers are presented in **Table 7 and 8**, per key issue. For more detailed findings, please refer to Section 4 and **Figures 11, 12, and 16**. The barriers that can be addressed should be resolved in the next station improvement cycle.

1. c) Interim Solutions: Barriers that will be resolved in station changes (i.e. the Dundas West-Bloor tunnel, and ECLRT) should still be addressed in upcoming station works or state of good repair (SORG).

1. d) Major Improvements: Major barriers to intermodal connectivity that cannot be resolved through upcoming station works should be addressed in future retrofits or in station building reconstruction, and should be considered in future transit station designs.

Table 7: Select examples of intermodal connectivity barriers at Dundas West-Bloor Gateway Hub

Examples of Intermodal Connectivity Barriers at Dundas West-Bloor Gateway Hub	Can be Addressed in Upcoming Station Work or SORG (Y/N)
Wayfinding	
• No maps in Dundas West TTC station showing the transfer route to Bloor GO Transit/UP Express station	Y
• Poor wayfinding signage along transfer route (small signs, only some transit modes indicated)	Y
• Real time information not directly visible from station entrance	Y
• Lack of staff to help riders with transfers	N
Pedestrian Route	
• Unmarked pedestrian pathway through a parking lot along Route 2	Y
• Crossing time along Route 1 too fast	N
• Unclear streetcar track crossings	Y
Public Realm and Amenities	
• Inadequate number of station amenities on station platforms (benches, garbage bins, washrooms), and along transfer routes (benches, garbage bins, trees)	Y
Winter Conditions	
• Too few enclosed shelters under the canopy on the ground floor of Dundas West TTC station	Y
• Lack of intuitive heating features for enclosed shelters on the Bloor GO Transit/UP Express platform	unknown

Table 8: Select examples of intermodal connectivity barriers at Kennedy Gateway Hub

Examples of Intermodal Connectivity Barriers at Kennedy Gateway Hub	Can be Addressed in Upcoming Station Work or SORG (Y/N)
Wayfinding	
• Too few wayfinding signage in the transfer area (of the existing TTC Kennedy station), especially towards the GO Transit platform	Y
• Small text and glare on real time information screens (in the existing TTC Kennedy station)	Y
• Lack of staff to help riders with transfers	N
Pedestrian Route	
• Poor connectivity due to placement of elevators, escalators, and stairs inside the station	N
Public Realm and Amenities	
• Inadequate number of station amenities on platforms (e.g. benches, garbage bins in the existing TTC Kennedy station)	Y
• Poor public realm (lack of natural lighting, trees and integrated art)	Y
Winter Conditions	
• Poor mitigation of wind tunnels circulating cold winter temperatures within Kennedy station	N

Phase 2: Conduct intermodal connectivity studies at all intermodal stations within mobility hubs

The second phase is to apply the same principles of this study to all mobility hubs that classify as intermodal stations in the GTHA to evaluate their intermodal connectivity, including site visit audits, intermodal connectivity audits, and sharing circles. Mobility hubs should be studied if two or more existing rapid transit lines intersect and stop within the mobility hub.

Recommendations

2. a) Responsibility: Metrolinx should lead and conduct intermodal connectivity studies in partnership with local transit agencies to ensure consistency of the audits, in accordance with other transit agencies' station requirements.

2. b) Audit Tool: Before conducting audits at all intermodal stations, the audit tool should be revised to consider other intermodal connectivity aspects, the potential of fare integration, and the tool's usability. Additionally, the audit tool should be reviewed by the Metrolinx Accessibility Advisory Committee (AAC) to ensure auditors are able to identify all accessibility barriers. The audit tool for this study was only completed with motorized wheelchair users; other types of disability experiences were not captured. For example, how a person who is blind navigates a transit system is much different than how a sighted person in a wheelchair does.

2. c) Priority: While all mobility hubs should be studied, priority should be given to stations with rapid transit transfers between different transit agencies, and stations that have upcoming station works. Studies of all intermodal stations should be completed as a part of the asset management program, under the Station Services division at Metrolinx. **Table 9** identifies the level of priority for completing studies at intermodal mobility hubs in the GTHA. Intermodal stations with high priority should be completed in the next three years; mobility hubs with low priority should be completed within 5 years. The considerations used to assign the level of priority for each hub is available in Appendix F.

Table 9: Level of priority for intermodal connectivity audits

High Priority (Unique Transit Agencies)	Low Priority (One Transit Agency)
• Kipling • Main-Danforth • Newmarket GO • Richmond Hill-Langstaff Gateway • Union	• Eglinton-Mt.Dennis • St.George • Yonge-Bloor • Yonge-Sheppard

Phase 3: Implement best practices in retrofits and future station design

The third phase is to evaluate the findings from Phase 2 (conducting intermodal connectivity audits at all intermodal stations) to determine which changes can be addressed through state of good repair or in major station upgrades through the capital program.

Recommendations

3. a) Responsibility: Any required changes should be addressed either by the owner of the facility and/or building, or the municipality for off-site improvements.

3. b) Upcoming Station Works: Barriers should be evaluated to determine if they can be addressed in upcoming station works, such as through state of good repair, in future retrofits, or in station building reconstruction.

Phase 4: Continue monitoring and evaluation

The final phase is to continue monitoring intermodal connectivity conditions at all intermodal stations, and to update relevant policies and programs in accordance with intermodal connectivity study findings.

Recommendations

4. a) Responsibility: Metrolinx should oversee the monitoring and evaluation process, as described in the following recommendations.

4. b) Ongoing Station Evaluation:
Intermodal stations that have implemented the needed changes from phase 1 and 3 (station retrofits to improve intermodal connectivity) as a part of station works or through major station improvements, should be evaluated either every 10 years, or before changes to a station occur (whichever occurs first). The purpose of this evaluation is to determine which retrofits were successful in addressing the identified barriers to intermodal connectivity and to identify where other improvements need to be made in future station works.

4. c) Policy and Initiative Upgrades:
Intermodal connectivity studies should be used to determine where gaps in existing or emerging policies and initiatives to address intermodal connectivity barriers exist. These gaps should be considered in future versions of these policies and initiatives, or before they are finalized. An evaluation of all policies and initiatives under Metrolinx's jurisdiction described in Section 5.1 should be reviewed every 5-10 years to ensure they address barriers to intermodal connectivity.

7.0 CONCLUSION

A well-connected transit system ensures people can reach their destination in a way that is direct, accessible, safe, convenient, intuitive, and enjoyable. Successful intermodal connectivity can lead to higher system ridership, which supports Metrolinx's objectives to optimize the GTHA's transportation system and deliver optimal mobility solutions for the region.

This report provided an overview of the barriers to intermodal connectivity through a case study of two Gateway Hubs—Dundas West-Bloor and Kennedy—including (i) wayfinding, (ii) the pedestrian route, (iii) the public realm and amenities, and (iv) winter conditions. Existing and emerging policies and initiatives were evaluated in relation to these barriers, and used to inform recommendations to improve intermodal connectivity in the GTHA. The recommendations from this report, focused on a four phased process, should be implemented to support a sustainable transportation system and to improve the quality of life of its users.

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