



Scarborough RT

Strategic Plan – Study Report

FINAL REPORT

August 2006



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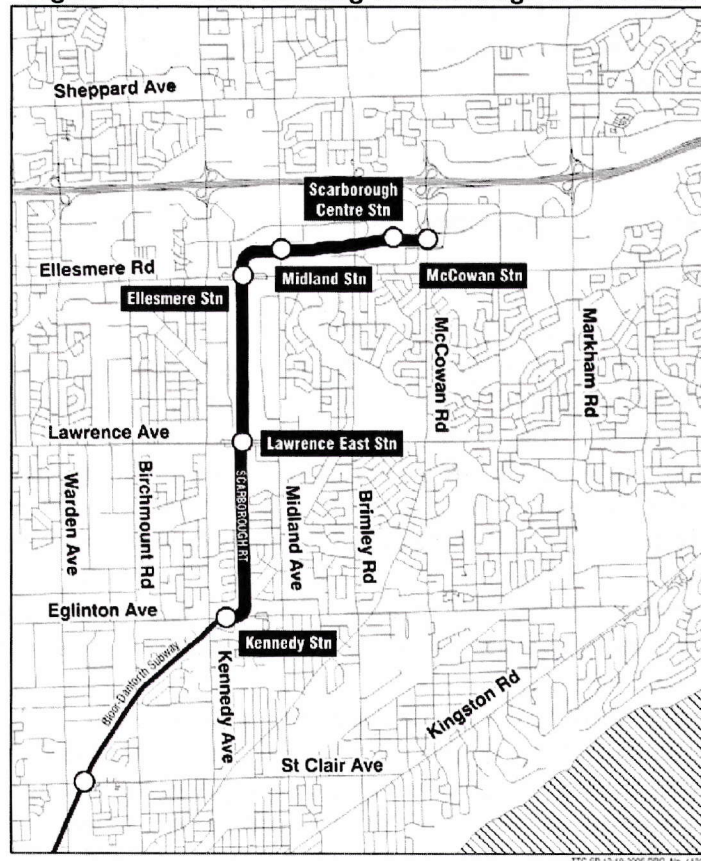
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Summary

Background

The Scarborough RT which operates between Kennedy Station on the Bloor-Danforth subway and McCowan Station, presently carries about 42,000 passengers daily. Most of these passengers transfer to and from the Bloor-Danforth subway and are required to traverse three levels at Kennedy Station. Although there are four intermediate stops on this line, as shown in Figure S.1, the main focus of the service has always been to support land development and intensification in the general vicinity of the Scarborough City Centre and to act as a continuation of the Bloor-Danforth subway, thereby providing improved access to downtown Toronto.

Figure S.1 – The Existing Scarborough RT Service



During peak periods, the Scarborough RT service operates every 3 minutes and 30 seconds carrying about 4,000 persons per hour in the peak direction. Service is overcrowded because the existing fleet of 28 vehicles is insufficient to offer higher-frequency.

The current fleet, acquired for the opening of service in 1985, is nearing the end of its economic life and, although these vehicles could probably be maintained for another eight or nine years, there is a clearly a need to acquire additional vehicles as quickly as possible

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to meet the present shortfall in capacity and to expand capacity to meet estimates of future travel demand.

Vehicles compatible with the current operation, however, are no longer manufactured and although “custom” vehicles (referred to as Mark IIA) could be procured, there would be a considerable capital cost premium per passenger. Longer, modern (Mark II) vehicles, which have lower capital costs per passenger, are now in production (and used in Vancouver). These Mark II vehicles, however, cannot operate on the curve approaching Kennedy Station.

Purpose of the Study

The main purpose of this Strategic Planning Study is to develop a plan both for replacing existing vehicles before the current fleet reaches the end of its useful service life, and for expanding capacity in the Scarborough RT corridor. Moreover, the main intention is to recommend a service option that provides service that is comparable to or better than the present Scarborough RT service, and which provides adequate capacity to meet projected future travel demand in the corridor.

Alternatives

In developing alternatives for upgrading service in the Scarborough RT corridor, the following should be noted:

- TTC policies place capital needs for maintenance and rehabilitation (“state of good repair”) ahead of capital needs for system expansion. Maintaining rapid transit service in the Scarborough RT corridor is part of the TTC’s “state-of-good-repair”,
- The transfer between the Scarborough RT and the Bloor-Danforth subway at Kennedy Station is poor from a customer service perspective, and there is considerable user dissatisfaction, particularly in view of the fact that about 75 percent of current passengers already transfer between feeder bus services and the Scarborough RT,
- The City of Toronto Official Plan calls for considerable intensification of population and employment in northeast Scarborough, notably in the general area of the Scarborough City Centre,
- The TTC *Ridership Growth Strategy*, prepared in response to the City’s Official Plan, designates a number of corridors within the study area for “higher order” transit (basically, service that is better than surface operation in mixed traffic),
- There is strong interest within the City of Toronto for considering a network of light rail transit (LRT) as a less expensive alternative to continued subway expansion,
- On the basis of the *Rapid Transit Expansion Study*, the TTC has formally established extensions of the Spadina and Sheppard subways as the highest priority capital needs for system expansion,
- Environmental assessments have been accepted, and “preferred” alignments designated for an extension of the Sheppard subway from Don Mills Road to the Scarborough City Centre, as well as for an extension of the existing Scarborough RT technology to Malvern (Markham Road and Sheppard Avenue), and

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- Public consultation and information sessions have raised the profile of transit needs within Scarborough and have generated considerable support for replacing the existing service with a subway extension.

The following potential alternatives were reviewed in this study:

- 1) Acquisition of replacement Scarborough RT vehicles,
- 2) Conversion of the existing route to a bus rapid service (BRT),
- 3) Conversion of the existing route to a Light Rail service (LRT),
- 4) Conversion of the existing route to an extension of the Bloor-Danforth subway,
- 5) BRT service on surrounding streets,
- 6) LRT service on surrounding streets, and
- 7) Extension of the Bloor-Danforth subway on a completely separate alignment.

Future Travel Demand

Alternatives for increasing capacity and improving service in the Scarborough RT corridor each have different implications for likely ridership within the corridor itself. Forecast ridership, of course, is one of the main determinants of required performance for the future Scarborough RT, most notably with respect to design capacity.

Ridership projections for the year 2021, the year for which Official Plan projections of growth in population and employment are available, derive principally from:

- projections of population and employment distributions (that is, land use) within the areas affected by the alternatives being considered,
- characteristics of alternative transportation facilities and networks that could be implemented, and
- the use of widely accepted City and TTC forecasting methods to predict ridership on specific transit facilities.

2021 forecasts were prepared for seven different scenarios involving various combinations of transit technology for Sheppard Avenue, the Scarborough RT, and the extension to Malvern. The base network assumes no other rapid transit improvements are made other than re-equipping the existing Scarborough RT.

Results are tabulated in Table S.1. The first row can be considered as the “base” case, that is, the situation in which there are no significant changes in transit service within the study area other than improvements to the Scarborough RT itself.

Figure S.1 shows a range the forecasts for three of the scenarios, namely, the base, intermediate (extensive surface transit priority) and full subway scenarios. Estimates have also been extrapolated to 2031 in order to provide a general picture of likely ridership over the next 25 years.

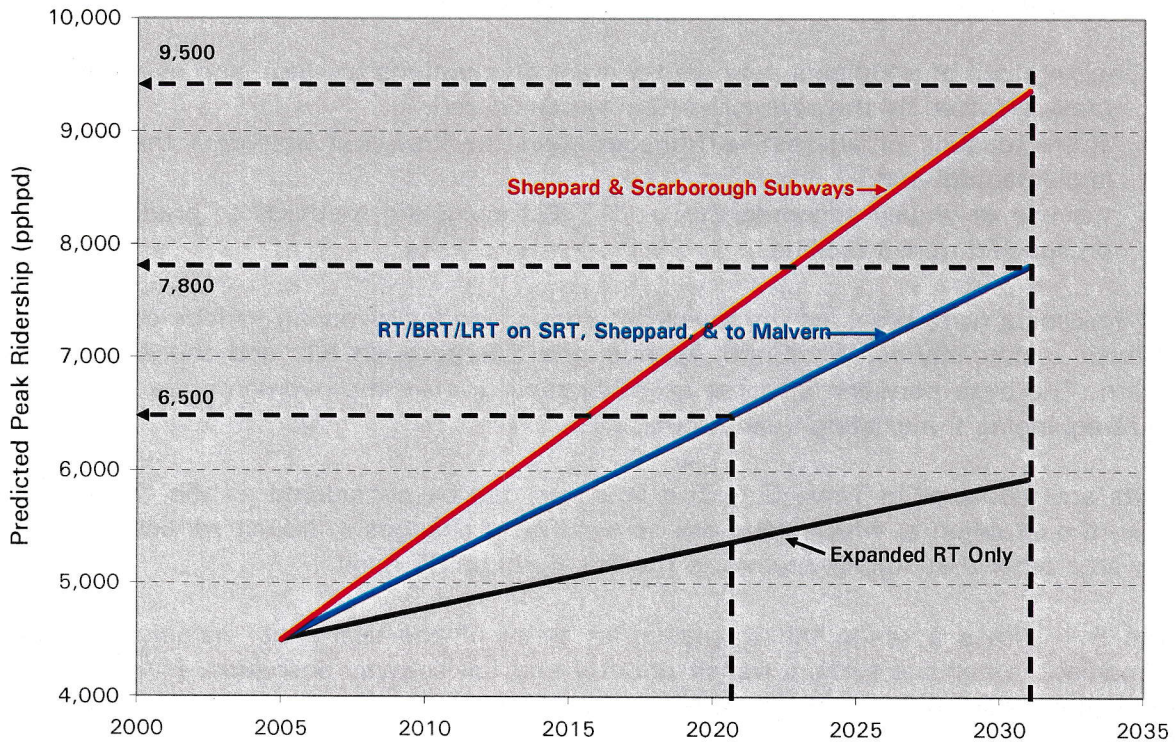
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Table S.1 – Summary of Scarborough RT Ridership Forecasts for 2021

Network	Technology Assumptions			SRT Corridor Ridership
	Scarborough RT Corridor	Sheppard Corridor	Malvern Extension	Maximum Passenger Capacity
1	RT	no change	none	5,400
2	RT/BRT/LRT	RT/BRT/LRT	none	5,700
3	RT/BRT/LRT	no change	RT/BRT/LRT	6,400
4	RT/BRT/LRT	Subway	none	5,500
5	RT/BRT/LRT	RT/BRT/LRT	RT/BRT/LRT	6,500
6	Subway	no change	none	6,700
7	Subway	Subway	BRT	7,500

The three examples shown in Figure S.1 essentially estimate what ridership would be if there were no capacity limitations due to insufficient vehicles. Current demand is about 4,500 passengers per hour in the peak direction (pphpd), about 500 more than can actually be carried with the existing fleet of vehicles.

Figure S.1 – The Range of Design Capacity Requirements



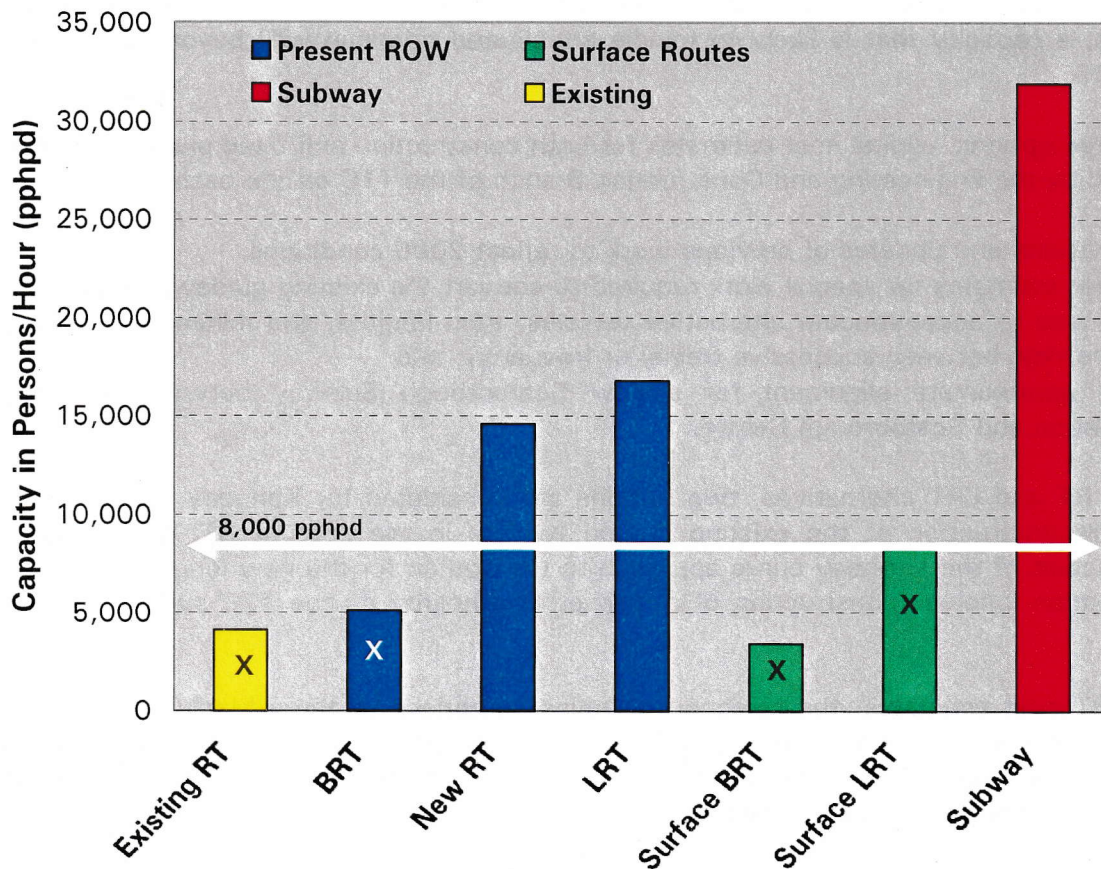
The most important conclusion to be drawn from these forecasts concerns the magnitude of future demand and resulting capacity requirements. Excluding the alternative that involves construction of both the Sheppard and Scarborough subways, where capacity is not an issue, the remaining 2021 estimates, based on the City’s projected employment and population for the Scarborough RT market, suggest a capacity requirement of less than 7,000 pphpd. In practical terms, prudent planning that allows for growth beyond 2021 suggests that a capacity of between 7,500 and 8,000 pphpd appears appropriate.

Preliminary Screening

For purposes of developing a shorter list of Scarborough RT upgrade alternatives for more detailed evaluation, capacity and level of service (quality) criteria are used as the basis of preliminary screening.

Figure S.2 compares capacities for alternative Scarborough RT corridor alternatives in relation to the estimated capacity requirement of about 8,000 pphpd. “Existing” capacity assumes the current maximum frequency of service (17 trains per hour).

Figure S.2 – Potential Capacities for Scarborough RT Alternatives



These comparisons suggest that neither surface BRT nor conversion of the current Scarborough RT guideway to BRT are likely to provide adequate capacity. Maintaining the

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existing infrastructure and only increasing the size of the vehicle fleet also does not pass the capacity screen.

With respect to quality of service, the operative word in Scarborough RT is “rapid”. Thus, the second “screen” is that the alternative must be at least as rapid (and reliable) as the current service. That screen, more or less, rules out any serious consideration of surface BRT or LRT on surrounding streets as an alternative to the level of service now provided by the Scarborough RT.

As a result, three main alternatives were retained for further analysis, namely:

- The acquisition of new current technology vehicles,
- Conversion of the Scarborough RT guideway to LRT, and
- Replacement of the current service by an extension of the Bloor-Danforth subway.

Cost Estimates

Costs are presented for only the three alternatives which remained after the preliminary screening process. For Scarborough RT and LRT technologies on the existing route, a one-way design capacity of about 8,000 passengers per hour has been used for capital estimates, a capacity that is likely to handle anticipated ridership well beyond 2021 and even 2031.

For all three options, capital cost estimates for both construction and fixed plant have been developed by the Engineering and Construction Branch of the TTC on the basis of:

- revisions and updates of previous work to reflect 2006 conditions,
- new estimates for special work required to convert the existing guideway and right-of-way to accommodate alternative vehicles, train lengths, and minimum headway (the time between successive trains) or frequency, and
- an approximate alignment for a new Scarborough Subway between Kennedy Station and Scarborough Centre.

For both RT and LRT alternatives, two options are considered for Kennedy Station. One involves reconstruction of the existing station (which, in the case of RT, also requires reconstruction of the Kennedy curve approach to the station for the new longer cars). The second option involves construction of a new station nearby on the TTC surface parking lot.

For the RT cost estimates, the selection of trains comprised of three Mark II cars and a relocated Kennedy Station results in the lowest total construction and vehicle capital investment. For the LRT alternative, the lowest capital investment involves two-car trains and modifications to the existing Kennedy Station.

Subway cost estimates are based on the route shown in Figure S.3, which provides only one intermediate station between the Kennedy Station and Scarborough Centre Station and

eliminates, as well, the existing McCowan Station. (Conversion of the existing Scarborough RT to subway does not appear to be either practical or cost-effective.) Figure S.4 summarize costs for the RT, LRT, and Subway alternatives. For both RT and LRT, capital costs are for a design capacity of approximately 8,000 pphpd (the 2031 estimate).

Figure S.3 – Possible Subway Corridor

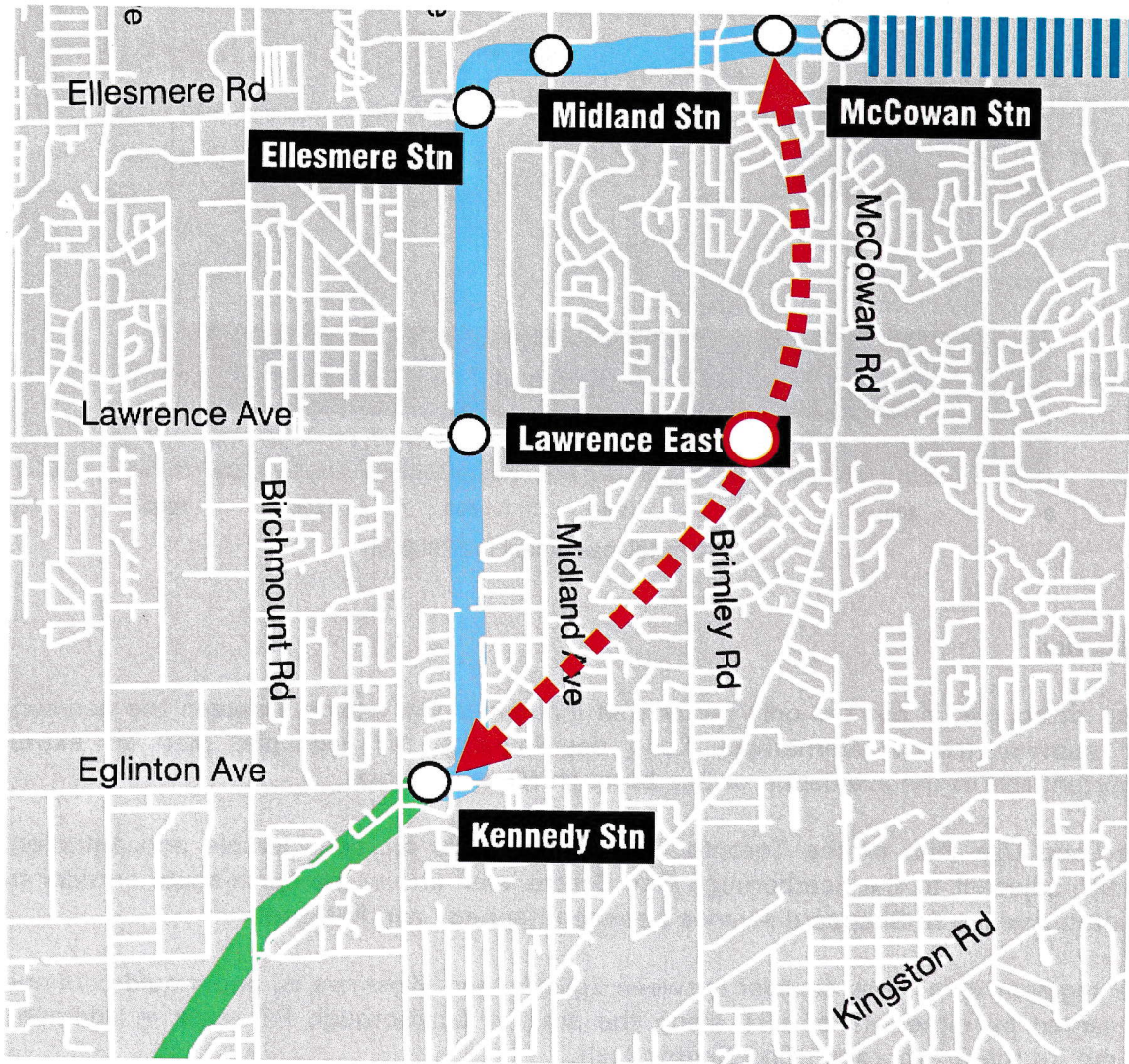
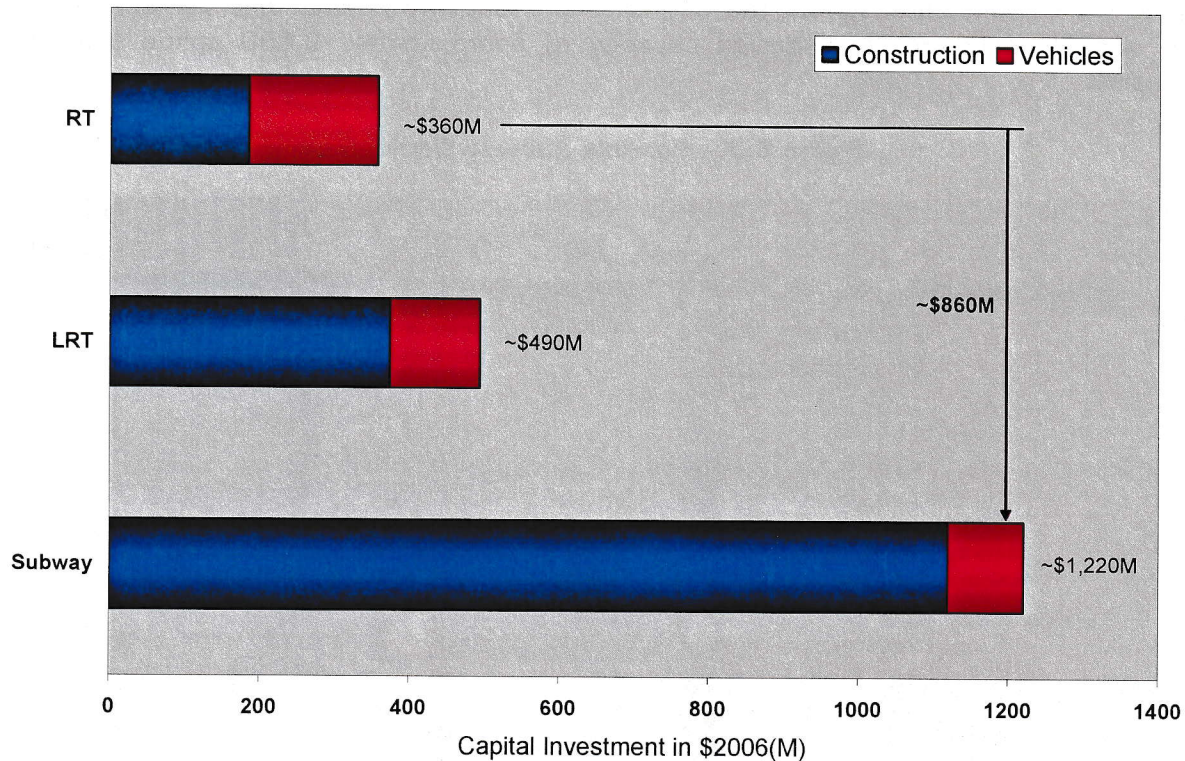


Figure S.4 – Comparative Capital Costs for 2031 Design capacity in 2006\$



Evaluation

Cost, of course, is not the only factor that influences the choice between the non-subway and subway transit alternatives. Land use impacts, for example, play an extremely important role in the evaluation of Scarborough RT alternatives.

The Land Use Plan of the Toronto Official Plan calls for considerable concentration of growth adjacent to the Scarborough City Centre itself and in the north-south corridor from Eglinton Avenue to Sheppard Avenue between Kennedy and Midland.

The segment within this corridor between Eglinton and Ellesmere is, and would continue to be served by either RT or LRT along the present Scarborough RT route in addition, of course, to the Scarborough City Centre itself.

In the case of the subway alternative, even better transit access would be provided to Scarborough City Centre. However, the route bypasses growth opportunities in the Kennedy-Midland corridor and passes through areas largely designated as "neighbourhoods" in the land use plan. Thus, opportunities for development and intensification between Kennedy Station and Scarborough Centre Station are more limited than in the case of either LRT or RT service in the existing Scarborough RT corridor. Moreover, the proposed subway route offers less service to the mixed land use proposed for the Ellesmere/McCowan area.

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In addition, if, as discussed in Section 7.5, selection of a Scarborough subway were to significantly delay the timing of rapid transit improvements (subway or otherwise) within the Sheppard corridor, other development opportunities and growth may be lost or delayed. Both corridors enhance development potential within the Scarborough Centre. However, development in areas on Sheppard Avenue bounded by the Don Valley Parkway and Victoria Park, as well as areas bounded by Warden and Midland would, at the very least, be delayed considerably.

To place these development alternatives in perspective, Figure S.5 compares Official Plan growth estimates for residential development and employment by corridor. For each corridor, the estimates are *net* of growth within the Scarborough Centre which is common to all corridors. As shown, viewed on a total corridor basis, the Sheppard subway extension serves a considerably larger potential growth in both population and employment than the Scarborough subway corridor.

Finally, large capital cost differences between the subway and non-subway alternatives for the Scarborough RT provide an opportunity to develop a network of higher-order transit services throughout Scarborough that would cost considerably less than building a Scarborough subway.

For purposes of illustration, two cases can be considered.

The first considers a Scarborough RT or LRT alternative as the first stage of an extensive network of higher order surface transit priority elsewhere in Scarborough. The second considers a Scarborough RT or LRT alternative as the first stage of an investment package that includes a connection to the terminal of the Sheppard subway (either existing or extended, perhaps to Victoria Park).

For example, selecting RT technology for the Scarborough RT and building an additional 20 km of higher order transit identified in the *Ridership Growth Strategy* would involve considerably less capital investment than replacing the Scarborough RT with a Scarborough Subway.

The main point is that for either the RT or LRT alternatives, significant lengths of additional, higher order transit could be provided well below the capital cost of the Scarborough subway alternative alone.

A summary evaluation is provided in Table S.2.

Figure S.5 – Comparison of 2001 to 2021 Official Plan Growth by Corridor

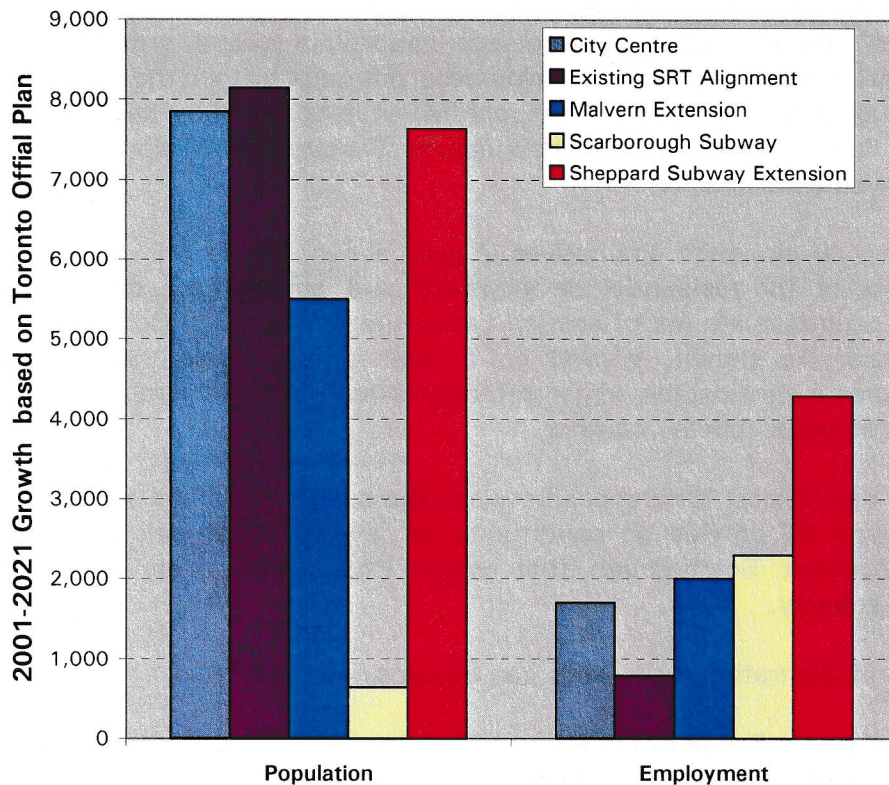


Table S.2 – Summary Evaluation of Scarborough RT Corridor Alternatives

Measure	Current RT	LRT	Subway
Stations	No change	No change	Eliminates: McCowan, Midland and Ellesmere
Support for Scarborough Centre	Good	Good	Superior (depending upon impact on Sheppard Corridor)
Capital Cost	\$360M	\$490M	\$1,220M
Resources available for other transit initiatives	Significant	Significant	None
Service Disruption	8 months	36 months	Uncertain
Early Capacity Increase	Yes	No	No
Implementation Risk	Low	High	Very high
Long Term Capacity	Meets needs	Meets needs	Exceeds needs
Transfer at Kennedy Station	Can be improved	Can be improved	Not required
Expansion Potential	Limited	Most Opportunities	Constrained by Resources
Stated Public Preferences	Low	Low	High

Conclusions

The main findings of this study are summarized in the brief analysis of strengths, weaknesses, opportunities, and threats provided in Table S.3. The key conclusions are as follows:

1. Treated in isolation of system wide implications, infrastructure modification in combination with the acquisition of an expanded fleet of new, longer, more modern RT vehicles similar to those used in Vancouver, represents the most cost effective solution for meeting transit needs within the existing Scarborough RT corridor, with minimum service disruption and with the greatest flexibility to provide near term capacity increases.
2. For RT technology, minimum total cost and minimum disruption to service due to construction can be achieved by the acquisition of these Mark II vehicles and construction of a new Kennedy Station in a location that eliminates the present curvature problem.
3. The RT technology still leaves the TTC with a unique technology that, due to widely held perceptions in Toronto regarding the desirability of the technology itself (despite successful applications throughout Vancouver and elsewhere), probably has less potential for network expansion (other than to Malvern in the protected right-of-way) than a network of LRT and surface, streetcar based, transit priority services on arterial roads.
4. With higher capital investment and a considerably longer disruption of service due to construction, conversion of the existing Scarborough RT to a multiple unit LRT technology offers greater potential for overall system expansion, consistent with the transit priority goals reflected in the City of Toronto's *Official Plan*, the TTC's *Ridership Growth Strategy* and the joint TTC/City *Building a Transit City* plan
5. There is considerable risk, however, that a decision to proceed with the higher cost LRT alternative will not be accompanied by a serious commitment to build on this technology to expand the surface network of right-of-ways.
6. For either the RT or LRT technologies, the inconvenient multi-level transfer between the subway and the Scarborough RT can likely be improved through relocation of the elevated Kennedy Station to a new surface location. There are other alternatives that may provide direct access to the subway platform, but they have not been analyzed in this study.
7. There is a need for further analysis of the specific network opportunities and their capital requirements that could be combined with either an RT or LRT technology in the Scarborough RT corridor as a single integrated project
8. As compared to the subway alternative, which would require almost an immediate decision to proceed if unacceptable disruption to service is to be avoided, there is

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a window of opportunity, over the next year or so, to further refine the RT and LRT technology alternatives within an analysis of realistic integrated packages of system expansion that would be possible at considerably less total capital investment than required for a Scarborough subway.

9. On the basis of ridership forecasts and preliminary cost estimates, replacement of the existing Scarborough RT by a new subway is not a cost effective solution that can be justified on technical grounds.
10. In the event City Council adopts the subway alternative, if the disruption of rapid transit service within the Scarborough RT corridor is to be kept within reasonable limits, there are serious timing issues that would undoubtedly affect implementation of the Sheppard subway and possibly a number of other transit right-of-way and other initiatives. If the subway alternative is selected, there is an immediate need to undertake an assessment of both the likelihood of funding, as well as realistic timing relative to other subway priorities previously identified by the TTC and reflected in the Minister of Transport's recent announcements pertaining to the Spadina subway extension to the Vaughan Corporate Centre.
11. In specific terms, allowing approximately nine years for an environmental assessment, detailed engineering, contracting, construction, testing and acceptance, approval and funding for the subway alternative would have to be guaranteed no later than early in 2007 to enable opening of a new subway between 2016 and 2018.

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Table S.3 – Summary Conclusions on the Scarborough RT Alternatives

Alternative	Strengths	Weaknesses	Opportunities	Threats
RT	<p>Lowest total capital investment</p> <p>Greatest flexibility with respect to cash flows</p> <p>Minimum disruption of service due to construction</p> <p>Capacity increase can be advanced and expanded incrementally through joint operation of existing and new cars</p>	<p>Highest cost cars per passenger</p> <p>Least potential for network integration</p> <p>Retains need for special purpose maintenance of unique technology</p> <p>Still requires transfer at Kennedy</p> <p>Low public acceptance</p>	<p>EA for extension already approved</p> <p>Could be extended to the terminal of the Sheppard subway at lower cost than subway construction.</p> <p>Improved transfer at Kennedy Station</p> <p>Final decision can be delayed for 1 to 2 years while integrated networks are assessed.</p>	<p>Same vehicle procurement problem may arise in 25 years</p> <p>Little or no perceived improvement in service</p> <p>No guaranteed network expansion</p>
Conversion to LRT	<p>Similar to replacement streetcars</p> <p>Eliminates need for specialized vehicle maintenance</p> <p>Greatest potential for expansion as a surface priority network</p>	<p>Lengthy service disruption</p> <p>High construction costs (partly offset by lower vehicle costs)</p> <p>Capacity increase delayed</p> <p>Still requires transfer at Kennedy</p> <p>Low public acceptance</p>	<p>Could be extended to the terminal of the Sheppard subway at lower cost than subway construction</p> <p>Improved transfer at Kennedy Station</p> <p>Final decision can be delayed for 1 to 2 years while integrated networks are assessed.</p>	<p>Little or no perceived service improvement</p> <p>No guaranteed network expansion</p>
Subway	<p>Widest range of capacity potential</p> <p>No service disruption if decisions are made soon</p> <p>Eliminates transfers</p> <p>Greater localized land use Impacts at terminal stations</p> <p>Generally highest public acceptance</p>	<p>Very high construction costs and highest total cost</p> <p>Capacity increase delayed</p> <p>Eliminates 3 stations</p> <ul style="list-style-type: none"> • Ellesmere • Midland • McCowan <p>Probably delays greater land use benefits in the Sheppard corridor</p> <p>A final decision is required almost immediately to avoid unacceptable periods of service disruption</p>	<p>Integration with Sheppard subway</p>	<p>Under-utilized capacity</p> <p>Potential longest period of service disruption</p> <p>Likely to defer other subway investments (ie completion of the Sheppard Subway)</p>

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Recommendations

1. Approve, in principle, the upgrading of the Scarborough RT as soon as possible to accommodate larger, new-generation vehicles, and to provide increased service capacity, noting that:
 - Upgrading of the line is estimated to cost \$190M and will require that service be disrupted for up to eight months,
 - The purchase of new-generation RT vehicles to replace the existing fleet and accommodate forecast future demand is estimated to cost \$120M by 2015, and
 - An additional \$50M is required to accommodate additional forecast growth between 2015 and 2031.
2. Include funding for upgrading the Scarborough RT, as well as for the purchase of larger, new-generation RT vehicles in the 2007-2011 TTC Capital Budget.
3. Prepare an implementation and staging plan for upgrading of the Scarborough RT line to accommodate new-generation vehicles.
4. Undertake a study of potential expanded networks based on routes identified in the *Building a Transit City* plan in order to develop an *Integrated Rapid Transit Plan for Scarborough* that specifically addresses:
 - Extension of the Scarborough RT line to Sheppard Avenue and other possible corridors,
 - Surface Bus Rapid Transit or streetcar-based LRT lines on Kingston Road, Danforth Avenue, Eglinton Avenue, Sheppard Avenue, Markham Road, and the Finch Hydro Corridor, consistent with the City's Official Plan, and
 - Staged construction of the Sheppard Subway east from Don Mills Station.
5. Based on cost and risk considerations related to the likelihood of funding, as well as realistic timing relative to other subway priorities, eliminate replacement of the existing Scarborough RT service with a Scarborough subway as a viable or cost effective solution.