

Next Connections 2.3

Transit in Toronto: Expanding to Sustainability by 2050

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Summary

“Next Connections 2.3” recommends a set of public transit infrastructure initiatives that will generate the volume of modal shifts away from travel by personal automobile that are necessary if road congestion is to be significantly reduced from 2016 levels.

It is assumed that the 2020 and 2021 transportation difficulties arising from the **COVID-19** pandemic will pass and that, as has been the case with cities around the world throughout history, the Toronto area recover, and in better fashion. People are naturally attracted to cities for reasons of culture, employment, competition and entertainment, and the vibrancy of cities themselves. It is not realistic, possible, affordable or a good idea for the city of Toronto and its bordering municipalities to sprawl further out into the countryside. Toronto’s population will continue to grow, and will make up for lost time during the border closures during the COVID-19 pandemic. The Ontario Ministry of Finance has forecasted that the City of Toronto’s population will grow by close to 800,000 between 2019 and 2046, and Toronto may reach 4,000,000 residents by 2051.

Currently underway in the Toronto area are enhancements to GO Transit, a new Finch West LRT, and the Eglinton Crosstown LRT. In 2019, the Government of Ontario announced a \$28.5 billion rapid transit plan for Toronto that included an extension of the Yonge Street subway to Highway 7, a Scarborough Subway extension, a new Ontario Line subway, an extension of the Eglinton Crosstown LRT to Pearson International Airport, and a Hurontario LRT. In early 2022 the Ontario government unveiled a transportation plan for the

Greater Golden Horseshoe, which includes the city of Toronto. The plan includes the transit expansions listed above plus additional transit infrastructure. All the initiatives together will cost approximately \$73 billion to construct, and generate approximately 170 million new transit trips per year by 2051. If fully implemented, these expansions will increase transit ridership significantly, but will not be able to keep up with growth in daily trips by automobile by the year 2051.

The transit expansion initiatives recommended in this **Next Connections** document include the \$28.5 billion Rapid Transit Plan for Toronto (with a small variation) plus a set of alternative rapid transit initiatives that will produce approximately 364 million new transit trips per year by 2051, at an estimated cost of \$77.6 billion. In total, it is estimated that, taking all **Next Connections** transit improvements into account, daily trips by automobile in Toronto may decrease from 2016 volumes by approximately 65 million by 2051.

Overall, on a cost per new transit user basis, the **Next Connections** vision is twice as cost effective as the GGH plan, at 6% more cost.

The rapid transit initiatives recommended by **Next Connections** reflect the magnitude of effort that is necessary to achieve a sustainable transportation network in a larger context, where Toronto is part of a larger region that includes rural communities that will be more dependent on personal vehicles rather than public transit.

Comparing Alternative Scenarios	GGH Plan	Next Connections
Total Infrastructure Cost (millions)	\$73,100	\$77,600
Total New Transit Users/year by 2051	168,000,000	364,000,000
Cost per New Transit User	\$435	\$213
New User Cost Effectiveness Ratio	1.00	2.04
Kilometres of New Track	198	206
Cost per Kilometre of New Track	\$435	\$378

It is essential that the struggle against the serious and rapid destabilization of our climate be accelerated, as the 2015 United Nations Conference on Climate Change in Paris and more dire warnings at the global COP26 conference have pointed out. Much more needs to be done to reduce GHG emissions. For example, relying on conversions of gasoline-powered motor vehicles to electric power will not produce adequate GHG reductions if the sources of electric power are not free of GHG emissions. The mining, production, maintenance and disposal of vehicles of any type will increase GHG emissions. Importantly, they are also not a solution to road traffic congestion.

The recommended **Next Connections** transit service expansions should be – and can be – completed well before 2050, due to the urgency of climate change action and action to avoid crippling road traffic congestion as Toronto’s population grows. The recommended **Next Connections** components are limited to those that would be located in Toronto, with the exception of the first on the list that follows. The recommended initiatives include:

1. A continuous east-west rapid transit line through the northern half of Toronto. Its absence is the most significant missing element in the rapid transit network in the core of the GTA, and is essential if worsening congestion on Highway 401 and on other roads is to be avoided. Normally, 1.8 million people per day in non-commercial vehicles use the Highway between Liverpool Road in Pickering and Hurontario Street in Mississauga. Once the effects of COVID-19 are fully overcome, Highway 401 in Toronto will again become congested. Highway improvements will not be able to accommodate future growth in travel demand.

Next Connections recommends that a singular east-west cross-boundary rapid transit line through the northern half of Toronto is essential if Highway 401 is not to become non-functional for longer periods of each day. This ‘401RT’ is recommended to operate between Pickering Town Centre and Hurontario Street in Mississauga, and would connect to at least nine rapid transit lines and 25 surface bus routes across the region. The 401RT can be either mostly at-grade in the highway corridor or, preferably, elevated above it, with diversions to and from key off-highway destinations, including Pearson International Airport and its surrounding employment area, Yorkdale, Scarborough Centre, Pickering Town Centre, and the Sheppard subway, with which the 401RT would be integrated.

The at-grade option would require a barrier-protected conversion of the leftmost express lane of Highway 401 to transit; the additional conversion of shoulder lanes to provide enough space for station platforms would be necessary. An elevated 401RT would avoid highway lane conversions and enable full-size rail cars to operate; most diversions to off-highway destinations can also be elevated. Storage and maintenance yards can be built over the highway where off-highway diversions occur. The 401RT concept also includes almost 500 additional buses for intersecting arterial roads.

The 401RT, because of its length, speed of service, linkages and location in the centre of Toronto would generate an estimated 185 million new TTC users per year by 2051, plus transfers from existing transit services.

The 401RT will more than double the trip capacity of the Highway 401 corridor and prevent future growth-related gridlock in the corridor. It would enable travelers to rapidly access downtown Toronto and points across northern Toronto (for example, from the Yonge Street subway at Sheppard Avenue to Pearson Airport in 26 minutes, or from Yorkdale station to the University of Toronto's Scarborough campus (UTSC) in 32 minutes), reduce greenhouse gas emissions, revitalize the employment area surrounding the airport, promote urban development across the city and in Mississauga and Pickering, and reduce travel costs for many thousands of households.

The elevated 401RT would cost approximately \$21.3 billion to build, with an overall cost of \$356 per kilometre of service, compared to approximately \$370 million for the recent York-Spadina subway extension. At 4% interest, the cost of the elevated 401RT would be \$0.88 billion per year to carry once it is completed, and cost-shared by Canada and municipal government. However, importantly, the capital cost of the 401RT can be reduced by cost avoidances of other planned rapid transit initiatives, potentially totalling \$17.2 billion (see below). Approximately 1,000 job years of employment would be created. The overall annual operating revenue-to-cost ratio is estimated to reach 100%. The mostly at-grade 401RT would cost \$1.5 billion less to build than the elevated 401RT.

1a. GO Transit Ridership: The 401RT will increase ridership on GO Transit beyond Metrolinx forecasts by an estimated 16 million trips per year by 2051, plus a similar increase in TTC trips, as a result of new 401RT stations at Woodbine/27, Barrie GO and Oriole GO (relocated to Sheppard Ave), and an Agincourt GO station that is either moved, or a new transfer point constructed.

1b. Eglinton East LRT Extensions: *Next Connections* recommends that the Eglinton Crosstown LRT be extended 4.5 kilometres eastward as far as the Kingston Road intersection, and no further, at a cost of approximately \$1.1 billion, generating seven million new transit trips per year. The 401RT would divert most trips to/from Malvern and the University of Toronto Scarborough Campus from the Eglinton East LRT.

With regard to other proposed LRTs, with a 401RT in operation, ridership on a Sheppard East subway or LRT, the Jane Street LRT, and the Eglinton West LRT between Eglinton Avenue and Pearson would drop. Improved bus services can replace those LRTs. It is a failing that the operation of LRTs will require the elimination of local transit stops that support convenient access to transit. Altogether, a highly significant infrastructure cost avoidance of \$12.3 billion can be realized.

2. 900 eBuses: Reducing the number of automobiles on Toronto's streets requires improving access to and from rapid transit services, and better comfort and speed to local destinations. 900 additional electric-powered buses, including electric trolley bus systems, are recommended to be added to Toronto's surface transit system (in addition to those supporting the 401RT) at a capital cost \$1.0 billion. To maximize modal shifts to transit, buses should operate in dedicated lanes wherever possible, without adding to the width of roadways, and operate with priority traffic signalling. Transit stops should have shelters with lock-ups for bicycles and e-scooters. Both local and express services should be improved. The operating revenue-to-cost ratio may reach 61%. Examples of some routes include:

- Finch East Priority Bus – Yonge Street to Toronto Zoo
- Kingston Road BRT – Main Subway Station to Port Union Road
- Dundas Street West of Kipling – To The West Mall, as step to a longer BRT across Mississauga
- Finch West Priority Bus routes – to Pearson and to Brampton
- Waterfront East Priority Bus
- Don Mills bus – From York Mills Road to North of Steeles Avenue
- Jane Street – From 401RT to Steeles Avenue

3. Ontario Line Extension to 401RT: The Ontario Line subway is an essential addition to Toronto's rapid transit system. Because new ridership on the 401RT would otherwise add to the congestion on the Yonge Street subway, the currently-approved Ontario Line should be extended north of Eglinton Avenue to intersect with the 401RT at Victoria Park Avenue, and from there continue to Sheppard Avenue East. An Ontario Line subway station at the York Mills-DVP intersection, supported by a multi-level parking facility, will help to divert trips by automobile from the Don Valley Parkway, easing parkway congestion. This extension would cost approximately \$3.8 billion to build, and generate an estimated 14 million new transit trips per year.

4. Ontario Line to Dundas West: *Next Connections* recommends that the Ontario Line be extended westward to the Dundas West subway station, and that it not be diverted to Exhibition GO station. Instead, it is recommended to continue westward to serve high-density communities along King Street west of King/Bathurst station, with stations at Liberty Village (GO station), Dufferin Street and Jameson Avenue. Increased ridership pressures on the Spadina-York subway portion of the Line 1 subway created by the Eglinton Crosstown LRT, GO Rail enhancements, the 401RT, improved bus services and population growth warrants the Ontario Line extension to the Dundas West station. As an example of improved speed of travel, a subway trip from Jameson Avenue to St. Andrew subway station would be cut from 23 minutes by streetcar to 9 minutes on the Ontario Line.

This extension would generate approximately 12.6 million new transit trips per year, plus transfers from existing transit services, at a net infrastructure investment of \$3.3 billion.

5. Ontario Line North of Bloor Street: *Next Connections* recommends that the Ontario Line be extended 8.4 kilometres northward from the Dundas West subway station to intersect with the Eglinton Crosstown LRT and with the 401RT at Jane Street, creating a multitude of new rapid transit options for travelers. This seven-station extension can generate approximately 16 million new transit riders a year shortly after it becomes operational. The extension would cost \$4.9 billion to construct, and generate approximately 24,000 job years during construction.

6. Eglinton Avenue West of Mt. Dennis: The 401RT will enable travelers on the Eglinton Crosstown LRT extension to Renforth Avenue to transfer to the 401RT for a direct connection to Pearson International Airport and to employment areas north of Highway 401. The Eglinton West LRT extension between Eglinton Avenue West at Renforth to Pearson will not be necessary.

7. West Commuter LRT: Once the Ontario Line between University Avenue and Dundas West subway station is operational, a West Commuter LRT is recommended to be constructed that extends westward around Humber Bay from the Ontario Line's QuRK station (Queen/Roncesvalles/King) using the existing streetcar right-of-way, and then onto or above the Gardiner Expressway corridor west of the Humber River (in a manner similar to the 401RT) to Kipling Avenue. Modal shifts to the LRT from the expressway and intersecting city streets would be supported by multi-level fee-based parking garages constructed above the expressway right-of-way at five West Commuter LRT stations. The West Commuter LRT would cost \$1.8 billion to build, excluding the parking garages. New transit ridership is estimated to be 12.3 million trips per year, plus transfers from existing TTC services.

Enhanced GO Transit rail services, the extended Ontario Line, linkages created by the 401RT, the Eglinton Crosstown LRT, and improved bus services will enable the removal of the entire elevated portion of the Gardiner Expressway, and to not (as currently approved by Toronto) re-build the expressway east of Jarvis Street.

8. Waterfront West LRT: *Next Connections* recommends that, once the West Commuter LRT is operational, a realigned Waterfront West LRT be built that runs along Lakeshore Boulevard for almost all of its route, and that it run northward, at grade or tunneled, to link to Union Station at York Street, the Line 1 subway and the Ontario Line subway at University Avenue. It would directly serve an enlarged parkland around Humber Bay, the Humber Shores community, Ontario Place and the CNE grounds, and the downtown core north and south of Lakeshore Boulevard. It would be integrated with streetcar services west of Parklawn Road, and generate approximately 10.9 million new transit trips a year. The 8.4-kilometre LRT would cost \$1.9 billion to construct.

9. Scarborough Subway Enhancement: Transfers to and from the 401RT will generate a significant increase in ridership on the approved three-station Scarborough Subway Extension (SSE) of the Danforth subway. To better serve the Malvern community and nearby employment areas, the SSE should be extended northward from Sheppard Avenue East by 2.3 kilometres, to Finch Avenue East. An additional station can be constructed at the Brimley/Danforth Road/Eglinton intersection, where urban redevelopment potential is high. The Scarborough Subway enhancements would cost \$1.4 billion to build, and generate an estimated 3.4 million new transit trips per year by 2051.

10. Finch West LRT extensions to Yonge Street: A 6-kilometre extension between the Finch subway station on Yonge Street and the Finch West subway station will eliminate the transfer delays between the subway stations, resulting in major improvements in trip times, and generate approximately 6.5 million new transit trips per year. East of Bathurst Street, the LRT may have to operate in mixed traffic, or be tunneled. Without tunneling, the investment to build the extension is estimated to cost \$1.1 billion.

11. Steeles Avenue LRT: An LRT on Steeles Avenue between Jane Street and the Scarborough Subway, included in The Ontario government's GGH Transportation Plan, should be extended westward to Islington Avenue, to capture additional employment and residential travel demand growth, and to intersect with more north-south arterial roads in Toronto and York Region. In the East, it is recommended to run south from Steeles at McCowan Road to terminate at the extended Scarborough subway's Finch East station. The net capital cost of lengthening the LRT in the West and a shorter segment in the East is approximately \$1.1 billion.

12. St. Clair LRT extension to Jane: Toronto has recommended that the St. Clair streetcar service be extended westward 1.5 kilometres to heavily-traveled Jane Street, at a cost of approximately \$170 million.

13. Dundas Street BRT to West Mall: A Dundas Street Bus Rapid Transit line has been identified by Metrolinx to operate from the Kipling subway station to and into Burlington. *Next Connections* includes the Kipling-to-West Mall segment, a length of two kilometres, at an approximate capital cost of \$100 million. New transit ridership may reach 4.9 million per year.

14. Active Transportation: The "Walk, Cycle, Other" modal category identified by MTO's Transportation Tomorrow Survey estimates it constitutes 15% of all daily trips; within that, less than 2% of all daily trips are by bicycle. Over time, with expansions to the bicycle network and more people walking as urban infill and intensification occurs, this percent should increase. *Next Connections* has not recommended or costed any specific examples of needed network locations, but has identified an additional modal shift of 150,000 daily trips by walking and cycling by 2050, drawing ridership equally from public transit and from the use of automobiles.

Transit Expansion Beyond Toronto – Due to limitations of resources to analyze the transit improvements needed to achieve climate change and road congestion goals in the municipalities outside Toronto, no recommendations for these have been made in the ***Next Connections*** document.

Movement of Goods – Reductions in travel by automobile benefit the movement of freight on major highways and on city streets. Overall, increases in truck movements may mirror the population growth estimated for Toronto by 2051. If transit expansion is limited to currently-approved projects, overall road traffic on roads and highways in Toronto will increase. By adding recommended ***Next Connections*** infrastructure, overall road traffic can be reduced to approximately 70% of 2016 volumes. However, that will not produce an adequate reduction in GHG emissions. It will be necessary for small trucks to become powered by electricity or hydrogen, and larger trucks by more benign fuels than gasoline, such as natural gas, hydrogen or electricity. Systems for reducing delivery times and kilometres traveled will also be needed.

Transit Ridership Analysis – While population growth and its effects on congestion will generate significant ridership increases, other factors will intensify the modal shift away from the use of automobiles, such as almost 30 new rapid transit-to-rapid transit connections created by ***Next Connections***, much better service frequencies on surface transit from 1,400 more buses included in the ***Next Connections*** scenario (including buses intersecting with the 401RT), and overall faster service to people as a result of more subways, LRTs and express bus services on dedicated lanes. An important driver of change will also be direct actions to combat climate change, such as carbon taxes.

Phasing – In light of worsening of the impacts of climate change, travel demand growth, the costs of owning and operating personal automobiles and other factors, the ***Next Connections*** recommended transit infrastructure should be operational within 25 years or sooner. Overall, the average rate of implementation of recommended initiatives would be 5.2 kilometres of at-grade LRTs and Priority Bus and BRT per year, and 3.1 kilometres of subway technology expansions per year. This is achievable.

The Environment: Climate Change – The dire consequences to all people of the ongoing pace of GHG emissions must be mitigated. ***The prospect of unstoppable climate destabilization and rapid global heating is real and will be devastating.*** Natural life will, in many cases, not be able to adapt quickly enough, causing tremendous damage and die-offs of ecosystems and habitats. The direct and indirect costs to human society will be great. **This is critical information. Refer to Appendix 2 for more information.**

Although the recommended new transit infrastructure will generate significant reductions in GHG emissions, it is not likely that hydroelectric, solar, wind, and geothermal power will be able to replace all fossil fuels. Safe nuclear power will also need to be increased. Disincentives to using fossil fuels will also be necessary.

Autonomous and Shared Vehicles – Autonomous vehicles (AVs) and electric vehicles will not resolve road traffic congestion as travel demand increases. Public transit vehicles are much more space-efficient than can be achieved by the spatial efficiencies that may be possible with AVs. AV-type buses will help with some shuttle services and in controlled rights-of-ways, but ongoing technical problems, changes in driving conditions and overall affordability of AVs will limit their distribution during the critical years needed to bring GHG emissions to net zero. Shared vehicle services such as Uber will contribute to congestion, as many one-way trips of clients will involve driving from an originating point to the client and then to the client's destination.

Next Connections Benefits – ***Next Connections*** identifies twenty-eight general economic, environmental, social and transportation benefits to government, households and commerce arising from the implementation of the recommended transit infrastructure (page 36). Overall, 13 benefits have been quantified, generating approximately \$3.3 billion annual benefits once all initiatives are operational, plus

almost \$90 billion during the implementation period. Overall, not implementing the recommended transit services (or similar services) is more costly than implementing them.

Affordability – The recommended **Next Connections** initiatives will require an estimated net infrastructure investment of \$45.8 billion that may cost \$1.8 billion annually in ongoing debt interest payments (@4.0%) once all components are operational – costs that will be shared by all levels of government. The cost to the average Toronto household would be as low as 23 cents per day by 2046, net of a 1/3 Canada government share of gross costs. Overall, based on estimations of new ridership for each of the **Next Connections** initiatives, operating revenues can offset approximately 90% of operating expenditures. Municipal subsidies to cover operating deficits may be as little as a penny per day per household.

This is an affordable investment to cut congestion and GHG emissions, and create ongoing employment. They are significantly more cost-effective than the current Ontario Rapid Transit Plan for the Toronto area. Overall, compared to the \$28.5 billion Ontario Rapid Transit Plan for Toronto announced in 2019, the updated **Next Connections** initiatives will generate 2.12 times as many new transit trips per dollar spent. (Note that transit trips quoted are new trips by transit rather than total ‘boardings’, because it is new trips that affect congestion on roads.).

	New Trips (Millions/yr)	Gross Infra. Cost (\$Mil)
Ontario Rapid Transit Plan	78	28,500
Next Connections**	268	46,500
Comparative Ratio	3.46	1.63

NC Cost effectiveness advantage: 2.12

*Yonge sbw y extn to Vaughan, Scarb Sbw y, Ontario Line, Eglinton W LRT, Hurontario LRT

** Excl. 103 m new trips re 900 additional buses included in Next Con

The **Next Connections** infrastructure costs are affordable on a budgetary basis and on a societal basis, and are necessary as the Greater Toronto Area’s population grows, and to achieve genuine progress in reducing road traffic congestion and greenhouse gas emissions. More than \$4 billion in annual benefits, comprised of a combination of budgetary, societal and employment benefits, will be generated after full implementation, and that this benefit would grow in years thereafter, in addition to \$87 billion in benefits that would accrue during implementation years. By these measures, it is correct to say that to not implement the recommendations is unaffordable. For a detailed summary of **Next Connections** initiatives, see page 38.

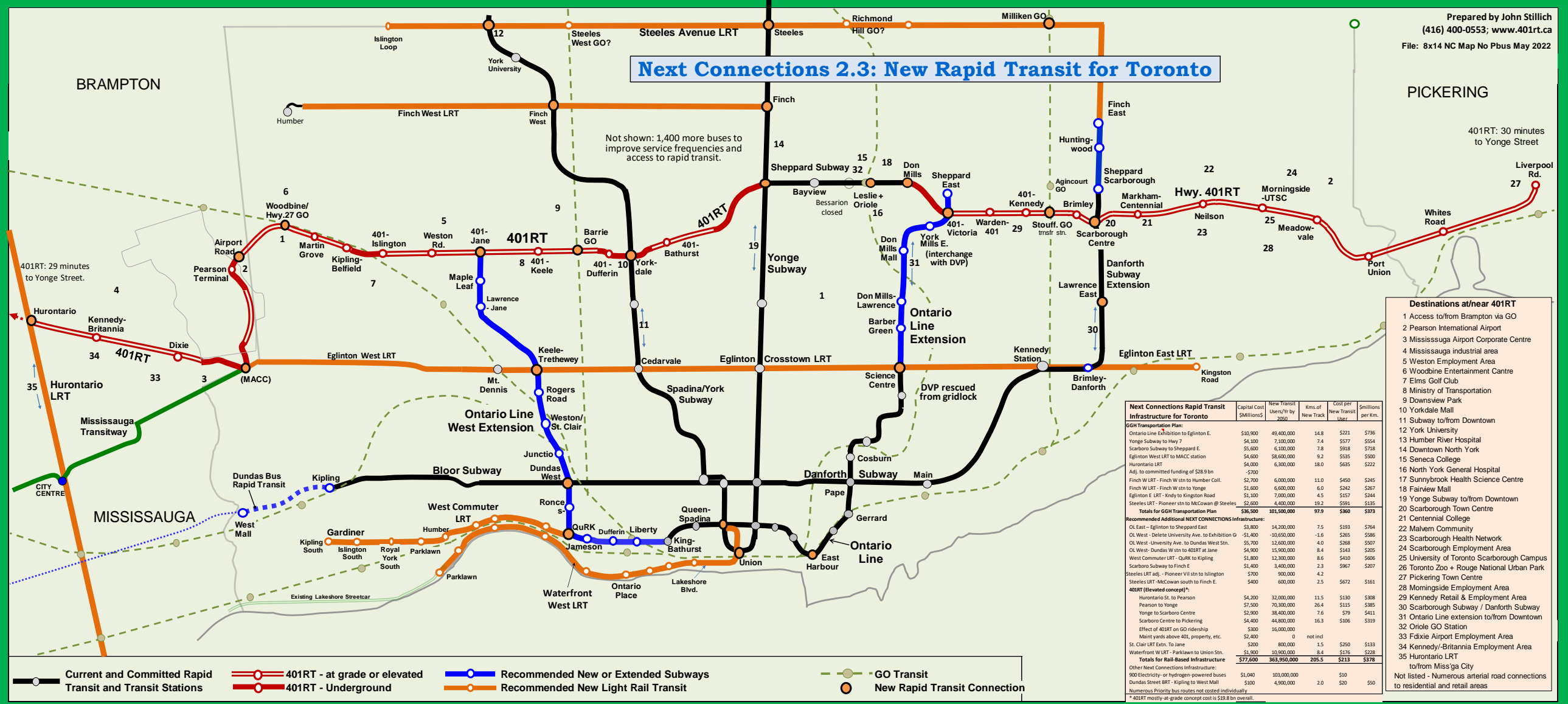
Recommendations

It is recommended to the government of Ontario, the City of Toronto, other cost-sharing partners and transit planning decision-makers that they, within current planning cycles, and in consultation with affected funding partners:

1. Recognize the brutal and existential nature of the climate change threat, and commit to meeting its challenges fully;
2. Recognize that the recommended transit initiatives by **Next Connections** are a necessary part of efforts to cut greenhouse gas emissions;
3. Recognize the vital importance of accelerating rapid transit planning and implementation, beyond current commitments, for easing road traffic congestion and reducing greenhouse gas emissions to net zero by 2050;
4. Take immediate steps, particularly at the Provincial level of government, to undertake a detailed analysis of the benefits, costs and overall feasibility of the **Next Connections** initiatives;
5. Recognize the urgent need to create a Mississauga-to-Pickering rapid transit line through the northern half of Toronto, known as the 401RT and described herein, and which will generate a modal shift to transit of approximately 185 million trips per year by 2051, plus 16 million new GO Transit trips, and include it in current transportation plans for completion in **less than** 20 years;
6. Recognize the significant and necessary positive effects of the 401RT for Toronto, Pearson International Airport and its surrounding employment area;

7. Work quickly to extend and construct the Ontario Line subway northward from Eglinton Avenue East to Sheppard Avenue at Victoria Park Avenue, and include in current transportation planning processes extensions west of the Exhibition GO station, as described herein;
8. Recognize the need for and benefits of the following additional rapid transit initiatives, and take urgent steps to bring them to operational status:
 - a. An extension of the Eglinton West LRT from Mt. Dennis to Renforth Drive, and no further;
 - b. Delete the Ontario Line diversion to Exhibition GO Station and, instead, extend the Ontario Line westward under King Street from Bathurst/King station to Roncesvalles Avenue and to the Dundas West subway station, and a further extension to intersect with the Eglinton Crosstown LRT and to the 401RT at Jane Street;
 - c. A West Commuter LRT to operate between Kipling Avenue in the Gardiner Expressway corridor and an Ontario Line subway station at QuRK station (Queen/Roncesvalles/King); recognize that this LRT can enable Toronto City Council to remove all of the elevated portion of the Gardiner Expressway and avoid the city's costly "Hybrid" reconstruction plan for the expressway east of Jarvis Street;
 - d. A Waterfront West LRT aligned along Lakeshore Boulevard as described herein that more directly serves communities and destinations along the Toronto waterfront;
 - e. An extension of the Danforth subway beyond Sheppard Avenue East, to Finch Avenue East;
 - f. A doubling of parkland around Humber Bay enabled by the recommended West Commuter and Waterfront West LRTs;
 - g. An extension of the Eglinton Crosstown LRT to Kingston Road, and no further;
 - h. An extension of the Finch West LRT to Yonge Street;
 - i. A Steeles Avenue LRT, to operate between Islington Avenue and the Danforth subway extended northward from Sheppard Avenue East to Finch Avenue East;
 - j. An extension of the St. Clair streetcar to Jane Street;
 - k. A Dundas West BRT to The West Mall, as a start to a longer BRT along Dundas Street through Mississauga;
 - l. An increase in the TTC bus fleet of 900 electricity-powered buses, in addition to the 496 recommended for roads intersecting with the 401RT, to provide both local and express services.
9. Continue and enhance the expansion of Toronto's bicycle transportation network, and enable widespread use of e-scooters;
10. Remove from current transportation plans the rapid transit infrastructure made unnecessary by the recommended **Next Connections** initiatives, those being the Eglinton West LRT extension from Renforth Drive to Pearson International Airport, the Eglinton East LRT extension to the University of Toronto Scarborough campus and Malvern, the Jane Street LRT, the Sheppard East Subway to McCowan Road, the Sheppard West subway and the Parklawn GO station, at a potential savings of approximately \$15 billion; and
11. Recognize the short-term and long-term affordability of the recommended initiatives, and its substantial benefits to the residents, economy and environment in the core of the GTA.

Figure 1



Next Connections 2.3 – Introduction

Every day (other than during the period of COVID-19), Torontonians take more than 5,000,000 trips on the city's roads and transit systems. Unfortunately, twice a day, many roads are clogged with traffic, and transit vehicles are crowded. According to the Ontario Ministry of Finance, the population of the Greater Toronto and Hamilton Area (GTHA) will grow from 7 million to 9.5 million people by 2046; within this, Toronto will increase from 3.0 million to 3.73 million. By 2051, Toronto's population may reach 4 million. By one estimate, travel demand in Toronto will grow by 15% after taking into account population aging; travel demand growth will be lower than population growth.

GO Transit enhancements, the Eglinton Crosstown LRT, the Ontario government's new rapid transit plan for Toronto, incremental increases in existing TTC services, an estimate for work-from-home situations, and increases in the number of commercial vehicles trips may keep the volume of road traffic in Toronto in 2051 close to 2016 levels (see Appendix 1).

Climate change is a critical and existential issue. The Toronto area must do its share in reducing its greenhouse gas (GHG) emissions, including from transportation sources. The United Nations' Intergovernmental Panel on Climate Change has issued repeated warnings that significant and transformative reductions must be achieved by 2030; in October of 2018 it warned that average global emissions must drop by 40% to 45% to avoid serious, permanent and perhaps unstoppable injury to our life support systems. As emitters of most GHGs, western industrial nations need to cut emissions by *much more*. **This is critical information.** View a list of impacts of climate change in Appendix 2.

Unfortunately, there are no plans to achieve adequate reductions in motor vehicle traffic and GHG emissions from current levels, which is what science says needs to be done. Generally speaking, governmental decisions on improving transportation are governed by the false economy of what is considered to be "affordable" for public sector budgets and for tax impacts, rather than on overall outcomes for our lives over the longer term, and the stability of our global life support systems.

Road traffic congestion and environmental imperatives will mean changes in how people travel. Energy efficiency will become much more important than it is today. Trips by personal automobile will have to be fewer, and daily destinations be closer to home wherever possible. More people will be working from home, as found to be workable during the COVID-19 pandemic. For people who commute to work, access to and service levels of GO Transit and municipal transit will have to be much better, and operate without GHG emissions. The use of electric scooters and e-bikes should become a common way to get to transit stops and to nearby destinations. Better and faster transit services will enable more offices to locate outside the downtown core of Toronto. With a million more people spread throughout the city by 2051, the operational efficiency of transit will improve, even in Toronto's suburbs and in the suburbs near Toronto. Freight movements and product deliveries will have to be more efficient if road congestion is not to worsen.

This document recommends a set of transit initiatives, largely focusing on rapid transit plus increases in municipal bus services, the magnitude of which will be needed to achieve real reductions in traffic congestion and GHG emissions even as the region's population surges. They are not the only solutions, but they, together with currently-approved rapid transit projects, will reduce daily trips by personal automobile to close to half of 2016 volumes. Even with this considerable reduction, more will need to be done, especially beyond the borders of Toronto. A key bottom line is that **now is not the time for half measures and timidity**; that will mean an expensive drift towards worsening conditions. The recommended transit initiatives for Toronto are

- A transformative continuous cross-boundary rapid transit line extending from Pickering to Mississauga through the northern half of Toronto, using for the most part the Highway 401-corridor – a rapid transit line known as the 401RT;
- An extension of the Ontario Line northward from Eglinton Avenue East, to Sheppard Avenue at Victoria Park Avenue;
- Extensions to the Ontario Line subway westward from the Exhibition GO station to the Dundas West subway station, and further northward beyond the Eglinton Crosstown LRT to the 401RT at Jane Street;
- A Rapid Bus Lane priority transit service west of an extension of the Eglinton Crosstown LRT to Jane Street, and which is fully integrated with the Mississauga Transitway;
- A “West Commuter” light rail transit line between the extended Ontario Line at Queen-Roncesvalles-King and Kipling Avenue that can enable the removal of the entire elevated portion of the Gardiner Expressway;
- A Waterfront West LRT that is realigned to more closely serve the Toronto waterfront and provide faster service;
- An extension and enhancement of the Danforth/Scarborough subway;
- An additional 900 buses powered by electricity, to improve frequencies of services across Toronto, and including several bus priority lanes across the city;
- An extension of the Finch West LRT to Yonge Street, and transit priority on Finch Avenue East;
- A Steeles Avenue LRT between Islington Avenue and the Scarborough Subway;
- A short extension of the St. Clair streetcar service; and
- A Dundas Street BRT west of Kipling subway station.

Altogether, they reflect the magnitude of effort that must be made in a short time, if absolute progress is to be made in reducing current levels of GHG pollution and reducing road traffic congestion. The recommended **Next Connections** transit infrastructure will, once fully in service,

- Increase the number of TTC trips by approximately 80% above 2016 volumes, and significantly increase the number of transit trips in Mississauga and Pickering;
- Contain congestion on major highways and on city streets even as travel demand increases;
- Combined with the current rapid transit projects approved for Toronto by the Ontario government, decrease 2016 levels of traffic congestion on major highways and local streets caused by automobiles, even as population-generated travel demand increases
- Decrease greenhouse gas (GHG) emissions;
- Create almost 300,000 job years during implementation, and permanent jobs thereafter;
- Promote economic development and improve social well-being;
- Provide financial relief from transportation costs for many households across the region; and
- Generate an annual return on investment of more than \$2.8 billion in terms of economic, social, environmental and household financial benefits, once all recommended initiatives become operational.

The recommended **Next Connections** initiatives are affordable within the timeframe recommended, especially when brought down to the level of the average daily cost per household and, additionally, for the variety and magnitude of benefits they convey to individuals and families. Altogether, the provincial and municipal cost to the average Toronto household of may grow to as low as 23 cents per day once all **Next Connections** initiatives become operational, and may cost the Ontario government 0.55% of a projected 2050-51 budget, after applying one-third federal capital cost sharing. Overall, it is more affordable for people and governments to invest in the expansion of the public transit system than to bear the environmental, social, congestion, financial, and economic consequences of not doing so.

Efforts to achieve a sustainable urban transportation network should not be delayed, curtailed or limited by existing budgetary concerns and tax fears. It is time that public sector budgets be enabled to achieve aggressive goals with intensive effort, to avoid declines in the collective well-being of Toronto-area residents and commerce. Constraining rapid transit to save households a few dollars per annum is false economy. People in Toronto and in the Greater Toronto Area want an end to daily congestion and want a clean environment.

1 - Highway 401RT

The most critical missing element to generating major modal shifts to public transit in Toronto is the lack of a singular east-west inter-municipal rapid transit line across the suburban middle of northern Toronto. Existing rapid transit service are inadequate. GO Transit provides a radial service to and from the downtown core that is used by only 1% of Toronto residents per day. The Sheppard subway is too short to have an effect on traffic congestion. The 18 stops planned for the 11-kilometre Finch West LRT will make that service too slow to attract a significant modal shift from automobile users, although existing local TTC riders will be better served. The Eglinton Crosstown LRT now under construction is too far south in Toronto to produce a significant reduction in trips by automobile to and from most locations in the northern half of Toronto, especially longer distance trips.

Getting across the Greater Toronto Area from Scarborough to Pearson Airport, or from Hurontario Street in Mississauga to any point in North York, or to and from thousands of destinations in suburban Toronto, Mississauga, Pickering and downtown Toronto normally means driving a car. Most people will not take a bus from Etobicoke or Scarborough to ride the Yonge Street or University/Spadina/York subways – it's simply too slow. The result is congestion and gridlock on Highways 401, 427, 409, the 404/Don Valley Parkway, the Gardiner Expressway and on city streets, and high emissions of greenhouse gases. Overall, traffic congestion on Highway 401 contributes more than a billion dollars in time lost each year for drivers and their passengers.

A review of MTO's AADT and commercial vehicles survey files indicates that on a typical weekday there were approximately 1.8 million vehicles on Highway 401 (pre-COVID-19) between Hurontario Street in Mississauga and Liverpool Road in Pickering. Of these, approximately 1.3 million were non-commercial automobiles, carrying 1.5 million persons. Approximately 450,000 trips are made by commercial vehicles.

The Greater Toronto Airports Authority (GTAA) is concerned that more than 90% of all trips to Pearson International Airport and its surrounding employment area are by personal automobile. Forecasted growth in air travel will strain the GTAA's ability to provide access and car parking, and daily trips by 300,000 workers to the area are clogging roads on Highway 401 and other roads. Because of congestion in the airport area, the GTAA is advocating the creation of a transit hub on its property at Airport Road that will provide linkages among various current and planned bus and rail-based transit services.

Overall, without practical public transit alternatives for the majority of daily travelers, the demand for trips taken by motor vehicles to, from and across northern Toronto and to/from the downtown area will continue to increase as the years go by – one estimate is that trips will increase by 24% by 2051. A major new rapid transit option is necessary if increases in motor vehicle traffic and gridlock are to be avoided.

Next Connections recommends that a continuous suburb-to-suburb rapid transit line with up to 34 stations be created to operate from Hurontario Street in Mississauga to Pickering Town Centre within the Highway 401 corridor. This 401RT is urgent, practical and affordable, and *with effort* can and should be fully completed in a ten-year timeframe. The 401RRT can be built mostly at-grade in the highway corridor, or can be built elevated over the highway.

The 401RT plus additional buses for intersecting arterial roads will generate an estimated 185,000,000 million new transit trips per year by 2051, and more in subsequent years as the city continues to grow (see Ridership Analysis section below). The estimate includes trip reductions related to a reduction in the Ministry of Finance's population forecast for Toronto. At least another 12 million per year may transfer to the 401RT from existing parallel bus routes.

The mostly-at-grade 401RT would require a concrete barrier-separated conversion to transit of the leftmost express lane in each direction on Highway 401, plus shoulder lanes at stations. Subway cars that are slightly narrower than current TTC subway cars may be necessary to avoid using additional highway space. The 401RT would divert underground to intersect with the Sheppard Subway, incorporating it into the overall 401RT concept. Other tunneled diversions to and from key off-highway destinations include Pearson International Airport, a station on the Kitchener GO Rail line (planned at Hwy. 27), the Mississauga Airport Corporate Centre, Yorkdale Mall and TTC station, Scarborough Town Centre, Pickering Town Centre, and can include other destinations as may be desired.

401RT stations in the highway corridor would use a centre platform, accessed by station entrances above the highway where intersecting roads run above the highway, and below the highway where arterial roads run below the highway. Platform widths would not require movement of pillars that support overhead roadways, except for a station at Keele Street.

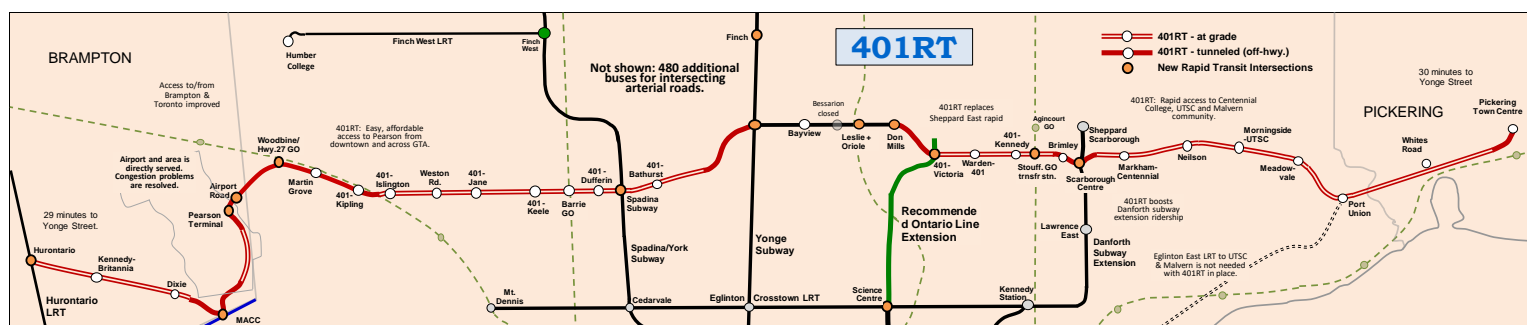
An alternative alignment is to bypass the Sheppard subway and continue the 401RT on the surface of the highway corridor, with new stations at Yonge, Bayview, Leslie and Don Mills. This would cost approximately \$3.1 billion more than tunneling to and from Sheppard Avenue. Both alignments would include a link to the Oriole GO station. Travel on the 401RT would also be somewhat faster, with one fewer station and a slightly shorter distance. In this scenario, the Sheppard subway would be closed. Sheppard Avenue would be served by enhanced bus services running seamlessly from Scarborough through Yonge Street to west of the Spadina/York subway.

The 401RT diverts from Highway 401 west of Islington Avenue, and rejoins it east of Dixie Road. By doing so, it avoids reducing lanes on one of the most congested part of Highway 401, while at the same time modal shifts to transit will reduce highway traffic volumes on that highway segment.

Importantly, an elevated 401RT can be built that avoids the conversion of a Highway 401 express lane to the 401RT. The 401RT-E would align mostly over the eastbound 401 collector lanes, and require tall structures for transporting travelers to and from ground level.

The elevated 401RT would cost approximately \$21.3 billion to build, compared to \$18.5 billion for the mostly-at-grade 401RT. The elevated 401RT would enable maintenance and storage yards to be built where the 401RT divert to off-highway destinations, such as Yorkdale and Scarborough Centre, and beyond the east and west terminuses. The 401RT would be covered by roofing to protect against weather. An elevated 401RT that bypasses the Sheppard subway would allow for additional tracks for express services that may be envisioned for the future.

Modal shifts to rapid transit would ensure that highway traffic would continue to flow well, as a modal volume balance would be struck based on relative speeds and convenience. Overall, the conversion of one lane in each direction reduces Highway 401 road capacity between Hurontario Street and Pickering Town Centre by about 16% and, taking truck traffic into account, would require an average modal shift of cars of approximately 20% during peak periods for most highway segments to maintain current highway speeds.



Importantly, the 401RT concept includes 16 additional buses for each intersecting road at stations, to improve service frequencies. Importantly, transit shelters should be included at every bus stop. Most transit trips begin with a bus ride, and ensuring maximum comfort and convenience is essential. These improvements will tend to make the first/last mile segments of trips more acceptable. The use of electric-powered scooters and electric-powered bicycles in suburban areas, as a convenient and effort-free means to access bus stops, can (should) become an important generator of new transit trips. Lock-ups for e-scooters and bicycles should be installed at all transit stops. Overall, 140 million new transit trips per year are estimated for the 401RT rail service by 2051, while improved TTC bus services on north-south routes that intersect with the 401RT will attract 45 million new non-401RT trips per year (see Transit Ridership Analysis section).

Because the overall number of new and transfer trips on the 401RT will continue to increase, integration with the Sheppard subway (if determined), spatial constraints in the highway corridor (lane widths) and because longer average trip lengths mean higher occupancy on trains, subway technology rather than light rail transit is the preferred mode – medium-capacity (shorter-width) rail cars for the mostly at grade 401RT and full-sized rail cars for the elevated 401RT. Peak one-hour volume may average more than 30,000 travelers by 2051 per direction, depending on location (for example, between Yonge Street and the airport employment area), and more in future years.

With capital cost sharing from upper levels of government, the daily municipal tax cost per average Toronto household to build the 401RT may be as low as 14 cents per day. This scenario assumes that the government of Canada would fund one-third of the gross 401RT cost, and the Province of Ontario would fund 100% of 401RT costs except for enhanced intersecting bus services.

Importantly, the \$21.3 billion cost to build the 401RT is reduced by numerous other rapid transit initiatives rendered unnecessary by the 401RT. These include the Eglinton West LRT extension from Renforth Drive to the Pearson transit hub (\$1.6bn), the Sheppard East subway extension to Scarborough Centre (\$4.8bn), the Eglinton East LRT extension on Kingston Road, Morningside and into Malvern (\$3.5bn), the Ontario Line extension from Eglinton East to Sheppard Avenue East (included in the GGH transportation plan; \$3.8bn), and the Jane Street LRT (\$2.6bn). The net increase becomes just \$8.8 billion in additional funding commitment. More information is available at www.401rt.ca's '401RT Doc May 20 2022' file.)

Operationally, the 401RT and its enhanced bus services should be able to achieve close to a breakeven revenue-to-cost ratio (100%), based on an overall operating cost of \$450,000 per bus and \$8 million per 401RT station, and a basic \$2.21 average fare plus a \$0.25 level-of-service premium for using the 401RT rail service.

Without a 401RT or other singular rapid transit line of similar length and location across Toronto and into Pickering and Mississauga, traffic congestion and its problems and costs will remain. The Ontario Ministry of Transportation has indicated that the highway will not be able to accommodate growing travel demand growth much longer, as segments of the highway in Toronto cannot be widened further. Work on developing

the 401RT should begin now. Widening the highway is also contrary to the promotion of transit ridership and the reduction of GHG emissions and congestion on city streets.

Measurements of potential ridership demand for the 401RT concept can be ascertained via surveys of the general public, and can be subsequently tested over two or three years using buses on a modified alignment, with up to 25 stops and not linked to the Sheppard subway. This test would require the use of dedicated highway collector lanes or shoulder lanes, plus construction to adjust most off- and on-ramps to Highway 401, and traffic signal priority at ramp/arterial intersections wherever possible. Marketing of this express services test to encourage use should be aggressive. The test should include a distribution of additional buses that are proposed for the 401RT, assigned to the test and to arterial bus routes, and which provide both arterial express and local services. The capital cost of the test may be approximately \$220 million, and may achieve an operating revenue-to-cost ratio of 50% during the test.

Travel Times: The 401RT would have a substantial positive effect on travel times for transit users, when compared to existing transit services and other proposed increases to transit services. On average, stations on the 401RT are 1.8 kilometres apart, enabling speeds between stations to cruise at 80-85 kilometres per hour. The illustration shows a selection of trip origins and destinations, and their trip times when using the 401RT compared to other modes.

Importantly, the capital infrastructure cost of \$21.3 for the 401RT is significantly reduced by potential \$17.2

Traveling on the 401RT:		Keele at Lawrence to Centennial College in Scarborough:		Kipling subway stn. to Bathurst at Sheppard:	
Pickering Town Centre to Yonge subway	29	Using Eglinton LRT +		Using Eglinton LRT	60
Yonge & Sheppard to Pearson Terminal	23	Markham bus	49	Using B-D & Yonge subways	58
Pearson Airport to Hurontario Street LRT	7	Using 401RT	39	Using 401RT	48
	59				
Average speed - 54 km per hour					
St. Andrew subway stn to Pearson Term'l:		York Mills subway station to U of T in Scarborough:		Yonge & Lawrence to Pearson:	
Using Eglinton LRT	42	Using Eglinton East LRT	59	Using Eglinton LRT	7
Using UP Express train (walk, wait, ride)	46	York Mills bus to Morningside	46	Using 401RT	4
Using Spadina subway & 401RT	43	401RT to Morningside + shuttle	32	Eglinton/Don Mills to Pearson Term'l:	
Sewells Rd at Morningside to Sheppard W Subway stn.:		Union station to Scarborough Centre:		Using Eglinton W LRT	37
Using Sheppard bus & Sheppard subway	68	Using Bloor-Danforth subway	38	Using 401RT to terminal	43
Using 401RT	43	Using 401RT	43	Keele at Sheppard to UTSC:	
		Eglinton LRT + McCowan bus	56	Using Keele bus + Eglinton LRT	84
				Using Keele bus + 401RT + shuttle at Morningside	44

billion in cost avoidances of other rapid transit initiatives, described below.

Sheppard East Subway: The Ontario government has proposed an extension of the Sheppard Subway from the Don Mills station to Scarborough Town Centre, replacing Toronto's plans for a Sheppard East LRT. The 401RT would run closely parallel to Sheppard Avenue East, and would attract significant numbers of travellers from intersecting arterial roads who would otherwise board transit services along Sheppard Avenue. The Sheppard subway extension (or an LRT) would no longer be operationally viable or appropriate. A cost avoidance of approximately \$4.8 billion can be realized.

49 Benefits of a 401RT: The 401RT is of transformative significance, and would affect almost all other transit enhancement decisions Toronto. It would be the most substantial single public works project planned for the Toronto area. The size of the project reflects the magnitude of the transportation problems facing the region, **and is the most urgent**. A list of general benefits follows below. Most local benefits are not included in this list.

1. Up to ten new rapid transit connections are created (Huron Ontario LRT, Mississauga Transitway, Union-to-Pearson Express, Woodbine GO, Barrie GO, Spadina/York Subway, Yonge Street Subway, Oriole GO at Leslie, an extended Ontario Line (see section below), the Scarborough Subway, and a possible relocated Agincourt GO station or additional GO/401RT transfer station south of the Agincourt GO station).
2. More than 25 new surface bus route connections to rapid transit are created.
3. The first practical transit alternative to driving across northern Toronto is created, bringing rapid transit much closer to many thousands of today's car-driving commuters.
4. Gridlock on Highways 401 is avoided as high volumes of transfers from the highway to rapid transit occur.
5. The trip capacity of the highway corridor is more than doubled.
6. Traffic congestion on the Don Valley Parkway and Highway 427 is reduced as access to north-south rapid transit via the 401RT becomes a viable option for many travelers.
7. Traffic congestion on city streets throughout Toronto and in parts of Mississauga and Pickering is reduced as major modal shifts to transit occur: all road trips begin and end on local streets.
8. Travel times across Toronto are significantly reduced when compared to current transit services.
9. The 401RT and its proposed increases in intersecting bus services increases municipal transit ridership by 185 million per year by 2051, including a 45 million annual increase in local non-401RT trips on enhanced intersecting bus services, and 16 million new trips resulting from new GO Rail intersects.
10. Social isolation is reduced for people who do not own cars or cannot drive, as many destinations across the region become more easily accessible.
11. Intersects with GO Rail services (Woodbine, Barrie GO Line, a potentially relocated Agincourt GO, and Leslie-Oriole GO) increase planned GO ridership by approximately 16 million trips per year beyond current forecasts.
12. Rapid, affordable, and direct rapid transit access to Pearson International Airport from downtown and from suburban locations across the region is created (Approximately 85% of trips to the airport do not originate from downtown Toronto).
13. The Greater Toronto Airports Authority's plans for a transit hub are transformed to be more effective. Rapid direct access to Pearson International Airport via the 401RT from locations across Toronto makes the Government of Ontario's planned extension of the Eglinton Crosstown LRT from Renforth Drive to Pearson International Airport unnecessary.
14. Access to the employment areas surrounding Pearson airport is greatly improved; these employment areas in Mississauga and Toronto revitalize as they become more attractive to business and to workers.
15. Employment opportunities and labour market conditions are enhanced. Fewer people will decline employment opportunities near the airport due to congestion and travel times.
16. The 401RT's intersect with the Danforth subway's extension at Scarborough City Centre increases ridership on that extension.
17. Enhanced access from across all of Toronto to the University of Toronto Scarborough Campus, Centennial College (Scarborough), York University, and the U of T downtown campus is created. Students will no longer need to decide on courses of study based on travel time and distances to campuses, or purchase a car.
18. A 401RT makes it unnecessary to build a Sheppard Avenue East LRT or subway, as many of its potential users would opt to use the nearby and faster 401RT. Infrastructure cost savings are approximately \$1.5 billion for an LRT and \$4.8 billion for a subway.
19. In general, access to services and to employment across Toronto and to/from Mississauga, Pickering and Brampton become much faster and easier, including especially for those people who are economically or socially disadvantaged.
20. Access to employment opportunities and services for residents of disadvantaged communities is significantly improved (e.g., northwest Etobicoke, Malvern in Scarborough).
21. Current and forecasted road overcapacity situations in the large employment areas around Pearson International Airport are alleviated or avoided.
22. Direct rapid transit access to Mississauga's Airport Corporate Centre from across northern Toronto and from Mississauga is created.

23. Traffic congestion on Highway 401 west of Toronto is reduced, as a Kitchener GO Transit Line link to the Woodbine/Hwy 27 401RT station enables car-free access to destinations in northern Toronto, and to downtown Toronto.
24. As an economic stimulus, more than 100,000 job years are created as the 401RT is constructed – more than any other public job creation project in the GTA has achieved.
25. Canada and Ontario government capital cost contributions can result in an influx of \$14.6 billion into the Toronto area economy.
26. Approximately 2,000 ongoing transit operating jobs are created.
27. Economic losses from traffic congestion are reduced; business efficiency is improved.
28. Economic losses from imports of motor vehicle fuels and automobiles are reduced – more than \$75 million per year.
29. The 401RT helps enable the transformation of Yonge Street north of Hwy 401. With the 401RT and Yonge Subway extension to Highway 7 operational, east-west access to employment is increased. Modal shifts to rapid transit by drivers who now use Yonge Street to access Hwy 401 increases, and the redesign of Yonge Street is supported.
30. Importantly, greenhouse gas emissions are reduced by more than 400,000 metric tons per year for the 401RT until reduced by electric vehicles. Exceeding current greenhouse gas reduction targets is essential for the future well-being of all people, and of the natural systems that support our existence.
31. The 401RT provides a significant long-term relief valve against future global energy shocks, and addresses potential future energy shortages head-on.
32. Toxic vehicle emissions are reduced as major modal shifts to transit occur, and the incidence and severity of respiratory diseases and medical costs is reduced.
33. The number of deaths and injuries from motor vehicle collisions and the traumas and costs borne by the families and friends of crash victims are reduced, as are the associated daily congestion effects of collisions.
34. The operational effectiveness of the Toronto area's pre-existing transit system is improved; for example, more people using existing buses and new buses, as service frequencies improve.
35. Suburban sprawl is eased, as development in the central area of the GTA is attracted by the 401RT, including at, above, or near the highway at 401RT stations.
36. New housing opportunities at, near or above the 401RT improve the ability of downtown workers to avoid having to live in the downtown core. Affordability is improved.
37. Distribution of work across Toronto is improved as the 401RT enables new office space and employment opportunities outside the downtown core. Rapid access to/from the 401RT improves automobile-free connectivity among businesses and access for workers who live both downtown and in suburban areas.
38. Rapid transit access to and from the downtown core to places of work or home enables the number of parking spaces downtown and across Toronto to be reduced. Opportunities to transform parking spaces in the downtown area to public open greenspaces are improved.
39. Property tax revenues are increased from new urban development at/near 401RT stations, and from increased property values in parts of Toronto, Mississauga, Pickering and some '905' areas served by GO Transit.
40. Travel costs are reduced for thousands of households as fewer cars need to be owned, or used less. Money saved can be redirected towards other household priorities. After-tax household savings vary widely, but can range to \$9,000 per year per vehicle, less the cost of using public transit.
41. Truck transport is improved as gridlock on highways 401 is avoided, even as road lanes are reduced for the at-grade 401RT, as car drivers transfer to transit when transit is seen to be as fast or as convenient as driving. (No reductions in road traffic lanes from east of Dixie Road to Islington Avenue, and no lane reductions with an elevated 401RT.)
42. Modal shifts to the 401RT from travel by automobile far exceed those for planned light rail transit lines in Toronto, including the Jane Street LRT, the Sheppard East LRT (or subway), and extensions of the

Eglinton Crosstown LRT, all of whose ridership will largely be transfers from existing TTC bus services rather than being new users.

43. The operational revenue-to-cost ratio of the Hurontario light rail transit line in Mississauga is improved; additional high-density urban nodal development at and near Hurontario Street is supported.
44. Improved and rapid access to the University of Toronto's Scarborough campus using the 401RT reduces anticipated ridership volumes on the proposed Eglinton Crosstown East LRT extension via Morningside Avenue, rendering it unnecessary. Savings from eliminating the LRT extension are approximately \$4.2 billion, less an approximate \$2.7 billion extension to Kingston Road only.
45. The Jane Street LRT proposed by Toronto is unnecessary as east-west connections provided by the 401RT and Eglinton Crosstown LRT at Jane reduce passenger volumes and trip-length crowding on Jane Street buses. Savings can range up to \$2.6 billion.
46. The overall operating revenue-to-cost ratio for the 401RT should reach close to breakeven by 2051, significantly better than the overall public transit system of the City of Toronto.
47. In Durham Region and the city of Pickering, the prospects for further development in the Pickering Town Centre area at Liverpool Road and Highway 2 would be enhanced. Future off-highway extensions of the 401RT under Highway 2 to Brock Road and beyond are possible. A 401RT would be a welcome alternative to what is now a forced daily drive on congested highways.
48. In York Region, the 401RT would ease road congestion to and from Toronto as connecting bus services are improved.
49. In Mississauga, access to the 401RT from the Hurontario LRT and more frequent bus service connections at Airport Road, Kennedy, Dixie and the Mississauga Transitway reduces Highway 401 volumes to/from Toronto. Future extensions of the 401RT across Mississauga are possible, including offshoots using the Highway 403 right-of-way.

1.a – GO Transit Ridership

The 401RT will increase ridership on GO Transit beyond Metrolinx forecasts by an estimated 16 million trips per year by 2051, and by a similar number on the 401RT, as a result of four new intersects: The Woodbine GO station at Highway 27 on the Kitchener GO Line, a 401RT transfer point at the Barrie GO line, a new link with the Richmond Hill GO line at Oriole GO/Leslie subway station, and a transfer-only station at the Stouffville line south of Agincourt GO station. The links will enable rapid access across the northern half of Toronto and to the Line 1 and Line 2 subways. For example, travel time on the 401RT between the Woodbine/Hwy27 401RT station and Yorkdale station on the Line 1 subway would be 16 minutes.

GO Transit operated Rapid Express Bus services proposed for Highway 401 by Metrolinx will not be as effective in attracting ridership, and may be difficult to operate across lanes of highway traffic to and from off-highway locations. Scheduling and locations of services will be complex and not practical for many potential users.

1.b – Eglinton Crosstown LRT East

Next Connections recommends that the Eglinton Crosstown LRT be extended 4.5 kilometres eastward as far as the Kingston Road intersection, at a cost of approximately \$2,700 million. With a 401RT operational and providing faster and better service from more locations across Toronto, the oft-proposed Eglinton East LRT to Malvern would experience significant decreases in ridership demand. Dedicated bus lanes providing both local and express services on Kingston Road and Morningside Avenue would be adequate. For example, a trip on the 401RT between University of Toronto's Scarborough Campus and the 401RT at Scarborough City Centre would take six minutes plus a 5-minute bus shuttle to/from the campus. Access to close-by Malvern would be via bus connection at Neilson or Morningside 401RT stations. For another example, a UTSC student or worker traveling from Lawrence Avenue West at Keele Street could ride a bus north to the 401RT, which

would then deliver him or her, including a short university shuttle bus ride, to the UTSC in approximately 54 minutes, compared to 77 minutes using the Eglinton East LRT.

A cost avoidance of \$3.3 billion can be realized by not constructing the Kingston Road, Morningside and Malvern segments of the LRT.

2 – 900 Additional Buses

While **Next Connections** recommends implementation of the rail-based services described above, the backbone of any public transit service is its bus system. It is the first point of contact for most transit users, and delivers more than 300 million travelers per year in Toronto directly to destinations and to other transportation connections. However, getting more people to walk past the cars in their driveways in order to use a bus is usually a hard sell.

The future will slowly give public transit the advantage. Toronto's roads will become more congested as the city's population grows by 1,000,000 over the next thirty years unless climate action reduces motor vehicle traffic volumes from today's high levels. For that to happen, the quality of bus services must improve:

- Frequency of services will have to improve – waiting at transit stops is among the least favourite of all uses of time, especially in inclement weather.
- To entice more travelers to a bus service, shelters must exist at *every* stop, together with lock-ups for bicycles and scooters. The use of e-Bikes and e-Scooters, which enable rapid access to transit stops with little or no muscular effort, can become an important factor. Wherever possible, buses should include on-board space for e-bikes and e-scooters.
- Once on a bus, travel times will have to be improved, by creating bus-only lanes and 'go-thru' traffic signal priority, either all-day or during peak periods.
- Both express and local services benefit from bus-only lanes. Having both local and express services on a route is best achieved with buses rather than light rail, which cannot do both and offers fewer stops, making it more difficult for many elderly and frail travelers, and people with children and/or baggage.
- Overall, the cost effectiveness of bus services compared to LRT services needs to give priority to the most important consideration: the service that maximizes daily ridership.
- To help buses in mixed traffic re-merge into mixed traffic from curbside bus bays, mandatory yield signals similar to STOP signs on school buses can be implemented.
- To maximize the benefit of go-thru signaling and to enable motor vehicle traffic to more easily make right turns at intersections, bus stops should be at the far side of intersections.
- To maximize their attractiveness, buses will need to be more comfortable, with sleek exterior design, and include internal climate control, comfortable seating, an absence of crowding and room for bicycle/carriage storage; road surfaces will need to be smoothly paved.
- Technologically-appropriate buses can be added to residential and employment roads to enable more people to avoid what can often be relatively long walk to and from local bus stops. Two examples are a Brimorton Road bus to the Scarborough Subway, and along Queen's Plate Drive and Bethridge Road to the 401RT at Kipling.

Next Connections recommends that the number of buses on Toronto streets be increased by 900 (including 500 buses connecting to the fully-extended Ontario Line). The 900 is in addition to the additional buses included as part of the critical 401RT rapid transit line, and will include a variety of appropriate types and sizes. They should all be electric-powered – by on-board batteries or as modern trolley buses, or powered by hydrogen fuel cells, and not by fossil fuels. By 2040 or sooner, all use of fossil fuels on transit services should end.

Services should, as much as possible, operate on a “Priority Bus Lane” (PBL) basis, which means dedicated lanes for buses using curb lanes, especially during peak travel hours. Over the longer term, reductions in the use of personal automobiles will enable existing road lanes to be converted to all-hour bus-priority lanes. “Bus Rapid Transit”, which normally uses the centre lanes of roadways, is more difficult to create on city streets, and do not offer enough added benefits to justify their creation. Priority Bus routes may include, but not be limited to, the following:

- **Finch Avenue East** – East of Yonge Street, Finch Avenue runs through a largely residential area, although it crosses an employment area on either side of Markham Road, and intersects with the Old Cummer GO station on the Richmond Hill GO line. For most of a 15.3-kilometre length between Yonge Street and the Toronto Zoo, the road is two lanes in each direction and cannot be widened further. Transit ridership may rise by 2.3 million new trips per year by 2051.
- **Kingston Road** – A 17-kilometre 24-stop Priority Bus route between Main subway station and Port Union Road, connecting with the Eglinton Crosstown LRT that is extended to Kingston Road, and the Guildwood GO station, may generate almost 1.8 million new transit trips per year. The Kingston Road corridor will continue to experience urban infill and intensification.
- **Waterfront East** – A 3-kilometre Union Station to Cherry Street segment may carry one million transit trips per year, with opportunity for future extensions to the East Harbour and/or Portlands area. This has been envisaged by Toronto as an LRT.
- **Dundas Street West** – Enhanced bus services operating in all-day bus-only lanes westward from Kipling Station to West Mall are a short segment of a much longer Priority Bus route from Kipling Subway station into Mississauga to Winston Churchill Boulevard and into Halton Region.
- **Finch West to Pearson** – Priority Bus between Humber College to Pearson International Airport can operate via Highway 27 and Dixon Road. Ridership will be low until future development of the Woodbine entertainment area increases ridership to minimum LRT volumes.
- **Don Mills Road** – A Priority Bus service between Don Mills Road at Lawrence Avenue East, where it connects with the Ontario Line (see below), and Steeles Avenue. An extension north of Steeles Avenue is possible.
- **Jane Street** – A Priority Bus service between Steeles Avenue and the 401RT. An Ontario Line West extension to Jane Street at the 401RT (see Ontario Line section below) will divert many transit users from the Jane Street bus service south of the 401RT.
- **Dufferin Street** – This priority bus lane service will operate in a densely-populated corridor. Improving bus service frequencies and adding express service will work to reduce travel by automobile on Dufferin Street.

Overall, assuming an average capital cost of \$1,000,000 per electric-powered bus, and including an allowance for shelters at bus stops, road surface repaving and priority ‘go-thru’ traffic signalling, 900 additional buses may cost \$1.04 billion to implement. Based on an average annual operating cost of \$450,000 per bus and an average \$2.21 fare, achieving this level of ridership can generate a revenue-to-cost ratio of more than 60%.

Transit ridership on local buses can be increased by reducing fares, and would be a highly significant mechanism for reducing the day-to-day financial hardship of residents of low-to-moderate income households. Operating subsidy increases would be partially offset by new transit ridership volumes. The need to achieve a net-zero transport system by 2050 can make reduced transit fares a productive strategy.

3 – Ontario Line East Link to the 401RT

A northern extension of the Ontario Line subway is an essential addition to Toronto’s rapid transit system. The currently-planned Ontario Line to Eglinton Avenue East must be extended northward to intersect with the 401RT, and from there extended to Sheppard Avenue. This extension would cost \$3.8 billion to build (with tunneled and elevated segments), and generate approximately 14 million new transit trips per year.

The currently planned to be elevated at Eglinton Avenue and Don Mills Road, the Ontario Line would descend underground south of York Mills Road and turn northeastward to intersect with the 401RT at Victoria Park Avenue, where it would provide significantly faster service for trips between downtown Toronto and Scarborough. This alignment includes a multi-level commuter parking garage and Ontario Line station above the Don Valley Parkway/York Mills Road intersect, to enable more than 1.8 million trips per year by automobile to be diverted from the DVP onto transit.

The Eglinton East to Sheppard Avenue East segment of the Ontario Line would

1. Reduce overcrowding on the Yonge Street subway by creating an alternative access to downtown Toronto for significant numbers of new and current transit users working or living north of Eglinton Avenue;
2. Increase trips by transit between Scarborough and the downtown Toronto area;
3. Reduce much of the traffic congestion on the Don Valley Parkway (DVP);
4. Create direct access between the Ontario Line and the 401RT east of Yonge Street, and its stations across Toronto;
5. Enable fast transit access to/from the corporate employment area at and north of Eglinton Avenue East and Don Mills Road;
6. By diverting DVP traffic to the Ontario Line at York Mills Road, improve the flow of road traffic through the downtown core;
7. Provide a rapid connection between the 401RT and the Eglinton Crosstown LRT, improving transit access to, from, and along Eglinton Avenue;
8. The intersect with the 401RT creates a multitude of new destination opportunities for residents across Toronto;
9. Generate 14 million new transit trips per year, plus transfers from existing bus services (primarily Don Mills Road buses);
10. Promote urban infill and intensification at and near Highway 401 and along Sheppard Avenue as population growth and economic growth continue in Toronto;
11. Reduce overall road traffic along Don Mills Road and nearby streets;
12. Reduce crowding on the Don Mills bus service;
13. Increase the attractiveness of urban infill and intensification development along Lawrence East, York Mills/Ellesmere, Victoria Park, and Sheppard East that are close to the Ontario Line, and increase ridership on their transit services;
14. Reduce greenhouse gas emissions from modal shifts to transit, including by 404/DVP drivers who would otherwise drive long distances to destinations in downtown Toronto;
15. **Together with enhancements to GO Transit, eliminate the perceived need to rebuild the Gardiner Expressway east of Jarvis Street;** and
16. Increase attendance at the Ontario Science Centre.

4 – The Ontario Line West

In April 2019 the Ontario government announced that it will fund an “Ontario Line”, meant to replace and extend pre-existing plans for a “Relief Line” subway that would operate between the downtown core of Toronto and the Pape subway station on Danforth Avenue. The Ontario Line is primarily intended to divert subway riders from the overcrowded Yonge Street subway. Unfortunately, the subway will not become operational until eight to ten years after the Eglinton Crosstown LRT becomes operational. Until the Ontario Line is completed, crowding on the Yonge Street subway will worsen.

The Ontario Line as approved by the Government of Ontario will run between Eglinton Avenue East at Don Mills Road and the Exhibition GO station. Its downtown segment between Sherbourne Street (Moss Park)

and Spadina Avenue is planned to run under Queen Street, although far more people – close to 50% more – use the King and St. Andrew subway stations and the King streetcar service, compared to the Queen and Osgoode subway stations and the Queen streetcar. The City of Toronto’s current streetcar-based transit priority service along a short portion of King Street will not resolve crowding on the King streetcar.

East of Sherbourne Street, the Ontario Line is planned to divert southeastward to run above or along the existing CN railway tracks as far as Gerrard Street, and then northward to Eglinton Avenue East at Don Mills Road. This effort to reduce infrastructure costs may be false economy; over the long term, service quality is more important than short-term dollar savings. West of Spadina Avenue the Ontario Line is planned to be aligned to run southwestward to a station at King and Bathurst streets, and from there to the Exhibition GO station.

Ontario Line West of University Avenue: In the past, studies by transit planners have said that over a relatively short term there would not enough new ridership to justify a subway extension from University Avenue to Dundas West station, because enhancements to GO Transit at fares integrated with the TTC would reduce Relief Line ridership demand. However, GO Transit cannot provide a practical option for most Toronto residents of the area due to its limited number of station locations.

Several factors support an Ontario Line extension to the Dundas West subway station, particularly as a “relief line” subway for the University/Spadina/York portion of the Line 1 subway. The recent extension of the University/Spadina/York subway to Highway 7 in the city of Vaughan is now adding to ridership volumes on that subway line. The Eglinton Crosstown LRT will add more volumes, and the essential 401RT will add many more. Because Toronto’s population is forecasted to increase by a million residents over the next 30 years, total transit usage will also increase, bringing ridership on the University/Spadina/York subway to more than the 2018 average for the Bloor-Danforth subway line. Moreover, demand for transit by residents south of Bloor Street and west of University Avenue will increase. Aggressive action on climate change will also generate additional modal shifts away from the use of personal automobiles. Overall, a westward extension of the Ontario Line to the Dundas West subway station will be needed.

For mostly political preferences, the Ontario Line has been approved to run along Queen Street from Sherbourne Street to Spadina Avenue, even though (pre-pandemic) 50% more people used transit services along King Street, including its King and St. Andrew subway stations, and is better located in the financial district and better suited to serve high populations and public amenities south of Front Street. The diversion to Exhibition will mean highly-populated King Street west of Bathurst street will not be served by rapid transit.

Accepting that a Queen Street alignment will not be changed, **Next Connections** recommends that the Ontario Line run westward under King Street from the currently-approved Bathurst/King station to a station at the Queen/Roncesvalles/King intersection (“QuRK” station), and then northward under Roncesvalles Avenue to Dundas West station at Bloor Street, a distance of 4 kilometres. The Ontario Line should not be diverted of the to Exhibition GO Station. The cost to construct the recommended Ontario Line extension between Osgoode Station and Dundas West station would cost approximately \$5.7 billion, less a reallocation of approximately \$1.4 billion already committed for the Osgoode to Exhibition GO station alignment.

The Ontario Line extension from Exhibition station to Dundas West would:

1. Increase the number of subway stations serving Toronto residents, including new stations at densely-populated Liberty Village (with GO Rail connection), Dufferin Street, Jameson Avenue, QuRK, and possibly at High Park Boulevard;
2. Create a fast and direct linear subway service across all of the downtown Toronto core;
3. Significantly cut travel times: for example, travel time between QuRK station and Osgoode subway station is reduced from 27 minutes by streetcar, to 11 minutes using the Ontario Line;

4. Overall, generate **16** million new transit riders per year by 2051 (including many trips to suburban locations), plus up to 20 million transferring from the existing TTC services along Queen and King streets;
5. End overcrowding on the Queen and King streetcar routes;
6. Peak period crowding on the University Avenue portion of the Line 1 Subway would be reduced by diverting commuter traffic from the Bloor subway line at Dundas West station;
7. Promote new transit trips to and from destinations outside the downtown core;
8. Serve people whose trip origins or destinations will not be well served by the limited number of GO/RER stations (Bloor, Exhibition, plus future Kng/Liberty), and which may be more local in nature;
9. Draw new transit riders from across the downtown core, from Queen Street to south of King Street;
10. Increase transit use by residents east of Yonge Street who have destinations west of University Avenue at or near King or Queen streets;
11. Enable rapid access to and from the downtown core for travelers using Queensway TTC services west of Roncesvalles Avenue;
12. Eliminate the need for the King Street transit priority service and its road restrictions;
13. Free up some road space across the downtown core for bicycle lanes or wider sidewalks;
14. Improve the flow of road traffic to and from the West through the downtown core;
15. Contribute to greenhouse gas emission reductions;
16. Improve access to destinations across Toronto for residents of Parkdale, designated by Toronto as a Neighbourhood Improvement Area.

5 – Ontario Line North of Dundas West Subway Station

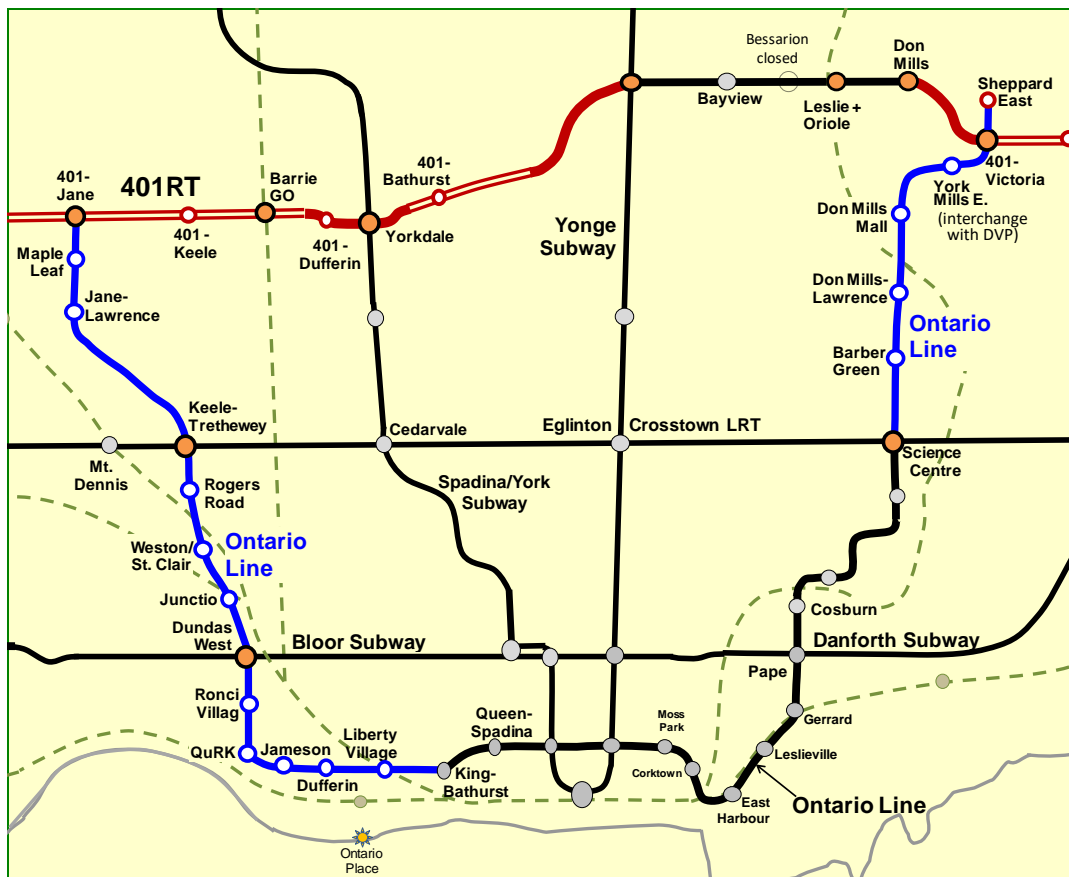
The Toronto area west of Yonge Street is more heavily populated than east of it, and population growth in the Cities of Brampton, Vaughan, and Mississauga and the Towns of Oakville and Milton will continue to add to the number of trips by automobile on the region's roads and highways, including trips to, from and within Toronto. Highway 401 west of Yonge Street is heavily traveled, and is congested during peak travel times daily.

Although GO Transit's Kitchener rail line and new stations in the rail corridor (Mt. Dennis, St. Clair) will improve service to travelers, an extension of the Ontario Line north of Dundas West subway station to a 401RT station at Jane Street should be built that would serve a different customer set, with more stations serving local communities east and west of the rail corridor. Stations north of Dundas West station can be located at Annette-Dupont-Dundas ("Junction" station), St. Clair West at Weston Road, Rogers Road/Keele, Keelesdale at Eglinton Avenue, Lawrence Avenue West at Black Creek Drive, Jane Street at Maple Leaf Drive, and the 401RT at Jane. A future northwesterly extension to the Finch West LRT can also be considered as pressures to generate more modal shifts to transit grow.

This 8.4-kilometre tunneled extension to the 401RT at Jane Street would cost \$4.9 billion. This extension would

1. Intersect with and attract ridership to/from at least eight existing TTC surface routes (35, 41, 59, 52, 171, 512, 26, 161) plus the Eglinton Crosstown LRT;
2. Eliminate the need for a Jane Street LRT. The Ontario Line extension to the 401RT would provide much faster north-south service for many travelers who now use Jane buses; capital cost avoidance could be \$1.5 billion;
3. Generate an estimated 18 million new transit trips per year by 2051;
4. Increase ridership on the 401RT and Eglinton Crosstown LRT;

5. Increase transit ridership on the extended Ontario Line to and from south of the Dundas West subway station as access to more destinations by rapid transit north of Bloor Street are created;
6. Support redevelopment and intensification in response to ongoing population growth pressures;
7. Enhance the economic and community profile of adjacent neighbourhoods;
8. Reduce road traffic congestion on local streets;
9. Further reduce travel by automobile and reduce annual emissions of GHGs; and
10. Enable an enhanced Wilson-Albion Priority Bus or BRT service between Steeles Avenue in Brampton and the Ontario Line at the 401-Jane 401RT station.



6 – Eglinton West of Mt. Dennis Station

As part of its rapid transit plan for Toronto, the Ontario government has committed to building a tunneled westerly extension of the Eglinton Crosstown LRT. It would operate for approximately 9.2 kilometres from the Mt. Dennis LRT station to the Mississauga Airport Corporate Centre (MACC), with 7 stops, plus a future further 3-kilometre extension to Pearson International Airport's regional transit hub at Airport Road and Highway 409.

With a 401RT in place, the extension from Renforth Drive to the Pearson transit hub would not be needed. a half kilometre extension of the Eglinton LRT will create a connection with the 401RT's MACC station (Mississauga Airport Corporate Centre), enabling easy transfers for travelers going to or from Pearson. Moreover, the 401RT enables rapid access between the Eglinton LRT and the employment areas around Pearson via 401RT stations Hurontario, Kennedy/Britannia, Dixie, Airport Road, Woodbine/27, Kipling/Belfield, Martin Grove and Islington North. Not building the Eglinton West LRT extension between Eglinton and Pearson can save \$1.6 billion.

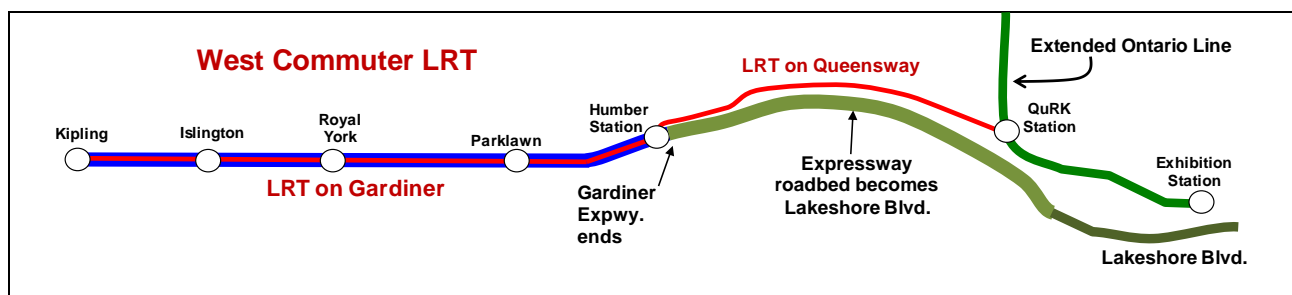
7 – West Commuter LRT

Population growth in Toronto and the GTA will tend to increase highway traffic coming into Toronto on the Gardiner Expressway. However, Toronto should reduce motor vehicle traffic on the expressway to offset population growth pressures and for Toronto to aggressively achieve its fair share of GHG reductions. A rapid transit opportunity exists that can divert many trips from the Gardiner Expressway to public transit. If successful, and with some adjustments to Lakeshore Boulevard, motor vehicle traffic can be reduced to the extent that it would be possible to close the Gardiner Expressway east of Humber River, and to remove its entire elevated portion.

Next Connections recommends that the Ontario Line be constructed to continue westward from Exhibition station to the Dundas West subway station, and that a West Commuter LRT be constructed that would run westward from the QuRK subway station at the juncture of Queen, Roncesvalles and King streets on the Ontario Line. This West Commuter LRT is recommended to operate around Humber Bay on the existing Queen streetcar right-of-way, and then divert via a short tunnel onto a separated right-of-way at grade in the centre of the Gardiner Expressway west of Humber River or elevated above the expressway, in a configuration similar to that of the 401RT, and which would extend at least as far west as Kipling Avenue. Double-ended light rail vehicles with pantographs would be needed to avoid the need to construct turnarounds at Kipling and QuRK.

This West Commuter LRT between Kipling Avenue and QuRK station would be 8.6 kilometres long. Stations at Kipling, Islington, Royal York, Parklawn and Humber River would include financially self-supporting user-pay multi-level parking garages built above the expressway right-of-way. East of Humber River, LRT stops can include the existing streetcar stops around Humber Bay.

The reductions of traffic on the expressway as a result of enhanced GO Transit services, the West Commuter LRT, the extended Ontario Line and other transit enhancements would enable the expressway to be closed east of Humber River, and enable Lakeshore Boulevard to be diverted onto the non-elevated portion of the Gardiner roadbed around the bay. It would return to its current Lakeshore Boulevard alignment west of Dowling Avenue. ***This would almost double the usable area of the lakefront parklands around the bay.*** The larger park can be transformed to include new areas for sports, and accommodate more special events. Residual expressway traffic would become Lakeshore Boulevard traffic.



The Humber and Parklawn West Commuter LRT stations deliver a key benefit to the growing and densely-populated Humber Shores community, enabling rapid transit access to the Ontario Line at QuRK, and to its connections to other transit routes. Pressures to create a Parklawn GO station, which is close to the Mimico GO station and would increase travel times on the Lakeshore West GO line, would no longer be needed.

The removal of the elevated Gardiner Expressway would create myriad opportunities for urban development across the waterfront. The modal shifts to transit generated by increased GO Rail services and the downtown portion of the Ontario Line would enable a redesigned Lakeshore Boulevard to replace the perceived need

for the reconstruction of the expressway east of Jarvis Street. ***The City of Toronto should not commit to any further work and expenditure on rebuilding the portion of the expressway east of Jarvis Street, known as the 'Hybrid Option'.*** Substantial reductions in motor vehicles traffic into and out of the downtown area of Toronto are necessary if bringing GHG emissions to net zero by 2050 or earlier is to be achieved.

Creating the West Commuter LRT is estimated to cost \$1.8 billion, plus \$1.7 billion to remove the elevated expressway (if decided) and to make other road adjustments. In comparison, the City of Toronto's cost of the "hybrid" reconstruction of the expressway east of Jarvis Street has been identified as \$1.4 billion. The staff report (released November 24, 2016) also identified a \$3.6 billion overall cost for maintaining the entire expressway. The eastern portion of the Ontario Line, the 401RT, GO Transit enhancements, the Eglinton Crosstown LRT, and their links to the Line 1 subway, plus enhanced bus services, would reduce travel demand to the downtown core via the Don Valley Parkway, enabling a 'grand boulevard' east of Yonge Street to replace the elevated expressway.

New transit ridership on the West Commuter LRT is estimated to be 12.3 million per year, attracting a portion of Humber Shores residents and new TTC ridership from intersecting bus routes, plus ridership from 6,000 new parking garage spaces.

8 – Waterfront West LRT

Proposals for the Waterfront West LRT (WWLRT) by the City of Toronto have varied, but a recent alignment is an attempt to economize on capital costs by using five existing streetcar route tracks between Union Station and Long Branch GO station. The Toronto Transit Commission estimates 21 million boardings per year. Most of these would be existing TTC users.

Next Connections recommends a route that more closely serves the shoreline, including an alignment around Humber Bay immediately south of the Gardiner Expressway roadbed, where the West Commuter LRT has enabled the amount of usable parkland to be doubled by diverting Lakeshore Boulevard traffic onto the Gardiner roadbed. As part of the West Commuter LRT concept, the Gardiner Expressway ramp to Lakeshore Boulevard east of Parklawn Road would be removed, creating space for the LRT to cross Humber River.

The proposed alignment includes a connection to Union Station at York Street rather than at Bay Street with an at-grade segment to the Osgoode subway station, where a direct connection to the Ontario Line and the Line 1 Subway would be enabled. The WWLRT would not use Queen's Quay, running instead along Lakeshore Boulevard.

The WWLRT would directly and efficiently serve the Humber Shores community and trip origins and destinations west of Parklawn Road, and provide direct access to both the CNE and Ontario Place at Lakeshore Boulevard. **It would eliminate the perceived need for a Parklawn GO station.** The number of new TTC trips per annum on the realigned Waterfront West LRT is estimated to be 10.9 million and cost approximately \$1.9 billion to construct. An illustration is attached as **Appendix 3**.

9 – Danforth Subway Extension in Scarborough

The Ontario government has announced that it will construct a northeastwardly extension of the Bloor-Danforth subway – also known as the Scarborough Subway Extension (SSE) – into the centre of Scarborough. This subway will consist of stations at Kennedy/Eglinton, Lawrence East, Scarborough Centre and Sheppard Avenue East, and be aligned mostly under McCowan Road. The subway option was approved as a replacement of the current Scarborough Rapid Transit line, which is to be closed. It will not become long operational until several years after the current SRT is closed.

The 401RT would intersect with the SSE at Scarborough Centre, adding approximately 6,000 daily trips to the SSE. In combination with the 401RT, the SSE would provide fast access to and from the Malvern Community, the University of Toronto Scarborough Campus (UTSC), Centennial College, and other post-secondary education campuses throughout Toronto, from many more trip origins than would be practically provided by Toronto's proposed Eglinton East LRT to Malvern.

Next Connections recommends that the Scarborough Subway be extended northward by 2.3 kilometres, from Sheppard Avenue East to Finch Avenue East, with new stations at Middlefield/Huntingwood and Finch Avenue East, to better serve nearby employment and residential areas, including the Malvern community. A station at the intersection of Brimley Road, Danforth Road and Eglinton Avenue should be added where, with the SSE's link to the Eglinton Crosstown LRT, there is great potential for urban intensification.

These stops and the 401RT with its Scarborough Centre station, and more aggressive land use intensification by the City, would help travelers access destinations across Toronto, and increase overall subway ridership to and from Scarborough. New transit ridership for the SSE is estimated at 3.4 million per year for the extension north to Middlefield and Finch Avenue and the addition of a Brimley/DanforthRd station, not including the transit ridership effect of closer access to and from the City of Markham.

Although not included in **Next Connections** figures, future extensions to Steeles Avenue, and to Highway 7 can be added to increase transit ridership between Toronto and Markham (with stations possible enroute at McNicoll, Dennison and 14th Avenue). Generally speaking, adding length and new stations to a rapid transit line increases ridership geometrically, as new ridership will come from not only at the new stations, but from areas near pre-existing stations that would now have rapid access to areas newly-served.

Eglinton East LRT extension: With the existence of the 401RT and the enhanced Scarborough Subway, Toronto's proposed Eglinton Crosstown LRT extension to UTSC and Malvern, estimated to cost \$4.2 billion to build, is not needed. However, dedicated priority bus services providing high-quality express and local bus services have begun to operate on Eglinton Avenue east of Kennedy station, and on Kingston Road and Morningside Avenue, with 'go-thru' signal priority and shelters and bike/scooter lock-ups at every stop. However, the Eglinton Crosstown LRT can be extended 4.5 kilometres eastward to Kingston Road (with turnaround loop) and no further, and to improve transfers to/from Brimley, McCowan and Markham roads. This extension may cost up to \$2.7 billion to build, and generate 7 million new transit trips per year.

10 – Finch West LRT Extension to Yonge Street

Construction of the Finch West LRT is now underway between Humber College and the Spadina/York segment of the Line 1 Subway. A future 5-kilometre 10-stop extension of the LRT between the Finch and Finch West subway stations is recommended. This connection will eliminate LRT-bus-LRT transfers between the two subway stations and enable better connectivity to and from the busy Yonge Street subway.

East of Bathurst Street, the LRT may have to run in mixed traffic due to the roadway's limited right-of-way. Rather than located in the center of the roadway with a boarding platform, the LRT may operate best as a curb-lane service to enable space for enclosed shelters at all stops and safer access for frail persons and persons with children. The LRT should run with signal priority, and stops be placed beyond signals to improve right turns for motor vehicle traffic. During peak periods, the curb lane should be transit-only. It is estimated that a mostly at-grade Finch West LRT east of the Spadina/York segment of the Line 1 subway will cost approximately \$1.6 billion to construct including rolling stock, and may generate 6.6 million new transit trips per year by 2051. If entirely tunneled between the Finch West and Finch subway stations, the cost may be \$2 billion to build, and some local stops will be lost. Tunnelling will be necessary for a short length east of the Finch West subway station.

11 – Steeles Avenue LRT

The Ontario government's Greater Golden Horseshoe Transportation Plan includes a light rail transit line on Steeles Avenue, between the Pioneer Village subway station on the Line 1 subway and the 3-stop Scarborough Subway Extension. **Next Connections** recommends that the LRT eastern terminus be at the Finch Avenue East subway station of the extended Scarborough Subway, and that its western segment extend beyond Pioneer Village station to the Islington transit loop. The LRT would connect with the Line 1 subway at Pioneer Village Station and the Steeles subway station at Yonge Street, and with the Milliken station of the Stouffville GO Rail Line, at Kennedy Road. The extension to Islington would serve a large employment area north and south of Steeles Avenue, and transit demand to and from busy Weston Road. Between Bathurst Street and the Richmond Hill GO rail line, Steeles Avenue is limited to two road lanes in each direction, and will require an LRT to operate in mixed traffic with peak hour priority for transit. A curb-lane alignment is preferred.

The Steeles LRT extension to Islington would cost \$700 million to build, and the shortened eastern terminus will cost \$400 million, compared to the estimated GGH cost of \$800 million to extend the LRT to Sheppard Avenue. The two extensions may generate 1.5 million new transit trips per year by 2051.

12 – St. Clair LRT to Jane

Toronto has recommended that the St. Clair streetcar service be extended westward 1.5 kilometres to Jane Street. St. Clair streetcars may have to operate in mixed traffic where there is not enough road space to create a separated right-of-way for the streetcars. Projected transit ridership on Jane Street is expected to be reduced as the 401RT, Finch West LRT and Eglinton Crosstown LRT divert ridership that would otherwise mean long distance travel on buses to the Jane subway station at Bloor Street to access the downtown core of Toronto. In this way, average trip lengths on Jane buses will shorten, thereby reducing crowding on buses.

13 – Active Transportation

The "Walk, Cycle, Other" modal category identified by MTO's Transportation Tomorrow Survey estimates that it constitutes approximately 15% of all daily trips in Toronto. Bicycling constitutes under 2% of this total, and walking is most of the remainder.

In addition to major increases in transit infrastructure, safe, secure and extensive networks that promote and active transportation are critical, and more so if the use of bicycles, e-scooters, other slow-moving vehicles is to become a principal mode of access to public transit and to local destinations. Enclosed transit shelters and bike/scooter lock-ups at surface transit stops should be universal. All-season maintenance of transit stops and bicycle and pedestrian pathways should be standard practice. Over time, with expansions to the bicycle network and more people walking as mixed-use urban infill and intensification occurs, the percent of all daily trips captured by walking and cycling should increase.

Especially in suburban areas, space for active transportation is usually available within the rights-of-ways of major roads. An example of a street with a secure bicycle lane would have, in sequence, motor vehicle road lane, curb, green boulevard that enables safe exiting from automobiles, a bicycle lane, a rumble strip, and finally a sidewalk for pedestrians.

Next Connections has not recommended or costed any specific examples of needed network locations, but has identified an additional modal shift of 160,000 daily trips in 2051 daily trips to the "Walk, Cycle, Other" category, reducing trips by automobile and Toronto transit by 80,000 each.

Transit Initiatives Beyond Toronto

The recommended **Next Connections** public transit initiatives are limited to those that should be implemented within the city of Toronto, save for the segments of 401RT that extend into Pickering and Mississauga. Ontario government's Greater Golden Horseshoe Transportation Plan to 2051 have included a significant magnitude of transit initiatives for the Regional Municipalities of Peel, York, Halton, Durham, and Hamilton, and for Toronto. It includes regional express rail (RER), subways, and light rail transit, and bus rapid transit and priority bus service opportunities for the existing arterial road and highway network across the region – all of which need to be implemented in the municipalities outside of Toronto if GHG and congestion reduction targets are to be achieved. It also prioritizes the need for better connectivity of transit services and improved access to transit services that are aligned with and support more sustainable land use.

Unfortunately, there is no apparent intent or goal in the GGH plan to adequately address the need to reduce transportation-source GHG emissions from current levels. However, the plan is clear that the transportation network and systems need to move towards sustainability. Given their relative low population densities, achieving major reductions in GHG emissions in communities outside of Toronto is more difficult. Generally speaking, enticing many more travelers to public transit means multiple increases in bus service systems to destinations and to existing and planned rapid transit services, and much better, more convenient, safe, secure and maintained infrastructure for bicycles, scooters, other low-speed vehicles, and pedestrians. The provincial plans emphasize the need for transit-supporting land use planning as the GTHA population grows.

In terms of overall outcomes, and in the context of ongoing and rapid population growth, the implementation of all initiatives included in the plan will help to reduce the growth in road traffic congestion in the region, but will not be enough to adequately address the magnitude of GHG emissions that need to be achieved. To some degree, automobiles powered by fossil fuels will need to be replaced to electric or hydrogen/electric vehicles. The reductions in the number of vehicles in Toronto to 60% of 2016 volumes as a result of implementing the **Next Connections** initiatives also improve the overall sustainability outcomes of the Toronto region, in which rural areas will be more dependent on personal vehicles to meet daily transportation needs.

Light Rail? Or Buses?

Traditionally, transit user volumes have determined whether bus services should be replaced by light rail. Light rail services on city streets provide one level of service – semi-rapid – and will require the loss of numerous local stops to maintain desired speeds. Bus services in dedicated lanes can provide both express and local services in the same right-of-way, with 'go-thru' signalling mechanisms at intersections, and the ability of transit vehicles to pass one another. The demographics of aging and for travelers with children and/or carrying burdens suggest that transit access needs to remain close to home, which means that local bus services – with stops relatively close together – should be maintained.

Speed of service is the most important element in attracting new transit users, including reduced wait times at transit stops, if the use of automobiles for travel is to be reduced. For travelers whose trip destinations are relatively distant, an LRT on city streets is normally not useful for people who currently drive cars: it is simply too slow, often with too many stops. Because traffic congestion on roads is directly proportional to the distances traveled by automobile, attracting longer distance drivers to transit in the Toronto region is very important. Before decisions are made to build new LRT infrastructure, additional express buses in dedicated lanes can be tested over multi-year period. *If necessary*, this may require adding a road lane in each direction on specific routes.

Because the overall passenger capacity of an articulated LRT vehicle can be three times that of an articulated bus, higher operating costs per passenger of running more buses compared to LRTs should be weighed

against the need to maximize modal shifts from the use of personal automobiles, and customer service and satisfaction.

Modal shift volumes should be the primary determinant, and relatively small differences in financing operating deficits (where they may exist) between bus and LRT services be considered acceptable.

Movement of Freight

The population of Toronto is estimated to grow from 2.97 million in 2018 to 3.73 million by 2046, and to four million by 2051, a one-third overall increase. Truck traffic will increase accordingly if there are no improvements in the efficiency of goods delivery. Cross-boundary trips to and from Toronto will add to the total. Implementation of all of the recommended **Next Connections** transit expansions and currently-approved transit expansion plans may reduce daily trips by personal automobile by half compared to 2016, enough to enable a freer movement of trucks.

Fewer automobiles on the road may provide opportunities for the creation of local distribution centres that can reduce travel times for trucks, such as using emptier parking lots, and perhaps sections of under-performing suburban retail malls. In Toronto, it would be possible to transport relatively small freight loads by freight cars in subway tunnels at night or in off-peak hours, especially if high-capacity elevators exist in stations and where rail sidings are created.

As significant generators of greenhouse gas emissions, trucks in the near future will need to be powered by more sustainable fuels, including smaller trucks that are electric-powered, and larger trucks that are powered by natural gas or hydrogen, or by electricity. Without significant changes that include efficiencies in the delivery of goods, there is little hope of net zero GHG emissions from transportation by 2050.

Transit Ridership Analysis

Further analyses of the **Next Connections** recommendations by the Ontario government, the City of Toronto and others regarding transit ridership impacts can be beneficial. However, the proposed transit improvements are sufficient in magnitude, connectivity and service quality to generate very significant modal shifts to transit that will increase steadily over time. Altogether, they will have a positive transformative effect on road traffic congestion, GHG emissions, quality of life, social equity and economic well-being.

Significant action against rapid climate change will very likely require deterrents to the use of automobiles, such as vehicle registration charges based on kilometres traveled, increases in parking charges, and fewer parking spaces. Transit fares can also be based on the levels of transit service to incentivize use – for example, lowered for local bus services, and raised for higher order transit services and/or express services.

Some general points:

- The addition of up to 32 new rapid transit intersects will create many travel options not available today, including
 - 401RT connections: Hurontario LRT; Mississauga Transitway; Union-to-Pearson Express; Woodbine/Hwy27 GO; Jane/Ontario Line; Barrie GO, Spadina/York Subway (at Yorkdale station); Yonge at Sheppard; Oriole/Leslie; Ontario Line at Victoria Park North station at Hwy 401; an Agincourt GO transfer station at Highway 401; Scarborough Centre.
 - New Ontario Line Connections: Jane/401RT; Keele/Eglinton LRT; St. Clair/Old Weston Rd; Bloor subway at Dundas West; QuRK station (Queen/Roncesvalles/King) at West Commuter LRT; Don Mills Road at the Eglinton LRT; Victoria Park Avenue at the 401RT.
 - Mississauga Transitway connections: 401RT at Mississauga Airport Corporate Centre; Eglinton Crosstown LRT at MACC;
 - West Commuter LRT connections: Ontario Line at QuRK station;

- Danforth/Brimley at Eglinton LRT; Steeles LRT at Pioneer Village station; Steeles West GO transfer; Yonge/Steeles LRT; Richmond Hill GO at Steeles transfer station; Milliken GO/Steeles RT; Finch East SSE station/Steeles LRT.
- Shorter bus trips to and from rapid transit will attract new transit users.
- Speed on rapid transit lines and express buses in dedicated lanes are crucial for attracting people who normally would drive an automobile; the 401RT is a particular example of speed – 58 km per hour overall *including* stopping times – with stations averaging 1.85 kilometres apart.
- Congestion on city streets and on limited access highways in the Toronto area is a default situation because of the lack of adequate rapid transit services. “If you build it, they will come.”
- Bus shelters at every stop (*every stop*) in Toronto and neighbouring municipalities, and bicycle/scooter lock-ups wherever possible will further attract transit ridership, and should be a part of all transit plans; this is a significant and inexpensive measure.
- The frequency and speed of bus services will be increased by the addition of almost 500 buses for routes intersecting with the 401RT, and 900 additional buses for other routes in Toronto; both local and express services would boost attractiveness to travelers.
- The 401RT would attract new longer-distance travelers from across Toronto and from Mississauga and Pickering; the Ontario Line would draw new users from the centre of Toronto, including from downtown Toronto.
- Populations and employment in Toronto and close to Toronto will continue to increase significantly for the foreseeable future, and will include potential transit users. Toronto’s population is likely to increase by 1,000,000 plus 500,000 jobs in 30+ years, and the near-Toronto 905 area by perhaps another 500,000, plus 250,000 jobs. Transit expansions must keep pace, and more.
- Urban development via infill and intensification will increase the use of transit close to new transit services.
- Construction of high-density buildings above, at or near 401RT stations and other rapid transit stations produces a higher-than-average modal split for transit.
- Across suburban Toronto, many thousands of people who are today forced to carry the cost burden of driving because of poor access to rapid transit will be encouraged to shift to transit.
- 401RT intersections with GO Rail will increase 401RT ridership to and from the Stouffville, Barrie, Richmond Hill and Kitchener GO lines, and also enable some Lakeshore GO riders to make longer-distance connections to the 401RT via the extended Ontario Line and the Line 1 subway.
- The 401RT’s ridership can be compared to that of GO/RER enhancement initiative: the 401RT’s forecast of 140 million new rail transit trips plus 45 million on enhanced north-south bus services compares to GO Transit’s forecasted increase of 130 million trips for GO by 2055. Perhaps 25 million of the new GO trips would be on the mostly-suburban Lakeshore line, which would have less frequent service than the 401RT, has a similar number of stops as the 401RT, have somewhat similar travel times to Yonge Street/Union Station, and is more expensive for users (barring level-of-service and/or fare-by-distance fare increases for travel on the TTC). The 401RT would draw riders from north and south of its alignment, whereas the GO Lakeshore line’s draw is largely from north of it.
- A transit surcharge levied on subways as a level-of-service premium and/or a fare-by-distance premium can be appropriate and would not be a significant deterrent to transit use. An offsetting decrease in fares for local bus services can generate additional transit ridership, and would be highly appropriate. Overall, quality of service is the prime determinant of transit ridership.
- Private and/or shuttle services to industrial and office employers can provide improved first/last mile connections to/from origins and destinations.

Overall, planners have avoided considering that many of the daily trips by non-commercial car drivers and passengers in the core of the GTA are taken so only because there is no practical alternative.

Estimating new transit trips for the 401RT: Because of the uniqueness of the 401RT, no comparable ridership forecasting methodology was found. However, it has estimated that the rail-component of the 401RT would generate 140,400,000 **new** transit trips per year soon after it becomes operational. The 2051 401RT ridership estimate is based on the Ontario Ministry of Transportation's 2011 Transportation Tomorrow Survey's origin-destination matrix for trips by residents by automobile for 24 hours for 44 wards in Toronto plus 16 close-by wards in neighbouring municipalities, and was adjusted to 2041 and 2051 for population growth. Modal shift factors to transit were assigned based on the proximities of trip origins and destinations to the Highway 401RT alignment and by length of trip. Additional ridership was added as a result of: worsening road traffic congestion from travel demand growth after 2041 (including growth in truck traffic); new high-density urban development encouraged at/near 401RT stations (including station construction partnerships with the private sector that includes air rights construction); trips to Toronto by residents living beyond the 60 Wards (Wards in 2018); positive impacts of new links to GO/RER; the added effect of direct access to Pearson International Airport from across Toronto; and driving costs.

The 401RT's bus component assumes that ridership would increase on bus routes in Mississauga, Toronto and Pickering that intersect with the 401RT for trips not involving a transfer to or from the 401RT itself, due to improvements in service frequencies, a mix of express and local services, shelters at every bus stop, more comfortable buses, and urban development along arterial roads. It is estimated that overall ridership volumes on intersecting bus services would increase by 21%, or 45 million annually by 2051.

The extensions of the Ontario Line are estimated to generate 42 million new transit user trips per year, plus transfers from existing transit routes, such as from King Street and Queen Street streetcars, and from buses on Don Mills Road, Jane Street, Keele Street, Weston Road, and other routes. The ridership projection for the Ontario Line is based on variable estimates of new fares per peak AM hour per station (both directions), extrapolated to a full day and then year, and based on a 308-day annual conversion factor. More detailed analyses can refine estimates.

Phasing

Despite a historically slow pace for urban rapid transit development in the Toronto area, an accelerated timetable for completion of the recommended rapid transit components before 2050 is warranted by the existentially deadly impacts of rapid climate destabilization, and by the ongoing economic and social costs of road congestion as The Toronto area's population increases. Success in coordinating and securing a continuous flow of planning and construction contracts, and overcoming political fears and biases, are needed for success.

The 401RT and the Ontario Line extension (OLX) north of Eglinton Avenue East should be the first rapid transit priorities of the overall transportation strategy for the central area of the Toronto area because

- The lack of a single, fast rapid transit service across northern Toronto is a principal cause of road congestion to, from, across and within all of Toronto;
- The 401RT will generate the highest volume of modal shifts to transit, by far, compared to other rapid transit infrastructure projects;
- The 401RT/OLX will avoid four other rapid transit projects from being unnecessarily being constructed, saving approximately \$ 13 billion that would otherwise be wasted;

The 401RT/OLX They should be completed within 12 years.

Within that first priority, the 401RT segment between Pearson International Airport and the Yonge Street subway is highly important, providing more than a dozen key linkages to and from downtown Toronto, the City of Vaughan, Brampton (via the Woodbine/Hwy27 GO station), Mississauga, York University, the airport and its surrounding industrial area, and other destinations.

From the first years onwards, adding to the fleet of electric buses will begin the process of accelerating modal shifts to transit. Ridership on buses will be modest until there are more linkages to new rapid transit services – the 401RT, the extended Ontario Line, the Line 1 subway, the Scarborough Subway, and several new LRT services.

Beyond a 2030 completion timetable for the Ontario Line to Eglinton Avenue East, the additional extension to the 401RT at Victoria Park Avenue and to Sheppard Avenue East should be completed to coincide with completion of the 401RT's eastern segments. These are needed to avoid further overcrowding of the Yonge subway by new transit users of the 401RT and the Eglinton Crosstown LRT.

The Eglinton Crosstown LRT, currently under construction until the end of 2022, can be extended to the 401RT's MACC station as an amendment to current construction and, in the East, to Kingston Road. Plans for extending the Eglinton Crosstown LRT to Pearson International Airport should be halted immediately. The extension of the Scarborough Subway to Finch Avenue East can become an amendment to the currently-approved 3-stop subway now moving towards construction.

The Steeles Avenue LRT and Kingston Road LRTs can be completed well before 2041, keeping in mind the urgency for modal shifts. The extension of the Finch West LRT to Yonge Street should have been an integral segment of the currently-approved LRT, given the significance of access to the Yonge Street corridor. The Dundas Street LRT across Mississauga, Oakville and Burlington – part of the 2022 GGH Transportation Plan - may be approved soon after 2031, in which case the short Toronto segment would be constructed first.

The extension of the Ontario Line between King/Bathurst station to the Dundas West subway station can be implemented once the currently-approved Ontario Line is completed from Eglinton Avenue East to King/Bathurst station. The Ontario Line should not divert to Exhibition GO station, but continue along King Street West.

Once the Ontario Line is completed to QuRK station (Queen/Roncesvalles/King), the West Commuter LRT can be built. As soon as possible, the City of **Toronto's plans to rebuild the Gardiner Expressway East of Jarvis Street should be paused** until the modal shift effects of the Ontario Line and enhanced GO Rail system are known. Once the West Commuter LRT is built and the eastbound off-ramp to Lakeshore Blvd from the Gardiner Expressway is removed, the improved alignment of the Waterfront West can be constructed, to better serve the lakefront.

As ridership pressures mount on the western leg of the Line 1 subway, extensions of the Ontario Line north of the Dundas West subway station to the 401RT at Jane should be completed by 2046, or sooner if pressures for a western relief line subway accelerate. Overall, achieving net zero GHG emissions from transportation sources in Toronto is essential and will, as a consequence, resolve road traffic congestion as the city's population increases by a million residents over the next thirty years.

The Environment: Climate Change

The dire consequences to all people of the ongoing pace of GHG emissions must be mitigated. Ontario and the Toronto area must do their share both as a necessity, and to be able to demonstrate to others not only the magnitude of effort that needs to occur in a short period of time, but that it can be done. ***The prospect of unstoppable climate destabilization and rapid global heating is real and brutally devastating.*** Natural life will, in many cases, not be able to adapt quickly enough, causing tremendous damage and die-offs of ecosystems and habitats. The overall costs to human society will be great. **This is critical information. Refer to Appendix 2 for more information.**

Rapid transit projects that generate significant numbers of new transit users produce positive environmental benefits for many years, and in this case, prior to a long period of change to electric vehicles, a reduction of

close to 800,000 tons of greenhouse gas emissions each year once all components of the recommended **Next Connections** rapid transit initiatives are operational, based on estimates of car-use kilometres avoided. Additionally, significant environmental damage from the production, maintenance and disposal of unneeded automobiles is avoided. Every delay in creating new transit infrastructure means that levels of environmental damage are continued.

Environmental assessment processes for the initiatives recommended in this document should be streamlined. Conditional Declaration Orders can be issued that recognize the trade-offs between short term environmental costs during construction and the environmental damages that are avoided as projects are more quickly implemented.

Getting to Net Zero by 2050

Reductions in trips by personal automobile as a result of transit expansion initiatives described herein will be partially offset by increases in trips by commercial vehicles, especially large trucks. Moreover, trucks of all types emit, on average, 1.7 times as many GHGs as gasoline-powered personal automobiles.

Much more must be done to achieve zero greenhouse gas emissions by 2050. In the broader sense, solar, wind, hydroelectric and geothermal power will not be enough to replace fossil fuels in Canada; nuclear energy (such as safe nuclear power, possibly using thorium) will have to be increased.

Vehicles powered by electricity rather than fossil fuels produce zero tailpipe emissions; however, the mining of materials, vehicle production, operating maintenance and disposal of vehicles creates significant GHG emissions. The degree to which the electric power for EVs is produced by fossil fuels is also critical; as electricity production decarbonates, EVs will make a significant contribution to reducing GHG emissions – by one example, lifecycle emissions can be cut by more than two-thirds per vehicle. For municipal bus systems, the least GHG emitting vehicles are those powered by overhead power lines (trolley buses) rather than batteries. For more information on EVs, visit <https://www.carbonbrief.org/factcheck-how-electric-vehicles-help-to-tackle-climate-change>.

A variety of disincentives to driving may accelerate the modal shifts to transit produced by better transit system quality. Some disincentives to driving can include

- The household costs of owning and operating automobiles as their costs increase;
- Motor vehicle licence plate renewal charges, reinstated and based on kilometres traveled;
- Fuel tax increases to help fund transit improvements or to fund rebates to households, particularly to those of modest income;
- Reductions in the number of public parking spaces, and increased parking fees;
- Road tolls once transit services are considered to be viable alternatives to driving;
- Better car-sharing and carpooling programs;
- Less road space due to conversions of lanes to transit-only use;
- An incentive: a freeze on transit fare increases, or fare reductions, and more fare integration among transit systems.

Autonomous and Shared Vehicles

The positive effects of autonomous vehicles (AVs) and shared vehicles on road traffic congestion in Toronto may be less than imagined. Over the longer term, travel demand growth will overtake space savings speculated for AVs. Road congestion will increase as more people use shared AVs, especially by people who cannot drive; this is because shared vehicles such as by UBER can take up to twice the road space per user as privately-owned vehicles, because each one-way trip will be a round trip (from an originating location to the client and then to the client's destination).

Overall, transit vehicles are more space-efficient, carrying many more times the number of travelers than AVs occupied by one or two people, and are more energy-efficient. The technology for autonomous vehicles will likely evolve over time to enable the use of short-distance transit shuttles to and from key transit connection points, reducing operating costs while improving the attractiveness of transit. It should be noted that ridership on those shuttles would be reduced if the use of e-bikes and e-scooters as first/last mile vehicles to/from transit stops on major arterial roads becomes commonplace; current (overly-cautious) public policy fears and uncertainties regarding these two-wheeled modes will have to be resolved.

On major highways, AV space savings will be less for trucks, especially larger trucks, as the ratio of vehicle length to space between vehicles is less; truck traffic may grow by one-third over the next 30 years. Many truck owners will opt not to convert to full AV, because trucks will need a human presence for security and for loading and off-loading of freight. However, the use of technology that prevents rear-ending and dangerous lane changes, as is now available on many automobiles, will become more widespread use for both trucks and cars.

In heavy traffic on highways, merging by autonomous vehicles across three or four lanes will likely slow vehicle speeds. On local streets, which would be shared by AVs and person-driven automobiles, AVs' speeds will be limited, as traffic lights will still be needed to facilitate pedestrian and bicycle/carriage crossings, and stops and turns will have to be slow enough not to disturb the physical comfort of passengers.

Technical problems with AVs are not fully resolved, such as 'seeing' through snow and rain, dealing with blowing leaves and debris, potholes, and slick surfaces on the road. Human drivers may have difficulty dealing with AVs in traffic. Mapping will be incomplete, because changes to roads occur on an ongoing basis. Legal, ethical and jurisdictional issues also remain.

The sophisticated components of autonomous vehicles may create affordability problems for many, who may as a consequence want or need to keep less expensive options. The currently-limited availability of rare earth metals may prevent universal availability of electric vehicles; efforts to develop substitutes for rare earth metals used by AVs may improve their affordability.

The use of shared vehicles will also be limited by the desire of people to own their own vehicles for matters of style, size, comfort, family size (for example, baby seats), personal effects remaining on board, having to manage access to shared vehicles, and fears regarding the cleanliness of shared vehicles.

Next Connections Benefits

The infrastructure development cost and public operating costs of the initiatives proposed will be significantly exceeded by the value of benefits generated. Only 13 of the 28 benefits listed below were quantified at a conceptual level, totaling an ongoing gross benefit of approximately \$2.8 billion per year at maturity. If phased-in over a 20-year period, quantified benefits may accumulate each year, to a total of \$89 billion.

In no particular order, and not a complete list, overall benefits for the recommended ***Next Connections*** infrastructure initiatives include the following, some of which are costed:

1. Road traffic volumes and congestion are reduced;
2. The ***Next Connections*** initiatives add 112 kilometres of new rapid transit.
3. 32 new rapid transit intersects and more than 50 new rapid-transit-to-local-bus route connections are created.
4. At long last, fast and affordable public transit access directly to Pearson International Airport and its surrounding employment areas becomes available from anywhere in Toronto and parts of Mississauga and Pickering.
5. Peak hour crowding on the Yonge and Spadina/York subway lines is resolved.

6. Peak hour crowding at Union Station and on the King and Queen streetcars is resolved.
7. Gridlock on Don Valley Parkway is resolved as the 401RT and Ontario Line attract drivers.
8. The functionality of Highway 401 is maintained; passenger capacity of the corridor is more than doubled.
9. Almost 300,000 job years are created during the construction of the 401RT, Ontario Line extensions, the West Commuter LRT, Sheppard Subway enhancements, Waterfront West LRT, the Eglinton West Rapid Bus Lane and other recommended transit lines.
10. Up to 13,000 ongoing new transit operating jobs are directly created, plus those created by Metrolinx's currently-approved projects (figure assumes no automation of direct services).
11. Thousands of jobs are created as a result of new urban development attracted to Toronto (\$207m benefit/annum).
12. Unemployment and unemployment costs decrease (>\$18m/ann).
13. Tax revenues increase from incomes of the newly-employed.
14. Nearly 800,000 metric tons of CO₂ per year are not emitted as a result of modal shifts to transit and EVs; Toronto leads Canada in reducing transportation-source emissions.
15. For many thousands of people, the frustrations of driving are reduced as they are able to use rapid transit. Quality of life and health of Ontarians increases.
16. Many thousands of families are relieved of the financial burden of car ownership.
17. Annual imports of automobiles and motor vehicle fuels into Ontario are reduced (approximately 80% of automobiles purchased in Ontario are imported).
18. Today's largely radial rapid transit system in the northern half of Toronto is changed into a true network as the Yonge, Spadina/York, Ontario Line and Scarborough rapid transit lines are connected at 401RT stations.
19. A single, direct east-west rapid transit line across the geographic centre of population of the GTA is created that is highly convenient for travelers.
20. Access between Brampton, Mississauga and northern Toronto is improved.
21. As a benefit to municipal finances, residential and non-residential property taxes on properties at locations near the 401RT and Ontario Line increase.
22. Travel times across the downtown area of Toronto are significantly reduced as the downtown portion of the Ontario Line becomes operational.
23. The complete removal of the elevated portion of the Gardiner Expressway and replacement by an improved Lakeshore Boulevard is made possible without congestion by the creation of the West Commuter LRT, the Waterfront West LRT, the extended Ontario Line and improvements to GO/RER Rail services. Construction of new buildings and public spaces are made possible.
24. The use of surface bus services is increased across the city, as the number of buses is increased by almost 1,400 (including approx. 500 as part of the 401RT initiative). Wait times at transit stops are reduced.
25. The potential for urban infill and intensification at/near 401RT and Ontario Line stations is significantly increased.
26. More people are attracted to transit as bus shelters at every stop protect them from the GTA's harsh climate, and which include bicycle and e-scooter lock-ups. First/Last mile deterrents are reduced.
27. New opportunities to access destinations across the region are created for elderly and socially, economically, and otherwise disadvantaged persons; isolation is decreased (\$122m/ann).
28. Toronto becomes a renewed leader in sustainable transportation in North America and beyond.

The quantified value of benefits is conservatively estimated, and also excludes a number of quality-of-life benefits, such as the value of reductions in greenhouse gas emissions, reduced frustrations arising from driving in congested conditions, less maintenance time and effort for personal vehicles, reduced crowding on

transportation systems, access improvements for existing and new transit users, improved functionality of the road system, and other factors.

When compared with overall costs to Toronto, the overall estimated impact is a large net benefit for the residents of Toronto. Overall, it is unaffordable to not implement the recommended **Next Connections** rapid transit services, or variants thereof that produce a similar magnitude of benefits.

Affordability

The quantity and extent of rapid transit initiatives and bus-based service initiatives recommended by **Next Connections** reflect the magnitude of effort needed to achieve a sustainable urban transportation network that will contribute significantly to critical climate change goals and to traffic congestion reduction, and will set Toronto apart as a leader in sustainable urban development.

The table below summarizes the capital cost components of the overall **Next Connections** scenario. Assuming a mostly elevated 401RT, the gross cost is \$46.5 billion. The totals exclude items that are already in Ontario and Toronto plans. The removal of the elevated portion of the Gardiner Expressway as a potential outcome of the West Commuter LRT is not included in the figures.

An important comparison is appropriate: The previous government of Ontario proposed a high-speed rail (HSR) service between Toronto and Windsor, at a cost of approximately \$21 billion. The mostly elevated 401RT and Ontario Line extension north of Eglinton Avenue East would cost \$25.5 billion. However, while the HSR plan has been estimated to serve 10 million passengers per year, the 401RT and Ontario Line extension would carry 215 million new transit riders per year – almost 18 times as cost effective than estimated for the proposed HSR. This advantage makes a priority implementation of the 401RT component of **Next Connections** highly appropriate.

	New Trips (Millions/yr)	Gross Infra. Cost (\$ Mil)
HSR to Windsor	10	21,000
401RT + OLX	215	25,500
Comparative Ratio	21.5	1.21

401RT/OLX Cost effectiveness ratio: 17.7

A comparison between **Next Connections** and the Ontario Subway Plan for Toronto is also useful. As indicated by the illustration at right, **Next Connections** achieves approximately 3.7 times as many new transit trips than estimated for the Ontario plan, at just 63% more cost. This indicates a relative appropriateness for implementing recommended **Next Connections** transit infrastructure.

	New Trips (Millions/yr)	Gross Infra. Cost (\$ Mil)
Ontario Rapid Transit Plan	78	28,500
Next Connections**	268	46,500
Comparative Ratio	3.46	1.63

NC Cost effectiveness advantage: 2.12

*Yonge sbw y extn to Vaughan, Scarb Sbw y, Ontario Line, Eglinton W LRT, Hurontario LRT

** Excl. 103 m new trips re 900 additional buses included in Next Con

The recommended rapid transit initiatives assume that capital investment costs would be phased in over a 25-year period. This relatively slow increase in costs would enable earlier starts to implementation, and spreads costs to the future users of the new transit services. At an average lending rate of 4.0%, the annual interest cost to carry the \$46.5 billion investment debt would phase in to \$1.8 billion once all initiatives are fully implemented, and would be shared by Toronto, Mississauga, Durham Region, Ontario and Canada governments, and the Greater Toronto Airports Authority.

If the government of Canada funds 33% of the gross capital cost, and the government of Ontario funds variable amounts (depending on the project) totalling \$28 billion, Ontario's annual cost would grow to \$1.12 billion once all transit elements are completed, or approximately 0.5% of a projected 2046-47 provincial budget. The Toronto share would phase in to be \$2.3 billion, or \$90 million per year during peak years; the average cost per household of the Ontario and Toronto shares of the gross infrastructure cost net of the government of Canada share would be approximately **27 cents per day** at completion.

The critical factor in achieving sustainable transportation is whether the people of Toronto and the governments of Ontario and Canada are willing to adopt a “can do” attitude and take aggressive action to reduce the negative effects of rapid climate destabilization and resolve overall transportation problems, and to create a better city for the people of Toronto.

The daily benefits of reduced motor vehicle congestion and frustration, reduced air pollution, reduced travel times for TTC users, enhanced property values and redevelopment potential, and long term economic, financial benefits to individuals, families and government, suggest that the **Next Connections** proposals are very affordable. Not investing in the recommended infrastructure would cost dollars per day in congestion and environmental costs, rather than cents per day. Failure to invest based on perceived short-term constraints is false economy.

Operating outcomes for the 401RT, and for the **Next Connections** initiatives altogether have been estimated to have an overall cost recovery of approximately 90%. The estimate is based on an average fare of \$2.46 for the rail service and \$2.21 for bus services, an annual operating cost of \$450,000 per bus, \$900,000 for an LRT, and \$8 million per subway station.

NEXT CONNECTIONS PUBLIC TRANSIT RECOMMENDATIONS		Km. Track or Bus Lane	Stations or stops	New Users (Millions/yr)	Gross Infrastructure Cost (\$M)	Cost per Km. (\$m)	Infra Cost Per New Ann. User*	Ann. Operating R/C Ratio
1	Elevated 401RT -- Rail and Bus	60	30	184.9	21,400	\$357	\$116	0.96
1a	Effect of GO Rail links on GO ridership	0	0	16.0	300	\$0	\$0	
1b	Eglinton East LRT- to Kingston Rd only	4.5	8	7.0	1,100	\$244	\$157	4.26
2	900 eBuses (add'l to 401RT buses) + road enhancements			102.0	1,000		\$10	0.56
3	Ontario Line Eglinton E to Sheppard E at Victoria Park	7.5	5	14.2	3,800	\$507	\$268	0.78
4	Ontario Line University Ave. to Dundas West station via King & Roncesvalles	4.0	8	11.4	5,700	\$1,425	\$500	0.44
4a	Ontario Line West adjustment	0	0	0.0	0			
5	Ontario Line - Dundas West to Eglinton West	4.2	4	10.1	2,700	\$643	\$267	0.78
5	Ontario Line - Eglinton W to 401RT at Jane	4.2	3	7.6	2,300	\$548	\$304	0.78
6	Eglinton West LRT to MACC stn.	0.5			100	\$175		
7	West Commuter LRT - QuRK stn to Kipling	8.6	5	12.3	1,800	\$209	\$146	3.92
8	Waterfront W LRT to Long Branch	8.4	12	10.9	1,900	\$226	\$174	3.55
9	Scarborough Subway enhancement	2.3	3	3.4	1,400	\$609	\$410	0.35
10	Finch West LRT extension to Yonge	6.0	10	6.6	1,600	\$267	\$243	3.00
11	Steeles Ave. LRT adjstment (Islington to Finch East)	6.7	13	1.5	1,100	\$164	\$726	0.62
12	St. Clair LRT extension to Jane Street	1.5	3	0.8	200	\$133	\$244	1.49
13	Dundas Street BRT - Kipling to West Mall	2.0	3	4.9	100	\$50	\$21	6.00
14	Active Transportation diverts transit users			-23.1				
	Transit initiatives beyond Toronto borders	Not included, other than 401RT (#1 above)						
Totals		120.4	107	370.4	46,500	\$378	\$126	0.91
* Excludes current riderships/boardings.		Fares at \$2.21 for bus trips; \$0.25 added for subway and LRT trips.						

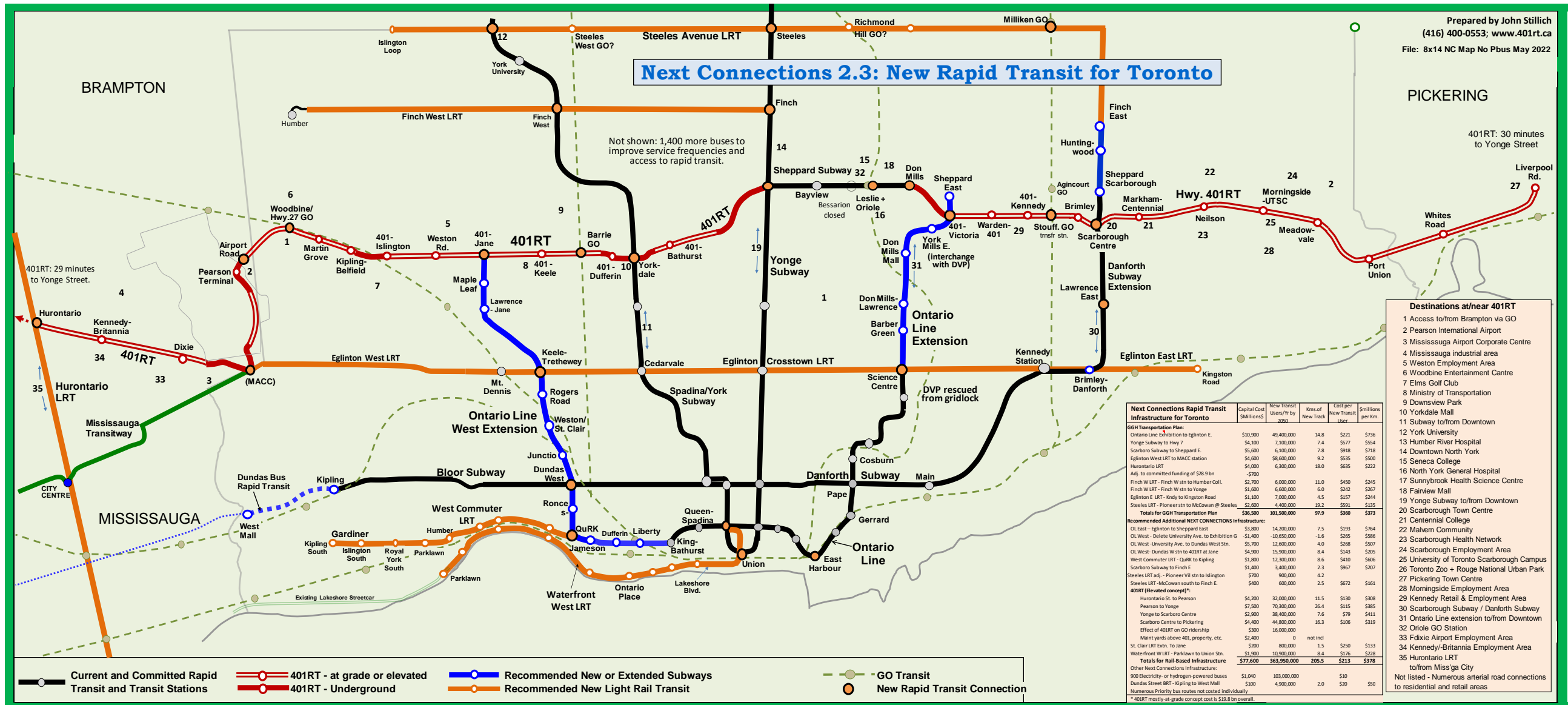
Recommendations

It is recommended to the government of Ontario, the City of Toronto, other cost-sharing partners and transit planning decision-makers that they, within current planning cycles, and in consultation with affected funding partners:

1. Recognize the brutal and existential nature of the climate change threat, and commit to meeting its challenges fully;
2. Recognize that the recommended transit initiatives by **Next Connections** are a necessary part of efforts to cut greenhouse gas emissions;

3. Recognize the vital importance of accelerating rapid transit planning and implementation, beyond current commitments, for easing road traffic congestion and reducing greenhouse gas emissions to net zero by 2050;
4. Take immediate steps, particularly at the Provincial level of government, to undertake a detailed analysis of the benefits, costs and overall feasibility of the **Next Connections** initiatives;
5. Recognize the urgent need to create a Mississauga-to-Pickering rapid transit line through the northern half of Toronto, known as the 401RT and described herein, and which will generate a modal shift to transit of approximately 185 million trips per year by 2051, plus 16 million new GO Transit trips, and include it in current transportation plans for completion in **less than** 20 years;
6. Recognize the significant and necessary positive effects of the 401RT for Toronto, Pearson International Airport and its surrounding employment area;
7. Work quickly to extend and construct the Ontario Line subway northward from Eglinton Avenue East to Sheppard Avenue at Victoria Park Avenue, and include in current transportation planning processes extensions west of the Exhibition GO station, as described herein;
8. Recognize the need for and benefits of the following additional rapid transit initiatives, and take urgent steps to bring them to operational status:
 - a. An extension of the Eglinton West LRT from Mt. Dennis to Renforth Drive, and no further;
 - b. Delete the Ontario Line diversion to Exhibition GO Station and, instead, extend the Ontario Line westward under King Street from Bathurst/King station to Roncesvalles Avenue and to the Dundas West subway station, and a further extension to intersect with the Eglinton Crosstown LRT and to the 401RT at Jane Street;
 - c. A West Commuter LRT to operate between Kipling Avenue in the Gardiner Expressway corridor and an Ontario Line subway station at QuRK station (Queen/Roncesvalles/King); recognize that this LRT can enable Toronto City Council to remove all of the elevated portion of the Gardiner Expressway and avoid the city's costly "Hybrid" reconstruction plan for the expressway east of Jarvis Street;
 - d. A Waterfront West LRT aligned along Lakeshore Boulevard as described herein that more directly serves communities and destinations along the Toronto waterfront;
 - e. An extension of the Danforth subway beyond Sheppard Avenue East, to Finch Avenue East;
 - f. A doubling of parkland around Humber Bay enabled by the recommended West Commuter and Waterfront West LRTs;
 - g. An extension of the Eglinton Crosstown LRT to Kingston Road, and no further;
 - h. An extension of the Finch West LRT to Yonge Street;
 - i. A Steeles Avenue LRT, to operate between Islington Avenue and the Danforth subway extended northward from Sheppard Avenue East to Finch Avenue East;
 - j. An extension of the St. Clair streetcar to Jane Street;
 - k. A Dundas West BRT to The West Mall, as a start to a longer BRT along Dundas Street through Mississauga;
 - l. An increase in the TTC bus fleet of 900 electricity-powered buses, in addition to the 496 recommended for roads intersecting with the 401RT, to provide local and express services.
9. Continue and enhance the expansion of Toronto's bicycle transportation network, and enable widespread use of e-scooters;
10. Remove from current transportation plans the rapid transit infrastructure made unnecessary by the recommended **Next Connections** initiatives, those being the Eglinton West LRT extension from Renforth Drive to Pearson International Airport, the Eglinton East LRT extension to the University of Toronto Scarborough campus and Malvern, the Jane Street LRT, the Sheppard East Subway to McCowan Road, the Sheppard West subway and the Parklawn GO station, at a potential savings of approximately \$15 billion; and
11. Recognize the short-term and long-term affordability of the recommended initiatives, and its substantial benefits to the residents, economy and environment in the core of the GTA.

Recommended Rapid Transit Network – Map



Appendix 1

Estimates of Trips in Toronto		Automobile + Trucks	Municipal Transit	GO Transit	Walk, Cycle, Other	Total
Toronto population 2051, adj. from Min. of Finance Summer 2020 Forecast, ages 11+ only						3,466,755
Trips per day per person, adjusted downward for aging demographics						1.85
Total daily trips						6,410,000
Modal split, per 2016 TTS, for Toronto	Annual - TTC+GO	57%	27%	1%	15%	100%
		Daily	Daily	Daily	Daily	Daily
Estimated daily trips by mode, 2051, Toronto residents		3,654,000	1,731,000	64,000	961,500	6,410,000
Cross-boundary trips into and out of Toronto by 2051		341,000	76,000	400,000	90,000	907,000
Commercial vehicle trips (mainly trucks) by 2051		806,000				806,000
Total trips in Toronto by 2051		4,801,000	1,807,000	464,000	1,051,500	8,123,000
TTS 2016 trips in Toronto, adjusted, excl. commercial vehicles		3,151,000	1,437,000	296,000	829,000	5,713,000
Add: 2016 daily trips by commercial vehicles (mainly trucks)		603,000				603,000
Total trips in Toronto by 2016		3,754,000	1,437,000	296,000	829,000	6,316,000
Increase in total trips by 2051, before major transit initiatives and before shifts to 'Work-From-Home'		1,047,000	370,000	168,000	222,500	1,807,000
Less announced major rapid transit enhancements: (New Ridership)						
GO Transit Enhancements (net; to 200m by 2055)	57.0	-185,000		185,000		0
Spadina Subway extn. into Vaughan	18.5	-60,000	60,000			
Eglinton Crosstown LRT	19.7	-64,000	64,000			0
Finch West LRT Humber Coll to Spadina/York subway	5.9	-19,000	19,000			
Add: Estimated incr. in transit trips arising from the 2019 Ontario Rapid Transit Plan for Toronto:						
Ontario Line - University Ave. to Pape Station	38.8	25.9	-84,000	84,000		0
Ontario Line - Pape Stn. To Eglinton Avenue East		12.9	-42,000	42,000		0
Ontario Line - University Ave. to Exhibition		0.0	0	0		0
Eglinton West LRT extension to Renforth		8.6	-27,900	27,900		0
3-Stop Scarborough Subway to Sheppard Ave. East		8.3	-27,000	27,000		0
Yonge subway extn. to Richmond Hill		1.4	-4,500	4,500		0
Hurontario LRT (7.7m assumed to be 100% in Peel)		0.0	0	0		0
Allowance for trip increases 2041 to 2051		5.2	-17,000	17,000		0
Effect of current transit enhancements	163.4	-530,400	345,400	185,000	0	0
SUMMARY:						
Total trips in Toronto by 2051, before transit expansion		4,801,000	1,807,000	464,000	1,051,500	8,123,000
Effect of current transit enhancements	163.4	-530,400	345,400	185,000	-	-
Estimate for work-from home - daily trips by 2051**	-52.4	-170,000	-170,000	-340,000	0	-680,000
Daily trips by 2051, after current initiatives	111.0	4,100,600	1,982,400	309,000	1,051,500	7,443,000
Change from 2016		9.2%				
Next Connections – Recommended transit infrastructure: (New Ridership)						
	TTC+GO	Daily	Daily			
401RT - Pickering Town Ctr. To Hurontario Street	184.8	-600,000	600,000			0
1 Additional effect of GO/401RT links	16.0	-52,000		52,000		0
1a Eglinton East LRT extn. to Kingston-Markham Roads	7.1	-23,000	23,000			0
1b 900 low/zero-emission buses (add'l to 401RT buses)	101.9	-331,000	331,000			0
2 Ontario Line extension - Eglinton East to Sheppard E	14.2	-46,000	46,000			0
3 Ontario Line - Delete University Ave. to Exhibition GO	0.0	0	0			0
4 Ontario Line - extn. University Ave. to Dundas West stn.	11.4	-37,000	37,000			0
5 Ontario Line - extn. Dundas West to Eglinton West	10.1	-32,800	32,800			0
5 Ontario Line - extn. Eglinton W to 401RT at Jane	7.6	-24,600	24,600			0
6 Eglinton West LRT extended from Renforth to MACC	0.0	0	0			0
7 West Commuter LRT - QuRK station to Islington Ave.	12.3	-40,000	40,000			0
8 Waterfront W LRT - Long Branch GO to Univ.Ave.	10.8	-35,000	35,000			0
9 Extension of Scarborough Subway to Finch Ave. E.	3.4	-11,000	11,000			0
10 Finch West LRT extension to Yonge Street	6.6	-21,300	21,300			0
11 Steeles Ave. LRT - Islington to Finch East SSE station	1.5	-4,900	4,900			0
12 St. Clair LRT extension to Jane Street	0.8	-2,700	2,700			0
13 Dundas Street BRT - Kipling to West Mall segment	4.9	-15,800	15,800			0
14 Increases in active transportation***	-23.1	-75,000	-75,000		150,000	0
Transit initiatives beyond Toronto borders	not included, other than 401RT (#1 above)					
Totals for 'Next Connections' infrastructure	370.2	-1,352,100	1,150,100	52,000	150,000	0
SUMMARY						
	Annual - TTC+GO	Auto + Truck	Municipal Transit	GO Transit	Walk/Other	Totals
Est. Total Trips by 2051, before transit initiatives		4,801,000	1,807,000	464,000	1,051,500	8,123,000
Effect of current transit enhancements	163	-530,400	345,400	185,000	0	0
Effect of Next Connections initiatives	370	-1,352,100	1,150,100	52,000	150,000	0
Estimate for work-from home - daily trips by 2051**	-52	-170,000	-170,000	-340,000	0	-680,000
Total Number of trips, by 2051, after all changes	481	2,748,500	3,132,500	361,000	1,201,500	7,443,000
'Do-Nothing' Total Number of Trips by 2051 (before any initiatives)		4,801,000	1,807,000	464,000	1,051,500	8,123,000
Total change in trips after all initiatives, by 2051	481	-2,052,500	1,325,500	-103,000	150,000	-680,000
Comparing to 2016:						
Total Trips in Toronto - 2016		3,754,000	1,437,000	296,000	829,000	6,316,000
Total Number of trips, by 2051, after all changes		2,748,500	3,132,500	361,000	1,201,500	7,443,000
Overall Change - 2016 to 2051		-1,005,500	1,695,500	65,000	372,500	1,127,000
Percent Change from 2016		-27%	118%	22%	45%	18%
* For Municipal transit, it is assumed that the TTC will undertake a variety of day-to-day enhancements over years to existing TTC services, e.g. adding buses & more trains to existing routes, to keep pace with population growth.						
** Based on office employment, assumes that post-COVID-19 50% of jobs can have a work-from-home component, and that, on average, 60% of work days would be taken at home.						
*** Assumes an additional 2% of all daily trips by 2051 will be by bicycle, as a result of more urban intensificatin and mixed use environments.						
N.B. Toronto plans for LRTs on Jane, Sheppard East, and Eglinton Avenue East are not included, and are not needed as LRTs.						

THIS IS CRITICALLY IMPORTANT

The Devastating Blows to Survival from Rapid Climate Change

Climate change is happening now, hundreds of times faster than natural changes in the past. It has consequences that will dramatically damage us in our lifetimes, and become far, *far* worse for our children and grandchildren.

An indication of a frightening global change is in the past: 250 million years ago, the Permian-Triassic extinction that left only a few species of life on earth alive was caused by rising carbon dioxide levels in earth's atmosphere, and also by huge releases of methane, resulting in a 5° Celsius warming of the planet. We are adding carbon dioxide into the atmosphere at a rate that is, by most estimates, ten times faster, and humanity is also now causing methane to be released from permafrost. There is right now a third more carbon in the atmosphere than at any time in the last 800,000 years*.

The rapid destabilization and heating of the earth requires actions much greater in scale than are currently planned, and they must be undertaken **now**. The UN's Intergovernmental Panel on Climate Change (IPCC), reflecting the conclusions of thousands of scientists around the world, said bluntly in October of 2018 that unless global GHG emissions are cut by 40% to 45% by 2030 (now just 10 years away), we will not be able to limit global heating to 1.5° Celsius above pre-industrial norms, and will face devastating consequences.

Instead of decreasing, global GHG emissions are still rising. The 1.5°C target will be exceeded by between 2030 and 2052*. ***According to the IPCC, current nationally stated commitments to cut GHGs, if achieved, will result in a 3.2° increase in global temperatures by 2100, and higher beyond that.*** If we do not meet those reduction targets, the 2100 average temperature increase will be more than 4°, very close to the levels of 250 million years ago. Temperatures in northern latitudes will be higher. Because North Americans produce a very disproportionate share of global GHG emissions, GHG emissions in North America need to decrease to almost zero.

Rapid global warming of 3.2° will have the following devastating and inter-connected impacts. Each of us will be affected as temperatures move rapidly higher to that level by 2100.

1. Every natural ecosystem will be at risk of collapse, and many will have collapsed.
2. There will be a much higher frequency of droughts and precipitation deficits, and lasting for longer periods. This will affect food production; food prices will be much higher than today, where food is available.
3. Extreme heat events will become normal, and will last longer. Costs to cool buildings will more than double. The mid-latitudes (including southern Canada, much of the USA, the Mediterranean, central Europe) will experience an average rise of 4° Celsius (7.2° Fahrenheit). **Average temperatures in arctic areas may rise by 6° Celsius.**
4. Heat-related morbidity and deaths will multiply, and be especially deadly in low latitude countries. Conflicts and economic dislocations will become widespread.
5. The loss of livestock and declines in livestock health will affect prices and human diets everywhere.
6. The number of wildfires will multiply and be more widespread. Controlling them will become more difficult, and drain public finances. The devastating fires in Australia, at the beginning of its summer season, is a current example.
7. Heating and habitat loss will decimate plant, insect and other animal populations. Rates of extinction will accelerate beyond already extreme rates.
8. Rising temperatures and dryness in parts of the USA will make much of its southern regions unlivable by 2100. Canada will experience a massive flow of climate refugees that will strain its ability and desire to accommodate them.
9. Arctic ice will continue to melt, at a more rapid rate than is happening now, and will not stop. Sea levels will rise by metres (6 metres once all of Greenland becomes ice-free), to the point that coastal cities will become at partially or fully flooded. Losses will be trillions of dollars.

10. Today's coastal marshes will be lost. By 2100, almost all ocean beaches will have disappeared.
11. Less arctic ice means more heat from the sun will be absorbed into the oceans, creating a feedback loop that will melt more ice.
12. Permafrost is thawing now, emitting billions of tons of methane, a greenhouse gas 20 to 25 times more powerful as a GHG than carbon dioxide. The permafrost will thaw faster, and may never freeze again. A feedback loop is already occurring that will accelerate global heating.
13. Boreal forests will be degraded, and some will be lost.
14. Vector-borne diseases will migrate with climate changes.
15. The ocean is becoming and will become more acidic, and will experience oxygen loss. Coral reefs will face total die-off. Populations of fish dependent on them will, in turn, be threatened. Food production from fishing and aquaculture will drop. Land animals will become a greater source of food in many regions; extinction rates of land animals will increase.
16. Armed conflicts will increase as famine and human-caused disasters spread. North America will likely not be without some strife. Military costs and emergency aid to other countries will increase.
17. National, regional and local economies will be strained as more financial resources are allocated towards adaptation and mitigation of climate events and trends. Employment dislocation and poverty rates will increase (with artificial intelligence systems as an additional factor), constraining the ability of governments to keep up with its social costs. Enforcement of laws to limit crimes of desperation will be more difficult. Politically-driven tax cuts to offset increased household costs of climate change will cripple the ability of governments to keep up with change. Delays in moving to net-zero carbon energy production will make necessary actions more difficult to undertake.
18. Political and monetary pressure from fossil fuel industries will make a rapid transition to energy based on non-fossil very difficult, and perhaps dangerous (How far will fossil fuel energy producers go to protect their industries?).
19. A multitude of small regional and local effects will require solutions.

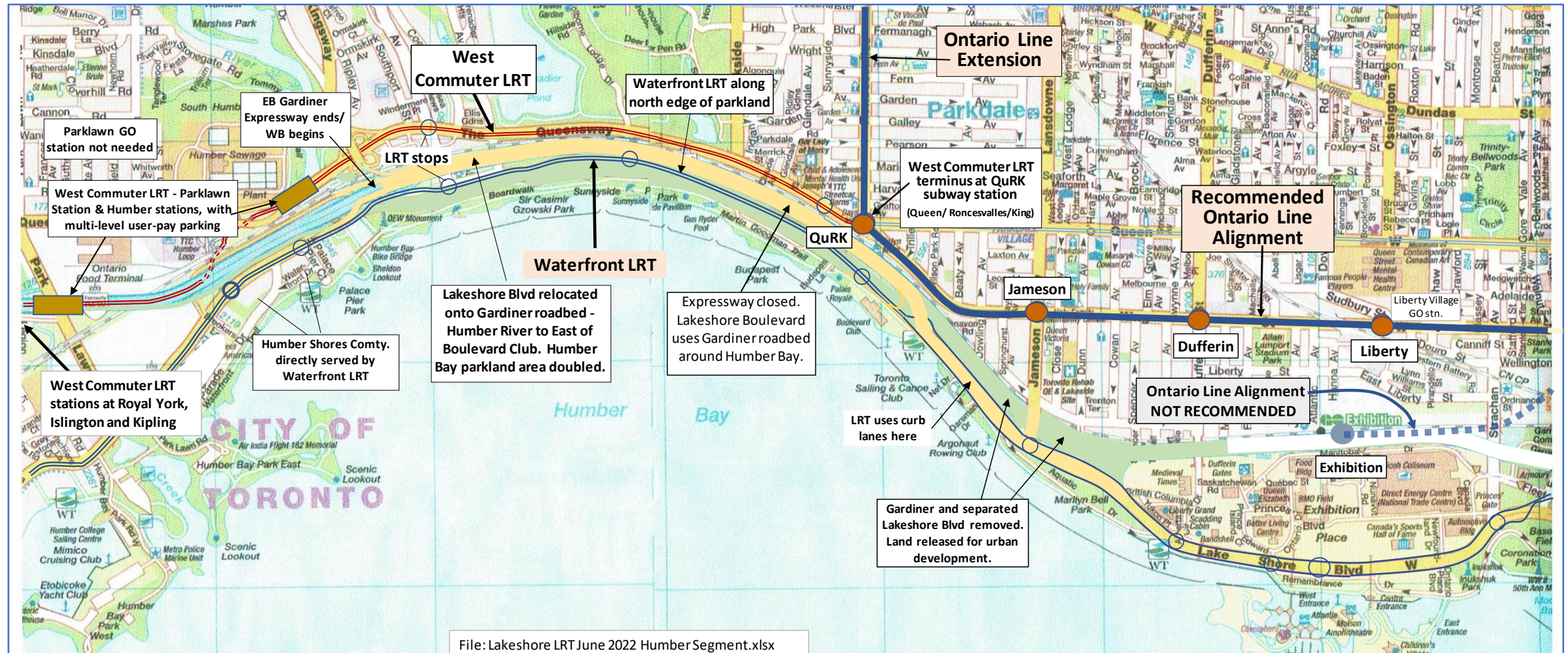
Adequacy of action is and will be constrained by denials of the existence and/or severity of the scientific evidence and, unfortunately for some, climate change has become politicized, at the expense of our children's future well-being.



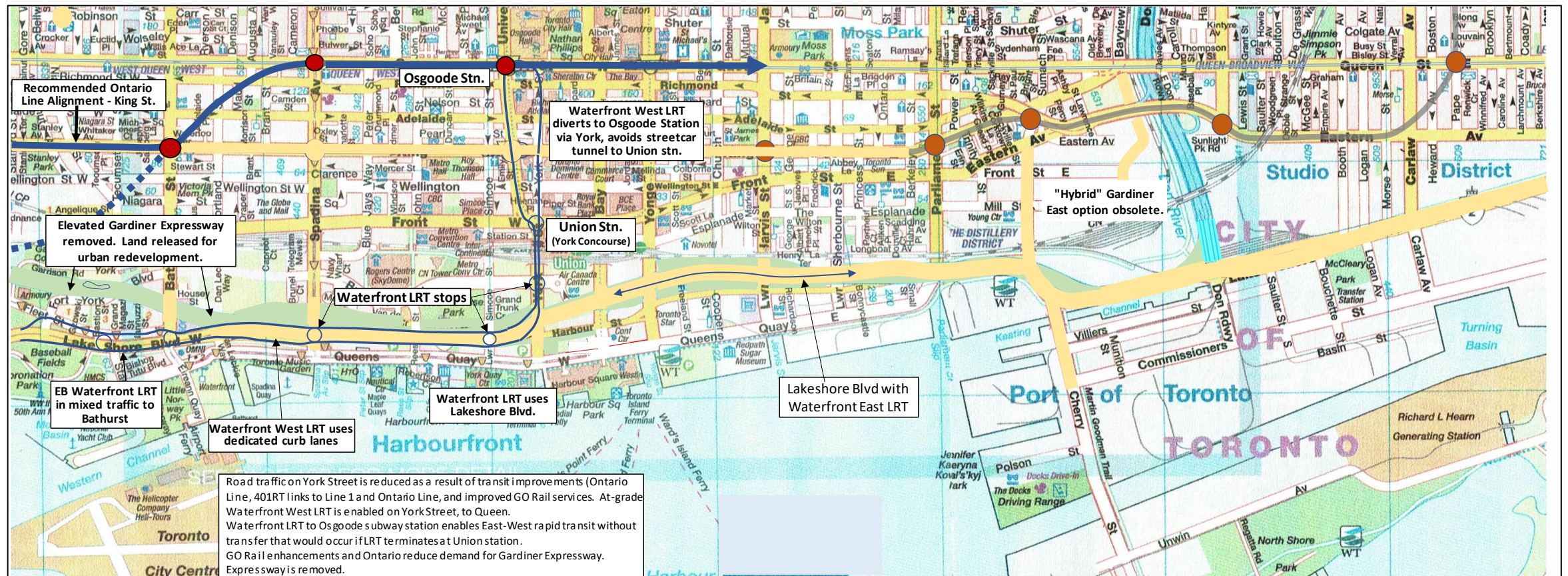
* Per sources identified in the book "The Uninhabitable Earth: Life After Warming", by David Wallace-Wells

Appendix 3

West Commuter LRT and Waterfront West LRT Humber Segment



West Commuter LRT and Waterfront West LRT Downtown Segment



West Commuter LRT and Waterfront West LRT Downtown Segment

