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February 16, 2016

To: John Livey, Deputy City Manager

From: Jennifer Keesmaat, Chief Planner and Executive Director

Re: **SmartTrack, Relief Line and Yonge Subway Extension Ridership Forecasts, Summary Report**

I am pleased to send you the *SmartTrack, Relief Line and Yonge Subway Extension Ridership Forecasts, Summary Report*. This represents the second in a series of three reports which present summary results from the SmartTrack ridership forecasts prepared by UTTRI in collaboration with City of Toronto Planning staff using the GTAModel V4.0 travel demand forecasting system.

The ridership numbers prepared through this process and summarized in the attached report have informed the Relief Line Project Assessment Study. The City and the TTC are assessing alignment and station location options for a new rapid transit line connecting the Yonge-University-Spadina Subway (Line 1) downtown, south of Gerrard, to the Bloor-Danforth Subway (Line 2) east of the Don River, between Broadview and Coxwell. This line, known as the Relief Line, has previously been identified by Council as a necessary addition to the transit network prior to the Yonge Subway being extended north into York Region.

The base SmartTrack scenario is used in all the model runs presented in the attached report. This base scenario consists of the full alignment from Unionville in the north-east, running along the Stouffville line, with through service at Union Station continuing along the Kitchener line to the Mississauga Airport Corporate Centre (MACC) in the north-west. At Mount Dennis this base alignment is assumed to leave the existing Kitchener line to continue to the MACC on a new heavy rail alignment along Eglinton Avenue. This base SmartTrack configuration is assumed to have 24 stations. The “with SmartTrack” options examined in this report assume that a TTC fare is charged for using SmartTrack and SmartTrack headways of 15, 10 and 5 minutes are considered.

Further work is underway to update the model integrating the westerly extension of the Eglinton Crosstown LRT. It is not expected that this direction would significantly impact the assessment of how SmartTrack would affect Relief Line ridership as documented in the attached report.

The assumed transportation network used to assess Relief Line ridership, as well as the ridership implications of including SmartTrack as part of the assumed transportation network, includes a 3 station extension of the Bloor-Danforth subway to Sheppard Avenue, with stations at Lawrence Avenue, Scarborough City Centre and the intersection of Sheppard Avenue/McCowan Road. This too will be updated in future model runs.

The base population and employment scenario for the model runs discussed in the attached report that do not include SmartTrack assume the “low population / medium employment” land use assumptions. Base runs which include SmartTrack assume the “low population / medium employment with SmartTrack influence”. The sensitivity of SSE ridership to this assumption was tested by repeating the analysis using the “low population / low employment scenario”.

Several different corridor alternatives were considered for the Relief Line with variations in terms of where they pass through the downtown, where they intersect with the Bloor-Danforth subway, and whether or not they directly serve the Unilever site east of the Don River and south of Eastern Ave. The effects of the addition of SmartTrack services and the extension of the Yonge Subway into York Region were also tested.

The ridership forecasts for 2031 show that:

- The Relief Line is capable of capturing significant ridership ranging from 90,400 to 189,600 daily boardings.
- The Relief Line reduces peak hour, peak point passenger volume on the Yonge subway, south of Bloor, by between 3,100 and 4,200 riders, in the absence of SmartTrack. This is larger than the 2,300 rider reduction provided by 15-minute SmartTrack service (in the absence of the Relief Line), but less than the 6,600 rider reduction provided by 5-minute SmartTrack service (in the absence of the Relief Line).
- The ridership shifts resulting from the Relief Line, in the absence of SmartTrack, bring the projected 2031 Yonge peak hour, peak point ridership to approximately the capacity of the line, which is expected to be in the order of 36,000 peak hour, peak direction riders.
- The combined effect of the Relief Line with SmartTrack reduces Yonge subway southbound volume between 4,200 and 5,400 riders, assuming 15-minute SmartTrack service and depending on the Relief Line corridor considered. This reduction increases to between 8,000 and 8,600 riders assuming 5-minute SmartTrack service and depending on the Relief Line corridor considered. In either case, ridership falls below the expected 2031 capacity of the Yonge subway. However, by 2041, only the combination of the Relief Line with 5-minute SmartTrack service will bring the projected

2041 Yonge peak hour, peak point ridership to approximately the capacity of the line (i.e. 36,000 passengers/hour) .

- Extending the Yonge Subway into York Region adds approximately 2,000 additional riders to the peak point on the line in 2031. Neither the Relief Line nor the 15-minute SmartTrack options bring this peak point below the expected capacity of the line. Overcrowding will continue and ridership growth will be suppressed. By itself, the 5-minute SmartTrack service reduces the Yonge Subway ridership to about the expected capacity of the line. The combination of the Relief Line and 5-minute SmartTrack service together appear to reduce peak point Yonge Subway ridership to a level significantly below capacity by 2031. However, peak point ridership again appears to exceed capacity by 2041.

The forecasts represent a moment in time; they will change and evolve as the Relief Line alternatives are further developed and as the SmartTrack service concept is refined in collaboration with Metrolinx. The material attached reflects the base SmartTrack scenario which has since evolved as a result of the HDR Western Corridor Feasibility Review and the GO RER integration options being studied by the City and Metrolinx. However, it does give us an indication of the opportunities associated with the different Relief Line alternatives and their interaction with the SmartTrack proposal.

The findings in this Summary Report make clear the importance of the Relief Line. It is apparent that both the Relief Line and SmartTrack will be required in the future to ensure the efficient operation of the existing and proposed future transit networks. Additional work is required to assess the potential benefits of extending the proposed Relief Line north of the Bloor-Danforth subway to Eglinton Avenue and potentially to Sheppard Avenue.

Jennifer Keesmaat, MES, MCIP, RPP
Chief Planner & Executive Director
City Planning Division



MEMORANDUM

To: City of Toronto, City Planning Division
From: Eric J. Miller, Ph.D.
Report: 2016-02
Database: Release 2 Forecast Runs
Subject: **SmartTrack, Relief Line and Yonge Subway Extension Ridership Forecasts, Summary Report**
Date: February 15, 2016

1. INTRODUCTION

This memorandum is the second report presenting summary ridership results from the SmartTrack ridership forecasts prepared by UTTRI in collaboration with City of Toronto Planning staff using the GTAModel V4.0 travel demand forecasting system. This report presents overall ridership estimates for the various Relief Line (RL) corridors, with and without implementation of the SmartTrack service. Preliminary overall ridership impacts of the Yonge Subway Extension (YSE) into York Region, with and without RL and SmartTrack are also presented, given the importance of Yonge subway relief that may be offered by these lines.

“Release 2” ridership numbers are used in this report, where “Release 2” represents minor updates of the future year networks relative to the networks used to generate the “Release 1” forecasts that were reported on January 19, 2016.

Full documentation of the demand model system, its base year validation and its assessment by an independent peer review panel will be provided in other reports.

Forecasts have been prepared for two future years: 2031 and 2041. In each case a base year forecast has been prepared which includes known committed major transit¹ and “RER” upgrades to the GO Rail system as defined by the Metrolinx RER Service Concept.

The base SmartTrack scenario is used in all the model runs presented in this report. As described in more detail in Report 1 of this report series, this base scenario consists of the full alignment from Unionville in the north-east, running along the Stouffville line, with through service at

¹ These include: Eglinton Crosstown, Finch West LRT, Sheppard East LRT, Toronto-York Spadina Subway Extension and the Scarborough Subway Extension (assumed McCowan3 alignment).

Union Station² continuing along the Kitchener line to the Mississauga Airport Corporate Centre (MACC) in the north-west. At Mount Dennis this base alignment is assumed to leave the existing Kitchener line to continue to the MACC on a new alignment along Eglinton Avenue.³ This base SmartTrack configuration is assumed to have 24 stations. The “with SmartTrack” options examined in this report assume that a TTC fare is charged for using SmartTrack and SmartTrack headways of 15, 10 and 5 minutes are considered.

All model runs discussed in this report that do not include SmartTrack assume the “Low population / medium employment” scenario. Runs which include SmartTrack assume the “Low population / medium employment with SmartTrack influence”. See Report 1 for more details concerning the population and employment forecasts used in this project’s forecasts.

GTAModel V4.0 generates a wealth of detailed information concerning the spatial pattern of travel by all modes (auto, transit, etc.) over a typical 24-hour weekday time period within both the City of Toronto and the entire Greater Toronto-Hamilton Area (GTHA). In particular, with respect to transit ridership, estimates of boardings for every transit line in the region and boardings/alightings at every higher-order transit station are generated. The origin-destination patterns of transit users under different scenarios can be mapped. Changes in travel times and congestion levels by mode, etc. are also generated. Subsequent reports will provide examples of more detailed information concerning the impact of SmartTrack and other transit investment options that should be of interest to planners and decision-makers.

This summary report, however, simply provides a first-cut summary of key ridership results across combinations of the options described above. These results are presented in two parts. Section 2 presents RL ridership results with and without SmartTrack. Section 3 then presents first results for the impact of extending the Yonge subway into York Region, with and without various combinations of SmartTrack and the RL. The results presented in Sections 2 and 3 are all for the 2031 forecast year. Appendix II presents the same information for the 2041 forecast year, which show the same general patterns as for 2031, but with increased ridership due to the growth in population and employment between the two forecast years.

2. SUMMARY OF 2031 RELIEF LINE RIDERSHIP FORECASTS

2.1 Alternative Relief Line Alignments

The concept of a “relief line” serving downtown Toronto that would offload some ridership from the over-crowded Yonge subway line has been under discussion for decades. Table 2.1 summarizes recent and on-going planning efforts to explore this concept.

Despite the widespread discussion of this relief line, no firm definition of its extent or alignment has ever been established. Broadly speaking, three scales of the concept exist:

² I.e., trains run through Union Station, connecting the Stouffville and Kitchener lines.

³ The assumption of this western alignment rather than extending the Eglinton Crosstown LRT west from Mount Dennis will not materially affect the results presented in this report.

- A “little-J” line that runs south from a station on the Bloor-Danforth line east of the Don Valley (Broadview, Pape etc.) and that at some point turns west, likely along either Queen or King, terminating at University Avenue.
- A “big-J” that extends the “little J” line north of Danforth, crossing the Don Valley at some point and running north to probably at least Eglinton Avenue.
- A “little-U” that extends the “little-J” west past University Avenue, turning north again at some point to terminate at a Bloor subway station. It is also possible that a “big-U” that extends the “little-U” line north beyond Bloor St. might at some point be contemplated, but this option is not presently under consideration.

Table 2.1: Summary of Recent/Current Relief Line Planning Efforts

2009	City Council approves Yonge North Extension EA, contingent on Relief Line and City/TTC commence study to determine need for the Relief Line
2012	Downtown Rapid Transit Expansion Study concludes that initial phase of Relief Line and GO Transit improvements would help ease crowding on the transit network.
2012	Relief Line identified as part of the “Next Wave” of transit projects in the Metrolinx Big Move plan and is identified by Metrolinx as a priority for future transit investment
2014	Relief Line Project Assessment launched. City/TTC commence planning for the preferred route alignment and station locations for the Relief Line, to deliver planning approvals in mid-2016. The relationship between SmartTrack and the Relief Line is being reviewed as part of this work.
2015	Yonge Relief Network Study recommendations approved by Metrolinx Board. Allows project development for the Yonge North Subway Extension. Affirms that the Relief Line Project Assessment should continue, to ensure that a project is ready for the future.

To date, only “little J” corridors have been identified in sufficient detail to be analyzed within the GTAModel travel demand modelling system. Seven alignments, involving a combination of Danforth terminal stations (Broadview and Pape), east-west alignments (Queen and King) and station options (with and without a station at the Unilever site) have been tested in this analysis. See Appendix I for maps defining these seven alignments. Of these, four have been tested with SmartTrack: the Pape to Queen and King corridors, with and without a Unilever stop.

All scenarios tested assume RL headways of 3 minutes in the AM and PM peaks and 4.5 minutes in the off-peak periods.

2.2 Summary of 2031 RL Ridership Forecasts, With & Without SmartTrack

Table 2.2 shows projected 2031 RL boardings for each of the seven “little-J” alignments considered by time of day (AM peak hour; AM peak, mid-day, PM peak and evening time periods; and all-day), as well as the AM peak hour peak loading point for each line. In general the RL options attract significant ridership, with between 90,400 and 173,000 all-day boardings, 14,600 and 28,300 AM peak-hour boardings, and AM peak-load point volumes of 9,900 to 15,000 passengers, depending on the alignment. Note that the results presented in this table are for the seven RL corridors without SmartTrack.

Tables 2.3(a) and 2.3(b) show the impact of SmartTrack with 15-minute and 5-minute headways, respectively, on RL boardings for the Pape alignments.⁴ Interestingly, RL boardings increase slightly with the 15-minute SmartTrack service. This may be an artifact of the population-employment scenarios assumed. The “with SmartTrack” runs use the “medium employment with SmartTrack influence” scenario while the “without SmartTrack” base RL runs do not include the SmartTrack influence on employment. It may also be possible that some SmartTrack riders find it attractive under the 15-minute headway assumption to transfer to the Bloor-Danforth line and then to the RL for their journey downtown, rather than to stay on SmartTrack for the entire journey. Or, in the case of inclusion of a Unilever stop on the RL, they transfer directly from SmartTrack to the RL at this stop. This issue will be investigated in more detail.

The 5-minute headway option for SmartTrack does reduce RL boardings relative to the non-SmartTrack case, indicating that at this service level SmartTrack provides better service to the downtown than the RL for these trips. These reductions in RL ridership range from 2,500 to 5,800 AM peak hour boardings and 13,300 to 26,700 total daily boardings, depending on the RL under consideration. The resulting RL boardings are still significant, both in the AM peak and over the course of the entire day.

Three key observations can be drawn from these findings:

1. Contrary to much prior speculation, SmartTrack and the RL are not significant competitors of, or substitutes for, one another. Rather, they are largely complementary to one another and largely serve somewhat different travel markets.⁵ Thus, investment decisions in one or the other or both of these lines should not be viewed as an “either/or”, “zero sum” exercise. Both lines display considerable ridership potential, individually and collectively, and both should be considered as viable additions to the transit network, subject, of course, to engineering and cost considerations.
2. Put another way, there is significant demand for more transit capacity to downtown Toronto. There is clearly scope/need from a ridership perspective for both lines to help serve this latent demand.
3. This analysis illustrates the need for comprehensive, network-level analyses of individual project proposals. The interactions between SmartTrack and the RL are complex and their outcomes cannot be anticipated without detailed modelling of the overall origin-destination demand patterns, mode choices and transit route choices as has been achieved using GTAModel V4.0.

⁴ At the time of preparation of this report, City Planning provided Pape as the preferred RL terminal on the Danforth line as the “little-J” alignment.

⁵ This conclusion will be explored in greater detail in subsequent reports.

Table 2.2: 2031 RL Boardings by Time of Day and Corridor, without SmartTrack

Corridor #	Corridor Description	RL Boardings, No SmartTrack Service						Peak Point - Peak Direction	
		AM Peak Hour Boardings	AM Peak Period Boardings	MD Boardings	PM Boardings	EV Boardings	All Day Boardings	Location	AM Peak Hour Volume
A3	Broadview via Queen	14,600	29,700	13,300	37,600	9,800	90,400	Wbound out of Sumach/Dundas	9,900
B1	Pape via Queen	21,500	43,800	17,200	53,100	11,400	125,500	Wbound out of Sumach/Queen	12,500
B2	Pape via Queen (with Unilever Stop)	20,700	42,100	19,700	52,400	13,500	127,700	Wbound out of King/Cherry	10,100
C	Broadview via King	26,800	54,800	28,000	64,200	17,500	164,500	Wbound out of Front/Cherry	14,100
D1	Pape via King	24,400	49,700	24,500	61,000	16,400	151,600	Wbound out of King/Cherry	13,800
D2	Pape via King (with Unilever Stop)	28,300	57,800	29,100	66,100	20,000	173,000	Wbound out of Front/Cherry	15,000

Table 2.3: 2031 RL Boardings by Time of Day and Corridor, with SmartTrack

Corridor #	Corridor Description	(a) RL Boardings, with 15-minute Headway SmartTrack Service						Peak Point - Peak Direction	
		AM Peak Hour Boardings	AM Peak Period Boardings	MD Boardings	PM Boardings	EV Boardings	All Day Boardings	Location	AM Peak Hour Volume
B1	Pape via Queen	22,900	46,700	18,400	56,500	11,500	133,100	Wbound out of Pape/Gerrard	11,600
B2	Pape via Queen (with Unilever Stop)	23,500	48,000	22,700	58,300	14,900	143,900	Wbound out of Queen/Pape	10,000
D1	Pape via King	26,600	54,300	25,400	65,200	16,100	161,000	Wbound out of Pape/Gerrard	13,200
D2	Pape via King (with Unilever Stop)	31,500	64,300	32,200	71,700	21,400	189,600	Wbound out of Front/Cherry	14,500
Corridor #	Corridor Description	Change in RL Boardings, with 15-minute Headway SmartTrack Service						Change in AM Peak Hour Peak Point Volume	
B1	Pape via Queen	1,400	2,900	1,200	3,400	100	7,600	Wbound out of Pape/Gerrard	-900
B2	Pape via Queen (with Unilever Stop)	2,800	5,900	3,000	5,900	1,400	16,200	Wbound out of Queen/Pape	-100
D1	Pape via King	2,200	4,600	900	4,200	-300	9,400	Wbound out of Pape/Gerrard	-600
D2	Pape via King (with Unilever Stop)	3,200	6,500	3,100	5,600	1,400	16,600	Wbound out of Front/Cherry	-500

Corridor #	Corridor Description	(b) RL Boardings, with 5-minute Headway SmartTrack Service						Change in AM Peak Hour Peak Point Volume	
		AM Peak Hour Boardings	AM Peak Period Boardings	MD Boardings	PM Boardings	EV Boardings	All Day Boardings	Location	AM Peak Hour Volume
B1	Pape via Queen	15,700	31,900	14,300	44,400	8,200	98,800	Wbound out of Pape/Gerrard	7,300
B2	Pape via Queen (with Unilever Stop)	18,400	37,600	19,100	50,800	12,000	119,500	Wbound out of Unilever	7,300
D1	Pape via King	19,700	40,200	19,300	51,800	11,300	122,600	Wbound out of Pape/Gerrard	9,600
D2	Pape via King (with Unilever Stop)	25,800	52,600	28,400	61,000	17,700	159,700	Wbound out of Unilever	11,500
Corridor #	Corridor Description	Change in RL Boardings, with 5-minute Headway SmartTrack Service						Change in AM Peak Hour Volume	
B1	Pape via Queen	-5,800	-11,900	-2,900	-8,700	-3,200	-26,700	Wbound out of Pape/Gerrard	-5,200
B2	Pape via Queen (with Unilever Stop)	-2,300	-4,500	-600	-1,600	-1,500	-8,200	Wbound out of Queen/Pape	-2,800
D1	Pape via King	-4,700	-9,500	-5,200	-9,200	-5,100	-29,000	Wbound out of Pape/Gerrard	-4,200
D2	Pape via King (with Unilever Stop)	-2,500	-5,200	-700	-5,100	-2,300	-13,300	Wbound out of Front/Cherry	-3,500

Table 2.4: 2031 Extent of Yonge Line Relief, with Relief Line & SmartTrack Combinations

RL Corridor #	RL Corridor Description	SmartTrack	Volume @ South Of Bloor (Peak Hour)	Peak Hour Reduction South of Bloor
2031 Low-Med Base			39,600	
A3	Broadview via Queen	None	36,100	3,500
B1	Pape via Queen	None	36,000	3,600
B2	Pape via Queen (with Unilever Stop)	None	36,500	3,100
C	Broadview via King	None	35,400	4,200
D1	Pape via King	None	35,700	3,900
D2	Pape via King (with Unilever Stop)	None	35,600	4,000
2031 Low-Med 15 min SmartTrack without RL			37,300	2,300
B1	Pape via Queen	15 min	34,600	5,000
B2	Pape via Queen (with Unilever Stop)	15 min	35,400	4,200
D1	Pape via King	15 min	34,200	5,400
D2	Pape via King (with Unilever Stop)	15 min	34,400	5,200
2031 Low-Med 5 min SmartTrack without RL			33,000	6,600
B1	Pape via Queen	5 min	31,200	8,400
B2	Pape via Queen (with Unilever Stop)	5 min	31,600	8,000
D1	Pape via Queen	5 min	31,000	8,600
D2	Pape via King (with Unilever Stop)	5 min	31,300	8,300

Table 2.4 shows the impact of the RL with and without SmartTrack on reducing the AM peak load on the Yonge subway line running southbound from Bloor station. The RL only reductions do not vary much by corridor, ranging from 3,100 to 4,200 peak-hour riders. These reductions bring the projected 2031 Yonge peak hour ridership to approximately the capacity of the line, which is expected to be in the order of 36,000 riders per hour in 2031.⁶

The RL reductions are larger than the SmartTrack 15-minute reduction of 2,300 riders, but significantly less than the SmartTrack 5-minute reduction of 6,600 AM peak hour riders, which is more than 50% higher than the best RL result. The combined effect of RL and SmartTrack further reduces the diversion from the Yonge line, with all RL-SmartTrack combinations falling below the expected 2031 Yonge line capacity.

⁶ In many cases with the introduction of the RL and the reduction in Line 2 riders arriving from the East, the Yonge subway southbound AM peak-load point actually shifts to just north of Bloor station, where the loadings are slightly higher than the south of Bloor values. The south of Bloor numbers are shown here for the sake of consistency and given that this been the traditional focus of Yonge line capacity concerns.

Observations to be drawn from these results include:

1. The RL provides relief to the Yonge line.
2. SmartTrack provides comparable relief to the Yonge line relative to the RL, with the magnitude of this relief very much depending on the SmartTrack headway. With 15-minute headways, SmartTrack has relatively marginal impact on Yonge line ridership, while at 5-minute headways, the impact is quite substantial.
3. There is an apparent shift of the Yonge AM peak load point from south of Bloor station to just north of it with the introduction of the RL indicates that reducing transfers from the westbound Bloor-Danforth line to the southbound Yonge line cannot, in itself fully solve Yonge line over-crowding, which largely results from heavy southbound flows along the Yonge line from points north.

This issue of transfers between the Bloor-Danforth line and the Yonge line at Bloor station is explored further in Table 2.5. As shown in the table, both the RL and SmartTrack very significantly reduce the number of peak period/hour transfers from the westbound Bloor-Danforth line to the southbound Yonge line at Bloor station. For the RL, these reductions range from 23-37%, depending on the corridor. SmartTrack alone generates 12-36% reductions as headways range from 15 to 5 minutes. Combined, the two lines further reduce these transfers by up to 53%. Thus, both lines individually and in combination have the potential to greatly reduce the problem of crowding from transfers at Bloor station. As discussed above, Yonge line crowding still generally remains a concern, however, due to the heavy volumes boarding the line from the north. The little-J RL options cannot address this problem directly. SmartTrack diverts some of this traffic, particularly at lower headways, but, ideally, more should still be done to keep the loading of the Yonge line during peak periods under capacity. This issue is discussed further in the next section.

Table 2.5: 2031 AM Peak Westbound Bloor to Southbound Yonge Transfers

RL Corridor #	RL Corridor Description	SmartTrack Frequency	WB BD-SB YUS Transfers at Bloor-Yonge		Change from Base
			AM Peak Period	AM Peak Hour	
2031 Low-Med Base			20,100	9,900	*Acts as Base
A3	Broadview via Queen	None	13,900	6,800	-31%
B1	Pape via Queen	None	13,600	6,700	-32%
B2	Pape via Queen (with Unilever Stop)	None	15,500	7,600	-23%
C	Broadview via King	None	13,100	6,400	-35%
D1	Pape via King	None	13,200	6,500	-34%
D2	Pape via King (with Unilever Stop)	None	13,200	6,500	-34%
2031 Low-Med 15 min SmartTrack without RL			17,700	8,700	-12%
B1	Pape via Queen	15 min	13,200	6,500	-34%
B2	Pape via Queen (with Unilever Stop)	15 min	14,100	6,900	-30%
D1	Pape via King	15 min	12,100	5,900	-40%
D2	Pape via King (with Unilever Stop)	15 min	12,100	5,900	-40%
2031 Low-Med 5 min SmartTrack without RL			12,900	6,300	-36%
B1	Pape via Queen	5 min	9,900	4,900	-51%
B2	Pape via Queen (with Unilever Stop)	5 min	10,600	5,200	-47%
D1	Pape via King	5 min	9,600	4,700	-53%
D2	Pape via King (with Unilever Stop)	5 min	9,800	4,800	-52%

Table 2.6: 2031 Daily Net Riders Generated by the Relief Line

RL Corridor #	RL Corridor Description	SmartTrack	Daily New Net Transit Riders (System Wide)
2031 Low-Med Base without SmartTrack			
A3	Broadview via Queen	None	5,800
B1	Pape via Queen	None	7,800
B2	Pape via Queen (with Unilever Stop)	None	9,800
C	Broadview via King	None	15,100
D1	Pape via King	None	10,700
D2	Pape via King (with Unilever Stop)	None	17,600
2031 Low-Med RL with 15 min SmartTrack			
B1	Pape via Queen	15 min	8,900
B2	Pape via Queen (with Unilever Stop)	15 min	12,500
D1	Pape via King	15 min	11,400
D2	Pape via King (with Unilever Stop)	15 min	21,100
2031 Low-Med RL with 5 min SmartTrack			
B1	Pape via Queen	5 min	4,700
B2	Pape via Queen (with Unilever Stop)	5 min	7,700
D1	Pape via King	5 min	6,400
D2	Pape via King (with Unilever Stop)	5 min	15,000
Notes:	1. Any runs that include SmartTrack were done using a land use that has SmartTrack influence. Therefore, the "Net New Riders" column for any RL with SmartTrack is based on a land use that has SmartTrack influence.		

Finally, Table 2.6 presents the daily net new riders generated by the RL, with and without SmartTrack. The RL net new daily riders are modest relative to the much more extensive SmartTrack service. As with RL boardings, the combination of a 15-minute SmartTrack and RL service increases the number of net riders attributable to the RL, especially for RL options involving the Unilever stop, again indicating the synergies between the two lines at this service level for SmartTrack. Again, this effect reverses with a 5-minute SmartTrack headway, in which case the SmartTrack service clearly is the dominant attractor of new riders, thereby reducing the new ridership attributable to the RL somewhat. These decreases, however, are relatively minor, again indicating that SmartTrack and the RL are not serious competitors with one another for riders.

In general, these results indicate that the RL primarily functions as providing an improved path into the Toronto downtown for trip-makers within its catchment area (e.g., diverting trips from the Bloor-Danforth Subway). It provides an improved level of service (e.g., reduced travel times) for these riders and helps reduce over-crowding on the Yonge line. Its potential for attracting large numbers of new riders to the transit system, however, appears to be somewhat limited.

3. SUMMARY OF 2031 YONGE SUBWAY EXTENSION (YSE) RIDERSHIP FORECASTS

Figure 3.1 shows the EA approved alignment for the Yonge subway extension. Ridership estimates have been generated for the extension alone, and then the YSE combined with:

- The RL alone (assuming the B1, Pape via Queen corridor).
- SmartTrack alone with 15- and 5-minute headways.
- The RL and SmartTrack (15- and 5-minute headways).

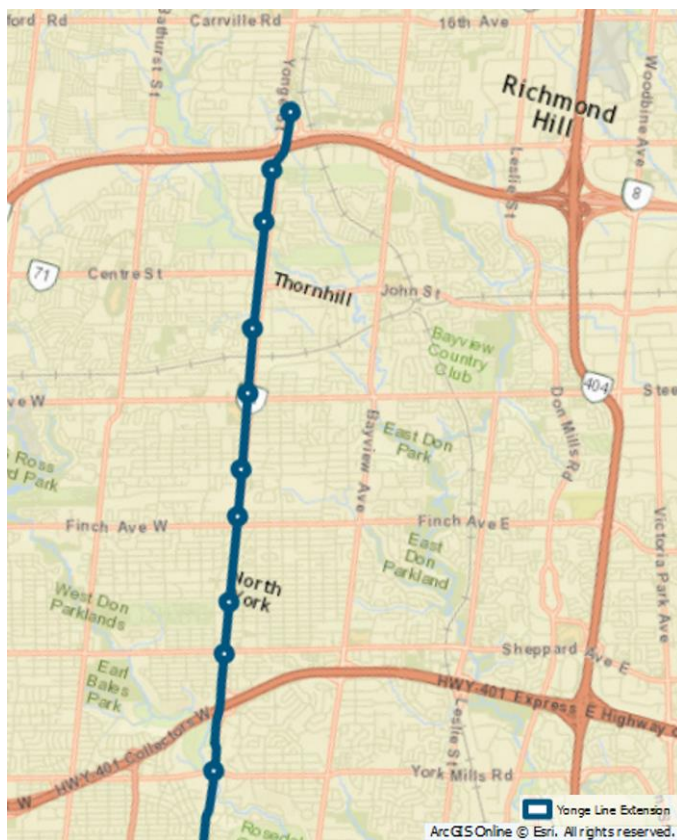


Figure 3.1: Yonge Subway Extension (YSE) Corridor

Table 3.1: Yonge Subway 2031 AM Peak Hour Volumes Southbound from Bloor

Scenario	SmartTrack Frequency	Volume Southbound @ South of Bloor (Peak Hour)		Transfers Bloor Danforth (Westbound) to Yonge Line (Southbound) (Peak Hour)	
		Volume	% Change from Base	Transfers	% Change from Base
2031 Base without YSE, RL and SmartTrack	None	39,600	* Acts as Base	9,900	* Acts as Base
2031 Base + YSE without RL and without SmartTrack	None	41,600	5.1%	9,100	-8.1%
2031 Base + YSE + RL	None	38,100	-3.8%	6,000	-39.4%
2031 Base + YSE + SmartTrack	5 min	35,800	-9.6%	6,000	-39.4%
	15 min	40,200	1.5%	8,400	-15.2%
2031 Base + YSE + RL + SmartTrack	5 min	33,800	-14.6%	3,600	-63.6%
	15 min	37,100	-6.3%	5,600	-43.4%

* For this table, the Relief Line option used was the B1 (Pape via Queen)

The AM peak hour southbound volumes on the Yonge line south of Bloor for these options are shown in Table 3.1, along with the base no-YSE case. Points to note from this table include:

- The YSE adds approximately 2,000 additional riders to the “south of Bloor” AM peak hour ridership, above the base of 39,600. These numbers exceed the expected 2031 capacity of the line of 36,000.
- This increase in Yonge line peak loading occurs despite a reduction of 800 peak-hour transfers at Bloor station from the Bloor-Danforth line (9,100 versus 9,900 in the base case). These trips have been “driven away” from using the Yonge line due to the excessive crowding on the line. These trips have either found different transit paths into the downtown or have switched to other modes to make their trip. Thus, the actual increase in AM peak hour Yonge riders southbound from Bloor coming from north of Bloor generated by the YSE is in the order of 2,800.
- The reductions in Yonge ridership generated by either the RL or SmartTrack individually are consistent with those generated in the no-YSE case (Table 2.4). Assuming an approximate capacity of the Yonge line in the order of 36,000 passengers/hour, then neither the RL nor the 15-minute SmartTrack options bring the Yonge line 2031 AM peak hour ridership below this capacity threshold.
- The 5-minute headway SmartTrack service brings the Yonge ridership south of Bloor marginally below its capacity. The addition of the RL further reduces the Yonge

ridership by another 2,000 peak-hour riders, resulting in a ridership level that is significantly below capacity.

APPENDIX I: RELIEF LINE CORRIDOR OPTIONS

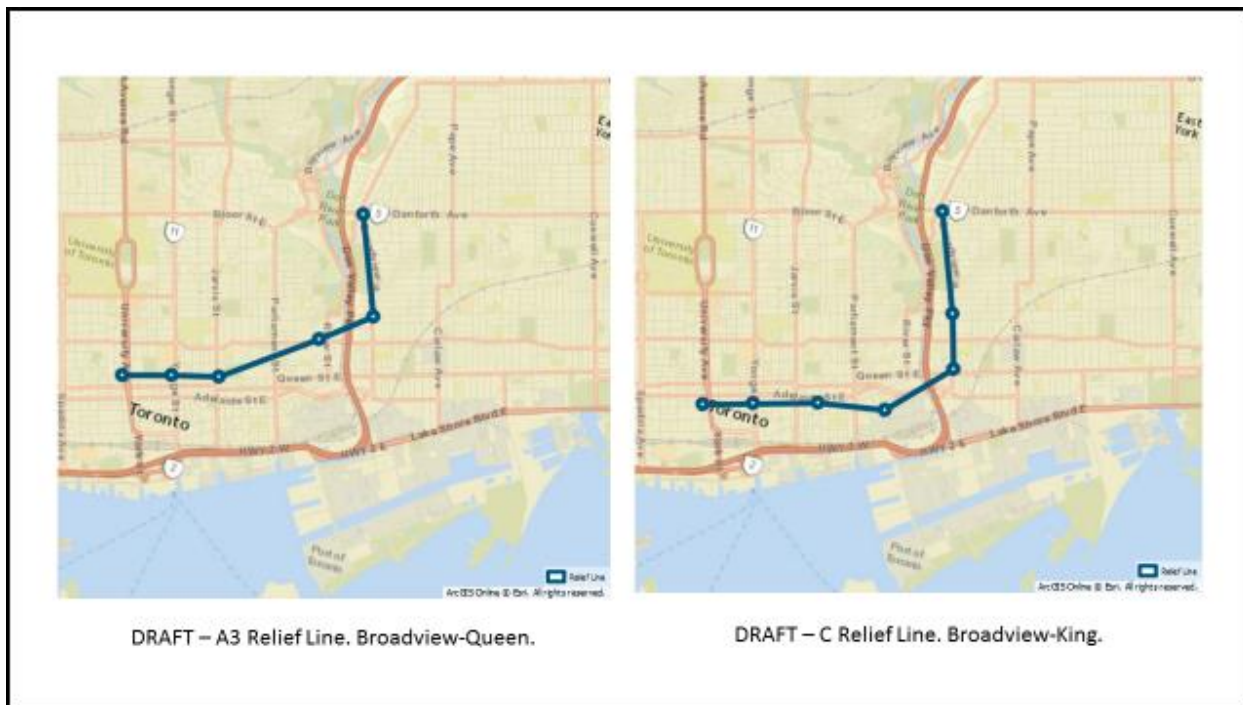


Figure I.1: Broadview Relief Line Corridor Options



Figure I.2: Pape-Queen Relief Line Corridor Options



Figure I.3: Pape-King Relief Line Corridor Options

APPENDIX II: 2041 RESULTS

Table II.1: 2041 RL Boardings by Time of Day and Corridor, without SmartTrack

Corridor #	Corridor Description	RL Boardings, No SmartTrack Service						Peak Point - Peak Direction	
		AM Peak Hour Boardings	AM Peak Period Boardings	MD Boardings	PM Boardings	EV Boardings	All Day Boardings	Location	Peak Hour Volume
A3	Broadview via Queen	15,000	30,600	13,100	39,600	9,600	92,900	Wbound out of Sumach/Dundas	10,100
B1	Pape via Queen	22,800	46,400	17,700	57,900	11,600	133,600	Wbound out of Queen/Broadview	12,200
B2	Pape via Queen (with Unilever Stop)	23,400	47,700	22,200	60,100	14,400	144,500	Wbound out of Unilever	10,400
C	Broadview via King	30,200	61,700	30,600	72,300	19,000	183,600	Wbound out of Front/Cherry	14,500
D1	Pape via King	27,300	55,600	26,600	68,000	17,000	167,200	Wbound out of King/Broadview	14,600
D2	Pape via King (with Unilever Stop)	32,500	66,300	33,000	76,000	22,000	197,300	Wbound out of Front/Cherry	16,000

Table II.2: 2041 RL Boardings by Time of Day and Corridor, with SmartTrack

Corridor #	Corridor Description	(a) RL Boardings, 15min SmartTrack Service						Peak Point - Peak Direction	
		AM Peak Hour Boardings	AM Peak Period Boardings	MD Boardings	PM Boardings	EV Boardings	All Day Boardings	Location	Peak Hour Volume
B1	Pape via Queen	27,400	55,800	20,100	69,600	12,400	158,000	Wbound out of Pape/Gerrard	12,200
B2	Pape via Queen (with Unilever Stop)	29,600	60,400	27,700	75,200	17,500	180,700	Eastbound out of Queen/Yonge	12,100
D1	Pape via King	32,900	67,000	28,600	80,000	17,800	193,500	Wbound out of Pape/Gerrard	15,200
D2	Pape via King (with Unilever Stop)	39,600	80,900	38,600	90,900	25,300	235,600	Wbound out of Queen/Pape	15,900
Alignment #	Alignment Description	Change in RL Boardings, with 15-minute Headway SmartTrack Service						Change in AM Peak Hour Peak Point Volume	
B1	Pape via Queen	4,600	9,400	2,400	11,800	900	24,400	Wbound out of Pape/Gerrard	0
B2	Pape via Queen (with Unilever Stop)	6,200	12,700	5,400	15,100	3,100	36,300	Wbound out of Queen/Pape	1,700
D1	Pape via King	5,600	11,400	2,100	12,000	800	26,300	Wbound out of Pape/Gerrard	600
D2	Pape via King (with Unilever Stop)	7,100	14,500	5,600	15,000	3,300	38,400	Wbound out of Front/Cherry	-200

Corridor #	Corridor Description	(b) RL Boardings, 5min SmartTrack Service						Peak Point - Peak Direction	
		AM Peak Hour Boardings	AM Peak Period Boardings	MD Boardings	PM Boardings	EV Boardings	All Day Boardings	Location	Peak Hour Volume
B1	Pape via Queen	17,700	36,100	14,800	51,000	8,200	110,200	Wbound out of Pape/Gerrard	7,400
B2	Pape via Queen (with Unilever Stop)	22,400	45,700	22,900	61,600	13,200	143,300	Eastbound out of Queen/Yonge	8,100
D1	Pape via King	22,700	46,300	21,100	60,100	11,900	139,400	Wbound out of King/Cherry	9,800
D2	Pape via King (with Unilever Stop)	31,500	64,200	33,900	75,300	20,600	194,000	Wbound out of Unilever	11,800
Alignment #	Alignment Description	Change in RL Boardings, with 5-minute Headway SmartTrack Service						Change in AM Peak Hour Volume	
B1	Pape via Queen	-5,100	-10,300	-2,800	-6,800	-3,300	-23,300	Wbound out of Pape/Gerrard	-4,800
B2	Pape via Queen (with Unilever Stop)	-1,000	-2,000	600	1,400	-1,200	-1,100	Wbound out of Queen/Pape	-2,300
D1	Pape via King	-4,500	-9,300	-5,500	-7,900	-5,200	-27,900	Wbound out of Pape/Gerrard	-4,800
D2	Pape via King (with Unilever Stop)	-1,000	-2,100	900	-700	-1,400	-3,300	Wbound out of Front/Cherry	-4,300

Table II.3: 2041 Yonge Line Relief, RL & SmartTrack Combinations

RL Corridor #	RL Corridor Description	SmartTrack	Volume Southbound @ South of Bloor (Peak Hour)	Peak Hour Reduction: South of Bloor
2041 Low-Med Base			42,600	0
A3	Broadview via Queen	None	39,500	3,100
B1	Pape via Queen	None	39,600	3,000
B2	Pape via Queen (with Unilever Stop)	None	40,100	2,500
C	Broadview via King	None	39,200	3,400
D1	Pape via King	None	39,000	3,600
D2	Pape via King (with Unilever Stop)	None	39,100	3,500
2041 Low-Med 15 min SmartTrack without RL			41,400	1,200
B1	Pape via Queen	15 min	38,700	3,900
B2	Pape via Queen (with Unilever Stop)	15 min	39,300	3,300
D1	Pape via King	15 min	38,100	4,500
D2	Pape via King (with Unilever Stop)	15 min	38,400	4,200
2041 Low-Med 5 min SmartTrack without RL			35,900	6,700
B1	Pape via Queen	5 min	36,000	6,600
B2	Pape via Queen (with Unilever Stop)	5 min	36,100	6,500
D1	Pape via Queen	5 min	36,000	6,500
D2	Pape via King (with Unilever Stop)	5 min	36,100	6,500

Table II.4: 2041 AM Peak Westbound Bloor to Southbound Yonge Transfers

RL Corridor #	RL Corridor Description	SmartTrack Frequency	WB BD-SB YUS Transfers at Bloor-Yonge		Change from Base
			AM Peak Period	AM Peak Hour	
2041 Low-Med Base			20,700	10,147	*Acts as Base
A3	Broadview via Queen	None	15,000	7,350	-28%
B1	Pape via Queen	None	15,800	7,750	-24%
B2	Pape via Queen (with Unilever Stop)	None	16,800	8,240	-19%
C	Broadview via King	None	14,800	7,250	-29%
D1	Pape via King	None	13,900	6,810	-33%
D2	Pape via King (with Unilever Stop)	None	14,000	6,860	-32%
2041 Low-Med 15 min SmartTrack without RL			20,400	10,000	-1%
B1	Pape via Queen	15 min	15,100	7,400	-27%
B2	Pape via Queen (with Unilever Stop)	15 min	16,500	8,090	-20%
D1	Pape via King	15 min	13,200	6,470	-36%
D2	Pape via King (with Unilever Stop)	15 min	13,500	6,620	-35%
2041 Low-Med 5 min SmartTrack without RL			13,900	6,810	-33%
B2	Pape via Queen (with Unilever Stop)	5 min	10,900	5,340	-47%
D2	Pape via King (with Unilever Stop)	5 min	11,800	5,780	-43%

Table II.5: 2041 Daily Net Riders Generated by the Relief Line

RL Corridor #	RL Corridor Description	SmartTrack	Daily New Net Transit Riders (System Wide)
2041 Low-Med Base Without SmartTrack			
A3	Broadview via Queen	None	4,900
B1	Pape via Queen	None	7,900
B2	Pape via Queen (with Unilever Stop)	None	11,100
C	Broadview via King	None	17,800
D1	Pape via King	None	11,900
D2	Pape via King (with Unilever Stop)	None	20,900
0			
2041 Low-Med RL with 15min SmartTrack			
B1	Pape via Queen	15 min	10,700
B2	Pape via Queen (with Unilever Stop)	15 min	17,100
D1	Pape via King	15 min	13,600
D2	Pape via King (with Unilever Stop)	15 min	27,600
0			
2041 Low-Med RL with 5min SmartTrack			
B1	Pape via Queen	5 min	4,700
B2	Pape via Queen (with Unilever Stop)	5 min	9,200
D1	Pape via King	5 min	7,400
D2	Pape via King (with Unilever Stop)	5 min	19,000
Notes:	1. Any runs that include SmartTrack were done using a land use that has SmartTrack influence. Therefore, the "Net New Riders" column for any RL with SmartTrack combo is based on a land use that has SmartTrack influence.		

Table II.6: Yonge Subway 2041 AM Peak Hour Volumes Southbound from Bloor

Scenario	SmartTrack Frequency	Volume Southbound @ South of Bloor (Peak Hour)		Transfers WBBD to SBYUS (Peak Hour)	
		Volume	% Change from Base	Transfers	% Change from Base
2041 Base without YSE, RL and SmartTrack	None	42,600	* Acts as Base	10,200	* Acts as Base
2041 Base + YSE without RL and without SmartTrack	None	45,400	6.6%	9,600	-5.9%
2041 Base + YSE + RL	None	42,500	-0.2%	7,300	-28.4%
2041 Base + YSE + SmartTrack	5 min	39,300	-7.7%	6,600	-35.3%
	15 min	44,300	3.99%	9,400	-7.8%
2041 Base + YSE + RL + SmartTrack	5 min	37,800	-11.3%	5,200	-49.0%
	15 min	42,100	-1.2%	7,200	-29.4%