

## Options to Expand the Current O-Train Service & to Provide Service on the Local VIA Route to Fallowfield – Technical Memo

One of the findings of the Mayor's Task Force on Transportation Report, as well as feedback received during the initial public consultations associated with the update to the City's Transportation Master Plan (TMP), has been the suggestion to use existing rail corridors to provide rapid transit services to a much greater extent. While a separate report has been prepared which reviews the overall Mayor's Task Force Report, this report deals specifically with the extension of the O-Train.

The suggestions generally fall into three groups of improvements:

- Develop a service on the existing VIA passenger rail corridor between Fallowfield and Train Stations;
- Extend the current 15-minute O-Train service south to Leitrim in the former CP Rail corridor; or,
- Branch the O-Train and extend it to serve Leitrim from one leg, and to Fallowfield along the VIA corridor to the southwest on the other leg.

The appeal of these corridors is the availability of a track that could be upgraded and used to provide additional capacity to move more commuters into and out of the downtown. While the success of the O-Train was built on this premise, the additional extensions are not as easily accomplished. The following sections outline some of the issues that will have to be solved to introduce these services.

The benefits of implementing expanded O-Train service on existing corridors need to be considered. The expanded service would:

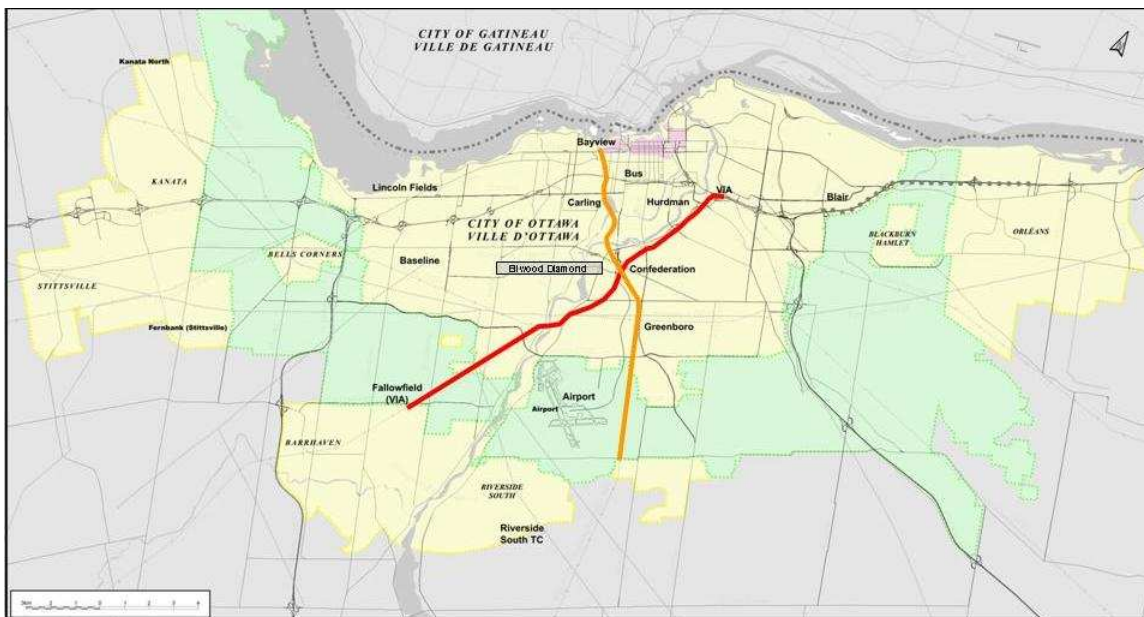
- Use the VIA Corridor to provide a relatively fast connection between Fallowfield and Train Stations for residents of Barrhaven,
- Provide an improved connection between Riverside South and the existing O-Train Stations for the new growth areas in Riverside South, and
- Potentially provide an interim solution way to draw passengers off the Southwest and Southeast Transitways, to relieve congestion during the conversion of the existing Transitway corridors to electric LRT.

The analysis conducted indicates that while agreements can be developed with VIA Rail and CN to use the existing passenger rail corridor out to Fallowfield Station, there are substantial infrastructure and regulatory issues to be overcome. The travel time benefits of service in the corridor, and the ridership that is likely to develop, does not appear to warrant its implementation. In addition, it appears that there are alternative construction sequences and options that avoid many of the potential delays associated with development of the LRT system in the core area which reduces the benefit of these alternate routes during the conversion phase.

The corridors are shown on Figure 1. The red line indicates the VIA Rail corridor between Fallowfield Station and the Train Station. The orange line indicates the O-Train and its potential extension south to Leitrim Road. Near the midpoint of the two lines is the Ellwood diamond where the two rail tracks cross each other.



Figure 1: VIA Rail Corridor and O-Train Corridor



## RAIL TRAFFIC ON THE CORRIDORS

### *VIA Route between the Fallowfield and Train Stations*

This section of single track is currently used by VIA Rail for their Montreal-Ottawa-Toronto services as outlined in Table 1, below. Any City of Ottawa transit service within this corridor would have to use equipment compatible with the mainline equipment used by VIA, or be safely separated from the VIA service through physical separations or a positive train control system. The cost of a positive train control system would properly be part of the transit project, and would have to be compatible with the CTC system in use already to control the movements of VIA trains.

The February 2008 VIA Rail schedule indicates that there are currently 14 weekday trains that operate over this segment. VIA trains would have priority over the track and would introduce scheduling problems for other services operating over this segment. The current train times are listed as follows:

Table 1: Train Times from the February 2008 VIA Schedule

Time <sup>(1)</sup>	Train Route	Train #
0600-0620	Ottawa to Toronto	41
0623-0650	Fallowfield to Montreal	30
0835-0857	Ottawa to Toronto	43
0901-0925	Fallowfield to Montreal	32
1106-1122	Toronto to Ottawa	40
1220-1239	Ottawa to Toronto	45
1339-1355	Toronto to Ottawa	42
1604-1621	Toronto to Ottawa	44
1650-1709	Ottawa to Toronto	47
1805-1824	Ottawa to Toronto	49
1829-1851	Montreal to Fallowfield	37

Time <sup>(1)</sup>	Train Route	Train #
1851-1909	Fall-Ottw	37's equipment <sup>(2)</sup>
1923-1940	Toronto to Ottawa	46
1957-2023	Montreal to Fallowfield	39
2023-2043	Fall-Ottw	39's equipment
2147-2157	Toronto to Ottawa	48

Note 1: The times listed here are from the VIA Timetable and indicate how long the trains occupy the track section between the Train Station and Fallowfield Station. The train times are from departure to departure, so the total time they occupy the track may be slightly less than indicated.

Note 2: The return of Train 37 and Train 39's equipment is not in the public timetable, but has to be accounted for in the track occupancy discussion.

Of particular concern are the three times per day when two trains use the track segment between Fallowfield Station and the Train Station relatively closely together, potentially excluding the City's O-Train use for 30-40 minutes or more. All three of these times are during key times for peak hour service:

- Train 41 leaves Ottawa Station at 06:00 bound for Toronto, and Train 30 leaves Fallowfield at 06:23 bound for Montreal. This is during the early morning period when the City's transit service is being deployed and ridership is building;
- Train 44 leaves Fallowfield Station at 16:04 bound for Ottawa, and Train 47 leaves Ottawa Station at 16:50 bound for Toronto. This is during the early afternoon peak period when transit ridership is building; and
- Train 49 leaves Ottawa Station at 18:05 bound for Toronto, and Train 37 leaves Ottawa Station to finish its trip from Montreal at 18:29, arriving at Fallowfield at 18:51. The equipment then returns to the Train Station, which occupies the track for an additional 20 minutes. This is during the latter part of the afternoon peak period.

While a schedule can be developed to avoid these conflicts with VIA operations, VIA's on-time performance must also be considered. In a press release dated 01 August 2008, the average on-time performance for the first six months of 2008 is reported as 65%, with June being substantially better at 85%. The six month average is pulled down by poor winter performance as a result of the weather. Train delays of 5-10 minutes would be relatively easy to accommodate, however holding transit service for an intercity train which subsequently arrives 45 minutes late would be unacceptable. Similarly, if an intercity train is late, it would be unacceptable for it to be held because of the lack of availability for a window between transit trips. Communication and coordination could lessen the impact of delayed VIA trains on local service, but it would not eliminate them.

As one way of compensating for the schedule gaps created by the VIA trains, an agreement could be struck to allow local passengers to travel between Fallowfield and Train stations on the VIA train. This service is not currently offered by VIA, nor does their ticketing process lend itself to this type of operation.

Potentially, VIA could operate the service and provide commute spaces on its current trains and add additional equipment to create a regular service in between the currently scheduled trains. This service would likely require the City of Ottawa to purchase a set number of seats, provide a re-selling service to sell the seats to commuters and provide staff to take tickets from boarding passengers. VIA staff may be able to assist in this role. This type of operation is not VIA's core market nor does it appear in their future



plans as an area of expansion. By special agreement GO Transit and VIA Rail have partnered to carry passengers on some trains in the Toronto area, but this requires GO passengers to pay higher fares on the VIA train. These types of special arrangements can be made, but will have to be negotiated.

Any arrangement for the use of this corridor for the City's trains will require an operating and maintenance agreement with both VIA Rail and CN. Any required track upgrades, additional sidings, train control systems, platform modifications or structure upgrades would be the City's cost. VIA Rail will retain priority on the track unless a very attractive arrangement is put in place. As noted below, physical separation would have to be guaranteed through a positive train control system.

### ***Former CP Route between Greenboro and Leitrim Stations***

This section of corridor currently provides a connection to the National Research Council facilities southeast of the Airport on Lester Road. Other than the occasional load, transferred from the Walkley Yard by the Ottawa Central Railway (OCR), the corridor is abandoned. The roadbed and track are in poor condition, and would have to be rehabilitated to provide service. At-grade crossings of Lester and Leitrim Roads must be upgraded, which will require the installation of signals and communications hardware and some associated roadworks. Approval requirements for the two at-grade crossings must be addressed, as the current O-Train regulations do not permit level crossing operation.

Station facilities, passing tracks and any required control systems would have to be provided, and the extension would have to be configured to permit continued access for deliveries to the National Research Council facilities.

## **INFRASTRUCTURE UPGRADES TO ALLOW AN EXPANDED O-TRAIN SERVICE**

There are several potential options to expand the current O-Train service, including a new service between the Fallowfield and Train Stations; an extension of the existing North-South line to Leitrim Station; or a combination that could include both a southern extension and a new branch to Fallowfield. The track areas in question require an in-depth review of three segments of the rail corridor:

1. The single track segment between Bayview Station and the Elwood Diamond just south of Confederation Station,
2. The continuation of the CP track through Greenboro and south past the Airport to Leitrim Road, and
3. The VIA Rail track from Fallowfield Station to the Train Station

### ***1) Expanded Service between Bayview and Confederation Stations***

To provide more frequent service on the northern section between Bayview and the Elwood Diamond, there are several infrastructure improvements required:

- New passing sidings would have to be strategically located to meet the operating requirements of the proposed service
- The rock cut that the line follows would likely have to be selectively widened to locate the new passing sidings, although the service design would attempt to make use of the former CPR industrial tracks
- An additional platform and track, along with switches, would be required at Bayview Station to accommodate two trains at the same time to ensure service reliability and make sure that trains can



always get to the station. This requirement becomes more critical as the time between trains reduces, but prior planning work indicated that the additional track and switches would be needed to achieve a 7-8 minute headway or less

- Avoiding the cost of twinning the Dow's Lake Tunnel or widening the rock cut will require specific planning and may result in less than optimal service design

Given that the city owns the corridor these changes could be made with relatively few approvals.

## ***2) New Service between Greenboro and Leitrim Stations***

As mentioned previously, extending the line south from Greenboro would be relatively straight forward, as the track has been removed south of the NRC access point, but the original rail bed is still in place. The major challenge in this section is to obtain approval for the current O-Train vehicles to operate over a level crossing. Initial planning work for this had been undertaken as part of the North-South Corridor LRT project, but the final approvals are not yet in place.

This section would require upgrading 4.6 km of the existing railway bed and track to continuously welded rail track from Greenboro Station to north of Leitrim Road, with the installation of new continuously welded rail track an additional 0.6 km to Leitrim Station. One additional train along with one additional siding to allow northbound and southbound trains to pass would be needed to permit continued 15-minute service. The exact locations would be determined in part by the inclusion of intermediate stations at South Keys or Lester Station. Modifications to the existing Maintenance Facility would be required to accommodate the additional train.

An amendment to the North-South Corridor LRT Project EA Study will have to be completed for both provincial and federal EA processes before the project could proceed.

This type of service would be suitable for an interim service, but is not likely to provide the frequency of service required to support the long term objectives of the Transportation Master Plan.

## ***3) New Service on the VIA Tracks between Fallowfield and Train Stations***

This section from the Elwood Diamond to Fallowfield Station is the most challenging. As noted above, this section is part of the single track VIA Rail corridor.

This section would require:

- A wye track to connect the O-train track to the VIA Rail line. The skewed angle of the diamond will help in creating an effective connection however the Bronson structure, the Airport Parkway Structure and the Bronson/Airport Parkway/Brookfield interchange may constrain the geometry of the track. A pedestrian pathway would also have to be relocated, requiring an additional at-grade pedestrian crossing or a grade separation. This wye should be capable of holding a train should the VIA service take precedence and require an O-Train to wait.
- Track along the VIA Rail corridor would require two intermediate passing sidings. The service would have to be designed to avoid locating these sidings at one of the major bridges.
- If additional intermediate stations are added to the line to serve development along the line, a siding would be required at each stations as the O-Train vehicles require a high platform for boarding, but are narrower than standard railway equipment. The solution of platform extenders used on the current O-Train line will not work for this segment of the line, because of the frequency of operation of the standard-width VIA intercity trains. Each of these sidings will require two switches as well as additional track.



## OPERATIONAL ISSUES

The O-Train currently operates over an 8-km segment of single track with a passing siding at Carleton Station. This layout permits 15-minute service with the two in-service trains departing Carleton Station at the same time and proceeding to the ends of the line, serving intermediate stations, reversing direction at the ends of the line and returning to Carleton Station. This simple pulse operation has operated very effectively over the track segment between Bayview and Greenboro Stations.

If the above-noted physical infrastructure issues can be resolved, there are still several operating issues that will have to be addressed. These issues relate to:

- Fleet expansion
- Dispatching trains on a single track system
- Separation from VIA traffic
- Line capacity occupied by trains (more frequent service requires more track occupancy as does longer routes)

The current pulsed operation works well with two trains meeting at the centre of the line but will become more complicated as several passing sidings are required to make the new service function. The operation of the line would require that all trains depart simultaneously and that all trains wait for all train-meets to be completed before following on to the next segment. As the number of trains and meets increases the flexibility in the service diminishes and delays on one train will hold up the rest of the service. The complexity grows geometrically, that is twice as many trains and meet points are four times more complex to operate. Providing service on two branches would further complicate the operating scenario.

Current operating procedures and signaling systems will have to be modified to accommodate train movements on the VIA Rail segment. Currently the O-Train corridor is dispatched separately and independently of the CTC system that operates on the VIA Rail line. The systems are not compatible, but will need to be interconnected to allow for coordinated dispatching.

Separation from other trains on the VIA Rail line will be required to comply with railway safety rules unless a new fleet that is compatible with the VIA equipment is used. Separation can be achieved in one of three ways:

- A separation window can be used, but that will severely limit the number of transit runs that can operate. This will likely result in a service that is not very attractive to riders as there will be a substantial time penalty if someone misses a departure,
- A positive train control system could be installed to manage train positions and maintain safe distances between trains. This system would properly have to be installed as part of the transit project, and
- The section could be double-tracked to allow VIA and an O-Train to operate on parallel single tracks. This has a major capital costs associated with it because of the bridges over the Rideau River, Prince of Wales Drive and Riverside Drive

### ***Regulatory and Track Access Issues***

After consideration of the physical plant and service options, there are regulatory issues to be considered. The current O-Train operates under a very specific set of rules that are not transferable to additional track sections. The rules would need to be renegotiated with Transport Canada before the service could be designed or implemented.



The O-Train is currently run as a single-operator vehicle. This type of operation is not currently permitted beyond the current O-Train limits without special permission, and would require a new set of rules that would have to be agreed to by the railways and Transport Canada.

Track access will require negotiation with VIA Rail, who leases the segment between Fallowfield and the Elwood Diamond from CN, and with CN who own the corridor. Any structural changes and track additions would also have to be approved by CN. While these agreements can be negotiated, there will be time and cost implications.

## TRAVEL TIME BENEFITS

Each of the options provides an alternate route to the downtown. The O-Train's success is attributed partially to the function it serves on carrying passengers from the southeast to the west end of downtown, without having to travel through downtown. Another major factor in its success is the ridership generated by Carleton University. This mid-line anchor is a popular trip origin and destination.

As the number of intermediate stations is increased, a transit line provides better accessibility but lower operating speed. The design of the service must balance both to provide a good level of service and a good degree of accessibility.

### *Travel Time to Downtown using the VIA Corridor*

To determine if this service will provide an attractive trip, an analysis of the complete trip is necessary. The following "trips" compare the total travel time from Fallowfield Station to Mackenzie King Station (Rideau Centre) via the two routes:

- Trip #1 – Current Bus Trip
  - Arrive at Fallowfield Station
  - 2 minute wait for first departure (half an average headway based on current scheduled departures)
  - 32 minutes to Mackenzie King Station via Express service
  - 34 minutes to Mackenzie King Station via Route 95
  - Total time is estimated at 34-36 minutes
- Trip #2 – Expanded O-Train Trip
  - Arrive at Fallowfield Station
  - 5 minute wait for first departure (half the estimated 10-minute service headway of a service operated like the O-Train)
  - 16 minute train trip (based on the VIA schedule for the same trip, with no intermediate stops)
  - 2-3 minute walk transfer to Train Station on the Transitway (240 metre walk plus stairs or elevator)
  - 2 minute wait for next departure (half an average headway based on current scheduled departures)
  - 9 minute trip to Mackenzie King Station
  - Total time is estimated at 34-35 minutes



If the O-Train operates on a 15-minute headway, then the total time increases 2-3 minutes to account for the slightly longer average wait time for the train arrival.

Based on these trips, there is little time advantage for most customers to initiating a train service between Fallowfield and Train Stations. Other observations about the efficiency of the service include:

- Adding additional stops along the route to serve the areas between Fallowfield and Train Stations would increase the travel time
- Passengers whose destination is east of MacKenzie King Station will have a longer bus trip and a shorter train/bus trip, however the majority of downtown employment is west of MacKenzie King Station

While this service could provide a direct and fast connection between the Fallowfield and Train stations, this is not a high demand corridor, except for a small group of residents such as RCMP employees living in Orleans. Residents of Fallowfield wanting to travel downtown would have to transfer at the Train Station onto the Transitway to complete their trip downtown. The transfer includes a 200-240 metre walk through the station. The trip to the Train Station may be relatively fast, but for travel to downtown there is not a significant time savings for the overall trip.

### ***Travel Time on the O-Train Extension to Leitrim***

The extension would take rail as far south as Leitrim Road. In this area a Park and Ride facility and station would allow passengers to transfer to rail to continue north. For those wanting to travel in the O-Train corridor the trip would be continuous however for those wanting to access the Southeast Transitway a transfer would be required at South Keys or Greenboro Stations.

Passengers needing to transfer to the Southeast Transitway would have to take the train for one stop and then walk from the train platform to the bus platform and then wait for the next bus. This would be a penalty of 2-4 minutes in peak hours relative to a direct bus trip from Leitrim Station.

The relatively infrequent service of the O-Train would provide a better interim service to Riverside South and Leitrim than exists today, but cannot compare to the bus frequency offered at South Keys. If park and ride facilities are provided at the southern stations it may offset the additional wait time, but many commuters will be tempted to drive north to South Keys to have access to a more frequent bus service.

### ***Travel Time on a Branch Service***

Branch service, with one branch operating between Bayview and Leitrim Stations and the other operating between Bayview and Fallowfield Stations, would offer the same level of service to residents in the southeast area. The major difference under this scenario is the Fallowfield to downtown service.

The following “trips” compare the total travel time from Fallowfield Station to Mackenzie King Station via the two routes:

- Trip #1 – Current Bus Trip
  - Arrive at Fallowfield Station
  - 2 minute wait for first departure (half an average headway based on current scheduled departures)
  - 32 minutes to Mackenzie King Station via Express service
  - 34 minutes to Mackenzie King Station via Route 95
  - Total time is estimated at 34-36 minutes





- Trip #2 – Expanded O-Train Trip
  - Arrive at Fallowfield Station
  - 5 minute wait for first departure (half the estimated 10-minute service headway of a service operated like the O-Train, assuming that the two branches operate a combined 5-minute service between Bayview and Confederation Stations)
  - 16 minute train trip (based on the VIA schedule and O-Train schedule for the same trip)
  - 1-2 minute walk transfer (at Bayview Station)
  - 2 minute wait for next departure (half an average headway based on current scheduled departures)
  - 8 minute trip to Mackenzie King Station
  - Total time is estimated at 32-33 minutes

If the O-Train operates on a 15-minute headway, then the total time increases 2-3 minutes to account for the slightly longer average wait time for the train arrival.

While there is a small time advantage to this route, it would require significant improvement to service on the northern part of the O-Train corridor. To achieve the time savings and provide the level of service needed to make the service attractive, some of the infrastructure improvement, such as the rock cut widening and the Dow's Lake Tunnel twinning would be required to allow for more passing tracks to be installed.

The transfer at Bayview, for the last leg of the trip into downtown, is a disincentive as riders could have boarded a near empty bus at Fallowfield and had a one seat ride downtown whereas train riders have to transfer at Bayview and stand for the last portion of their trip. This service would be much more attractive once light rail in place from Bayview to downtown.

## RIDERSHIP

A preliminary review of the model results from the Transportation Master Plan exercise indicates that a high quality service in the Bayview to Fallowfield branch could attract up to 1,000 riders in the morning peak hour, however to attract that level of ridership the model assumed a more frequent service than can be operated with a single track (and appropriately positioned passing tracks). A service frequency of 2-3 minutes was assumed, to match other rail corridors in the proposed network. The potential ridership would be lower for wider headways. While model results are not available, a service frequency of 7-8 minutes would likely see about 500 riders in the peak hour and a 15-minute headway about the 300 riders in the peak hour. The model also indicates that the majority of the passengers are diverted from other transit routes rather than being new passengers attracted to transit.

The southern extension of the O-Train also attracts relatively few passengers given the limited potential for ridership growth. For example, Leirim Station is in a very isolated area with little to no walk in traffic access. A park and ride could provide some attraction, but limited service to the station (likely 10-minute service) would likely mean that many drivers will continue north to a station with more frequent service. The line will only become viable if it is extended into the Riverside South area. It does provide some benefit as an interim station to help develop ridership from this area in the same way the Transitway has helped develop overall ridership across the City.



Stations along the VIA corridor, provided they could be justified, are also somewhat isolated. Much of the development is too far away to be effectively served. Merivale Station would be served by buses on Merivale Road. Collonade Business Park is another potential site, but there is little potential for additional ridership and limited potential for other facilities such as park and ride.

## FLEET REQUIREMENTS

Preliminary review indicates that seven or eight trains are needed (six in operation and one or two spares) to meet the timetable requirements. This will require purchasing and additional four or five trains. The fleet requirements vary depending on the options selected and the number of intermediate stations added to the line. Exact fleet requirements were not calculated as part of this review exercise.

Additional maintenance and storage space is required to clean, repair and stable these additional trains. This space would have to be accommodated at the existing facility or at a new facility.

## CONSTRUCTION DISRUPTION ALONG THE TRANSITWAY

One of the main reasons put forward for the introduction of the VIA corridor link is to provide a second route or a relief options to avoid congestion and delays during the construction of the LRT on the West Transitway. A review of the available corridor and alternative routes indicates that there are mitigation options in the corridor that will allow bus service to continue with few interruptions during construction. For instance;

- The portion south of Lincoln Fields Station has sufficient right of way to allow bus service to continue while construction proceeds.
- Buses similarly would continue to operate along the Ottawa River Parkway while the LRT was constructed on a parallel route.
- The Parkway, Scott Street, or a combination thereof could be used for bus service east of Dominion Station in the same fashion it was during the construction of the existing Transitway.
- A separate LRT corridor is identified in the Transportation Master Plan for the eastern section through the LeBreton Flats. Bus service would continue to operate on the Transitway.

The availability of these alternate routes for bus operation will reduce the need for an O-Train solution during construction.

## CONCLUSION

There is merit in considering the extension of the O-Train and the use of the VIA Rail tracks between the Fallowfield and Train Stations, there are substantial capital costs as well as risk, approval and regulatory issues to be overcome. Operational challenges will also limit the ability of the service to respond to ridership.

The ridership predicted for the Fallowfield to Train Station leg is quite low, as there is no busy destination for Nepean residents at the Train Station. The additional transfer and trip into downtown combined with the walk between platforms at the transfer will not encourage ridership.



Extending the existing 15-minute O-Train service to Leitrim Station would be suitable as an interim measure, as it provides rapid transit service to Riverside South and Leitrim growth communities early in their development, and provides near-term Park & Ride access to commuters travelling from areas south along Albion Road and Hwy 31. It will also relieve pressure on bus operations in the downtown, as it will not add ridership to eastbound Slater Street in the afternoon rush hour, where Transitway operation is most constrained.

While an extension of the O-Train south to Leitrim or the use of the Fallowfield to Train Station links may serve a useful interim purpose, implementing both is more challenging. The problems associated with each service would compound if both legs were adopted. As noted above it is also more likely that additional infrastructure improvements will be required along the northern portion of the O-train line as the service becomes more complex.

