Submitted by Councillor Lee

PG33.12.7

Suburban

TORONTO'S ~~DOWNTOWN~~ RELIEF LINE

Brady Yauch
Executive Director and Economist of Consumer Policy Institute
(416) 964-9223 ext 236
bradyyauch@consumerpolicyinstitute.org
http://cpi.probeinternational.org

The City of Toronto is considering proposals to build a subway line – referred to as the Downtown Relief Line – to address various traffic congestion problems in the city. These proposals are counterproductive and based on three misunderstandings.

Misunderstanding #1: *The Downtown Relief Line needs to be built because more people are living downtown.*

Contrary to its name, the real reason for the Downtown Relief Line is increased ridership from the distant corners of the city and the surrounding suburbs to the downtown core during the busy morning commute. The TTC expects total public transit ridership into the downtown core to increase by 55% by 2031, but the source of that traffic is unevenly distributed, with trips from outside the city expected to grow by 83% over that time period, while trips from within Toronto will grow by just 17%. In short, the TTC's future capacity constraints on the Yonge-University subway line and Bloor-Yonge station are largely a result of growth in suburban, long-distance ridership.

Misunderstanding #2: *The Yonge-University subway line can't handle future ridership without building the Downtown Relief Line.*

According to estimates from the TTC, future ridership on the Yonge-University subway line will be handled through a better signalling system to allow more trains to run during rush hour and the introduction of new subway cars capable of moving more people. The Yonge subway line, designed to carry 26,000 people into the downtown core during the peak morning commute, currently moves 28,400. With a better signalling system and new cars, the TTC expects to increase capacity on the subway line by 45% to 38,000 passengers per hour – above the expected future ridership of 35,800.

Misunderstanding #3: *The Downtown Relief Line would be economic.*

Fare revenues from the Downtown Relief Line would likely never support its operating costs, let alone its capital costs, because even during the busiest travel periods the line is expected to operate at less than half of its total capacity. The Downtown Relief Line, with a best case scenario price tag of $3 billion and a worst-case of $8 billion, leaves the TTC's riders and taxpayers exposed to the risk of cost overruns and chronic operating deficits.

What the Yonge Line needs

The TTC's problem as it relates to the Yonge line is high demand during a very short period of time – the morning commute between 8:00 and 9:00 a.m. into the downtown core. The solution being proposed to this narrow problem is the construction of a multi-billion dollar subway line that – even during the busiest times – will be vastly underutilized. This high-cost solution, in turn, will require future fare increases, discouraging the future use of transit and leading to lower ridership.

A more targeted solution is needed. Other jurisdictions around the world use peak pricing to encourage commuters to travel at less busy times. In Melbourne, Australia, transit officials now offer free rides to those commuters who travel prior to the peak morning commute. The effect was to reduce peak ridership, obviating the need for expansion. The solution in Melbourne ended up benefiting transit riders in two ways: for some, their morning commute was free; for others, their morning commute was less crowded, but for all fare-payers and taxpayers, high capital and operating costs were avoided and people travelled more efficiently at lower cost than if the system had been expanded

Commuters in Toronto could expect to benefit from a similar approach.

I: EXECUTIVE SUMMARY

Contrary to its title, the proposed Downtown Relief Line (DRL) is not being built because there are more residents and increased transit ridership in Toronto's downtown core. The $3 billion – and counting – subway line is being proposed, largely, as a way to deal with growing long-distance ridership on the Yonge-University and Bloor-Danforth lines, as well as the regional commuter service GO Transit, and the impact this is having on the city's downtown transit infrastructure during the busy morning commute.

The DRL will require billions of dollars in capital costs and tens of millions of dollars in operating subsidies annually from the Toronto, Ontario and federal governments – and, ultimately, taxpayers. That money will likely be raised through greater-than-inflation increases in fares – which have more then doubled since the early 1990s while inflation has been about half of that – as well as higher property and other taxes. It will also go to support a subway line that will be nearly as underutilized as the controversial Scarborough subway.

Though the DRL is being built largely to accommodate riders originating in the outer rings of the TTC system and heading towards the downtown core, all riders will pay the cost of fare increases, while the benefits will be enjoyed by far fewer.

The intended benefits of the DRL can be achieved by other means that would save riders and taxpayers billions of dollars.

Consumer Policy Institute estimates that offering discounted fares in the hours before the peak morning commute – rather than building a new subway line – would save the agency billions of dollars in capital and operating costs. For example, even offering residents and TTC riders a free ride to the downtown core in the hours prior to peak morning commute, would save at least $1.5 billion over the next two decades compared to building even the shortest version of the DRL. Such savings would alleviate pressure to increase fares, which would be paid by all riders, while easing overcrowding at critical points in the transit system and ensure greater reliability.

The TTC is already finding ways to alleviate congestion on the Yonge subway line – with longer trains and a better signalling system. If the TTC were to also introduce targeted fare reductions, the peak morning commute and future growth would likely be accommodated without building the DRL.

We believe our proposal to reduce fares in the off-peak periods of travel – even to zero, in the most extreme scenario – is the best and most immediate solution. We also believe that the introduction of an electronic fare payment system over the next two years provides an excellent opportunity for the TTC to use fares as a way to address overcrowding. Doing so would entice those riders with more flexible schedules to change their travel patterns slightly – and receive a discount for doing so – and ease congestion on the entire system.

Building expensive new infrastructure which meets peak demand but remains underutilized off-peak, is an uneconomic and risky way to meet the needs of commuters and does so only at great expense to fare and taxpayers.

II: WHY IS THE DOWNTOWN RELIEF LINE BEING PROPOSED?

Overcrowding on the TTC during the peak morning and (to a lesser extent) evening travel periods is becoming the norm. The Yonge-University subway line is already at overcapacity for those riders travelling south along Yonge Street during the morning commute. According to the TTC, the Yonge subway line heading into the downtown core moves 28,400 people during the peak morning commute, <u>yet the capacity for that subway line is currently 26,000 people.</u>[1] (See Figure 1.)

Figure 1[2]:

Existing Rapid Transit Capacity Deficiencies, Inbound Travel to Downtown Core, AM Peak Hour

	Capacity	Inbound Demand	V/C	Inbound Deficiency
AM from NORTH				
University Subway	26,000	19,300	0.74	0
Yonge Subway (South of Bloor)	26,000	28,400	[redacted]	2,400
Barrie-Bradford GO	3,200	3,800	[redacted]	600
Richmond Hill GO	3,200	2,900	0.91	0
Stouffville GO	3,200	4,100	[redacted]	900
AM from WEST				
B-D Subway (west of Bathurst)	26,000	21,800	0.84	0
Georgetown GO	6,400	4,700	0.73	0
Milton GO	7,700	7,600	0.99	0
Lakeshore West GO	9,600	13,000	[redacted]	3,400
AM from EAST				
B-D Subway (east of Sherbourne)	26,000	25,900	0.99	0
Lakeshore East GO	9,600	12,100	[redacted]	2,500
TOTALS				
TOTAL from NORTH (South of Bloor)	61,600	58,500	0.95	0
TOTAL from WEST (Excluding BD)	23,700	25,300	[redacted]	1,600
TOTAL from EAST (Excluding BD)	9,600	12,100	[redacted]	2,500
TOTAL Inbound	**94,900**	**95,900**	[redacted]	**1,000**

Source: TTC and GO count data
PHF of 0.55 applied to TTC routes and 0.67 to GO Routes where required
Deficiency calculation based on demand minus capacity

---

[1] All figures from the TTC's Downtown Rapid Transit Expansion Study.
http://www.ttc.ca/PDF/About_the_TTC/DRTES_Final_Report_-_September_2012.pdf

[2] V/C/ is the volume to capacity ratio. In the case of the Yonge Subway that would be 28,400/26,000.

What's Being Done About It?

The TTC is currently upgrading its system in two ways to deal with these capacity constraints.

First, the TTC has ordered new "Toronto Rocket" trains that will increase passenger carrying capacity by 10% when fully introduced. The TTC expects the Yonge-University subway line to be completely converted to the new trains by 2015. It will then begin upgrading trains on the Bloor-Danforth line.

The TTC is also updating its antiquated signalling system on the Yonge-University subway line. The TTC says the new signalling system – which it calls Automatic Train Control – will shorten the time between arriving trains. Under this new system, a train will arrive every one minute and forty-five seconds – as opposed to the current time between trains of two minutes and twenty seconds – and will increase the capacity on that subway line by 30%. The TTC also says it may be possible to add another car to each train and further increase capacity by 10%, but admits this is not part of its current plans.

Cumulatively, the two upgrades will increase capacity on the subway line by 45% to 38,000 passengers per hour – exceeding expected future ridership.

Future Ridership and the Suburbs

Those upgrades – longer trains and better signalling – would accommodate the increase in ridership into and within the downtown core that the TTC and city planners expect over the next two decades. Specifically, by 2031, ridership is expected to grow to 35,800 per hour during the morning peak while these upgrades would give the TTC the capacity to accommodate a peak of 38,000 riders. (See Figure 2.)

Figure 2:

2031 Reference Network Rapid Transit Capacity Deficiencies, Inbound Travel to Downtown Core, AM Peak Hour

	Capacity	Inbound Demand	V/C	Inbound Deficiency
AM from NORTH				
University Subway	38,000	25,100	0.66	0
Yonge Subway	38,000	35,800	0.94	0
Barrie-Bradford GO	6,400	7,500	[redacted]	1,100
Richmond Hill GO	4,800	2,500	0.52	0
Stouffville GO	6,400	8,600	[redacted]	2,200
AM from WEST				
B-D Subway (west of Bathurst)	33,000	20,100	0.61	0
Georgetown GO	9,600	11,000	[redacted]	1,400
Milton GO	11,500	12,000	[redacted]	500
Lakeshore West GO	19,200	13,900	0.72	0
AM from EAST				
B-D Subway (east of Sherbourne)	33,000	31,400	0.95	0
Lakeshore East GO	14,400	21,200	[redacted]	6,800
TOTALS				
TOTAL from NORTH (South of Bloor)	93,600	79,500	0.85	3,300
TOTAL from WEST (Excluding BD)	40,300	36,900	0.92	1,900
TOTAL from EAST (Excluding BD)	14,400	21,200	[redacted]	6,800
TOTAL Inbound	**148,300**	**137,600**	**0.93**	**12,000**

Source: 2031 TTC Maditue Model
PHF of 0.55 applied to TTC routes and 2031 GO routes
Deficiency calculation based on demand minus capacity
Existing subway capacity based on 1000 persons per train, 30 trains per hour
GO capacity based on existing schedules, 160 persons per train-car, 10 car trains (12 on Milton)
Demand is adjusted for calibration of 2001 model against 2001 cordon counts

For all modes of public transit, including GO Transit and surface bus and streetcar routes, the TTC forecasts that transit demand into the downtown core will increase by 55% from 155,000 to 236,000 during the peak morning commute. Meanwhile, the number of residents living in the downtown core is expected to grow by 83% from 71,000 to 130,000.

Those figures lay the foundation from planners and proponents for the push to build the DRL.

In addition, advocates of the DRL argue that because more people will be living and working in the downtown core over the next two decades, more subway lines will be needed to move those workers and residents around the city, particularly during the busy morning commute.

Yet, on closer inspection, the Yonge subway line – even with the growth in suburban and urban ridership and employment in the downtown core – is expected to be below capacity in 2031 after the planned upgrades. The TTC forecasts that ridership on the Yonge subway line into the downtown core during the busiest hour in the morning will grow to 35,800 riders by 2031– or about 6% below peak capacity after the planned upgrades.

The TTC acknowledges that of the increased ridership in the downtown core over the next two decades, a large percentage of that increase will be coming from the suburbs, not from short-distance riders who both live and work downtown. The TTC expects ridership into the downtown core to increase by 55% in 2031, but the source of that traffic is unevenly distributed , with trips from outside the city expected to grow by 83%, while trips from within Toronto are expected to grow by just 17%.[3] In short, the TTC's capacity challenges moving forward are largely a result of a growth in suburban, long-distance ridership.

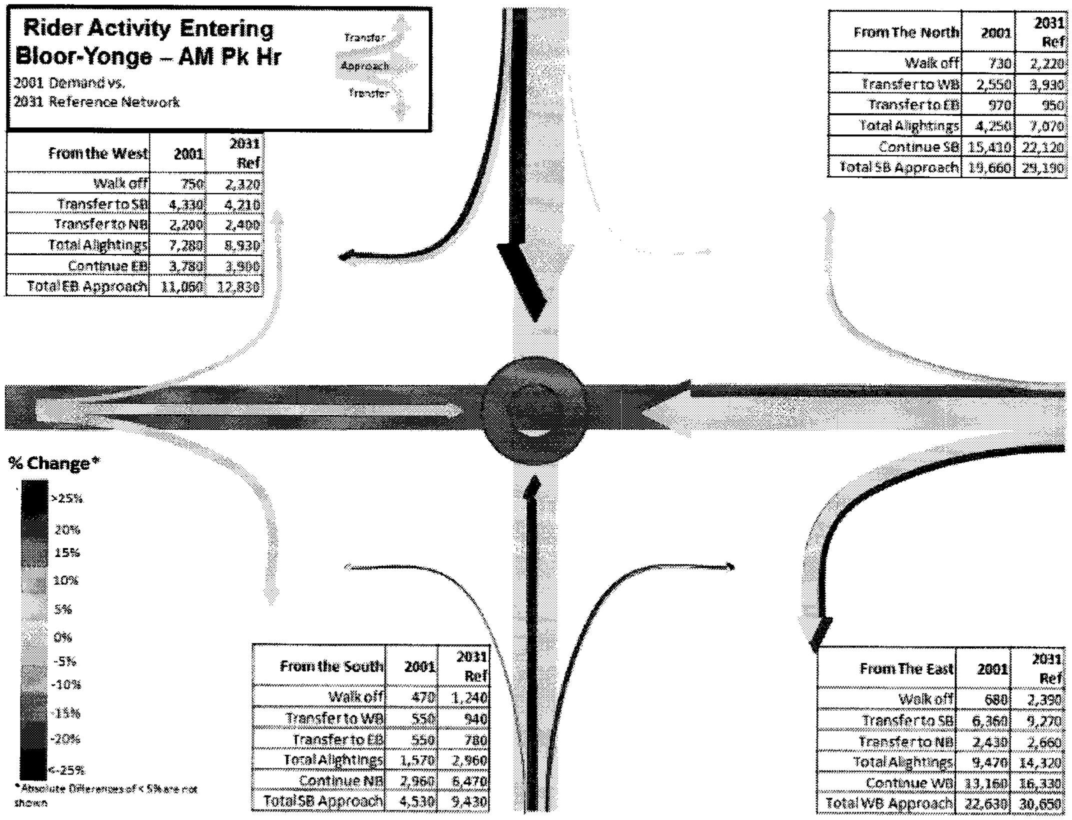
Capacity Constraints Will Linger At Some Stations

Two TTC subway stations that will continue to face capacity constraints are the Bloor-Yonge station, which is the main transfer point from riders coming from the Bloor-Danforth line and headed into the downtown core, and the TTC platform at Union Station.

The TTC forecasts that the number of passengers traveling through the Bloor-Yonge subway station will increase from 23,000 per hour today to 37,000 by 2031, or about a 60% increase. (See Figure 3.) It argues that such an increase will "compound existing concerns about the adequacy of Bloor-Yonge Station from a passenger safety perspective" and may have a negative impact on the ability of the new signalling system and new longer trains to add capacity. It is currently studying ways to improve the station's capacity.

[3] Downtown Raid Transit Expansion Study, Presentation, http://www.ttc.ca/PDF/About_the_TTC/DRTES/DRTES_Commission_Presentation.pdf

Figure 3:



From the West	2001	2031 Ref
Walk off	750	2,320
Transfer to SB	4,330	4,210
Transfer to NB	2,200	2,400
Total Alightings	7,280	8,930
Continue EB	3,780	3,900
Total EB Approach	11,060	12,830

From The North	2001	2031 Ref
Walk off	730	2,220
Transfer to WB	2,550	3,930
Transfer to EB	970	950
Total Alightings	4,250	7,070
Continue SB	15,410	22,120
Total SB Approach	19,660	29,190

From the South	2001	2031 Ref
Walk off	470	1,240
Transfer to WB	550	940
Transfer to EB	550	780
Total Alightings	1,570	2,960
Continue NB	2,960	6,470
Total SB Approach	4,530	9,430

From The East	2001	2031 Ref
Walk off	680	2,390
Transfer to SB	6,360	9,270
Transfer to NB	2,430	2,660
Total Alightings	9,470	14,320
Continue WB	13,160	16,330
Total WB Approach	22,630	30,650

At Union Station, the number of boardings is expected to "grow significantly," largely because of more GO Transit riders transferring to the Yonge-University subway line and, to a lesser extent, because of more residents living in the downtown core who are boarding the trains to go uptown and to other areas in the city. The TTC expects boardings at Union Station to triple by 2031 from 5,700 to 17,300.

Other stations in the downtown core, such as King, are also expected to see dramatic increases in boardings, which the TTC says "may exceed station capacities in the future during peak periods."

Making Matters Worse and Adding Fuel to DRL Fire

Potentially exacerbating those capacity concerns are calls to extend the Yonge subway line north into Richmond Hill. Metrolinx – the provincial transit agency – has made the project to extend the Yonge subway line north by as many as six stops one of its priority projects.[4]

---

[4] Yonge North Subway Extension, Metrolinx
http://www.metrolinx.com/en/docs/pdf/nextwave/Fact_Sheet_Yonge_North_Subway_EN.pdf

The TTC forecasts that, even with the upgrades to longer trains and better signalling, such an extension could potentially push the subway system beyond capacity within a decade. (See Figure 4.) It also argues that a Yonge subway extension will "aggravate concerns" about riders using the TTC, rather than GO Transit for long distance trips. Already some commuters take the TTC rather than GO Transit for their trip into the downtown core, largely the agency says, because the cost of a TTC token is cheaper.

Figure 4:

2031 Reference Network with Yonge Subway Extension - Rapid Transit Capacity Deficiencies, Inbound Travel to Downtown Core, AM Peak Hour

	Capacity	Inbound Demand	V/C	Inbound Deficiency
AM from NORTH				
University Subway	38,000	23,500	0.62	0
Yonge Subway	38,000	39,400	[redacted]	1,400
Barrie-Bradford GO	6,400	7,400	[redacted]	1,000
Richmond Hill GO	4,800	2,200	0.46	0
Stouffville GO	6,400	8,000	[redacted]	1,600
AM from WEST				
B-D Subway (west of Bathurst)	33,000	20,000	0.58	0
Georgetown GO	9,600	11,000	[redacted]	1,400
Milton GO	11,500	11,900	[redacted]	400
Lakeshore West GO	19,200	13,800	0.72	0
AM from EAST				
B-D Subway (east of Sherbourne)	33,000	31,000	0.94	0
Lakeshore East GO	14,400	20,800	[redacted]	6,400
TOTALS				
TOTAL from NORTH (South of Bloor)	93,600	80,500	0.86	4,000
TOTAL from WEST (Excluding BD)	40,300	36,700	0.91	1,800
TOTAL from EAST (Excluding BD)	14,400	20,800	[redacted]	6,400
TOTAL Inbound	**148,300**	**138,000**	**0.93**	**12,200**

Source: 2031 TTC Madituc Model
PHF of 0.55 applied to TTC routes and 2031 GO routes
Deficiency calculation based on demand minus capacity
Existing subway capacity based on 1000 persons per train, 30 trains per hour
GO capacity based on existing schedules, 160 persons per train-car, 10 car trains (12 on Milton)
Demand is adjusted for calibration of 2001 model against 2001 cordon counts

The Real Reason for the DRL

The DRL is being proposed as a way of dealing with a growing influx of suburban and other long distance riders who use the TTC to commute to jobs in the downtown core, as well as over capacity concerns on GO Transit, which may push more commuters to use the TTC. While ridership across the system is expected to grow in the coming decades, a majority of that ridership will be initiated in the suburbs. The capacity constraints on the Yonge subway line are largely a result of this increase in long-distance journeys – essentially the trains are already full by the time they reach outer edge of the downtown area.

The push by Metrolinx and other levels of government for extensions of the Yonge-subway line and, potentially, the Scarborough subway line will only exacerbate these capacity issues.

III: WHAT IS THE DRL?

There are a number of different plans for the DRL, but in its most likely form, it would be a subway that runs from Pape station (most likely) on the Bloor-Danforth line to the downtown core. The TTC is currently proposing three different plans for the DRL, each with different costs.

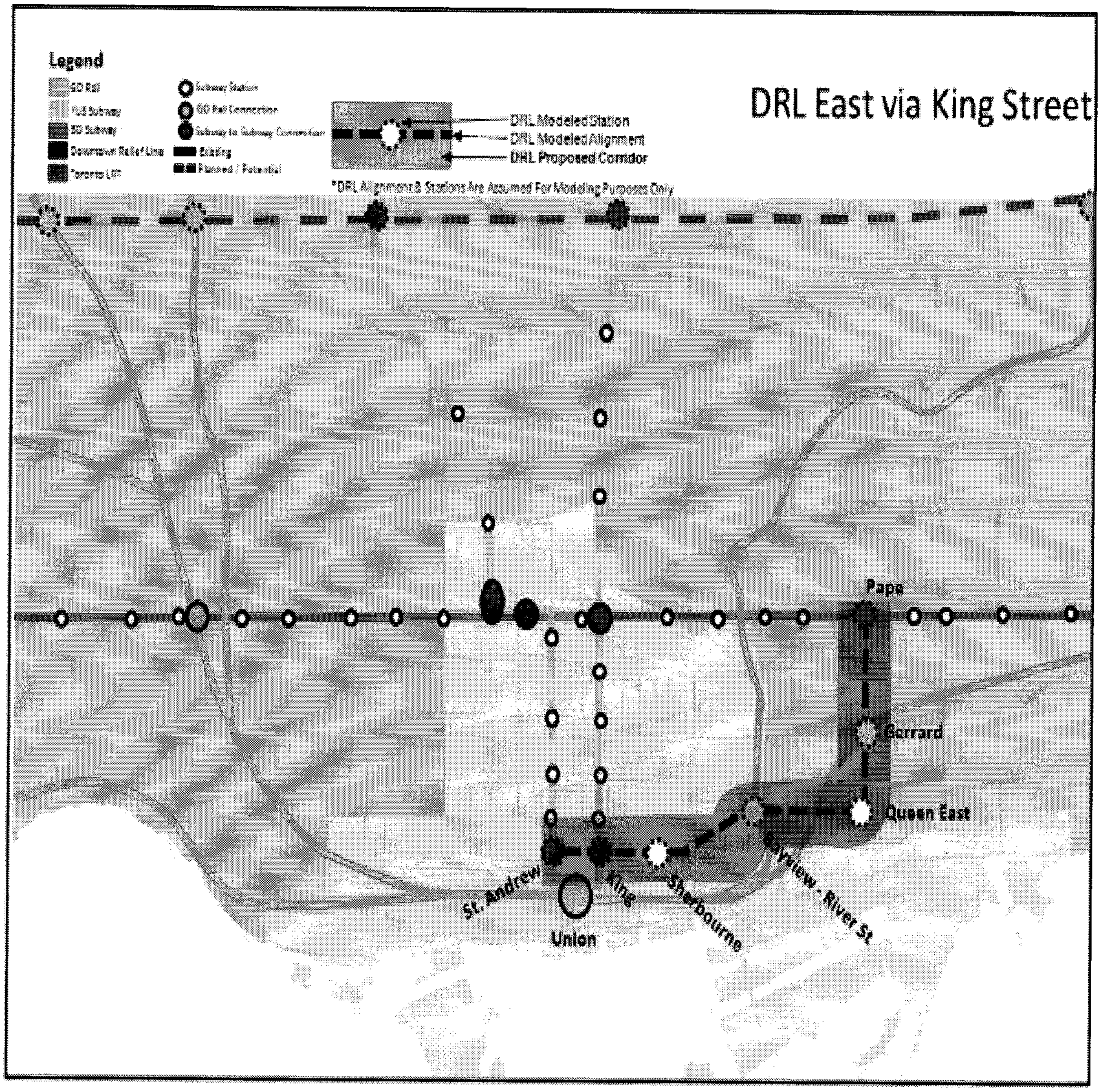
Option 1: DRL East via King Street

Figure 5:

Scenario	**Option 1: DRL East via King Street**
Headway Assumption	3 minutes
Speed Assumption	34 km/h from Pape Station to Sherbourne / King 25 km/h from Sherbourne / King to St Andrew Station
Fare Assumption	Existing Fare Structure
Stations (East to West)	Pape Station **Gerrard Street & Pape Avenue** Queen Street & Pape Avenue **Queen Street & River Street** King Street & Sherbourne Street King Station St Andrew Station

Note: Intermodal TTC / GO stations are shown in **bold** above.

Figure 6:


DRL East via King Street
Legend
Existing
DRL Modeled Station
DRL Modeled Alignment
DRL Proposed Corridor
Pape
Gerrard
Queen East
Bayview - River St
Sherbourne
King
St. Andrew
Union

Option 2A: DRL East and West along King Street

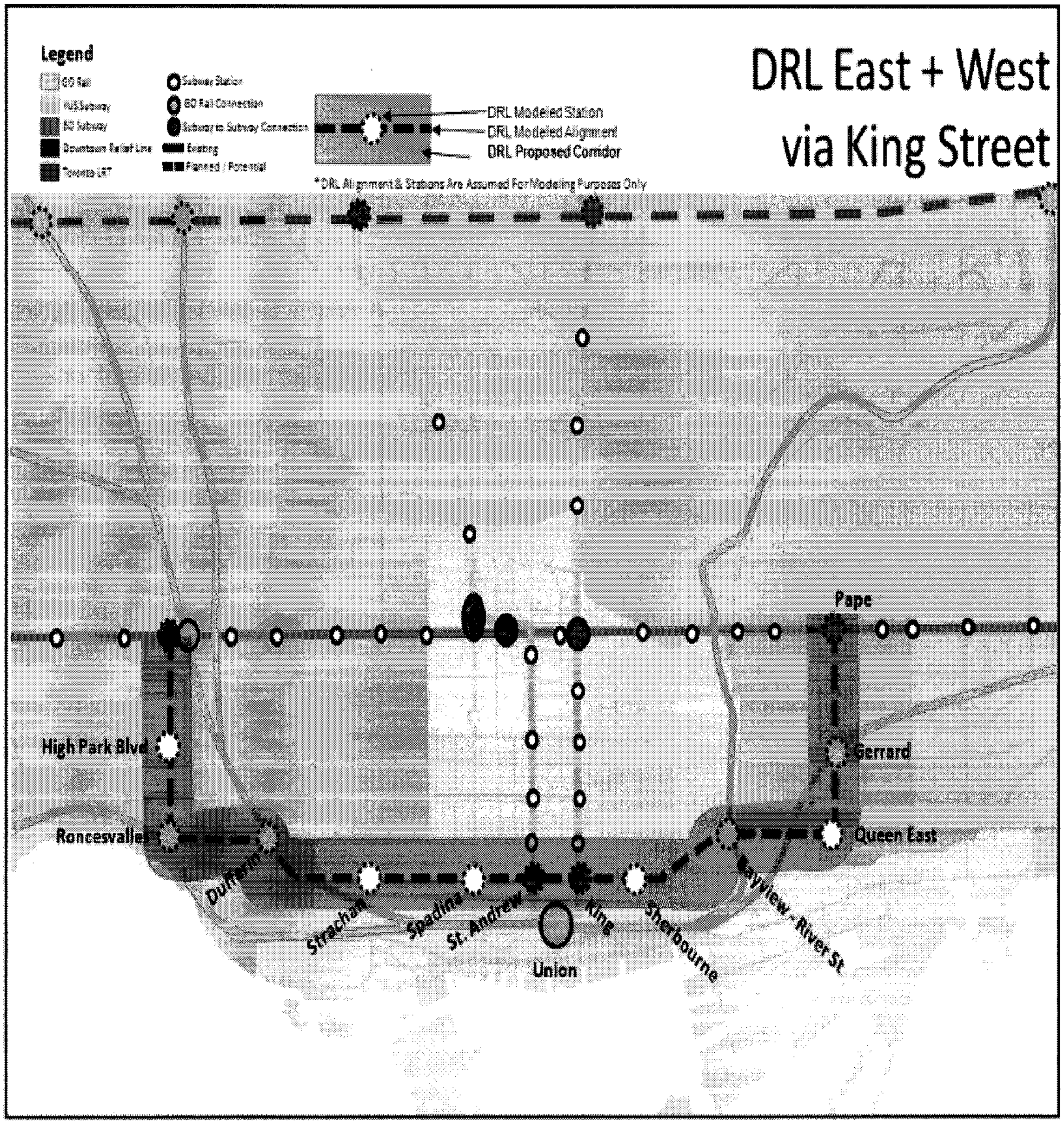
Figure 7:

DRL Option 2A Assumptions

Scenario	**Option 2A: DRL East + West via King Street**
Network	Reference network + Yonge Extension + Below
Headway Assumption	3 minutes
Speed Assumption	34 km/h from Pape Station to Sherbourne / King 25 km/h from Sherbourne / King to Spadina 34 km/h from Spadina to Dundas West Station
Fare Assumption	Existing Fare Structure
Stations (East to West)	Pape Station **Gerrard Street & Pape Avenue** Queen Street & Pape Avenue **Queen Street & River Street** King Street & Sherbourne Street King Station St Andrew Station King Street & Spadina Avenue King Street & Strachan Avenue **Queen Street & Dufferin Street** **Queen Street & Roncesvalles Avenue** High Park Boulevard & Roncesvalles Avenue Dundas West Station

Note: Intermodal TTC/GO stations are shown in **bold** above.

Figure 8:


DRL East + West
via King Street
Legend
Subway Station
Existing
DRL Modeled Station
DRL Modeled Alignment
DRL Proposed Corridor
*DRL Alignment & Stations Are Assumed For Modeling Purposes Only
Pape
High Park Blvd
Gerrard
Roncesvalles
Queen East
Dufferin
Strachan
Spadina
St. Andrew
King
Sherbourne
Bayview - River St
Union

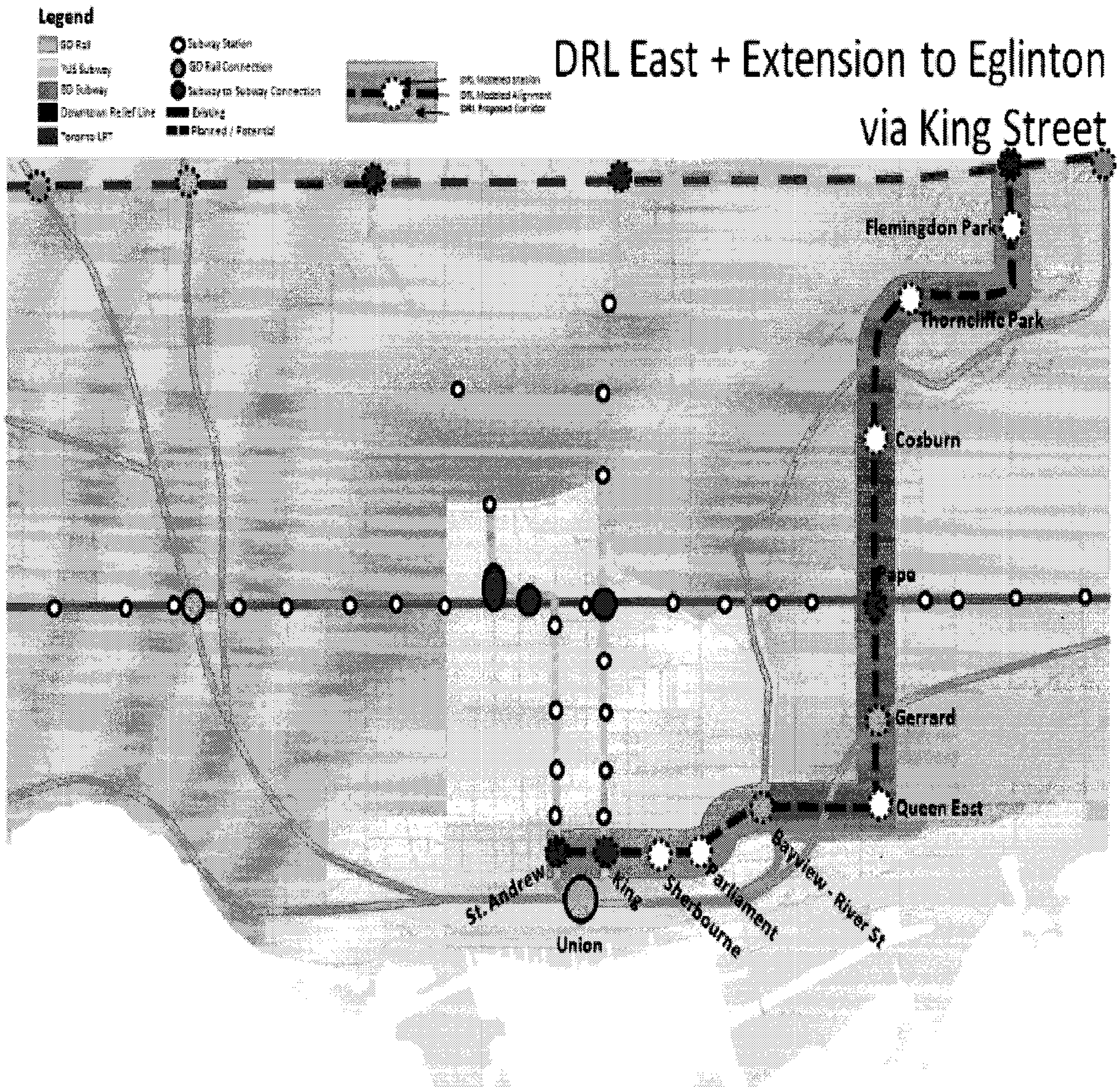
Option 2B: DRL East with Extension to Eglinton

Figure 9:

Scenario	**Option 2B: DRL East + Eglinton Extension via King Street**
Network	Reference network + Yonge Extension + Below
Headway Assumption	3 minutes
Speed Assumption	34 km/h from Eglinton / Don Mills Station to Parliament / King 25 km/h from Parliament / King to St. Andrew Station
Fare Assumption	Existing Fare Structure
Stations (East to West)	Eglinton Avenue & Don Mills Road Flemingdon Park (Don Mills Road between St. Dennis Drive & Gateway Boulevard) Thorncliffe Park (Thorncliffe Park Boulevard & Overlea Boulevard) Cosburn Avenue & Pape Avenue Pape Station **Gerrard Street & Pape Avenue** Queen Street & Pape Avenue **Queen Street & River Street** King Street & Sherbourne Street King Station St Andrew Station

Note: Intermodal TTC/GO stations are shown in **bold** above.

Figure 10:


Legend
Subway Station
GO Rail Connection
Subway to Subway Connection
Downtown Relief Line
Existing
Planned / Potential
DRL East + Extension to Eglinton
via King Street
Flemingdon Park
Thorncliffe Park
Cosburn
Pape
Gerrard
Queen East
Bayview - River St
Parliament
Sherbourne
King
St. Andrew
Union

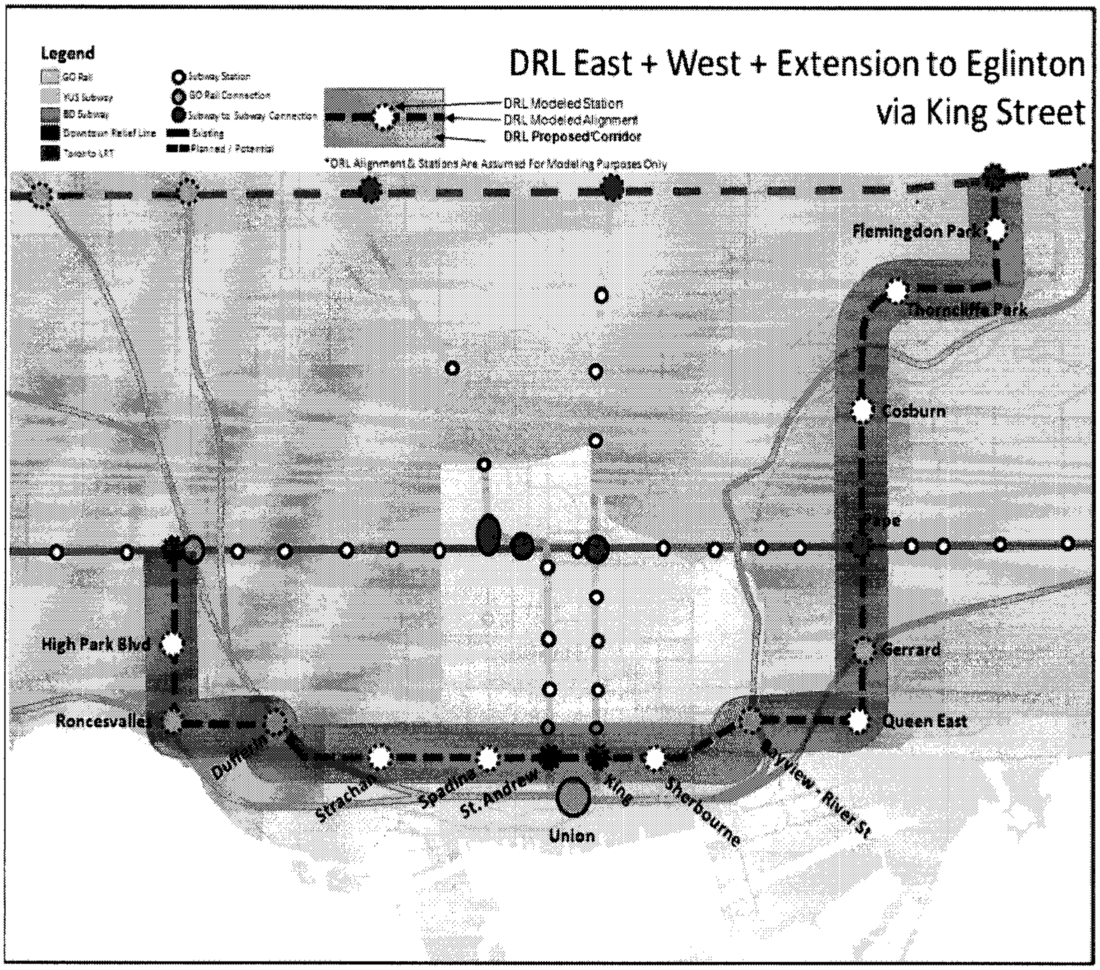
Option 3: DRL East and West with Extension to Eglinton

Figure 11:

Scenario	**Option 3: DRL East + West + Eglinton Extension via King Street**
Network	Reference network + Yonge Extension + Below
Headway Assumption	3 minutes
Speed Assumption	34 km/h from Eglinton / Don Mills Station to Parliament / King 25 km/h from Parliament / King to Bathurst / King 34 km/h from Bathurst / King to Dundas West Station
Fare Assumption	Existing Fare Structure
Stations (East to West)	Eglinton Avenue & Don Mills Road Flemingdon Park (Don Mills Road between St. Dennis Drive & Gateway Boulevard) Thorncliffe Park (Thorncliffe Park Boulevard & Overlea Boulevard) Cosburn Avenue & Pape Avenue Pape Station **Gerrard Street & Pape Avenue** Queen Street & Pape Avenue **Queen Street & River Street** King Street & Sherbourne Street King Station St Andrew Station King Street & Spadina Avenue King Street & Strachan Avenue **Queen Street & Dufferin Street** **Queen Street & Roncesvalles Avenue** High Park Boulevard & Roncesvalles Avenue Dundas West Station

Note: Intermodal TTC/GO stations are shown in **bold** above.

Figure 12:



What will each proposed DRL cost?

Depending on the length of the DRL, it will cost anywhere from $3 billion for the shortest route to as much as $8.2 billion for the longest route, making it one of the most expensive capital projects ever undertaken by the TTC. While those costs are preliminary, the TTC admits that for large infrastructure projects, costs could be 30% higher than original estimates. The current renovation project at Union Station, for example, was first projected to cost $640 million, but has since grown to $800 million. With such overruns, the shortest route could end up costing $4 billion, or more than $600 million per kilometre.

Using the shortest route – and depending on how frequently the trains run on the new subway line – the current 26,000 people per hour capacity or the 38,000 people per hour capacity with the new trains and signalling system – the DRL would run at just 45% or

30% of its capacity, respectively. For comparison, the controversial Scarborough subway will move more than 9,000 people per hour during the peak morning commute, but will have the capacity to move 30,000 – meaning it will be operating at a third of its total capacity.

This mismatch between capacity and actual usage will likely make it impossible for the DRL to cover either its operating or capital costs through fares. As a result, it will either drain resources from other parts of the transit system or require further subsidies from all municipal and provincial governments.

Figure 13:

Cost and Ridership Projections of the DRL[5]

	Cost	Peak Hour Ridership	Increase in Rapid Transit	Reduction of Yonge Subway Demand
1: DRL East via King Street	$3 billion	11,700	5%	4,700 (12%)
2A: DRL East and West along King Street	$5.9 billion	13,600	12%	4,800 (13%)
2B: DRL East with Extension to Eglinton	$5.3 billion	12,900	5%	5,400 (14%)
3: DRL East and West with Extension to Eglinton	$8.2 billion	14,900	12%	6,300 (17%)

IV: SHIFTING DEMAND THROUGH DISCOUNTED FARES

At the heart of the DRL proposal is an effort to limit overcapacity on one part of the subway system during the morning commute. While a subway that costs billions of dollars is being offered as the best solution to that problem (see Figure 12), other transit agencies have shown there are cheaper solutions that are easier to implement, more equitable and will have an immediate impact.

One solution that would not cost riders any more than they already pay, and indeed would cost some less, is to offer a discount – or even free rides – in the hours before or after the morning commute (shoulder periods). Research indicates that offering a discount during

---

[5] Relief Line Preliminary Benefits Case Analysis, Metrolinx
http://www.metrolinx.com/en/regionalplanning/projectevaluation/benefitscases/Preliminary_Benefits_Case-Relief_Line.pdf

the shoulder periods would be enough to keep TTC ridership well below capacity until 2031 and beyond.

Peak and off-peak fares are already commonly used by transit agencies around the world, with as many as 40% of all major urban public rail networks using them.[6]

One common rule of thumb in the transit industry is the Simpson-Curtin Rule,[7] which suggests that every 3% decrease in the price of a ticket will increase ridership by 1%. If this holds true, then a $1 reduction in off peak cash fares on the TTC – which would amount to a 33% decrease in cash fares – would produce an 11% increase in off-peak ridership.

Other evidence from transit agencies around the world shows that many riders are willing to change their commute times if offered a significant discount in off-peak fares. Focus groups undertaken by Transport in London, for example, reported that as many as 41% of travelers arriving during the peak morning commute were willing to switch their schedule, with many respondents saying they would prefer to arrive earlier.[8]

In the UK one survey said that 17% of travelers would be willing to commute earlier or later if offered a 20% discount in fares.

Another survey done with travelers across the UK showed that nearly one in five commuters who currently travel in the peak hours said they were 'very or fairly likely' to travel outside of busy travel periods if offered a 10% to 20% reduction in fares. They also said that the discounted fares made them feel that they were being rewarded for good behaviour, rather than being punished for 'bad behaviour.'[9]

In Sydney, Australia one survey[10] showed that 37% of commuters would travel 30 minutes earlier for a 10% discount on their fare, while 15% would travel 30 minutes later. If the fare discount was increased to 30%, then 52% of travellers would shift their commute 30 minutes earlier, while 25% would travel later.

One study,[11] which compiled an average from decades worth of studies on transit elasticities, showed that the overall fare elasticities of travelers during the peak commute over a long period of time (more than two years) was -0.4 to -0.6 (see table below). This means that every 10 percent increase in fares would result in a 4 to 6 percent decrease in ridership. While the elasticities in Figure 14 are for fare increases, research suggests that

---

[6] Spreading peak demand for urban rail through differential fare policy: A review of empirical evidence. Yulin Lie, Phil Charles.

[7] Fare Elasticity and Its Application to Forecasting Demand, The American Public Transit Association

[8] 'Edge of morning peak travel' – Research findings prepared for Passenger Focus by Consolidated, Transport for London

[9] 'Encouraging edge of morning peak travel' research findings and policy considerations. Transport for London

[10] Surveying Sydney rail commuters' willingness to change travel time. Liesel Henn, Neil Douglas and Keith Sloan.

[11] Transit Price Elasticities and Cross-Elasticities. Todd Litman

you can use the same figure for fare decreases. For example, if a 10% increase in fares produces a 5% decrease in ridership, the reverse would be true if there was a 10% reduction in fares – ridership would increase by 5%. Caution should be applied to calculations for elasticities for extreme fare changes (50% lower or higher), as they are less accurate.

The study also showed that riders were more willing to switch their schedules over a longer period of time, meaning sustained fare discounts are an effective way of altering travel times.

Fare Elasticities

The table below gives an estimate of transit elasticities compiled from a number of studies on the topic. The most important figure is the one related to peak travel. According to these figures, free travel in off-peak times could result in as much as 30% of travellers shifting their trip in the short term (1 to 2 years) from the peak period. If the TTC offered discounted fares – with $1 or 33% off the cash fare – then demand could be expected to shift by anywhere from 4.5% to 9%.

Figure 14[12]:

Transit ridership with respect to transit fares	Market Segment	Short Term (less than 2 years)	Long Term
	Overall	-0.2 to -0.5	-0.6 to -0.9
	Peak	-0.15 to -0.3	-0.4 to -0.6
	Off-Peak	-0.3 to -0.6	-0.8 to -0.1
	Suburban Commuters	-0.3 to -0.6	-0.8 to -0.1

Successful examples of discounted and free fares

Melbourne, Australia was experiencing a problem of over capacity during the morning commute on its regional trains running into the central business district. Because of these capacity issues, the city's transit agency was considering ordering new trains that would cost tens of millions of dollars. In an effort to find a cheaper way to solve the problem, the agency in 2008 tried something novel: It offered free rides to the downtown core for those riders traveling before 7:00 a.m.

In the wake of the new, free fares, research showed that 23% of riders travelling prior to 7:00 a.m. had shifted their travel from the peak period by an average of 42 minutes. [13] Peak demand on the rail system has dropped by as much as 1.5% in the months following

[12] See note 11.
[13] Design and Impact of a Scheme to Spread Peak Rail Demand Using Pre-Peak Free Fares. Graham Currie.

the new, free fare – accounting for as much as 3% of peak train capacity. In the medium term – over 1 to 2 years – take up of the "early-bird special" grew by 1.7%, while overall rail travel declined by 1.2%. Pushed out over many years, such growth would be substantial and offer significant help in easing over capacity during the peak hour.

Data from the project also suggests that longer distance travellers are more likely to change their travel patters and take advantage of the cheaper ticket. Transposing this experience to the TTC would have a dramatic effect, as an overwhelming majority of its growth is long distance riders.

When forecast out over multiple years the financial impacts for the Melbourne transit agency are positive (where the loss in revenue is less than buying new trains) or, in a worst case scenario, neutral (where the loss in revenue is equal to the cost of new trains). The difference in the two forecasts depends on how many travellers take up the early bird special over the next 30 years. Moving even a small number of passengers from the peak travel periods saved the agency millions of dollars each year by not having to purchase new trains and shifted enough riders out of the peak morning commute to handle capacity issues. Transit officials in Melbourne called the program a success.

The TTC would enjoy far higher economic benefits, as it is proposing building an entirely new subway line to handle peak demand, not just adding new trains. We also propose offering free rides in the hour immediately prior to the 8:00 a.m. peak commute, whereas in Melbourne they offered free rides only between 6:00 a.m. and 7:00 a.m.

In Singapore,[14] transit officials offered free rides before 7:45 a.m. to those commuters headed to 16 different subway stations in the downtown core. Those travellers arriving between 7:45 a.m. and 8:00 a.m. would receive 50 cents off of their fare.

The transit agency in Singapore also launched a trial offering riders "points" on their travel cards if they travelled outside of the busy 7:30 to 8:30 morning commute. Those points could be redeemed for prizes and cash rewards. Those who commuted outside of the morning rush received additional bonus points compared to riders in the peak period.

One person involved[15] in the program said that 10% of those participating in the trial had shifted their commutes away from rush hour.

In the U.S., both the Denver, Colorado, and Trenton, New Jersey, transit systems have offered free bus fares to entice riders to shift their commute to off-peak hours. In both

---

[14] Travel Early, Travel Free on the MRT, http://app.lta.gov.sg/apps/news/page.aspx?c=2&id=c3983784-2949-4f8d-9be7-d095e6663632

[15] Gaming the System to Beat Rush-Hour Traffic, Wall Street Journal, http://online.wsj.com/news/articles/SB10001424127887323997004578639802367960498

cases the transit agencies were able to reduce peak ridership as a percentage of total ridership from 50% to 30% and 68% and 55%, respectively[16].

Section V: HOW MUCH WILL IT COST?

Consumer Policy Institute (CPI) examined the cost to the TTC of offering discounted or free rides to commuters traveling outside of the peak morning commute. We did so by looking at the cost of lost revenue to the TTC between now and 2031 from lower fares and compared that to the cost of building the DRL. We present five different scenarios: a $1, $2, $2.70 and $3 discount to all travelers on the Yonge-University and Bloor-Danforth subway lines from when the subway system opens at 6:00 a.m. until the peak morning commute at 8:00 a.m. All our figures are based on estimated transit ridership, as the TTC does offer detailed data and did not respond to our requests.

Our fifth – and preferred – scenario involves a more targeted approach that will be possible once an electronic fare system is in place. Under this solution, we propose offering a $3 discount to riders travelling to the downtown core, while charging riders going in the opposite direction the full fare. In the other $3 discount scenario (in Figure 15) we assume that all riders traveling on the subway – regardless of where they are going – prior to the peak commute would enjoy a discount. With an electronic fare system that discount can be better targeted just to those riders traveling to the downtown core.

We also forecast a $2.70 and $3 fare discount as they present the full cost of a ride using tokens or paying cash, respectively.

The table below presents the results from our calculations (See the Appendix for a more detailed discussion of how we reached our conclusions.)

In the most extreme scenario – opening the gates to the Yonge-University and Bloor-Danforth subway lines for the two hours prior to the peak hour and a sustained change in behaviour by riders – the cost to the TTC due to lost revenue over the reference period (2014-2031) is just more than half of the cost of the shortest version of the DRL. If we assume that 1.5% of all peak riders annually shift their commute into the shoulder period or into other off-peak times, then ridership on the crowded Yonge subway line will be about 28,500 by 2031, or nearly identical to today's ridership.

With the TTC's new signalling system and longer trains – which could increase capacity to 38,000 riders per hour – the Yonge subway line would be well under capacity by 2031.

[16] Transit Pricing and Fares Traveler Response to Transportation System Changes. Brian E. McCollom and Richard H. Pratt. http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_rpt_95c12.pdf

Figure 15:

Cost of Offering Discounted Rides in Off-Peak Hours

Discount	Cost assuming 1% of peak riders shift commute annually from 2014 to 2031	Cost assuming 1.5% of peak riders shift commute annually from 2014 to 2031
$1	$574,640,848	$592,515,975
$2	$1,149,281,697	$1,185,031,949
$2.70	$1,551,530,290	$1,599,793,131
$3	$1,723,922,545	$1,777,547,924
CPI preferred solution[17]	$1,516,944,555	$1,567,872,172

From the table above, CPI estimates that the cost to the TTC of implementing reduced fares for the two hours before the peak travel period would be significantly less than building even the smallest version of the DRL, which would cost at least $3 billion.

In the table below, we present the savings to the TTC from each of the above options. Even with the most aggressive plan – offering free rides on all cash fares on the subway for two hours – the TTC would still be saving more than $1.2 billion over the next 17 years.

[17] Under our preferred solution, only those riders traveling to the downtown core would enjoy a discounted fare.

Figure 16:

Savings From Off-Peak Discounts Compared to DRL

	Savings from DRL East via King Street assuming 1% of peak riders shift commute annually from 2014 to 2031	Savings from DRL East via King Street assuming 1.5% of peak riders shift commute annually from 2014 to 2031
$1	$ 2,425,359,152	$ 2,407,484,025
$2	$ 1,850,718,303	$ 1,814,968,051
$2.70	$ 1,448,469,710	$ 1,400,206,869
$3	$ 1,276,077,455	$ 1,222,452,076
CPI preferred solution	$1,483,055,445	$1,432,127,828

Section VI: CONCLUSION

Our analysis shows that the TTC and Toronto fare and tax payers – and to a lesser extent Queens Park and Ottawa – could save billions of dollars by tackling the current and future capacity issues on the Yonge subway line and Bloor-Yonge station by modifying fares. Changing the fare structure has the added benefit of avoiding building an expensive subway through a dense area in the country's largest city – an endeavour that is risky and could be riddled with cost overruns.

Consumer Policy Institute understands that offering free rides to TTC commuters may seem far-fetched and unlikely. We used the most extreme example to illustrate the expense of building a new subway compared to the readily available cheaper alternatives to alleviating congestion during the morning commute. We believe that steeply discounted fares would be more than enough to shift small percentages of riders out of the peak morning commute over the next decade and beyond. The number of riders switching their commute may seem small at first, but pushed out over many years offer a real solution to the TTC's capacity concerns. And while those reduced fares will have a negative, short-term impact on the TTC's operating budget, they will have a positive impact on the TTC's long-term capital and operating budgets. The TTC could eventually use dynamic and distance-based fares (among other policies) as a way to sustain its operating costs.

The DRL would consistently run under-capacity, draining the transit agency's finances. The politicians would then have to make up losses from fare payers and taxpayers. If fares rise high enough, the transit system could go into a "death spiral" in which fare increases lead to reduced ridership and revenues. Taxpayers eventually have to foot the bill. Our solution avoids this problem.

APPENDIX:

Consumer Policy Institute made a number of assumptions in calculating the potential savings from scrapping the DRL and, instead, offering discounted fares to travelers outside of the peak morning commute.

First, we estimate the growth in subway commuters using the TTC's own projections laid out in its study on the DRL. We then make assumptions whether 1%, 1.5% and 5% of riders each year change their commute to outside of the peak hour, yet continue to maintain the increase in peak ridership assumptions made by the TTC. We eliminated the 5% option, as empirical research from other transit agencies showed that was unlikely to occur. We then take the difference between what the TTC forecasts for ridership and the number of riders we expect will change their commute and multiply this by 251 (for the number of business days each year) and the discount offered to those riders now commuting off-peak.

For example, if the TTC expected peak hour ridership on the Yonge subway line going south into the downtown core to be 28,792 in 2015, we would then assume 1% of riders would switch their commute if offered a $1 discount. This means that only 28,551 commuters would travel on the Yonge subway line going south during the morning commute. We then take the loss in revenue from those riders switching each day and multiply it by 251. We then do this for all of the other years going out to 2031.

But because the discount would be applied to all riders on the Yonge-University and Bloor-Danforth lines, we have to do a similar calculation for all riders that would switch their commute. In our preferred scenario we only offer the discount to riders going into the downtown core during the peak morning commute (similar to what Singapore does). Riders travelling in opposite directions would still pay the full fare.

We then also have to consider the riders already commuting prior to the peak morning commute and the loss in revenue that this discount would have on the TTC. Because the TTC doesn't offer any of its data – and didn't answer requests from Consumer Policy Institute – we assume that ridership for the two hours prior to the peak morning commute is the same as that during the morning commute.

We should stress that our forecasts are made on assumptions of ridership. The TTC does not offer detailed data on its ridership – including data such as how many riders board the subway each hour at individual stations.

We had to estimate the ridership on the subway from the limited TTC data that is available. For example, ridership going north on the Yonge subway line is taken from the TTC's study on the DRL, but ridership going north on the University line to Downsview station is not available. We assume ridership on both lines is the same – knowing that they are not – but we feel that this overestimates the cost to the TTC and allows for greater future ridership on the University line that is likely to occur because of the current extension to Vaughan. This means the savings could be higher than we estimate.

We also assume a discount in fares and ignore the potential for fares to increase. For example, we assume a $3 discount in fares would actually offer a free rider to commuters who pay cash. But we don't consider any fare increases between now and 2031 – even though that is likely. If fare increases do occur over that time period, then the $3 discount would no longer offer a free ride. To make our calculations simple, we only estimated the cost of the discount and avoided trying to time them to some future fare increases.

We also don't inflation adjust our savings over the forecast period. We didn't do so because we feel that the discounts can also be pegged to inflation and so would have limited impact on our study.

You can download the full excel model here.