

# The 401RT: Rescuing Highway 401 and Decongesting Transportation in The Greater Toronto Area

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The absence of an east-west inter-municipal rapid transit line through the suburban middle of northern Toronto is the most significant single factor in preventing major modal shifts to public transit. It is significantly more cost-effective than current transit plans by Ontario and the City of Toronto.

A review of MTO's AADT on-ramp and commercial vehicle survey files (2013 adjusted to 2019) indicates that on a typical weekday there are 1.8 million vehicles on Highway 401 between Hurontario Street in Mississauga and Liverpool Road in Pickering. Of these, approximately 1.5 million are non-commercial automobiles, carrying almost 1.7 million persons.

Traffic volumes on Highway 401 will increase as close to a million more people will live in Toronto by 2051. The number of commercial vehicles (trucks, vans) will likely increase with population growth. However, post-pandemic work-at-home situations can reduce the increase in Highway 401 traffic growth to a small degree. Growth in the municipalities around Toronto will add to traffic pressures. Growth in traffic on the highway is highly leveraged toward congestion, and is a scenario that must be avoided. Unfortunately, current rapid transit expansions approved by Ontario will not have a significant effect on the number of trips taken on the 401.

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 and Pickering normally means driving a car. Most people will not ride a bus from Etobicoke or Scarborough to the Yonge Street or University/Spadina/York subways – it's simply too slow. The result is congestion on Highways 401, 427, 409, the 404/Don Valley Parkway, the Gardiner Expressway and on city streets.

The Greater Toronto Airports Authority (GTAA) has been concerned that more than 90% of all trips to Pearson International Airport are by automobile; this ratio holds true for its surrounding employment area. Forecasted growth in air travel will strain the GTAA's ability to provide access and car parking, and daily trips by more than 300,000 workers and visitors to the overall employment area have contributed to clogged roads on Highway 401 and city streets. Because of

the threats posed by growth-related congestion in the airport area, the GTAA is pursuing the creation of a transit hub on its property at Airport Road. Its intention is to provide linkages among various current and planned bus and rail-based transit services.

Overall, existing rapid transit services in Toronto are inadequate for travelers who have some or all of their daily trips across parts of the northern half of Toronto. GO Rail provides a radial service to and from the downtown core that is used by just 1% of Toronto residents per day. The Sheppard subway is too short to have an impact on traffic congestion. The Eglinton Crosstown LRT, soon to become operational, is too far south in Toronto to produce a significant reduction in trips by automobile to and from most northern Toronto locations, including longer distance trips. The 18 stops on the planned 11-kilometre Finch West LRT will make that service too slow to attract a significant number of new transit riders, although most existing TTC users of the Finch bus will be better served. Improvements to transit in Toronto's employment areas and in its underserved communities, particularly in northwest Toronto and eastern Scarborough, are necessary.

New rapid transit services initiated by the government of Ontario may not generate enough new transit ridership to keep 2051 trips by automobile close to 2016 levels, until population growth begins to add more road vehicles. (The Ontario initiatives include expansions of GO Transit, the Finch West and Eglinton Crosstown LRTs, and the \$28.5 billion plan for an Ontario Line, which include a Danforth subway line extended further into Scarborough, an Eglinton West LRT to Pearson International Airport, an extension of the Yonge subway to Highway 7, and a Hurontario LRT.)

Generally speaking, a rapid transit alternative for the 1.7 million daily trips in non-commercial vehicles on Highway 401 between Pickering and Mississauga has not been considered. However, population growth dictates that a new rapid transit line across the northern half of Toronto is necessary if worsening traffic congestion is to be avoided. *Nothing else will be enough.* Moreover, avoiding the consequences of rapid planetary heating requires that the number of automobiles (electric-powered, gas-powered or hydrogen-electric) be significantly reduced.

## [Highway 401RT](#)

This document proposes the creation of an affordable suburb-to-suburb rapid transit line with up to 33 stations, operating from Hurontario Street in Mississauga to Pickering Town Centre. This "401RT" is urgent infrastructure and is practical and affordable, and ***with effort*** can be, and should be, fully completed in less than 15 years. Planning for its construction should begin now.

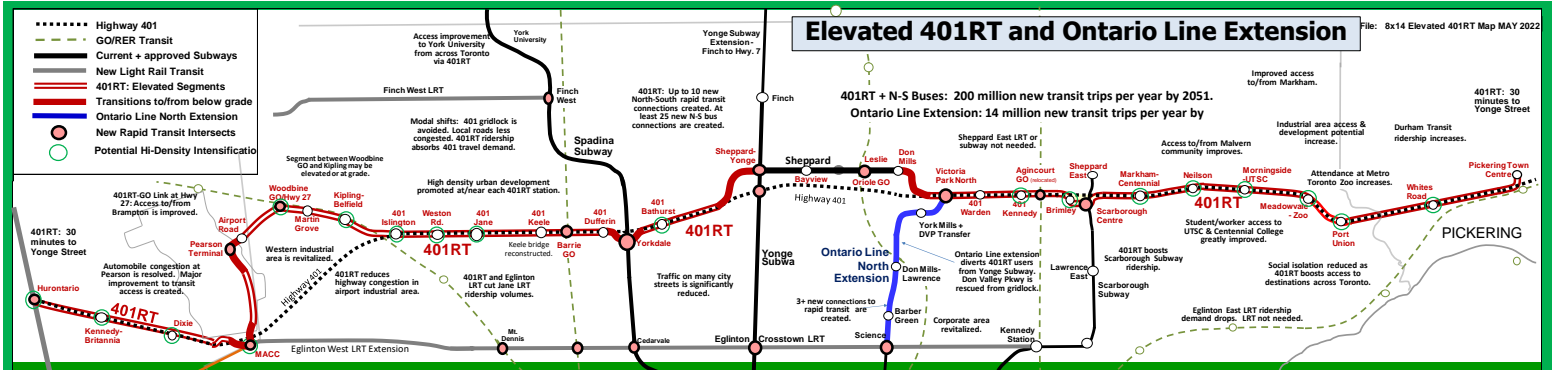
It is estimated that the 401RT plus the addition of many more buses for intersecting bus services will generate more than 200 million *new* transit trips per year by 2051, and more in subsequent years as the region's population continues to grow. Another 12 million or more boardings per year will come from transfers from existing parallel bus routes. The 401RT would be able to link travelers to nine intersecting rapid transit lines and at least 25 surface bus routes.

The 401RT can be either elevated or mostly at-grade in the highway corridor, plus off-highway elevated or underground segments. A mostly at-grade 401RT in the highway corridor would require the conversion to transit of the leftmost express lane in each direction, plus absorb shoulder lanes for centre-platform stations. Medium-capacity rail cars (such as Bombardier's MOVIA metro rail cars) would not require that the transit right-of-way be wider than the typical width of a Highway

401 lane. The 401RT would divert underground to intersect with several key destinations and the Sheppard Subway, incorporating it into the overall 401RT concept.

Alternatively, a 401RT that is elevated above the highway would avoid the closure of an express highway lane in each direction that would occur with a mostly-at-grade 401RT. It would be elevated for almost all of its 56-kilometres of new track plus 5.5 kilometres of the current Sheppard Subway.

The 401RT would divert to key off-highway destinations, including Pearson International Airport, the Mississauga Airport Corporate Centre (MACC), Yorkdale subway station, Scarborough Town Centre and Pickering Town Centre, plus other destinations as may be desired.



The elevated option would enable full-sized rail cars to be used, to carry more travelers for more years into the future, and can have wider station platforms than would be possible with an at-grade 401RT. Because the overall number of trips on the 401RT would continue to increase, plus its integration with the Sheppard subway, and because long average trip lengths per user mean higher occupancy rates on trains, subway technology (rather than light rail) is the preferred mode. An elevated 401RT would also enable multi-track maintenance yards to be built over the highway at several points, rather than tunneling to off-highway sites. Property acquisition costs would be almost entirely avoided.

The track structure would need to be high enough above ground to cross over intersecting arterial bridges. The elevated 401RT would cost approximately \$21.6 billion – \$1.8 billion more than the \$19.8 billion mostly at grade alternative. Tunneling would occur where the 401RT serves the Mississauga Airport Corporate Centre, the segment approaching and leaving Yorkdale subway station, the descent to the Yonge-Sheppard Subway station from east of avenue Road, and a transition from tunnel to above grade east of the Don Mills Station. Tunneling at Pearson may be necessary. The tracks are recommended to include roofing to protect against snow (included in the \$21.6 bn).

An alternative 401RT alignment may be to bypass the Sheppard subway and continue the 401RT above the surface in the highway corridor between Avenue Road and Victoria Park Avenue, with new stations at Yonge, Bayview, Leslie and Don Mills. This alignment may cost \$3 billion more than tunneling to/from Sheppard Avenue. With this alignment, travel on the 401RT would be somewhat faster, and be of slightly shorter distance. In this bypass scenario, the Sheppard subway can be closed, and Sheppard Avenue would be served by enhanced bus services running seamlessly from Scarborough to Etobicoke.

Station designs are recommended to be of a simple, practical nature. Depending on the configuration of arterial road interests, there can be significant vertical distances for stairways, escalators and elevators. Passenger car drop-off and pick-up facilities can exist where space allows at Highway 401 on-ramps and off-ramps. For stations where right turn on-ramps to Highway 401 would interfere with the safe movement of buses leaving 401RT station stops, left turns onto the 401 governed by traffic signals can replace circular right-turn on-ramps to the highway; alternatively, signal lights can enable bus merges. At a few stations, multi-level pay-for-parking garages can be built with drop-off incorporated in their designs.



Importantly, the 401RT concept includes 16 additional buses for each intersecting arterial bus route to improve service frequencies, plus a transit shelter at every bus stop on these routes. Most transit trips begin with a bus ride, and ensuring maximum comfort, convenience and shorter wait times is essential. These improvements will tend to make the first/last kilometre segments of trips acceptable to more travelers. Another new factor in enhancing the first/last mile experience is the growing use of electric scooters and e-bicycles. These enable relatively fast access to/from bus stops, especially in suburban areas, with little or no muscular effort. All bus stops should include scooter and bicycle lock-ups.

Overall, the 401RT itself will generate an estimated 140 million new transit trips per year (455,000 per day) by 2051, while improved TTC bus services on north-south routes that intersect with the 401RT will attract an additional 45 million new non-401RT trips per year (145,000 per day; see Transit Ridership Analysis section). New intersects with GO Transit will add another 16 million. Altogether, including ongoing work-from-home circumstances and other rapid transit initiatives, the number of daily trips on Toronto's roads in 2051 can be reduced by approximately 11% below 2016 levels (Scenario estimations in Appendix 2).

Altogether, the 401RT will enable the trip capacity of the highway corridor itself to be at least doubled, and enable all growth in commercial vehicle trips (mostly trucks) to be accommodated. The implementation of variable highway tolls for small and large vehicles, and by distance traveled, can foster more efficiencies.

The 401RT's connections to north-south rapid transit and bus services and its ability to take travelers from Pickering to Mississauga in one hour or less make it a practical choice for travelers. Its visibility and speed compared to rush hour road congestion will create a general equilibrium that will see modal shifts to transit occur when the highway is congested or too frustrating to bear, and from transit to driving when the highway is seen as more desirable. Traffic will continue to flow. However, without a 401RT or similar rapid transit option, worsening congestion is inevitable.

Highway 401 in the core of the Greater Toronto Area will not be able to accommodate travel demand growth much longer, as segments of the highway in Toronto cannot be widened further. A 401RT or similar east-west rapid transit line should be built soon, before it becomes more disruptive to do so.

Widening the highway is also contrary to the promotion of transit ridership and the reduction of greenhouse gas emissions and congestion on city streets, and is likely to be impossible. A recent commitment by the Ontario government to increase highway capacity between Highways 427 and 404 would require double-decking the highway; this would be highly expensive and likely impossible.

Conversions of vehicles to electric power will be helpful, but residual GHG production will remain, from the mining and production of EVs and from fossil-fuel electric power plants. While currently-approved transit system expansions and enhancements and the 401RT may seem to be ambitious, in light of the dire consequences to all life of accelerating global warming, they are far short of enough. **The climate crisis alone is sufficient reason to create a 401RT.**

Appendix 3 Answers a variety of questions or concerns.

## 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 LRT services. On average, stations on the 401RT are 1.8 kilometres apart, enabling speeds between stations to reach 80 kilometres per hour or faster. The illustration above shows a selection of trip origins and destinations, and their trip times when using the 401RT compared to other modes.

<b>Traveling on the 401RT:</b>		<b>Keele at Lawrence to Centennial College in Scarborough:</b>		<b>Kipling subway stn. to Bathurst at Sheppard:</b>	
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 <b>401RT</b>	39	Using <b>401RT</b>	48
	<u>59</u>				
Average speed - 54 km per hour					
<b>St. Andrew subway stn to Pearson Term'l:</b>		<b>York Mills subway station to U of T in Scarborough:</b>		<b>Yonge &amp; Lawrence to Pearson:</b>	
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 <b>401RT</b>	4
Using Spadina subway & <b>401RT</b>	43	<b>401RT</b> to Morningside + shuttle	32	<b>Eglinton/Don Mills to Pearson Term'l:</b>	
				Using Eglinton W LRT	37
<b>Sewells Rd at Morningside to Sheppard W Subway stn.:</b>		<b>Union station to Scarborough Centre:</b>		Using <b>401RT</b> to terminal	43
Using Sheppard bus & Sheppard subway	68	Using Bloor-Danforth subway	38	<b>Keele at Sheppard to UTSC:</b>	
Using 401RT	43	Using <b>401RT</b>	43	Using Keele bus + Eglinton LRT	84
		Eglinton LRT + McCowan bus	56	Using Keele bus + <b>401RT</b> + shuttle at Morningside	44

## Benefits of a 401RT

The 401RT is of transformative significance, and would affect other transit enhancement decisions in Toronto, Mississauga and Durham Region. The scale of the 401RT reflects the magnitude of the transportation and climate change problems facing the region. The overall traffic congestion problem in Toronto cannot be resolved with constrained approaches. The following list of general benefits is lengthy and significant, and highlights the strategic importance of the 401RT in the Toronto area. Local benefits are generally not included in this list.

1. 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.



2. Up to twelve new rapid transit connections are created (Hurontario LRT, Mississauga Transitway, Eglinton West LRT at Renforth, Union-to-Pearson Express, Woodbine GO, Barrie GO, Spadina/York Subway, Yonge Street Subway, Oriole GO (re-located), an extended Ontario Line at Victoria Park Ave., the Scarborough Subway extension, and a possibly-relocated Agincourt GO station or additional GO/401RT transfer station south of the Agincourt GO station).
3. More than 25 new surface bus route connections to rapid transit are created.
4. North-south bus trips to rapid transit are made significantly shorter in time and distance.
5. Gridlock on Highways 401 is avoided as high volumes of transfers from the highway to rapid transit occur.
6. The trip capacity of the highway corridor is more than doubled.
7. Overcrowding of the Yonge Subway is avoided as a recommended Ontario Line extension (OLX) to the 401RT at Victoria Park diverts travelers from the Yonge subway as it is extended to Highway 7.
8. The 401RT plus an Ontario Line extension (OLX) that intersects with the 401RT (described below) reduces road congestion on the Don Valley Parkway.
9. 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.
10. Truck transport is improved as gridlock on highways 401 is avoided as car drivers transfer to transit when the highly-visible 401RT is seen to be as fast or as convenient as driving.
11. Travel times across Toronto are significantly reduced when compared to current transit services. End-to-end travel time on the 401RT (Pickering Town Centre to Hurontario Street; 56 kilometres) is 60 minutes.
12. The 401RT increases transit ridership by 200 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 401RT trips resulting from new GO Rail intersects.
13. GO ridership increases by 16 million trips per year beyond current forecasts by 2051 as a result of up to four new Intersects with the 401RT (Woodbine, Barrie GO Line, a potentially relocated Agincourt GO, and Leslie-Oriole GO).
14. In general, access to services and to employment across Toronto and to/from Mississauga, Pickering and Brampton becomes much faster and easier, including especially for people who are economically or socially disadvantaged, or do not own cars or cannot drive.
15. 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).
16. The Greater Toronto Airports Authority's plans for a transit hub are transformed to be more effective.
17. Rapid direct access to Pearson International Airport via the 401RT from locations across Toronto makes the Government of Ontario's planned \$1.6 billion western extension of the Eglinton Crosstown LRT from Renforth to Pearson International Airport unnecessary. The MACC 401RT station at Eglinton Avenue can provide the rapid transit link to/from Pearson.
18. Access to the employment areas surrounding Pearson airport is greatly improved; these employment areas in Mississauga and Toronto revitalize as their enhanced accessibility helps them to become more attractive to business and to workers.
19. Current and forecasted road overcapacity situations in the large employment areas around Pearson International Airport are alleviated.

20. Employment opportunities and labour market conditions are enhanced. Fewer people will decline distant employment opportunities (for example near the airport) due to road congestion and travel times.
21. The 401RT's intersect with the Danforth subway's extension at Scarborough City Centre increases ridership on that extension.
22. A 401RT makes it unnecessary to build a Sheppard Avenue East LRT or subway, which would be replaced by the nearby and faster 401RT service. Infrastructure cost savings are more than \$1 billion for an LRT and \$4.8 billion for a subway.
23. 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. Many students will no longer need to decide on courses of study based on travel time and distances to campuses, or need to purchase a car.
24. Improved and rapid access to the University of Toronto's Scarborough campus using the 401RT will reduce ridership volumes on the proposed Eglinton Crosstown East LRT extension, rendering it unnecessary beyond Kingston Road at Eglinton East. Savings from eliminating the LRT extension may approach \$4.0 billion.
25. The Jane Street LRT proposed by Toronto becomes unnecessary as east-west connections provided by the 401RT and the Eglinton Crosstown LRT (extended to Jane) reduce passenger volumes and trip-length crowding on Jane Street buses to Bloor Street. Savings are \$2.6 billion.
26. A frequently-proposed \$2 billion Sheppard Avenue subway extension between Yonge Street and Sheppard West station would become unnecessary and can be avoided, as the 401RT would extend from the Sheppard-Yonge subway station to Yorkdale station and much farther westward, into Mississauga, making it more advantageous for travelers.
27. Access to employment opportunities and services for residents of disadvantaged communities is significantly improved (e.g., northwest Etobicoke, eastern Scarborough).
28. Direct rapid transit access to Mississauga's Airport Corporate Centre from across northern Toronto and Mississauga is created.
29. Traffic congestion on Highway 401 west of Toronto is reduced, as a Kitchener GO Transit Line link to a Woodbine/Hwy 27 401RT station enables car-free access from Brampton to destinations in northern Toronto and in downtown Toronto.
30. As an economic stimulus, approximately 100,000 job years are created as the 401RT is constructed – far more than any other public job creation project in the GTA has achieved.
31. Canada and Ontario government capital cost contributions can result in an influx of \$21 billion into the Toronto area economy.
32. Approximately 2,000 ongoing transit operating jobs are created (assuming no automation of operations).
33. Economic losses from traffic congestion are reduced; business efficiency is improved.
34. Economic losses from imports of motor vehicle fuels and automobiles are reduced.
35. The 401RT helps enable the transformation of Yonge Street north of Hwy 401 as the Yonge Street subway is extended to Highway 7. The 401RT makes it easy for access to east-west employment is enhanced.
36. Greenhouse gas emissions are reduced by up to 400,000 metric tons per year until electricity-powered vehicles become more prominent. Toxic vehicle emissions and their negative effects on health are also reduced.

37. 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.
38. The operational effectiveness of the Toronto area's pre-existing transit system is improved; for example, more people will use existing buses and new buses, as service frequencies improve.
39. Suburban sprawl is eased and infill/intensification increased, as development in the central area of the GTA is attracted by the 401RT, including near, at or above the highway at 401RT stations.
40. Improved transit access via the 401RT supports an increased distribution of work across Toronto 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.
41. Rapid transit access to places of work or home outside the downtown core enables the number of parking spaces downtown and across Toronto to be reduced; opportunities to transform public downtown parking spaces into open greenspaces are increased.
42. Property tax revenues are increased from new urban development at/near 401RT stations, and from increased property values in parts of Toronto, Mississauga and Pickering, and in some '905' areas served by GO Transit.
43. Travel costs are reduced for thousands of households as fewer cars need to be owned, or are used less. Money saved can be redirected towards other household priorities. After-tax household savings vary widely, but can range to more than \$10,000 per year per vehicle, less the cost of using public transit.
44. Modal shifts to the 401RT from travel by automobile far exceed shifts generated by planned on-street light rail transit lines in Toronto, including the Jane Street LRT, the Sheppard East LRT (or subway), and the Eglinton East LRT extension, all of whose ridership may mostly be transfers from existing TTC bus services rather than being new users.
45. The overall operating revenue-to-cost ratio for the 401RT should approach 100% by 2051, much better than that of Toronto's overall public transit system.
46. The overall cost-effectiveness of the 401RT/OLX is three times that of Ontario's \$28.5 billion Rapid Transit Plan for Toronto (\$25bn/214m vs. \$28.5bn/76m), based on new transit ridership generated.
47. 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.
48. In Durham Region and the city of Pickering, the prospects for further development in the Pickering Town Centre area at Liverpool Road and along Highway 2 would be enhanced. Future off-highway extensions of the 401RT above Highway 2 to Brock Road and beyond are possible. A 401RT would be an alternative to what is now a forced daily drive on congested highways.
49. In York Region, the 401RT would ease road congestion to and from Toronto as connecting bus services to and from the region are improved.
50. In Mississauga, access to the 401RT from the Hurontario LRT and more frequent bus service connections 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.

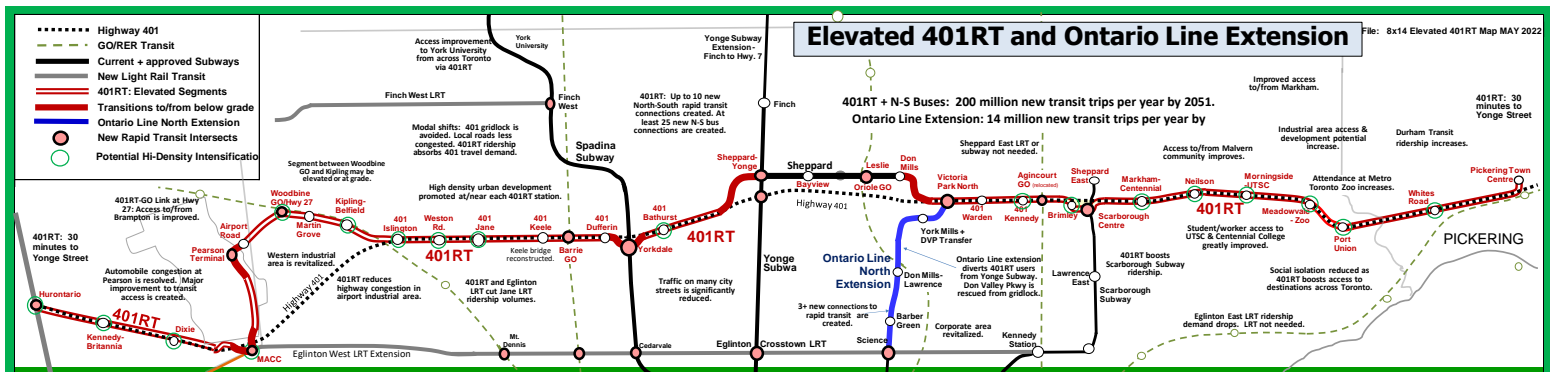
## [A 'Relief Line' for the 401RT](#)



The City of Toronto and the Government of Ontario have recognized for many years the need for a “Relief Line” subway to divert transit ridership from the already-crowded Yonge subway, portions of which will be at or beyond capacity by 2031. The new Eglinton Crosstown LRT is scheduled to become operational in early 2023, and will add to the crowding the Yonge Street subway. In April of 2019, the Ontario government announced its commitment to build an “Ontario Line” subway from Exhibition Place to Eglinton Avenue East at Don Mills Road to ease crowding on the Yonge subway. Unfortunately, the Ontario Line is not scheduled to become operational until 2029 or later, long after the opening of the Eglinton LRT. This will be a significant problem for the Toronto transit system and for transit users.

The 401RT will worsen crowding on the Yonge subway unless the Ontario Line is extended northward from its currently-approved terminus at Eglinton Avenue East, to a 401RT station. West of Yonge Street, the Spadina/York subway line is currently operating under capacity and can accommodate transfers to and from 401RT users, via the Yorkdale subway station.

Between Eglinton and north of Lawrence Avenue, the Ontario Line can operate above ground. South of York Mills Road, the Ontario Line would descend (alongside parkland) to underground and turn eastward under York Mills Road (and under the East Don River) to a station at Victoria Park Avenue at Highway 401. The intersect at Victoria Park Avenue would be most effective for trips to and from Scarborough and Pickering. Stations can be at Barber Green, Lawrence East, a mall at Kern Road, and York Mills Road, plus a station at Sheppard Avenue East. The York Mills station, located below the Don Valley Parkway, would include a multi-level user-pay garage above or alongside the parkway intersection, to enable drivers to transfer from the 404/DVP to the Ontario Line. The map below illustrates the combination of the 401RT and Ontario Line extension.



This 7.5-kilometre extension of the Ontario Line north of Eglinton East would cost approximately \$3.8 billion, excluding the parking garage. The Eglinton to Sheppard Avenue East segment of the Ontario Line would

1. Increase trips by transit between Scarborough and the downtown Toronto area, including an increase in the transit modal share of all trips;
2. Divert significant traffic volumes from the Don Valley Parkway (DVP);
3. Create direct access to the 401RT east of Yonge Street, and 401RT stations across Toronto;
4. Enable fast transit access to/from the corporate employment area at and north of Eglinton Avenue East at Don Mills Road;
5. Improve/Reduce the flow of road traffic through the downtown core;
6. Increase utilization of the Eglinton Crosstown LRT by creating quick access to it;

7. Avoid overcrowding on the Yonge Street subway by creating an alternative access to downtown Toronto for significant numbers of new and current transit users;
8. Increase planned ridership on the Ontario Line south of Eglinton Avenue East as residents along the currently-planned route have faster access to new Ontario Line stations and to many other rapid transit network connections;
9. Generate 14 million new transit trips per year by 2051, plus transfers from existing bus services (primarily Don Mills Road buses);
10. Promote urban infill and intensification at and near Highway 401 along its route, from ongoing population growth and economic growth in Toronto;
11. Reduce overall road traffic along Don Mills Road and nearby streets, while promoting urban infill and intensification;
12. Reduce crowding on the Don Mills bus services;
13. Increase the utilization of intersecting surface transit services (Lawrence East, York Mills/Ellesmere, Victoria Park, Sheppard East);
14. Reduce greenhouse gas emissions from modal shifts to transit, including by DVP drivers who would otherwise drive long distances to destinations in 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.

## Affordability

Beyond the basic numbers, there's something to be said about doing more than what is normally thought to be affordable. Until recent years, the Ontario government has declined to build more than about three kilometres of municipal rapid transit per year (Eglinton LRT, Spadina subway extension), blaming a lack of fiscal resources for not undertaking more projects. The Ontario government's 2019 \$28.5 billion rapid transit plan for the GTA would add an average of 6.2 kilometres per year, if spread over a ten-year implementation. The 401RT and Ontario Line extension north of Eglinton Avenue East would add another 4.6 kilometres per year, if spread over the next 15 years. While this seems to be a great deal compared to past years, it is relatively small when compared to the growing multi-billion-dollar annual cost of road congestion and the devastating impacts of climate change (Appendix 1).

The money for more and better rapid transit services exists within Ontario's \$750 billion (2019 est.) annual gross domestic product, and Canada's annual \$1.8 trillion GDP. It is fundamentally a decision about the allocation balance of the GDP between supporting and enhancing public services or favouring private wants.

The gross capital investment cost of a 56-kilometre elevated 401RT (excluding 5.5-km Sheppard subway segment) that extends from Liverpool Road in Pickering to Hurontario Street in Mississauga is estimated to be \$21.3 billion (before offsets) for the mostly-at-grade concept, or \$382 million per kilometre. This is similar to the \$370 million per-kilometre cost to build the Spadina subway extension into York Region. The capital cost estimate includes construction of the tunnels, rights-of-way and tracks, rail cars and buses, some adjustments to bridges and ramps, 32 new and upgraded stations, power systems, land acquisition, a maintenance yard and equipment.

These costs are highly affordable when compared to the benefits of the 401RT and the negative impacts of its absence, principally widespread gridlock on roads and highways. Upper levels of government have a direct and significant economic interest in ensuring the free flow of people and goods on major highways. In the scenario described, the Ontario and Canada governments fund 100% of all rail and on-highway costs, and municipalities would fund 100% of additional buses on intersecting routes. In addition to the cost to build the 401RT, the Ontario Line extension will require an additional \$3.8 billion investment. **However, these are investment costs before offsetting savings and cost avoidances.**

## Savings and Cost Avoidances

The gross cost of the 401RT/OLX itself is significantly overstated because it does not include savings and cost avoidances that would or should be applied. As illustrated below, in a scenario where the 401RT and OLX become a planning reality, the 401RT makes several transit expansion plans contained in Ontario’s recent Greater Golden Horseshoe Transportation Plan unnecessary. **The cost savings and offsets are highly significant – potentially totalling \$17.2 billion.**

- The 401RT would be faster for many travelers heading to and from the University of Toronto’s Scarborough campus and the Malvern community than using the planned Eglinton East LRT extension (\$4.4 bn); ridership on the LRT would drop.
- The 401RT’s station at the Mississauga Airport Corporate Centre (MACC) renders the Eglinton West LRT extension from Eglinton Avenue to Pearson transit hub unnecessary; its \$1.6 billion cost can be avoided.
- The GGH transportation plan already includes a northward extension of the Ontario Line past Sheppard Avenue East. In other words, it’s already willing to pay the \$3.8 billion for the OLX needed to keep 401RT users from overloading the Yonge Street Subway.
- The GGH plan also includes a \$4.8 (originally estimated at \$2.8 billion) extension of the Sheppard Subway to McCowan Road that would not be needed with a nearby 401RT in place.
- Lastly, a 401RT and Eglinton LRT may divert enough Jane Street bus users from riding all the way to Bloor Street; a Jane LRT is probably not needed – a \$2.6 billion cost offset to the 401RT.

Not in the illustration below, but not needed once the 401RT is in place are, the GGH plan’s Pickering-to-Scarborough Centre portion of the proposed Durham-Scarborough Bus Rapid Transit concept, because the 401RT would replace it. Moreover, the GGH plan’s extension of the Ontario Line north of Sheppard Avenue that loops to a transit hub at Highway 7 is too close to the Yonge subway to be of practical use, and would not be justifiable based on ridership.

The bottom line is a more functionally appropriate transit strategy for Toronto that totals a net additional investment of just **\$8.8 billion** for a 56-kilometre 401RT, 7.5-kilometre Ontario Line extension,

Effects of 401RT + Ontario Line Extension	Kns.	New Trips (Millions/yr)	Gross Infra. Cost (\$Mil)	Cost per New Trip	Cost per km.
401RT: Pickering Town Centre. to Hurontario Street (elevated)	59.0	185.4	21,300	115	361
Resultant increase in GO Ridership	0.0	16.0	0		
Ontario Line to Sheppard @ Victoria Pk.	7.5	14.2	3,800	268	507
Add: Eglinton E LRT to Kingston Rd. only	4.5	7.0	900	129	200
<b>Total for 401RT/OLX</b>	<b>71.0</b>	<b>222.5</b>	<b>26,000</b>	<b>117</b>	<b>366</b>
<b>Less infrastructure investments already in GGH Transportation Plan:</b>					
Ontario Line Eglinton E to Sheppard E	7.5	14.2	3,800	268	507
Eglinton E LRT - Kennedy to Malvern to McCowan	13.0	24.3	4,400	181	338
Eglinton W LRT - Eglinton to Pearson	4.0	8.6	1,600	186	400
Sheppard E Sbw to McCowan	6.8	8.4	4,800	574	706
Jane Street LRT	16.5	5.7	2,600	456	158
<b>Total Cost Avoidances</b>			<b>17,200</b>		
<b>Net 401RT/OLX Investment</b>	<b>71.0</b>	<b>222.5</b>	<b>8,800</b>	<b>40</b>	<b>124</b>

File: Consol GTA Rapid Transit \$\$ SEPT 2020

and an Eglinton East LRT segment to Kingston Road – a net \$124 million per kilometre that carries far more new transit users.

**The comparative cost-effectiveness is stark.** The 401RT/OLX scenario (chart above) would produce approximately 222.5 million new transit trips at a cost (before savings and offsets) of \$26 billion, or \$117 per new transit user. The set of infrastructure initiatives that can be avoided would generate just 61 million new transit trips at a cost of \$17.2 billion, or \$281 per new transit user. By any standard, the 401RT/OLX is unaffordable *not* to do.

A key point is that even if all the current and desired-but-unfunded initiatives are constructed, it will still be necessary to construct the 401RT/OLX. The appropriate approach would be to build the 401RT/OLX first, and then evaluate the necessity of additional transit infrastructure.

Because there is significant benefit to the federal government in terms of improved access to Pearson International Airport, contribution to federal greenhouse gas reduction targets, and increased employment, a one-third federal contribution is assumed to be attainable. Similarly, provincial funding is also appropriate because of positive impacts on provincial finances from employment, improved road traffic flow for freight transport, reductions in overall road traffic congestion, and reduced importation of motor fuels and automobiles.

**Other affordability comparisons are also appropriate:**

A high-speed rail (HSR) service between Toronto and Windsor, at a cost of approximately \$21 billion, has been proposed in the recent past. The capital cost of the 401RT and Ontario Line extension north of Eglinton Avenue East would be similar. 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 by 2051 – 21.5 times more than the proposed HSR. This advantage makes a priority implementation of the 401RT/OLX highly appropriate.

A comparison between the elevated 401RT/OLX scenarios and the Ontario Subway Plan is also useful. The 401RT/OLX achieves 3.0 times as many new transit trips than estimated for the Ontario plan, and is 3.21 times as cost-effective.

	New Trips (Million/yr)	Gross Infra. Cost (\$Mil)
Ontario Rapid Transit Plan	76	28,500
401RT/ OLX scenario	223	26,000
Comparative Ratio	2.93	0.91
401RT/OLX Effectiveness Advantage	3.21	

**Generating New Transit Ridership**

The operational viability of the 401RT depends on ridership, operating costs and the fare structure. Based on an extrapolation analysis of the 2011 Transportation Tomorrow Survey data, population forecasts by the Ontario Ministry of Finance, and a number of assumptions and estimations about

- proximity of trip origins and destinations on either side of the 401RT, by Ward,
- effects of congestion on modal shifts, and
- projections of trip growth in the GTA – 2011 to 2041, and 2041 to 2051

it is estimated that by 2051, a 401RT plus its arterial road feeder buses would carry 201 million new transit riders annually, plus 12 million or more transfers from existing local transit services. The Ontario Line extension to Sheppard Avenue East would add 14 million more new transit trips per year. The 401RT would also boost GO Transit ridership by approximately 16 million trips per year.

An important viability factor is that the longer the length of an urban rapid transit line, with stations added along the way, the more intensively it is used. As length is increased and new stations are added, new ridership not only originates at each new station added; the new stations also become a destination for additional transit riders whose trip origins are at pre-existing stations and who can now easily access the new stations. The shortness of the Sheppard subway (5.5 km.) is the principal reason why it is not operationally viable.

Ridership on the 401RT would come from a variety of sources, including

- ◆ Modal shifts by drivers using Highway 401 between and beyond the east and west 401RT terminals at Pickering Town Centre (Liverpool Road), and Hurontario Street in Mississauga;
- ◆ Modal shifts from local roads and current and planned transit services;
- ◆ Future growth in suburban travel demand that cannot be accommodated by Highway 401 and other roads due to road traffic congestion;
- ◆ Toronto drivers whose trip origins and/or destinations are in close proximity to Hwy 401, principally on intersecting arterial roads; accessibility to transit is extended once the use of e-bikes and scooters becomes more widespread;
- ◆ Car drivers who use the Don Valley Parkway and Highway 427 to travel downtown but who would, via a 401RT, have quick access to the eastern and western segments of the Line 1 subway and the extended Ontario Line;
- ◆ People who currently drive to the airport and its employment area from trip origins near the existing rapid transit network;
- ◆ Travelers who wish to access destinations directly at 401RT stations (such as Pearson International Airport and Scarborough Town Centre);
- ◆ Downtown residents who would have access to suburban destinations via existing rapid transit (GO Transit and the Line 1 subway);
- ◆ Transfers from existing nearby east-west surface transit routes (such as Sheppard Avenue, Wilson Avenue, Belfield Road, and Ellesmere Road);
- ◆ Transfers from GO Transit: the Barrie GO Rail Line, the Kitchener GO Rail line, possibly at Kennedy Road/Agincourt, and the Oriole GO Station relocated to the Leslie subway station (to replace the current station at Highway 401);
- ◆ Travelers whose trip origins and destinations are in close proximity to the extended Ontario Line and locations in Scarborough and Pickering that are near the 401RT;
- ◆ Future residential and commercial development over, adjacent to and near the Highway 401 corridor and at off-highway stations in Mississauga (Dixie, Kennedy-Britannia) and Pickering (Whites Rd);
- ◆ People who live or work close to north-south surface transit services that link to 401RT stations;
- ◆ Non-401RT users who are attracted by increased bus service frequency on local north-south arterial routes, and by shelters at every transit stop;
- ◆ From many other locations in the GTA, people who wish to reduce their household cost of transportation;
- ◆ People who face financial hardship caused in part by motor vehicle ownership and the costs of fuel and maintenance;
- ◆ People who do not have access to personal transportation and would benefit from the improved access that the 401RT/OLX provides;

- ◆ Drivers and automobile passengers who are ‘fed up’ with the stresses and delays of daily gridlock on highways and city streets.

The fact that the 401RT would not be located in a high-density urban corridor is not as important a factor as the speed and comfort of the 401RT service, the linkages to other transportation services, the relatively inexpensive cost of using the service, and the frustrations of traffic congestion. As with most suburban transit nodes, boardings onto 401RT and OLX trains would be mostly via transfers from feeder bus services and adjacent commuter parking lots, where they may exist.

This is similar to GO Transit’s Lakeshore Line, which has been highly successful, even though transit access to GO stations is often poorly available. Ridership on the 401RT is enhanced by the fact that it is long enough to serve both shorter-distance and longer-distance travelers, and major roads link directly to it. Importantly, a 401RT would have no rapid transit competition – it is significantly distant from the Eglinton Crosstown LRT, filling a critical void in the transit network, and is unique.

**Quantifying new transit trips for the 401RT:**

Because of the uniqueness of the 401RT, no comparable ridership forecasting methodology was found. However, it is estimated that the 401RT itself would generate 140,400,000 **new** transit trips per year once it becomes fully operational. The estimate is partly 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 (those in effect prior to 2018) in Toronto plus 16 close-by Wards in neighbouring municipalities, and was adjusted to 2041 and 2051 for population and trip growth. Modal shift factors to transit were assigned based on the proximities of trip origins and destinations to the Highway 401 corridor and by length of trip. Additional ridership was added for increased road traffic congestion resulting from travel demand growth beyond 2041, new high-density urban development assumed to occur at and near 401RT stations, trips to/from Toronto by residents living beyond the 60 Wards, positive impacts on GO/RER ridership, the effect of direct access to Pearson International Airport from across Toronto, and driving costs.

<b>401RT Ridership Estimate</b>	
110,000	Daily new 401RT trips 2041 by residents: modal shifts by auto driver and passenger
20,000	Incr in daily Sheppard Subwy ridership
2,000	Non-resident trips to/from 401RT (travelers living outside the 60 Ward survey area)
132,000	
308	Annualization factor
40,656,000	New transit trips from auto driver & psngr
23,000,000	New urban development at/near/above 26 401RT stations; @ higher transit % share
63,656,000	
16,000,000	Est. effects of GO RER intersects with 401RT (stouffville, Barrie, Kitchener, Richmond Hill)
79,656,000	
50,050,000	Add'l. Hwy 401 congestion shift 2041 to 2051 (Hwy unable to carry demand growth).
4,170,000	Reduction in 90% auto share of air passenger trips to/from Pearson
133,876,000	Total
1.05	Driving cost Increases (tolls, energy, other ca
1.00	Other factors
<b>140,600,000</b>	<b>TOTAL - New TTC Riders using 401RT by 2051</b>
<b>45,000,000</b>	Bus component new non-401RT ridership
<b>185,600,000</b>	
16,000,000	GO Transit ridership increase
201,600,000	Estimated total effect of 401RT by 2051
14,000,000	Ontario Line extension – new ridership
215,600,000	Total new transit users er year by 2051

The 401RT’s bus component assumes that ridership would increase on bus routes that intersect with the 401RT in Mississauga, Toronto and Pickering, for trips to and from the 401RT and for trips not involving a transfer to or from the 401RT itself. This would be due to improvements in service



frequencies, a mix of express and local services, shelters at **every** bus stop, and more comfortable buses. It is estimated that overall ridership intensity on intersecting bus services would increase by 25%, or 45,000,000 by 2051 for trips not involving a transfer to or from the 401RT. Bus ridership increase estimates are preliminary and can benefit from further reviewed.

The Ontario Line extension (OLX) north of Eglinton Avenue East is estimated to generate 14 million new transit user trips per year, plus transfers from existing transit routes, such as Don Mills and Victoria Park bus services. Ridership is based on population growth to 2051, modal shifts, fares on intersecting bus routes, plus a 25% modal shift of daily DVP traffic volumes between Don Mills and Highway 401, and then extrapolated to a year, based on a 308-day annual conversion factor. More detailed analyses can refine estimates. **The OLX is essential to avoid or reduce overcapacity problems on the Yonge Street subway** segment of the Line 1 subway in Toronto, while still encouraging new transit ridership on the Yonge Street subway.

<b>401RT Bus Component Ridership:</b>	
2011 Daily Boardings on 36 intersecting bus routes	559,500
Travel demand growth to 2041	27%
Boardings 2041	710,565
Number of existing buses	626
401RT: Additional buses	496
Ridership spread over all buses	1,122
Boardings per bus	633
Assigned ratio fares to boardings	70%
Total fare boardings per bus 2041	443
Assumed effect of improved service frequency + comfort	25%
New fare ridership per bus	111
Total buses on intersecting routes	1,122
New ridership/day re 401RT impact	124,349
Annual equivalent @ 308 FTE days	38,299,000
Increase 2041 to 2051	6.0%
	40,597,000
Add'l modal shifts re road congestion (e.g. shared Avs) and transit priorities	1.05
Driving cost increase scenario (tolls, carbon taxes, new technology)	1.05
	Annual 45,000,000
	Daily 146,104

The overall effect of implementing the 401RT/OLX rapid transit lines, combined with the implementation of current rapid transit commitments by the Ontario government, would be a reduction of approximately 450,000 daily automobile trips in Toronto by 2051, compared to 2016, and an increase in trips by transit of close to 1,300,000 (GO + municipal transit). See Appendix 3 for more information.

## Operating Revenue-to-Cost Ratios

Annual operating costs for the completed 401RT and expanded feeder bus services would be approximately \$442 million annually, based on \$8 million for each of 30 new stations (compared to an estimated \$4.2 million for each of the new Spadina subway extension stations), and \$450,000 for each new bus on intersecting transit route. Overall, it is estimated that fare revenues would offset operating costs (table at right). No segmentation of 401RT operating outcomes has been estimated for Mississauga, Toronto and Durham transit systems; these will vary the figures to a minor extent.

401RT Rail Component		401RT Bus Component	
New stations	30	448	No. of buses
Unit Cost	\$8,000,000	\$450,000	Unit Cost
Operating Cost	\$240,000,000	\$201,600,000	operating Cost
New fares	140,400,000	45,000,000	New fares
Average fare	\$2.46	\$2.21	Average fare
Revenues	\$346,010,000	\$99,650,000	Total Revenues
Net	\$106,010,000	-\$101,950,000	Net
Combined Net	\$4,060,000		
Rev/Cost ratio	1.01		

file: 401RT Costs & Riders ELEVATED Aug 2021 - updated March 2022

## Urban Development Impacts

The alignment of the 401RT provides opportunities for development and redevelopment at most stations, for either the mostly-at-grade concept or the mostly-elevated concept. Off-highway

stations, such as the Scarborough Town Centre area, at/around Pickering Town Centre, the planned Woodbine/Hwy 27 GO station (replacing the Etobicoke North GO station) and the Mississauga Airport Corporate Centre are near lands that may be underutilized and can generate both residential and non-residential opportunities.

Development potential exists adjacent to many stations that are in the highway 401 corridor, within a five- to ten-minute walk from station entrances. In addition, development rights over the highway and over highway stations can be sold or leased. The government of Ontario can or may offer opportunities for private development at new subway stations, if building developers fund the capital costs of the stations themselves. This is already a policy for new GO Rail stations.

## Unaffordable Not To Do

The costs of traffic congestion in the Greater Toronto and Hamilton Area are oft-quoted, totalling billions of dollars a year (with ranges from \$1.5 billion to \$5 billion to \$11 billion per year). Unless dramatic measures are taken, the problem will continue to worsen as travel demand continues to grow. Implementation of current rapid transit plans by Metrolinx and others will slow down the deterioration of conditions, but beyond 2051 will not result in absolute improvements.

As mentioned, major modal shifts to public transit are necessary as part of efforts to stabilize the impacts of rapid climate change. Although electricity-powered vehicles are touted as the solution to transportation-source GHG emissions, that solution assumes that mining for minerals, fabrication of auto parts and assembly of vehicles will be benign; nor is it guaranteed that the source of electricity will be generated without GHG emissions. The body of scientific evidence pointing to rapid deterioration of the Earth's natural life support systems is conclusive. The United Nations Intergovernmental Panel on Climate Change warns that global greenhouse gas emissions need to be cut in half by 2030 and to zero by 2050 if devastating and unstoppable consequences for humankind and the biosphere are to be avoided. For North Americans, who are among the world's worst emitters of greenhouse gases, much more than half of GHG emissions should be eliminated by 2030. **This is critical information. Refer to Appendix 1 for more information.** There is general agreement that, for urban areas, the solution for both environmental stability and avoiding road congestion lies with massive transfers of daily trips to public transit. 401RT, an extended Ontario Line and other new transit initiatives are *essential* if that goal is to be achieved.

Based on a broader definition of affordability – beyond the narrow public budgetary definition – not building the 401RT and an extension of the Ontario Line to Sheppard Avenue East at Victoria Park Avenue, *is unaffordable*. Detailed feasibility and impact studies should begin now.

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## **Appendix 1 - Rapid Climate Change**

### **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.

A frightening indication of 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° Celsius 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 extinction levels of 250 million years ago. Temperatures in northern latitudes will be higher. Canada will face widespread and severe devastation. Because North Americans produce a very disproportionate share of global GHG emissions, GHG emissions in North America need to decrease quickly to almost zero.

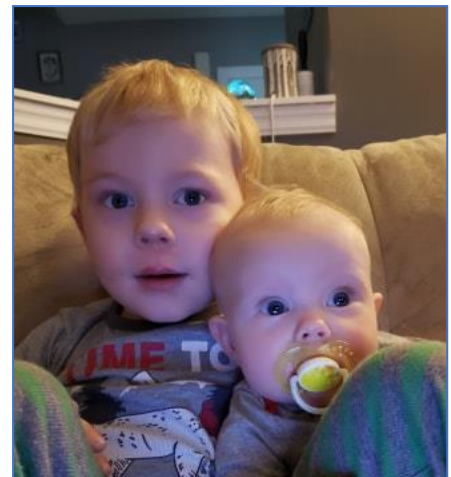
#### **Rapid global warming of 3.2° will have the following devastating and inter-connected impacts.**

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 regions may be twice that.
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 2019 summer season, is a recent example.
7. 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.

8. Heating and habitat loss will decimate plant, insect and other animal populations. Rates of extinction will accelerate beyond already extreme rates.
9. Arctic and Antarctic ice will continue to melt, at a more rapid rate than is happening now, and will not stop melting. Sea levels will rise by metres (6 metres once all of Greenland becomes ice-free), to the point that coastal cities will become at least partially flooded, and today's coastal marshes will be lost.
10. 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, decline. 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 employment 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 fuels 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.**

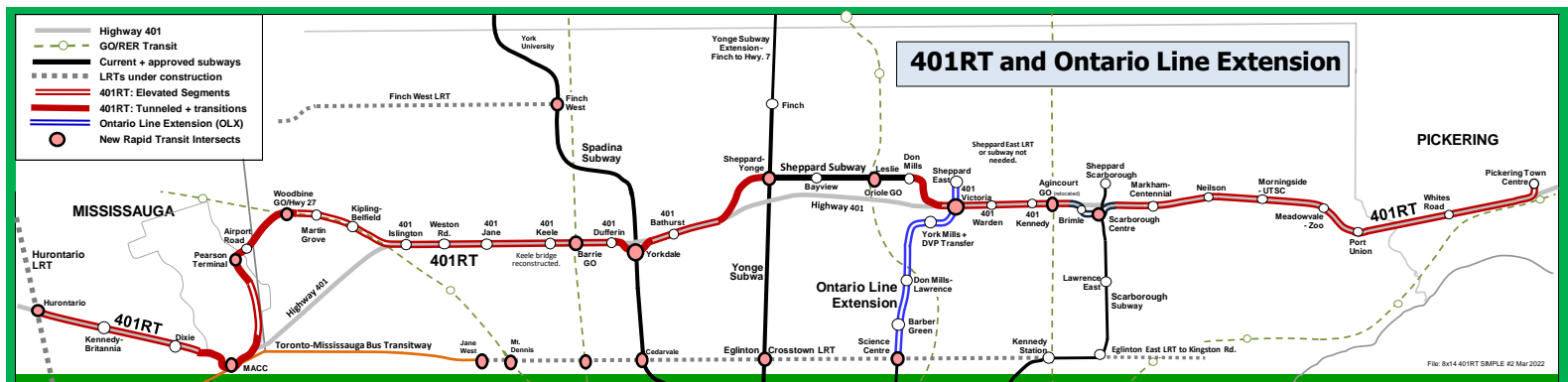


\* Per sources identified in the book "The Uninhabitable Earth: Life After Warming", by David Wallace-Wells.

## Appendix 2 – A Scenario of Daily trips in Toronto

Estimate of daily trips in Toronto	Automobile + Trucks	Municipal Transit	GO Transit	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	
<b>Total daily trips</b>					<b>6,413,000</b>	
Modal split, per 2016 TTS, for Toronto	Millions	57%	27%	1%	15%	100%
	<u>per Year</u>	<u>Daily</u>	<u>Daily</u>	<u>Daily</u>	<u>Daily</u>	<u>Daily</u>
Daily trips by mode, Toronto residents, 2051 estimate*		3,654,000	1,731,000	64,000	961,500	6,410,000
Cross-boundary trips into & 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
<b>Total trips in Toronto - 2051</b>		<b>4,801,000</b>	<b>1,807,000</b>	<b>464,000</b>	<b>1,051,500</b>	<b>8,123,000</b>
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
TTS 2016 trips in Toronto, adjusted		3,754,000	1,437,000	296,000	829,000	6,316,000
<b>Increase in total trips by 2051, before major transit initiatives and before estimatons for Work-From-Home circumstances</b>		<b>1,047,000</b>	<b>370,000</b>	<b>168,000</b>	<b>222,500</b>	<b>1,807,000</b>
Add major announced rapid transit enhancements:						
GO Transit Enhancements (net; to 200m)	57.0	-185,000		185,000		0
Spadina Subway extrn. into Vaughan	18.5	-60,000	60,000			0
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			0
Est. increase in transit trips arising from the 2019 Ontario rapid transit plan:						0
Ontario Line University Ave. to Pape Stn.	49.5	25.9	-84,000	84,000		0
Ontario Line Pape Stn. To Eglinton East		12.9	-42,000	42,000		0
Ontario Line University Ave. to CNE		10.7	-34,600	34,600		0
Eglinton West tunneled LRT to Renforth		8.6	-27,900	27,900		0
3-Stop Scarborough Subway to Sheppard East		8.3	-27,000	27,000		0
Yonge subway extrn. to Richmond Hill		8.5	-27,600	27,600		0
Hurontario LRT (assumed as 100% in Peel; 7.7m new/year)		-	0	0		0
Allowance for trip increases 2041 to 2051 9.0%		6.8	-22,000	22,000		0
<b>Effect of listed transit enhancements</b>		<b>182.7</b>	<b>-593,100</b>	<b>408,100</b>	<b>185,000</b>	<b>0</b>
Less: Est. for work-from home - daily trips by 2051		- 52.4	- 170,000	- 170,000	- 340,000	- 680,000
<b>Net change in daily trips in Toronto, by 2051</b>		<b>130.3</b>	<b>-763,100</b>	<b>238,100</b>	<b>-155,000</b>	<b>0</b>
Daily trips in 2051 before current approved transit initiatives		4,801,000	1,807,000	464,000	1,051,500	8,123,000
Effect of current approved transit initiatives + work-from-hom	130.3	-763,100	238,100	-155,000	0	-680,000
No. of daily trips in 2051 after current approved transit initiatives		4,037,900	2,045,100	309,000	1,051,500	7,443,000
TTS 2016 trips in Toronto, adjusted (per above)		3,754,000	1,437,000	296,000	829,000	6,316,000
Change from 2016 - Number of daily trips in Toronto		<b>283,900</b>	<b>608,100</b>	<b>13,000</b>	<b>222,500</b>	<b>1,127,000</b>
		<b>7.6%</b>	<b>42.3%</b>	<b>4.4%</b>	<b>26.8%</b>	<b>17.8%</b>
<b>Recommended additional transit infrastructure:</b>						
401RT - Pickering Town Ctr. To Hurontario Street (rail)	123.9	(402,000)	402,000			
401RT - Additional buses intersecting with 401RT	45.0	(146,000)	146,000			
401RT - Additional ridership from GO Rail intersects	16.0	(52,000)	52,000			
Total for 401RT	184.8	(600,000)	600,000			
Additional effect of 401RT-GO links on GO ridership	16.0	(52,000)		52,000	0	0
Ontario Line N extrn. Eglinton to 401RT + to Sheppard E	14.2	(46,000)	46,000			
Effect of recommended transit infrastructure	<b>215.0</b>	<b>- 698,000</b>	<b>646,000</b>	<b>52,000</b>	<b>-</b>	<b>-</b>
<b>SUMMARY:</b>						
Total trips in Toronto by 2051 before transit initiatives		4,801,000	1,807,000	464,000	1,051,500	8,123,000
Effect of current transit enhancements	182.7	(593,100)	408,100	185,000	-	-
Estimate for work-from home - daily trips by 2051	-52.4	(170,000)	(170,000)	(340,000)	-	(680,000)
Effect of recommended additional transit infrastructure	215.0	(698,000)	646,000	52,000	-	-
No. of daily trips in Toronto in 2051 after all initiatives	<b>345.3</b>	<b>3,339,900</b>	<b>2,691,100</b>	<b>361,000</b>	<b>1,051,500</b>	<b>7,443,000</b>
No. of daily trips in Toronto in 2016		3,754,000	1,437,000	296,000	829,000	6,316,000
<b>Change in daily trips, 2016 to 2051</b>		<b>(414,100)</b>	<b>1,254,100</b>	<b>65,000</b>	<b>222,500</b>	<b>1,127,000</b>
		<b>-11%</b>	<b>87%</b>	<b>22%</b>	<b>27%</b>	<b>18%</b>
* For Municipal transit, it is assumed that the TTC will undertake a variety of day-to-day enhancements over years to existing TTC services, such as adding buses & more trains to existing routes, to keep pace with population growth. Excludes new subway and LRT routes or extensions.						
** The 401RT will draw ridership from the Eglinton West LRT, which can be replaced by a modified BRT integrated with the Mississauga Transitway. Transit ridership growth will be carried by the 401RT (est. half of LRT new tris), a short extrn of the LRT to Jane, and to enhanced bus services along Eglinton.						
N.B. Toronto plans for LRTs on Jane, Sheppard East, Eglinton Avenue East and the waterfront are not included.						

## Appendix 3 – Answers to Questions and Concerns



### Why A 401RT? – Answering Doubts, and Rescuing Highway 401

An east-west rapid transit line across the northern half of Toronto is essential to the Toronto area's economic and social prosperity and environmental sustainability. Its absence is a costly handicap to progress. It has been presented as a “401RT” extending from Pickering Town Centre to Hurontario Street in Mississauga, with up to 34 stations over a 60-kilometre length (including its Sheppard subway segment). Although a great deal of work is now underway on other rapid transit initiatives, it is important that ***work to study the feasibility and impacts of a 401RT begins now.***

Although the Eglinton Crosstown LRT and expansions to GO Transit are underway, and plans for new subway and LRT lines have been approved, the structure and scale of what is needed to cut road traffic congestion and its costs are being missed, and measures being planned and taken to date are a collection of piecemeal actions.

The 401RT can be either mostly at grade in the Highway 401 corridor, or be constructed above it. Concerns of those who are skeptical of the 401RT idea as workable and important for Toronto are addressed here:

#### **1. The suburbs are not the place for subways; ridership will not be enough.**

Many factors will make a 401RT operationally viable:

- Over many decades, jobs and people have gravitated towards locations near Highway 401 and along major arterial roads that intersect with the highway.
- Transit connections contribute to making it work. A 401RT will create potentially up to eleven north-south rapid transit connections, and two dozen station stops at major arterial roads.
- The 401RT would deliver many people close to final daily destinations (for example, Pearson International Airport or Scarborough Town Centre).
- Comparatively, GO Transit operates almost all of its rail stations in the suburbs and has been an operational success; about 96% of its riders go to a single high-density stop (Union Station), whereas the 401RT will deliver travelers to many significant destinations.



- Many people today are forced to drive a car because of the absence of east-west rapid transit in northern Toronto, and would welcome an alternative.
- Estimated ridership for the 401RT and GO Transit impacts is 201 million new transit trips per year; the Ontario Line extension north of Eglinton East will add another 14 million new transit trips per year. An extension of the Ontario Line north of Eglinton Avenue East is necessary to avoid adding to congestion on the Yonge subway.

## **2. Removing a highway lane for a 401RT that is mostly-at-grade when traffic is already congested is a non-starter.**

- A survey of Highway 401 users is very likely to show that a significant portion of them would take an east-west rapid transit line across the city to their destinations or to north-south transit – enough to offset the conversion of one express lane in each direction to transit.
- Failure to construct a rapid transit line that can compete with Highway 401 means inevitable worsening congestion and gridlock as Toronto's population and employment continues to grow. Eventually, nothing will move for long periods of the day.
- The 401RT will rescue Highway 401 by more than doubling the corridor's trip capacity.
- Locating segments of the 401RT at grade in the 401 corridor is \$1.5 billion less expensive than elevating it over the highway corridor. However, a mostly-elevated 401RT avoids closure of a highway lane.

Major modal shifts away from using automobiles is a vital part of reducing rapid climate change impacts.

## **3. The Ontario government is already doing what it can to reduce road traffic congestion in the GTA.**

- No, it is not. Politically-determined budget decisions constrain what is done and what can be done.
- Current transit initiatives funded by Ontario – the Eglinton LRT, GO Transit expansion, and Ontario's \$28.5 billion subway/LRT plan announced in 2019 – are necessary, but will not be enough to stop long term growth in road traffic congestion in Toronto. While altogether they may generate perhaps 120 million new transit trips per year, the total number of trips by automobiles and trucks in Toronto will continue to increase. A 401RT across the northern half of Toronto and an Ontario Line extension to Sheppard Avenue East will reduce the use of automobiles in Toronto by more than 200 million, compared to 2016 levels.
- The key to real cuts to road traffic congestion is to maximize modal shifts, but most users of the Eglinton LRT and new subways and LRTs will be transfers of existing transit riders from current transit services. Ontario's should focus on more modal shifts.

## **4. We can't afford it. There's a deficit and taxes are already too high.**

- Failure to adequately address road congestion is not affordable. Estimates of the cost of congestion in the Toronto area are in the billions of dollars per year, borne by households

and businesses. 1.8 million people in cars and trucks on Highway 401 (pre-pandemic) traveling every day between Hurontario Street and Liverpool Road suffer from congestion and car costs *now*, and that is unaffordable.

- The infrastructure cost of the 401RT is estimated to be \$19.8 billion for a mostly-at-grade 401RT and \$21.3 billion for a mostly-elevated 401RT, plus \$3.8 billion to create the Ontario Line extension north of Eglinton Avenue East. These costs can be partially offset by not building the Eglinton East LRT beyond Eglinton Avenue, the Sheppard subway extensions, and the government of Canada's one-third share of the overall cost.
- In a larger context, Toronto's GDP in 2016 was about \$308 billion per year. The city's share of the 401RT infrastructure cost may be, in one scenario, as high as \$1.33 billion, which would cost just \$46 million per year to finance – 0.015% of its GDP to resolve a major issue that plagues travelers almost every day.
- If the 2019 \$28.5 billion Ontario Plan for Rapid Transit for Toronto is considered worthwhile, a 401RT is much more so – the 401RT/OLX is at least three times as cost-effective, based on cost per new transit user.
- Whether taxes are too high is a subjective opinion, based on the degree to which people have prioritized their after-tax incomes, and on the scale of income tax levels as incomes rise.
- *It makes sense to undertake the 401RT analyses now*, so that construction can begin as labour becomes available, or when current project work begins to wind down.
- Up-front analyses cost relatively little.

## **5. The northern parts of Toronto will be well-served by the Eglinton Crosstown LRT, especially when it is extended.**

- The Eglinton Crosstown LRT is geographically within the southern half of Toronto. The northern half of Toronto and several adjacent Wards in the '905' area are home to more than 1.3 million people and more than 400,000 jobs – including the airport employment megazone around Pearson International Airport, and the airport itself.
- Under current plans, northern Toronto will remain very poorly served by east-west rapid transit.

## **6. There would be too much disruption during construction.**

- Work on building a 401RT should begin before highway volumes increase further; delays will make construction more difficult and congestion temporarily worse.
- Without a 401RT, locking Toronto into permanent disruption via growing congestion and gridlock will be much worse. That must *not* be allowed to happen. It may also be true that few years of construction for a 401RT is not much different than delays that occur now.
- Construction can begin with off-highway segments, including to/from Pickering Town Centre, Scarborough Centre, the Sheppard Subway, Yorkdale station, the off-highway diversion to/from Pearson, and the Mississauga Airport Corporate Centre.
- Once tunneled segments rise onto the surface or elevated above of the 401, multiple construction companies can, within even a single year, construct and complete the stations

and at-grade tracks between stations. Some construction by private developers of multi-level buildings above the highway that envelop stations may require more than a year to build.

- For a 401RT that is elevated above the highway, ground-level disruptions can be limited to the construction of the vertical frameworks that support the transit line, and scheduling to avoid peak hour highway volumes can reduce disruptions. Stations will be elevated above the highway.
- During construction, the TTC can provide special east-west express bus services to/from key destinations.

A full-length east-west rapid transit line from Pickering Town Centre and Hurontario Street across the northern half of Toronto and an extension of the Ontario Line north of Eglinton East to Sheppard Avenue East at Victoria Park Avenue will rescue the Highway 401 transportation corridor and the Don Valley Parkway from becoming non-functional for long periods of time each day, and will significantly transform transportation across the region. It is inevitable and needs a full detailed analysis by transportation agencies on an urgent basis.

***Quite simply, if a 401RT or rapid transit line of similar length and location is not built soon, with its many north-south linkages, there is no hope of containing a worsening of road congestion and environmental damage in the core of the GTA.***

