



WATERFRONT TRANSIT RESET



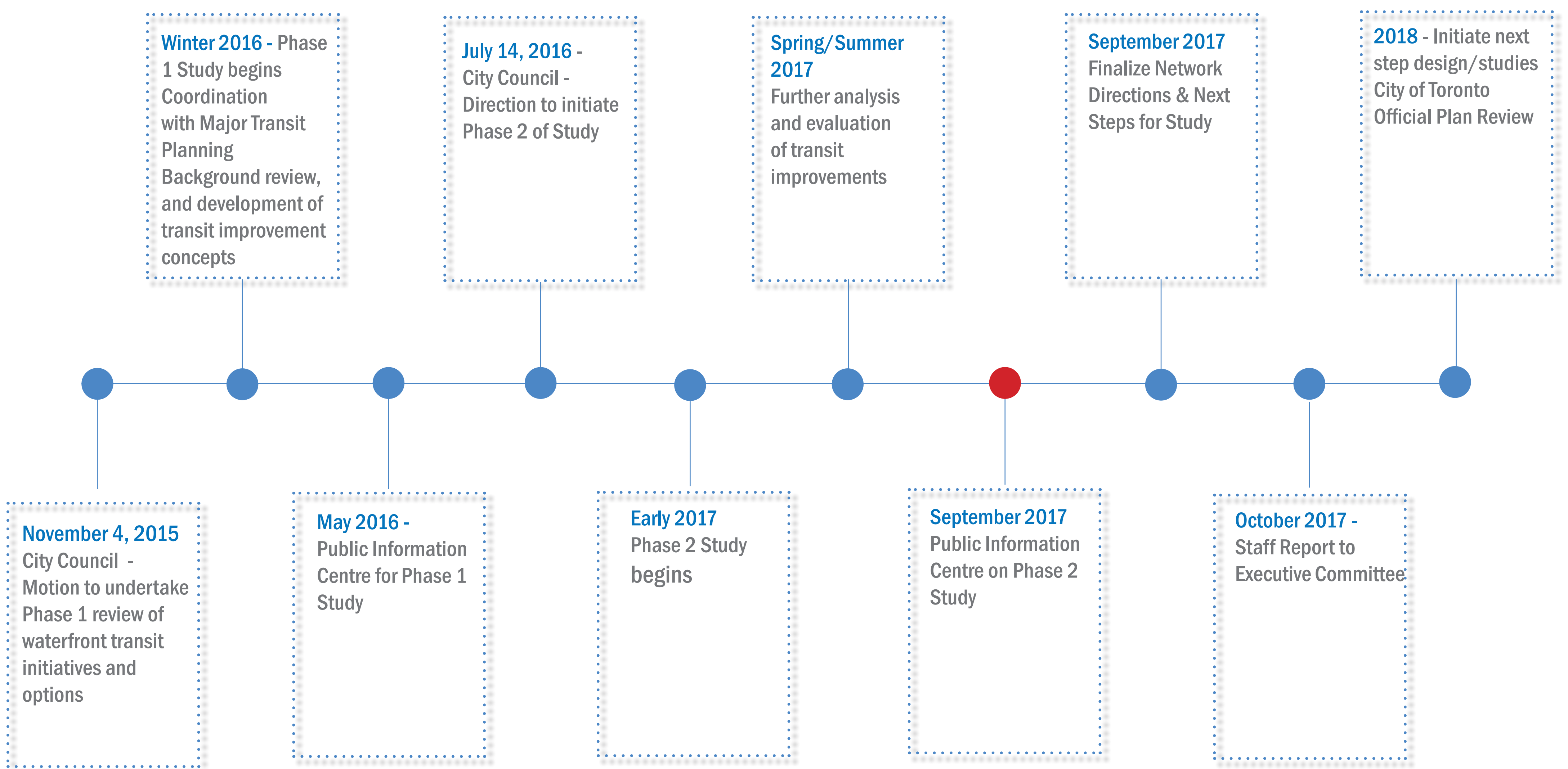
Coordinated Transit Consultation Program September 2017

Transportation Planning Section | City Planning Division
Toronto Transit Commission
Waterfront Toronto

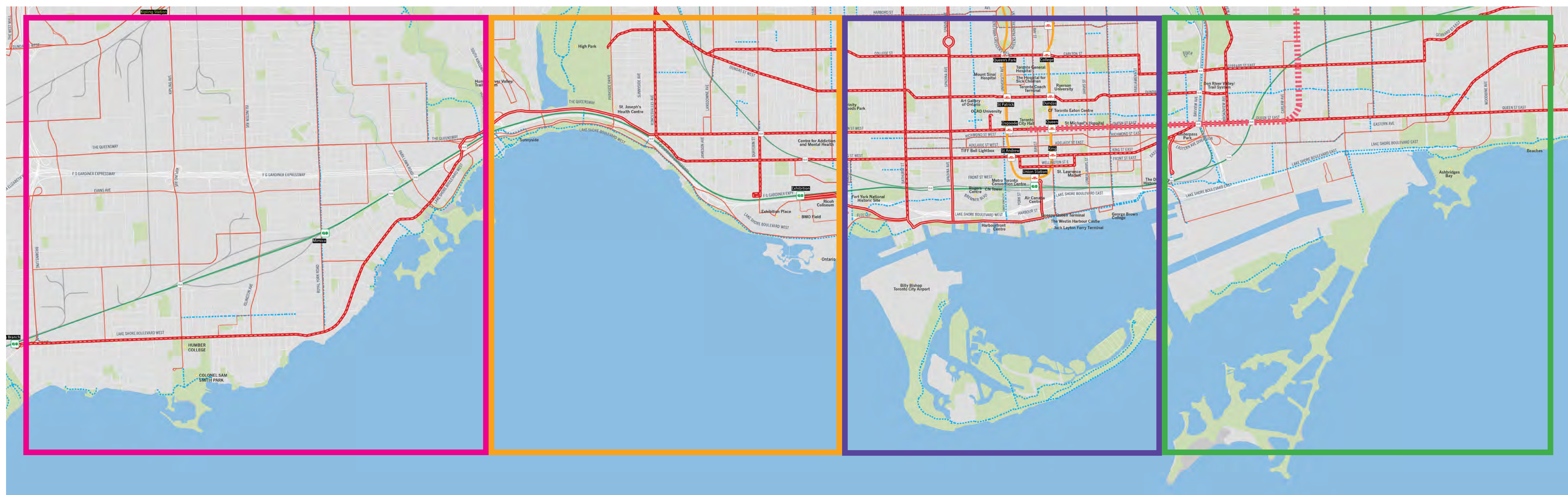
Why Are We Here Today?

- Present the waterfront transit network travel demand considerations to 2041
- Present and gather feedback on options assessment for transit improvements in key areas of the network, including:
 - Union Station – Queens Quay Connection
 - Humber Bay Link
 - Bathurst - Fleet - Lake Shore – Queens Quay Intersection
- Report the overall draft findings of the Phase 2 Study, priorities, and draft directions for further study prior to reporting to Executive Committee and Council

Where Are We Today?



Study Area Segments



01 Long Branch to Humber River

02 Humber River to Strachan Ave

03 Strachan Ave to Parliament St

04 Parliament St to Woodbine Ave

Vision and Objectives

Provide high quality transit that will integrate waterfront communities, jobs, and destinations and link the waterfront to the broader City and regional transportation network



1. Connect waterfront communities locally and to downtown with reliable and convenient transit service:
 - Promote and support residential and employment growth
 - Provide mobility choice opportunities



2. Enhance accessibility (improved reliability and convenience) of transit service linking key destinations (employment, housing, institutional, education, cultural, recreational, commercial):
 - Better connect people to everyday places
 - Improve connectivity in neighbourhood improvement areas
 - Make transit an attractive option for more trips
 - Attract new transit riders
 - Improve quality of life

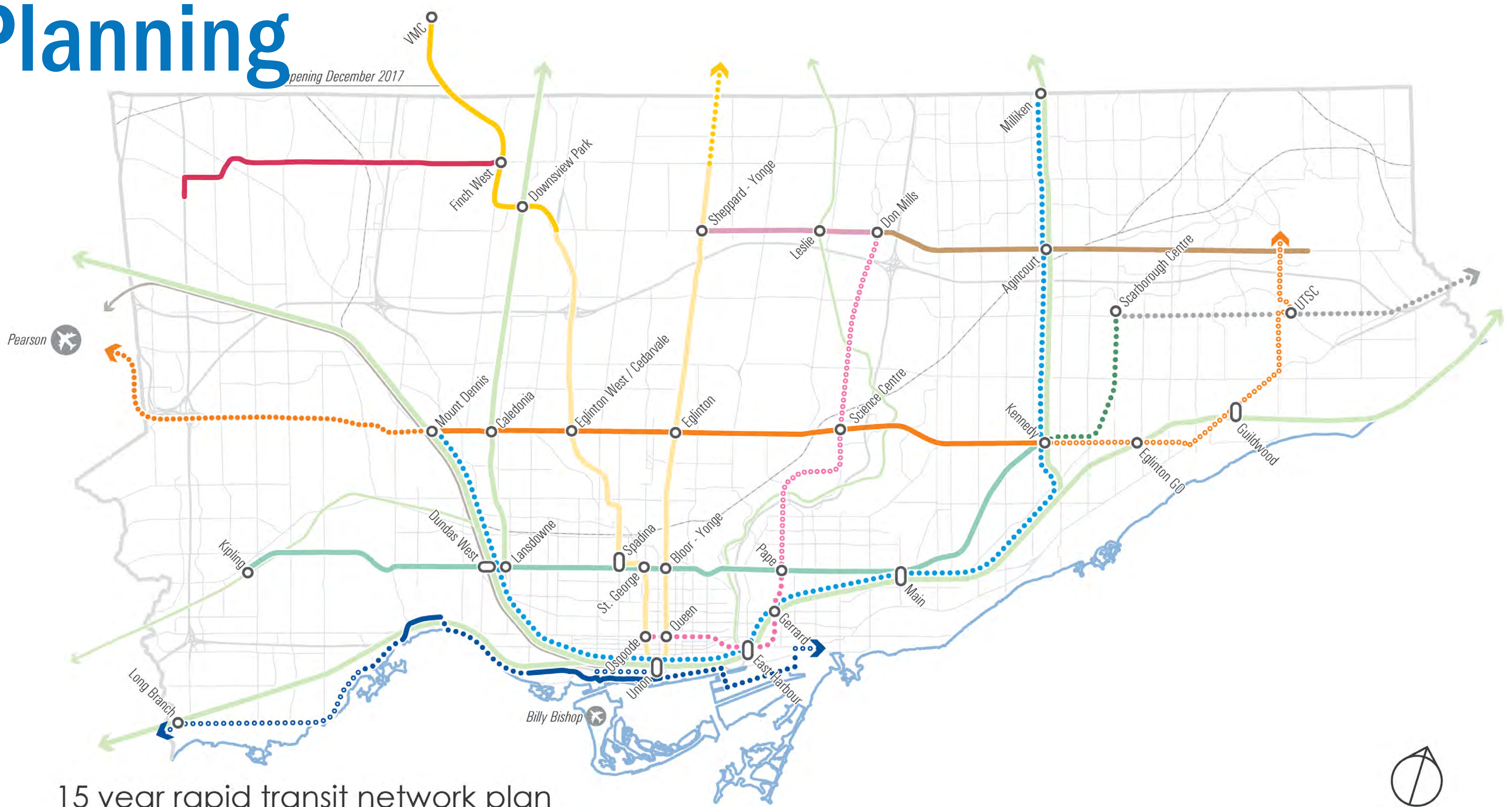


3. Promote broader City and regional transportation network connections

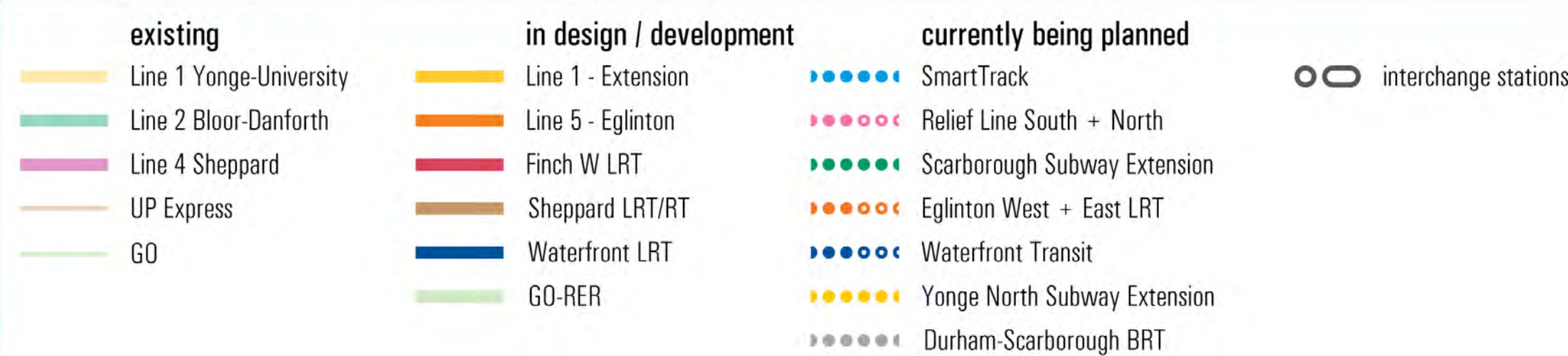


4. Develop implementable and affordable solutions, including phasing considerations, and flexibility to respond to future conditions

Coordinated Priority Rapid Transit Network Planning



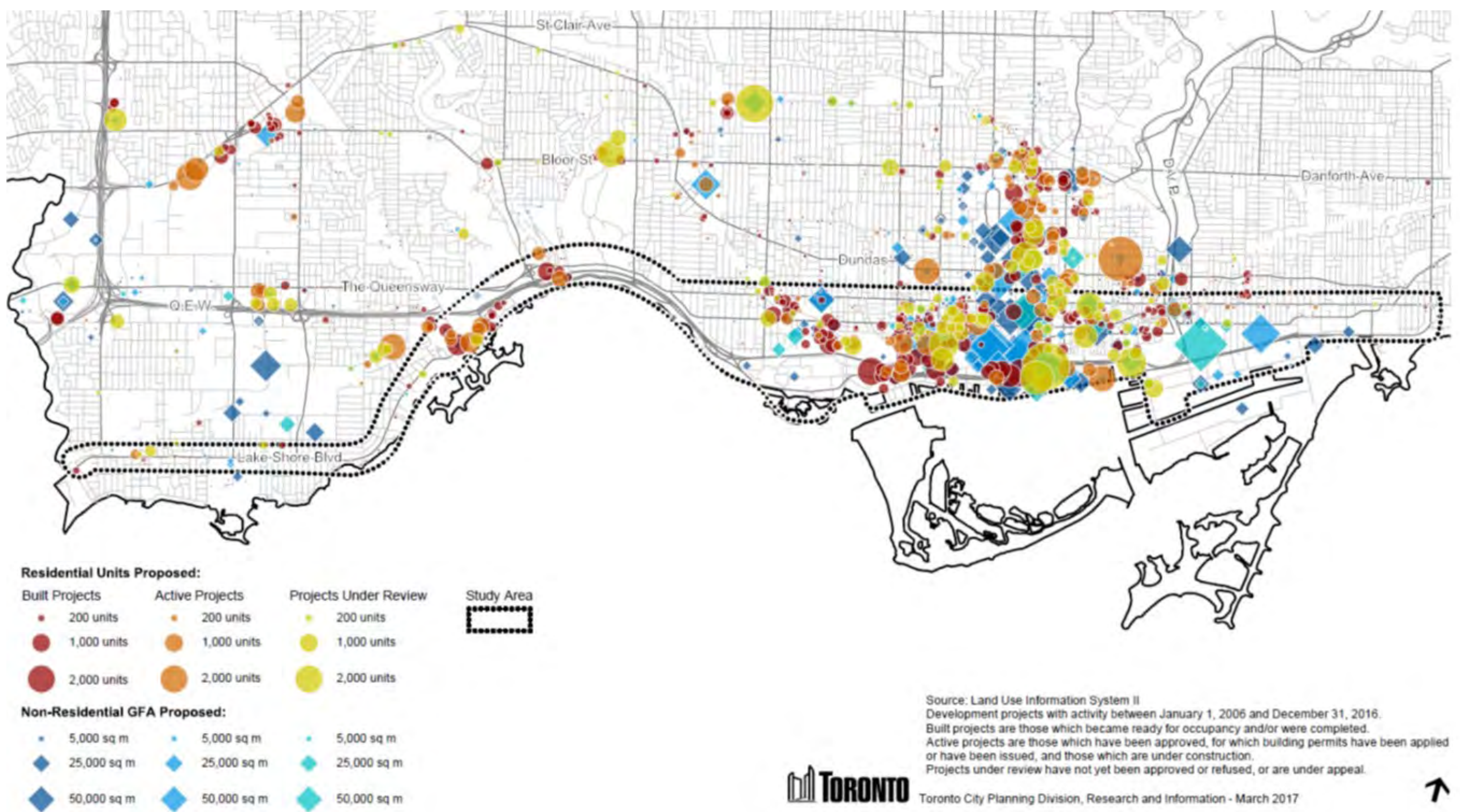
15 year rapid transit network plan



* City Council, at its meeting of May 7, 8, 9, 2013, resolved to support the extension of the Bloor-Danforth Subway from Kennedy Station to north to Scarborough Town Centre and Sheppard Avenue in place of the Scarborough RT Extension

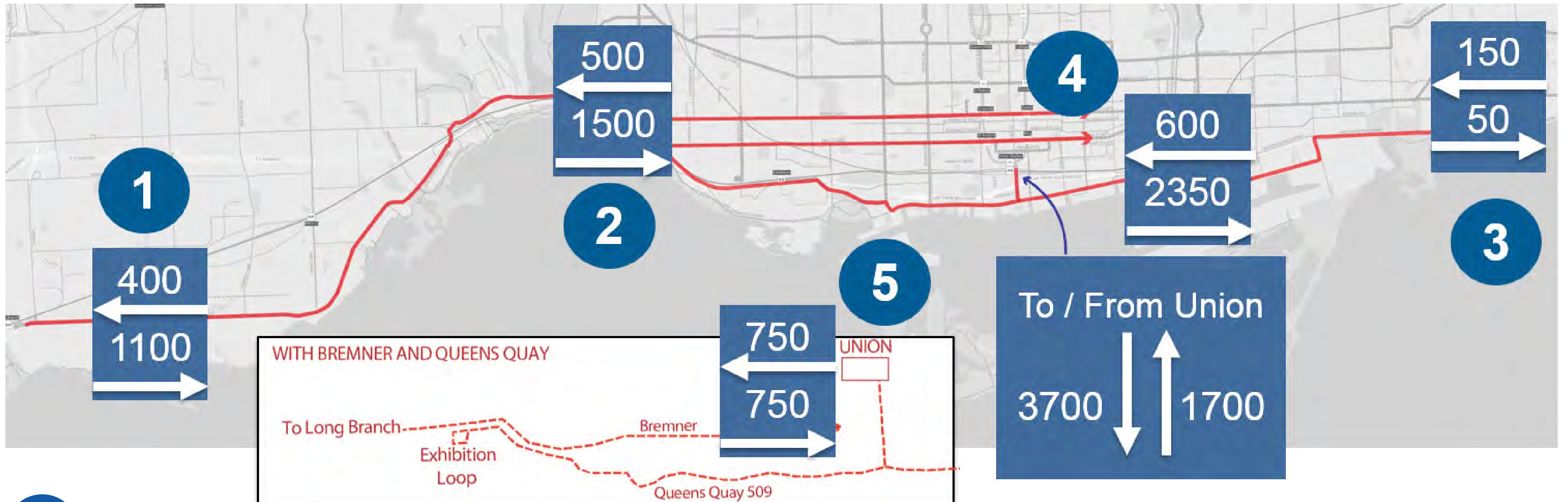
Note: The alignment and stations of projects that are currently being planned are subject to change.

Current Development in the Waterfront Transit Corridor



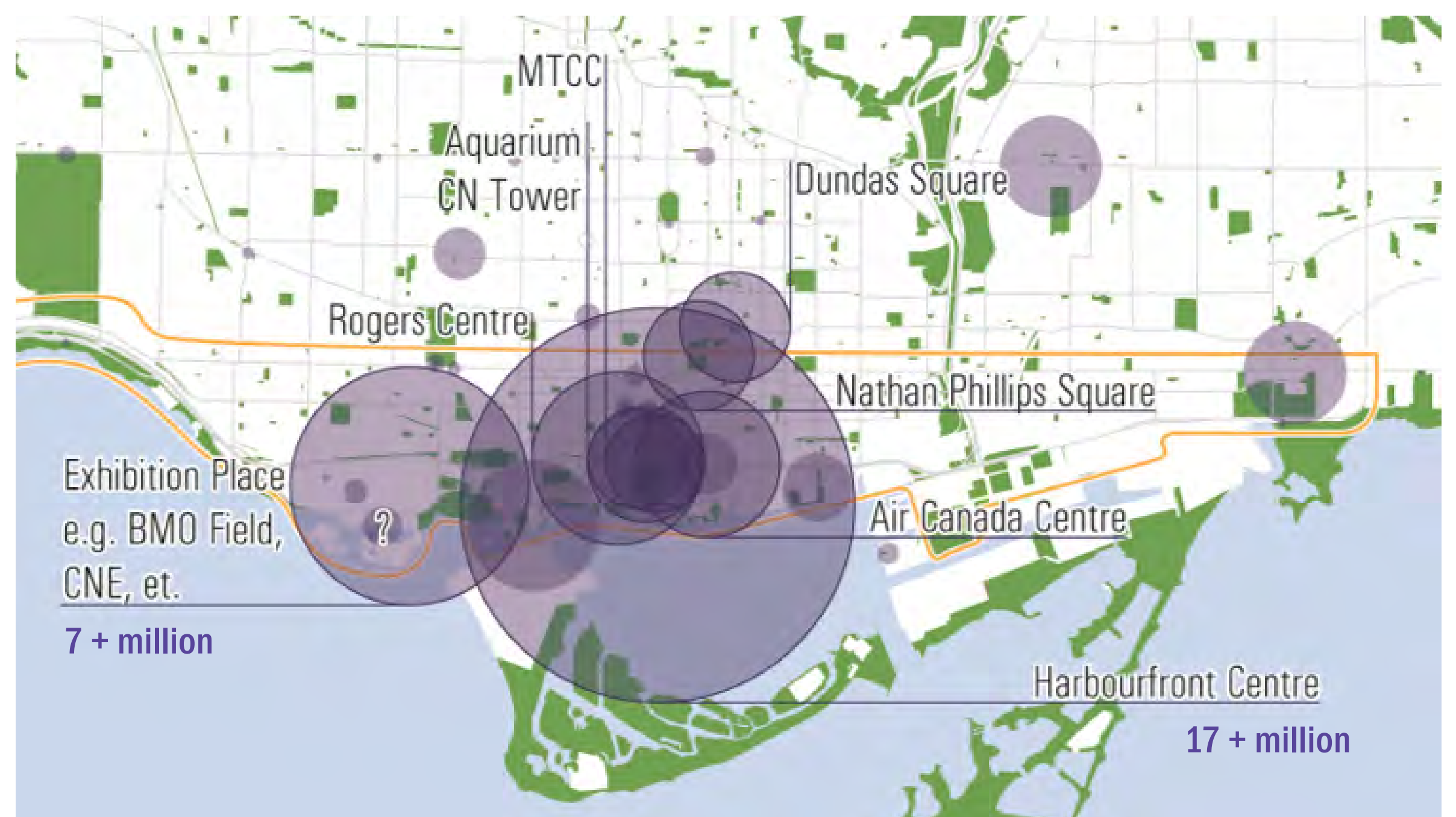
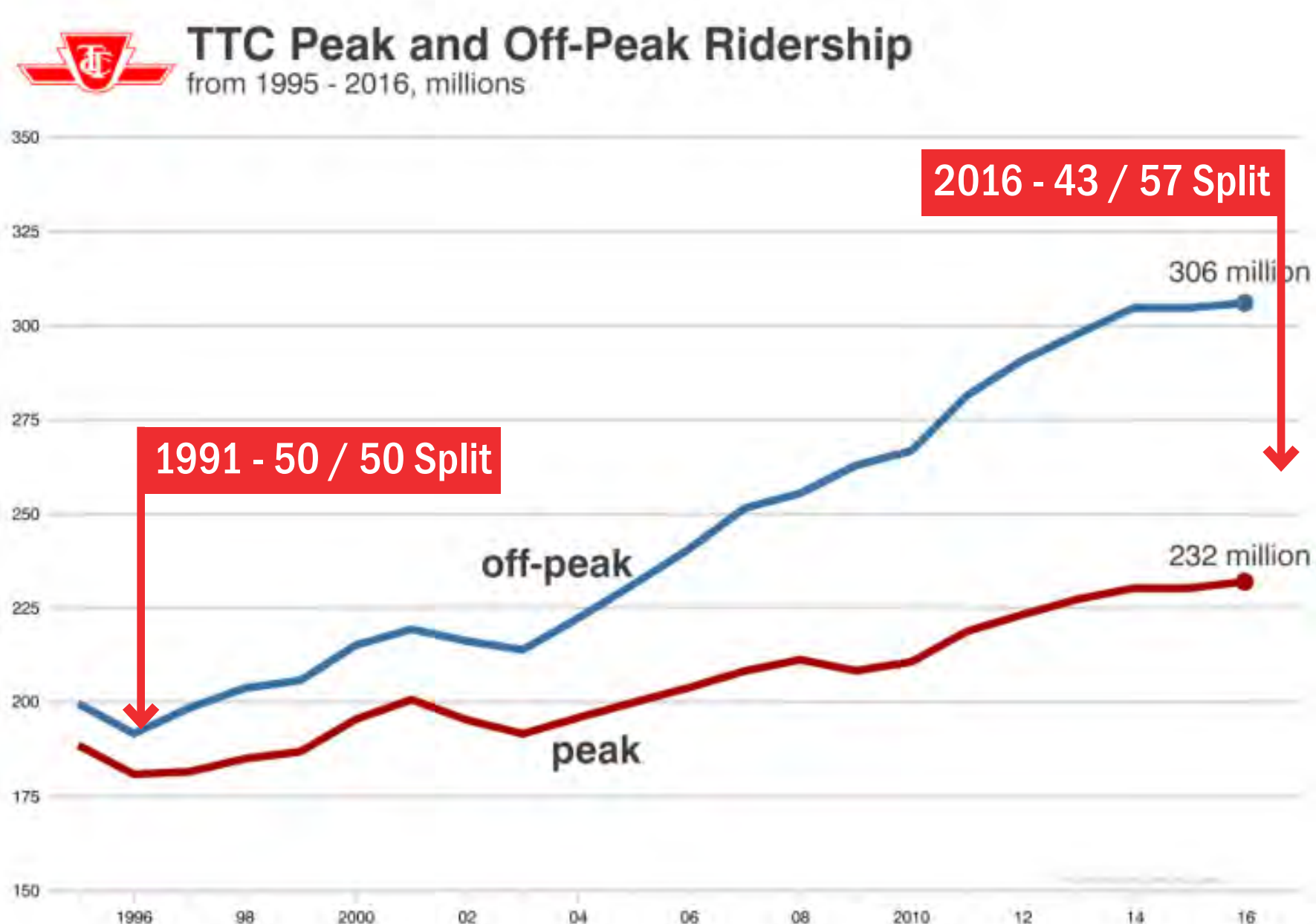
Transit Demand Forecasting Estimates

AM Peak Hour Forecast Estimate



- 1 South Etobicoke – forecasted 2041 ridership and travel market supports enhanced streetcar operations
- 2 Humber River to Dufferin – Preliminary evaluation for new dedicated transit infrastructure complete and Preliminary Business Case underway
- 3 Leslie to Woodbine – forecasted transit demand is low, and consideration of a LRT is post-2041
- 4 East Bayfront and Union-Queens Quay connection is the highest ridership forecasted in the Waterfront Transit corridor, and is a priority (up to 50% higher without Relief Line)
- 5 Fort York / Bremner – forecasted transit demand to 2041 does not support an additional LRT corridor, however there may be potential operational advantages

Transit Demand - Off-Peak/Special Event



- Across the TTC Network, there is a steadily growing trend toward increased travel in off-peak periods
- The waterfront area has a very high number of special events, cultural and recreational destinations, generating significant additional network trips, in both peak and off-peak periods
- These factors may not be comprehensively captured in the transportation network model forecasts, which is peak period and commuter focused
- Hence, greater weighting to access, choice and reliability factors is required when considering network improvements in this corridor

Network Direction to 2041 - South Etobicoke



Long Branch to Legion Road

- Lake Shore Boulevard streetcar to generally remain in mixed traffic Improvements targeted as follows:
 - transit signal priority (in progress)
 - enhancing GO / TTC / MiWay interface
 - improving transfers at north-south routes, particularly at Kipling Avenue

Next Steps

- Feasibility studies
- GO station improvements (Metrolinx lead)
- Coordinate with Mississauga
- Monitor transit volumes



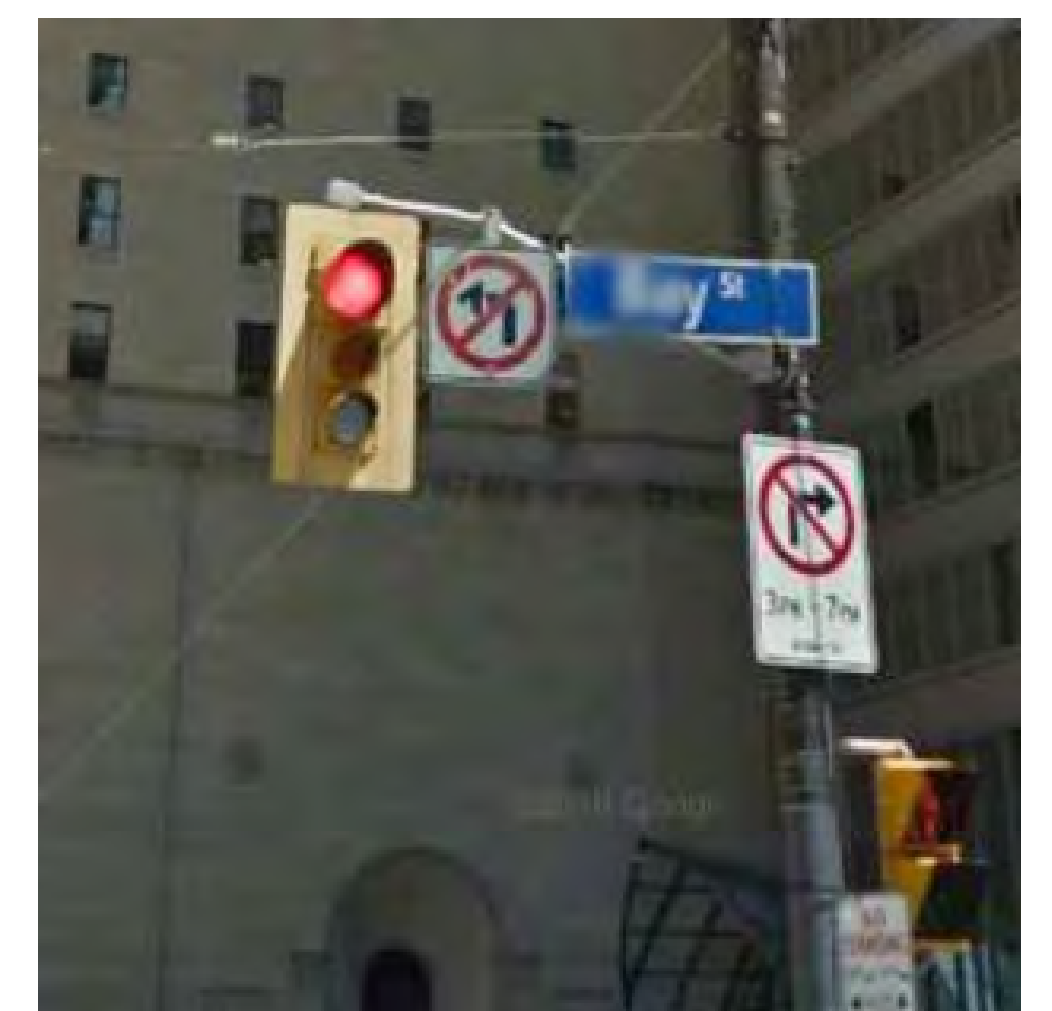
Enhanced streetcar operations along the corridor could include:



Improving North-South Linkages



Transit Signal Priority



Turning Restrictions



Improving North-South Linkages

01 SEGMENT

Network Direction to 2041 - South Etobicoke



Legion Road to Humber Loop (Humber Bay Shores)

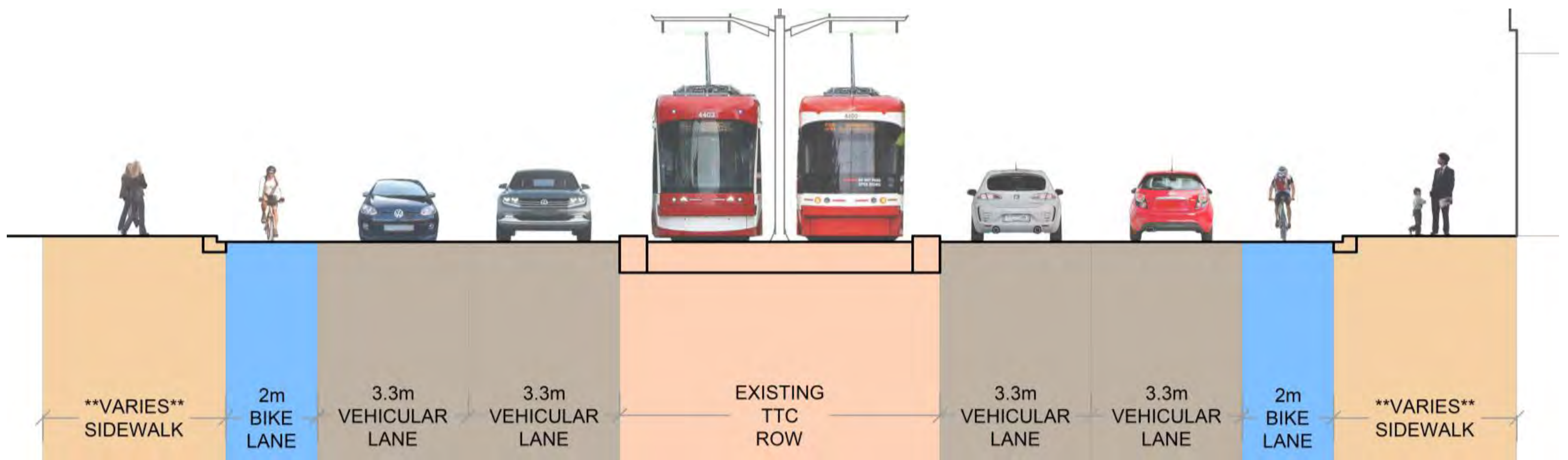
- Introduce dedicated transit right-of-way on Lake Shore Boulevard
- Integrate new transit hub with new development on First Capital site (former Christies Site)

Next Steps

- Park Lawn Lake Shore Transportation Master Plan EA will incorporate a dedicated transit right-of-way on Lake Shore Blvd. into all right-of-way design alternatives
- Funding required for detailed design and construction



Humber Bay Shores Dedicated Transit Right-of-Way



*Cross section detail to be determined by Park Lawn Lake Shore TMP

Network Direction to 2041 - Humber Loop to Strachan



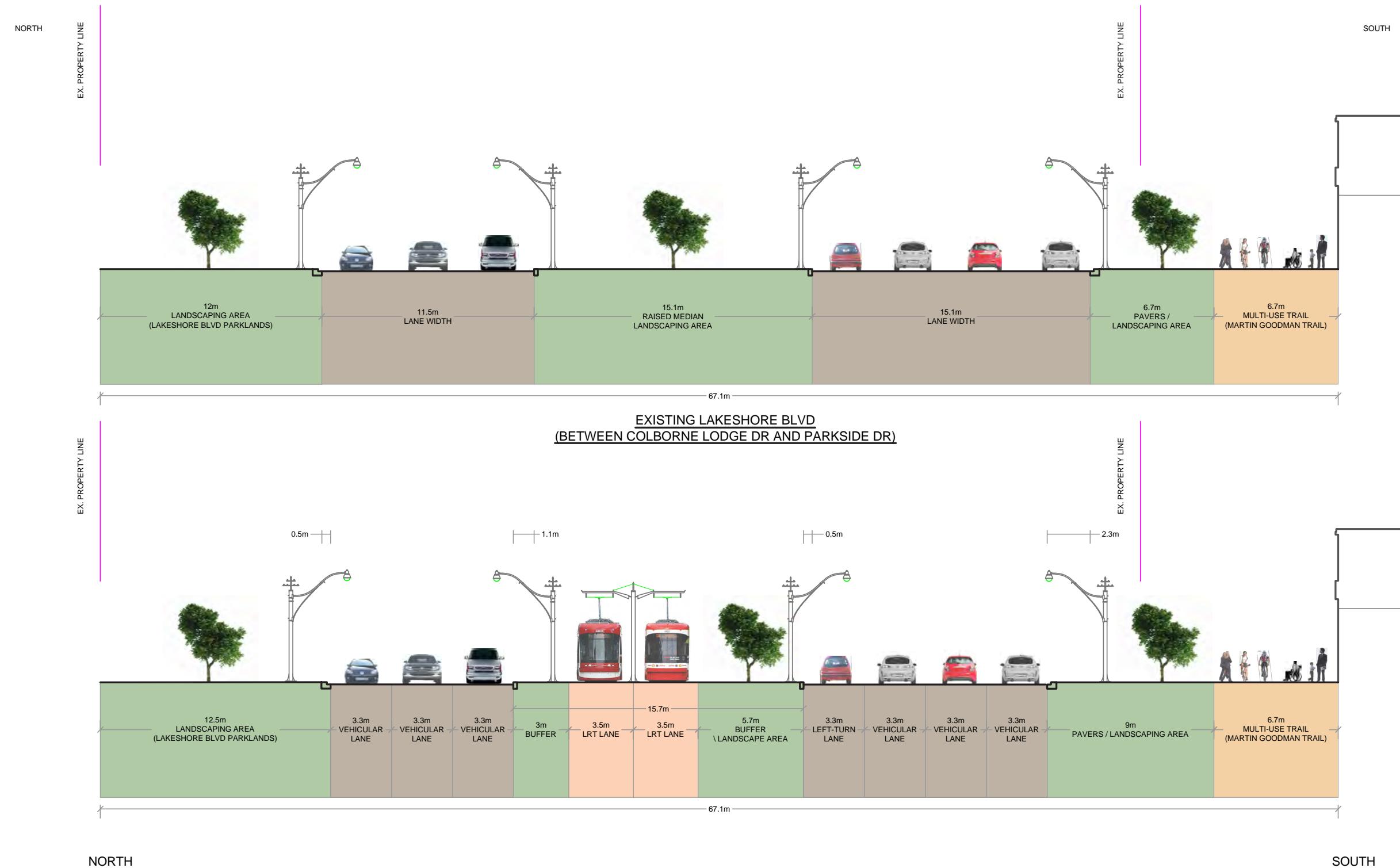
Humber Bay Link

- Preliminary evaluation of short listed options for new transit infrastructure completed
- Preliminary Business Case for new transit infrastructure underway

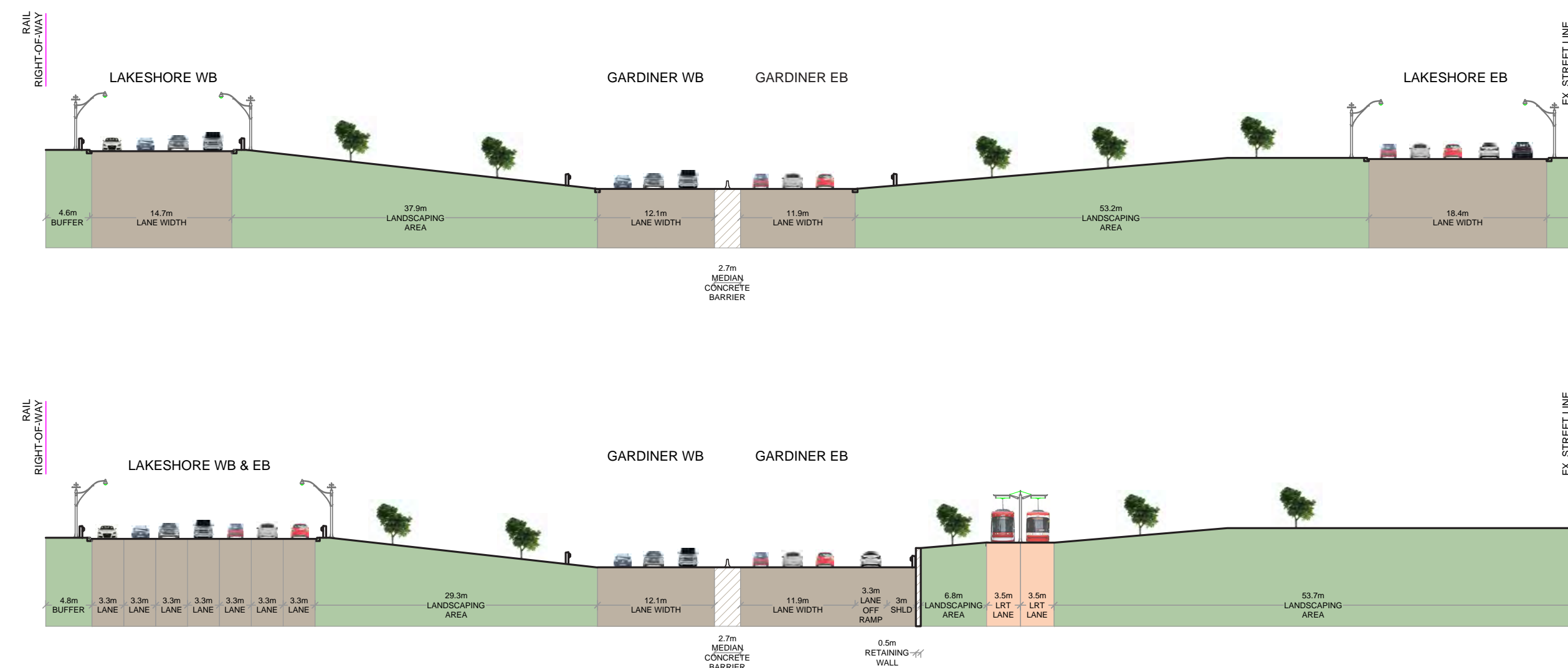


Image Source: <http://jsdoit.ca/?tag=sunnyside-pool>

Concept 2E Typical Lake Shore Boulevard Cross Section, Between Colborne Lodge Drive and Parkside Drive



Concept 2E Typical Lake Shore Boulevard Cross Section, vicinity of Jameson Avenue



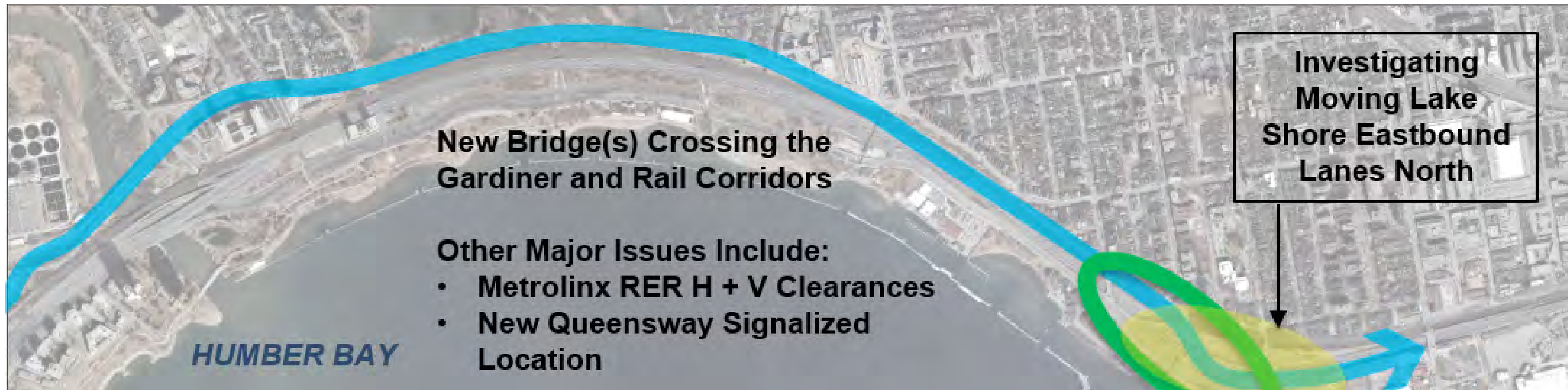
Preliminary Preferred Option: Concept 2E – via Colborne Lodge Drive and Lake Shore Blvd.

- Provides a balanced trade-off between improved transit service, mobility choice, and enhanced connections to key destinations
- Comparatively minimal environmental and property impacts
- Presents a lower construction cost by avoiding major construction impacts and issues

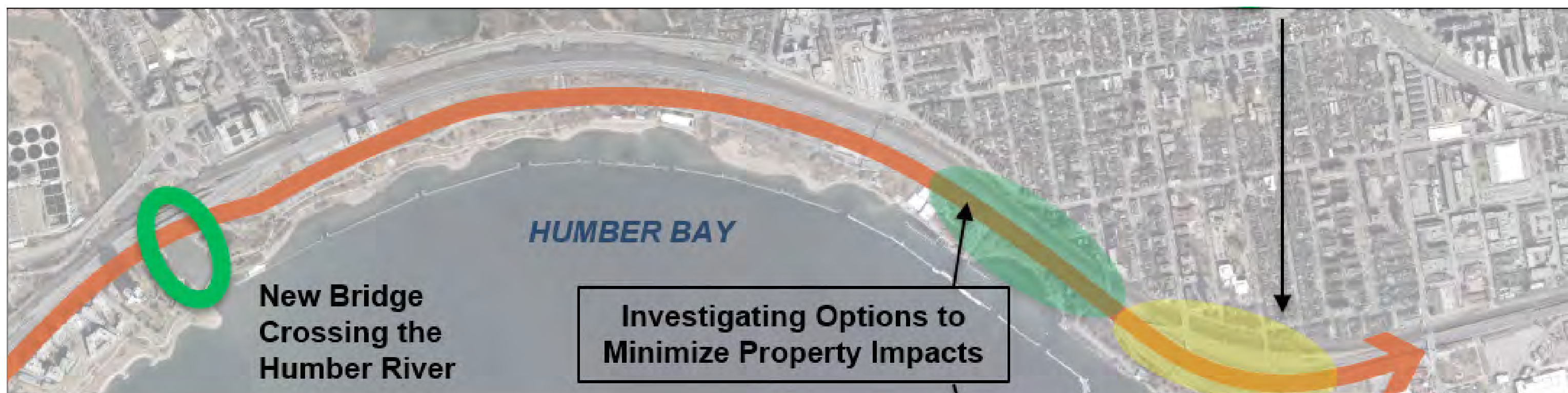
Preliminary Functional Plan



Humber Bay Link Options Humber Loop to Dufferin Street



Concept 2A - Bridge across Gardiner and Rail Corridors



Concept 2D - via Lake Shore Blvd.



Concept 2E - via Colborne Lodge Drive and Lake Shore Blvd.

Humber Bay Link Options - Preliminary Evaluation

		2A	2D	2E	Key Considerations
SERVING PEOPLE	EXPERIENCE	1/4	1/4	1/4	Travel Time • Concept 2D performs best, both Concepts 2A and 2E are 2-3 minutes longer in the peak direction Capacity Provided • All concepts can meet transit demands to 2041 Perceived User Experience • Concept 2A presents shorter walking distance from the South Parkdale neighbourhood, while Concepts 2D and 2E provide shorter walking distances to waterfront destinations
	CHOICE	1/4	1/4	1/2	Connectivity • Concept 2A provides high quality streetcar / bus connections, but with significant overlap with the 501 Queen service and limited access improvement to waterfront destinations and active transportation network • Concept 2D provides limited direct connections to the streetcar / bus network, but provides good access to waterfront destinations and active transportation network • Concept 2E provides good connections to both the streetcar / bus network and to waterfront destinations and active transportation network Choice • All concepts provide new mobility access and choice
	SOCIAL EQUITY	1/2	1/4	1/4	• Concept 2A provides direct connection to St. Joseph's Health Centre and the South Parkdale neighbourhood • Concepts 2D and 2E will require a transfer to the 501 Queen service or the 504 King service
STRENGTHENING PLACES	SHAPING THE CITY	1/4	1/2	1/2	• All concepts options are consistent with the City's and Waterfront Toronto's planning policies • Concepts 2D and 2E are consistent with the approved Western Waterfront Master Plan, including presenting new placemaking opportunities
	HEALTHY NEIGHBOURHOODS	1/4	1/4	1/4	• All concepts perform well • Concept 2A supports the South Parkdale neighbourhood directly • Concepts 2D and 2E provide additional opportunities for north-south linkages and reducing barriers to waterfront access
	PUBLIC HEALTH AND ENVIRONMENT	1/4	1/4	1/2	• Concept 2A present environmental impact and loss of parkland (i.e. mature tree loss, community disruption) along the entire rail embankment • Concept 2D introduces environmental and property impact near the Humber River and the Palace Pier development • Concept 2E avoids major environmental and property impacts
SUPPORTING PROSPERITY	SUPPORTS GROWTH	1/4	1/4	1/4	• All concepts serve and strengthen planned employment areas and cultural / recreational business
	AFFORDABILITY	1/4	1/4	1/4	• Concepts 2A and 2D present higher construction costs to address construction issues and risks (i.e. difficult and disruptive embankment construction within a mature neighbourhood and parallel to an active rail corridor for 2A, and for 2D to address Humber River and the Palace Pier development constraints and a longer construction length) • Concept 2E offers a lower construction cost by avoiding major construction impacts and issues • All concepts present post-construction traffic impacts due to additional signalized intersections (Concept 2A present traffic delays along The Queensway, and Concepts 2D and 2E along Lake Shore Boulevard)
		Moderate to High Cost	Moderate to High Cost	Low to Moderate Cost	PRELIMINARY PREFERRED CONCEPT

Network Direction to 2041 - Humber Loop to Strachan

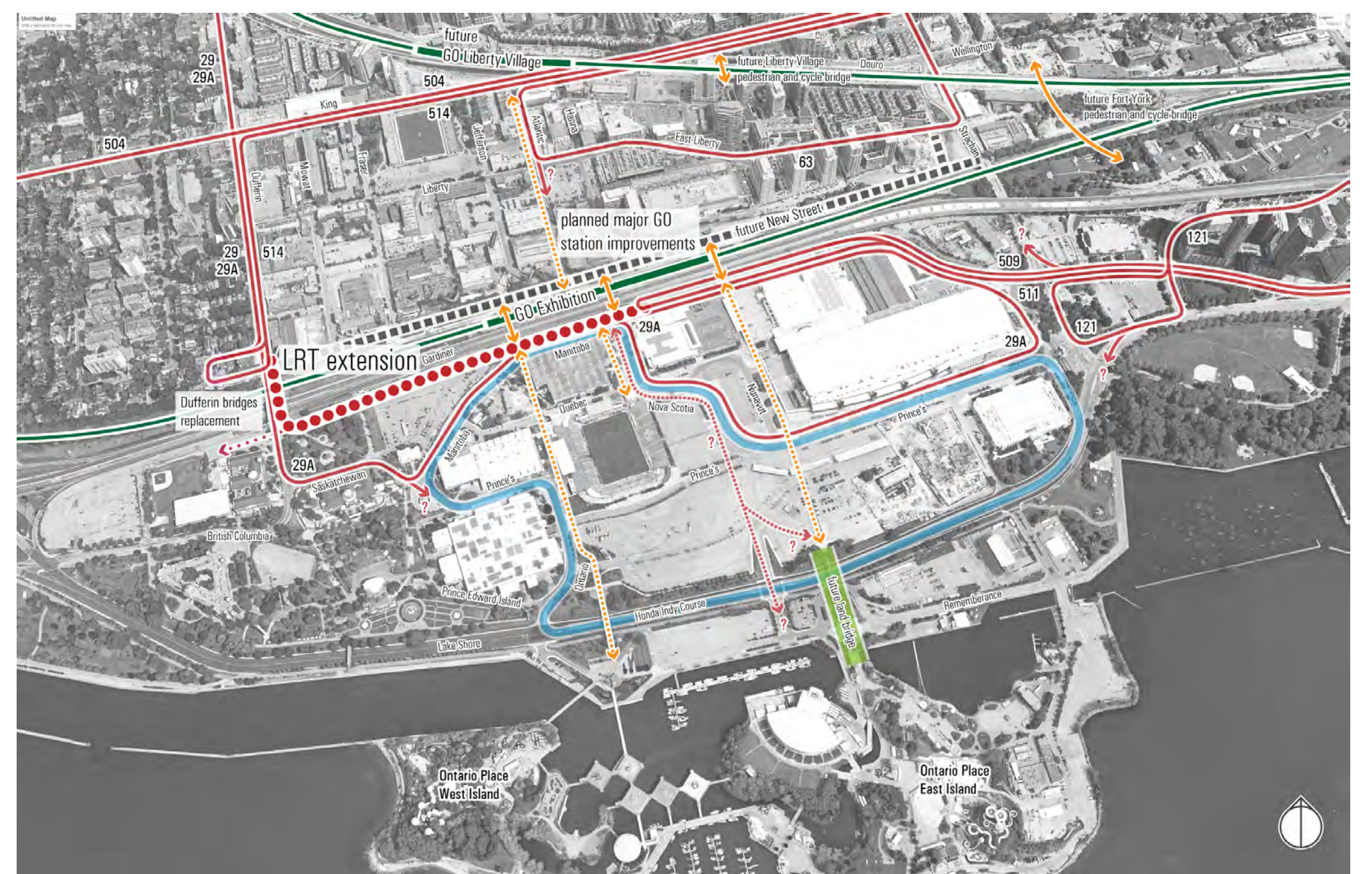


Liberty Village - Exhibition Place - Ontario Place Area

- 30% design for LRT extension along north side of Exhibition Place is underway and coordinating with:
 - Dufferin Bridges replacement
 - Metrolinx Exhibition GO Station Improvements and Electrification

Next Steps...

- Funding required for detailed design and construction of northerly LRT extension
- Go station improvements (Metrolinx lead)
- Followup studies for additional transit links to be determined based on Ontario Place redevelopment and demand



Network Direction to 2041 - Strachan to Parliament



Lake Shore - Fleet Street - Bathurst Intersection

- Preliminary evaluation of short listed options for transit infrastructure/intersection improvements completed

Next Steps...

- Feasibility study and/or EA



Queens Quay/Fleet/Lake Shore/Bathurst Intersection Improvement Options

Option 3A

Operational improvements include:

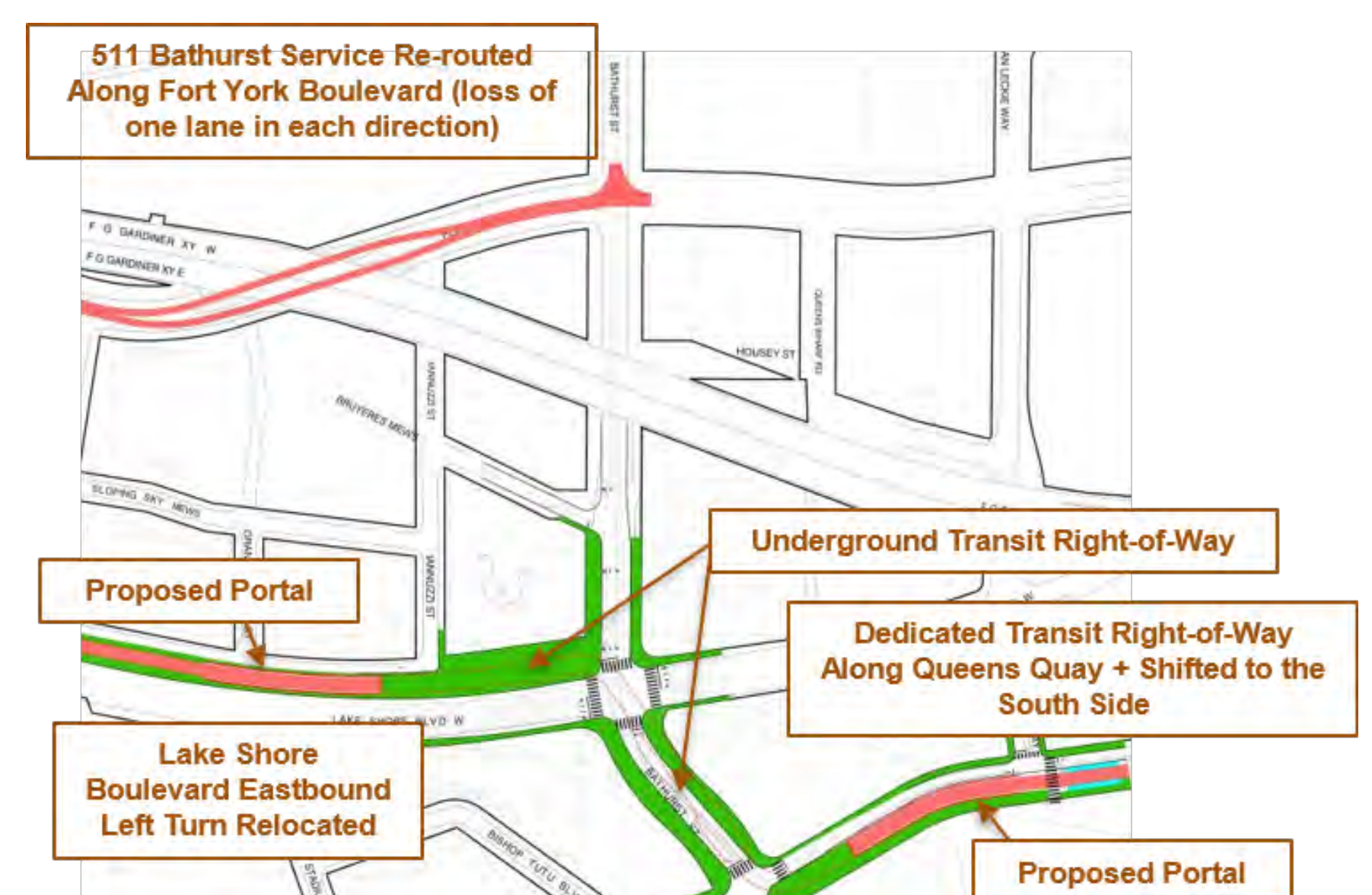
- Transit signal priority
- signal timing modifications
- Turning restrictions

Option 3B

Intersection reconfiguration (at-grade)

*refer to next panel

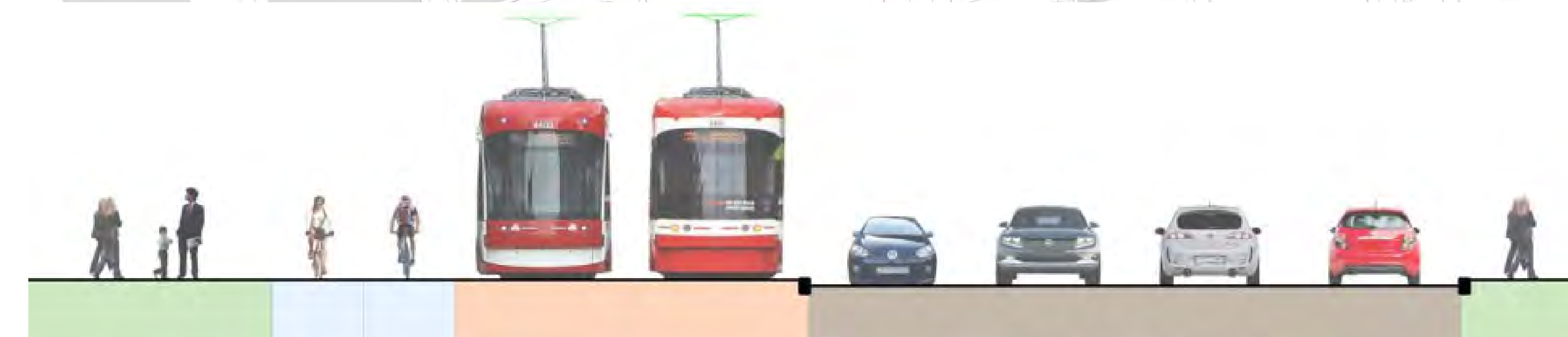
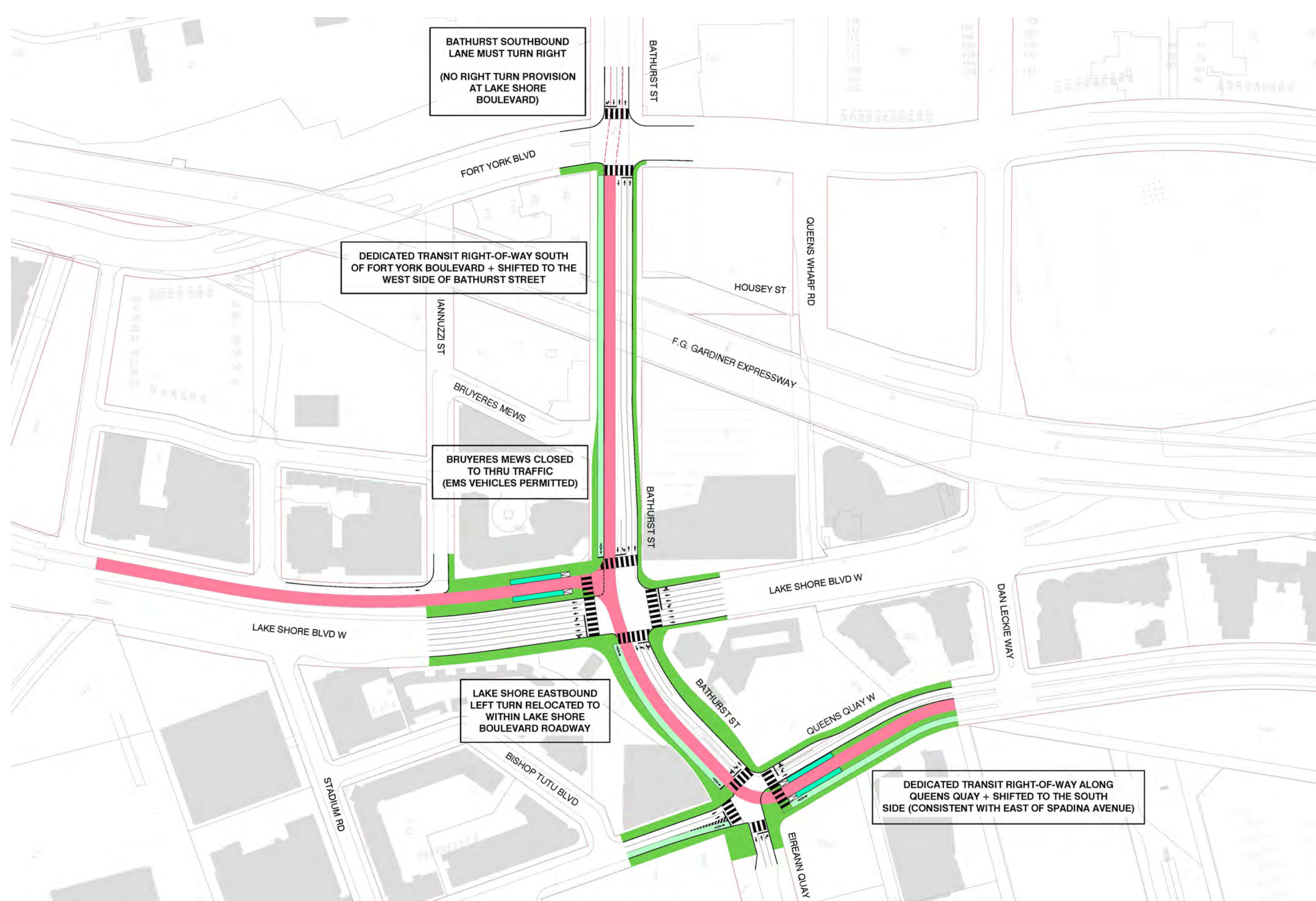
Option 3C



Grade separation (transit underground)

Preliminary Evaluation: Intersection Improvements

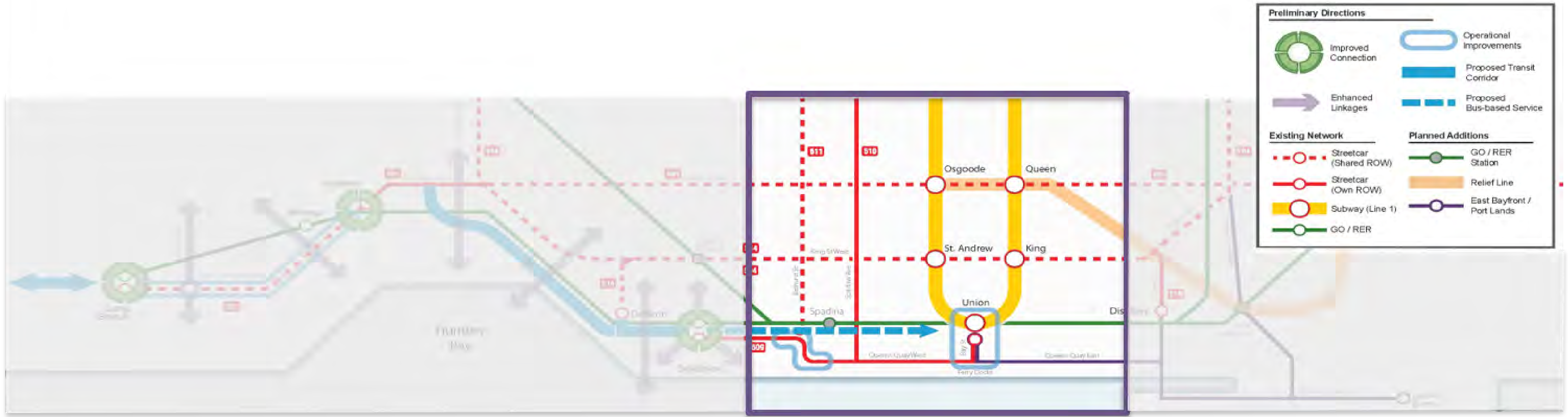
	3A	3B	3C	Key Considerations	
SERVING PEOPLE					<ul style="list-style-type: none"> Travel Time Concepts 3B and 3C both present significant transit travel time and reliability improvements Capacity Provided Concepts 3B and 3C will be able to accommodate increasing transit demands Perceived User Experience Concepts 3B and 3C introduce tighter intersection layouts with corresponding shorter walking distances Concept 3C has 2 underground stations requiring vertical circulation (i.e. stairs, escalators, elevators)
					<ul style="list-style-type: none"> Connectivity Concept 3C diverts the 511 Bathurst service along Fort York Boulevard, thereby requiring a transfer for connecting to the Billy Bishop airport and to the central waterfront area Choice Concepts 3B and 3C present enhanced cycling and pedestrian opportunities, particularly along Bathurst Street
					<ul style="list-style-type: none"> Concepts 3B and 3C introduce tighter intersection layouts with corresponding shorter walking distances for all users Concept 3C present vertical circulation requirements at the 2 underground stations, and transfer requirements for the 511 Bathurst service users
STRENGTHENING PLACES					<ul style="list-style-type: none"> Concepts 3B and 3C are consistent with the City's and Waterfront Toronto's planning policies, including enhanced cycling and pedestrian opportunities
					<ul style="list-style-type: none"> Concepts 3B and 3C introduce tighter intersection layouts with corresponding shorter walking distances for all users, including providing additional opportunities for north-south linkages that will reduce barriers to waterfront access
					<ul style="list-style-type: none"> Concepts 3B and 3C introduce tighter intersection layouts that also reduce the number of potential conflicts between vehicles, transit, cyclists and pedestrians
SUPPORTING PROSPERITY					<ul style="list-style-type: none"> Concepts 3B and 3C serve and strengthen planned development areas and cultural / recreational business
					<ul style="list-style-type: none"> Concept 3A presents a lower construction cost, but with marginal transit improvements in the short term only Concept 3B presents a moderate construction cost, with limited construction risks Concept 3C presents a higher construction cost, including associated higher risks with underground construction Concepts 3B and 3C present increased traffic delays compared to Concept 3A, in order to improve transit and active transportation mobility options
	Very Low Cost	Moderate Cost	High Cost	<p> PRELIMINARY PREFERRED CONCEPT</p>	



Preliminary Preferred Option: Concept 3B – Re-configured At-Grade Intersection

- Provides improved transit service reliability and local transit travel time
- Presents enhanced intersection safety and north-south linkages for pedestrians and cycling
- Comparatively moderate construction cost, including associated risks

Network Direction to 2041 - Strachan to Parliament



Front Street and/or Bremner Boulevard Transit

- Additional analysis and longer-term consideration for LRT may be required as major initiatives in this area advance (e.g. RER, Rail Deck Park, Relief Line West)

Next Steps...

- Consider in conjunction with overall TOcore mobility strategy



Union Station - Queens Quay Connection

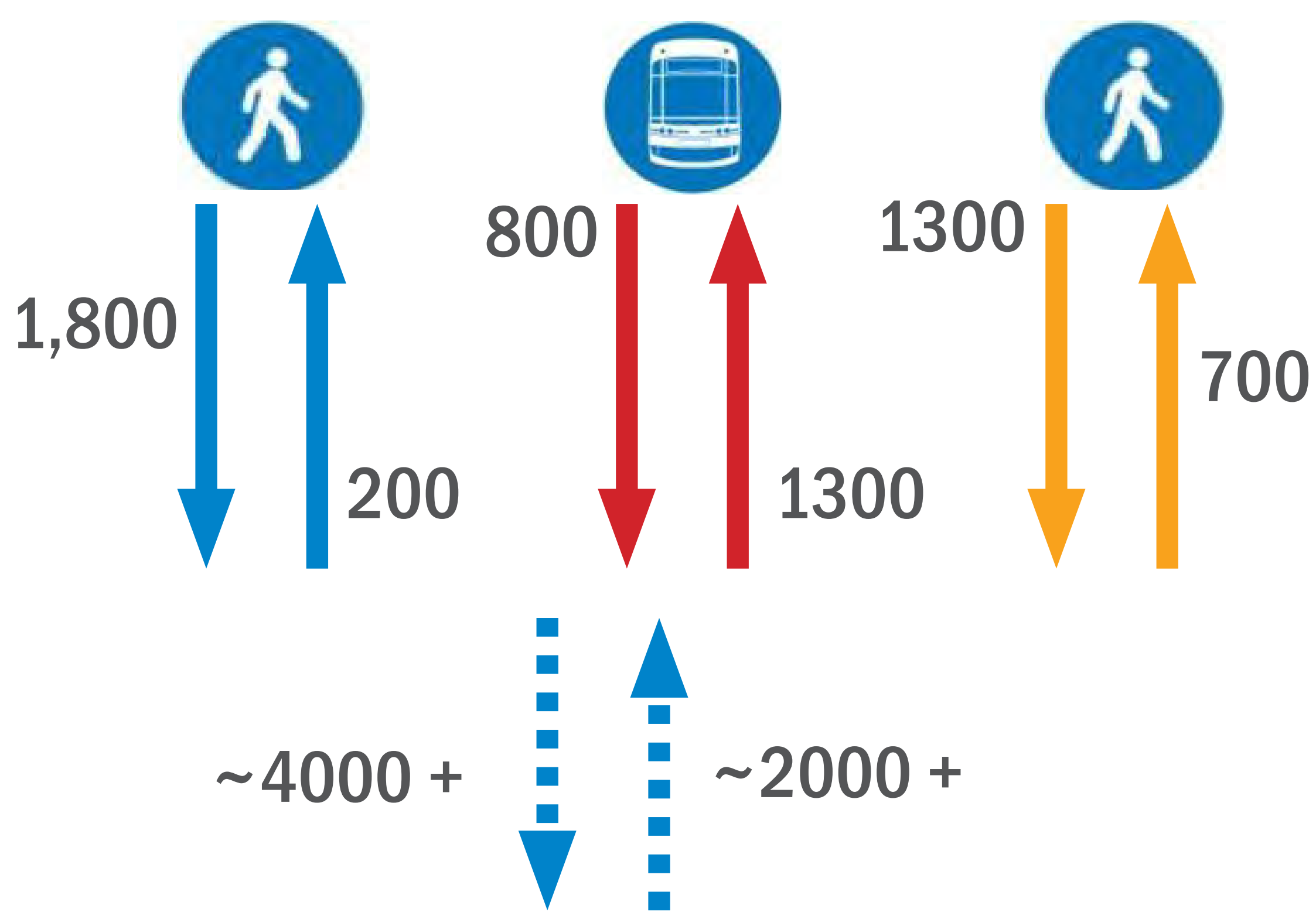
- EA Approved Option - LRT Expansion
- Critical portion of network
- Initial proof of alternative concepts is complete and all have been found to meet forecasted 2041 transit demand
- Other considerations are required

Next Steps..

- To be determined



Existing South Bay Corridor Travel Patterns



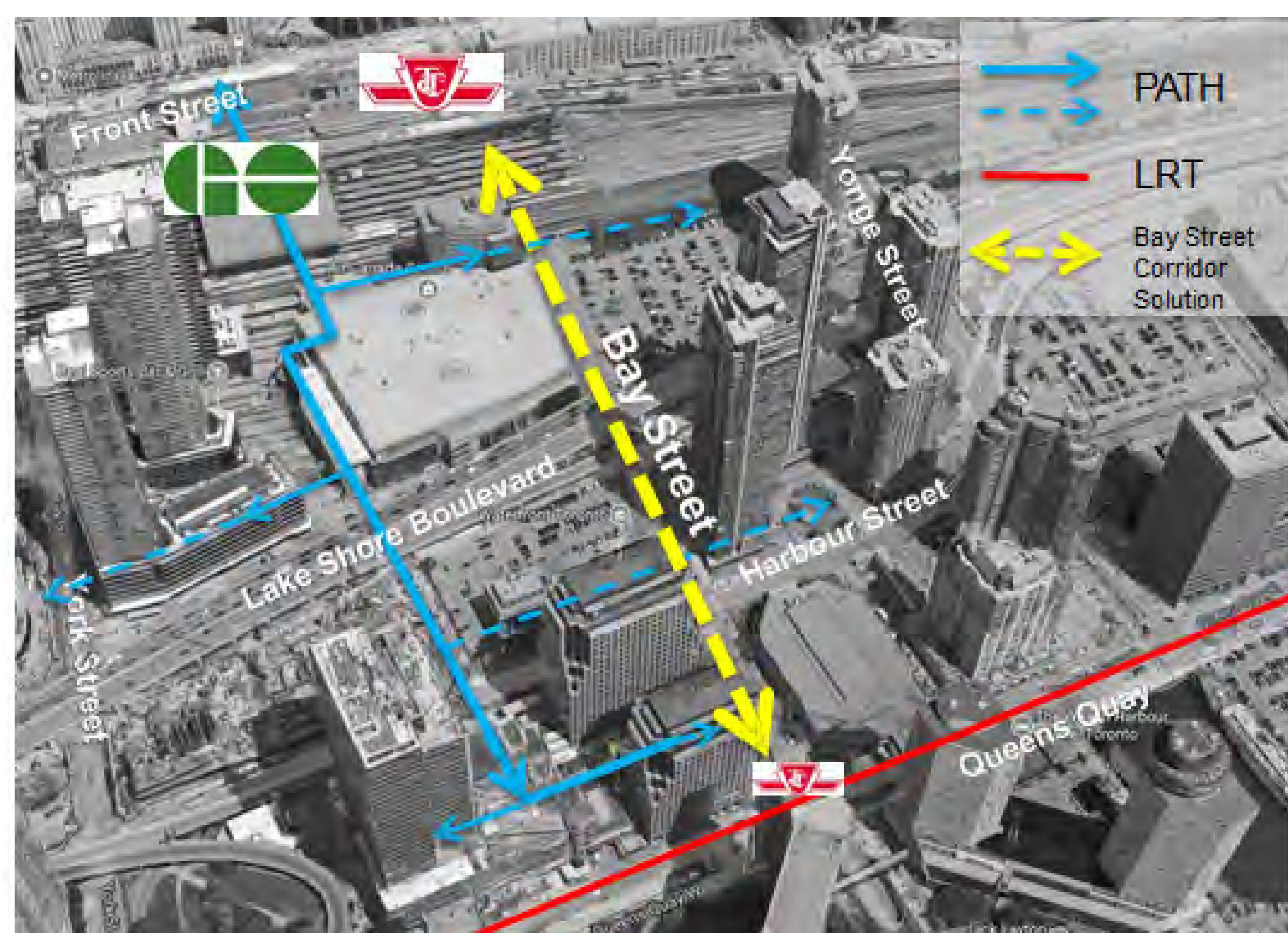
Transit Characteristics

- ~25% of SB passengers travel one stop to Queens Quay (50% at AM peak hour)
- ~20% of NB passengers travel one stop from Queens Quay (5% at AM peak hour)

Pedestrian Characteristics

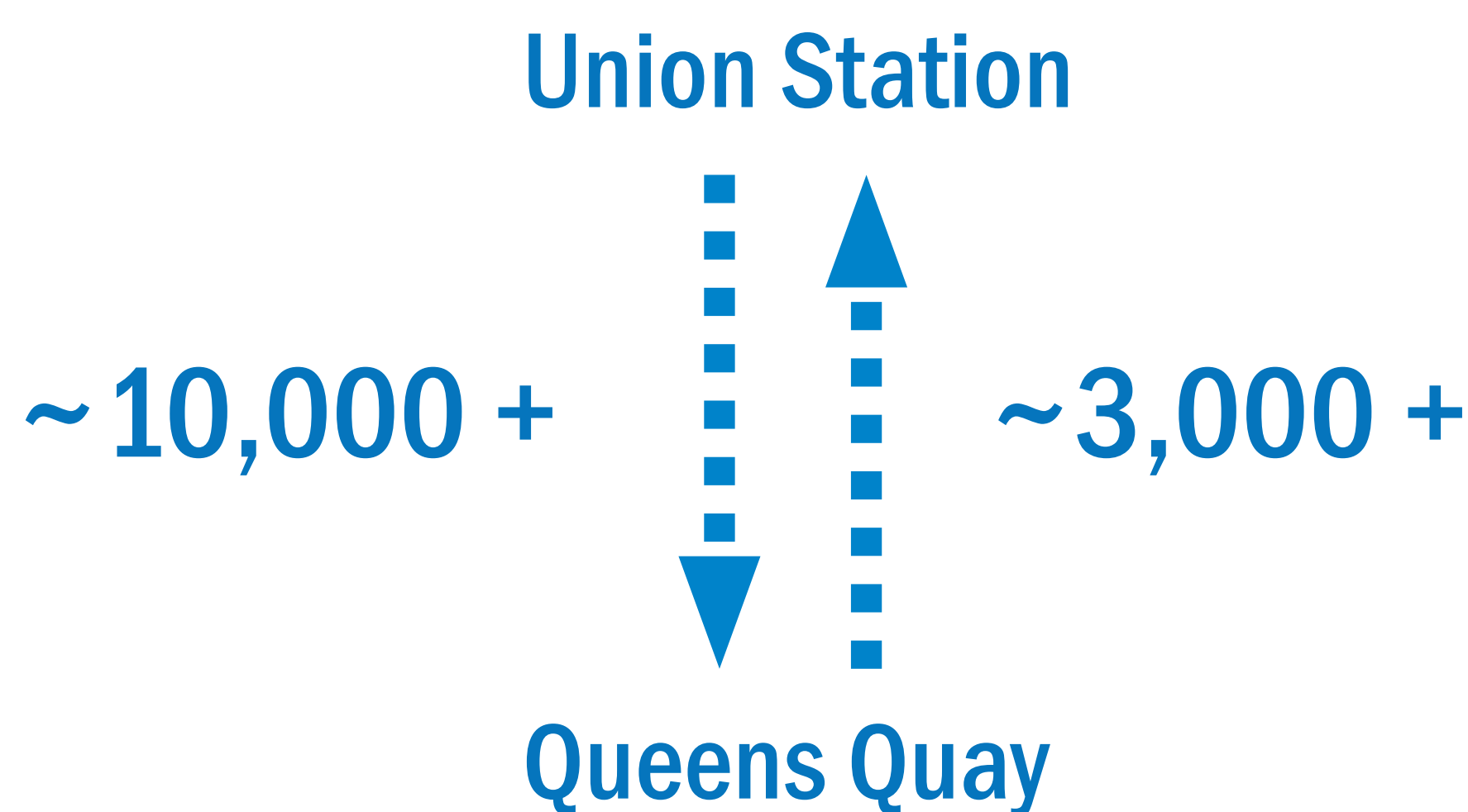
- Significant volumes along Bay Street and new elevated PATH west of Bay between Union and Queens Quay

Future South Bay Corridor Travel Patterns



North/South Movements

Combined Pedestrian and Transit Volume
(Projected 2041 AM Peak Hour Estimates)



Future Trend

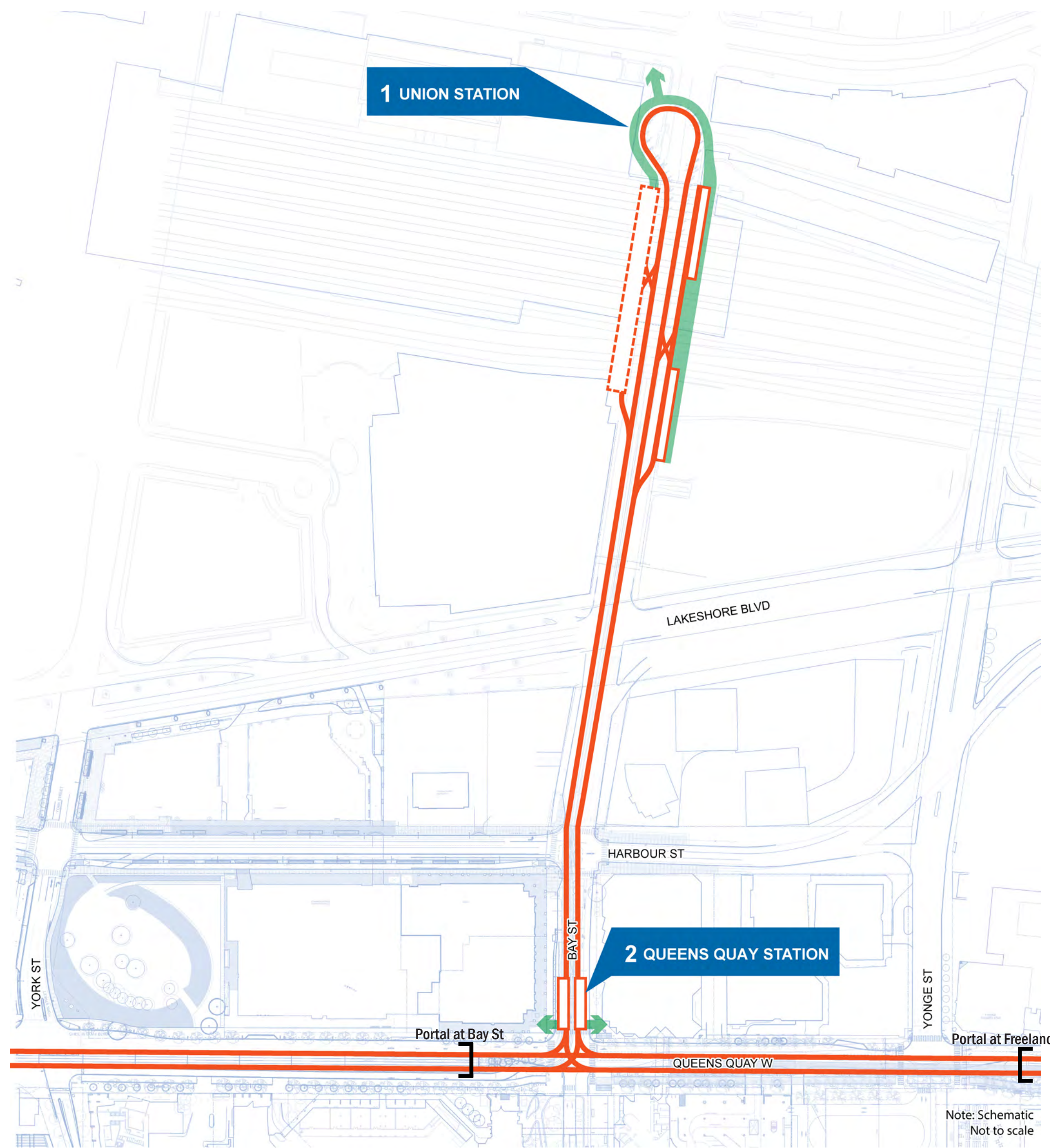
- Significant increase in N/S movements along the southern Bay corridor as new development emerges locally and further to the east
- Southbound movements in particular may increase more than 100% (AM peak)
- How may these movements be accommodated?

Notes:

1. Estimated transit volumes: 3700 pph southbound and 1700 pph northbound.
2. Estimates are conservative.

OPTION A: Expand LRT Infrastructure

This option expands capacity at the Union Station streetcar loop to allow future eastbound and westbound service along Queens Quay to run into Union Station.



Option A1: Major Union Station Loop Expansion

Key Infrastructure (EA Approved)

- Union Station
 - Provisions for 4 platforms
 - Additional by-pass trackage to access each platform separately
 - Integrated pedestrian tunnel between Union Station and new inter-regional bus terminal
- Queens Quay
 - Extend underground tunnel to east of Freeland

Operations

- Operates as a mainline station (not as a terminus)
- Assumed 4 min headways in each direction
- On-board operator

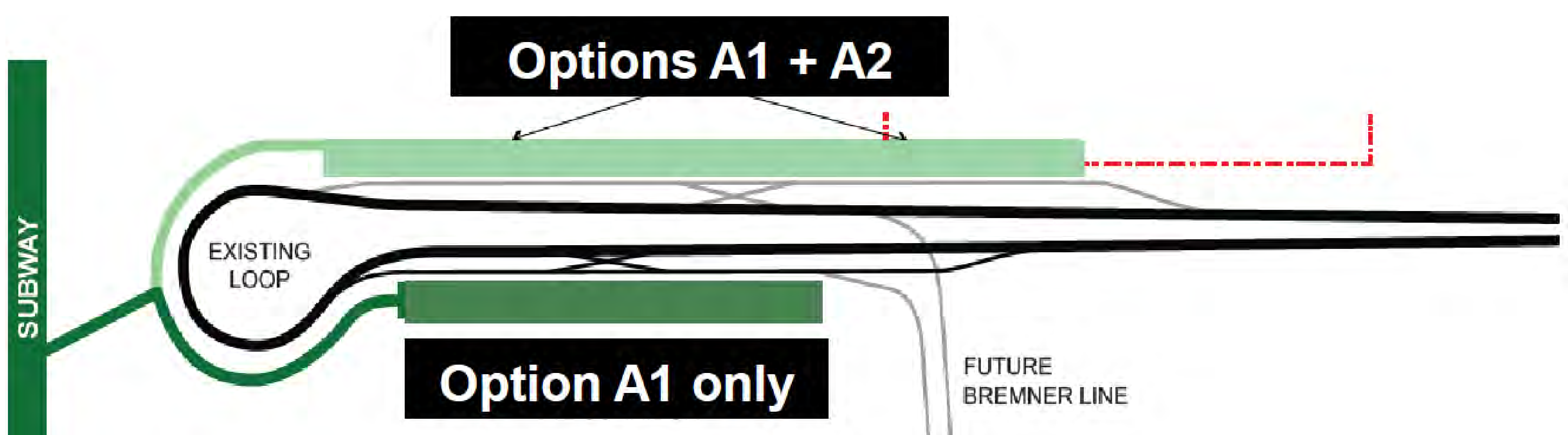
Option A2: Smaller Union Station Loop Expansion

Key Infrastructure (EA Approved)

- Similar as per Option A1, except there are initially only provisions for 2 platform

Operations

- similar as per Option A1

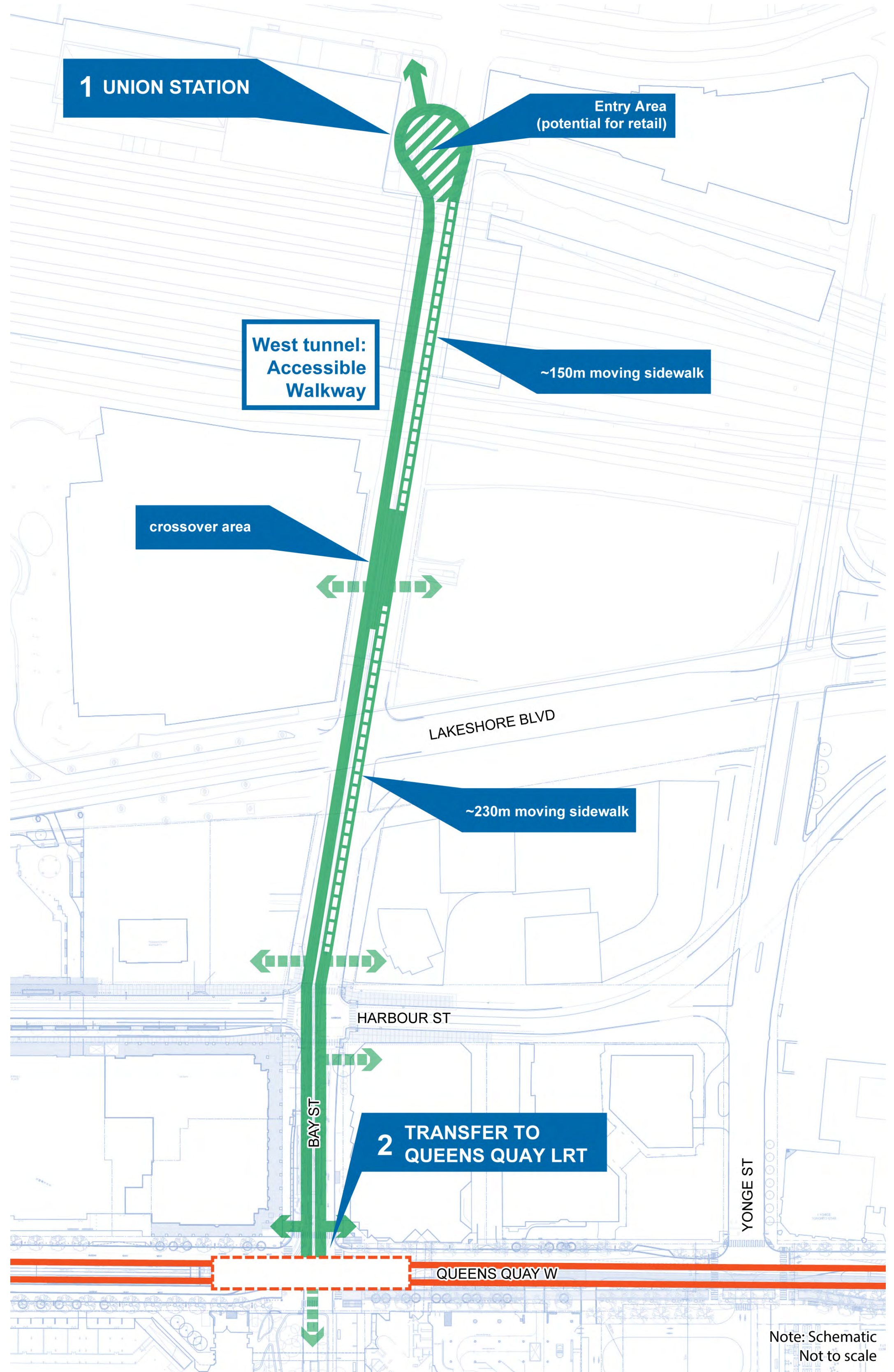


OPTION B: Repurposing the Tunnel - Walkway/Moving Sidewalk

This option replaces the single-line streetcar service between Union Station and Queens Quay with a moving sidewalk and walkway within the existing tunnel. There would be a convenient transfer to a future east-west LRT through service along Queens Quay.

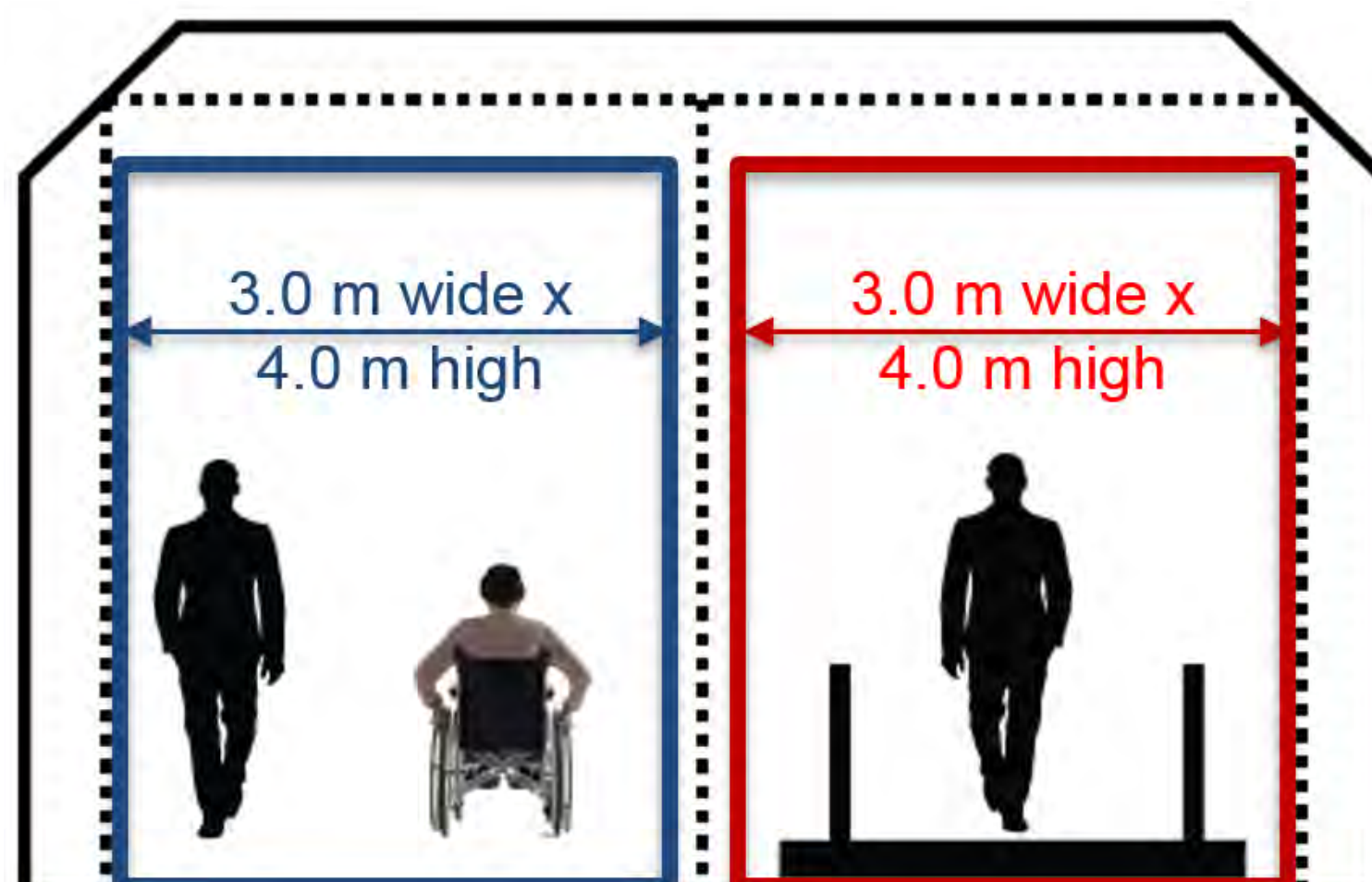
Repurpose Tunnel for Pedestrian Activity

Walking and using a moving sidewalk technology for the peak direction movement, similar to those around the world at airports and other transit systems, significant capacity can be provided in each direction. Potential to integrate with the City's PATH system and connect to existing and planned developments.



Sidewalk – West Tunnel

- Finished Tunnel Width – 3.0 m
- Effective Walking Width – 2.4 m
- Tunnel Length – 530 m



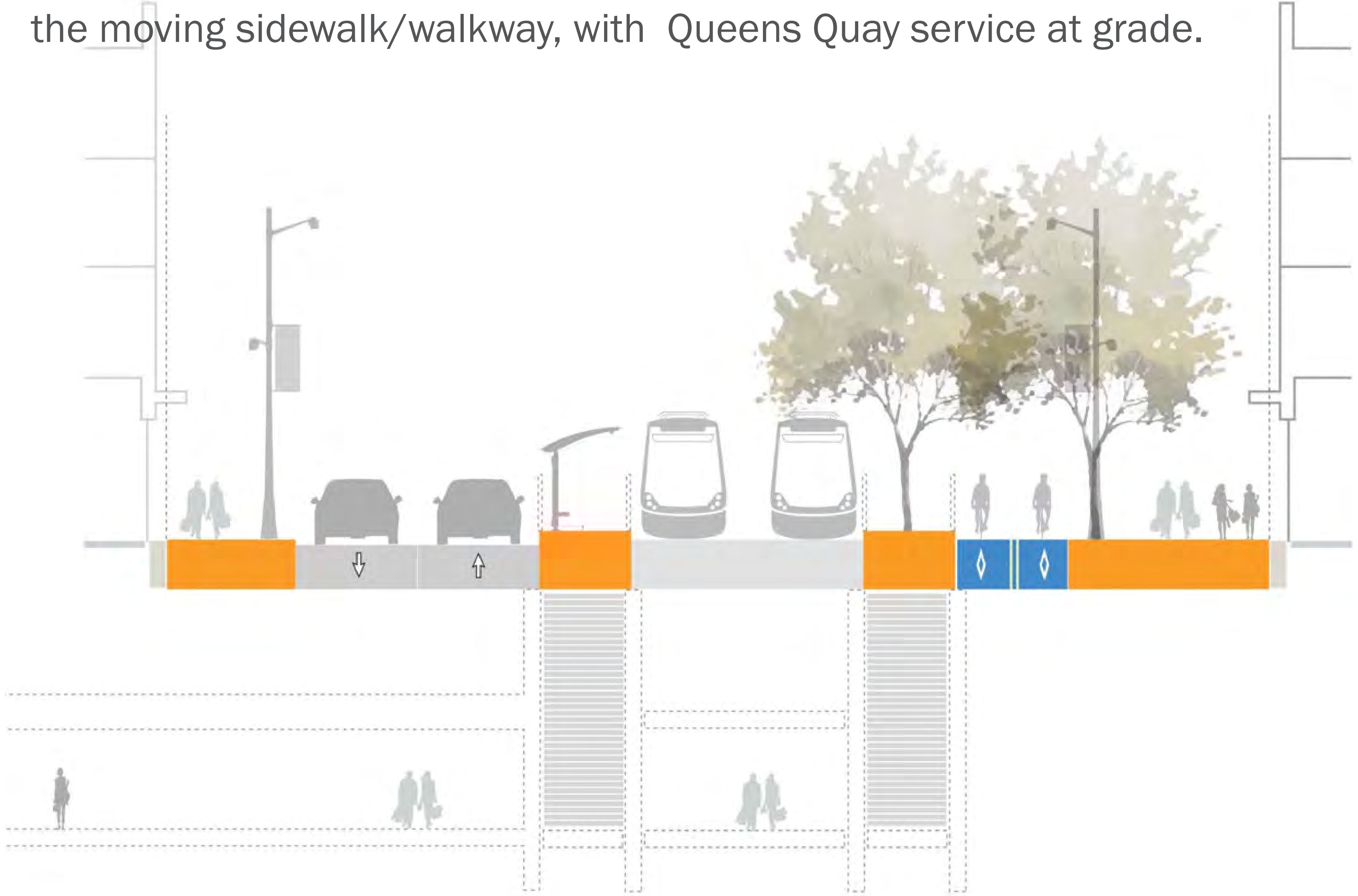
Moving Sidewalk – East Tunnel

- Finished Tunnel Width – 3.0 m
- Moving Sidewalk Width – 1.2 m (wider widths available)
- Tunnel Length – 530 m (moving sidewalk not continuous due to tunnel constraints and to allow for cross-overs and connections to destinations along the tunnel)



OPTION B: Queens Quay Section

Option B1 Conceptual illustration of the relationship between the streetcar and the moving sidewalk/walkway, with Queens Quay service at grade.



Option B2 Conceptual illustration of the relationship between the streetcar and the moving sidewalk/walkway, with Queens Quay service below grade.

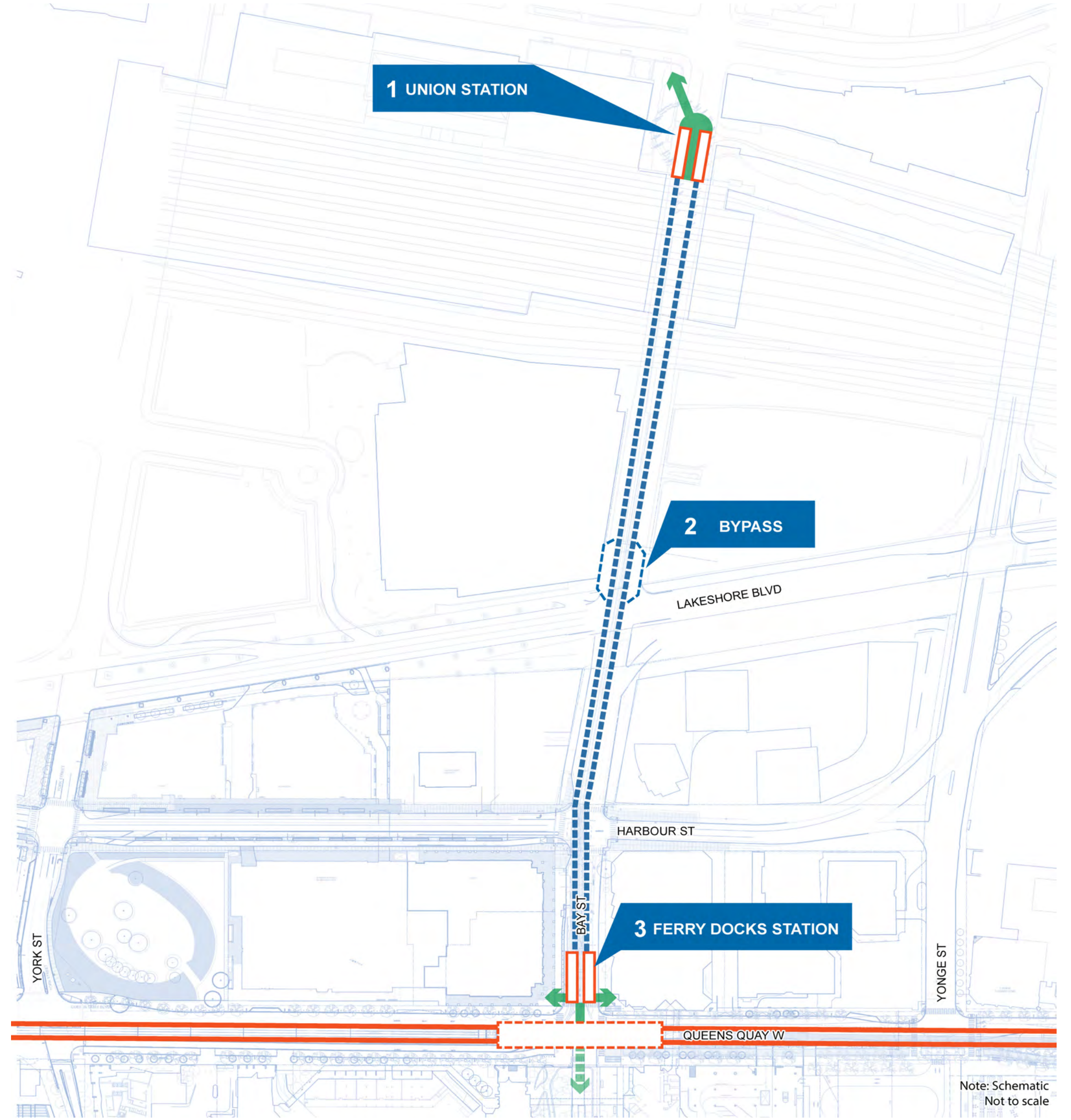
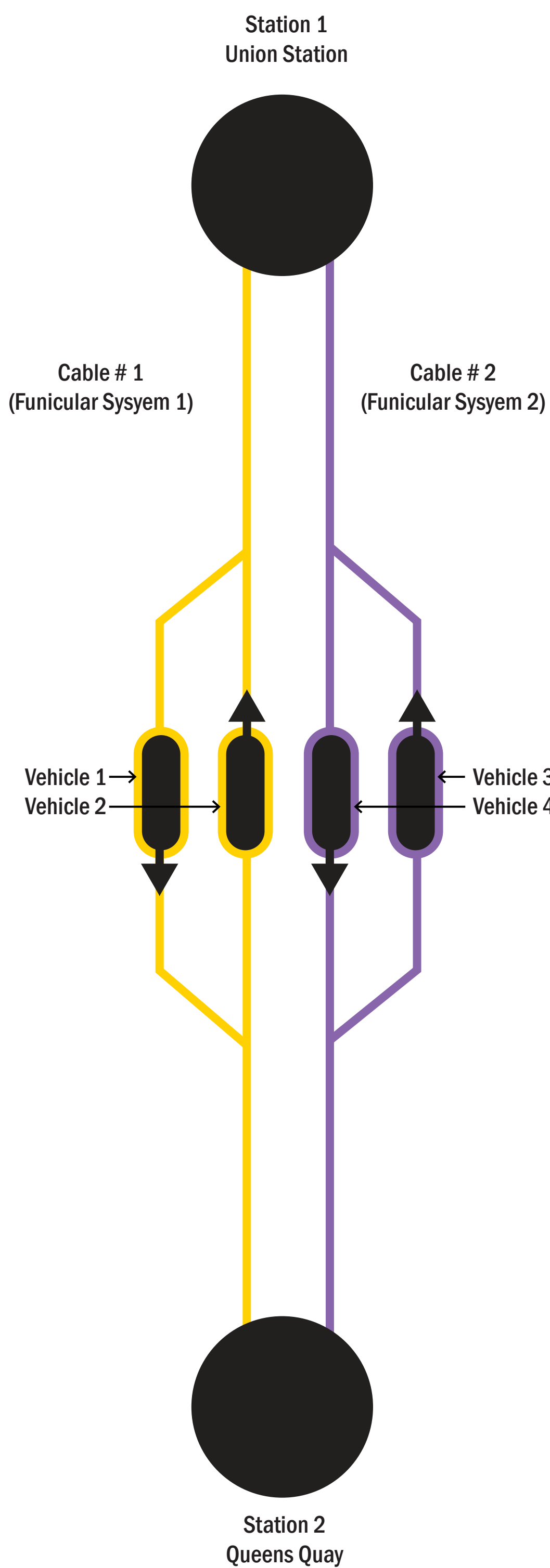


OPTION C: Repurposing the Tunnel for Alternate Transit Technology

This option replaces the single-line streetcar service between Union Station and Queens Quay with a high-speed, high capacity, dual-line cable-pulled system in the existing tunnel. There would be a convenient transfer to a future east-west LRT through service along Queens Quay.

Automated Dual Line, Dual Haul Bypass Funicular

Using technology similar to the train at Pearson Airport, four cars would operate on two lines, with a total capacity of 8,250 pphpd and reliability of over 98% with no human operator on the cars.



Precedents

Existing technology can be readily adapted for this system. Automated funicular technology is increasingly being used for short-haul service around the world, including as a connector between longer-haul systems, such as the Red Bridge Funicular in Luxembourg, which provides transfers between the Northern Line train and the Kirchberg Plateau Tram. The Fun'ambule in Neuchatel, Switzerland provides a direct link between the main commuter train station and the university.

Red Bridge Funicular (Luxembourg)



<https://www.youtube.com/watch?v=PkUbh1m3hPU>

Length (m)	240
Configuration	Dual haul bypass
Capacity (pphpd)	6,000
Total Train Capacity	168
Number of Trains	4
Speed	7 m/s

Fun'ambule (Neuchatel, Switzerland)

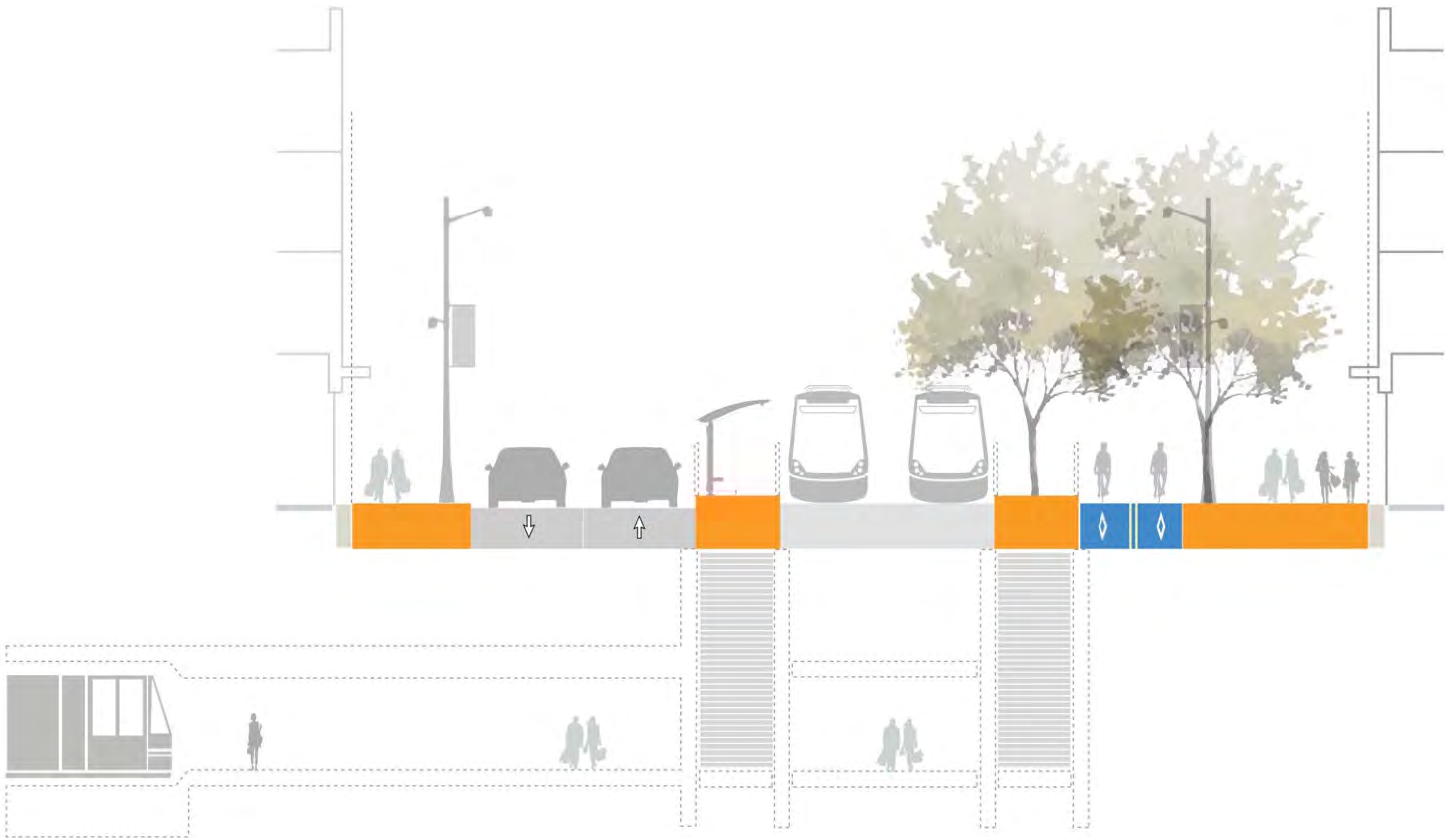


image by Funimag (Michel Azema)

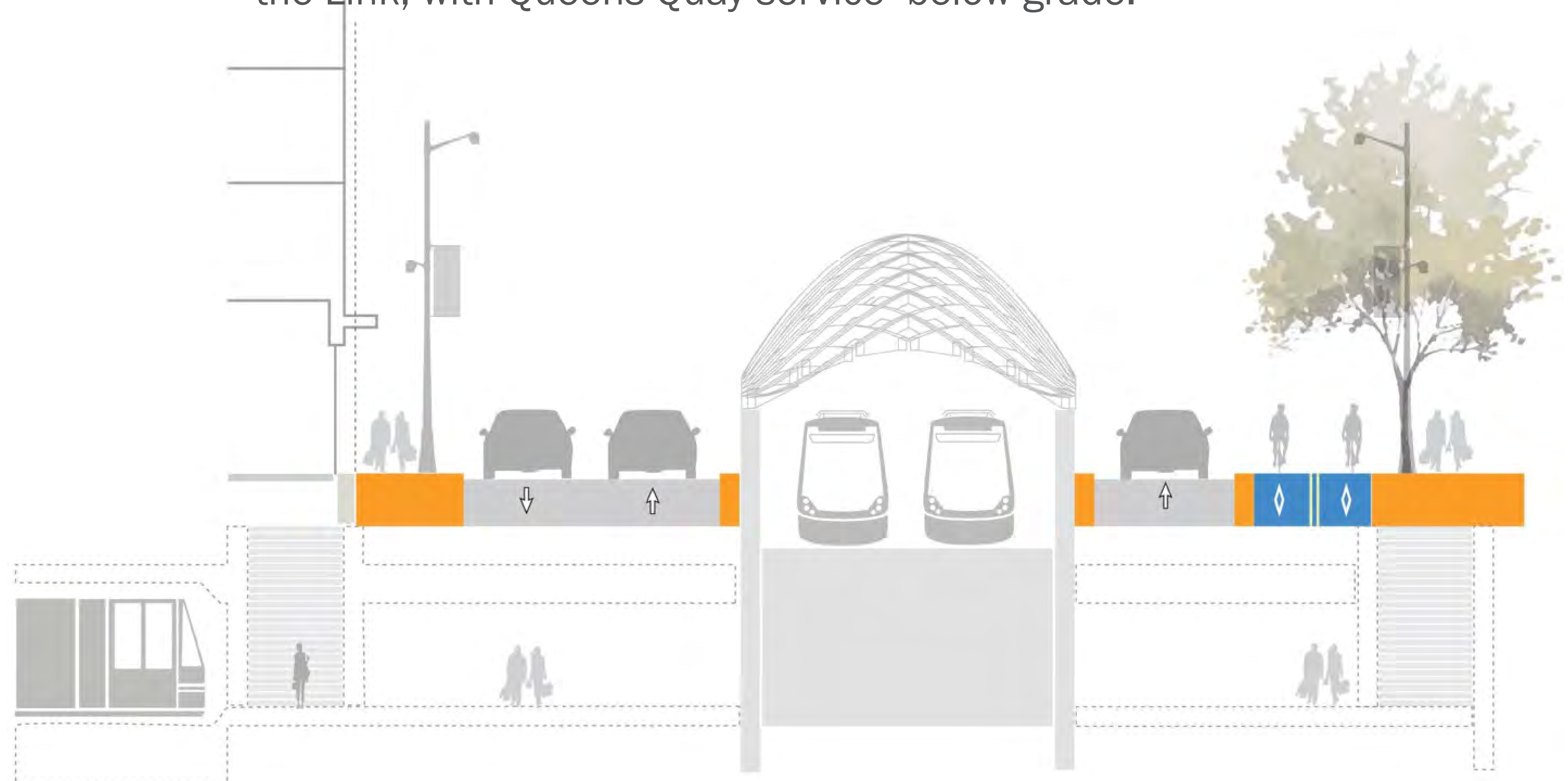
Length (m)	330
Configuration	Funicular. Single track bypass.
Capacity (pphpd)	3,400
Total Train Capacity	126
Number of Trains	2
Speed	8 m/s

OPTION C: Union Station / Bypass and Queens Quay Station

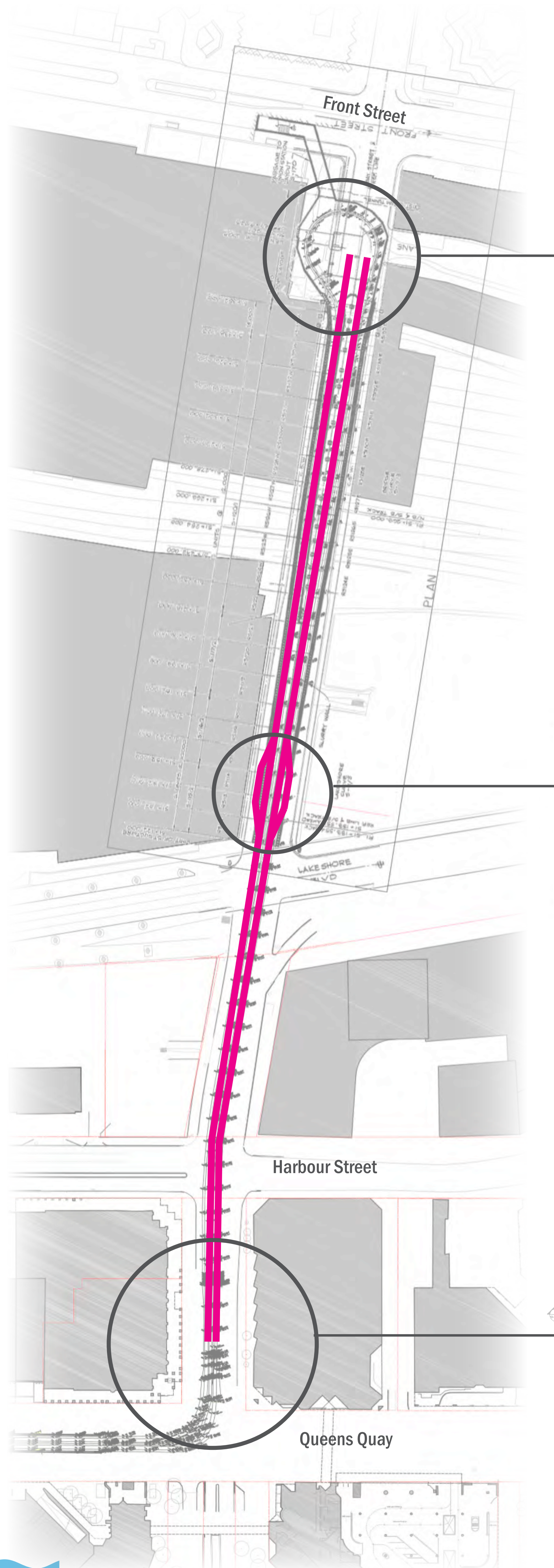
Option C1 Conceptual illustration of the relationship between the streetcar and the Link, with Queens Quay service at grade.



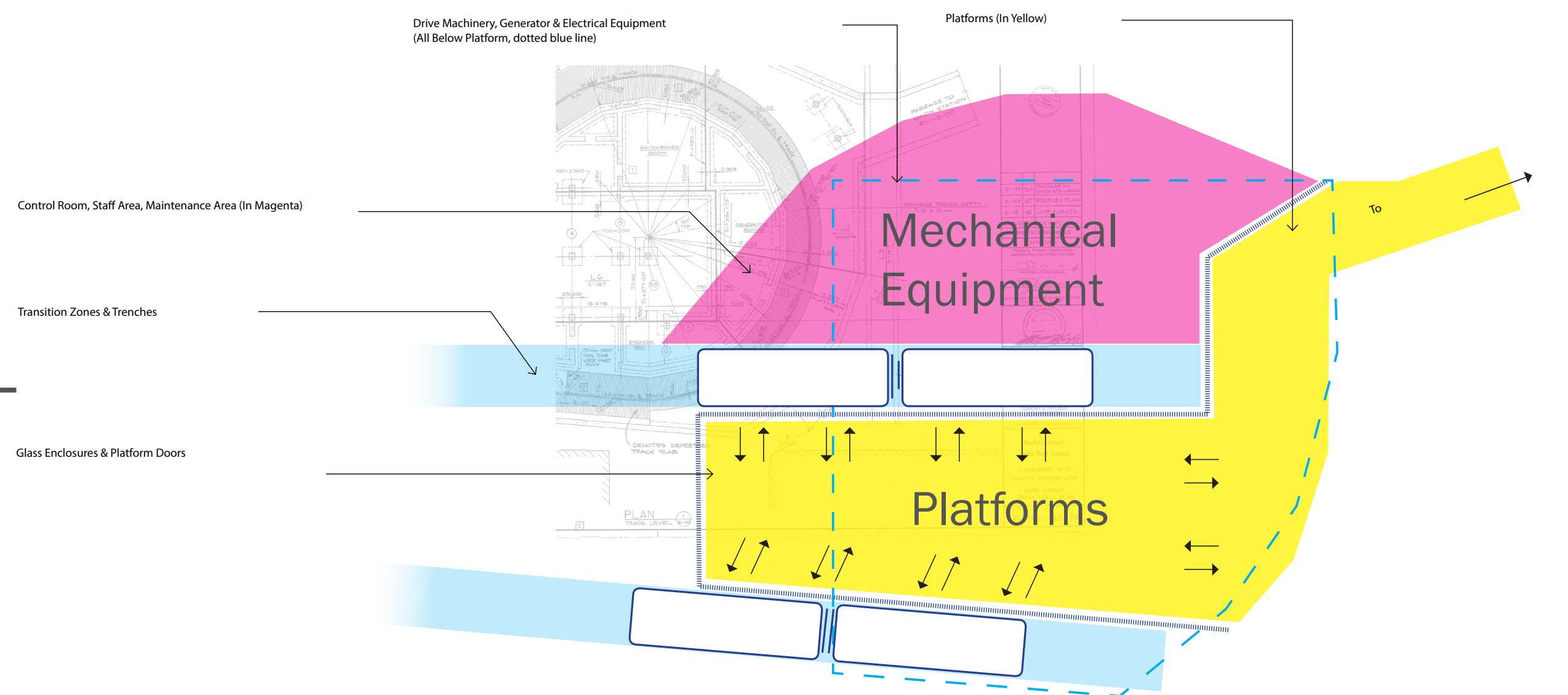
Option C2 Conceptual illustration of the relationship between the streetcar and the Link, with Queens Quay service below grade.



OPTION C: Union Station / Bypass and Queens Quay Station Modifications

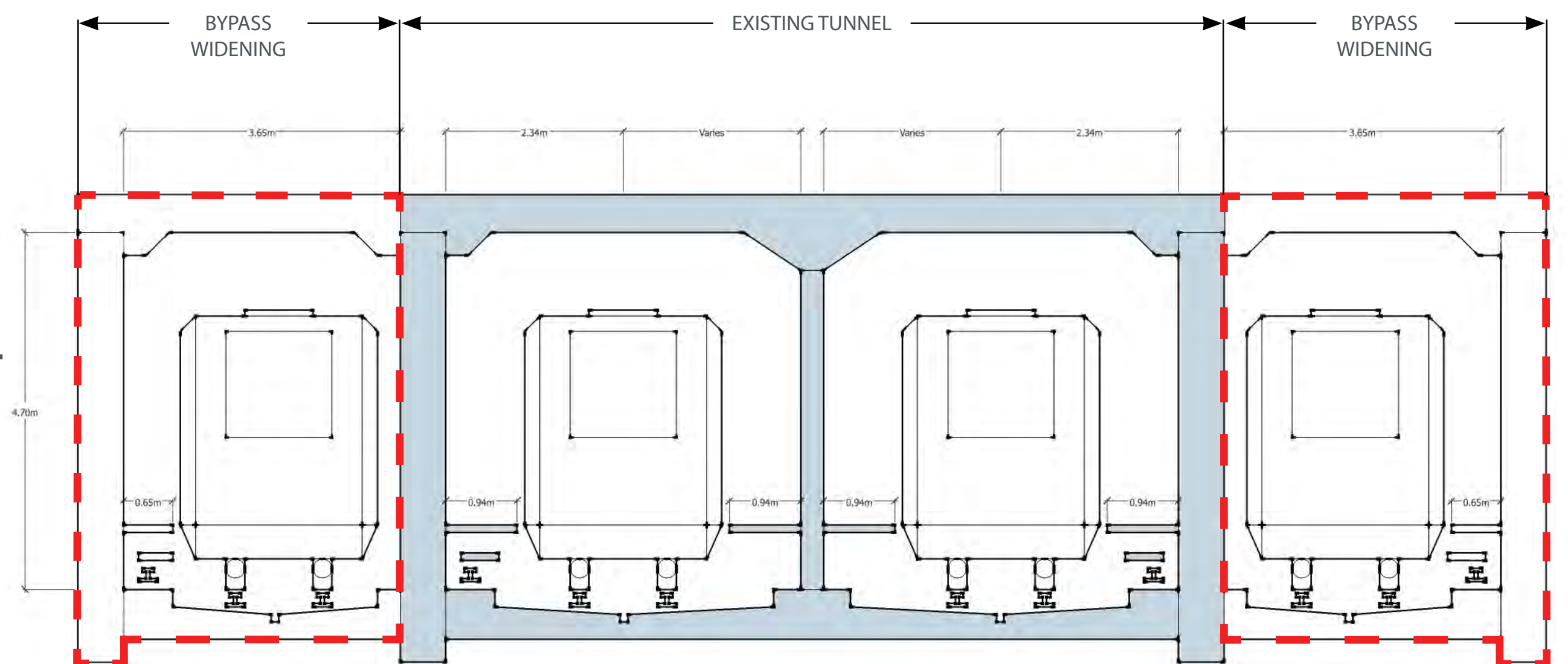


Union Station (Drive Room)



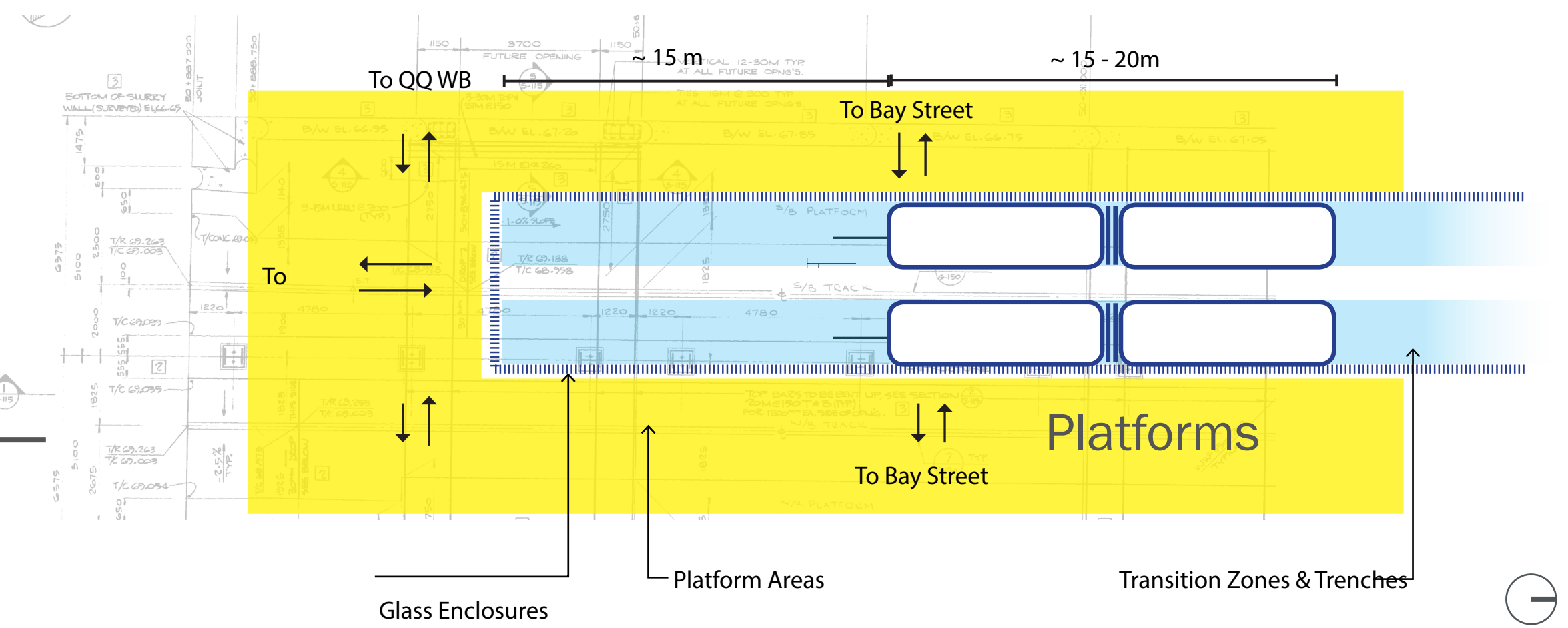
The existing loop is large enough for expanded two-sided platform and all drive equipment.

Tunnel (Section Showing Bypass)



The existing tunnel can accommodate the funicular system without impacting the slurry wall, with the exception of a 50m segment in the middle for the bypass.

Queens Quay Station (Return System)



The existing Queens Quay Station can be retained and retrofitted for the Link, or the station could be pushed farther south to bring it closer to the Queens Quayline and the Ferry terminal.

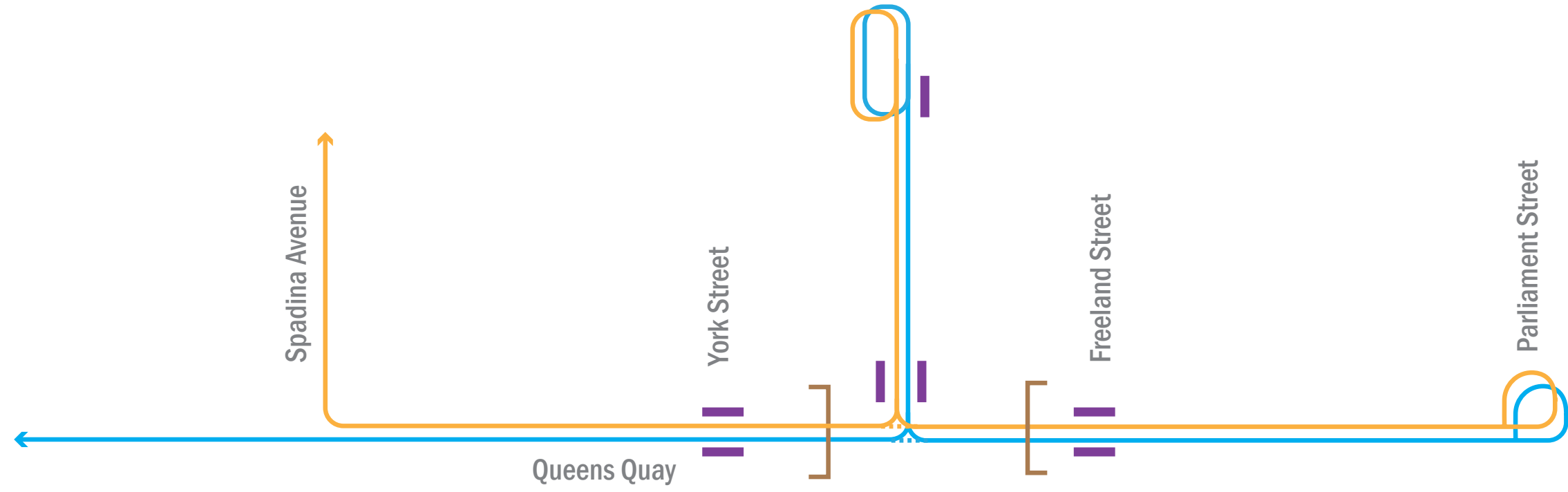
LEGEND	
	Streetcar Service
	Streetcar Service
	Platform
	Portal
	Bypass Track
	Walkway
	Moving Sidewalk
	Cable-pulled Link
	Optional Through Service

Summary of Union to Queens Quay Connection Options

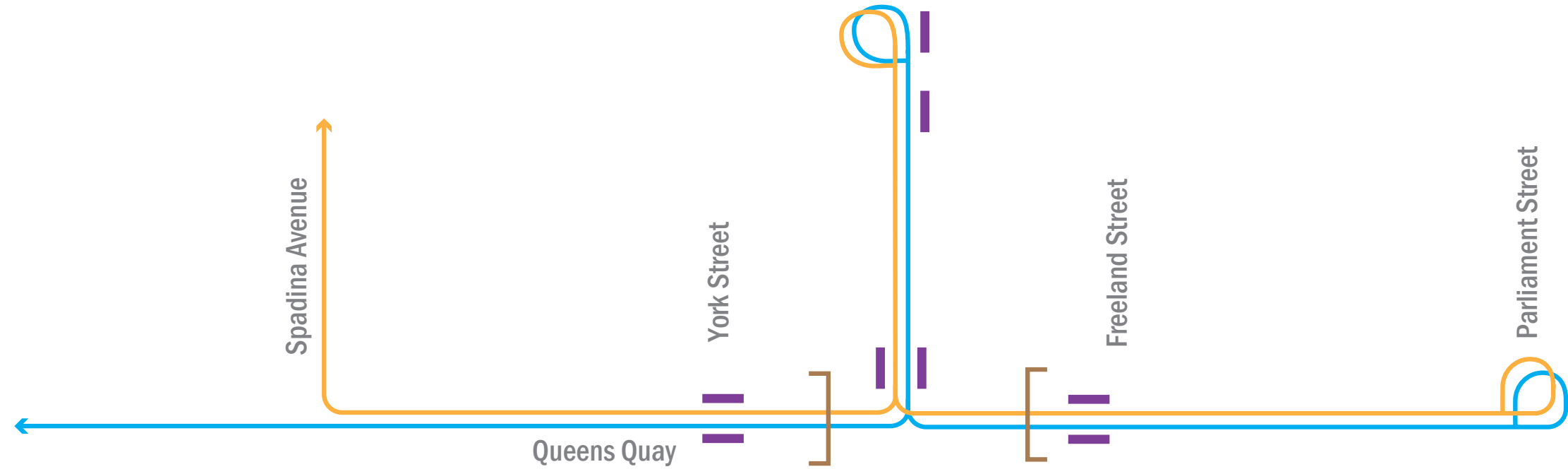
TODAY



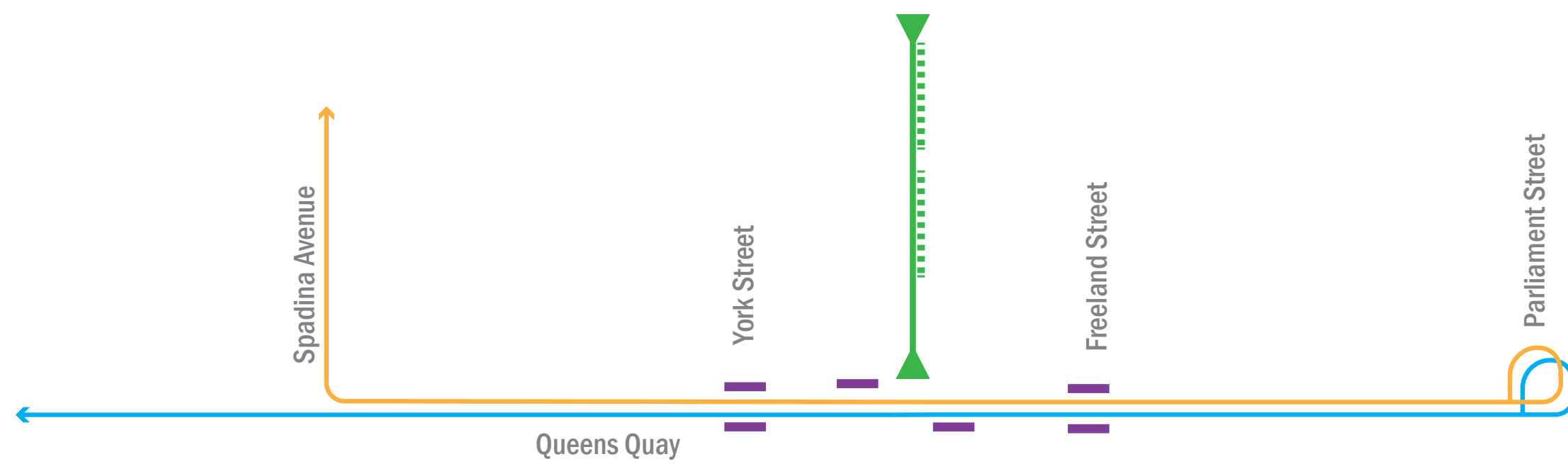
A1 - Expand LRT Infrastructure
(Major Loop Expansion)



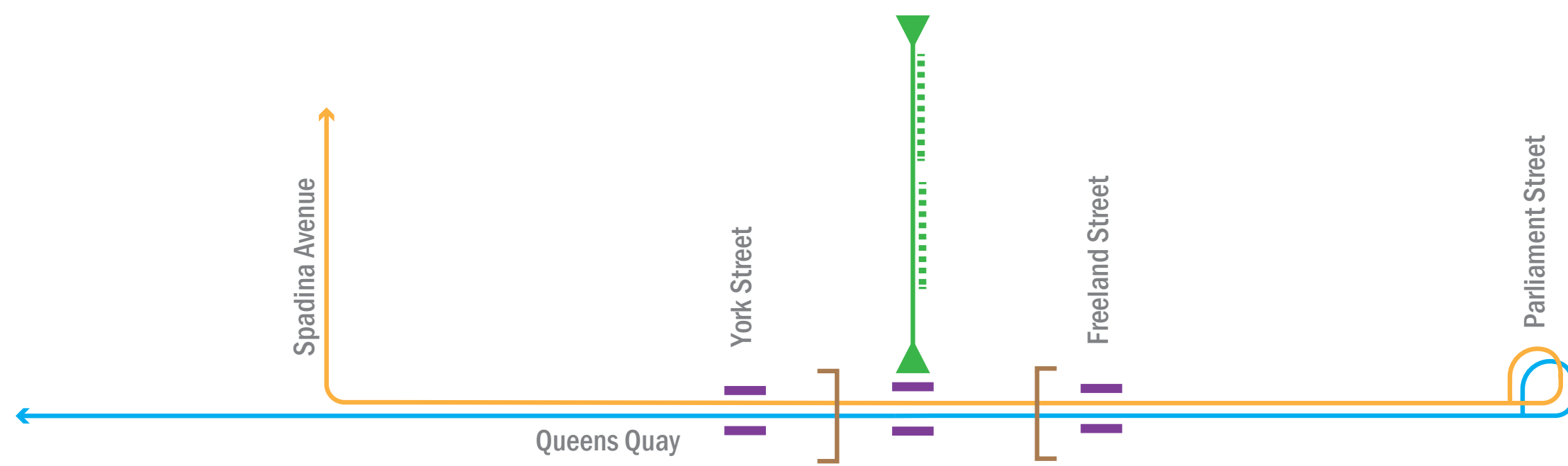
A2 - Expand LRT Infrastructure
(Loop Expansion 45 Bay Street)



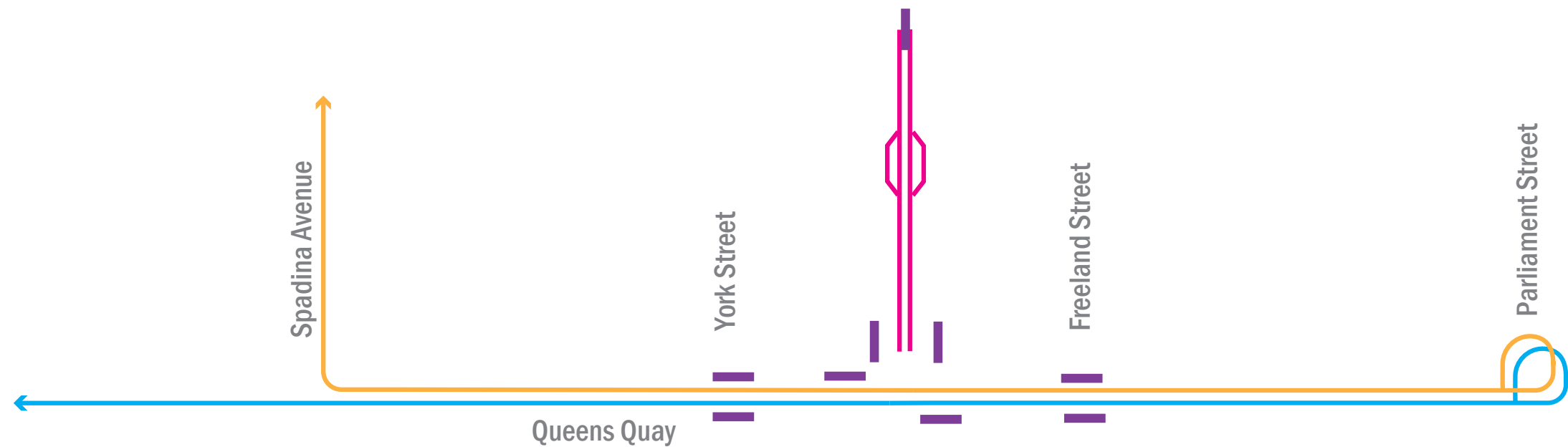
B1 - Repurpose Tunnel for Moving Sidewalk/Walkway
(Queens Quay at Grade)



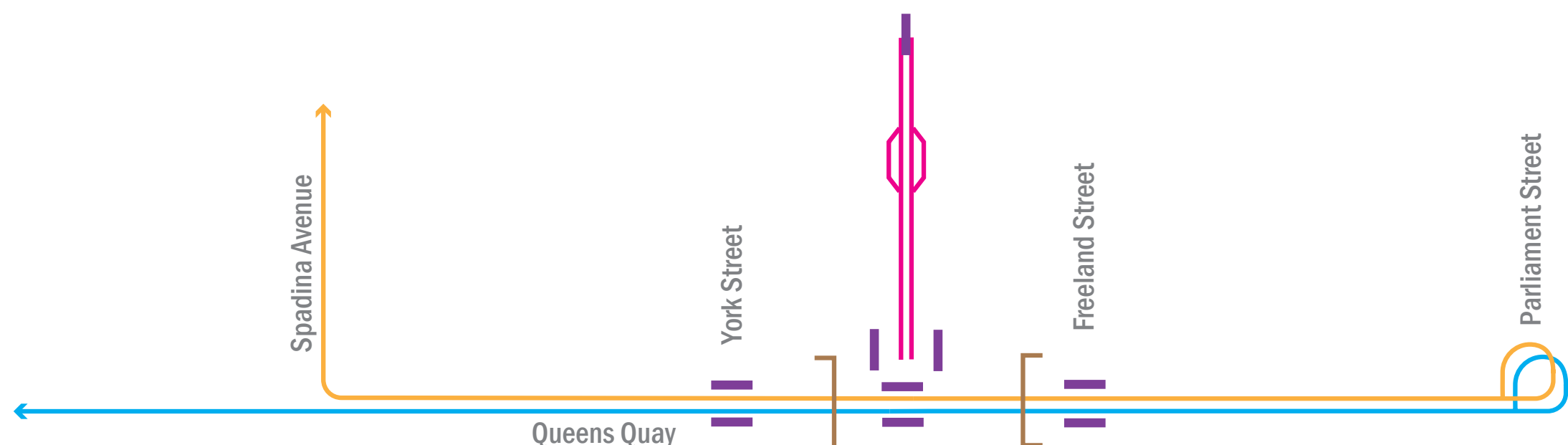
B2 - Repurpose Tunnel for Moving Sidewalk/Walkway
(Queens Quay Underground)



C1 - Repurpose Tunnel for Alternative Transit Technology
(Queens Quay at Grade)



C2 - Repurpose Tunnel for Alternative Transit Technology
(Queens Quay Underground)



Network Direction to 2041 - Strachan to Parliament

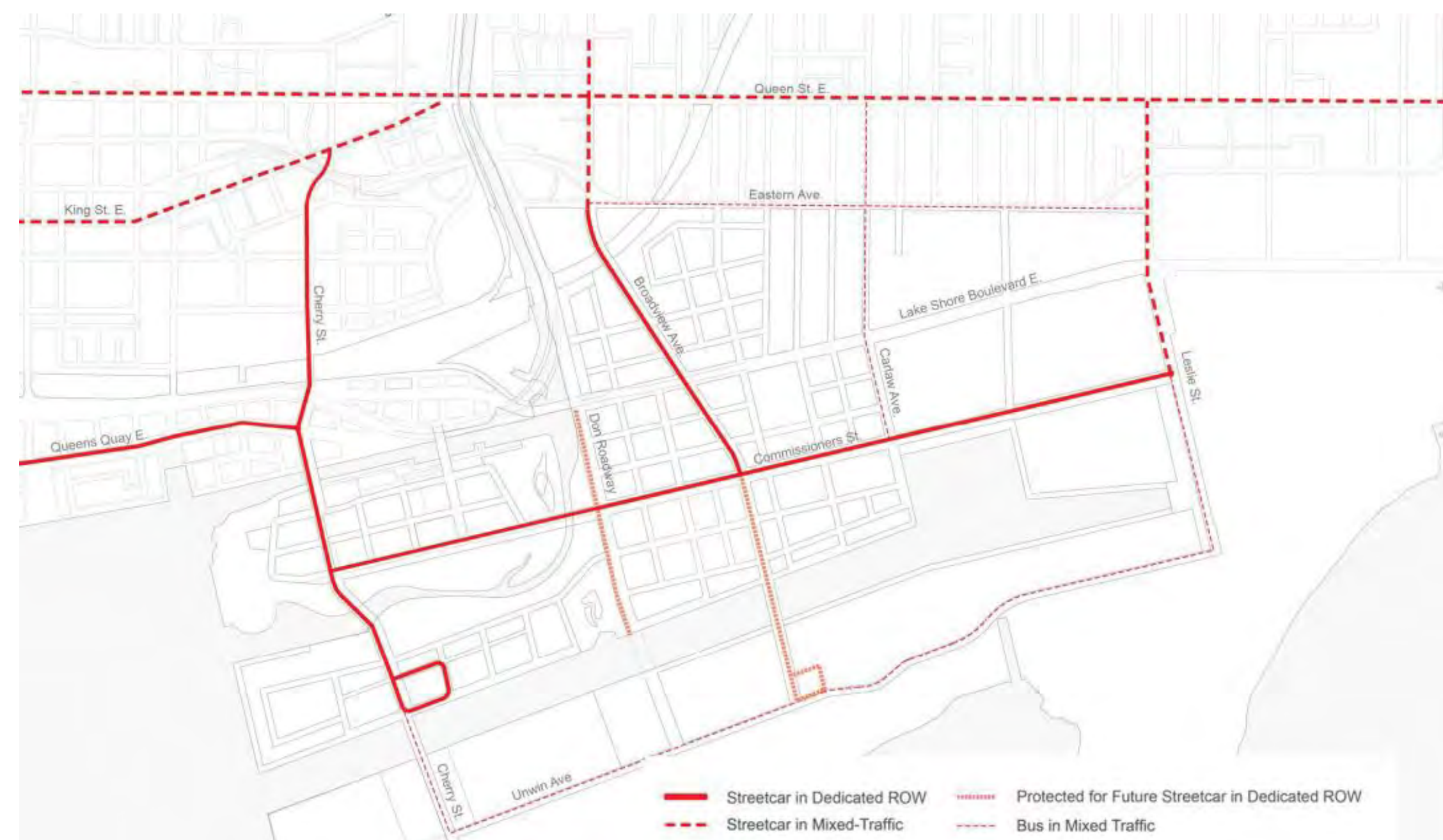


East Bayfront / Port Lands

- Transit planning completed under separate studies:
 - East Bayfront LRT EA (2010)
 - Port Lands and South of Eastern Transportation and Servicing Master Plan (TSMP) EA (2017)

Next Steps:

- Future considerations subject to Union - Queens Quay Connection recommendation:
 - Phasing and timing of incremental transit extensions
 - Alternative Downtown transit routing implications (i.e. size and location of terminus loop(s))



source: Port Lands + South of Eastern Transportation and Servicing Master Plan, Open House Nov 14, 2015

Leslie Street to Woodbine Avenue



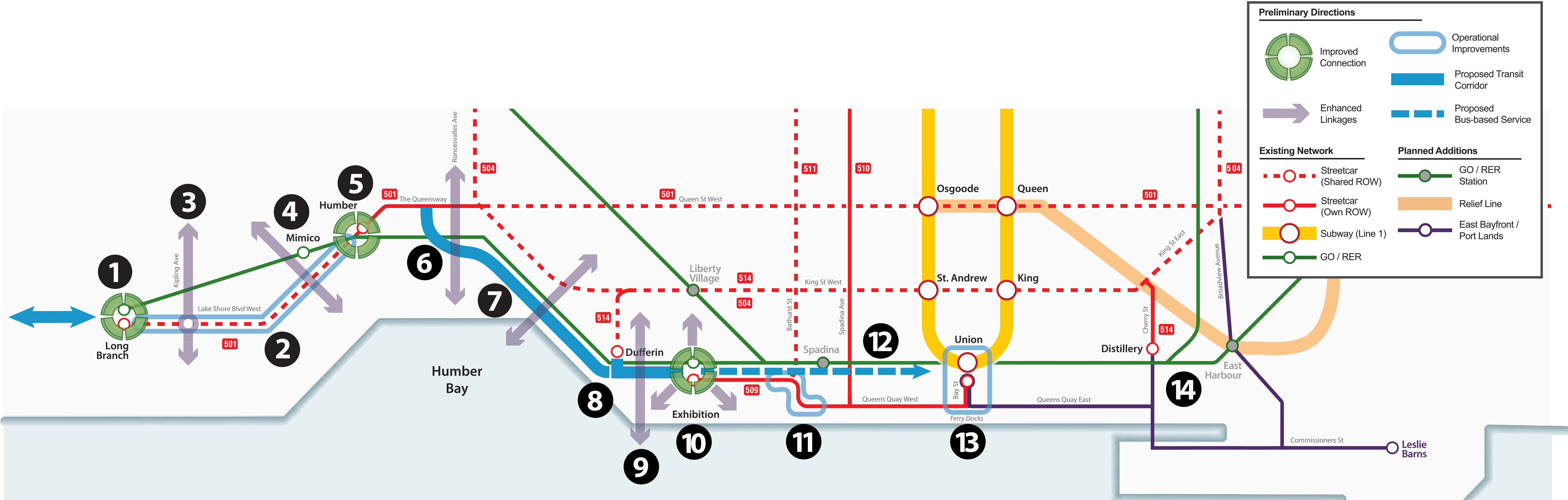
- Forecasted transit demand is low
- Post-2041 transit network consideration
- To consider bus-based solutions as part of the network solution

Next Steps:

- To be determined



Summary Network Plan



PRELIMINARY DIRECTIONS

- 1** Long Branch GO - Improved Multi-modal Connection Including Potential Cross Border Extension
- 2** Enhanced 501 Operations
- 3** Kipling - Enhanced N-S Multi-modal Linkage
- 4** Mimico GO - Enhanced N-S Multi-modal Linkage
- 5** Park Lawn to Humber Loop - Separated Transit Right-of-way
- 6** Humber Bay Link
- 7** Enhanced Waterfront Multi-modal Linkages

- 8** Dufferin to Exhibition Loop Connection
- 9** Ontario Place Connections
- 10** Exhibition GO / Liberty Village - Enhanced Multi-modal Linkages
- 11** Bathurst / Fleet / Lake Shore / Queens Quay Intersection Operational Improvement
- 12** Exclusive Transit Right-of-Way (Potential)
- 13** Union / Waterfront Link Recommendation
- 14** East Bayfront / Port Lands Implementation / Phasing