City of Peterborough

To:	**Members of the General Committee**
From:	**Cynthia Fletcher** **Commissioner of Infrastructure and Planning Services**
Meeting Date:	**July 12, 2021**
Subject:	**Report IPSTS21-013** **Transit Route Review Study Recommendations**

Purpose

A report to present the findings from the Transit Route Review Study, recommend a new Transit Route Network, an On-Demand pilot program and a Service Enhancement plan.

Recommendations

That Council approve the recommendations outlined in Report IPSTS21-013, dated July 12, 2021, of the Commissioner of Infrastructure and Planning Services, as follows:

a) That a presentation by IBI Group on the Transit Route Review Study be received;

b) That the recommended Transit Route Network, as attached in Appendix B, be approved, with implementation beginning in May 2022;

c) That an On-Demand pilot program, proposed for fall 2021 implementation, be approved at a cost of $650,000, $150,000 of which will be recovered from the MTO Safe Restart Program, for a net requirement of $500,000 to be funded from the uncommitted balance of the Transit Garage Replacement Project;

d) That the proposed Service Enhancement Plan be endorsed subject to future operating and capital budget approvals;

e) That staff report back to Council as part of the 2022 budget process with a recommended implementation plan for service enhancements including

additional recommended staffing, operating costs and revenues, and additional capital funding to support the initial phase of the implementation plan; and

f) That staff seek Federal-Provincial approval to reallocate $2,798,300 in approved ICIP -Transit Stream funding from the New Transit Bus Project, approved as part of Report CLSFS21-001, to the Conventional Bus Replacement Project, and to extend the project completion date to March 31, 2024.

Budget and Financial Implications

There are no direct financial implications associated with approval of recommendations a) and b).

Approval of recommendation c) will require a budget transfer of $650,000 in previously approved capital funding from the uncommitted balance of the Transit Garage Replacement Project, with $150,000 in funding support through the MTO Safe Restart Funding program, for a net requirement of $500,000 as summarized in Table 1. Additional funding to replace the transferred amount will be requested in future capital budgets.

Operating costs to implement the pilot program (net of any savings) will be funded from this capital project during the pilot period. Before the end of the pilot period, staff will report back to Council on the potential to implement the on-demand service as a permanent program, including any future operating costs to be considered in future budget reviews.

Table 1 – Summary of Costs – On-Demand Pilot

Recommendation	Total Cost	MTO Safe Restart Funding (50%)	Municipal Contribution
On Demand Hardware/Software	$100,000	$50,000	$50,000
(South East Community Bus – Fall 2021 – Dec 2021)	$200,000	$100,000	$100,000
South East Community Bus – 2022	$400,000		$400,000
Technology Drive Route Removal	($50,000)		($50,000)
Total Cost	**$650,000**	**$150,000**	**$500,000**

Approval of recommendations d) and e) will result in staff reporting back to Council as part of the 2022 budget process with a proposed implementation plan for the service enhancements outlined in the report, including additional recommended staffing,

operating costs, operating revenues, and capital funding to support the implementation plan. If all phases and associated components of the plan were approved, the impact would be annual operating costs of approximately $4,700,000, offset by anticipated annual revenues of $1,480,000 for a net annual cost of $3,220,000. It is anticipated, however, that the recommended service enhancements, summarized in this report, will be phased in over multiple years.

Approval of recommendation f) to reallocate the Provincial and Federal funding, and the extension of time to purchase new vehicles will allow for a deferral of the municipal $1,017,730 capital funding request in 2022, to the 2023 budget year.

Background

History and Study Overview

The completion of a Transit Route Review and Long-Term Growth Strategy Study was identified as part of the 2018 approved capital budget for Transit (project reference 5-11.02). Council, in approving Report IPSTR18-020, awarded this project to IBI Group.

The Transit Route Review and Long -Term Growth Strategy is structured as a three-part project.

Part One, and the primary objective of the project, is the completion of a review of existing transit services and recommended redesign of the Transit route system for the City to reduce transit travel times; improve the frequency of service between popular high demand destinations; increase transit ridership; optimize the use of vehicles and staff resources and mitigate service constraints at the downtown transit terminal. This initial phase of work is the subject of the current report presented to Council.

Part Two of the study will develop a future long-term Transit vision, to serve the City over the next 20-30 years, along with developing a long-term service plan including estimates of the long-term capital and operating costs necessary to achieve this vision. This portion of the Project will build on the redesign of the Transit route system completed in Part One, with a view to establishing the overall role that transit can play in an integrated transportation system. This portion of the project will be completed in conjunction with the ongoing Transportation Master Plan Update project.

Part Three of the project will complete the functional planning for the future downtown Transit Terminal to address current operational deficiencies and constraints, long term growth needs, and provide cost estimates for improvements to support future capital budgeting and funding requests. A complementary review of the Specialized Transit system, also known as the Handi-van service, is also being completed as part of the overall project. Recommendations from Part Two and Three of the study will be presented to Council for consideration in the Fall of 2021.

Work on the project commenced in the Fall of 2018, including a review of the previous transit system, benchmarking the system against other comparable transit systems in other communities, data collection, the completion of an on-board travel survey to collect data on travel patterns of transit riders. An initial round of public consultation was held in February 2019 to discuss challenges and opportunities for the update of the route system.

In March 2020, as the project team was preparing to host a second round of public consultation to discuss ideas for changes to the route system, the COVID-19 Pandemic required a pause to the Route Review while staff and community stakeholders focused on the health emergency impacting Peterborough and the Transit adjustments required to comply with the Provincial Emergency Order related to operating transit systems. In June 2020, an interim route system was put in place to help protect the health and wellbeing or customers, employees, and the community during the COVID-19 pandemic.

In January 2021, work on the project recommenced, including a technical evaluation of three proposed route network alternatives, and a second round of public consultation to present the advantages and challenges of each of the route network alternatives and conduct a survey on the route network options.

Assessment of 2019 Transit Route System (Pre-Covid19)

As a public service, transit must provide a basic level of access for residents of a community to travel to work, school, and obtain various services in the community, particularly for those that do not have alternative means of transportation. At the same time, there are social and environmental benefits associated with attracting new riders to transit by directing resources to areas that will generate new ridership. The 2012 Transportation Master Plan presented a vision for transit that "…provides an efficient, reliable, convenient and affordable form of mobility throughout the city for users that offers an attractive alternative to the automobile, particularly to the Downtown, Trent University, Fleming College and other major activity centres around the City." The vision included increasing service levels to attract ridership within the community and enhancing U-Pass programs with post-secondary institutions to increase student ridership on the system, such that by 2031 6% of all daily trips made in the city use public transit.

Within this context, as part of the annual budget approval process, incremental service enhancements towards achieving the vision are explored, and opportunities to increase revenues and improve the financial efficiency of the delivery of transit services are also assessed.

The first step in the assessment of the 2019 Route system was to have the consultants review the performance of transit systems in six municipalities that are comparable to Peterborough in terms of size and demographics. While the needs of each municipality

are unique, a peer review is a useful benchmark for the effectiveness and efficiency of Peterborough's transit operations against its peers. The peer systems selected for review were Brantford, Sault Ste. Marie, Niagara Falls, Thunder Bay, Guelph, and Kingston. Similar to Peterborough, Brantford, Guelph and Sault Ste. Marie operate radial systems, all of which originate from their downtown transit terminals. Guelph's system slightly differs from Peterborough's in that it has two main hubs connected directly along a major transit corridor. Niagara Falls operates a grid transit system with three major terminals, two of which provide access to inter-municipal services, and four smaller terminals at major trip generators. Kingston and Thunder Bay operate multiple hub systems, with hubs located at major trip generators, such as the downtown areas, post-secondary institutions, and the major retailers.

Key findings:

- Compared to its peers, Peterborough currently provides more annual hours of transit service per resident (1.65) than most of the peer communities, second only to Kingston (1.97).
- The service is well used, with Peterborough ranking the second highest among its peers at nearly 29 passengers per revenue vehicle hour compared to a peer average of 24.5 passengers per revenue hour. Annual per capita ridership is also higher than the average of the peer group at 47 riders per resident per year compared to the average of 36 riders per resident. Peterborough's service utilization and ridership per resident is comparable to Guelph and Kingston, both of which are much larger in size, and have large universities and colleges.
- The strong performance on service hours and utilization are primarily due to the high level of service requisitioned by the student associations at Trent University and Fleming College, both of which have express routes with frequent service and strong ridership levels. An analysis of 2019 ridership data found that approximately 21% of the daily ridership on the Post Secondary Express routes in Peterborough was comprised of non-student riders, who were able to take advantage of the increased frequency and directness of the express routes.
- Peterborough's operating costs are below the peer average, and most comparable to Niagara Falls, which is similar in size. The portion of costs funded by Municipal Taxes is one of the lowest of the peer cities at $69.32 per resident compared to an average of $86.06 per resident. Guelph and Kingston, while providing similar annual hours of service per resident and similar service utilization on a per resident basis, provide a higher level of municipal investment to achieve these results, with per capita annual funding of $112.94 and $117.45 respectively.
- Peterborough's low municipal operating contribution per capita is influenced by the funding provided by the post-secondary institutions for the Trent and Fleming express routes. The benefit of this agreement is evident in the cost effectiveness

of Peterborough's transit system: at $3.19 per revenue passenger, Peterborough has the lowest direct operating costs among its peers. The system also has the second highest cost recovery among its peers at 43% – Guelph being the highest at 45%. Compared to systems of a similar size in Canada, it is a very cost-effective service.

- The Downtown-centric radial network in Peterborough is common among smaller peer cities because of similar land development patterns and relative efficiency of this network at lower levels of service frequency. Larger peer cities that offer more frequent service are moving towards a Grid or Multi-hub style of service (Guelph, Kingston, Thunder Bay).
- Ridership in Peterborough is driven by the post-secondary travel market, a trend similar to other communities with large post-secondary student populations. Kingston has invested heavily in an express network that serves the entire City and forms the spine of their system as opposed to express routes serving student travel.

The consultant assessment of the 2019 route system examined the previous radial system's performance trends, and service area characteristics to determine whether the system is effectively and efficiently meeting the travel needs of its users.

Key findings

Locations

- The downtown is a major destination and is well served by transit. However, other areas outside the downtown are of growing importance, and the downtown-oriented nature of the transit network can lead to longer travel times to these destinations. This is compounded by the relatively low frequency (40 minutes) of most routes, which makes the coordination of transfers imperative to the success of the network.
- The Lansdowne Street and Chemong Road corridors are candidates for increased transit services because they have high population and employment densities and are identified in the Official Plan as opportunities for intensification.

Ridership

- Past Service enhancements have increased ridership, but only in the post-secondary travel market. As a result, ridership is plateauing or declining among other markets. This trend will have an impact on the City's ability to reach its transit mode share target of 6% of all trips as outlined in the 2012 Comprehensive Transportation Plan.

- Past increases in revenue vehicle hours of service are matched with increases in ridership, while the cost-effectiveness of the system has remained fairly constant. This pattern demonstrates that increasing service levels can increase system ridership while maintaining the long-term sustainability of the system.
- Transit mode share is high among non-resident (post-secondary student) households (34% of all trips) but very low among resident households (3% of all trips), indicating both the need to continue to provide strong connections to the post-secondary institutions, and the need to address the gaps in the remainder of the service to ensure the system meets the needs of resident households and attracts new users.

Service Concerns

- Travel demand is highest in the afternoon peak, with a significant number of trips being generated in the zones with large format retail, Trent University, and Fleming College. The current transit network does not have any direct connections between these zones and does not serve trips between these areas efficiently.
- A majority of the challenges faced by the system are related to travel time and maintaining routes on-time compared to the schedule.
- Transfers are only coordinated at the downtown terminal, forcing all transfer trips through the terminal and increasing overall travel time;
- Trips that require transfers do not benefit from the increased frequency of service provided on some routes during peak periods if transferring to routes with regular 40 minute frequency;
- Maintaining coordinated transfers with the current frequency of service results in service delays throughout the system (buses are often held at the terminal to accommodate late buses that have experienced on-route delays);
- Chemong Road and Lansdowne Street are very congested and cause service delays on various routes;
- Access challenges at many locations require route deviations and cause additional delays (e.g., front door service to various senior residences, access to Portage Place, Lansdowne Place, and Hedonics Rd.); and
- The additional time required for buses to access and leave the terminal significantly reduces system productivity.

Public Consultation - Round 1

The first wave of consultation occurred in the winter of 2018-2019 and included consultation with the public, bus operators, and key funding partners. The main objectives of the first wave were to inform the public about the study and to obtain public and stakeholder input on opportunities to improve the transit network, their travel patterns, and their vision for transit in the community.

Consultation activities consisted of a workshop session for transit staff, operators and funding partners followed by a Public Information Centre (PIC), which was supplemented by a web-based survey. The staff workshop session and the PIC were held on February 5, 2019. The online survey was live from February 5, 2019 to February 20, 2019.

Approximately 50 people attended the PIC. A total of 117 members of the public also completed the web-based consultation survey, which included a mapping tool to identify challenges and opportunities for the transit system.

The feedback from the public was mainly centred on the challenges of the current network design and many comments were similar to the observations noted during the consultant's assessment of the current system. The following main themes were noted:

- Long travel times on the system make transit less attractive to users;
- Reducing travel times and making trips more direct was the top priority for respondents and participants.
- Low service frequency, specifically the 40-minute frequency on most routes, can mean very long waits between any missed connections.
- Inconvenient transfers at the downtown terminal frustrate some users.
- Eliminate the need for all trips to transfer at the downtown terminal
- Increase service to areas outside of the downtown core
- Improve service equity and accessibility (increase travel options)

Based on these observations and public perspectives obtained during the initial phase of public consultation, the following objectives were summarized to provide strategic direction to develop and assess proposed change scenarios for the conventional route network:

1. **Balancing access to service (coverage) and mobility (travel times):** Potential changes to the route network will need to make the service

attractive to new riders, while considering the basic transportation needs of vulnerable populations.

2. **Meeting the needs of distinct travel markets:** As of 2017, post-secondary students constitute the majority of the city's transit riders, and the market continues to grow. In contrast, non-student ridership is in decline despite increases in the City's full-time population. Short-term changes to the route network will have to recognize the importance of the post-secondary market while still trying to meet the needs of resident households and build ridership .

3. **Providing high-quality service in a challenging urban context:** Peterborough presents a number of challenges that make the provision of attractive transit service difficult. A discontinuous road network, limited canal crossings, and widely distributed trip generators such as schools, malls, employment areas and housing clusters, have limited the competitiveness of transit relative to other modes of travel. The new network will have to address these challenges through careful consideration of routing and service levels.

4. **Improving the convenience of transit:** Low frequency and downtown orientation of most routes can mean prohibitively long travel times for many users. In addition, average operating speeds on the system are low due to route alignment constraints (e.g., access to some malls), traffic congestion, and the configuration of the downtown terminal. Improving the efficiency of the system and building new ridership will depend on addressing these challenges.

5. **Minimizing service duplication:** Dedicated express routes serving Trent and Fleming generally overlap with regular routes serving the rest of the city. While these routes serve different markets, this duplication can come at the expense of providing attractive transit service for riders outside of those corridors.

6. **Improving service to areas outside the downtown:** Some members of the public expressed frustration that transit service was only convenient for travelling to or from the city's downtown because of the orientation of the route network. While there are benefits to such an orientation, any potential service changes should strive to improve the quality of services to and from destinations that are not located downtown, such as a major shopping centres and the Peterborough Regional Health Centre.

7. **Providing service to developing areas:** Residential growth is occurring around the City's periphery, especially to the north and northwest of existing urban areas. Providing transit service to these emerging areas will be critical

to building a future ridership base, but existing routes cannot be extended without reducing existing service (e.g., reducing frequency), adding resources, or reconfiguring the route network.

8. **Mitigating operational issues at the downtown terminal:** The downtown terminal is an operational pinch point due to its size and design. It is currently operating above its intended capacity (both in terms of bus activity and passenger activity), preventing the introduction of new routes to the downtown. This challenge is compounded by the current network design, which requires all transfers to happen at the downtown terminal.

Consultation During Interim Route Network

Following the implementation of the COVID-19 interim route system, the community was invited to provide feedback on the service to help inform the need for service adjustments to improve the customer experience during this period of uncertainty. Consultation activities consisted of a Transit Rider Survey, public outreach using Transit Ambassadors, and key stakeholder information sessions. Transit staff received valuable input from transit users related to the interim network. The feedback is summarized in the section below and the key themes from this consultation were also considered during the development and evaluation of the alternative route networks:

Approximately 70% of respondents indicated that the COVID-19 interim route system was working for them or would work for them with some minor adjustments. While 30% of respondents felt the COVID-19 response network did not work for them, their open-ended feedback was included in the assessment of results and key themes as well as ongoing adjustments that were made to the network.

Priorities for adjustments were focused on four main themes:

- Increased bus frequency and improved transfer times
- Addition of some more direct routes/service locations
- Improved infrastructure (shelters, stops) with a focus on accessibility
- Options for reduced walking distance to stops for some users in some areas.

In response to this feedback, Transit staff made interim improvements to:

- Some route re-alignments;
- Increased frequency and improved transfer times;
- Increased travel options;
- Expanded hours of service on community buses;
- Streamlined application and expanded eligibility for access to specialized transit services; and
- Improved communication strategy

Transit staff also worked closely to support educational and mentorship programs and partnerships with key community groups such as the Council for Persons with Disabilities, Age Friendly Peterborough and local seniors residences, and as a result have improved connection and responsiveness to these ridership groups.

Public Consultation – Round 2

The second wave of formal consultation was delayed due to the COVID-19 pandemic. Informal consultation and communication continued from June 2020 to January 2021 to gather feedback from members of the community and key stakeholder groups and included a transit survey conducted by the Council for Persons with Disabilities, a transit rider survey conducted by Peterborough Transit (with 257 responses), and outreach from dedicated Transit Ambassadors and staff.

Due to public health restrictions and to ensure optimal public engagement, consultation on the alternative route networks included two virtual town hall meetings, an online interactive map of the route network options (hosted on connectptbo.ca) to allow for residents to provide feedback, a survey with online and paper options, a dedicated Transit Study phone line, and key community stakeholder presentations.

For the Route Network Alternatives Survey a total of 434 survey responses were gathered from individuals online and via hard copy. The respondents represented a broad cross section of residents and transit users from different age groups, occupational types and neighbourhoods. A summary of the detailed public consultation feedback from Round 2 engagement process was synthesized within the Transit Route

Review Study Report, attached in Appendix A, and several themes emerged from this feedback:

- Increase service frequency and hours of operation for regular and community bus services
- Create more convenient transfers across the city
- Maintain faster, more direct trips across the city
- Improve transit infrastructure to include amenities (benches, shelters, waste disposal) and accessibility features
- Identify improvements for accessible and senior services
- Increase service to new and developing areas
- Provide more direct trips to established areas of the community
- Provide access to the downtown area without using the downtown terminal
- Improve opportunities for customer communication and access to route and schedule information (wayfinding, maps, transfer signage).

Route Network Alternatives and Evaluation

The transit network alternatives are based on three different approaches to address transit needs and opportunities:

1. A grid style of network, which focuses service along major corridors.
2. A modified radial network, which builds upon and improves the existing (2019 Pre-COVID-19) downtown-oriented network.
3. A multi-hub network, which focuses service at several major trip generators in various locations around the city.

Based on technical assessment work, which reflects both qualitative and quantitative data, and the key themes emerging from the two public consultation sessions each of the network alternatives were assessed and evaluated against seven key evaluation criteria, reflecting the objectives noted previously, and the results are summarized in Table 2.

Table 2: Evaluation Summary for Radial, Grid and Multi-hub Network Alternatives

Evaluation Criteria	Grid	Radial	Multi-hub
Balancing access (coverage) and mobility (travel times) given the challenging urban context			
Serves different travel markets efficiently			
Provides more direct connections to trip destinations			
Minimizes service duplication			
Improves service to trip destinations outside the downtown			
Serves new neighbourhoods/can be expanded to serve new areas cost-effectively			
Mitigates issues at the Downtown Terminal			

The grid network is the recommended route structure as it meets the identified objectives most effectively and on balance performs better than the other two alternatives as identified below:

- Reduces reliance on the constrained downtown terminal
- Provides better service to key locations outside downtown, and new and developing areas
- Increases service coverage to post-secondary institutions and provides increased frequency to improve travel times for non-student riders
- Allows most trips to be completed with a maximum of one transfer
- Provides faster and more direct trips to major destinations
- Balances service coverage and travel times
- Minimizes duplication and maximizes travel efficiency
- Improves on time service performance, reliability

During public consultation, one of the key themes identified was providing a transit service with faster, more direct trips. Providing faster, more direct trips contributes positively to the customer experience and is a key pillar to maintaining and growing public transit ridership. Ridership data within the City of Peterborough validates that the weekday morning rush or “peak” service period is a critical, high demand travel time for customers. In evaluating the network alternatives from a quantitative and qualitative customer perspective, an evaluation of their experience during this time period was completed using the Remix Transit Planning software, which includes travel time on the bus plus any walking time to get to the nearest transit stop, plus the number of routes (transfers) needed to make the trip.

Twelve (12) starting locations were chosen from across the city and measured against 8 major trip destinations. These destinations include the Downtown Terminal, Peterborough Regional Health Centre, Willowcreek Plaza, Walmart (Chemong), Lansdowne Place, Costco, Trent and Fleming. Of the trips evaluated:

- The comparison results summarized in Appendix D found that the Grid network trips are 74% more direct with 73% faster overall trips than the Radial (Hub and Spoke) network.

- The Radial (Hub and Spoke) required 68 transfers while the Grid network required 37 transfers to connect these major trip destinations resulting in the Radial (Hub and Spoke) network requiring 84% more transfers.

A map illustrating the recommended route structure is attached in Appendix B.

Role of On-Demand Transit

On-Demand Transit is a modern evolution of the former demand responsive transit service that many municipalities, including Peterborough, used to operate. In Peterborough this was the former dial-a-bus service.

Instead of fixed transit routes, users request a pick-up and drop-off location (usually at a regular transit stop), the time they are wanting to travel, and other information (i.e. accessibility needs) and the automated system determines which vehicle should provide pick up, the route the vehicle should take to get them to their destination stop, and opportunities to pick up other passengers along the way. Modern On-Demand systems utilize advanced technology and advanced algorithms to optimize all of the above factors to serve all of the trip requests in the most efficient manner. In many cases, the efficiency of the On-Demand system can also reduce the number of vehicles that need to be in service to accommodate all trip requests.

With the introduction of smart phones, riders can book their transit trip using their phone, receive updates in real time on when their bus will arrive, and can receive an estimated drop off time at their destination. Most systems also feature online (website)

trip booking features or telephone trip booking support for customers who do not have smartphones or data plans.

As part of the Transit Route Review project, the City retained Via Transportation (a company that plans and operates On-Demand Transit services across the world) to undertake a feasibility review for implementing an On-Demand Transit Service in Peterborough. Using Pre-Covid 19 historical ridership data by route and by hour of day, along with the previous service schedule for fixed routes, Via undertook a simulation using their On-Demand software to determine optimum operating hours for the service, daily and annual ridership estimates, number of vehicles required to deliver the service. They generated a number of performance statistics related to average utilization (passenger per vehicle), maximum and average customer waiting time, walk distances, and trip duration.

Based on the results of the review, attached in Appendix D, three potential applications for On-Demand transit were identified as follows:

1. Launch new on-demand service in high-need areas: The southeastern area of the city, which includes portions of East City, Coldsprings, Collison Heights, and Technology Drive, can be connected to the downtown area with a one or two vehicle new on-demand area. This service would supplement the existing fixed routes to improve access to services. The Technology Drive route previously ran only during morning and evening peaks. After a period of review, the new proposed service may even be able to fully replace the Technology Drive route, offering the city cost savings while providing a higher quality of service in an area that is challenging to serve with fixed routes.

2. Replace low ridership routes during off-peak hours: After 9 PM, many bus routes have low ridership while also operating infrequently. While it is unlikely to be feasible to replace all bus routes, several low ridership routes could be replaced with an on-demand service. Conversion of low ridership routes to an on-demand service during off-peak hours could offer passengers shorter wait and travel times, thereby improving the customer experience and enhancing value for money. Peterborough may also be able to operate with smaller (potentially cheaper) vehicles. This option focuses on improving quality of service for evening passengers.

3. Upgrade specialized transit technology: Upgrading the specialized transit service can improve the booking experience for passengers, while creating more efficient service that requires fewer vehicles and driver hours. This option could include allowing general trips during specific hours or to specific locations, should additional capacity be available.

Based on the results of the feasibility assessment it is recommended that an On-Demand Pilot be introduced in the fall of 2021. The first phase of the pilot would be to add service to the South-East area of the City, which includes portions of East City,

Coldsprings, Collison Heights, and Technology Drive. This new service would replace the TransCab service that provides access to transit where there are no fixed bus routes, would improve accessibility to areas that are beyond the target walking distance of 400 m, and would improve travel times for customers in this lower ridership area. The proposed pilot would operate from fall 2021 until December 2022, approximately 14-15 months. During the pilot period additional opportunities to implement evening On-Demand service will also be further explored. Using On-Demand services to replace or augment the current booking system for the specialized transit service will considered further as part of the ongoing review of the Specialized Transit Service.

The total estimated cost of the On-Demand pilot program is $700,000 which includes the cost for new software and equipment on the buses, and the staff and vehicle operating costs to run this new service for the pilot period. Costs incurred in 2021 for implementing On-Demand services are eligible for 50% funding under the Provincial Safe Restart Funding program, which is estimated to reduce the net cost of this pilot by about $150,000. The potential replacement of the Technology Drive fixed route is also expected to save approximately $50,000 in current operating costs.

Other potential cost savings from piloting the On-Demand service during the evening hours may be possible, but have not been included at this time, as more detailed operational planning would be needed to quantify additional potential cost savings once a vendor has been hired. Table 3 summarizes the net costs to run this pilot program.

Table 3 – Summary of Costs – On-Demand Pilot

Recommendation	**Total Cost**	**MTO Safe Restart Funding (50%)**	**Municipal Contribution**
On Demand Hardware/Software	$100,000	$50,000	$50,000
(South East Community Bus – Fall 2021 – Dec 2021)	$200,000	$100,000	$100,000
South East Community Bus – 2022	$400,000		$400,000
Technology Drive Route Removal	($50,000)		($50,000)
Total Cost	**$650,000**	**$150,000**	**$500,000**

It is recommended that the $650,000 in required capital funding (net capital funding request of $500,000 is required as noted above) be transferred from the uncommitted balance in the Transit Garage Replacement Project, which would allow for the issuing of an RFP to secure a vendor to provide the equipment and software, and to provide

funding to operate the On-Demand Transit Pilot Program through to the end of 2022. Operating costs to implement the pilot program (net of any savings) will be funded from this capital project during the pilot period. At the end of the pilot period, staff will report back to Council on the potential to implement the On-Demand service as a permanent program, including any future operating costs, which would be included in future budget requests.

Additional funding for the Transit Garage Replacement Project will be requested in future capital budgets to replace the transferred amount.

Recommended Full Service Expansion and Enhancement Plan

Although the Transit route network can be a separate consideration from Levels of Service, this review has contemplated both aspects. The route network and the service expansion and enhancement plan together create a strategic transit vision for a system that improves the customer experience and the attractiveness of the transit system to build ridership growth. The route network provides a foundation for the service enhancement plan to deliver increased frequency and service area expansion.

Proceeding with the On-Demand pilot program will provide more focused customer service in some areas and will permit further analysis to assess opportunities for On-Demand service to reduce or change conventional bus routes, modify evening services during low ridership periods, affect the size and numbers of fleet vehicles, and driver requirements.

Prior to the initiation of this study, the City's transit system operated under two distinct service plans, one for regular base routes and one charter-style service for post-secondary express routes. The chart in Appendix B provides a full summary of the service plan for the 2019 pre-COVID route network. The regular routes were operated on a 40-minute service frequency, with four of the busiest routes providing 20-minute frequency on weekday peak periods. Weekday service operated between 6:00 am and 11:20 pm, Saturday service operated between 6:40 am and 11:20 pm, and Sunday service operated from 8:00 am to 7:20 pm. Service for the Trent Express routes operated between 7:20 am and midnight on weekdays with a service frequency of 10 minutes between 7:20 am and 6:40 pm, dropping back to 20-minute frequency the rest of the day. The two Fleming Express routes operated weekdays between 6:30 am and 10:40 pm, with a service frequency of 30 minutes on each route. Late night services were also provided for each campus, between midnight and 3:00 am. The post-secondary institutions paid the entire cost for the level of service provided on the express routes, with students provided full access to all base transit routes.

During the public consultation, transit customers raised the need for more frequent service and expanded hours of operation as two of their top priorities for the review.

The proposed service plan for the recommended Grid route network represents more of a blend between the regular routes and post-secondary express routes. A portion of the

service hours that used to be dedicated to the post-secondary express routes, have been reallocated to improve service frequency on the regular routes, and by doing so community-based riders will benefit from the service frequency improvements, while post-secondary riders benefit from improved and more direct access between the campuses and various areas of the City.

The regular routes on the Grid network are based on providing a weekday base service of 30-minute frequency on all routes all day long, although 3 of the 8 primary routes would reduce to 60-minute frequency in the evening, to reflect lower ridership periods. On Saturdays and Sundays, all routes would operate at 30-minute service frequency during the mid-day period, and key routes (such as Chemong, Sherbrooke, and Lansdowne) would maintain this frequency all day long, while the other routes would feature 60-minute service frequency in the morning and evening periods.

With the remaining service hours funded by the post-secondary institutions, one express route to the Trent University campus would operate similar to the previous West Bank route, with 7.5- minute service frequencies during the morning and afternoon rush periods, 10-minute frequency in the mid-day and 15-minute service in the evening. For Fleming College, one express route would provide 30-minute service frequency during the weekday morning and afternoon peak periods to complement the enhanced frequency and additional number of regular routes serving the campus.

The recommended service plan also extends the operating hours for the 4 Community Bus Routes, with service starting at 8:00 am on weekdays, Saturdays and Sundays and extending service to 6:00 pm on weekdays, and 5:00 pm on Saturdays and Sundays. Each of the Community Bus routes would operate on a base 60-minute service frequency, except the Red Community Bus Route, which would provide 30-minute service frequency during the weekday mid-day and afternoon rush periods, and during the Saturday and Sunday mid-day periods. Appendix B provides a summary of the recommended service plan for the weekday, Saturday and Sunday periods by route.

In addition to improved frequency, the service enhancement plan also extends routes to provide transit serve to new areas of the City which never had transit service before. The Peterborough Airport is proposed to be serviced by extending the Sherbrooke route from Fleming College, down Airport Road to the airport and back to the hub at Fleming College, where riders can transfer to one of the other 4 routes providing access to the rest of the City. Similarly, an extension of the Chemong Route is proposed to provide transit service into the Mason Homes subdivision, along Broadway Boulevard. The Park Route is proposed to provide service into the Hetherington Drive / Woodland Drive area in the north end of the City.

The recommended service enhancement plan adds approximately 54,000 hours of new service annually, representing an increase of 26% compared to the hours of service provided in 2019.

In the current COVID-19 recovery environment, it is not possible to know or predict the full benefits or impact of the new transit route network and the On-Demand pilot program on ridership and financial performance. Table 3 outlines the full proposed service frequency and network expansion costs. It is expected that the full implementation plan will be completed in a phased approach and will be subject to further recommendations based on service delivery experience, lessons learned as the service plan phases are implemented, and each stage has the benefit of evaluation for opportunities for improvement and/or adjustment.

The first phase of the route network implementation is recommended to begin in spring 2022. As part of the 2022 budget review process, staff will provide recommendations for Council consideration on a phased approach to implementing the recommended service improvements along with the potential annual funding and operating budget impacts.

For the full recommended route network enhancement and expansion plan, an annual investment of $4,700,000 in operating funding would be required, which includes 28 additional transit operators, additional supervisory and support staff, and the added operating costs for the fleet. Additional revenues of $1,480,000 are forecast, which includes additional revenues from the Trent and Fleming U-Pass programs, and a conservative estimate of additional fare revenue from increased ridership as the service plan reaches a mature state and COVID related ridership returns to normal levels. A fare increase of approximately 10% is recommended in the future to fund continual service enhancements, which is estimated to generate approximately $200,000 annually. The net increase in operating funding to sustain the service enhancement plan, as summarized in Table 4, is estimated at $3,220,000 annually. Further opportunities to optimize the service and reduce the estimated implementation costs will be reviewed during implementation and through the proposed On-Demand pilot program, as outlined in this report and detailed in Appendix C.

Table 4 – Service Enhancement Plan

Service Enhancements	**Annual Operating Cost**
Weekday Service Frequency Enhancements (30 Minute / 15 Minute Frequency)	$1,342,623
Service Area Expansion (Airport, Hetherington Drive, Broadway Boulevard)	$763,328
Weekend Service Frequency Enhancements (30 Minute / 15 Minute Frequency)	$717,035
Post Secondary Frequency Upgrade	$1,054,983
Other Service Enhancements	$474,688
New Supervisory Support Staff	$347,343
Total Operating Cost – Service Enhancements	**$4,700,000**
Additional Post Secondary Revenues	($260,000)

Fare Revenue from Ridership Growth	($1,020,000)
Future Fare Increase	($200,000)
Total - New Revenue Growth	**($1,480,000)**
Total Net Operating Cost	**$3,220,000**

Phased Implementation Plan

Approval of recommendations b), d) and e) will result in staff reporting back to Council as part of the 2022 budget process with a recommended implementation plan for the proposed service enhancements, including additional recommended staffing, operating costs and revenues, and additional capital funding to support the implementation plan.

Achieving the full recommended service enhancement plan will take a phased approach that recognizes budget constraints and the time required to recruit, hire, and train an additional 28 drivers and other support staff.

Each of the major enhancements in the service plan has been costed on an individual incremental basis, allowing for various options to implement any or all of the recommendations over the next few years.

COVID-19 has destabilized the traditional delivery of Transit services across the province, significantly reducing ridership and revenue for all municipalities. In September 2020, Council approved Report IPSTR20-027 which protected the continuity and consistency of transit service delivery during the winter of 2020 and spring of 2021, as the community experienced an extended period of lockdown followed by the gradual re-opening of the community in June. As the community moves through the Province's phased recovery model, it is recommended that the interim route network and Council directives in Report IPSTR20-027 remain in place until the initial phase of the network plan is implemented, beginning in May 2022. This approach will allow for continued stability of service delivery and maintaining consistent customer expectations, as the community gradually recovers and ridership demand increases. This approach will also enable Transit to continue to respond to evolving Public Health and provincial COVID safety protocols during the recovery period. The approach will also maintain the City's existing Universal Transit Pass Agreements with the Trent Central Student Association and Fleming Student Administrative Council throughout the 2021-2022 school year.

Fleet Requirements

To deliver the Conventional Transit service, the City currently has a fleet comprised of 55 40-foot buses and 1 30-foot Community Bus. Three new 40-foot buses and 8 new 30-foot Community buses were purchased in 2020 and will be delivered by September 2021, bringing the total fleet to 58 conventional 40-foot buses and nine 30-foot Community Bus vehicles.

Based on the recommended Service Enhancement Plan, it is estimated that the recommended network will require 52 buses during peak service. The total recommended fleet size to maintain a 25% spare ratio for the recommended network is 65 buses, including 56 40-foot buses and 9 30-foot buses. Based on the new buses being delivered this year, there will be no need for near-term expansion of the fleet as the additional buses will provide sufficient spare vehicle allowance in the event of mechanical or other vehicle issues. As such, it is anticipated that the existing conventional bus fleet can accommodate the peak vehicle requirements of the recommended network.

Report CLSFS21-001, dated January 18, 2021, authorized the execution of a transfer payment agreement under the Investing in Canada Infrastructure Program – Transit Stream, for 5 separate transit projects, one of which included a multi-year project to fund new expansion transit buses. The 2021 approved capital budget identified a 2022 forecast of $3,816,000 in capital funding to purchase additional expansion buses, pending completion of the Transit Route Review and Long Term Growth Study. Of this amount, $2,798,270 in funding has already been approved under the Federal-Provincial Investing in Canada Infrastructure Program (ICIP) – Transit Stream, with $1,017,730 in municipal funding identified as a 2022 funding requirement.

With the conclusion that the current transit fleet will be sufficient to accommodate the bus requirements for the Service Enhancement Plan, while providing sufficient spare buses to maintain operational flexibility, these new buses will no longer be required. Given the significant financial benefit associated with the approved ICIP program funding, it is recommended that staff seek approval to reallocate the approved ICIP funding to the bus replacement program and to extend the project completion date to March 31, 2024.

Pending completion of the Alternative Fuel Study for Transit, funding for which was approved in the 2021 Capital budget, the reallocated bus replacement funding could be used to purchase new electric or other low/zero emission fuel vehicles. Approval of this reallocation, and the extension of time to purchase new vehicles would allow for a deferral of the $1,017,730 capital funding request in 2022, to the 2023 budget year.

Staffing and Organizational Review

As part of the Transit Route Review, IBI Group also completed a staffing and organizational review of the Transit Division. The review examined the current organizational structure of Transit, completed a peer review of the organizational structure of similar sized Transit Agencies in Ontario, considered emerging trends and issues impacting all Transit Agencies across the province, and considered the potential growth in the Transit Staff complement associated with implementation of enhanced service levels and community growth.

In addition to the need to hire new transit operators to deliver the Service Enhancement Plan, discussed above, the review also identified the need for:

1. a reorganization and better definition in transit supervisory staff responsibilities;
2. the reallocation of administration resources to better align with customer service needs;
3. additional on-road supervision and safety and training resources; and
4. additional resources for planning/scheduling/workforce management.

The first two actions have already been completed through ongoing staffing reviews and minor reallocations of existing staff resources. Items 3 and 4 will require the addition of 3 new supervisory staff positions, as summarized in Table 5. Some of the new positions are needed now and some are required as the overall staff complement grows. Estimated costs for these additional resources are shown in 2022 dollars for illustration purposes.

Table 5 – Summary of Proposed Staffing Requirements

Position Recommendation	**FTE/Assumed Level**	**2022 Cost (including benefits)**
On Road Safety & Training Supervisor	2 @ NU 4	$222,621
Planning, Scheduling & Data Coordinator	1 @ NU 5	$124,722
Total Estimated Annual Cost		**$347,343**

Funding for additional staffing increases would be included in future operational budgets as part of the annual budget review and approval process.

Next Steps

Following Council endorsement of the Route Network and Service Enhancement Plan, staff will monitor ridership trends as the Community emerges from the COVID pandemic and restrictions on non-essential travel and in person gatherings are eased.

Investment Plan

As noted previously, staff propose to report back to Council during the 2022 budget review, with a recommended phased implementation plan for the proposed Service Enhancements and Staffing requests identified in this report. As part of the report, ridership forecasts and revenue forecasts will be updated and a range of revenue opportunities including a potential fare increase program to fund service enhancements will be assessed and presented for approval.

Staff will also report back to Council on additional capital projects and funding required to support the implementation plan, including an assessment of options for improvements to the downtown bus terminal, and a program to upgrade existing and new transit stop infrastructure to improve accessibility and provide customer amenities such as shelters, benches and waste disposal.

Long-Term Growth

Staff will report back to Council in Fall of 2021 with recommendations resulting from Part Two of the Transit Study, the Long Term Growth Strategy. This project component will detail the future long-term Transit vision for the City over the next 20-30 years, along with a long-term service plan including estimates of the long-term capital and operating costs necessary to achieve this vision. This portion of the Project will build on the redesign of the Transit route system completed in Part One and will be integrated with ongoing work being completed as part of the Transportation Master Plan with a view to establishing the overall role that transit can play in an integrated transportation system.

As part of the Long Term Growth Strategy report, Staff will also report back to Council on Part Three of the project, the functional planning for the future replacement of the downtown Transit Terminal to address existing operational deficiencies and constraints, long term growth needs, and provide cost estimates for improvements to support future capital budgeting and funding requests.

Specialized Transit

As noted earlier, a complementary review of the Specialized Transit system, also known as the Handi-van service, is being completed as part of the overall Transit Study project. Work will continue on this component of the project over the summer and Fall of 2021, and additional consultation with customers and stakeholder organizations will help to finalize recommendations that will be presented to Council in late 2021 for consideration.

Summary

The Transit Route Review Study contains recommendations for Council consideration to guide the near-term delivery of improved City public transit services. A new Transit Route Network has been recommended to provide on time delivery of services, more direct routes, faster overall travel times, and reduced reliance on the constrained downtown bus terminal. An On-Demand pilot program is also recommended to meet specific demands and assess opportunities to reduce the number of vehicles required to deliver service during key periods of lower ridership demand. A Service Enhancement Plan has also been developed that responds to public feedback requesting improved transit services. Approval of the enhanced service will be the subject of future budget discussions over a number of years.

The Route Review recommendations provide the foundation for Peterborough Transit to make significant and effective improvements, transforming an inflexible route network and unreliable service to an agile network that delivers a faster, more dependable service.

Submitted by,

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Attachments:
Appendix A – IBI Transit Route Review Report
Appendix B – Recommended Route Network and Proposed Transit Service Enhancement Plan
Appendix C – VIA OnDemand Transit Planning Study
Appendix D – Customer Travel Comparison

DRAFT Report

Transit Route Review

Peterborough Transit Study

Prepared for the City of Peterborough
by IBI Group
April 29, 2021

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1 Introduction

This report provides a critical review of Peterborough's transit system and recommendations for how service can be improved in the near term. It is one of three parallel and related studies undertaken by the City of Peterborough to improve transit service; the companion review of the City's long-term vision for transit and downtown terminal study are published under separate cover. This transit route review focuses on short term changes to the network that can be implemented in the next 5 years and will set the foundation for the long-term vision.

1.1 Background

Until 2020, the City of Peterborough operated a downtown-oriented radial transit network consisting of 12 regular routes, 4 post-secondary express services, and various targeted services that included a community bus, a peak period commuter service, and 4 high school routes. In 2017, the system carried 3.8 million riders, and ridership has been growing consistently in the post-secondary school market.

Upon the onset of the COVID-19 pandemic, the City developed a temporary network of routes that, among other features, aimed to minimize the number of people congregating at the downtown terminal. As of the time of writing, this temporary network is still in operation; however, the focus of this review will remain the previous "permanent" radial network described above.

In 2012, the City completed a review of its conventional and specialized transit systems and has since implemented a number of the recommendations. Service levels on some routes has been increased during peak periods, which has alleviated some overcrowding and increased ridership. The implementation of more recommendations was delayed by constraints in funding. Changes in the operating context necessitate a further review of the existing network and its effectiveness, as well as re-visiting the long-term vision for transit in Peterborough.

The radial design of the transit system connects most parts of the city to downtown, providing a one-seat ride to riders headed to downtown. While this network design has served Peterborough's traditional single-use zoning patterns and downtown-centric travel well, as the city grows and expands, there is increasing demand to serve destinations outside the downtown core without the need to travel through the downtown. These destinations and travel patterns are not well-served by transit. In addition, new growth areas are occurring on the periphery of the city with a resultant need to expand service into these areas. Extending the existing route network to these areas presents challenges in terms of efficiency and may require major changes to the route network.

1.2 Objectives

The primary objective of the Route Review is to develop service recommendations that address the short-term needs of the travelling public while improving the efficiency and effectiveness of the system and accommodating future growth in the city. To this end, the route review will:

- **Provide a critical analysis** of the existing transit network in relation to travel patterns and needs in the city
- **Benchmark current performance** against Peterborough's peer group;
- **Evaluate existing service standards** and recommend potential changes;
- **Identify needs and opportunities** for near term improvements to the route network;
- **Develop alternative solutions** to address these needs; and
- **Recommend changes** and set the stage for an implementation plan.

1.3 Report Structure

This report is structured around the following sections:

- Section 2 is a review of relevant background information, including the operating context and the policy framework guiding the provision of transit service in Peterborough;
- Section 3 is a review of six peer transit systems, which provide a benchmark for the effectiveness, efficiency, management and operations of Peterborough's transit system;
- Section 4 is a detailed review of the transit system, identifying travel patterns, trends, performance measures, and service area characteristics;
- Section 5 is a review of individual routes to identify their attributes, including identifying major trip generators, operational challenges, and potential gaps and opportunities in their alignment; and
- Section 6 presents a summary of needs and opportunities that will guide subsequent changes to the transit system.
- Section 7 presents the network alternatives and evaluates them based on the needs and opportunities to inform the selection of a recommended route network for Peterborough; and

- Section 8 is an outline of the recommended network, and the resources and investment required for its implementation.
- Section 9 is an overview of public and stakeholder feedback on the transit system received during the two waves of consultation, which also informed the development and selection of a recommended route network; and
- Section 10 concludes the report with recommendations to consider during implementation, and opportunities to integrate that process with the development of the long-term growth strategy and Downtown Terminal study.

2 Background Review

Peterborough is a single-tier municipality in the “outer ring” of the Greater Golden Horseshoe (GGH). The city experienced a major industrial expansion in the post-war period when its population more than doubled. The effects of this growth are evident in development patterns: moving outward from the core, the compact grid of the historic downtown transitions to suburban development typical of the post-war period. The city is the regional hub for employment, health services, education and recreation as the main urban centre in the Kawarthas. This has resulted in a significant growth of employment in the service sector, which now boasts many of the city’s largest employers (Peterborough Regional Health Centre, Trent University, and Ministry of Natural Resources etc.).

In recent years, growth in the City has been buoyed by new residential developments on its periphery, a new casino, and a proposed environmentally-focused research and innovation site near Trent University (Cleantech Commons). In the next two decades, Peterborough’s population and employment are expected to increase by over 35% and 30% respectively. These changes are changing how people move in the city, and will continue to have an impact on travel demand patterns.

This section identifies transportation and land use policies that direct transit delivery in Peterborough.

2.1 Policy Framework

The current policy framework that guides the provision of transit in Peterborough is reviewed below. The documents reviewed make up the City’s transportation and land-use planning framework and influence the effectiveness of the transit system.

Transportation Policies

In 2012, the City updated its Transportation Master Plan (TMP) and conducted a Transit Operations Review. Transportation and transit policies and decisions are mainly guided by these documents. The 2012 TMP included various recommendations to improve transit, such as accessibility improvements, improved connectivity for pedestrians and a more transit supportive street network, and transit service guidelines and performance targets. These included a transit mode share target of 6% by 2021.

To achieve this target, the 2012 Transit Operations Review recommended several actions, notably:

- Enhancing service levels by increasing frequency on all regular routes; and
- Improving the efficiency of the existing network by rationalizing low-volume and duplicative services.

Increased frequencies were implemented on four routes at peak periods, and were very successful. Other changes were less successful due to operational challenges and were largely reverted, while the remaining changes were stalled by funding constraints.

Land Use Context

The land use context has a significant impact on the nature of the transportation network and where, why, when, and how it is used. Land use policies dictate the urban structure and built form and how it should change to accommodate growth.

As a single-tier municipality in the “outer ring” of the GGH, Peterborough is subject to the provincial intensification targets set in the *Growth Plan for the Greater Golden Horseshoe*. This Provincial plan directs growth toward growth centres, built-up areas and designated greenfield areas. To accommodate the proposed population and employment growth efficiently, the City has been updating its Official Plan (OP). The official plan includes various transit supportive policies, such as

- Planning employment areas in locations served by transit and where feasible, encouraging compact built form and minimized surface parking;
- Developing greenfield and intensification areas with urban forms and densities that support transit and active transportation;
- Promoting the use of transit and active transportation modes to support energy efficiency and improve air quality;
- Encouraging the construction of pedestrian sidewalks and walkways to link transit stops directly to developments;
- Reconsidering the continuation of fixed route services continually providing less than 10 trips per revenue hour;
- Encouraging street patterns that support the extension of transit routes into new developments;
- Ensuring appropriate street design to accommodate transit use; and
- Minimizing duplication between school board bus service and Peterborough Transit.

The Growth Plan identifies Downtown Peterborough as an Urban Growth Centre and a targeted area for intensification, indicating policy direction to significantly increase density. This is supported by the City's OP, which also identifies additional corridors and nodes for intensification. These intensification areas encourage mixed land-uses ad transit-supportive densities. The main corridors identified in the Official Plan update are Lansdowne St., Chemong Rd., Clonsilla Ave., Armour Rd., and Water St. Three of the nodes are along Lansdowne St., two are on Armour Rd., and one each on Chemong Rd., Closnilla Ave. and Water St. As the city grows, these areas will have a land-use mix and population and employment density that can support transit.

3 Peer Review

This section summarizes the performance of transit systems in six municipalities that are comparable to Peterborough in terms of size and demographics. While the needs of each municipality are unique, a peer review is a useful benchmark for the effectiveness and efficiency of Peterborough's transit operations against its peers. The review will also be used to identify best practices, standards, and strategies from other agencies in the development of the second phase of the study.

The peer systems selected for review are: Brantford, Sault Ste. Marie, Niagara Falls, Thunder Bay, Guelph, and Kingston. The data used for the peer review was sourced from the 2017 Canadian Urban Transit Association's (CUTA) Fact Book. The sections below focus on four categories: the service area and network, performance measures, financial performance and operations, expanding on the summary of peer system characteristics in Exhibit 3-1.

Exhibit 3-1: 2017 Service and Performance Characteristics of Peer Transit Systems

	Peterborough	Niagara Falls	Brantford	Kingston	Sault Ste Marie	Guelph	Thunder Bay	Average
Service Characteristics								
Municipal Population	81,000	85,000	98,225	124,454	74,200	131,794	146,048	105,817
Service Area Population	81,000	80,000	98,225	121,133	69,900	131,794	107,909	98,566
Service Area Size (Sq.Km.)	67	81	75	132	224	87	323	141
Population Density (People/Sq. Km.)	1,201.8	988.9	1,307.9	919.8	312.8	1,514.9	334.1	940
Number of Fixed Routes	19	27	15	22	10	30	17	20
Routes per 1,000 capita	0.23	0.34	0.15	0.18	0.14	0.23	0.16	0.20
Fleet	53	27	30	74	28	102	42	51
Active Vehicles at Peak	41	25	21	55	17	65	32	37
Spare Ratio	23%	7%	30%	26%	39%	36%	24%	26%
Employee Statistics								
Full Time Operators	72	61	44	99	52	144	99	82
Part Time Operators	17	26	13	59	-	19	10	21
Employees Per Peak Vehicle	2.2	3.5	2.7	2.9	3.1	2.5	3.4	2.89
Top Operator Wage Rate	$ 28.20	$ 28.20	$ 26.43	$ 29.17	$ 26.16	$ 28.84	$ 26.82	$ 27.69
Ridership								
Ridership (Revenue Passengers)	3,845,224	2,310,328	1,435,449	6,145,809	1,627,289	6,476,108	3,779,172	3,659,911
Revenue Vehicle Kilometres	2,448,340	2,261,560	1,857,121	4,473,753	1,710,087	3,853,130	3,044,157	2,806,878
Revenue Vehicle Hours	133,808	106,101	77,400	238,688	79,800	205,820	145,157	140,968
Operating Revenue								
Regular Service Passenger Revenue	$ 5,021,958	$ 1,413,066	$ 2,371,809	$ 7,181,973	$ 2,188,354	$ 11,696,803	$ 5,534,920	$ 5,058,412
Total Operating Revenue	$ 5,247,440	$ 4,208,483	$ 2,930,153	$ 7,313,339	$ 2,282,623	$ 12,137,418	$ 5,641,438	$ 5,680,128
Total Revenue	$ 5,254,104	$ 5,849,507	$ 2,969,585	$ 8,179,560	$ 2,282,623	$ 12,170,120	$ 5,641,438	$ 6,049,562

Source: Canadian Urban Transit Association Factbook 2017

	Peterborough	Niagara Falls	Brantford	Kingston	Sault Ste Marie	Guelph	Thunder Bay	Average
Operating Expenses								
Transportation Operations	$ 8,250,411	$ 7,085,073	$ 4,671,776	$ 14,165,238	$ 4,252,836	$ 17,178,171	$ 7,664,037	$ 9,038,220
Fuel/Energy Exp. For Vehicles	$ 1,366,845	$ 1,203,627	$ 937,468	$ 2,885,006	$ 996,591	$ 2,519,091	$ 1,706,246	$ 1,659,268
Vehicle Maintenance	$ 1,457,405	$ 2,206,017	$ 2,206,984	$ 3,325,988	$ 1,449,891	$ 5,105,371	$ 3,220,882	$ 2,710,363
Plant Maintenance	$ 619,266	$ 582,503	$ 710,108	$ 743,272	$ 760,200	$ 1,206,238	$ 1,052,924	$ 810,644
Genera/Administration	$ 585,649	$ 271,085	$ 352,090	$ 415,561	$ 761,082	$ 1,045,981	$ 2,616,688	$ 864,019
Total Direct Operating Expenses	$ 12,279,576	$ 11,348,305	$ 8,878,427	$ 21,535,065	$ 8,220,600	$ 27,054,852	$ 16,260,777	$ 15,082,515
Net Cost/Capita	$ 86.73	$ 68.73	$ 60.16	$ 110.25	$ 84.95	$ 112.94	$ 98.41	$ 88.88
Performance Indicators								
Financial								
Total Oper. Rev. / Total Dir. Oper. Exp (R/C Ratio)	43%	37%	33%	34%	28%	45%	35%	36%
Municipal Operating Contribution / Capita	$ 69.32	$ 89.47	$ 48.19	$ 117.45	$ 73.16	$ 112.94	$ 91.90	$ 86.06
Net Dir. Oper. Cost / Reg. Serv. Pass.	$ 1.83	$ 3.09	$ 4.12	$ 2.31	$ 3.65	$ 2.30	$ 2.81	$ 2.87
Average Fare								
Reg. Serv. Pass. Rev. / Reg. Serv. Pass.	$ 1.31	$ 0.61	$ 1.65	$ 1.17	$ 1.34	$ 1.81	$ 1.46	$ 1.34
Cost Effectiveness								
Tot. Dir. Oper. Exp. / Reg. Serv. Pass.	$ 3.19	$ 4.91	$ 6.19	$ 3.50	$ 5.05	$ 4.18	$ 4.30	$ 4.48
Service Utilization								
Reg. Serv. Pass. / Capita	47.47	28.88	14.61	50.74	23.28	49.14	35.02	35.59
Rides per 1000 capita	47,471.90	28,879.10	14,613.89	50,736.04	23,280.24	49,138.11	35,021.84	
Reg. Serv. Pass. / Rev. Veh. Hr.	28.74	21.77	18.55	25.75	20.39	31.46	26.04	24.67
Amount of Service								
Rev. Veh. Hrs. / Capita	1.65	1.33	0.79	1.97	1.14	1.56	1.35	1.40
Average Speed								
Rev. Veh. Kms. / Rev. Veh. Hr.	18.30	21.32	23.99	18.74	21.43	18.72	20.97	20.50
Labour Productivity								
Rev. & Aux. Rev. Veh. Hrs. / Oper. Paid Hr.	0.63		0.70	0.75	0.79	0.59	0.69	0.69
Top Wage Rates								
Operators	$ 28.20	$ 28.20	$ 26.43	$ 29.17	$ 26.16	$ 28.84	$ 26.82	$ 27.69
Cost per Rev. Vehicle Hour								
Tot. Dir. Oper. Exp. / Rev. Hrs.	$ 91.77	$ 106.96	$ 114.71	$ 90.22	$ 103.02	$ 131.45	$ 112.02	$ 107.16

Source: Canadian Urban Transit Association Factbook 2017

3.1 Service Area and Network

This section reviews the service area characteristics of the peer transit systems, including the population, population density, and type of transit network to set the context for the peer review.

Peterborough's population is similar to Niagara Falls, Brantford, and Sault Ste. Marie. Kingston, Guelph, and Thunder Bay have larger populations, but are within the range of Peterborough's projected 2041 population. In terms of service area, Peterborough is the smallest among its peers, but comparable to Niagara Falls, Brantford, and Guelph. Peterborough has higher population density in its service area compared to its peer average, at 1,200 people per square kilometre. Of the peer communities, Brantford, Niagara Falls, and Guelph are all in the "outer ring" of the GGH, and subject to the provincial intensification targets. Additionally, Downtown Brantford and Downtown Guelph are designated Urban Growth Centres, similar to Downtown Peterborough.

Similar to Peterborough, Brantford, Guelph and Sault Ste. Marie operate radial systems, all of which originate from their downtown transit terminals. Guelph's system slightly differs from Peterborough's in that it has two main hubs connected directly along a major transit corridor. Niagara Falls operates a grid transit system with three major terminals, two of which provide access to inter-municipal services, and four smaller terminals at major trip generators. Kingston and Thunder Bay operate multiple hub systems, with hubs located at major trip generators, such as the downtown areas, post-secondary institutions, and the major retailers.

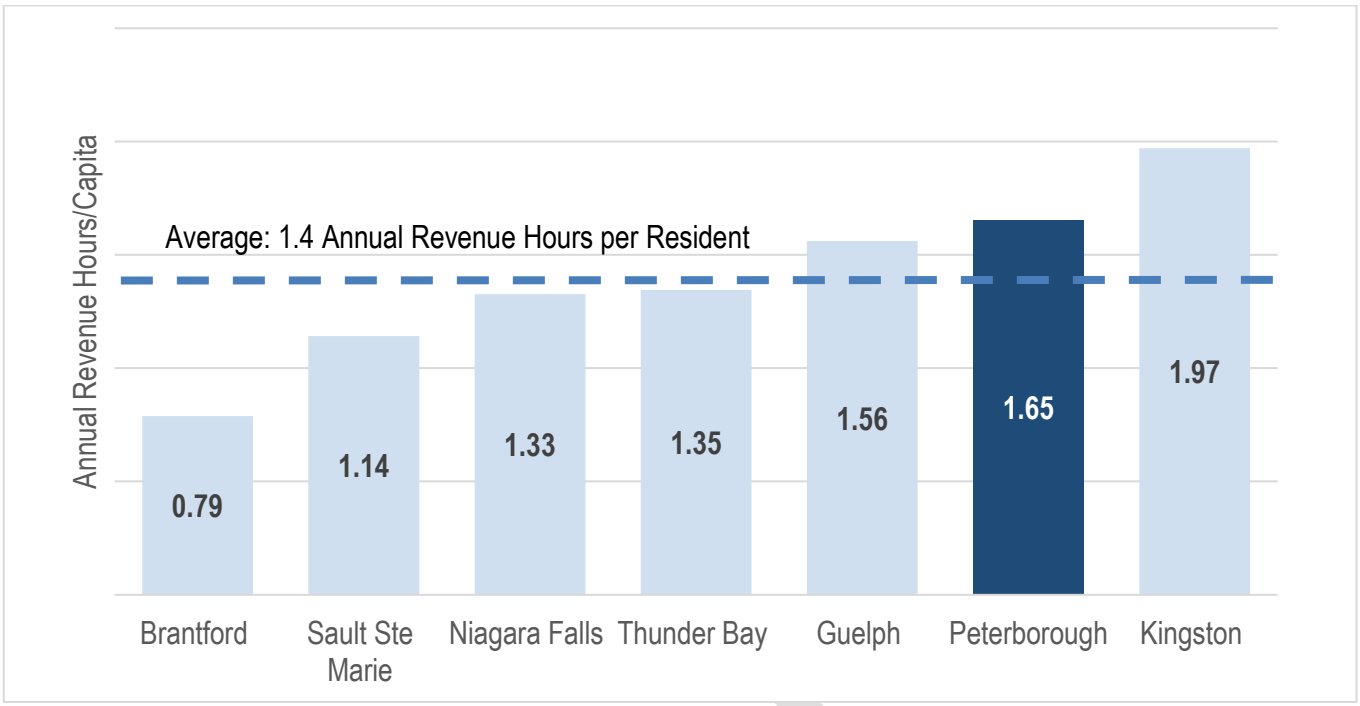
Peterborough operates 19 routes, on par with the peer average of 20. Niagara Falls and Guelph operate the most routes in the peer group. In the case of Niagara Falls, the number of routes is higher because they have a separate schedule for evenings and Sunday/Holiday service. Although Guelph has a higher population than Peterborough, it has the same number of routes per capita.

3.2 Performance Measures

The main performance measures reviewed in this section are the investment into the system, service utilization and ridership. These metrics influence the financial performance of the system, reviewed in Section 3.3.

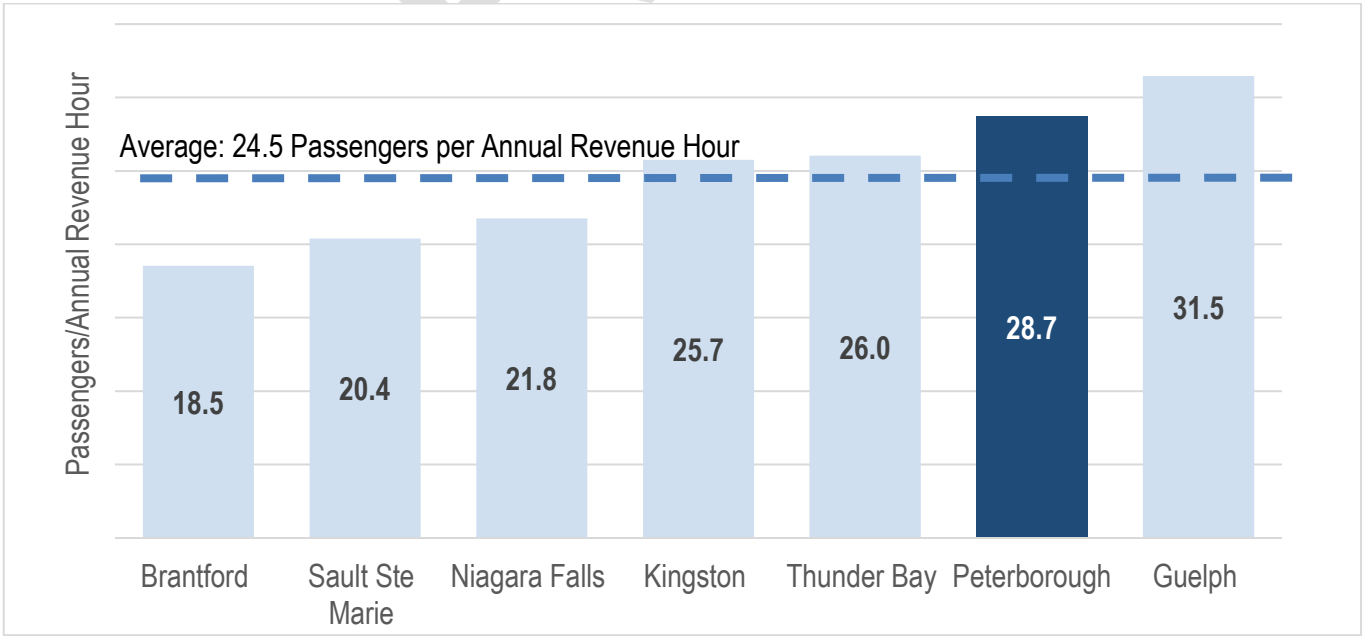
Compared to its peers, Peterborough currently provides above average vehicle-hours per capita (Exhibit 3-2). This is primarily due to the high level of service provided to Trent University and Fleming College, both of which have frequent service. Kingston has the highest annual revenue vehicle-hours per capita, and Brantford the lowest.

Exhibit 3-2: Peer System Service Levels



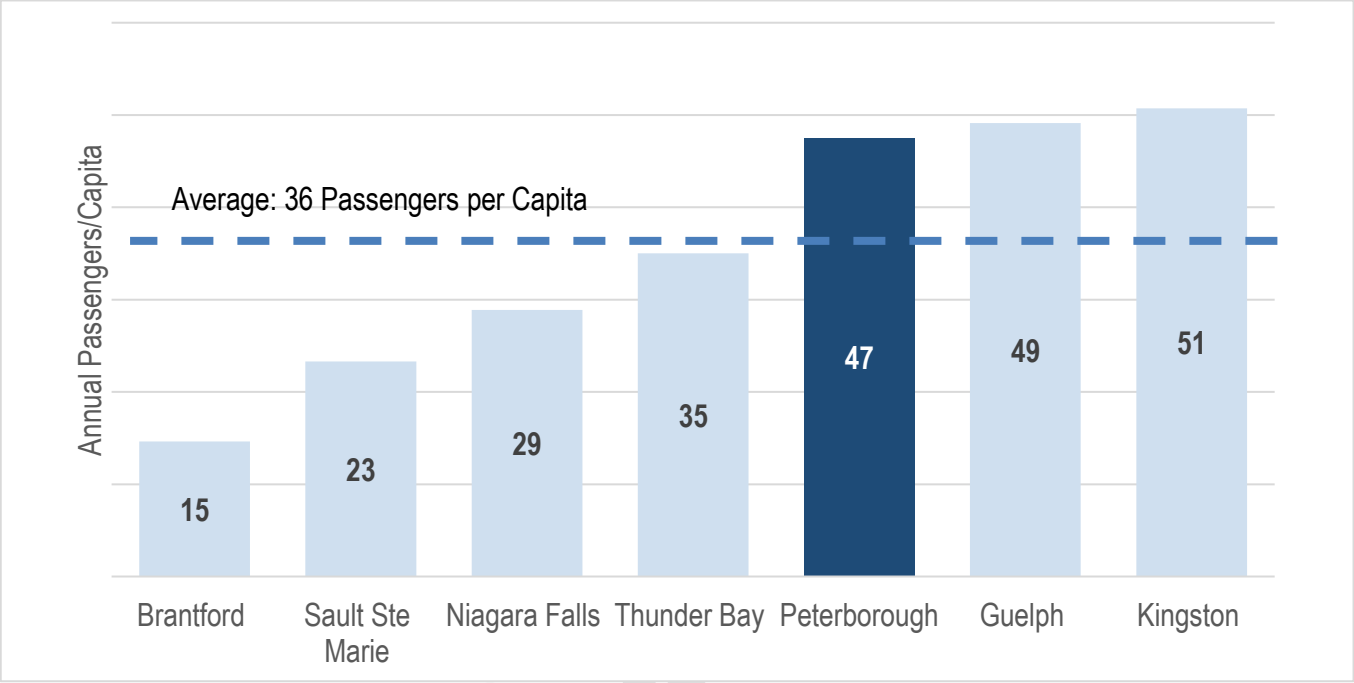
Service utilization in Peterborough is the second highest among its peers at nearly 29 passengers per revenue vehicle hour (Exhibit 3-3). Service utilization in the peer group is highest in communities that also have large post-secondary populations. Peterborough's service utilization is comparable to Guelph and Kingston, both of which have universities and colleges.

Exhibit 3-3: Peer System Service Utilization



Peterborough's per capita ridership is also higher than the peer average (Exhibit 3-4). Guelph and Kingston are the only systems with higher per capita ridership than Peterborough. Brantford has the lowest per capita ridership.

Exhibit 3-4: Peer System Passengers per Capita



Ridership in Peterborough is strongly influenced by the high ridership in the post-secondary market. The level of service provided to Trent University and Fleming College in terms of route alignment, service span and frequency is also significantly higher than the rest of the network.

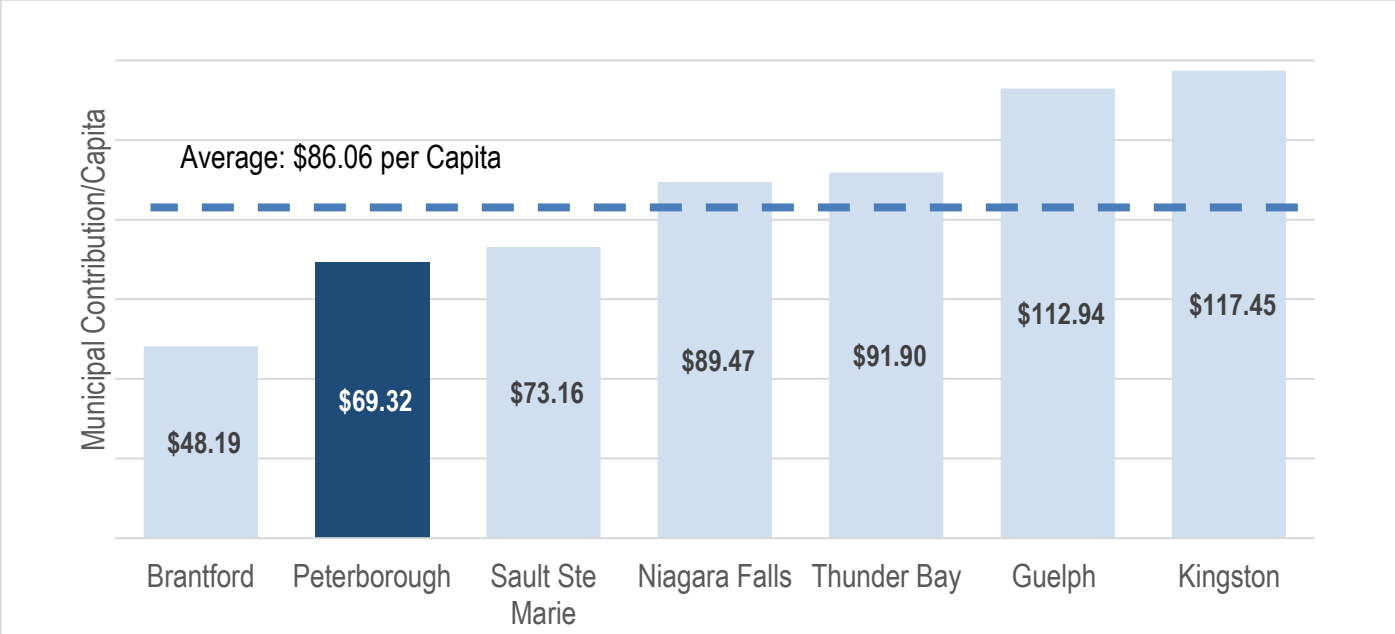
Similar to Peterborough, Kingston and Guelph provide express and regular services, as well as late-night routes in partnership with post-secondary institutions. Peterborough provides a similar service span to its peers; however, the 40-minute headways on most routes are unique to Peterborough. Additionally, Peterborough's average operating speeds are the lowest among its peers at 18.3 kilometres per hour. This is likely due to the indirectness of routes, and terminal access challenges, which also necessitate the 40-minute headways.

3.3 Financial Performance

This section reviews the overall financial performance of the system, including the costs of operation, the municipal investment, and the revenues. While transit offers many community benefits irrespective of cost, these measures are indicative of the sustainability of the system.

Peterborough's operating costs are below the peer average, and most comparable to Niagara Falls, which is similar in size. Guelph and Kingston have the highest and second highest operating costs in the peer group and Sault Ste. Marie the lowest. Peterborough's municipal operating contribution per capita is the second lowest in the peer group, influenced by the funding provided by the post-secondary institutions for the Trent and Fleming express routes (Exhibit 3-5).

Exhibit 3-5: Peer Systems Municipal Investment



Peterborough's passenger revenues are comparable to the peer average. Kingston and Guelph, which have larger populations, service areas, and annual revenue hour.

Trent and Fleming express services are purchased at cost from Peterborough Transit by the two post-secondary institutions. The benefit of this agreement is evident in the cost effectiveness of Peterborough's transit system: at $3.19 per revenue passenger, Peterborough has the lowest direct operating costs among its peers. The system also has the second highest cost recovery among its peers at 43% – Guelph being the highest at 45%. Compared to systems of a similar size in Canada, it is a very cost-effective service.

3.4 Operations

This section reviews the fleet and staffing characteristics of the peer systems, which are illustrative of the management of the system.

Peterborough has a 23% fleet spare ratio, which is the ratio of buses operating at peak to the total fleet. Spares are required to accommodate scheduled

maintenance programs and unexpected breakdowns. The industry standard for mid-size transit systems is a spare ratio of 20% to 25%. With the exception of Niagara Falls, Kingston, and Thunder Bay, the spare ratios for the other peer systems are higher than recommended.

The composition of Peterborough's labour force is average amongst its peers in terms of the ratio of full-time to part-time operators. The ratio of operators to peak vehicles at 2.2 is below the peer average of 2.9. Top operator wage rates are on par with peer communities.

3.5 Key Findings

Given the size and characteristics of the community, Peterborough's transit system performs well on most measures. It has significantly better ridership and service investment than communities with a similar population.

The key conclusions from the peer analysis are below.

- **Service area and network:** Downtown-centric radial networks are common among peer cities because of similar land development patterns and relative efficiency of this network type at low levels of service frequency.
- **Performance Measures:** Ridership is driven by the post-secondary travel market, a trend similar to other communities with large post-secondary student populations. Kingston has to some degree bucked this trend by investing heavily in an express network that forms the spine of the system rather than focusing on student travel.
- **Financial Performance:** Peterborough performs well on cost measures compared to its peers. The system is more cost-effective and has a higher cost-recovery rate than the majority of its peers. This trend is likely in part due to funding agreements with post-secondary institutions, which purchase a fixed number of service hours at cost.
- **Operations:** Peterborough's spare ratio is within the industry standard for a mid-sized system, and comparable to its peers. The composition of labour force and the top operator wage rates are also comparable to peers.

4 System Review

This section presents a critical assessment of the network and service attributes, the system's performance trends, and service area characteristics to determine whether the system is effectively and efficiently meeting the travel needs of its users.

4.1 Network and Service Attributes

Peterborough operates a downtown-oriented radial transit network with three service layers:

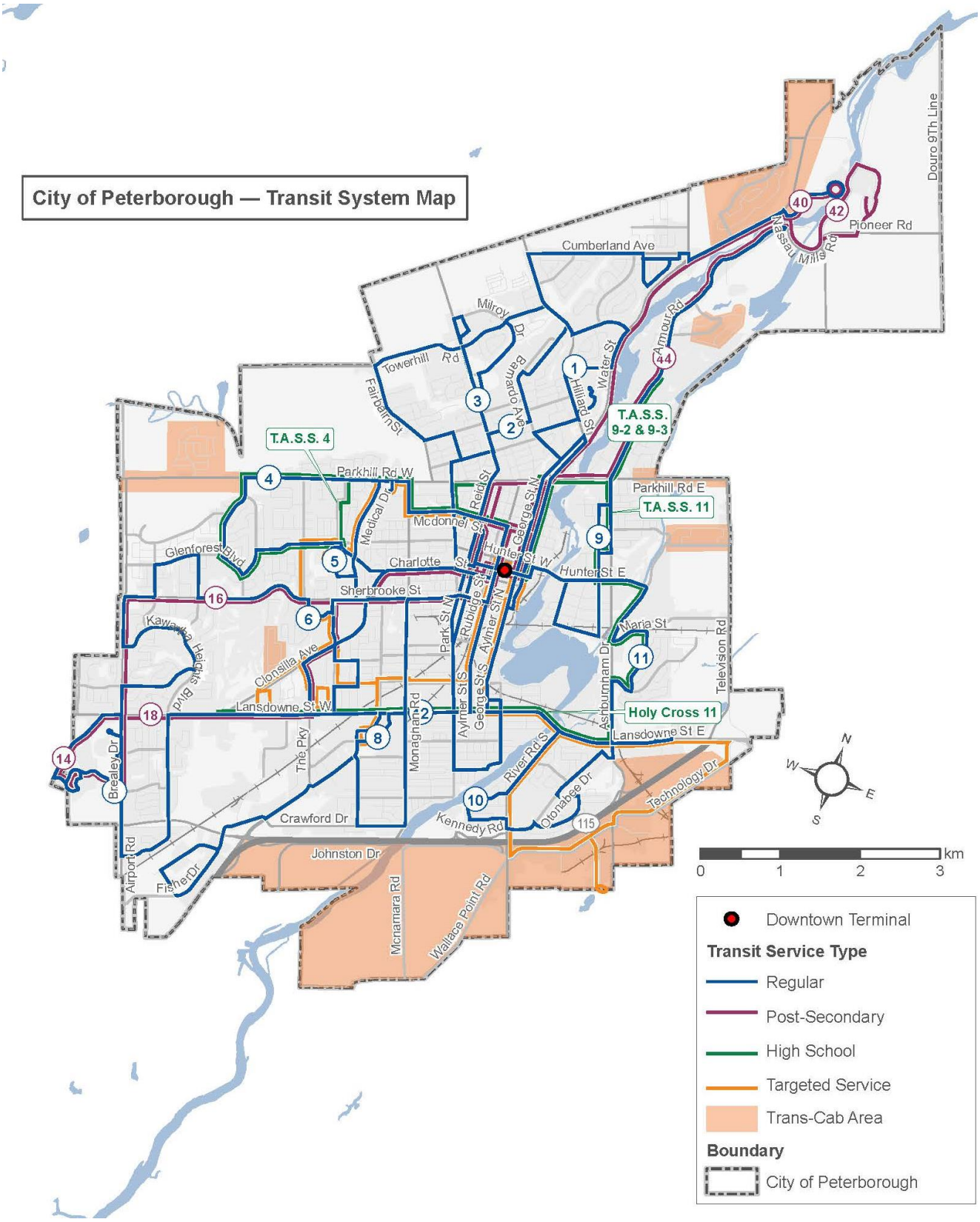
- 12 regular routes connecting different parts of the city to downtown;
- 4 post-secondary express routes to Trent University and Fleming College (which also provide late night service); and
- Various targeted services, including:
  - a community bus route connecting major trip generators outside downtown;
  - a peak period commuter service to the industrial lands in the southeast of the city; and
  - 4 high school routes operating at bell times.

All the routes originate in the downtown terminal, with the exception of the community bus, which does not directly access the downtown terminal. The fixed routes are supplemented by TransCab services in areas with transit demand that are not currently served by the system.

The main challenge of the design of Peterborough's transit network is high average travel times between point of origin and point of destination. The city is fairly compact, and most routes have short cycle times – a benefit for the competitiveness of transit. However, for trips not centered on the downtown, the radial design of the network can significantly increase travel times. Compounding this issue is the street network. While the downtown benefits from a compact and walkable grid, the majority of the city is in the typical suburban pattern of dead-end curvilinear streets bounded by arterial roads. This development pattern forces a trade-off between providing direct service and reducing walking distance to transit. The street network results in circuitous routing, which limits average speed of transit vehicles and increases overall travel time.

Exhibit 4-1 presents a map of the existing transit system route network.

Exhibit 4-1: 2019 Transit System Map

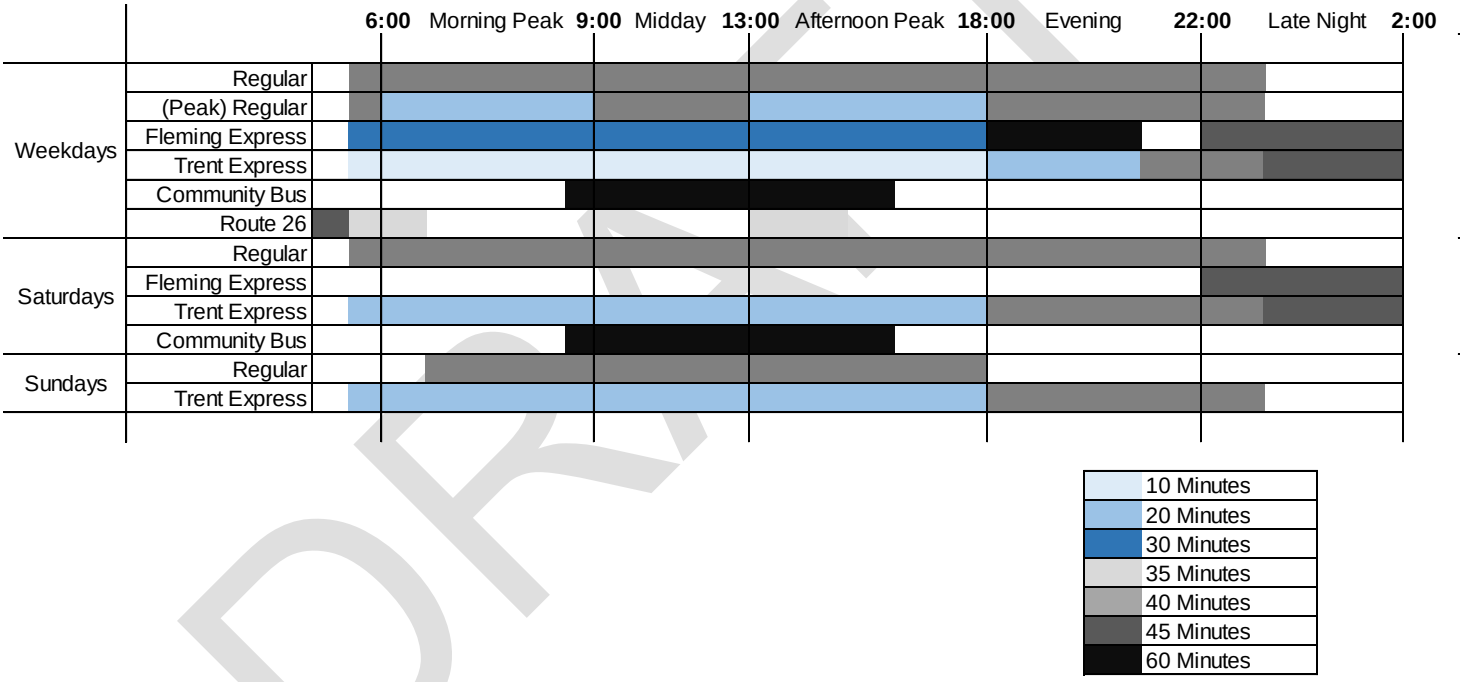


The span and frequency of the regular routes is uniform, with the exception of four routes (2, 7, 8, and 10) which have increased frequencies during the morning and afternoon peaks. All the regular routes operate on 40 minute headways. The uniform headways are beneficial for facilitating transfers for system, which can only happen at the downtown terminal. Non-clock headways are usually avoided in service planning because they do not align with typical start times for services, and their pattern is not repetitive on the hour, making them less intuitive for users.

Among the express routes, the Trent routes have a 10-minute frequency and the Fleming routes have a half-hour frequency.

The span and frequency are illustrated in (Exhibit 4-2).

Exhibit 4-2: Peterborough Service Span and Frequency



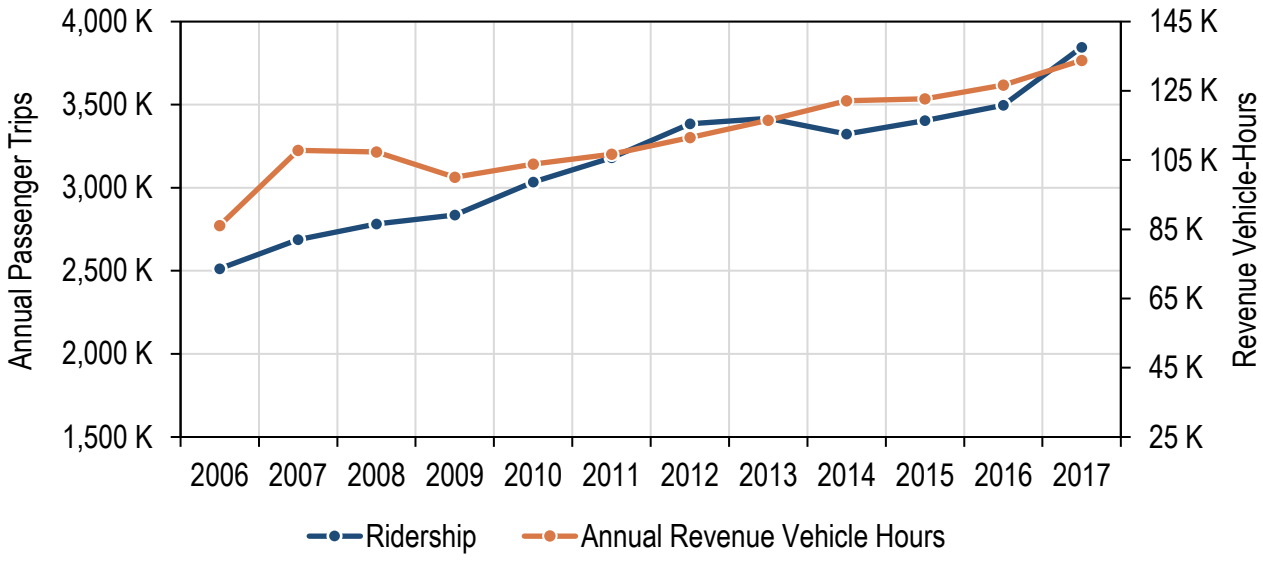
4.2 Performance Trends

This subsection focuses on the historical performance of the transit system by reviewing three main indicators:

- **Ridership versus annual revenue vehicle hours**, to determine the relationship between increasing investment has on ridership;
- **Ridership versus population**, to determine whether transit is taking up a larger share of the travel market; and
- **Ridership per revenue hour versus operating cost per service hour** and cost recovery over time to assess the efficiency of the system.

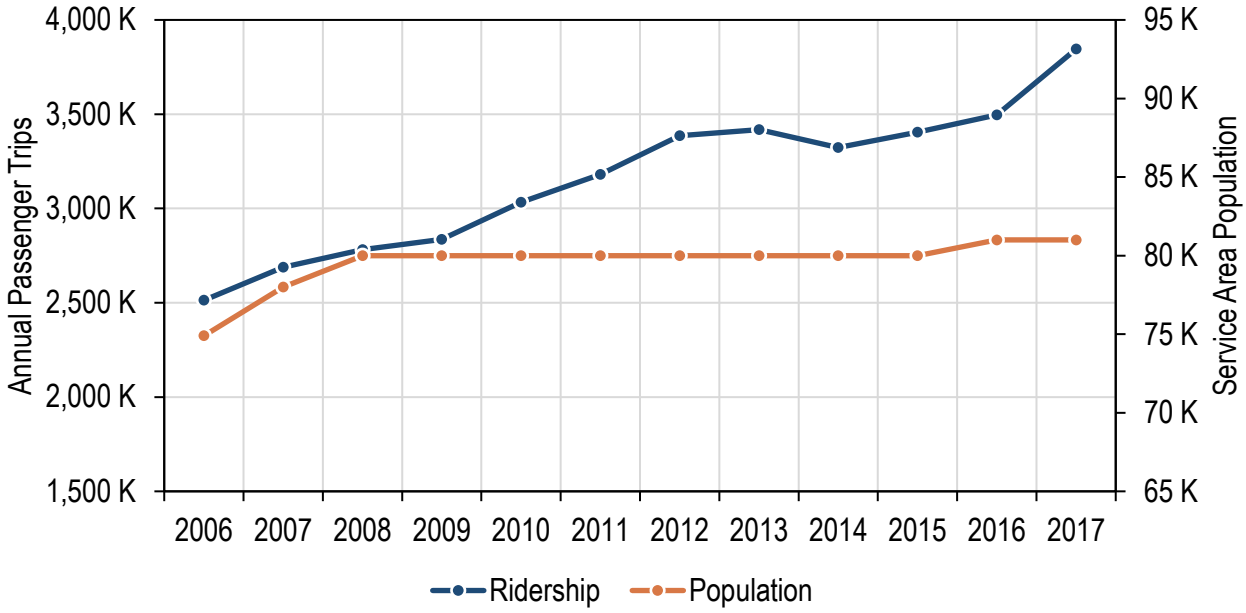
Since 2007, transit ridership in Peterborough has grown by 43%, while the annual revenue vehicle hours have increased by 24%, illustrated in Exhibit 4-3. Ridership growth is outpacing investment in the system, a trend expected to continue with the expansion of the Universal Transit Pass (U-Pass) program to full time Fleming students and the accompanying increase in service to Fleming College. This trend shows a relationship between service enhancements and ridership, although it's worth noting that the improvements were targeted towards a specific trip type.

Exhibit 4-3: Ridership and Annual Revenue Vehicle Hours: 2007 - 2017



While ridership has seen significant growth in the past decade, it's worth noting that Peterborough's population has been fairly static in the same time period, only growing by 4% (Exhibit 4-4). The bulk of this growth can be attributed to new trips by post-secondary students, as discussed in Section 4.3.

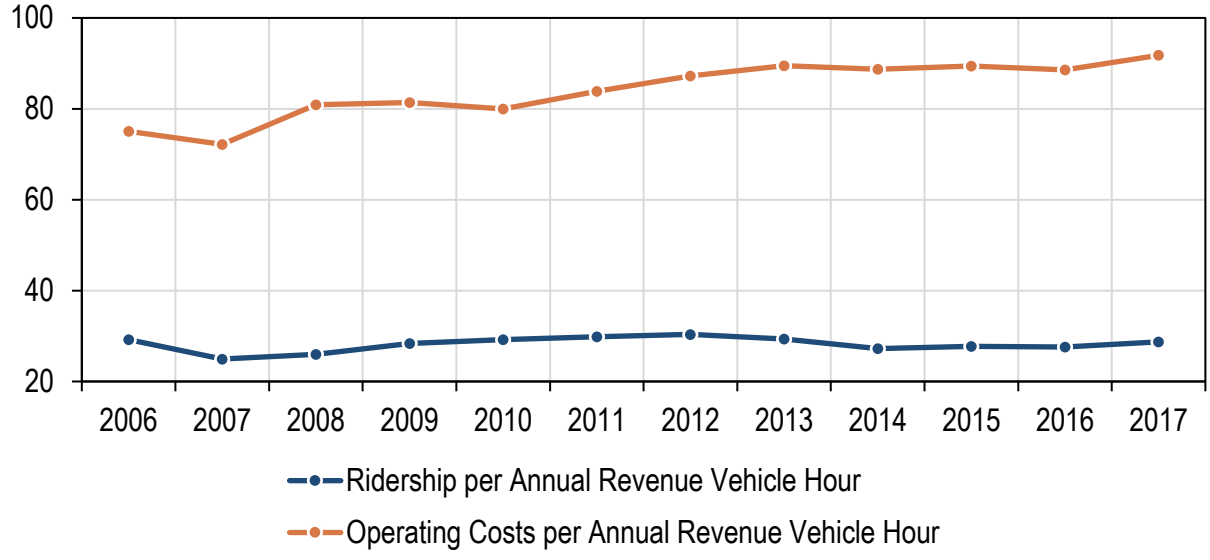
Exhibit 4-4: Ridership and Service Area Population: 2007 - 2017



Since 2007, the ridership per revenue hour has increased by 15%, while the operating costs per revenue vehicle hour have increased by 27% (Exhibit 4-5). The increase in costs can be attributed to various factors, including maintenance, wages, and fuel.

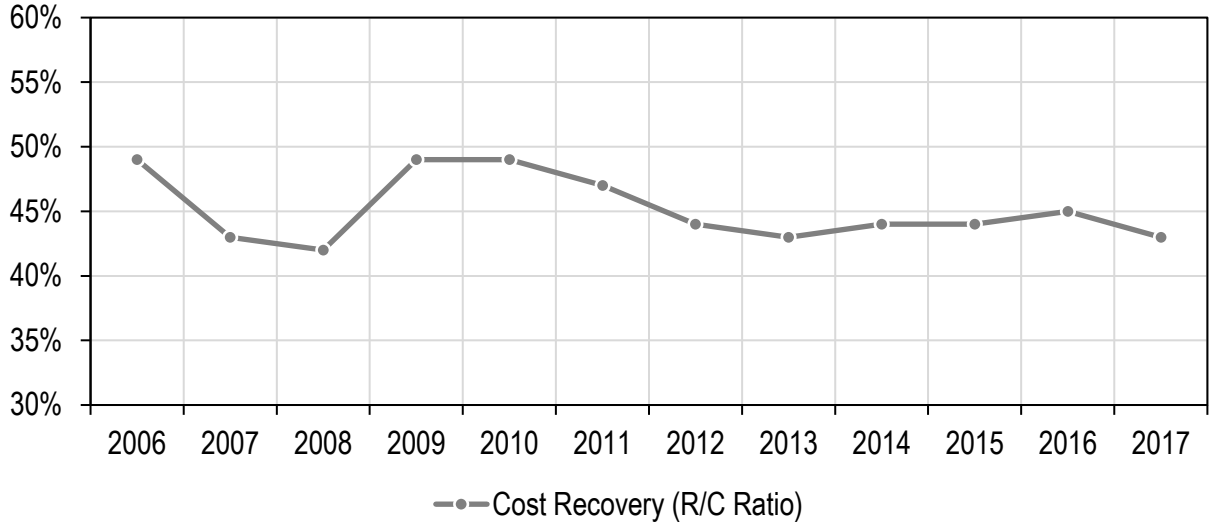
Ridership per service hour has remained steady in the same time period. Although the steady ridership is a positive trend, the lack of growth indicates that there is opportunity for the system to better meet the transportation needs of Peterborough residents.

Exhibit 4-5: Cost Efficiency versus Service Utilization: 2007 - 2017



As previously discussed, the system's cost recovery rate is high in comparison to peers and has not changed significantly since 2007. (Exhibit 4-6). This is positive and reflects the effect of the increase in transit ridership and fare revenue, which has outpaced the increase in the service levels and operating cost increases since 2007.

Exhibit 4-6: Cost Recovery: 2007 - 2017



4.3 Service Area Characteristics

The City of Peterborough has approximately 81,000 residents and 44,000 jobs. By 2041, both are expected to grow by over 30%. The population is fairly evenly dispersed throughout the city in a primarily low-rise residential built form. There are some pockets of higher residential density in the southeast and northwest, as well as the western parts of the city. As part of the Growth Plan and Official Plan Review, several nodes and corridors were identified as designated growth areas. The population density and the areas targeted for growth are illustrated in Exhibit 4-7.

A majority of the city's commercial areas are concentrated in the downtown area and along the Lansdowne and Chemong corridors. A significant portion of the City's employment is concentrated in periphery areas, made up primarily of the industrial lands in the south and Trent and Fleming. Other more centrally located major employment areas are the hospital, downtown and major retailers along the Lansdowne and Chemong corridors. Exhibit 4-8 illustrates the employment distribution in Peterborough.

Exhibit 4-7: Peterborough Population by Traffic Zone: 2016 and Official Plan Designated Growth Areas, Nodes and Corridors

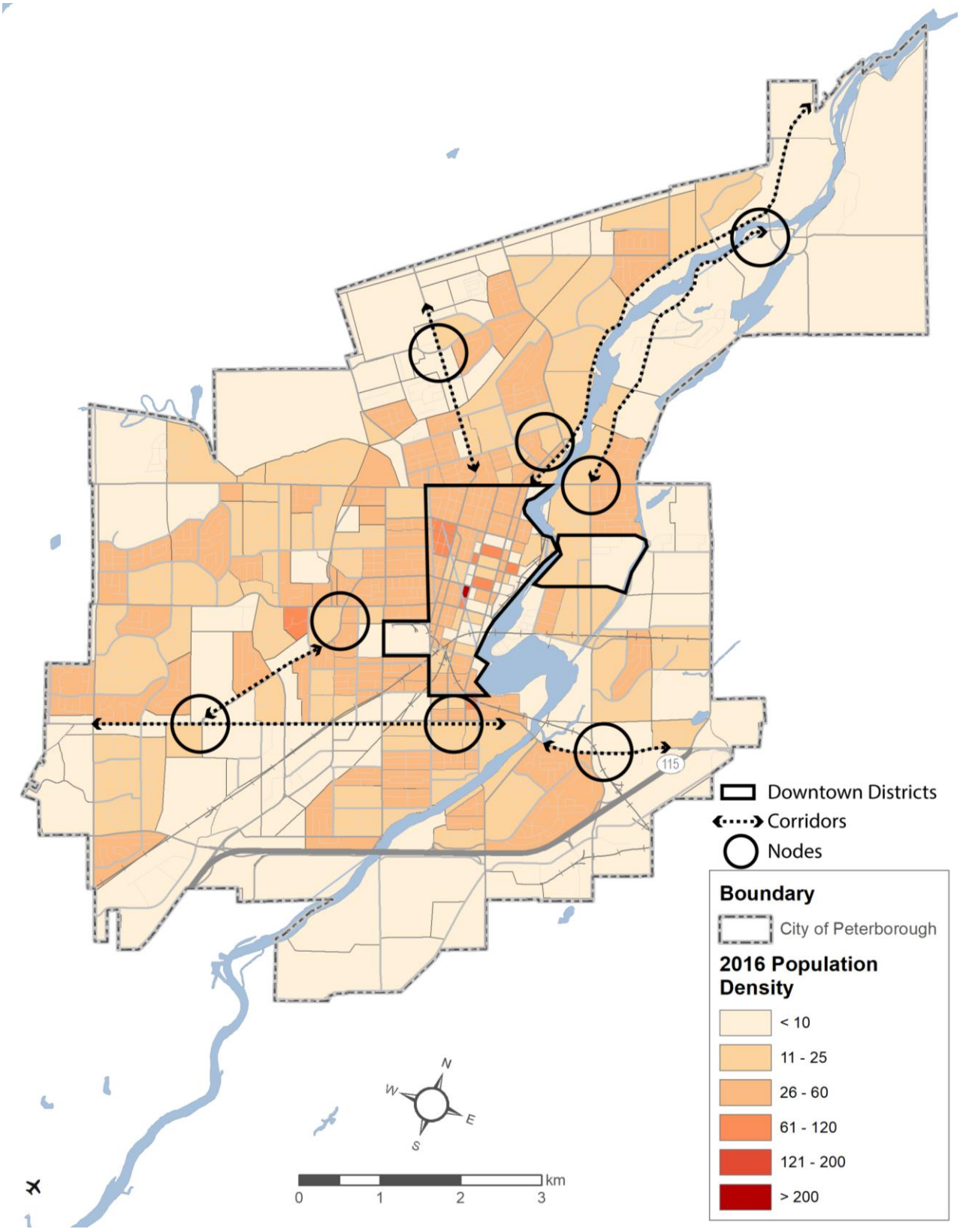
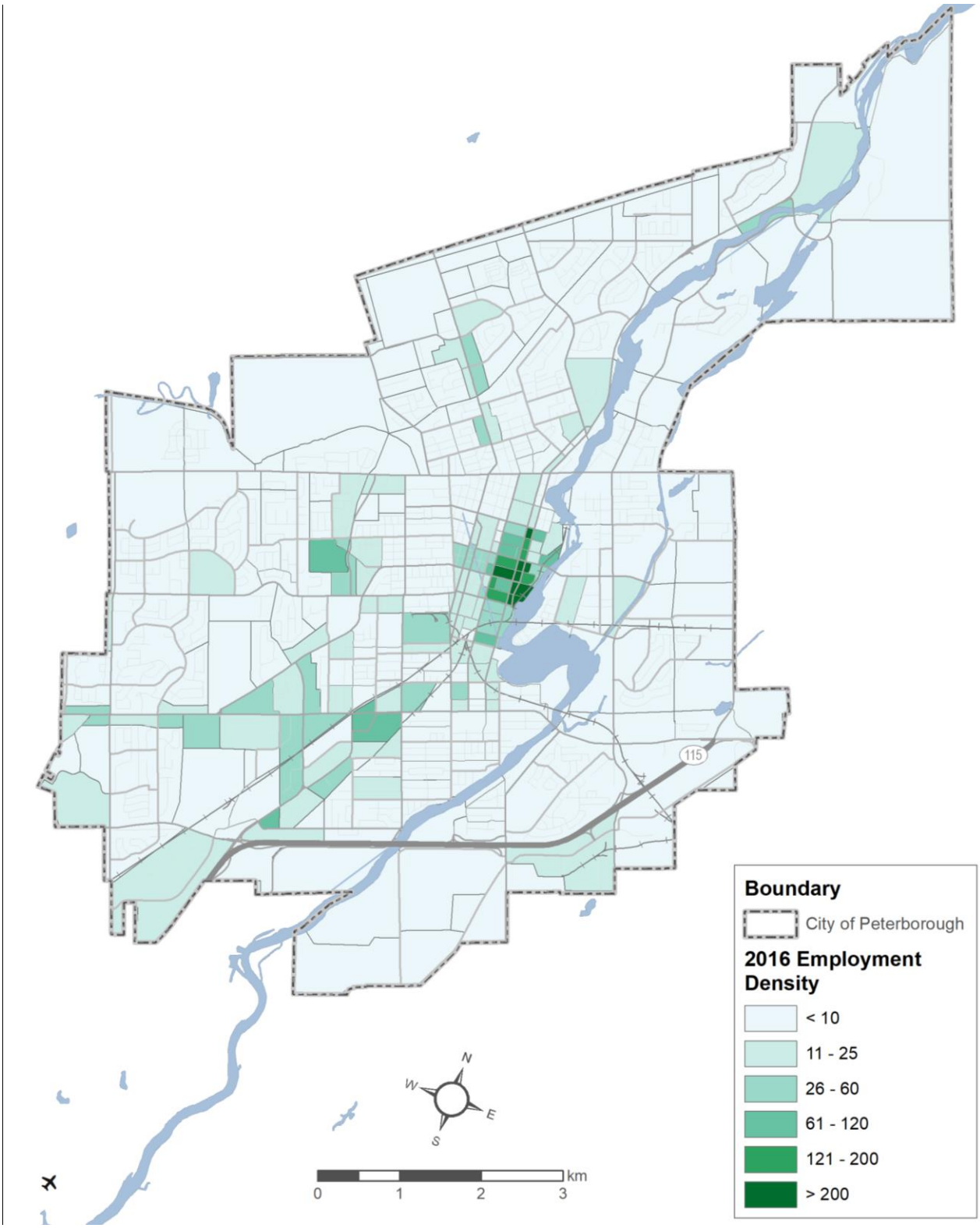


Exhibit 4-8: Peterborough Employment by Traffic Zone: 2016



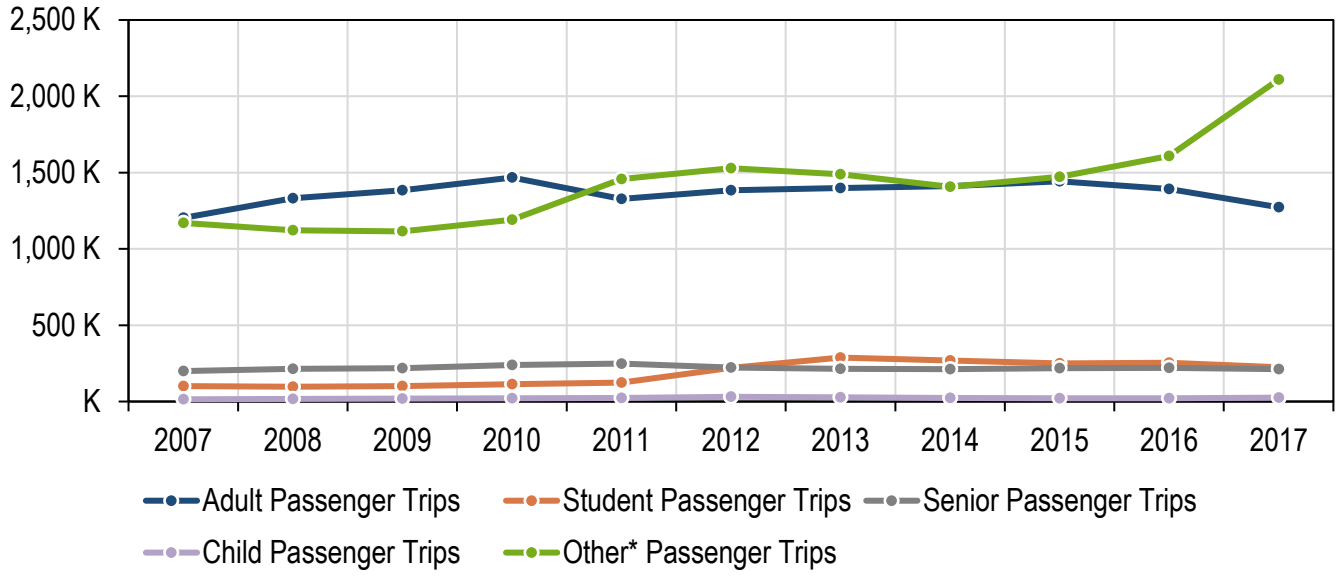
Demographics

Peterborough has a significant student population due to the presence of two major post-secondary institutions in the city. Since 2007, enrollment at Trent University and Fleming College have increased by nearly 70%. As a result, various transit enhancements have been targeted at the post-secondary student population.

According to the 2016 census, approximately 22% of Peterborough's residents are above the age of 65. This represents a 2% increase of the senior population since 2011, the largest population increase among all of Peterborough's age groups. At 43.5, the city's average age is also higher that the provincial average of 41. As the city's population grows and ages, the transit system will become a more essential form of mobility.

Exhibit 4-9 illustrates annual transit ridership by fare category. "Student" passenger trips include high school students up to Grade 12, "Child" passenger trips are for riders below the age of 12, and "Senior" riders are above the age of 65. The "Other" category includes the post-secondary ridership. Adults make up a significant portion of Peterborough's transit ridership. Ridership is plateauing among every demographic group, with the exception of the post-secondary population. This indicates that all of the recent ridership gains in recent years have been from post-secondary students, while ridership from other sources is steady or in decline.

Exhibit 4-9: Annual Ridership by Fare Category: 2007 - 2017



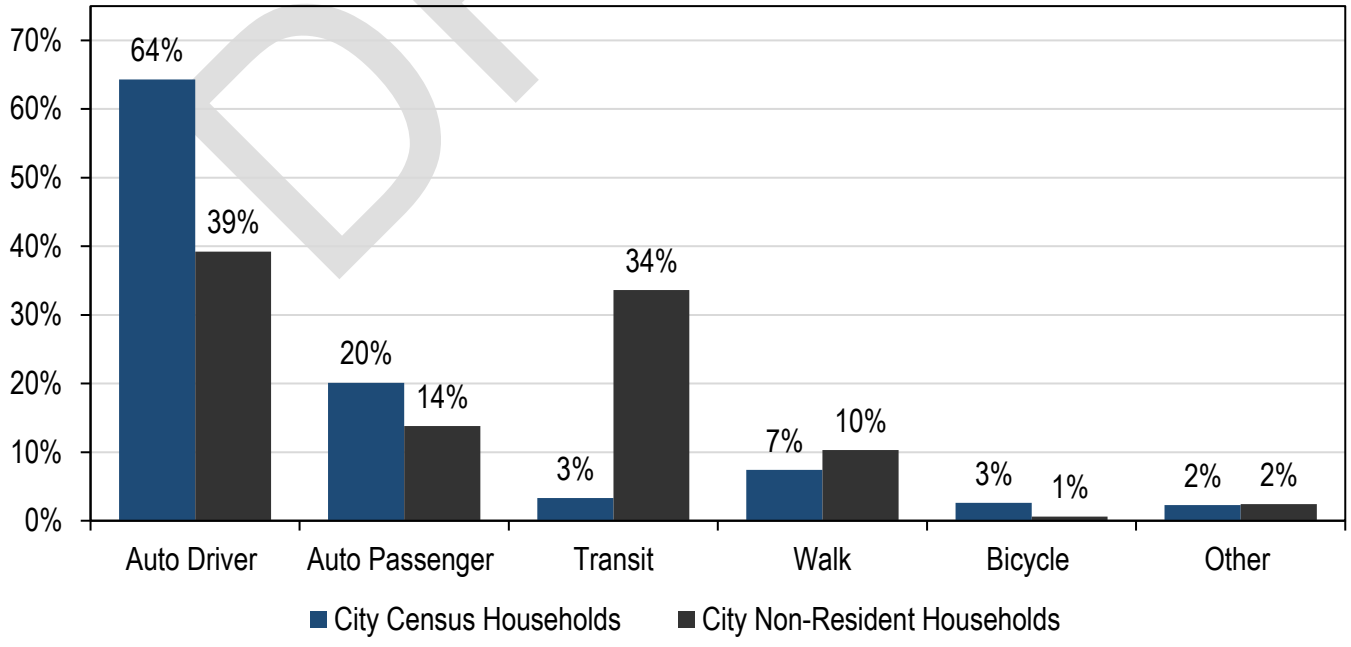
4.4 Travel Patterns

As part of the development of the Transit Long-Term Growth Strategy (LTGS), a transit travel survey was conducted in the fall of 2018 to provide a detailed picture of transit travel behaviour in the Peterborough Census Metropolitan Area (CMA). The survey was designed to supplement the 2016 Transportation Tomorrow Survey (TTS) to account for transit users and post-secondary students, who are underrepresented in the TTS. The design, conduct and analysis of the transit travel survey is detailed in the Peterborough Travel Survey Report (2020). This section outlines the key findings of that report, as they relate to travel patterns in Peterborough, and form part of the review of the existing transit service.

Mode Share

Travel mode share in the city is dominated by the car, especially for resident households. Exhibit 4-10 illustrates the mode share for daily trips, and how it differs between resident and non-resident (predominantly post-secondary student) households. For both resident and non-resident households, auto driver is the dominant mode, representing 61% of daily trips, followed by auto passenger at 19%. Transit trips make up 7% of daily trips, however, this share varies significantly between resident and non-resident households, as shown in Exhibit 4-10. Non-resident households have a daily transit mode share of 34%, reflecting the importance of transit for serving post-secondary student travel needs.

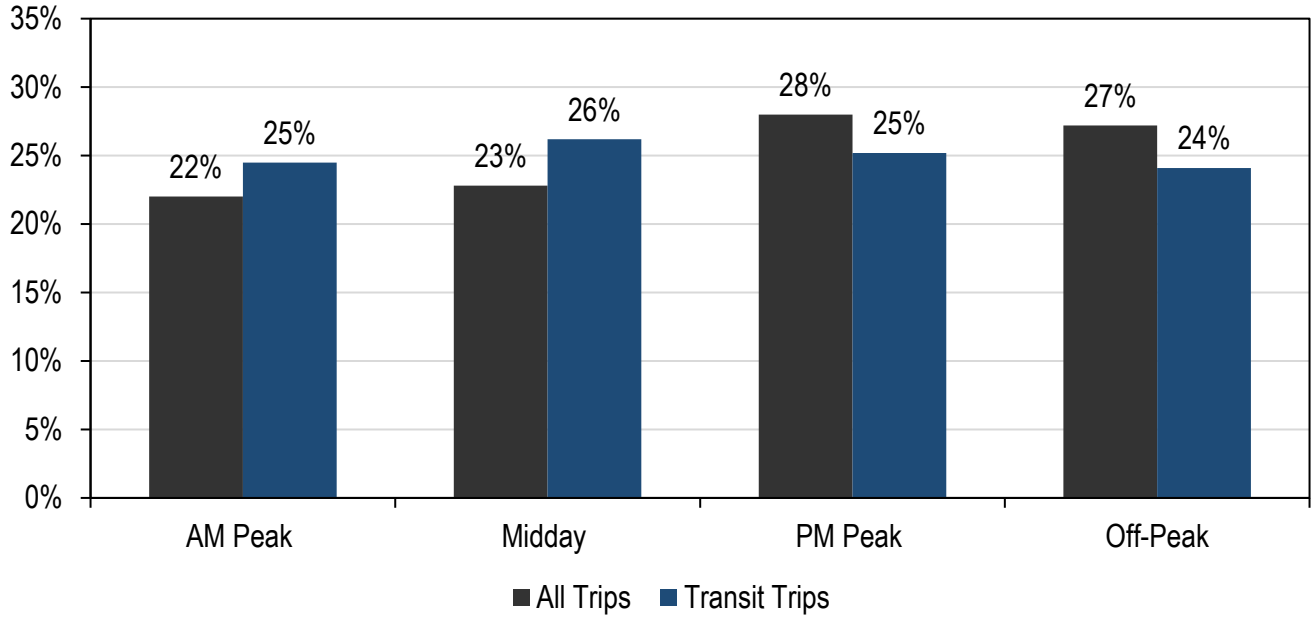
Exhibit 4-10: 2018 Peterborough City Daily Mode Share (Resident vs. Non-resident Households)



Time of Day Patterns

The 363,000 daily trips within the Peterborough CMA are fairly consistently split throughout the four time periods (AM peak, midday, PM peak, off-peak). As illustrated in Exhibit 4-11, the 3-hour PM peak has the highest share of trips (28%) for all trips. For transit, the 4-hour midday period has the highest share of daily trips (26.2%). Notably, compared to all modes, a higher share of transit trips occur in the AM peak and the midday period, potentially due to school trips. These time period travel trends indicate an opportunity to better serve midday transit trips by increasing service levels. There is also an opportunity to increase transit mode share by providing better service levels throughout the system during the PM peak to attract new riders.

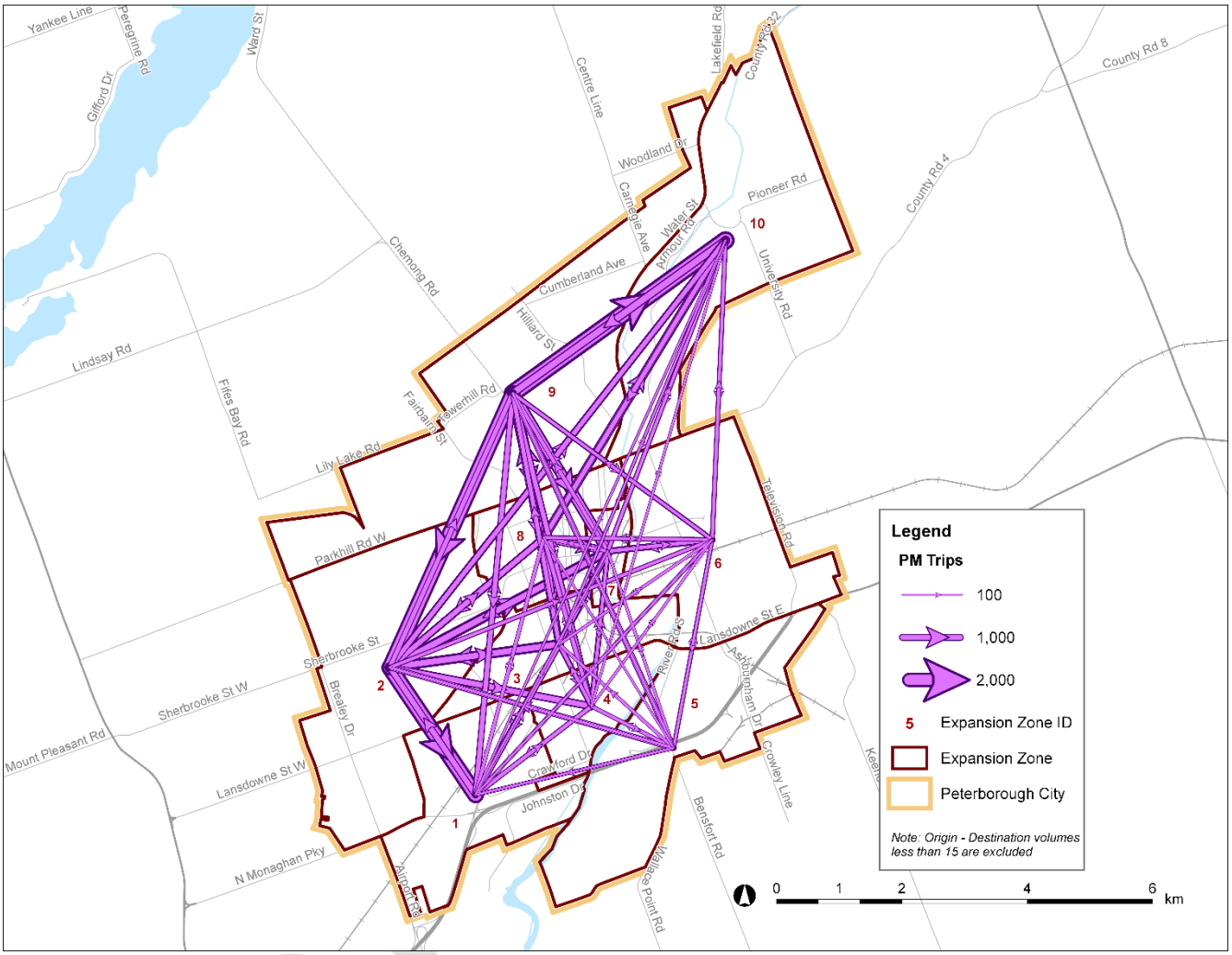
Exhibit 4-11: 2018 Peterborough CMA Trips by Time Period (All Trips vs. Transit Trips)



Trip Origins and Destinations

Travel demand is generally evenly distributed by location and direction throughout the city. Downtown, Trent University and Fleming College generate a substantial number of trips, especially during the PM peak, which is the time period with the most trips in general. This trend is illustrated in Exhibit 4-12. For transit trips during the AM peak, the zone Trent University is in attracts the most trips, and the zone just northeast on the downtown produces the most trips. This trend is reversed in the PM peak. Travel demand for transit in the midday period is more evenly distributed by location and direction. The origin-destination patterns observed in the PM peak period can be better served by a transit network that provides direct connections between trip generators outside the downtown area, which may in turn increase the transit mode share.

Exhibit 4-12: 2018 Peterborough Origin-Destination Flow Map (All Modes, PM Peak Period)



4.5 Key Findings

Given the size and characteristics of the community, Peterborough's transit system performs well on most measures. It has significantly better ridership and service investment than communities with a similar population.

The key conclusions from the system review are below.

- The downtown is a major destination, and is well served by transit. However, other areas outside the downtown are of growing importance, and the downtown-oriented nature of the transit network can lead to longer travel times to these destinations. This is compounded by the relatively low frequency of most routes, which makes the coordination of transfers imperative to the success of the network.

- The Lansdowne and Chemong corridors are candidates for increased transit services because they have high population and employment densities, and are identified in the Official Plan as opportunities for intensification.
- Service enhancements have increased ridership, but only in the post-secondary travel market. As a result, ridership is plateauing or declining among other markets. This trend will have an impact on the City's ability to reach its transit mode share target.
- Increases in revenue vehicle hours are matched with increases in ridership, while the cost-effectiveness of the system has remained fairly constant – a good indication for the long-term sustainability of the system.
- Transit mode share is high among non-resident (post-secondary student) households but very low among resident households, indicating both the need to continue to provide strong connections to the post-secondary institutions, and the need to address the gaps in the remainder of the service to attract new users.
- Transit usage is reasonably consistent throughout the day, but highest in the midday period and lowest in the evening. A more even distribution of service hours could better align service hours with ridership.
- Travel demand is highest in the PM peak, with a significant number of trips being generated in the zones with large format retail, Trent University, and Fleming College. The current transit network does not have any direct connections between these zones, and does not serve these origin-destination flows efficiently.

5 Route Review

5.1 Operating Characteristics

Exhibit 5-1 presents a summary of the operating characteristics of the City's transit routes. It includes headways, route lengths, cycle times, and buses required to operate the daily service

The table illustrates that cycle times and headways are fairly uniform, mainly due to the similar route lengths. The uniform headways are beneficial for facilitating transfers, which can only happen at the downtown terminal. Non-clockface headways (i.e. an irregular number of trips each hour) are usually avoided in service planning because they do not align with typical start times for services, and their pattern is not repetitive on the hour, making them less intuitive for users.

The industry standard for the average operating speed of a regular bus route in an urban setting is 22km/h. Peterborough has a mix of urban and semi-urban development, and the operating speeds should be within this range. Routes operating above or below the average speed guideline tend to have schedule adherence issues, which can negatively impact users' perception of the system. A high operating speed implies insufficient running time, while a low operating speed implies excess running time. Express routes are exempt from this guideline due to the nature of the service they provide.

Many of the City's routes fall below the 22km/h threshold. Some routes have exceptionally low speeds, including the 3, 5, and 8, which warrant further scrutiny. The 9, 12, and 26 have high average speeds, which may be due to their operating environments (service is outside the more densely populated core of the city).

Exhibit 5-1: Transit Routes Key Operating Statistics

Route	Headway Peak (mins)	Headway Offpeak (mins)	Headway Late Service (mins)	Length (km)	Cycle Time (mins)	Buses Required (Peak)	Buses Required (Offpeak)	Buses Required (Late Service)	Cycles per Day	Revenue Vehicle kms	Daily Revenue Vehicle Hours	Average Speed (km/h)
Weekday												
1 George St N	40	40	40	25.6	80	2.0	2.0	2.0	26.0	665.6	34.7	19.2
2 Chemong Road	20	40	40	12.8	40	2.0	1.0	1.0	35.0	448.0	23.3	19.2
3 Highland Road	40	40	40	10.4	40	1.0	1.0	1.0	26.0	270.4	17.3	15.6
4 Jackson Park	40	40	40	12.5	40	1.0	1.0	1.0	26.0	325.0	17.3	18.8
5 Charlotte West	40	40	40	9.9	40	1.0	1.0	1.0	26.0	257.4	17.3	14.9
6 SSFC/Kawartha	40	40	40	25.2	80	2.0	2.0	2.0	26.0	655.2	34.7	18.9
7 Lansdowne West	20	40	40	25.0	80	4.0	2.0	2.0	35.0	875.0	46.7	18.8
8 Monaghan Road	20	40	40	9.9	40	2.0	1.0	1.0	35.0	346.5	23.3	14.9
9 Nicholls Park	40	40	40	15.2	40	1.0	1.0	1.0	26.0	395.2	17.3	22.8
10 Collision	20	40	40	11.6	40	2.0	1.0	1.0	35.0	406.0	23.3	17.4
11 Ashburnham	40	40	40	11.9	40	1.0	1.0	1.0	26.0	309.4	17.3	17.9
12 Major Bennett	40	40	40	14.1	40	1.0	1.0	1.0	26.0	366.6	17.3	21.2
Subtotal				184.1		20.0	15.0	15.0	348.0	5320.3	290.0	18.3
14 Fleming Lansdowne	30	60	60	16.8	60	2.0	1.0	1.0	29.0	487.2	29.0	16.8
16 Fleming Sherbrooke	30	60	60	17.4	60	2.0	1.0	1.0	28.0	487.2	28.0	17.4
18 Fleming Late Night			45	17.4	40			0.9	5.0	86.8	3.3	26.0
40 Trent West-Bank	10	20	40	16.2	40	4.0	2.0	1.0	82.0	1328.4	54.7	24.3
42 Trent East-Bank	10	20	40	17.4	40	4.0	2.0	1.0	80.0	1392.0	53.3	26.1
44 Trent Late Night			45	19.9	45			1.0	4.0	79.6	3.0	26.5
Subtotal (Express)				105.1		12.0	6	6	228.0	3861.2	171.3	22.9
9-3, 9-2	15			7.4	15	1.0			2.0	14.8	0.5	29.6
TASS 4 a.m.		35		11.3	35		1.0		1.0	11.3	0.6	19.4
TASS 4 p.m.	15			3.8	15	1.0			1.0	3.8	0.3	15.2
TASS 4 p.m.	25			8.1	25	1.0			1.0	8.1	0.4	19.4
TASS 11 a.m.		25		5.9	25		1.0		1.0	5.9	0.4	14.2
TASS 11 p.m.	20			5.9	20	1.0			1.0	5.9	0.3	17.7
Holy Cross 11	20			7.4	20	1.0			2.0	14.8	0.7	22.2
Subtotal (HS Routes)				49.8		5.0	2.0		9.0	64.6	3.2	19.7
26 Technology Drive	35	50		15.6	35	1.0	0.7		6.0	93.6	3.5	26.7
Community Bus	60	60		17.4	60	1.0	1.0		8.0	139.2	8.0	17.4
Subtotal (Targeted Services)				82.8		7.0	3.7	0.0	23.0	297.4	14.7	22.1
Total				**372.0**		**39**	**27**	**21**	**599**	**9479**	**476**	**19.9**

Route	Headway Peak (mins)	Headway Offpeak (mins)	Headway Late Service (mins)	Length (km)	Cycle Time (mins)	Buses Required (Peak)	Buses Required (Offpeak)	Buses Required (Late Service)	Cycles per Day	Revenue Vehicle kms	Daily Revenue Vehicle Hours	Average Speed (km/h)
Saturday												
1 George St N	40	40		25.6	80	2.0	2.0		25.0	640.0	33.3	19.2
2 Chemong Road	40	40		12.8	40	1.0	1.0		25.0	320.0	16.7	19.2
3 Highland Road	40	40		10.4	40	1.0	1.0		25.0	260.0	16.7	15.6
4 Jackson Park	40	40		12.5	40	1.0	1.0		25.0	312.5	16.7	18.8
5 Charlotte West	40	40		9.9	40	1.0	1.0		25.0	247.5	16.7	14.9
6 SSFC/Kawartha	40	40		25.2	80	2.0	2.0		25.0	630.0	33.3	18.9
7 Lansdowne West	40	40		25.0	80	2.0	2.0		25.0	625.0	33.3	18.8
8 Monaghan Road	40	40		9.9	40	1.0	1.0		25.0	247.5	16.7	14.9
9 Nicholls Park	40	40		15.2	40	1.0	1.0		25.0	380.0	16.7	22.8
10 Collision	40	40		11.6	40	1.0	1.0		25.0	290.0	16.7	17.4
11 Ashburnham	40	40		11.9	40	1.0	1.0		25.0	297.5	16.7	17.9
12 Major Bennett	40	40		14.1	40	1.0	1.0		18.0	253.8	12.0	21.2
Subtotal				184.1		15.0	15.0		293.0	4503.8	245.3	18.3
18 Fleming Late Night			45	17.4	45			1.0	5.0	86.8	3.8	23.1
40 Trent West-Bank	20	40		16.2	40	2.0	1.0		40.0	648.0	26.7	24.3
42 Trent East-Bank	40	40		17.4	40	1.0	1.0		23.0	400.2	15.3	26.1
44 Trent Late Night			45	19.9	45			1.0	4.0	79.6	3.0	26.5
Subtotal (Express)				70.9		3.0	2.0	2.0	72.0	1214.6	48.8	25.0
Community Bus	60	60		17.4	60	1.0	1.0		8.0	139.2	8.0	17.4
Subtotal (Targeted Service)				17.4		1.0	1.0		8.0	139.2	8.0	17.4
Total				**272.4**		**19.0**	**18.0**	**2.0**	**373.0**	**5857.6**	**302.1**	**19.8**

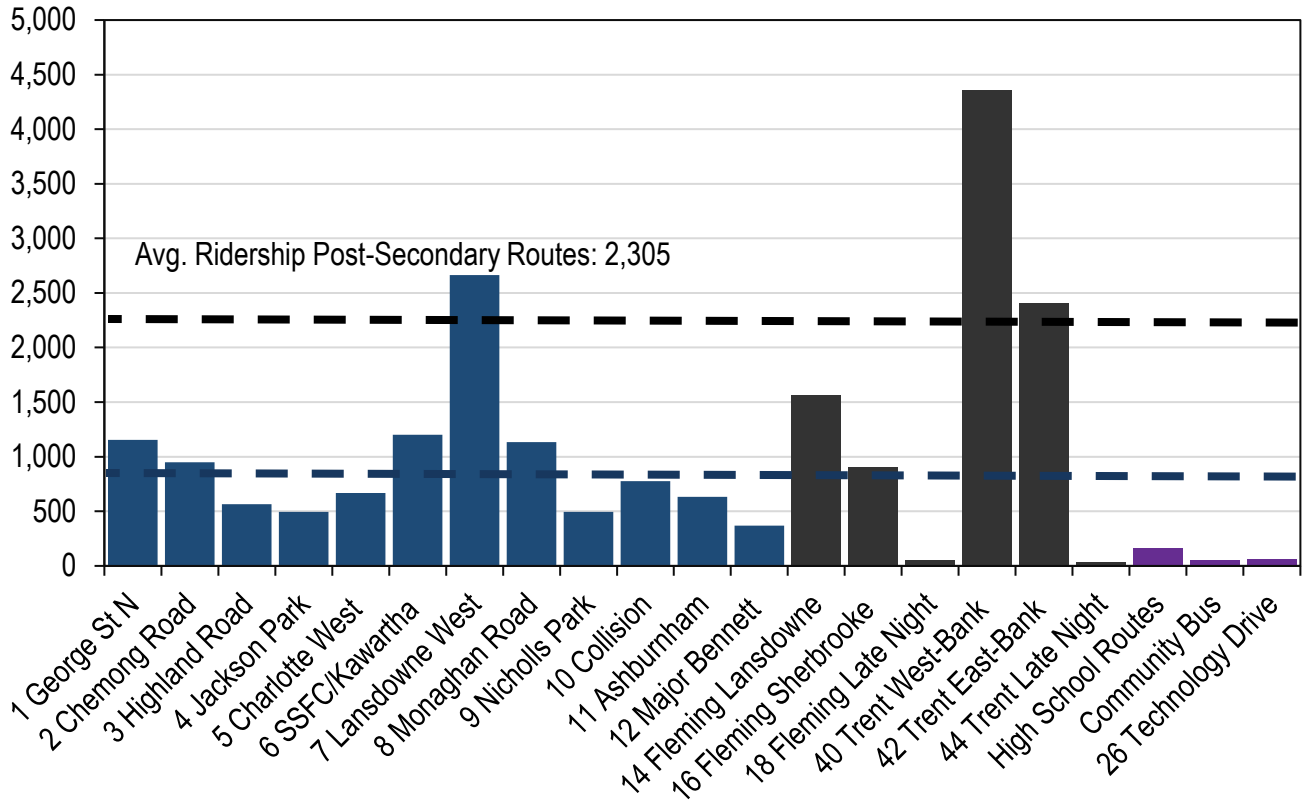
Route	Headway Peak (mins)	Headway Offpeak (mins)	Headway Late Service (mins)	Length (km)	Cycle Time (mins)	Buses Required (Peak)	Buses Required (Offpeak)	Buses Required (Late Service)	Cycles per Day	Revenue Vehicle kms	Daily Revenue Vehicle Hours	Average Speed (km/h)
Sunday												
1 George St N	40	40		25.5	80	2.0	2.0		17.0	433.5	22.7	19.1
2 Chemong Road	40	40		12.8	40	1.0	1.0		17.0	217.6	11.3	19.2
3 Highland Road	40	40		10.5	40	1.0	1.0		17.0	178.5	11.3	15.8
4 Jackson Park	40	40		12.4	40	1.0	1.0		17.0	210.8	11.3	18.6
5 Charlotte West	40	40		10.0	40	1.0	1.0		17.0	170.0	11.3	15.0
6 SSFC/Kawartha	40	40		25.2	80	2.0	2.0		17.0	428.4	22.7	18.9
7 Lansdowne West	40	40		25.1	80	2.0	2.0		25.0	627.5	33.3	18.8
8 Monaghan Road	40	40		9.9	40	1.0	1.0		17.0	168.3	11.3	14.9
9 Nicholls Park	40	40		15.2	40	1.0	1.0		17.0	258.4	11.3	22.8
10 Collision	40	40		11.6	40	1.0	1.0		17.0	197.2	11.3	17.4
11 Ashburnham	40	40		11.8	40	1.0	1.0		17.0	200.6	11.3	17.7
12 Major Bennett	40	40		14.2	40	1.0	1.0		13.0	184.6	8.7	21.3
Subtotal				184.2		15.0	15.0		208.0	3275.4	178.0	18.3
40 Trent West-Bank	20	40		16.2	40	2.0	1.0		40.0	648.0	26.7	24.3
42 Trent East-Bank	40	40		17.4	40	1.0	1.0		23.0	400.2	15.3	26.1
44 Trent Late Night			45	19.9	45			1.0	4.0	79.6	3.0	26.5
Subtotal (Express)				53.5		3.0	2.0	1.0	67.0	1127.8	45.0	25.6
Community Bus	60	60		17.4	60	1.0	1.0		6.0	104.4	6.0	17.4
Subtotal (Targeted Service)				17.4		1.0	1.0		6.0	104.4	6.0	17.4
Total				**255.1**		**19.0**	**18.0**	**1.0**	**281.0**	**4507.6**	**229.0**	**19.6**

5.2 Route Analysis

This section provides a route-by-route overview of the fixed route network. It describes the role and function of each route and outlines potential issues to be investigated and/or resolved as part of future service planning work.

Exhibit 5-2 illustrates the fall 2018 ridership on each of the regular, express, and community bus routes operated prior to the COVID-19 pandemic. Unsurprisingly, the routes with the best ridership are those with the highest level of service (post-secondary express routes and routes with higher peak period frequencies). The only exceptions are routes 1 and 6, which provide local service to Trent and Fleming respectively.

Exhibit 5-2: Average Weekday Ridership by Route (Fall 2018)



Route 1 – George North

Function:

- Coverage service between downtown and Trent along the West Bank
- High demand for service toward Trent in the morning, and towards downtown in the afternoon

Issues:

- Route diversions to accommodate pickups present operating challenges
- Residential concerns about service through Cartier Blvd. and Amunsden Ave

Demand:

- Demand for service in developing subdivisions (Chemong East, Carnegie)

Route 2 – Chemong North

Function:

- Connects major retailers along Chemong to downtown, passing through various residential areas

Issues:

- Traffic volumes on Chemong Rd cause delays throughout the day (particularly Bellevue to Parkhill)
- Passenger volumes at off peak periods cause delays
- Parking lot design for the Walmart stop blocks row access

Demand:

- Demand for service in developing subdivisions (Chemong East) and on Sunset Blvd

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Route 3 – Highland Road

Function:

- Connects residential neighbourhoods west of the Chemong corridor to downtown and back up along the Chemong corridor

Issues:

- Traffic volumes on Chemong Rd cause delays throughout the day
- Service into Portage Place causes delays due to the parking lot design and route alignment
- One-way service through the residential area it serves results in longer travel times
- Short route but operates slowly (no schedule adherence issues)

Demand:

- Demand for service in developing subdivisions (Chemong East)

Route 4 – Jackson Park

Function:

- Connects residential neighbourhoods in the west to the hospital, a school and downtown

Issues:

- Schedule adherence issues reduced by introducing the community bus to provide service on Hedonics road and by removing direct access into the hospital
- One-way service through the residential area it serves results in longer travel times
- Winter maintenance on Hedonics Rd. causes delays

Demand:

- Demand for service into new subdivisions in the northwest, preferably providing direct connections to Fleming

---

Route 5 - Charlotte

Function:

- Connects the hospital and the south-end Walmart to downtown

Issues:

- Often runs ahead of schedule
- One-way service to the hospital results in longer travel times
- Schedule adherence issues reduced by removing direct access into the hospital

Demand:

- Runs just short of some high density residential areas and areas of high demand

---

Route 6 – Kawartha

Function:

- Coverage service between downtown and Fleming along Sherbrooke and into residential neighbourhoods in the west-end

Issues:

- Challenging access into a long-term care facility on Brealey Dr.
- Kawartha Heights Blvd and Cherryhill Rd are challenging to operate on in the winter

Demand:

- Demand for more direct service to Holy Cross from the west-end

Route 7 - Lansdowne

Function:

- Coverage service between downtown and Fleming along Lansdowne

Issues:

- Significant delays along Lansdowne (particularly eastbound between Parkway and Park)
- Significant delays when the Memorial Centre is in use (weekly detours for Petes' games and other events);
- Spillsbury Dr. south of Sanford Fleming is challenging to operate on in the winter; service has to be detoured skipping significant demand

Demand:

- Very high demand route

Route 8 – Monaghan

Function:

- Connects a south-end neighbourhood to Lansdowne Place and downtown

Issues:

- Often behind schedule (the slowest of all the routes) causing trips to be dropped and forcing deadhead trips to the halfway point
- One-way service from the south-end neighbourhoods to Lansdowne place results in longer travel time
- Significant delays at the Lansdowne/Monaghan intersection

Demand:

- Demand for bi-directional service in the south-end loop
- High demand between 9am and 9pm
- High demand on this route because of the north/south access it provides

---

Route 9 – Nicholls Park

Function:

- Coverage service along the east bank to downtown

Issues:

- Average speed is high, limiting opportunities to expand to new areas without impacting service

Demand:

- Demand for service to Trent (particularly in the summer), but the impact on schedule is too high
- New city-owned sports arena planned for Nassau Mills

Route 10 – Collison

Function:

- Connects residential neighbourhoods in the southeast end to downtown, and to Del Crary Park for summer events

Issues:

- Significant delays when the Memorial Centre is in use (weekly detours for Petes' games and other events)
- One-way service in the southeast neighbourhood results in longer travel times
- High passenger volumes cause delays around George St. and Water St.

Demand:

- High population density in the coverage area

Route 11 – Ashburnham

Function:

- Connects residential areas on the southeast bank to downtown and commercial areas on Ashburnham

Issues:

- Potential for travel through the Liftlock to be restricted in the future

Demand:

- Increasing demand in developing subdivisions (Liftlock)

Route 12 – Major Bennett

Function:

- Connects major employers in the south west to Lansdowne Place and downtown

Issues:

- Schedule adherence issues at Lansdowne St and High St

Demand:

- Direct connection to Fleming from GO stop
- Demand for service to the airport
- High demand at the casino

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26 – Technology Drive

Function:

- Peak period commuter service connecting downtown to industrial land uses on Technology Drive

Issues:

- High average speeds indicate the route may be tight on time

Demand:

- Low ridership

Community Bus

Function:

- One-directional circle route connecting downtown to secondary hubs (Hospital, Lansdowne)
- Alleviates schedule adherence issues on routes 4 and 5

Issues:

- Limited span and low frequency
- Low average speed
- Schedule is not coordinated to facilitate transfers between routes

Demand:

- High demand in the Hedonics Rd. area

Post-Secondary Routes

Function:

- Provide frequent and express service to Trent and Fleming along major corridors (Water St. Armour Rd., Lansdowne St., Sherbrooke St.)

Issues:

- Duplicate existing regular services along corridors, resulting in very high levels of service that may cause bunching (e.g. sections of Lansdowne St. and sections of Water St. have an effective headway of less than 10 minutes between 8 a.m. and 9 a.m.)

Demand:

- Very high demand services

5.3 Key Findings

Based on the analysis of the overall network and the individual routes, the following key areas were identified for improvement.

A majority of the challenges faced by the system are related to travel time and schedule adherence.

- Transfers are only coordinated at the downtown terminal, forcing all transfer trips through the terminal and increasing overall travel time;
- Trips that require transfers do not benefit from increased headways at peak if transferring to routes with regular headways
- Maintaining coordinated transfers with such long headways results in service delays throughout the system (buses are often held at the terminal to accommodate delays);
- Chemong Rd and Lansdowne Rd are very congested and cause service delays on various routes;
- Access challenges at many locations require route deviations and cause delays (e.g. front door service to various senior residences, access to Portage Place, Lansdowne Place, and Hedonics Rd.); and
- The additional time required for terminal access significantly reduces system productivity.

6 Needs and Opportunities

The preceding sections have highlighted a number of important findings about recent trends, current operations, and public perspectives. The following needs and opportunities distill these findings and provide strategic direction to guide potential changes to the conventional route network.

- **Balancing accessibility and mobility:** As a public service, transit must provide a basic level of access to work, school, and maintenance activities for those that do not have alternative means of transportation. At the same time, there are social benefits associated with attracting new riders to transit by directing resources to areas that will generate new ridership. Potential changes to the route network will need to make the service attractive to new riders, but not at the expense of meeting the basic transportation needs of vulnerable populations.

- **Meeting the needs of distinct travel markets:** As of 2017, post-secondary students constitute the majority of the city's transit riders, and the market continues to grow. In contrast, non-student ridership is in decline despite increases in the City's full-time population. Short-term changes to the route network will have to recognize the importance of the post-secondary market while still trying to build ridership among permanent residents of the city.

- **Providing high-quality service in a challenging urban context:** Peterborough presents a number of challenges that make the provision of attractive transit service difficult. A discontinuous road network, limited canal crossings, and widely-distributed trip generators have limited the competitiveness of transit relative to other modes of travel. The new network will have to address these challenges through careful consideration of routing and service levels.

- **Improving the convenience of transit:** Low frequency and downtown orientation of most routes can mean prohibitively long travel times for many users. In addition, average operating speeds on the system are low due to route alignment constraints (e.g. access to some malls), traffic congestion, and the configuration of the downtown terminal. Building new ridership will depend on addressing these challenges.

- **Minimizing service duplication:** Dedicated express routes serving Trent and Fleming generally overlap with regular routes serving the rest of the city. While these routes serve different markets, this

duplication can come at the expense of providing attractive transit service for riders outside of those corridors.

- **Improving service to areas outside the downtown:** Some members of the public expressed frustration that transit service was only convenient for travelling to or from the city's downtown because of the orientation of the route network. While there are benefits to such an orientation, any potential service changes should strive to improve the quality of services to and from destinations that are not located downtown, such as a major shopping centres and the Peterborough Regional Health Centre.
- **Providing service to developing areas:** Residential growth is occurring around the City's periphery, especially to the north and northwest of existing urban areas. Providing transit service to these emerging areas will be critical to building a future ridership base, but existing routes cannot be extended without reducing existing service (e.g. reducing frequency), adding resources, or reconfiguring the route network.
- **Mitigating operational issues at the downtown terminal:** The downtown terminal is an operational pinch point due to its size and design. It is currently operating above its intended capacity, preventing the introduction of new routes to the downtown. This challenge is compounded by the current network design, which requires all transfers to happen at the downtown terminal.

7 Network Alternatives

The needs and opportunities identified in the preceding section provide the strategic direction to develop three new network alternatives. This section describes each of these alternatives, their advantages and disadvantages, an evaluation of the three networks, and recommends one network for near-term implementation.

7.1 Network Descriptions

The transit network alternatives are based on three different approaches to address transit needs and opportunities:

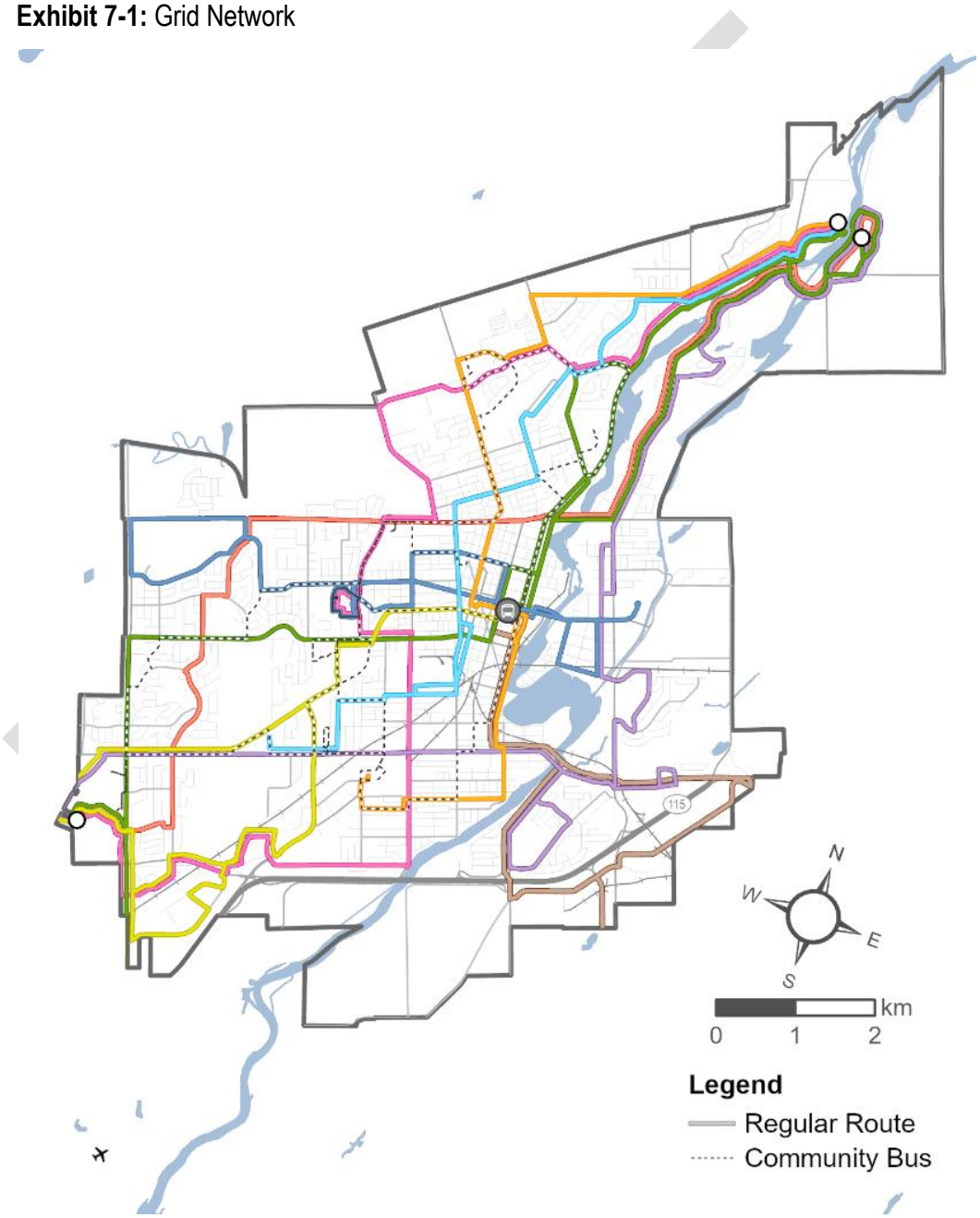
- A **grid** network, which focuses service along major corridors;
- A **modified radial** network, which builds upon and improves the existing (2019) downtown-oriented network; and
- A **multi-hub** network, which focuses service at several major trip generators in various locations around the city.

These three approaches represent different ways transit service can be allocated to address the needs and opportunities identified earlier in this report. Each network alternative has potential advantages and disadvantages in the local context, as further described in the following subsections.

Grid Network

This network concept focuses service along major corridors and prioritizes direct routing as much as possible. Due to the travel patterns in Peterborough and the street network, all routes on the grid network serve the three main trip generators: the Downtown Terminal, Trent, and Fleming. Most routes serve more than one of the identified trip generators, providing additional connections. The base route network is supplemented by community buses to increase coverage. A conceptual map of the grid network is shown in Exhibit 7-1.

Exhibit 7-1: Grid Network



Advantages

- Reduced reliance on the downtown terminal, which addresses operational challenges and increases service to trip generators outside downtown;
- Added capacity to the post-secondary institutions, addressing observed travel patterns;
- Convenience of the network structure, allowing most trips to be completed with a maximum of one transfer; and
- The directness of the routes, which not only reduces existing access challenges at many of the major trip generators (e.g. circuitous access roads, traffic in large retail lots), but also decreases travel times in general.

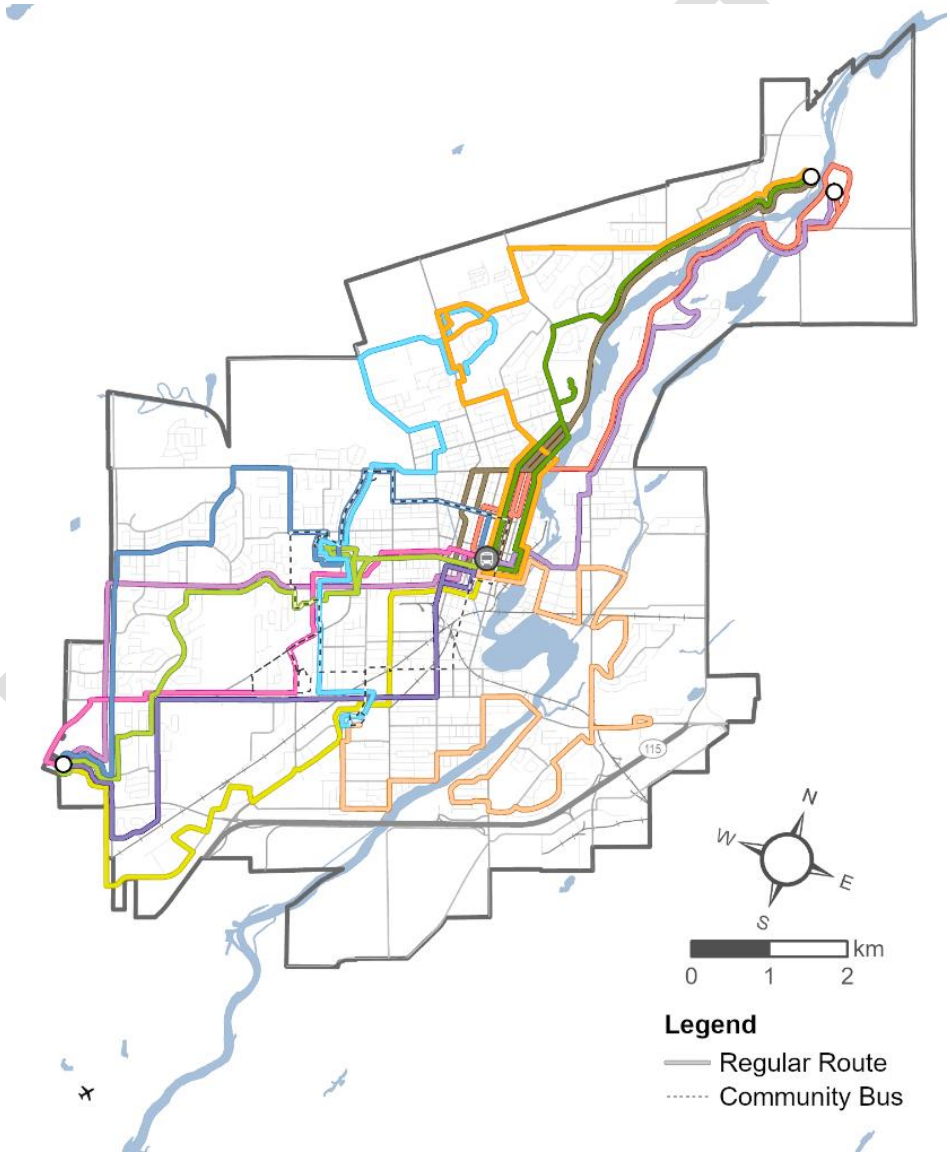
Disadvantages

- Increased distance between bus stops and some major trip generators, which can present challenges for some transit customers;
- Decentralized operations, which may increase the need for improved infrastructure outside of the downtown terminal to accommodate operational needs, such as layovers and operator recovery;
- The length of the routes, which in the event of delays or detours can present an added challenge for passengers looking to transfer; and

Modified Radial Network

This network concept focuses service at one high-demand hub: the Downtown Terminal. It prioritizes direct routing as much as possible, connecting different parts of the city to the main hub. This network was designed with uniform route lengths and cycle times to facilitate timed (coordinated) transfers downtown. Some new direct connections between other trip generators were introduced, so that all routes in this network serve one or more trip generator outside downtown. This network also maintains one community bus route to increase service between the hospital, Lansdowne Place and downtown. A conceptual map of the modified radial network is shown in Exhibit 7-2.

Exhibit 7-2: Modified Radial Network



Advantages

- No new transfers where trips were previously direct;
- Added capacity to the post-secondary institutions and other destinations outside of downtown;
- Any and all transfers are timed (coordinated) at the Downtown Terminal; and
- The coverage of the network has most residents of the city within a one-seat trip to the downtown.

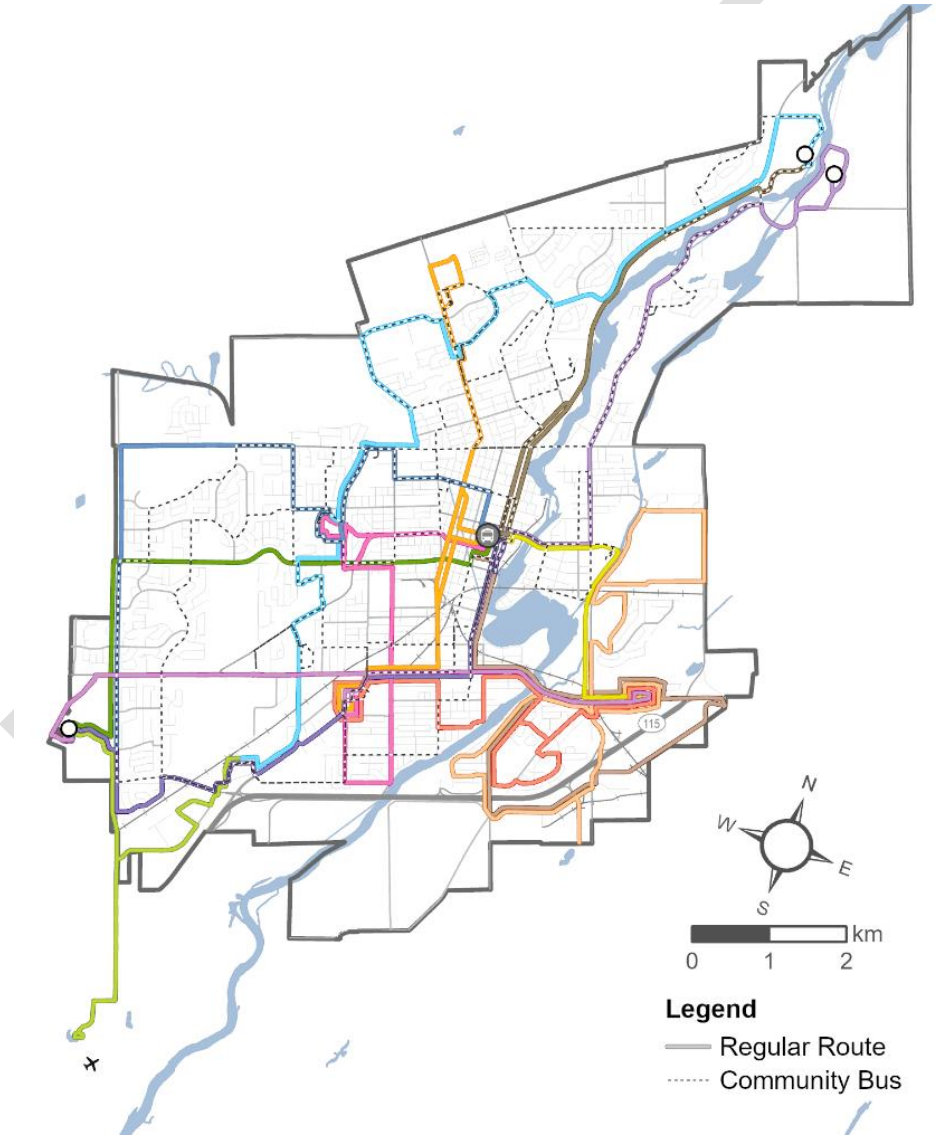
Disadvantages

- Continued reliance on the downtown terminal, which would required substantial modification in order to address operational issues that could be experienced with this network option;
- Coordinating transfers at a single location can result in cascading issues throughout the network in the event of a delay on one route; and
- Relatively difficult to incrementally improve frequency and/or serve new areas while still coordinating transfers at the downtown terminal.

Multi-hub Network

This network concept focuses routes at multiple hubs, providing direct connections between the hubs. These direct routes are supplemented using feeder routes at the neighbourhood level. The main hubs identified for this network are based on travel patterns identified in the analysis of the network. They are: the Downtown Terminal, Trent, Fleming, the Hospital, Lansdowne Place, and Willowcreek Plaza. This network also supplements service on the base network by expanding the community bus services. A conceptual map of the multi-hub network is shown in Exhibit 7-3.

Exhibit 7-3: Multi-hub Network



Advantages

- Reduced reliance on the downtown terminal, addressing some of the operational challenges of the existing network;
- The proposed service layers create a hierarchy of service levels consistent with the current transit ridership of the city and can be scaled up as more resources become available for the network;
- High service coverage utilizing community buses, which addresses some of the challenges of the road network; and
- Increased connections to trip generators outside the downtown with a variety of service types.

Disadvantages

- Some proposed satellite hubs present bus access challenges, which may lead to additional travel time and/or risk delays;
- Some of the proposed satellite hubs may require new infrastructure to accommodate increased bus and rider volumes (e.g. adding bus bays, accessible platforms);
- Increased transfers from neighbourhood routes to corridor routes, which may be exacerbated by differences in service frequency between these routes;
- Complex service structure, which may be confusing for some customers; and
- Reduction in service levels for some areas currently served by regular routes.

7.2 Evaluation

The three network alternatives were evaluated using a framework that drew on the needs and opportunities identified in section 6. Each of the needs and opportunities were assigned a metric and every network alternative was evaluated against each metric. Quantitative metrics were used when applicable, while the remainder of the metrics were assessed qualitatively. Each network alternative is assigned a rating of between 1 and 4 for each metric, presented in a summative form at the end of this sub-section.

Balancing Access and Mobility

Transit must provide a basic level of access to work, school, and maintenance activities for those that do not have alternative means of transportation.

To understand how well each network balances access and mobility, two main considerations were made:

- **Access**, which measures how many people or destinations are reachable on each network within a given amount of time; and
- **Equity and inclusion**, which explores how vulnerable populations might experience each network, in terms of ease of use.

Access

To measure access, isochrones for four travel time increments (15 minutes, 30 minutes, 45 minutes, and 60 minutes) were produced for a variety of trip generators using the “Jane” tool on the Remix software platform. The total number of residents within each of these isochrone areas was then used as the quantitative measure of access.

The access time is based on a combination of the travel time on transit, including time to walk to the stop along the existing pedestrian network and average wait times (based on the frequency of the routes). It also includes the access that can be achieved using transfers between routes if they’re within the travel time window. The Jane tool has some limitations, including the precision of the pin drop and the potential to capture areas outside what would be a reasonable walking distance. In addition, the Jane tool does not limit what proportion of the entire trip can be a walking trip, which may result in overestimating the coverage of the network in some instances. Despite these limitations, the travel time measured provides an insight as to how well each network performs in terms on access.

For this analysis, the average population within a 60-minute combined walk and transit trip of three of the city’s major trip generators was measured. Average wait times (rather than scheduled trip times) were used to generate the isochrones because this measure better reflects the travel time and distance for

users who do not perfectly schedule their trips, and because the schedules have not been fully developed for each network to coordinate transfers. The three trip generators selected were

- the Downtown Terminal,
- the Gzowski College stop at Trent on the east bank, and
- the Fleming College stop on Fleming College Way.

These three locations were selected as potential trip origin/destinations because of the city's identified travel patterns, and because their geographic distribution allows for nearly city-wide coverage. The selected locations are also major hubs for each of the three networks. The access was also measured at each of these locations along four time-periods:

- Midday on weekdays to capture the access to transit for off-peak users;
- PM peak on weekdays, which has the highest volume of trips, based on the 2018 travel survey;
- Late evening on weekdays in response to public feedback about the need for better service in the evenings; and
- Midday on Sundays, also in response to public feedback, and because it is similar to the Saturday service.

The results of this analysis are shown in Exhibit 7-4. Overall, the grid network provides the highest access from all three trip generators, and across all time periods. In addition, the population within an hour of the trip generators is fairly consistent throughout the four service periods reviewed. The radial network provides the second-highest access from all three trip generators, and across all time periods, but has a noticeable drop in access for late evening service, particularly from Fleming. This is similar to the multi-hub network, which has the worst performance among the three. Another noticeable challenge based on this evaluation is the low access of the Trent stop, which was specifically chosen to represent a destination on the east bank. This can be partly attributed to the lower density and road network constraints on the east side (such as the limited canal crossings), but also presents an opportunity to consider how access to the east bank can be improved in the delivery of the new network.

Exhibit 7-4: Summary of Access for Radial, Grid and Multi-hub Network Alternatives

Network	Origin/Destination	Average Population within a 60 minute Walk/Transit Trip			
		1:30 PM	5:30 PM	11:00 PM	Sunday 1:30 PM
Grid	Downtown	55,845	54,168	49,257	54,100
	Trent (Gzowski College)	34,218	30,826	28,559	31,985
	Fleming	40,866	39,788	35,665	39,274
Radial	Downtown	51,542	48,314	40,923	47,726
	Trent (Gzowski College)	28,164	27,768	21,070	14,663
	Fleming	28,646	28,474	6,694	25,221
Multi-hub	Downtown	50,940	47,876	39,269	44,830
	Trent (East Bank)	19,933	18,910	12,927	13,668
	Fleming	28,829	20,636	6,685	22,662

Source: IBI Group Analysis of Travel Time and Population Data from Remix, 2021

Equity and Inclusion

The equity and inclusion considerations are a supplement to the access measure, to better understand how vulnerable users may experience each network. Two main considerations were reviewed:

- ease-of-use for passengers, and
- first and last “mile” access to bus stops.

In terms of ease-of-use, the main consideration is the complexity of the schedules. In this regard, repetition is key in reducing the complexity of schedules. “Clockface” schedules that repeat every hour are easier to remember for users and can be useful in coordinating bus arrivals and departures at transit hubs or timing points to coordinate transfers.

While all three networks are designed to use clockface schedules, the radial network coordinates all transfers at the Downtown Terminal. This design also offers predictability for users in that they can always expect to make their transfers at one location. In addition, the increased service to Trent, Fleming, and Lansdowne Place with similar cycle times and scheduling principles allows for transfers to be coordinated at those locations as well. The multi-hub network can be scheduled to achieve similar results, but the need for connections between additional hubs combined with the different service levels offered at most hubs (express routes, regular routes, community buses) increases the complexity of timing transfers. The grid network, by design, is more decentralized with more routes intersecting and providing many more potential transfer opportunities. However, due to the frequencies provided, most of these transfers are not achievable outside of specific timing points on the network. The simplicity of the radial network in this regard makes it easier to understand.

First and last "mile" access is determined by the coverage of route network, with access to stops made easier by higher coverage networks. In this regard, the multi-hub network, which provides many community routes with access to the front entrance of various trip generators has the shortest walking distances to service for most users. The radial network also provides high coverage on most routes, and front entrance service to the major trip generators in the system. The grid network focuses on reducing deviations along most routes, and as such does not directly access some trip generators (e.g. Portage Place). However, the community bus routes on the grid network help to supplement the first and last "mile" access from some locations, such as Lansdowne Place and the hospital albeit with shorter service spans and lower frequencies.

Serving Different Travel Markets

Short-term changes to the route network will have to recognize the importance of the post-secondary market while still trying to build ridership among permanent residents of the city.

To understand how well each network serves the city's different travel markets, the quantity of service provided to major trip generators was measured for each network. This measure includes community buses and late-night service. The trip generators were chosen based on the established travel patterns, and their geographic distribution in the city. The number of daily trips to each trip generator for the three network alternatives is shown in Exhibit 7-5.

Exhibit 7-5: Weekday Bus Trips Serving Major Trip Generators for Radial, Grid and Multi-hub Networks

Network	Downtown	Trent	Fleming	Hospital	Lansdowne Place	Portage Place	Willowcreek Plaza
Grid	255	233	253	95	140	58	43
Radial	525	282	194	111	111	68	40
MultiHub	351	160	161	112	231	54	102

All three networks provide the most service to the downtown, Trent, and Fleming, as is expected, given that post-secondary students constitute the majority of transit riders in the city. However, overall access is also improved to other trip generators. Portage Place has the fewest trips on all three networks, and Willowcreek Plaza, the only trip generator on the east bank, has the fewest trips on the radial and multi-hub network, indicating potential opportunities to improve service delivery in those areas.

The multi-hub network provides fewer trips to Trent and Fleming than the other two networks, but more trips to the hospital, Lansdowne Place and Willowcreek Plaza. Despite the additional trips to these locations, since the multi-hub network utilizes the most community buses of the three networks, more trips does not necessarily mean higher service levels. The radial network provides

the most trips overall, and although service is fairly distributed among the other main trip generators, the emphasis on serving the downtown is evident. The grid has the fewest overall trips to these trip generators, but that is expected as the network is less focused on serving each hub.

Direct Connections to Major Generators

Building new ridership will depend on addressing low average speeds, indirect routing, and low frequency of service.

To determine which network provides the fastest travel times and most direct connections to major trip generators, the travel time between six trip origins and destinations was calculated, as a proxy for what the actual travel time may be to each of these destinations from various origins between them. The origins and destinations (Downtown Trent, Fleming, Portage Place, Lansdowne Place, Willowcreek Plaza) were selected based on travel demand and geographic distribution. The travel time origin and destination matrix is shown in Exhibit 7-6.

Routes were selected for the shortest possible travel times, and exclude potential dwell times, access times, or transfer time where transfers are required. To minimize the effect of excluding access times, routes serving the stops closest to the front entrance were selected. In addition, to minimize the effect of excluding transfer time, where possible, transfers occurring at hubs were selected because they're likely to be timed at those locations. Community bus routes were excluded because of their low frequencies and short service spans, which may significantly increase travel times. The travel time is based on the average speed calculation of the routes used for the trip, based on their route length and cycle time.

Overall, travel times are comparable on each network, but the radial network requires more transfers than the other two networks (with the caveat that in some instances, one-seat rides are available with longer travel times). The grid network provides the most direct trips, but the access distance to some locations (all Portage Place trips and some Lansdowne Place trips) is higher than the equivalent trip on the radial or multi-hub networks. In addition, the grid network includes some variants, which may affect the calculation of the travel speed.

Exhibit 7-6: Travel Times Between Major Trip Generators for Radial, Grid and Multi-hub Network Alternatives

In Vehicle Travel Times in Minutes - [Transfers]	Trip Destination					
Trip Origin	**Downtown**	**Trent University**	**Fleming College**	**Lansdowne Place**	**Portage Place**	**Willowcreek Plaza**
Grid						
Downtown		18 - [0]	21 - [0]	16 - [0]	11 - [0]	**18 - [1]**
Trent University	18 - [0]		39 - [0]	46 - [0]	19 - [0]	30 - [0]
Fleming College	21 - [0]	39 - [0]		12 - [0]	37 - [0]	29 - [0]
Lansdowne Place	16 - [0]	46 - [0]	12 - [0]		27 - [0]	18 - [0]
Portage Place	11 - [0]	19 - [0]	37 - [0]	27 - [0]		**32 - [1]**
Willowcreek Plaza	**18 - [1]**	30 - [0]	29 - [0]	18 - [0]	**32 - [1]**	
Radial						
Downtown		19 - [0]	21 - [0]	10 - [0]	12 - [0]	21 - [0]
Trent University	19 - [0]		**40 - [1]**	**29 - [1]**	17 - [0]	**40 - [1]**
Fleming College	21 - [0]	**40 - [1]**		19 - [0]	**33 - [1]**	**42 - [1]**
Lansdowne Place	10 - [0]	**29 - [1]**	19 - [0]		**22 - [1]**	**30 - [1]**
Portage Place	12 - [0]	17 - [0]	**33 - [1]**	**22 - [1]**		**33 - [1]**
Willowcreek Plaza	21 - [0]	**40 - [1]**	**42 - [1]**	**30 - [1]**	**33 - [1]**	
MultiHub						
Downtown		21 - [0]	26 - [0]	12 - [0]	15 - [0]	15 - [0]
Trent University	21 - [0]		**47 - [1]**	**34 - [1]**	25 - [0]	**36 - [1]**
Fleming College	26 - [0]	**47 - [1]**		17 - [0]	**41 - [1]**	**30 - [1]**
Lansdowne Place	12 - [0]	**34 - [1]**	17 - [0]		27 - [0]	13 - [0]
Portage Place	15 - [0]	25 - [0]	**41 - [1]**	27 - [0]		**41 - [1]**
Willowcreek Plaza	15 - [0]	**36 - [1]**	**30 - [1]**	13 - [0]	**40 - [1]**	

Notes: Bolded trips include transfers and highlighted trips do not provide front entrance access to one of the trip generators.
Travel times are estimates, and do not include access, egress, or transfer time to and between buses, or dwell time on buses.

Minimizing Service Duplication

Service duplication can come at the expense of providing attractive transit service for riders outside of higher-volume corridors.

The route network operated prior to the COVID-19 pandemic had an additional service layer of express routes focused on serving the post-secondary market, resulting in some duplication of service. The three network alternatives integrate the express service to varying degrees to reduce service duplication. For all three networks, express service is provided to Trent and Fleming, but to a lesser degree on the grid network, which includes the express routes as variants of existing service to Trent and Fleming. The radial network, by design, maintains the downtown orientation of the express services to Trent and Fleming, including a route to Trent on the east bank. The multi-hub network extends its express to serve additional hubs, including Lansdowne Place, the hospital, and the casino, which results in higher service duplication than the grid and radial networks.

In addition to the express overlay, the community bus routes which provide additional coverage on all three networks increase service duplication to some trip generators. This is most evident on the grid and multi-hub networks which have more community buses, many of which have segments of overlap with the regular and express routes. The radial network generally has less service duplication in terms of the community buses, but there is some duplication in the downtown area as a natural outcome of the coordinated transfer hub.

Improving Service Outside of the Downtown

Any potential changes should strive to improve the quality of services to and from destinations that are not located downtown

To determine how well each network improves service outside downtown, the average population within a 60-minute combined walk and transit trip of four of the city's major trip generators outside the downtown was measured using the Jane tool as previously described. The four trip generators selected were the hospital, Lansdowne Place, Portage Place, and Willowcreek Plaza. Measurements were made at each of these locations along the same four time-periods previously identified: midday on weekdays, the PM peak on weekdays, late evening on weekdays, and midday on Sundays. The results of this analysis are shown in Exhibit 7-7.

Overall, the grid network provides the highest access from all four trip generators, including across all time periods. In addition, the population within an hour of the trip generators is fairly consistent throughout the four service periods reviewed. The radial and multi-hub networks are comparable for all locations with the exception of Willowcreek Plaza, where the multi-hub network

outperforms the radial network for all service periods except the late evening. Similar to the previous access analysis, the east bank location (Willowcreek Plaza in this instance) underperforms on all three network alternatives.

Exhibit 7-7: Summary of Access for Radial, Grid and Multi-hub Network Alternatives

Network	O/D	Average Population within a 60 minute Walk/Transit Trip			
		1:30 PM	5:30 PM	11:00 PM	Sunday 1:30 PM
Grid	Hospital	47,422	47,112	44,104	45,378
	Lansdowne Place	40,908	40,017	37,803	38,945
	Portage Place	38,721	38,710	30,320	33,346
	Willowcreek Plaza	26,856	25,450	25,611	24,684
Radial	Hospital	41,540	41,585	33,137	39,107
	Lansdowne Place	38,732	38,768	28,680	36,368
	Portage Place	31,556	31,568	20,312	30,759
	Willowcreek Plaza	18,813	18,830	13,337	17,445
MultiHub	Hospital	42,309	42,231	31,756	39,722
	Lansdowne Place	41,535	38,088	26,258	35,236
	Portage Place	30,310	30,204	20,028	30,310
	Willowcreek Plaza	26,214	25,893	13,376	22,770

Source: IBI Group Analysis of Travel Time and Population Data from Remix, 2021

Serving New Areas and Neighbourhoods

Providing transit service to emerging areas will be critical to building a future ridership base

To understand how each network alternative improves service to new areas and neighbourhoods, the networks were reviewed for their planned service to the following developing neighbourhoods:

- **Lily Lake**: A new subdivision in the north west area of the city, expected to consist primarily of single-family residential housing and some townhomes.
- **Television Road**: The second phase of the Burham Meadows subdivision on the south east corner of Old Norwood Rd and Television Rd, as well as the Ashborough Village subdivision planned for the south west corner of the same intersection and expected to include single family residential as well as apartments and townhomes.

- **Chandler Crescent**: A recently developed residential subdivision near the Parkhill and Brealey intersection, which is currently served by Transcab due to constraints in its road network.
- **The Airport**: A potential trip generator south of Fleming College.

The multi-hub network serves the developments on Television Road with a route connecting to Willowcreek Plaza. The Chandler Crescent subdivision cannot be served with standard buses, but was cited as a popular trip origin through the consultation process. The grid and multi-hub networks serve the subdivision from a stop on Parkhill, but the access distance would be high. None of the networks serve Lily Lake in their current configuration, which is still in the early stages of development. The grid and multi-hub networks both serve the airport with routes from Fleming College. In terms of providing service to these new areas, the multi-hub network outperforms the grid and radial networks.

Providing service to these locations is challenging due to their locations in the periphery areas of the city, and in some instances, due to their road networks which are not always designed to accommodate standard city buses. However, alternative service delivery methods such as Transcab or on-demand service, as well as expansions to the community bus networks can be considered as supplements to any of the three networks to serve the new areas.

Mitigating Issues at the Downtown Terminal

The downtown terminal is an operational pinch point for Peterborough transit due to its size and design, and the fact that it is currently operating at its capacity.

A number of operational strategies, such as interlining and revising schedules, can be undertaken to mitigate issues at the downtown terminal. From a network design perspective however, reducing the number of routes using the downtown terminal is the most effective way of mitigating operational issues.

To understand how each of the network alternatives addresses the constraints of the downtown terminal, the number of routes using the terminal were counted. The radial network has the most routes through the terminal (13 routes, 516 daily trips), followed by the multi-hub network (8 routes, 331 daily trips). The grid network most effectively mitigates issues at the Downtown Terminal, by providing the fewest routes and trips through the terminal (5 routes, 235 daily trips).

Summary

Based on the qualitative and quantitative assessment of the three networks to inform the selection of a recommended network. Exhibit 7-8 is a summary of the evaluation of the three networks.

Exhibit 7-8: Evaluation Summary for Radial, Grid and Multi-hub Network Alternatives

Evaluation Criteria	Grid	Radial	Multi-hub
Balancing accessibility (coverage) and mobility (travel times) given the challenging urban context			
Serves different travel markets efficiently			
Provides more direct connections to trip generators			
Minimizes service duplication			
Improves service to trip generators outside the downtown			
Serves new neighbourhoods/can be expanded to serve new areas cost-effectively			
Mitigates issues at the Downtown Terminal			

Overall, the grid network alternative meets the identified needs and opportunities most effectively. It performs better than the other two alternatives in terms of providing more direct connections to trip generators because its routes are more direct, and it is able to mitigate operational issues at the downtown terminal effectively. The grid network also balances access and mobility well, by providing consistent access to transit across different service periods, effectively serving different travel markets.

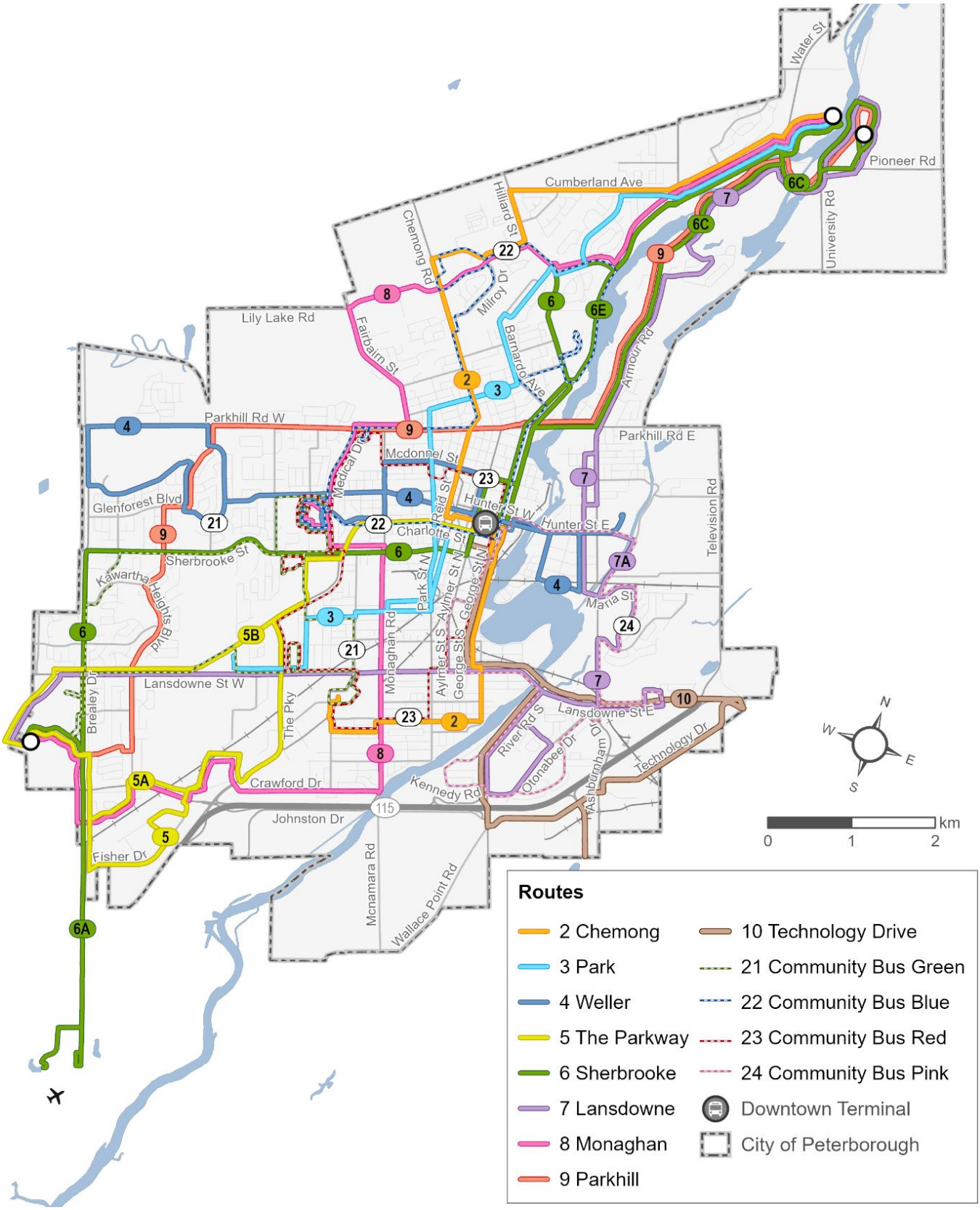
8 Recommended Network

The grid network is recommended as the preferred approach to address the needs and opportunities for transit service in the near term. This section describes the attributes of the recommended network, and the resources and investment necessary for its implementation.

8.1 Network Attributes

A map of the recommended network is shown in Exhibit 8-1, followed by descriptions of the routes, service levels and potential risks to address in its implementation.

Exhibit 8-1: Recommended Network



Routes

This section describes the role and function of each route and outlines potential opportunities for schedule refinement before implementation.

Route 2 – Chemong

Function:

- Connects Trent to Lansdowne Place, via Chemong Rd and the Downtown Terminal
- Provides service to Portage Place and the north-end Walmart with stops on Chemong Rd, and is the only regular route providing front entrance access to Lansdowne Place
- Primarily serves commercial destinations, as well as some residential areas on its north and south ends

Frequency:

- 30-minute weekday frequency, with some additional trips between noon and 6p.m. on weekdays between the Downtown Terminal and Towerhill, resulting in a 15-minute frequency
- 30-minute weekend frequency, including additional trips between the Downtown Terminal and Towerhill.

Opportunities:

- Potential opportunities to coordinate transfers with routes serving the downtown terminal

Route 3 – Park

Function:

- Connects Trent to commercial destinations on Clonsilla and Lansdowne via Park St.
- Primarily serves residential areas in the north end and medium-density residential along Park St, and some commercial destinations on its south end

Frequency:

- 30-minute weekday frequency, reduced to hourly after 6p.m.
- 30-minute frequency on weekends, reduced to hourly on weekend morning and evenings

Route 4 – Weller

Function:

- Connects the west end to Peterborough Museum via the Downtown Terminal and the hospital
- Primarily serves residential areas along Weller St. and medium density residential on Hunter St. E, as well as some institutional destinations

Frequency:

- 30-minute weekday frequency, reduced to hourly after 6:30p.m.
- 30-minute frequency on weekends, reduced to hourly on weekend mornings and evenings

Opportunities:

- Potential opportunities to coordinate transfers to route 8 at the hospital for a north/south connection, as well as routes at the Downtown Terminal, and route 7 for a north/south connection on the east bank.

Route 5 – The Parkway

Function:

- Connects Fleming to major employers in the south west to downtown via the Parkway and Fisher Dr.
- Includes an express variant connecting Fleming to downtown via Clonsilla Ave.
- Primarily serves commercial and institutional destinations, along with some residential along Charlotte

Frequency:

- 30-minute weekday frequency on the main route, reduced to hourly from 7p.m. to 2a.m.
- 30-minute weekday frequency on the express variant until 10p.m., resulting in a combined 15-minute frequency until 7p.m. and a combined 20-minute frequency between 7p.m. and 10p.m.
- 30-minute frequency on weekends, reduced to hourly on weekend morning and evenings; no express variant on weekends

Opportunities:

- Potential opportunity to coordinate transfers at the Downtown Terminal and at Fleming College for airport service

Route 6 - Sherbrooke

Function:

- Connects Trent to Fleming via Sherbrooke St, the Downtown Terminal, and Water St.
- Includes an express variant connecting Trent and the Downtown Terminal along the west bank
- Includes a variant serving the Airport from Fleming College
- Primarily serves residential areas along Sherbrooke St and Water St, as well as institutional destinations
- Provides late night service

Frequency:

- 30-minute weekday frequency on main variant, reduced to hourly between 11p.m. and 2a.m.
- 8.5-minute frequency on the express variant, running between the Downtown Terminal and Trent, until 6p.m. when it reduces to 20-minute frequency until 11p.m. The combined frequency between the Downtown Terminal and Trent is about 7.5 minutes until 6p.m.
- Hourly frequency on the airport variant between 6 a.m. and 7p.m. on weekdays, 6a.m and 6p.m. on Saturdays, and between 8a.m and 6p.m. on Sundays
- 30-minute Saturday frequency on main variant, reduced to hourly between 11p.m. and 2a.m.
- 30-minute Saturday frequency on the express variant between 9:30a.m. and 11p.m. running between the Downtown Terminal and Trent, resulting in a combined 15-minute frequency
- 30-minute Sunday frequency on main variant, reduced to hourly between 7p.m. and midnight
- 30-minute Sunday frequency between 11a.m and 7p.m. between the terminal and Trent

Opportunities:

- Potential opportunities to coordinate transfers at the Downtown Terminal
- Consideration may be made for splitting the express route to provide service on both the east and west banks of the river, providing a combined 10-minute frequency on the west bank and 20-minute frequency on the east bank.

Route 7 - Lansdowne

Function:

- Connects Trent to Fleming via Lansdowne St., Willowcreek Plaza, and Armour Rd.
- Main north/south connection on the east side of the city, and east/west connection along Lansdowne St.
- Primarily serves commercial destinations along Lansdowne St., medium density residential on the east side of the city, and institutional destinations
- Route detours along Ashburnham and uses the Hunter St. Lift Lock during the summer months to maintain reliability.

Frequency:

- 30-minute daily frequency

Opportunities:

- Potential opportunities to coordinate transfers to 2 and 4 to provide service to the downtown for the east side of the city

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Route 8 - Monaghan

Function:

- Connects Trent to Fleming via Towerhill Rd., the hospital and Monaghan Rd.
- Primarily serves residential areas, including medium density residential areas on Spillsbury Dr., as well as major employers in the south west and institutional destinations

Frequency:

- 30-minute weekday frequency
- 30-minute frequency on weekends, reduced to hourly on weekend morning and evenings

Opportunities:

- Potential opportunities to coordinate transfers to route 4 at the hospital for an east/west connection

Route 9 - Parkhill

Function:

- Connects Trent to Fleming via Parkhill Rd. and Armour Rd.
- Primarily serves residential areas in the west end, and some medium density residential areas along Parkhill Rd., as well as institutional destinations

Frequency:

- 30-minute weekday frequency, reduced to hourly after 6p.m.
- 30-minute frequency on weekends, reduced to hourly on weekend morning and evenings

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Route 10 – Technology Drive

Function:

- Commuter service connecting downtown to industrial land uses on Technology Dr.

Frequency:

- Limited service during the morning and afternoon peak

Opportunities:

- Potential opportunities to coordinate transfers at the Downtown Terminal, and to route 7 at Willowcreek Plaza for a north/south connection on the east bank.

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21 – Community Bus Green

Function:

- One-directional loop route connecting residential areas in the west end to the hospital, Lansdowne Place, and the south-end Walmart and other commercial destinations on Lansdowne
- Provides front entrance service to a nursing home on Brealey Dr. and more coverage to medium density residential areas on Goodfellow Rd.

Frequency:

- Hourly frequency daily, short service spans

22 – Community Bus Blue

Function:

- One-directional loop route connecting residential areas in the north to the hospital, Portage Place, and downtown
- Provides front entrance service to a nursing home on Dutton Rd. and more coverage to medium density residential areas on Hedonics Dr.

Frequency:

- Hourly frequency daily, short service spans

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23 – Community Bus Red

Function:

- One-directional loop route connecting residential areas near downtown and south of Lansdowne St. to the hospital, Lansdowne Place, and downtown
- Provides more coverage to medium density residential areas on Goodfellow Rd. and Hedonics Dr.

Frequency:

- 30-minute frequency on weekdays, short service spans
- Hourly frequency on weekend mornings, 30-minute frequencies otherwise

---

24 – Community Bus Pink

Function:

- One-directional loop route connecting downtown to residential areas on the east bank, Willowcreek Plaza, and higher density residential areas south of Lansdowne on the east bank
- Provides a more coverage and a connection to downtown for residents of the south side of the east bank

Frequency:

- Hourly frequency daily, short service spans

Opportunities:

- Potential opportunity to combine service area with the 10 – Technology Drive and trial a demand-responsive service

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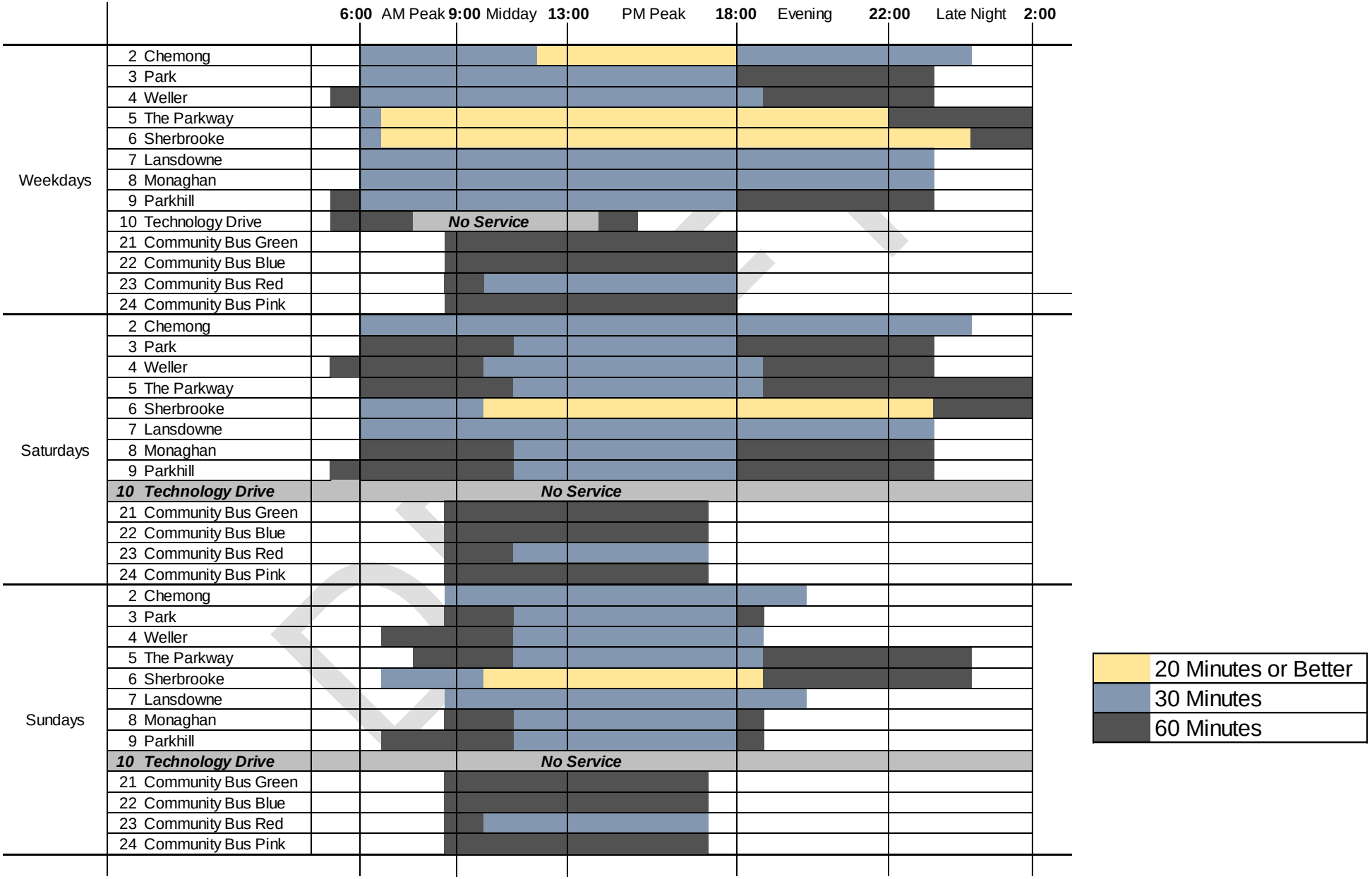
Service Levels

The span and frequency of the recommended network is uniform, with the exception of the community buses, route 10 and routes 2, 5, and 6, which include express variants. The community buses have shorter service spans and provide hourly service, with the exception of the 23 (Community Bus Red). The 10 operates only during weekday peaks. The 2 has additional service in the afternoons between the Downtown Terminal and Towerhill, and the 5 and 6 provide additional service on their variants for higher combined frequencies. The 5 and 6 have longer service spans overall, and provide late night service on weekdays and Saturdays. The higher frequencies on the 5 and 6 make transfers easier, however, their variants don't always serve the same alignments as their core routes, which can be less intuitive for some users. The span and frequency of the recommended network are illustrated in Exhibit 8-2.

Exhibit 8-2: Recommended Network Span and Frequency



Potential Risks

Some challenges of implementing the grid network can be addressed in the implementation process as routes and schedules are further refined. The main challenge to be addressed for the grid is the coordination of transfers. While the network provides direct connections between most trip generators, there are opportunities for transfers to be further refined. Transfers between routes at the downtown terminal can be improved, specifically connecting between lower frequency routes at the terminal, such as the 2 and the 4. In addition, transfers from harder to serve areas of the city such as the east side should be prioritized to improve access. Transfers between the 7 and the 2 and 4 specifically should be prioritized as they provide the only link to downtown from the north east and south east of the city.

Access distance to stops is also a challenge for some destinations using the grid network, which will be a barrier for some users. The community bus routes partly alleviate this issue, although their limited frequencies and shorter service spans mean that users that have challenges with the higher access distances also end up with lower service levels and fewer route options. Opportunities to provide bi-directional service on the community bus routes can be explored to improve service for community bus users where warranted by demand.

8.2 Fleet and Staffing Requirements

Buses

Prior to the COVID-19 pandemic, the City's hub network peak vehicle requirements were 44 conventional 40-foot buses, plus 1 community bus, and the fleet had a total of 58 buses, including spares. It is estimated that the recommended network will require 52 buses during peak service. The total recommended fleet to maintain a 25% spare ratio for the recommended network is 65 buses, including 56 40-foot buses and 9 "cutaway" 30-foot buses. With the expected delivery of 8 "cutaway" 30-foot buses in September 2021, there will be no further requirement for a near-term expansion of the fleet as the additional buses will provide sufficient spare vehicle allowance in the event of mechanical or other vehicle issues. As such, it is anticipated that the existing conventional bus fleet can accommodate the peak vehicle requirements of the recommended network. It should be noted that further expansion of the fleet may be required in subsequent years to accommodate service expansion, and the estimates above do not include replacement bus purchases to mitigate aging fleet assets.

Staff

Prior to the COVID-19 pandemic, Peterborough Transit employed 101 full-time equivalent bus operators to operate the hub network. Subject to detailed scheduling and final runcutting, the recommended grid network's proposed service levels and revenue-hours will require 129.6 full-time equivalent (FTE) bus operators to deliver the planned service enhancements. This is subject to approvals and prioritization of future network enhancements.

No additional maintenance staff are anticipated to be needed in the immediate term, given that the fleet is not expanding nor is the number of revenue service hours per bus projected to increase substantially.

Detailed recommendations for staffing levels and organizational structure are included in **Appendix A**.

8.3 Infrastructure Requirements

Bus Stops

Where transit service is being changed or introduced, new stops will be required while stops on streets where service is discontinued will need to be removed. As well, many of the remaining existing stops will need to be re-signed to reflect new route numbers. Depending on the cost of signs, posts, and labour, the cost to install new signs may be approximately $150 each and removal of old stops approximately $75 per sign subject to final decisions regarding stop requirements and locations. Based on the stop locations identified by Transit staff, it is anticipated that 25 new stops will need to be installed and 10 stops will need to be removed.

In addition to changes to bus stops, some shelters may need to be relocated subject to final route design and bus stop location changes. The cost to relocate these shelters will depend on the condition of each new location in terms of required upgrades. A relocation budget allowance of approximately $2,500–$3,000 per shelter should be planned for.

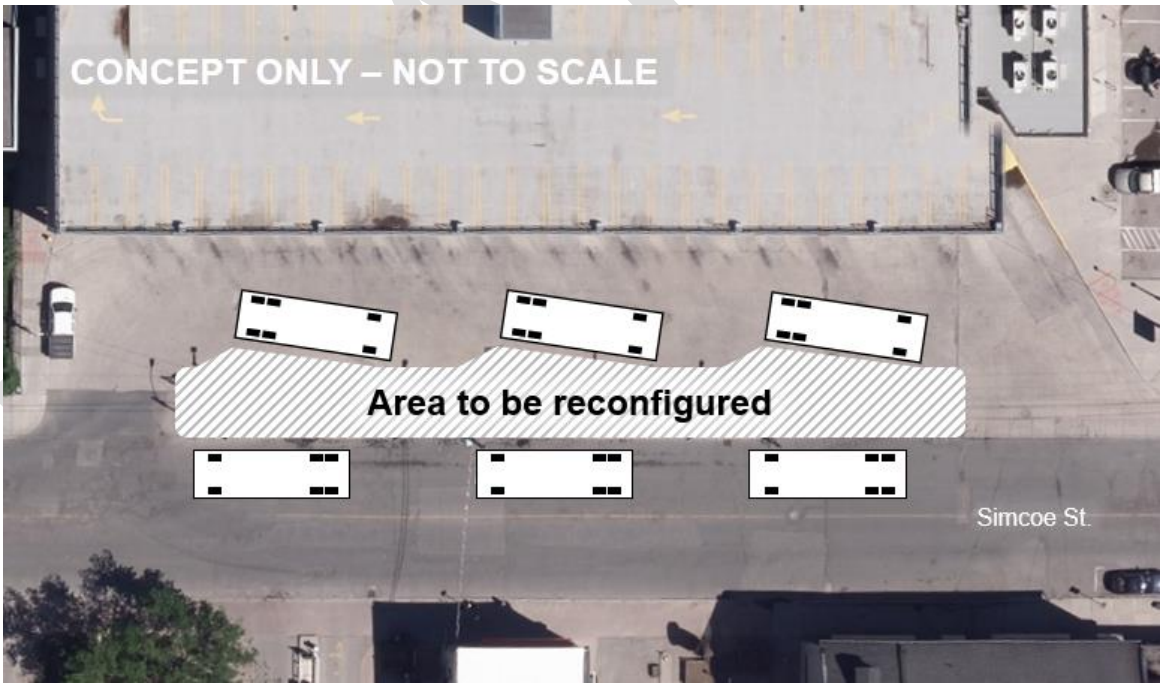
Terminal and Satellite Hubs

As previously described in section 7, the recommended network reduces service and passenger activity at the downtown terminal while simultaneously increasing service and passenger activity at the Trent and Fleming "hubs". This presents an opportunity to reconfigure the downtown terminal to better suit the reduced bus and pedestrian volumes and also a need to improve physical infrastructure at the Trent and Fleming hubs.

Prior to the COVID-19 pandemic, the **downtown terminal** served 12 regular bus routes within the terminal itself, plus express buses and a GO Bus route served by on-street stops adjacent the terminal. The physical layout of the terminal was insufficient to accommodate this high volume of bus movements, and often resulted in delays that cascaded throughout the bus network. The recommended network reduces the number of buses serving the downtown terminal to six, which presents an opportunity to reconfigure the layout of the terminal to improve operations and the customer experience.

Exhibit 8-3 presents a high-level concept of how the downtown terminal could be reconfigured to accommodate the six bus routes that will continue to serve it in the recommended network. This island platform design, combining "sawtooth" bays on the north end of the platform with parallel bays on the south end of the platform, would make the most of the space available to the south of the current terminal bays. It would also substantially improve operations at the terminal by facilitating much more efficient bus access and egress movements from the site. In addition, the single island platform can facilitate transfers between routes for passengers. This concept, and variations on it, will continue to be developed and refined as part of the Long-Term Growth Strategy.

Exhibit 8-3: Downtown Terminal Concept



Basemap source: Peterborough e-maps

Additional physical infrastructure is also desirable at the **Trent University and Fleming College** satellite hubs as passenger and vehicle volumes increase under the recommended network. To accommodate the increased bus volumes, additional bays are recommended at both locations, with dedicated bays for each route. For routes with express variants, separate bays are recommended

for the variants to make wayfinding simpler. Passenger amenities, such as weather protection, seating, and garbage bins should also be provided at these locations. As the grid network relies less on the downtown terminal, driver facilities (washrooms or access to washrooms, break rooms etc.) should also be considered for the satellite hubs to facilitate operations and driver switch-over.

8.4 Financial Requirements

This subsection outlines the anticipated operating costs and revenues associated with the recommended network. These figures are subject to refinement as the recommended network concept is advanced and, in particular, as ridership evolves in the coming year following the worst of the COVID-19 pandemic. There is also significant uncertainty surrounding operating funding from senior levels of government for the year 2022, which could have a material impact on the City's net operating costs.

Annual operating expenses for the final recommended network are estimated at $20,880,015 (excluding the costs to operate the Selwyn service, revenue from fares, revenue from senior levels of government, and revenue from other funding partners), an increase of $5,239,111 from the 2019 hub network operating costs. This represents a 33.5% increase in the gross cost to operate the transit network.

Step changes in network frequency and services will be implemented through 2022 and, as such, the net municipal investment has been staged through several service periods through this budget year. A summary of the service hours, fleet, staffing and financial requirements for the recommended network is shown in Exhibit 8-4, highlighting the current service levels and the fully implemented grid network.

Exhibit 8-4: Recommended Network Budget Forecast

	2019 Hub Network	Recommended Grid Network
Annual Service Hours	210,896	264,986
Total Fleet (including spares)	58	65
Bus Operators FTE (full-time equivalent)	101	129
Annualized Gross Operating Costs	$15,640,904	$20,880,015

9 Public and Stakeholder Consultation

This section summarizes the public and stakeholder consultation efforts undertaken on the study's strategic direction and network alternatives. The broader Transit Study includes three waves of consultation, each of which provide an opportunity for the public and key stakeholders to provide direct input on the study and its findings. These three waves correspond to three critical periods in the study:

- **Wave 1**: Identification of needs and opportunities;
- **Wave 2**: Appraisal of alternative near-term solutions; and
- **Wave 3**: Feedback on the long-term growth strategy and terminal study.

The following subsections describe the consultation activities and associated feedback received during the first two consultation waves. Consultation activities for Wave 3 will be described under separate cover.

9.1 Wave 1: Needs and Opportunities

The first wave of consultation occurred in the winter of 2019, and included consultation with the public and bus operators. The main objectives of the first wave were to inform the public about the study and to obtain public and stakeholder input on opportunities to improve the transit network, their travel patterns, and their vision for transit in the community.

Consultation Activities

Consultation activities consisted of a drop-in information session for transit staff and operators and a Public Information Centre (PIC) supplemented by web-based survey. The staff information session and the PIC were held on February 5th, 2019. The online survey was live from February 5th 2019 to February 20th 2019.

The drop-in information session for staff was promoted internally, and had approximately 10 attendees. The PIC and web consultation tool were promoted through various channels, including a statutory notice on the City's website, and notices on the City's social media channels. Approximately 50 people attended the PIC. A total of 117 members of the public also completed the web-based consultation survey, which included a mapping tool to identify challenges and opportunities for the transit system.

Feedback

Transit staff and members of the public identified their challenges and priorities related to transit service in Peterborough. The feedback from the public was mainly centred on the challenges of the current network design. This was a recurring theme in comments on the web-consultation tool and in correspondence received through the study website. Stemming from this challenge were three main themes:

- **Long travel times** on the system make transit less attractive to users; reducing travel times was the top priority for respondents and participants.
- **Low service frequency,** specifically the 40-minute frequency on most routes, can mean very long waits between any missed connections.
- **Inconvenient transfers at the downtown terminal** frustrate some users.

The consultation session also included a mapping activity where respondents could indicate locations that were easily accessible by transit, and locations that were challenging to access on transit. Most of the locations identified by the public were within a 400m straight line distance of existing transit service. As expected, the most transit accessible locations in the city are the downtown, Trent University and Fleming College, and some sections on the Lansdowne corridor. Much of the remainder of the city, including the new residential developments on the periphery of the city and many new residential developments were identified as challenging to access on transit. The mapped responses are included in **Appendix B**.

9.2 Wave 2: Network Alternatives

The second wave of formal consultation was delayed due to the COVID-19 pandemic. Informal consultation and communication continued from June 2020 to January 2021 to gather public feedback. This process included transit staff, transit users, members of the community and key stakeholder groups. The main objective of the interim consultation was to inform the public about the need for transit services changes and solicit feedback to balance opportunities for improvement and adjustment with the overarching principle of public health and safety. In addition to ongoing consultations held on request for individuals in the community using a variety of communication platforms, additional “interim” consultation activities included a transit survey conducted by the Council for Persons with Disabilities, a transit rider survey conducted by Peterborough Transit, and outreach from dedicated Transit Ambassadors and staff.

Consultation Activities

Stakeholder Survey

In August 2020, 211 participants provided feedback as part of a transit accessibility survey conducted by the Council for Persons with Disabilities. The recommendations were publicly released on Wednesday, October 28, 2020. Peterborough Transit and the Council established three key areas for ongoing engagement and consultation during the study:

- **Communication and Consultation:** the parties have established an Information Sharing Initiative to support the targeted and tailored distribution of information to the accessibility community.
- **Public Education:** the parties have worked together to ensure a partnership on the Time in My Shoes Program Delivery which is designed to provide an experiential learning opportunity for business and service staff to better understand the day to day challenges faced by the accessibility community. This program includes use of simulation equipment, real life experience, and direct interaction with persons with lived experience and was conducted at transit from February 9-11, 2021.
- **System Evaluation:** the parties have partnered to initiate a Mentorship Program where CPD volunteers have connected with Transit staff to talk about accessibility challenges, route navigation, and other relevant topics to deliver one-on-one rider travel training to customers who need or request it. This program is being extended to Age Friendly Peterborough for pilot and will develop to include key stakeholders across the community and anyone is eligible to participate.

Transit Rider Survey

Following the COVID-19 response network implementation, the community was invited to provide feedback on the route network to help inform developments to improve the customer experience. Consultation activities consisted of a Transit Rider Survey, public outreach using Transit Ambassadors, and key stakeholder information sessions. The Transit Rider Survey was promoted using online and paper media, radio ads, posters, email, and social media. Opportunities for paper and online participation were provided. The survey was held from December 17, 2020 to January 17, 2021, with opportunities for paper and online participation.

Route Network Alternative Survey and Virtual Town Hall

The community was invited to provide feedback on three route network alternatives and other transit priorities to help inform the final transit route review assessment and evaluation process. The survey was held from February 12, 2021, to February 26, 2021 with opportunities for paper and online participation.

Consultation and engagement opportunities were promoted using online and paper media, radio ads, posters (at facilities, on board buses, in shelters), email (an exhaustive list including internal and external stakeholder contact lists), and social media. Council was advised by email of the consultation and opportunities to engage on February 12, 2021. Key stakeholder presentations included the Mayor and Transportation Co-Chairs, the City's Accessibility Advisory Committee, Age Friendly Peterborough, Trent University, Peterborough Public Health, Fleming College, Council for Persons with Disabilities, Student Transportation Services of Central Ontario, and all transit staff including drivers.

The primary platform for feedback was the City's Connect PTBO online platform; however, to optimize feedback from transit users, there were opportunities for paper-based participation using printed maps and surveys. A video presentation of the Route Review and Long-Term Growth Strategy was available for viewing online. Hard copies of the PowerPoint presentation were distributed electronically and in print form on request. Two Virtual Town Halls with an interactive Q&A component were held on Thursday, February 18th, 2021 from 1:00 to 3:00pm and Wednesday, February 24th, 2021 from 5:00 to 7:00pm. Presentations for individuals in the community were held on request. A dedicated Transit Study phone line was available to the public on weekdays from 8:30 a.m. to 4:30 p.m. The Study Team was available 24/7 by direct email. Frequently Asked Questions and detailed Transit Study information were available on Connect PTBO.

The consultation also included an interactive mapping activity where respondents could indicate where they travelled from, where they most frequently travelled to and where they occasionally travelled to.

Feedback

The surveys, interactive map and virtual town halls allowed the project team to receive valuable input from the public related to the City's current transit network and future alternatives. The feedback is summarized in the section below.

Transit Rider Survey

Of the 257 responses received, 70% of respondents generally favourably viewed the COVID-19 response route network as working as is or with adjustments. 30% of respondents felt the COVID-19 response network did not work for them and their open-ended feedback was included in the assessment

of results and key themes as well as ongoing adjustments that were made to the network. Priorities for adjustments were focused on four main themes:

- Increased bus frequency/improved transfer times;
- Addition of some more direct routes/service locations;
- Improved infrastructure (shelters, stops) with a focus on accessibility; and
- Options for reduced walking distance to stops for some users in some areas.

Route Network Alternative Survey

A total of 434 survey responses were gathered from individuals online and via hard copy. The respondents represented a broad cross section of residents and transit users from different age groups, occupational types and neighbourhoods.

The results indicated that a majority of respondents preferred more frequent, direct bus services in lieu of a high degree of service coverage. The trade-offs they are willing to make include longer travel distances between stops and fewer non-terminal bus connections across the city. The majority of individuals were also willing to make more transfers to achieve a faster overall trip time. Finally, there is a slight majority of respondents that would prefer to make transfers at the downtown terminal. Exhibit 9-1 summarizes the survey responses when respondents were asked to consider which options were important to them.

There was generally widespread support for improving transit service during the morning and afternoon rush hours on weekdays. The morning rush (7 a.m. to 10 a.m.) was most often selected as the time period that was most in need of service improvements, followed closely by the afternoon rush (2 p.m. to 6 p.m.) Early morning (before 7 a.m.) and late evening (after 9 p.m.) were ranked as the lowest priority periods.

For community bus service, more individuals preferred shorter travel times and were willing to accept lower service frequency to achieve this. Most respondents (~40) believed that the on-demand service should continue to serve the purpose of non-rush hour service in low ridership areas. There was little support for on-demand service to operate on weekday evenings, weekends and holidays.

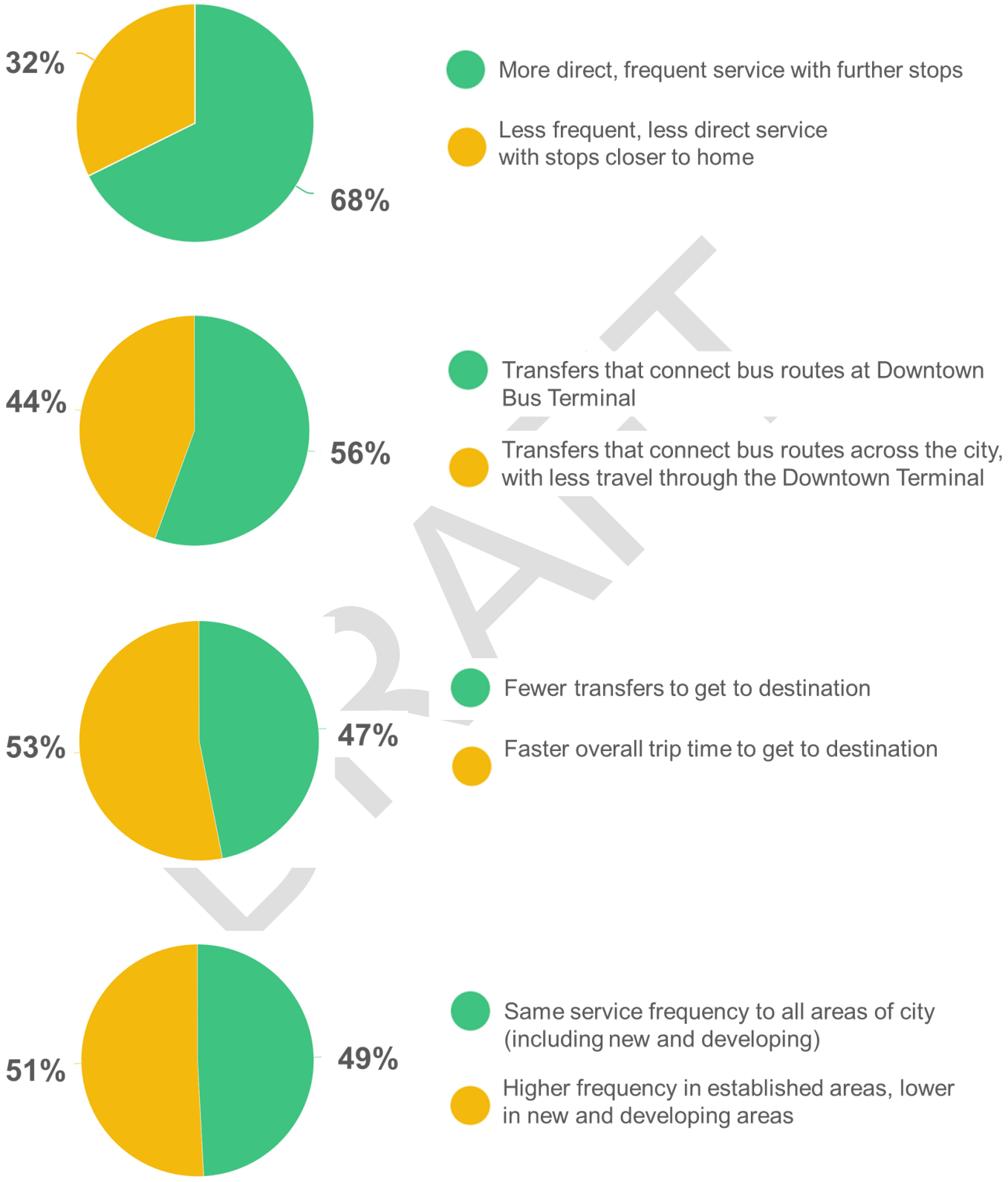
The survey also included an open-question comment component for respondents which yielded 267 responses. Several themes emerged from this feedback:

- Increase **service frequency** and **hours of operation** for regular and community bus services
- Create more **convenient transfers** across the city

- Maintain **faster, more direct** trips across the city
- Improve transit **infrastructure** to include amenities (benches, shelters, waste disposal) and **accessibility** features
- Identify improvements for **accessible** and **senior** services
- Increase service to **new** and **developing areas**
- Provide more **direct trips** to **established** areas of the community
- Provide **access to the downtown area** without using the downtown terminal
- Improve opportunities for **customer communication** and access to route and schedule information (wayfinding, maps, transfer signage)

In addition to the overarching themes, there was some competing feedback between respondents with respect to transit route planning to meet the City standard of 450 metres walking distance to a bus stop location. Some respondents preferred a to-the-door service though specific neighborhoods to reduce walking distances from the city service standard and some respondents who preferred service along main corridors to remove transit from specific neighbourhoods.

Exhibit 9-1: Summary of Survey Respondent Preferences



Interactive Map

A total of 507 pins were placed on the online map to indicate where respondents travelled from and where they most frequently travelled to. Several pins were outside city limits or in peripheral locations; however, 97% of pins were within 450 metres and 96% were within 400 metres of the proposed bus service. Hotspot maps showing popular origins and destinations for transit passengers are included in **Appendix C**.

Trip origins are relatively spread throughout residential areas in the City, with some concentration in the north (around and near Trent), along the George and Water Street corridors and in the heart of the south end of the city, south of Lansdowne Place. Most respondents indicated travel to destinations around the downtown area, although not specifically concentrated at the terminal location. Trips to this area are typically made for work, shopping and recreational purposes. Other notable trip attractors are along the Lansdowne corridor, the hospital, and the Trent University and Fleming College campuses. Tertiary destinations include commercial plazas (e.g. both Walmart Supercentres) and Portage Mall.

10 Recommendations

Following a comprehensive analysis of the City's transit network, this route review recommends improvements to better serve residents, based on eight identified needs and opportunities:

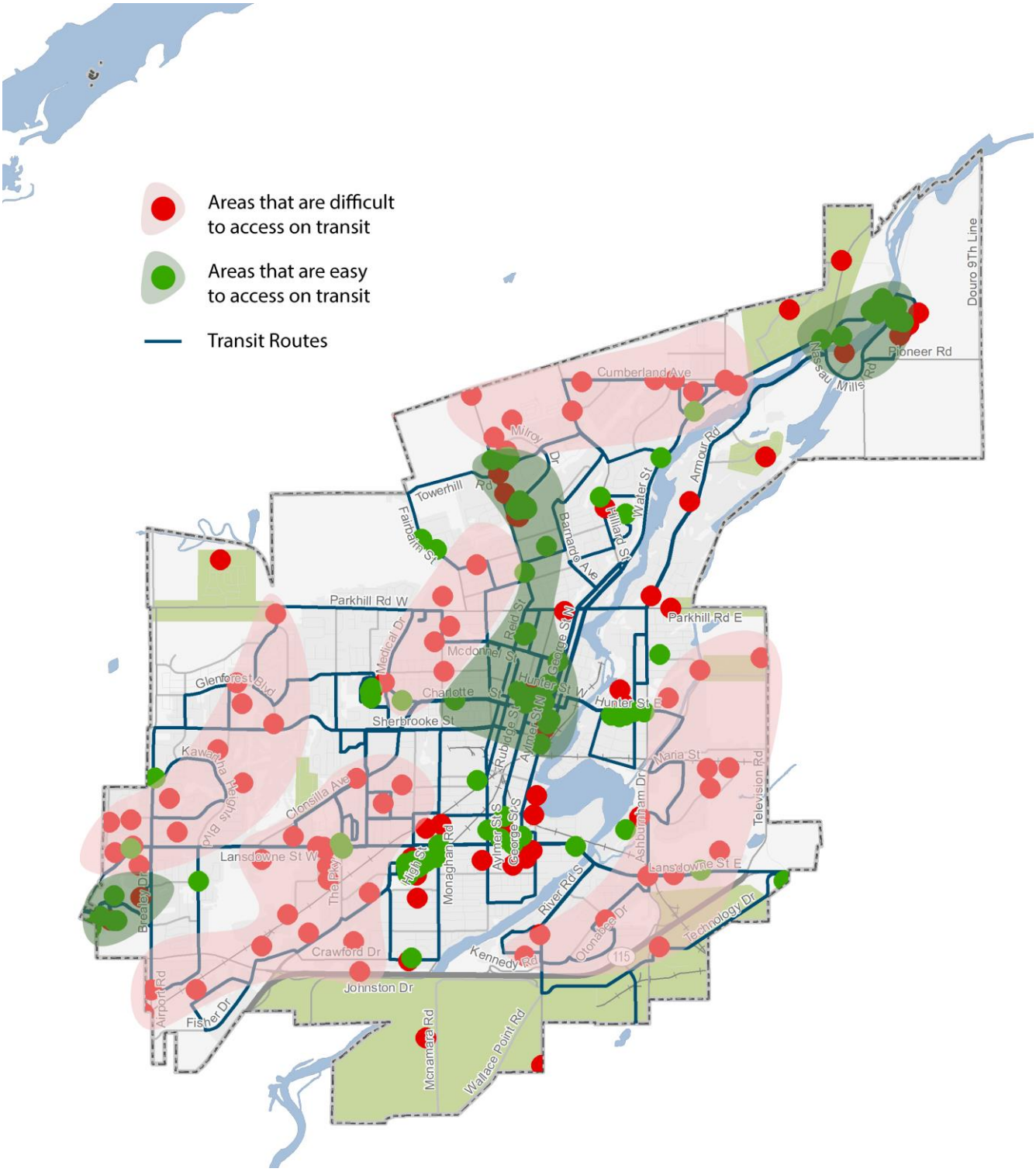
- Balancing access and mobility;
- Meeting the needs of distinct travel markets;
- Providing high-quality service in a challenging urban context;
- Improving the convenience of transit;
- Minimizing service duplication;
- Improving service to areas outside the downtown;
- Providing service to developing areas; and
- Mitigating operational issues at the downtown terminal.

The implementation of a grid-oriented network is recommended as the preferred approach to address the needs and opportunities for transit service in the near term. The recommended network's annual gross operating expenses are estimated at $20,880,015, a 33% increase over the cost to operate the existing network. The fleet required to support the network includes 65 buses, an increase from the current fleet requirements of 57 buses.

This route review provides the City with a recommended network that enhances transit service for residents, and a first step towards the long-term transit strategy. The key recommendations, to serve as the next steps are:

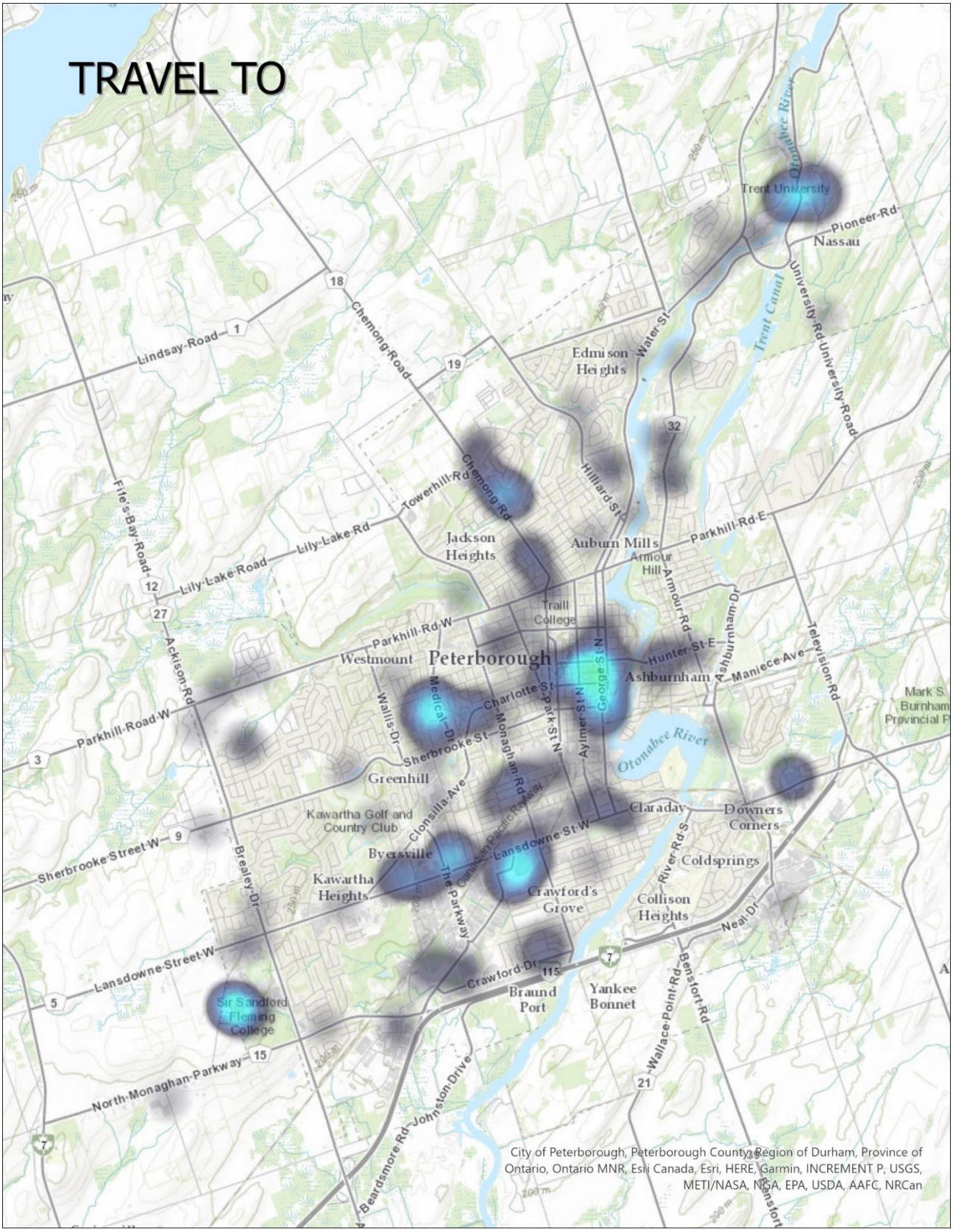
1. Adopt the grid-oriented network and proposed service levels as the basis for providing transit service in the coming years.
2. Implement the grid network in phases, increasing service levels from the current service offering to achieve full implementation of the network.
3. Explore infrastructure funding opportunities to implement infrastructure improvements, specifically provincial and federal funding agreements.
4. Develop the Long-term Transit Strategy and Downtown Terminal Improvements with the recommended network as the foundation for growth.

Appendix A – Wave 1 Public Consultation Mapping Exercise Summary

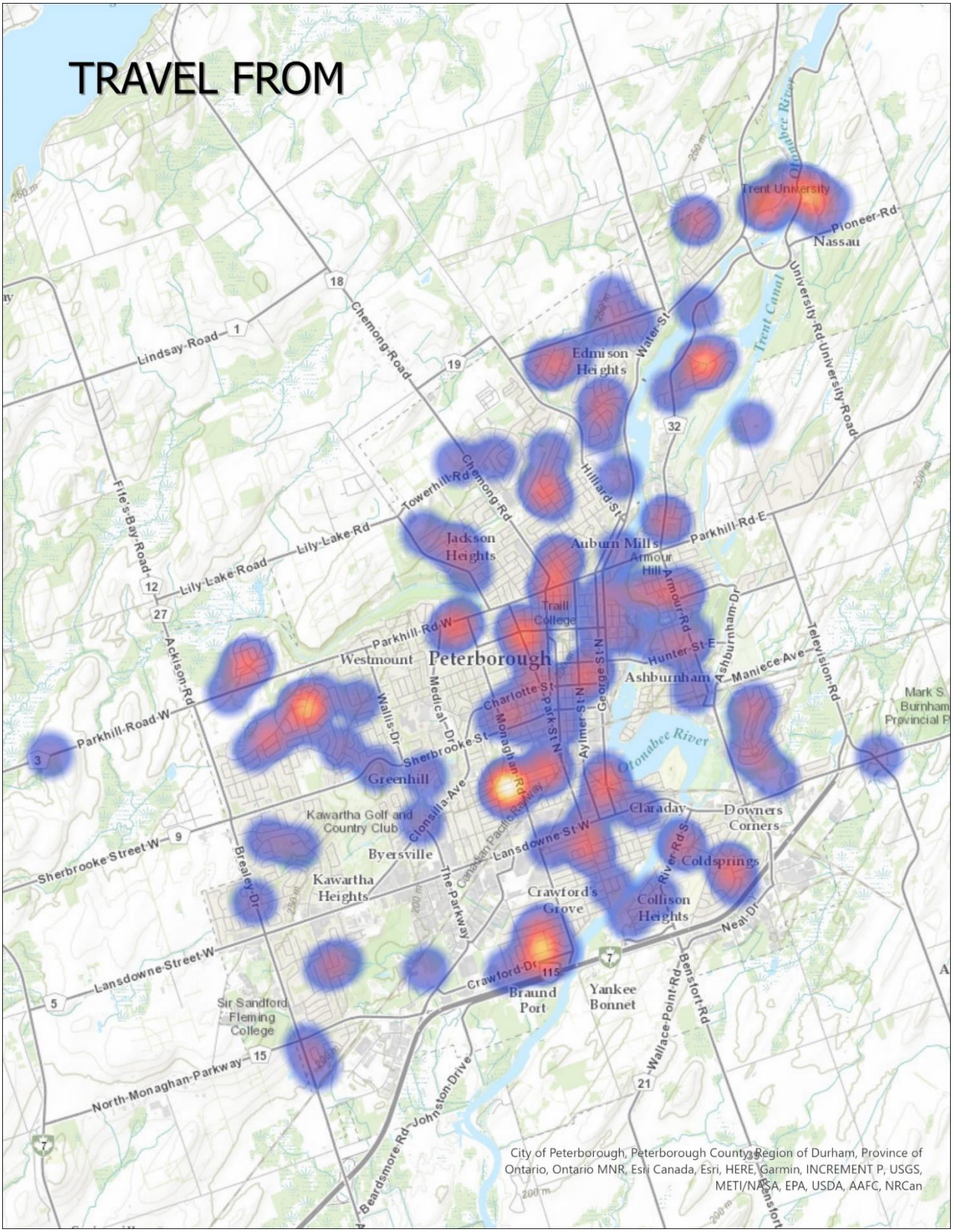

Areas that are difficult to access on transit
Areas that are easy to access on transit
Transit Routes
Douro 9Th Line
Pioneer Rd
Cumberland Ave
Milroy Dr
Towerhill Rd
Fairbairn St
Barnardo Ave
Hilliard St
Water St
Armour Rd
Parkhill Rd W
Parkhill Rd E
Reid St
Medical Dr
Mcdonnel St
George St N
Hunter St W
Hunter St E
Glenforest Blvd
Charlotte St
Sherbrooke St
Rubidge St
Aylmer St N
Maria St
Kawartha Heights Blvd
Clonsilla Ave
Lansdowne St W
Aylmer St S
George St S
Monaghan Rd
High St
Ashburnham Dr
Television Rd
Lansdowne St E
Brealey Dr
The Pky
River Rd S
Technology Dr
Crawford Dr
Kennedy Rd
Otonabee Dr
115
Johnston Dr
Airport Rd
Fisher Dr
Mcnamara Rd
Wallace Point Rd

Appendix B – Wave 2 Public Survey Summary

Interactive Map Results for Most Frequent Destinations

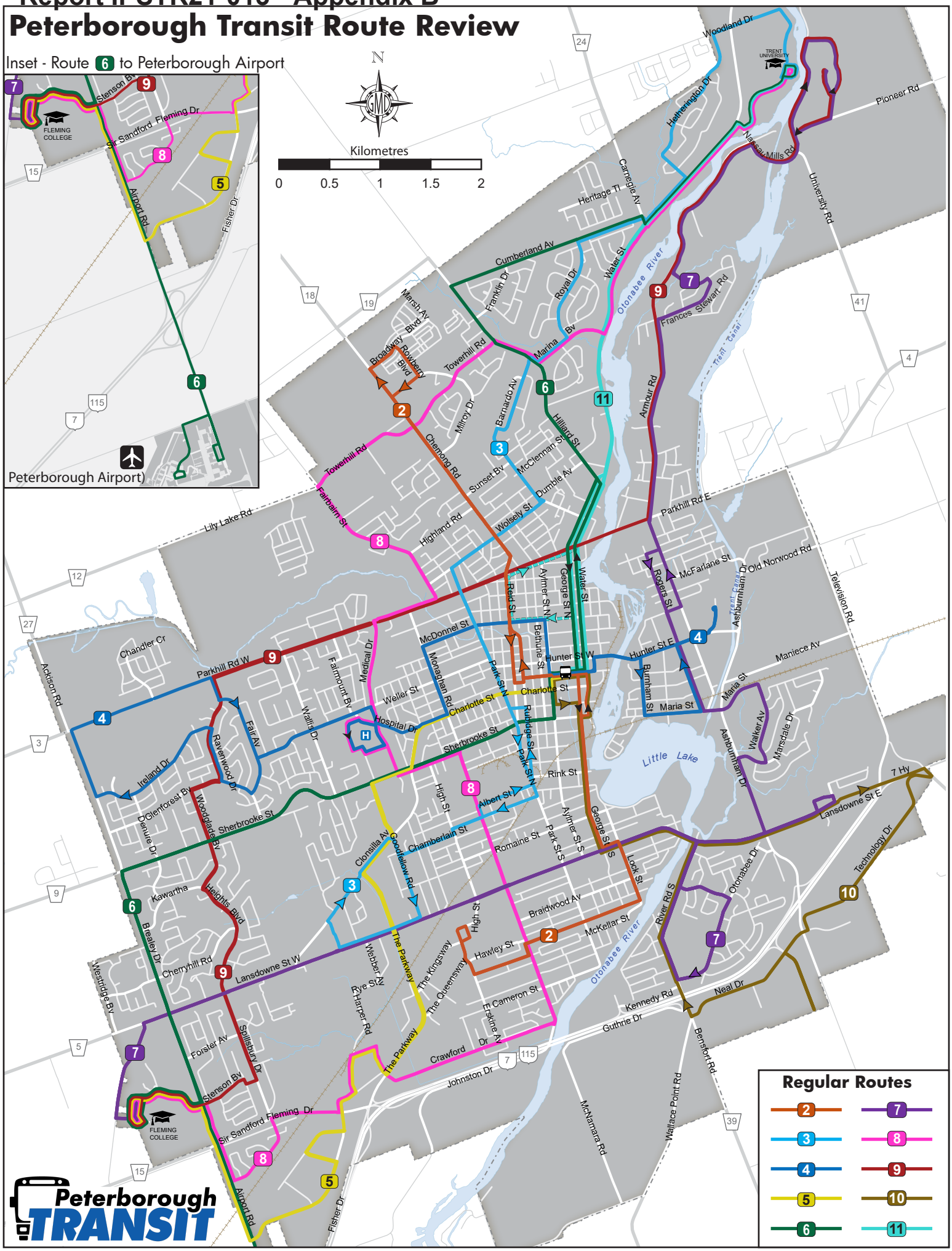


Interactive Map Results for Most Frequent Origins

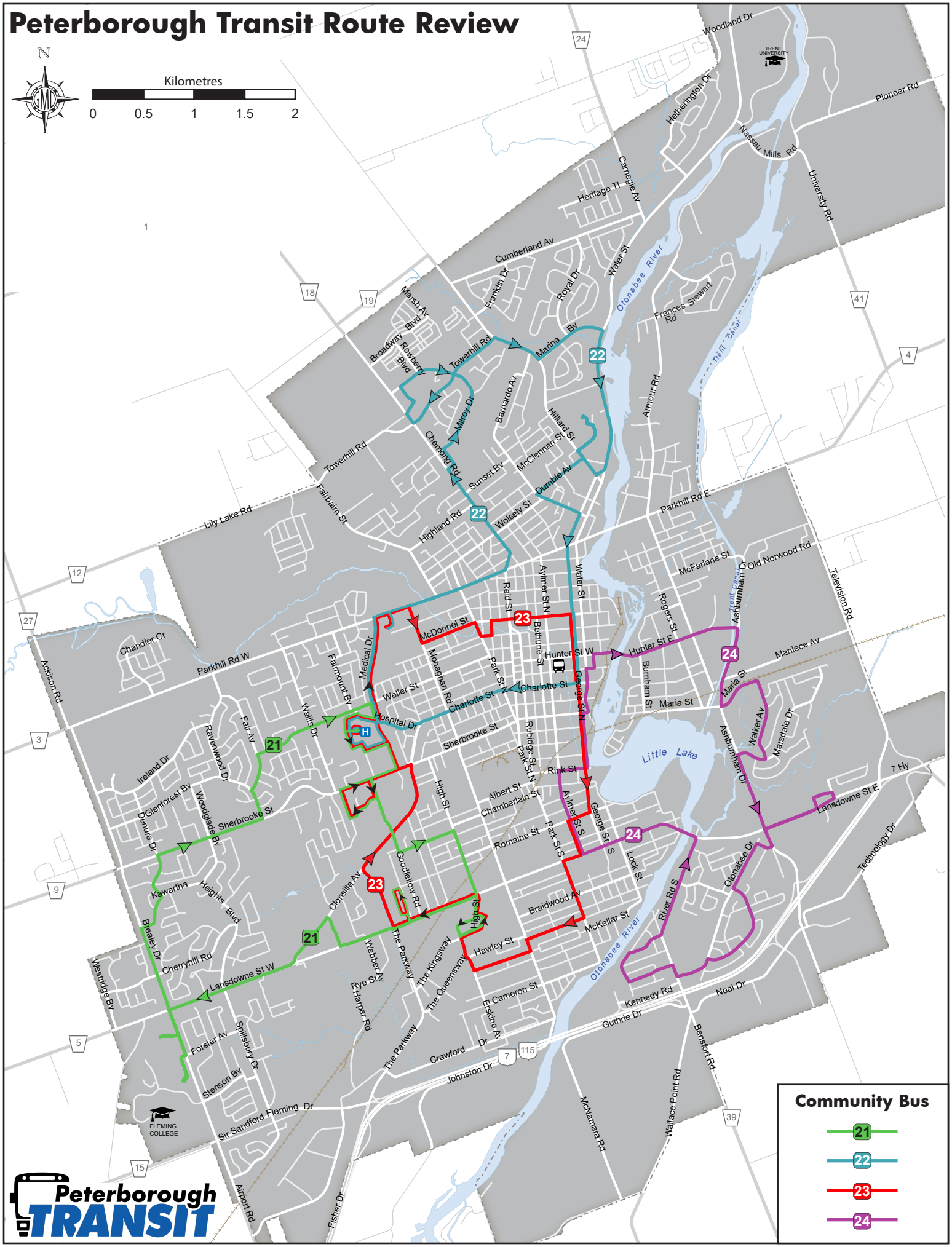


Report IPSTR21-013 - Appendix B

Peterborough Transit Route Review



Peterborough Transit Route Review



Frequency Comparison

Changed from previous period

60	45	30	20	15	10	
40						

HUB Sept 2019

Annualized Hours 210,896 — Drivers 101.0

	Rte	Weekdays: Service Time First Dept	Last Dept	Range	Weekdays: Frequency AM Rush	AM Mid	PM Rush	PM Eve	Late Eve	Saturday: Service Time First Dept	Last Dept	Range	Saturday: Frequency Morn	Morn Mid	Morn Eve	Late Eve	Sunday & Holiday: Service Time First Dept	Last Dept	Range	Frequency Morn	Morn Mid	Eve	Late Eve
George North	1	6:00	22:40	17:40	40	40	40	40		6:40	22:40	17:00	40	40	40		8:00	18:40	11:40	40	40		
Chemong	2	6:00	22:40	17:40	20	40	20	40		6:40	22:40	17:00	40	40	40		8:00	18:40	11:40	40	40		
Highland	3	6:00	22:40	17:40	40	40	40	40		6:40	22:40	17:00	40	40	40		8:00	18:40	11:40	40	40		
Jackson Park	4	6:00	22:40	17:40	40	40	40	40		6:40	22:40	17:00	40	40	40		8:00	18:40	11:40	40	40		
Charlotte	5	6:00	22:40	17:40	40	40	40	40		6:40	22:40	17:00	40	40	40		8:00	18:40	11:40	40	40		
Kawartha	6	6:00	22:40	17:40	40	40	40	40		6:40	22:40	17:00	40	40	40		8:00	18:40	11:40	40	40		
Lansdowne	7	6:00	22:40	17:40	20	40	20	40		6:40	22:40	17:00	40	40	40		8:00	18:40	11:40	40	40		
Monaghan	8	6:00	22:40	17:40	20	40	20	40		6:40	22:40	17:00	40	40	40		8:00	18:40	11:40	40	40		
Nicholls Park	9	6:00	22:40	17:40	40	40	40	40		6:40	22:40	17:00	40	40	40		8:00	18:40	11:40	40	40		
Collison	10	6:00	22:40	17:40	20	40	20	40		6:40	22:40	17:00	40	40	40		8:00	18:40	11:40	40	40		
Ashburnham	11	6:00	22:40	17:40	40	40	40	40		6:40	22:40	17:00	40	40	40		8:00	18:40	11:40	40	40		
Major Bennett	12	6:00	22:40	17:40	40	40	40	40		6:40	18:00	12:20	40	40	40		9:20	17:20	9:00	40	40		
Regular Route	**avg**	**6:00**	**22:40**	**17:40**						**6:40**	**22:16**	**16:36**					**8:06**	**18:33**	**11:26**				
Technology Drive	26	5:55	16:00	11:05	45		45																
Express - Fleming Lansdowne	14	6:30	22:00	16:30	30	30	30	60															
Express - Fleming Sherbrooke	16	6:45	22:15	16:30	30	30	30	60															
Express - Trent WB	40	7:10	23:40	17:30	10	10	10	20		8:20	23:40	16:20	20	20	40		8:20	23:40	16:20	20	20	40	
Express - Trent EB	42	7:15	23:35	17:20	10	10	10	20		8:35	23:15	15:40	40	40	40		8:35	23:15	15:40	40	40	40	
Late Night - Fleming	18	23:30	26:30	4:00					45	23:30	26:30	4:00				45							
Late Night - Trent	44	24:20	26:35	3:15					45	24:20	26:35	3:15				45	24:20	26:35	3:15			45	
Community Bus	32	9:00	16:00	8:00	60	60	60			9:00	16:00	8:00	60	60			10:00	16:00	7:00	60	60		
Community Bus	**avg**	**9:00**	**16:00**	**8:00**						**9:00**	**16:00**	**8:00**					**10:00**	**16:00**	**7:00**				

GRID Full Build Target

Annualized Hours 276,357 — Drivers 132.4

	Rte	Weekdays: Service Time First Dept	Last Dept	Range	Weekdays: Frequency AM Rush	AM Mid	PM Rush	PM Eve	Late Eve	Saturday: Service Time First Dept	Last Dept	Range	Saturday: Frequency Morn	Morn Mid	Morn Eve	Late Eve	Sunday & Holiday: Service Time First Dept	Last Dept	Range	Frequency Morn	Morn Mid	Eve	Late Eve
Chemong	2	5:32	23:15	18:43	30	15	15	30		5:32	23:15	18:43	30	15	30		7:32	19:15	12:43	30	15		
Park	3	6:05	23:05	18:00	30	30	30	60		6:05	23:05	18:00	60	30	60		8:05	19:35	12:30	60	30		
Weller	4	5:23	23:04	18:41	30	30	30	60		5:23	23:04	18:41	60	30	60		7:23	19:04	12:41	60	30		
The Parkway	5	5:45	23:10	18:25	30	30	30	30		5:45	23:10	18:25	60	30	60		7:45	19:10	12:25	60	30		
Sherbrooke	6	6:02	23:10	18:08	30	30	30	30		6:02	23:10	18:08	30	30	30		8:02	19:10	12:08	30	30		
Lansdowne	7	5:44	23:05	18:21	30	30	30	30		5:44	23:05	18:21	30	30	30		7:44	19:05	12:21	30	30		
Monaghan	8	6:15	23:15	18:00	30	30	30	30		6:15	23:15	18:00	60	30	60		8:15	19:15	12:00	60	30		
Parkhill	9	5:30	23:15	18:45	30	30	30	60		5:30	23:15	18:45	60	30	60		7:30	19:15	12:45	60	30		
Regular Route	**avg**	**5:47**	**23:09**	**18:22**						**5:47**	**23:09**	**18:22**					**7:47**	**19:13**	**12:26**				
Technology Dr	10	5:55	16:00	11:05	45		45																
Express - Fleming	5	7:05	18:00	11:55	30		30																
Express - Trent	6	7:12	22:30	16:18		10		15		9:22	22:30	14:08	30	20	30		10:52	19:00	9:08	30	20		
Late Night - Fleming	5	24:05	26:05	3:00					60	24:05	26:05	3:00				60	20:05	24:05	5:00			60	
Late Night - Trent	6	24:10	26:30	3:20					60	24:10	26:30	3:20				60	20:10	24:30	5:20			60	
CB Green	21	8:05	17:05	10:00	60	60	60			8:05	16:05	9:00	60	60			8:05	16:05	9:00	60	60		
CB Blue	22	8:15	17:15	10:00	60	60	60			8:15	16:15	9:00	60	60			8:15	16:15	9:00	60	60		
CB Red	23	8:15	17:15	10:00	60	30	30			8:15	16:15	9:00	60	30			8:15	16:15	9:00	60	30		
CB Pink	New	8:15	17:15	10:00	60	60	60			8:15	16:15	9:00	60	60			8:15	16:15	9:00	60	60		
Community Bus	**avg**	**8:12**	**17:12**	**10:00**						**8:12**	**16:12**	**9:00**					**8:12**	**16:12**	**9:00**				

On-Demand Transit Planning Study

City of Peterborough, ON

March 2021

Table of Contents

1. Executive Summary

This study was conducted for the City of Peterborough to create a high-level review of the potential for on-demand transit to improve the local transit network. The City is currently completing a network planning exercise for its fixed routes and seeks to understand how on-demand can be integrated into the proposed alternatives.

On-demand transit can achieve several goals for transit agencies, including:

- Providing transit in previously underserved areas (transit deserts)
- Enhancing efficiency and value for money
- Improving the customer experience
- Retiring under-performing fixed route services
- Providing first- and last-mile connections to fixed route buses
- Mitigating traffic congestion
- Reducing parking congestion
- Upgrading a paratransit offering

The project team has identified several promising use-cases for on-demand transit in Peterborough:

1. **Launch new on-demand service in high-need areas**: The southeastern area of the city, which includes Coldsprings, Collison Heights, and Technology Drive, can be connected to the downtown area with a one or two vehicle new on-demand area. This service would supplement the existing fixed routes, one of which, Technology Drive, previously ran only during morning and evening peaks. The new service may even be able to fully replace the Technology Drive route, offering the city cost savings while providing a higher quality of service in an area that is challenging to serve with fixed routes.

2. **Replace low ridership routes during off-peak hours:** After 9 PM, many bus routes have low ridership while also operating infrequently. While it is unlikely to be feasible to replace all bus routes, several low ridership routes could be replaced with an on-demand service. Conversion of low ridership routes to an on-demand service during off-peak hours could offer passengers shorter wait times and in-vehicle journey times compared to the fixed routes thereby improving the customer experience and enhancing value for money. Peterborough may also be able to operate with smaller (potentially cheaper) vehicles. This option focuses on improving quality of service for evening passengers.

3. **Upgrade specialized transit technology:** Upgrading the specialized transit service can improve the booking experience for passengers while creating more efficient service that requires fewer vehicles and driver hours. This option could

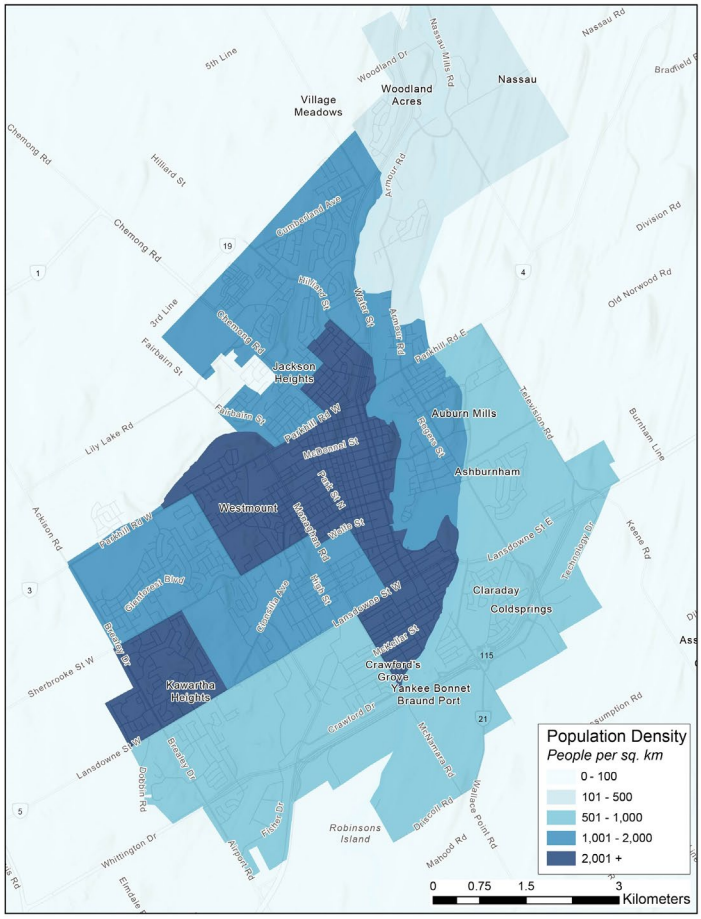
include allowing general trips during specific hours or to specific locations, should additional capacity be available.

2. Existing Conditions Analysis

In order to effectively recommend the best opportunities for on-demand transport in Peterborough, the Via team first conducted an analysis on the existing conditions based on pre-COVID-19 data and the original fixed route network from 2019. The purpose of this step is to visualize travel patterns based on points of interest and population density and compare that to the performance of the fixed-route network both in terms of ridership and productivity of routes.

2.1 Population Density

Population density is highest in downtown Peterborough, as well as areas to the north and west of downtown. The area surrounding Trent University and east of the Otonabee River have a lower population density.

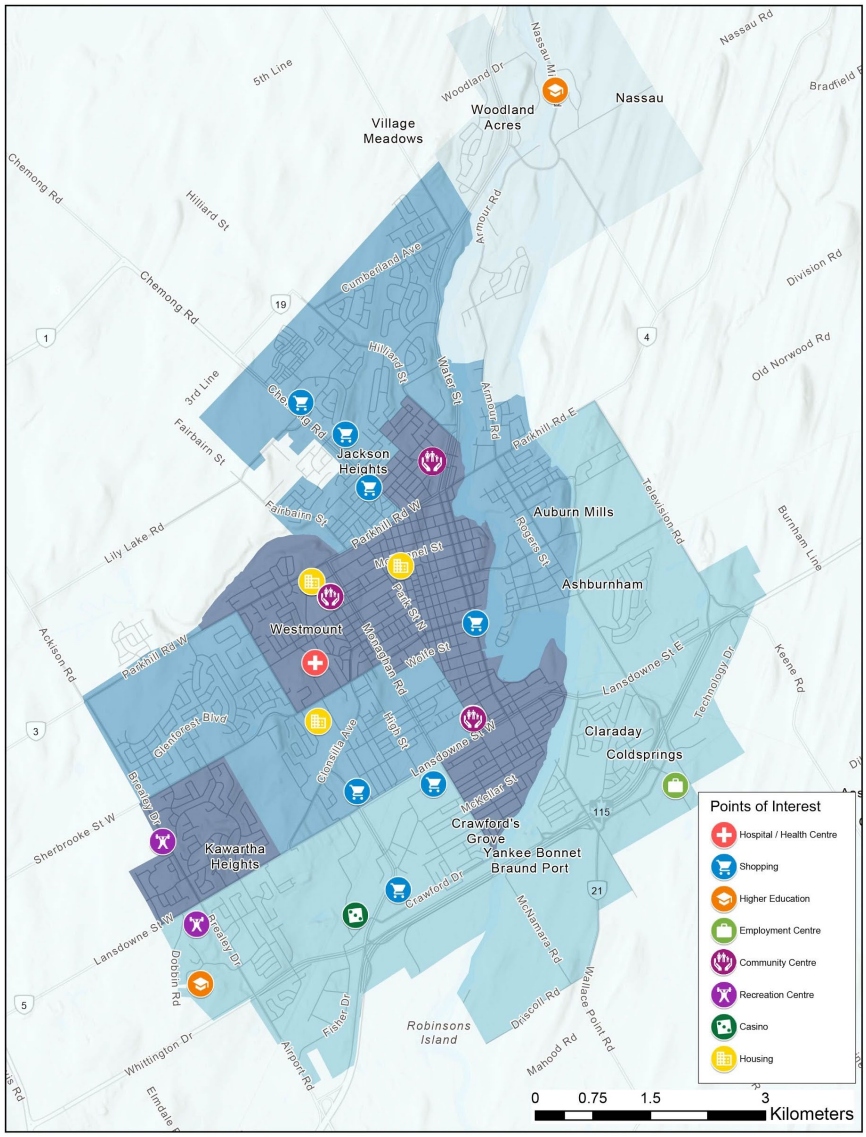


2.2 Points of Interest

Points of interest, including those that are significant generators of public transit demand, are shown on the map below. Locations on this map include:

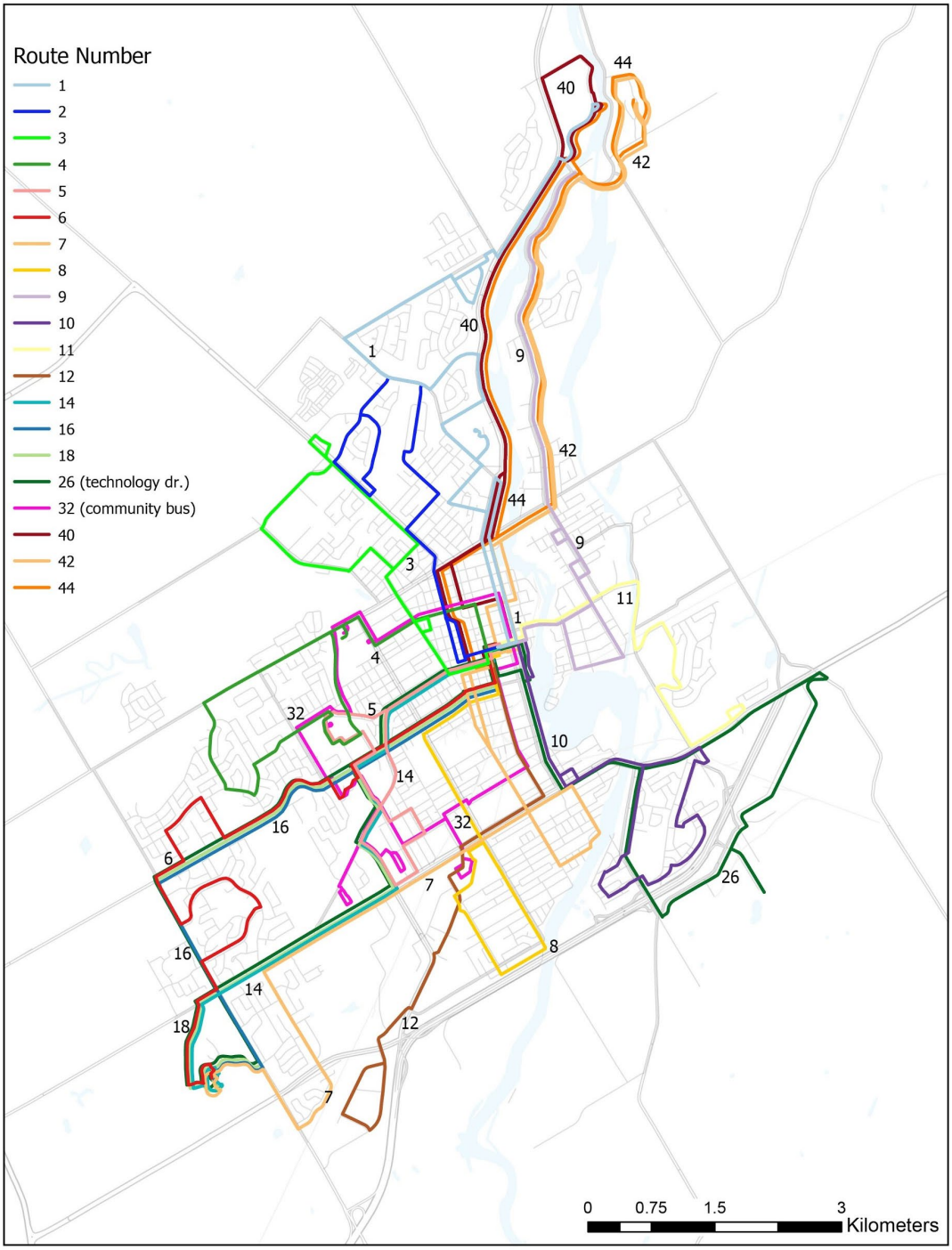
- Balsillie Family YMCA
- Brookdale Plaza
- Chartwell Jackson Creek Retirement Residence
- Costco Wholesale
- Dynacare Laboratory and Health Services Center
- Hedonics Rd. Housing
- Fleming College
- Lansdowne Place
- LifeLabs Medical Laboratory
- Mapleridge Recreation Centre
- The Mount Community Centre
- No Frills
- Peterborough Regional Health Centre

- Portage Mall
- Shorelines Casino
- Sport and Wellness Centre
- Technology Dr.
- Trent University
- Walmart Supercentre



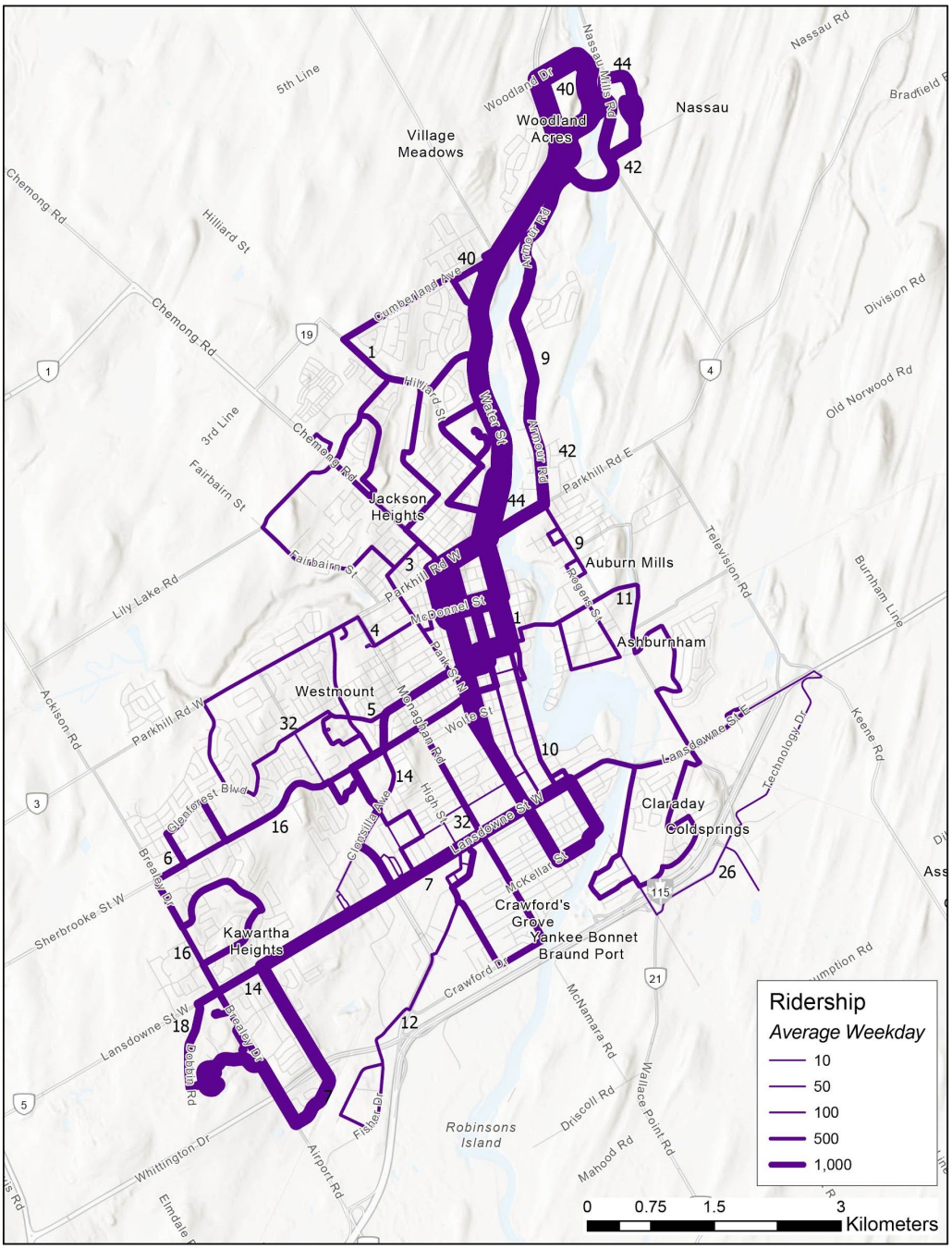
2.3 Existing Fixed-Route Transit

The pre-COVID Peterborough public transit route map is shown below. Most routes terminate at the Downtown Transit Center. Most areas of the city are served by at least one bus route.



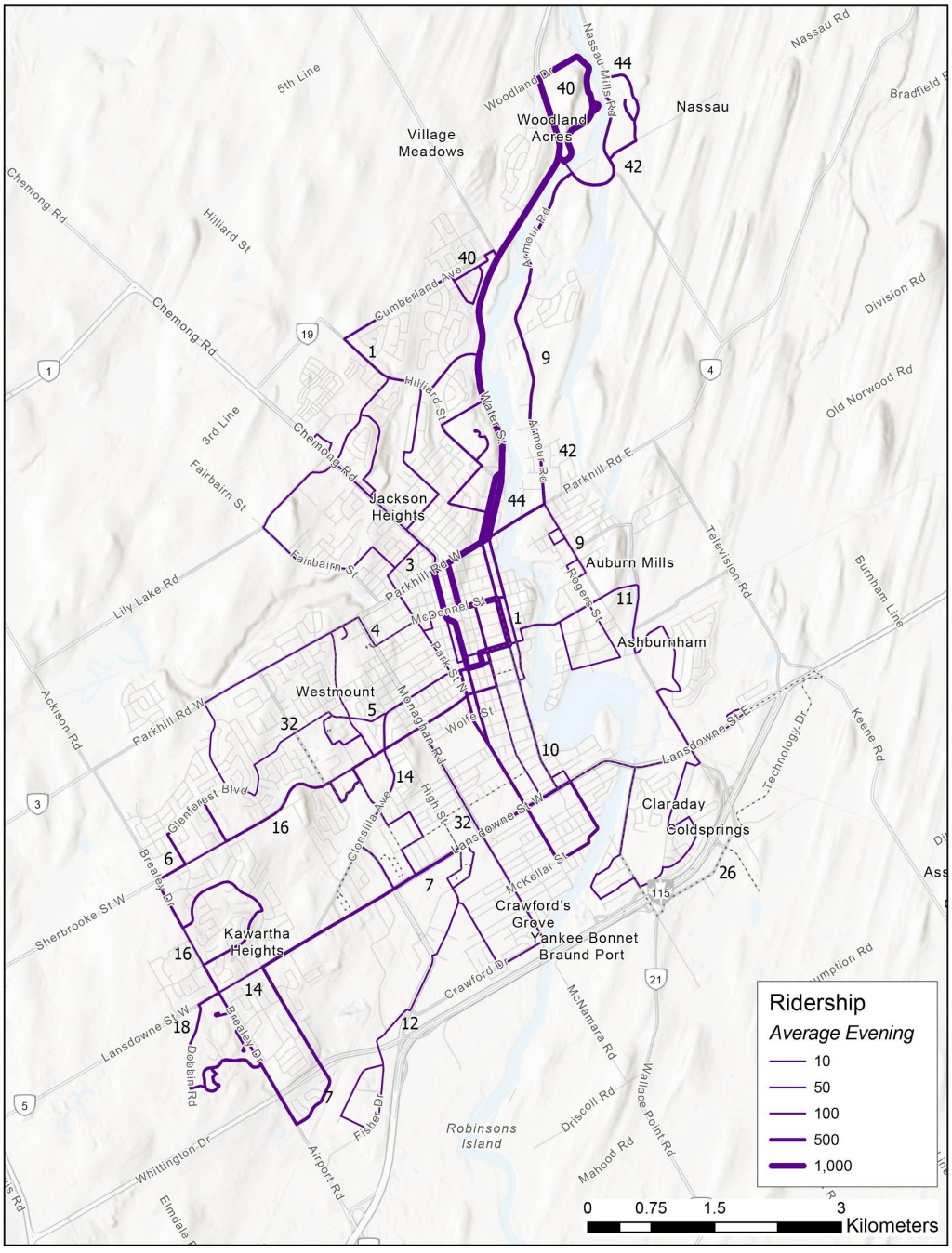
2.4 Weekday Ridership

The highest weekday ridership routes are between Trent University and downtown Peterborough. Route 7 to Fleming University also generates significant ridership, with all other routes transporting significantly fewer passengers.



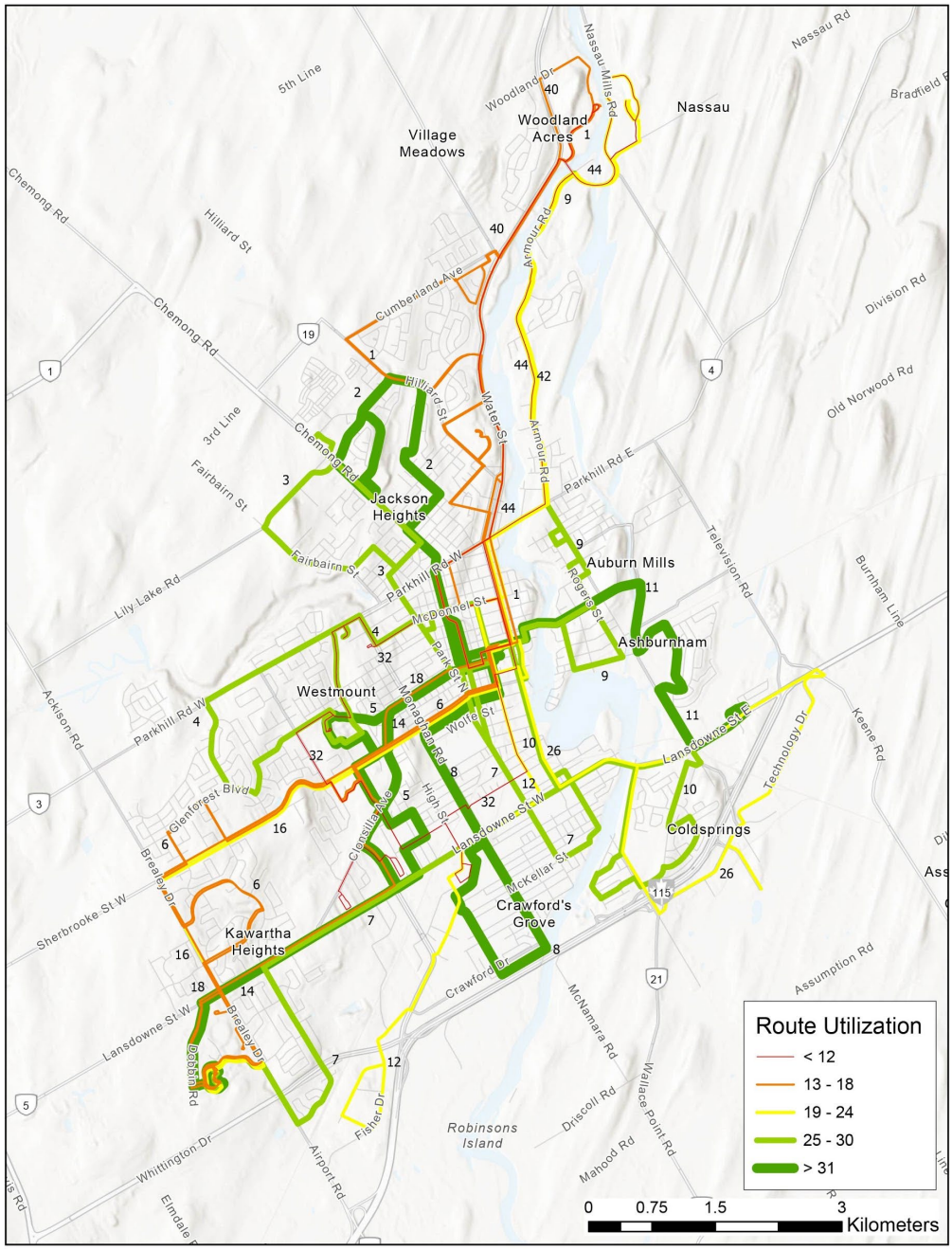
2.5 Weekday Evening Ridership

The highest weekday evening ridership routes are between Trent University and downtown Peterborough. Evening ridership was defined as 8:00 PM to midnight.



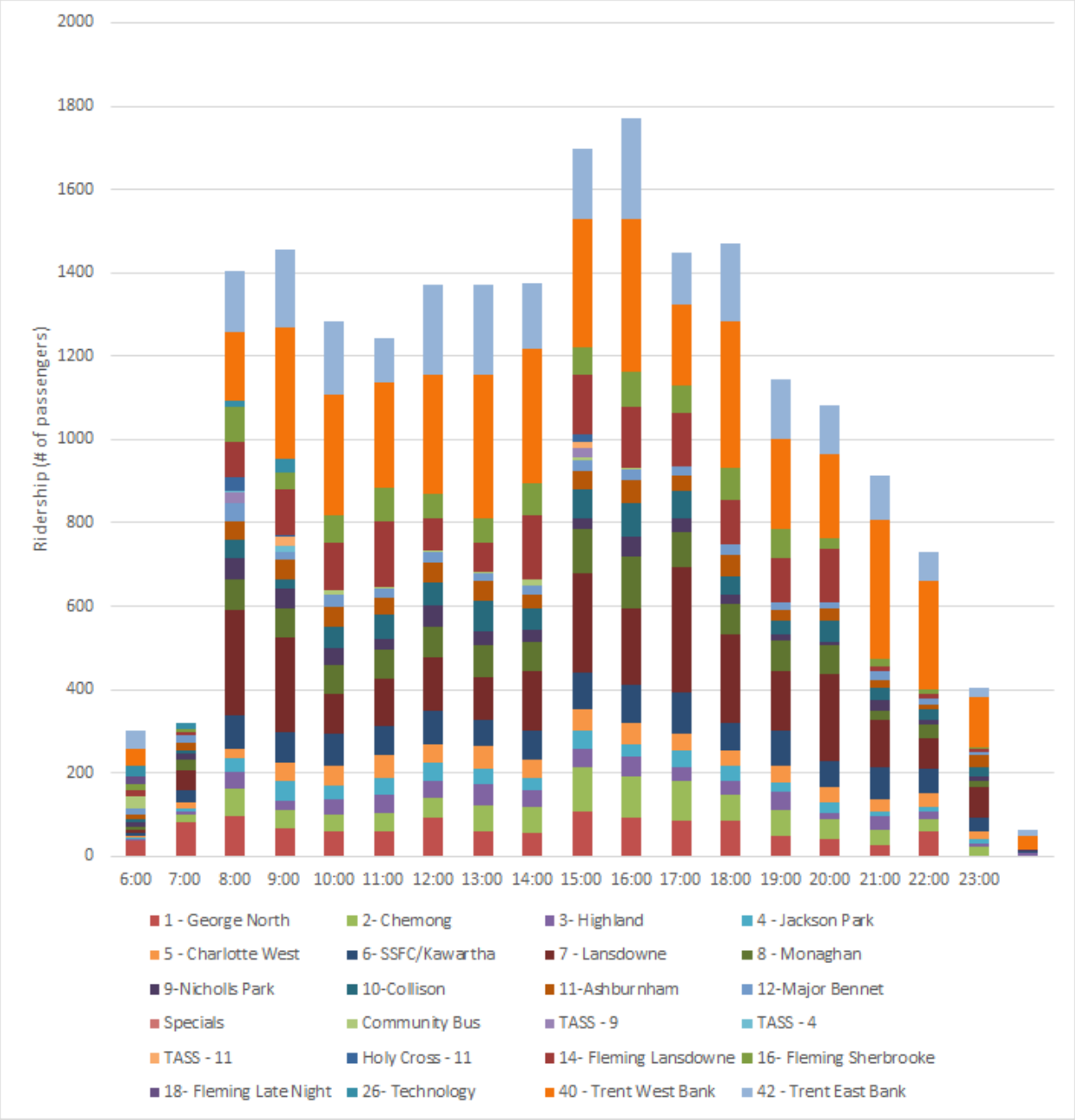
2.6 Route Utilization

The number of passengers per vehicle hour (utilization or productivity) is an indicator of the cost efficiency of each bus route. Generally, Peterborough routes have relatively high utilization, although a few routes, particularly late-night routes, have relatively low utilization (below 12).



2.7 Ridership by Hour

Ridership increases sharply after 8 AM, and remains relatively high until ~8 PM, after which point it steadily drops off. Route 40 (Trent West Bank) has the highest ridership and particularly into the evenings, makes up a significant portion of the entire city's ridership (more than most other routes combined).



3. Bus Network Proposed Changes

Three proposed new route network alternatives have been developed. While the route frequencies have not yet been finalized, each network can be classified based on the pattern of routes and transfer points. The three route networks are:

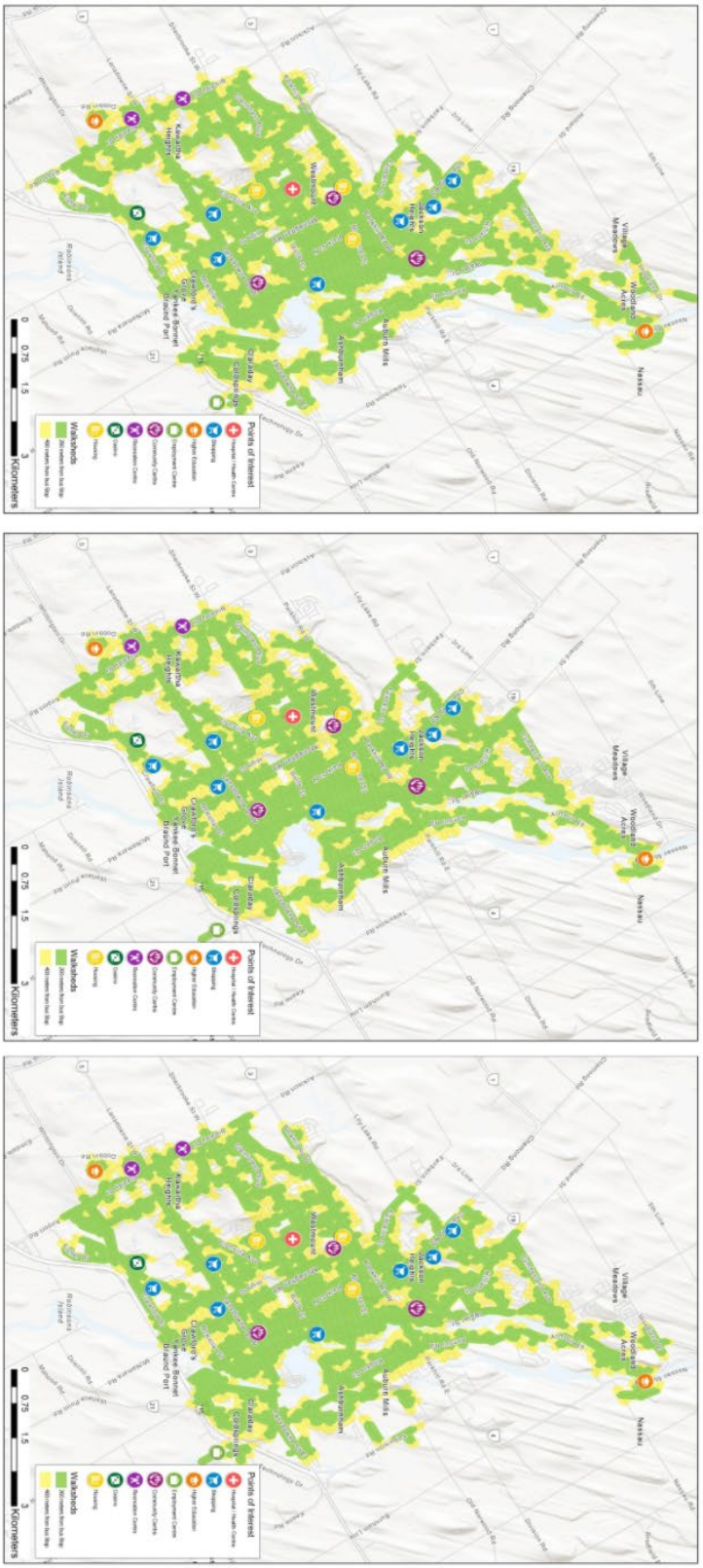
1. Grid
2. Radial
3. Multi-hub

Generally, on-demand transit could work well with all three alternatives. A key factor to consider when integrating fixed-routes and on-demand is ensuring connections are seamless for passengers, with short wait times and limited walking requirements. To ensure passengers are not asked to wait long during their transfer, we recommend on-demand zones that provide a connection to a well-served transit hub or frequent route.

Key considerations for each model are:

- **Grid:** The on-demand service zone should connect to one or more frequent fixed-routes (ideally headways of 15-20 minutes) in order to ensure most passengers have quick transfers and can connect to most destinations with just one transfer.
- **Radial:** The on-demand service should connect to the Downtown Transit Center in a radial model to maximize utility for passengers, as this is where most routes originated.
- **Multi-hub:** The on-demand service should connect to one or more hubs to allow frequency transfers to other locations.

Via examined all three route networks to determine whether there were significant gaps in the access to bus stops. As illustrated in the maps on the following page, all three options provide coverage across the entire city, with almost all areas within the commonly accepted maximum walking distance of 400 meters from a bus stop (yellow shading). The green shaded areas show a higher standard of 200 meters, and much of the city also meets this standard.



Walking accessibility to bus stops for the three fixed-route alternatives (from top to bottom: Grid, Radial, Multi-Hub)

4. Results and Recommendations

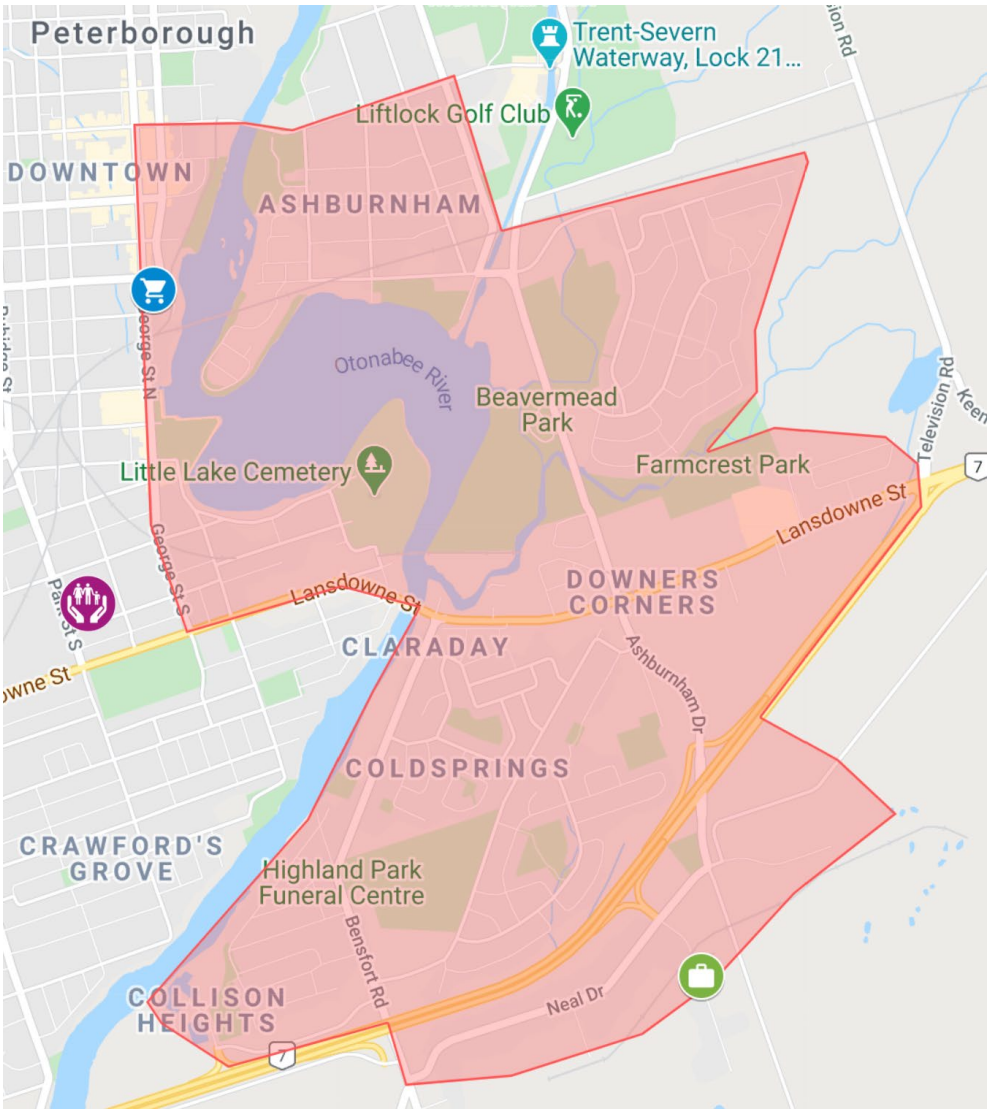
Based on the review of the existing network, proposed network, and Peterborough's goals of improving the customer experience and enhancing value for money, we identified several potential on-demand use cases that may apply in Peterborough. They are:

1. Launch new on-demand service in high-need areas
2. Replace low ridership routes during off-peak hours
3. Upgrade specialized transit technology
4. Large scale or entire network bus route replacement
5. Provide transit in areas without bus service

Each option was analyzed and is discussed in this section.

4.1 Launch new on-demand service in high-need areas

While there are very few areas of Peterborough with no public transit service in walking distance, some parts of the city appear to be underserved and high need. Based on conversations with the Peterborough employees and the network maps, it appears that the Coldsprings, Collison Heights, and Technology Drive area could be a good opportunity for a new on-demand service as they are currently underserved by fixed-route transit. In order to ensure the service is useful to passengers, we believe a connection to a high-frequency transit hub or line is required. In this case, the downtown transfer center appears to be an ideal location.



Proposed on-demand zone in Coldsprings, Collison Heights, and Technology Drive

Benefits:

- Provides a high quality of service in areas that might be otherwise challenging to serve
- Replaces Technology Drive Route which has low ridership

Risks:

- The zone must provide connections to places where people are travelling (e.g., high-frequency bus stops, downtown, or major shopping centers) or demand will be very low.

Via simulated a one and a two-vehicle fleet in this proposed zone, the results are shown below.

Results:

Performance Metrics	One vehicle fleet	Two vehicle fleet
Operating hours	7 AM - 9 PM	
Daily ridership (# passengers per day)	80	200
Annual ridership (# passengers per year)	25,000	60,000
Peak fleet size (# vehicles)	1	2
Wheelchair Accessible Vehicles (WAVs)	1	1
Service hours per year (hours)	5,000	9,000
Average utilization (# passengers per vehicle hour)	5	7
Maximum waiting time (minutes)	30	
Average waiting times (minutes)	10 - 12	
Maximum walking distance (meters)	400	
Average walking distance (meters)	120	
Average trip duration (minutes)	8 - 10	

Discussion:

Via simulated this service with one- and two-vehicle fleets and the results table above indicates the ridership capacity of each fleet option. While predicting demand is inherently uncertain, Via would recommend launching with a two-vehicle fleet if budget allows. This will ensure a high quality of service as ridership grows. Having a high quality of service upon launch also helps to grow ridership more rapidly and build confidence in on-demand services as a new mode of transport.

4.2 Replace low ridership routes during off-peak hours

During low ridership hours such as evenings after 9PM and weekends, several low ridership routes could efficiently be replaced by on-demand transit.

Benefits:

- Potential to reduce the cost of operating service
- Ability to operate smaller vehicles (recommended 10+ seat minimum)
- Shorter waits times during night when passengers are particularly sensitive to waiting
- Can complement other on-demand services that operate during peak hours, allowing the fleet to transition between services

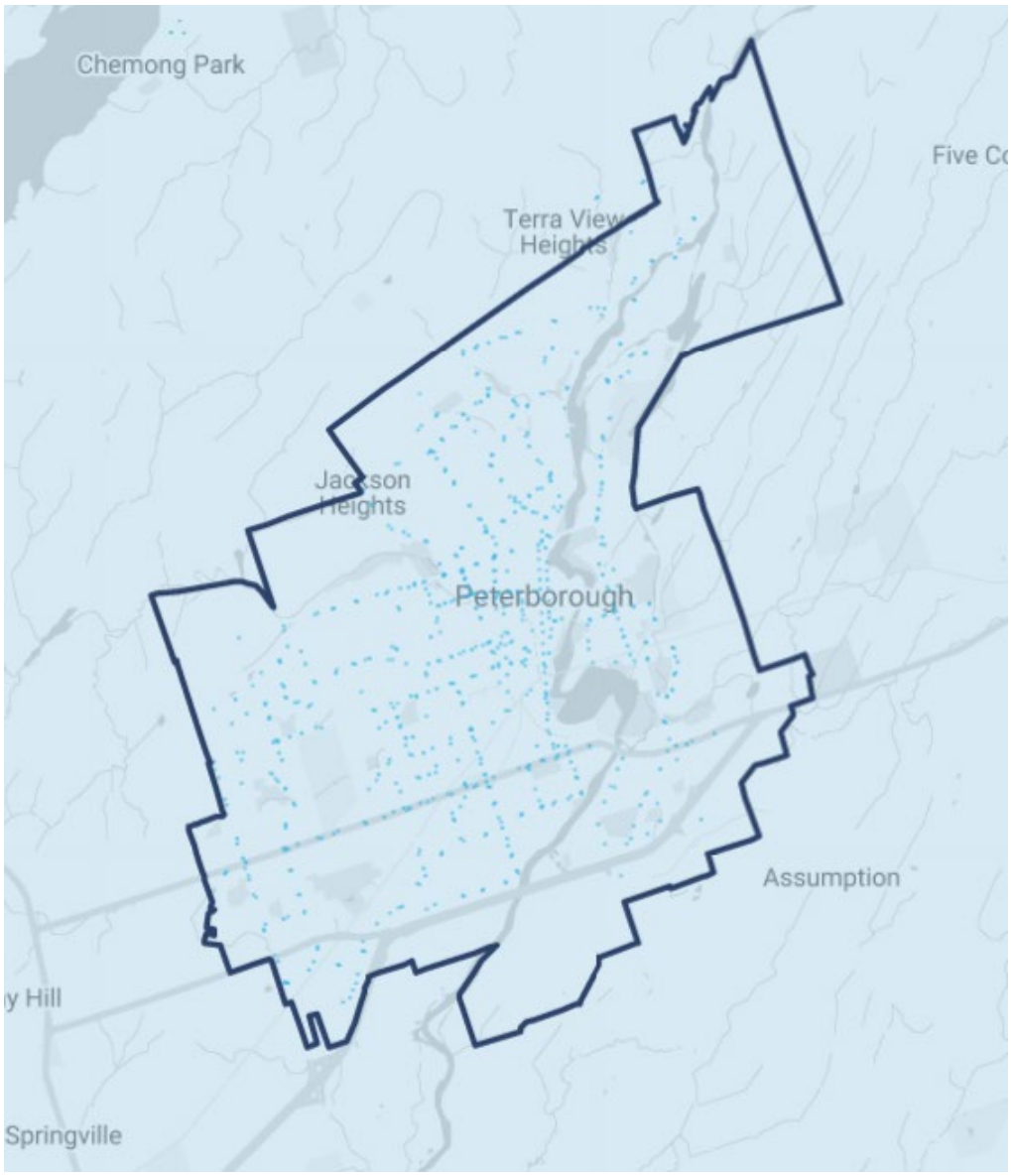
Risks:

- Must ensure passengers are aware of each route's operating hours. This can be mitigated with a strong public engagement process and a multimodal trip planning app that directs passengers to the appropriate mode where relevant.

For these simulations, Via assumed the Routes 2, 6, and 7 in the grid route alternative will continue to operate. These routes would capture ~80% of estimated ridership, or up to 1,200 of the ~1,500 weekday trips across the network.[1] The remaining ~300 trips would be assigned to the on-demand network. A maximum of seven vehicles would be available for this service, with the other 11 allocated to operating the remaining three routes on ~30-minute headways.

To maximize the efficiency of the service, this model was simulated using the existing bus stops only. A map of the existing stops is shown below (blue dots are stops).

[1] Assumes passengers using the existing Routes 1, 6, 7, 9 10, 11, 14, 16, 18, 40, 44, 42 take the three remaining fixed-routes.



Results:

Performance Metrics	
Operating hours	9 PM - 12 AM
Daily ridership (# passengers per day)	300
Annual ridership (# passengers per year)	75,000
Peak fleet size (# vehicles)	7

Wheelchair Accessible Vehicles (WAVs)	2
Service hours per year (hours)	7,700
Average utilization (# passengers per vehicle hour)	10
Service Quality	
Maximum waiting time (minutes)	40
Average waiting times (minutes)	20
Maximum walking distance (meters)	400
Average walking distance (meters)	200
Average trip duration (minutes)	15

Discussion:

Via recommends that all seven vehicles are used to provide this service. For most passengers, we believe this will offer shorter wait times and significantly shorter trip durations, especially for those who would previously be required to transfer between routes.

4.3 Upgrade specialized transit technology

Via simulated the existing specialized transit service in Peterborough and believes there is a significant opportunity for a more efficient routing and booking platform to reduce cost and improve customer satisfaction.

Benefits:

- By increasing the utilization/productivity of the service, more trips can be completed with fewer vehicles, resulting in lower specialized transit operating costs
- Additional capacity would also be freed up which will enable specialized transit vehicles to be shared for conventional service delivery (for example, commingling conventional and specialized customers in areas and at times when it makes sense to do so)
- Ideally, the new specialized transit platform will offer an improved booking process including a smartphone application for passengers and potentially the ability to book on-demand trips rather than requiring them to be pre-scheduled

Risks:

- By improving the service, there is a risk that it will generate additional demand as eligible passengers move from other modes to improved specialized transit

Results:

Via simulated specialized transit ridership from November 11, 2019. A comparison between the existing service and the Via simulation are shown below:

Performance Metrics	Existing service	Via simulation
Travel demand data	Real origin + destination data	
Negotiated trip window	-	+/- 15 minutes
Ridership (# passengers on 11/27)	173	173
Peak fleet size (# vehicles)	9	7
Vehicle hours (# hours on 11/27)	~80	~60
Utilization (passengers per vehicle hour)	~2.2	~2.8

Discussion:

Via simulations identified a significant opportunity to improve the utilization and therefore reduce the cost per passenger for the specialized transit service. To realize these improvements, Via recommends using a competitive procurement process to identify providers who can deliver improved performance. It may also be possible to achieve higher utilization with the existing provider, and these simulations may be a useful prompt for these discussions.

4.4 Large scale or entire network bus route replacement

A large scale or entire network replacement in Peterborough would be difficult within the existing budget. The existing route network in Peterborough completes approximately 25 trips per vehicle hour, while an on-demand service would likely complete between 5-15 trips per vehicle hour depending on the parameters chosen, meaning costs are likely to increase as more vehicles would be required. It is possible that a service like this could be operated at a significantly lower cost per vehicle hour, particularly if smaller vehicles are used. However, as this option does not appear to be feasible in the short term, it was not investigated in detail. This option should be investigated in the future,

ideally after on-demand transit has already been proven in one of the other use-cases described above.

Another option is to convert one or all of the community buses to an on-demand zone covering these existing routes. Although current ridership and productivity data for the community buses are limited, these circuitous routes could be replaced with an on-demand service to provide significantly shorter trip durations and minimize walking for passengers. Any conversion of Peterborough's community bus services should be carefully managed though to ensure all existing passengers understand the proposed change and the benefits it will provide. In addition, there is a risk that conversion of the community bus routes could attract riders from other routes onto the community bus. Successful conversion of one or more community bus routes to on-demand will likely require that pickup and dropoff points be limited to key locations and eligibility requirements be implemented to ensure that the community bus is not overwhelmed with new ridership.

4.5 Provide transit in areas without bus service

As illustrated in Section 3. Proposed Route Network Changes, all potential route networks provide good coverage across the entire city. While some small pockets of the city may be 400 meters or further from a bus stop, there appears to be limited opportunity or need to launch on-demand service in areas without bus stops, as these areas typically are not populated.

4.6 Summary

The following table summarizes the on-demand options and how each helps achieve Peterborough's goals:

Options	Improves customer experience?	Enhances value for money?
1. Launch new on-demand service in high-need areas	✔	✔
2. Replace low ridership routes during off-peak hours	✔	✔
3. Upgrade specialized transit technology	✔	✔
4. Large scale or entire network bus route replacement	✔	

5. Provide transit in areas without bus service	✔	

5. Accessibility

Any proposed on-demand transit system must support the needs of all passengers, providing a fully accessible transit network. We have taken special care to ensure that Via-powered services are accessible to everyone, including passengers with disabilities and passengers without smartphones or credit cards. The following recommendations should be considered:

- **For customers with limited mobility:** The service should include at least 20% wheelchair-accessible vehicles (WAV), which our detailed analysis and simulations indicate will provide equivalent quality of service for all passengers requiring a WAV. The software platform should also remember a passenger's need for a WAV, and ensure that a WAV request is the default for future bookings. When a new ride request is received, the system will only assign passengers to vehicles with an available wheelchair position.

- **For customers with hearing, vision or cognitive impairments:** Either directly through the app, or through notifying the customer service agent at the time of booking, passengers should be able to indicate their disability status. This information can be used to modify the service to better adapt for their needs, whether it's through enabling point-to-point pick-up and drop offs, concessionary pricing, or notification to the driver to provide additional assistance.

- **For customers without smartphones:** In addition to the smartphone app for booking trips, a web portal and phone booking option should be provided for passengers without smartphones or for those who are unable or choose not to use an app. Using our back-end tools, administrators should be able to easily book on-demand rides on behalf of customers who phone in. For customers, booking a trip outside the home, without smartphones or internet access, Via recommends setting-up low-cost kiosks at central locations, such as the downtown transit center, where passengers can request rides. Finally, Via recommends partnering with community organizations to train workers on how to book trips on behalf of passengers.

- **For customers without credit cards:** Unbanked or underbanked passengers should be able to pay for services with several different options: digital vouchers (purchased in cash at community centers, transit hubs, or other key locations), prepaid debit cards, and - to the extent feasible - cash onboard the vehicle.

6. Community Engagement

Our ability to move conveniently and affordably between our homes, work, school, childcare, and healthcare determines our ability to thrive. The transportation systems that enable this movement play such a crucial role in our everyday lives, that any changes to these systems — even positive ones — can naturally be a source of apprehension.

Service changes can be particularly fear-inducing for our most vulnerable populations, for whom public transit serves as a vital lifeline with no easy replacement. These fears are only exacerbated when there's a lack of information (or misinformation) as to what this new form of public transit really means for the community. Concerns about cost, access for those with accessibility needs and/or lack technology, service coverage, and more, routinely create opposition to projects before they even get off the ground.

Taking a high-touch and proactive approach to community engagement can not only help to mitigate concerns, but can actively turn those in the community who could potentially be your biggest opponents into your biggest advocates. Support from the community at-large is essential, both to ensure a smooth launch but also to set the scene for the continued success, funding, and growth of the service. Community Engagement should be a critical component of every stage of the project — from planning, to implementation and beyond.

6.1 Consulting and planning

Community engagement should begin as early as possible to allow for the maximum time to incorporate feedback from key stakeholders into the final service design and ensure the community's needs are being met. Starting community engagement early in the process also allows ample time to preempt passenger and stakeholder concerns through thorough education about the service offerings.

To start this process:

1. Map out any subcommunities of passengers that may be highly sensitive to changing dynamics or might require a higher-touch approach in order to drive adoption of the new service. Examples of communities to keep in mind:

Higher Barriers To Entry	Sensitive to Changing Dynamics
Seniors	Unions (driver unions, call center unions, etc)

Unbanked/Cash preferred passengers	Advocacy Groups
Passengers with accessibility needs	Elected Officials (City Council, Mayor)
Passengers without access to smartphones	Civic and business leaders
Homeless populations	Major local employers
Non-native English speakers	

Once you've mapped out these key stakeholders, there may be several steps you can take as part of your service design process to preempt their concerns. For example, if accessibility is an expected concern, plan to include a number of wheelchair-accessible vehicles in your fleet and consider including accessibility features in your service, such as enabling point-to-point trips for mobility-impaired passengers.

2. Develop materials that engage with the dialogue around the new service by proactively addressing likely questions. These materials can include pamphlets, mailers, videos, or physical or digital advertisements. The materials should explain the mechanics of the service, how passengers will book, proposed service zone, and proposed cost. Be sure to address how passengers in high-barrier groups will be able to access the service such as including information around phone booking, voucher payment, and accessibility features. You can also leverage call-out questions in these materials, as well as surveys and focus groups to involve the community in the planning process. Solicit feedback on key open questions that can help to shape the fine details of a service — like the precise service zone.

3. Plan to speak with advocacy groups, elected officials, civic and business leaders, and major local employers as part of your broader community outreach. With unions, it's important to map out any contractual disclosure and grievance processes. We strongly recommend maintaining open and transparent dialogue with union representatives and getting them involved as early as possible. Where feasible, incorporate their feedback into service considerations. For example, if drivers are concerned about cannibalization of existing fixed route services, consider including multimodal offerings in your app to drive first-and-last mile connections.

6.2 Launching your service

Now that it's time to start getting riders ready for day 1, you can build off of the work that you already started. Leverage the groups you've already established relationships with to help distribute key information about the service, and build a list of other organizations that can be helpful in getting the word out.

These can include:

- Libraries
- Health centers
- Care facilities
- Civic groups
- Social services

Along the way, be sure to ask organizations to use their connections to quickly expand your reach. A simple "Who's missing?" often helps to open up the conversation and find other key allies that can help get the word out. At this stage, you can:

- Work with these groups to understand which service offerings are most impactful to their unique membership.
- Offer to conduct training sessions or create training videos for staff of these organizations to get them up to speed, as they often serve as the first line of assistance for vulnerable passengers and can provide an extra layer of on-the-ground assistance.
- Make it simple for these groups to amplify your message. Organizing materials into a "digital packet" for quick access to all multi-channel marketing assets is a highly effective way to make sure these organizations can easily and effectively disseminate service information.

In projects where there is a cohort of existing users that are transitioning from a legacy service, taking an individual approach to engagement can be particularly effective.

- Where existing data allows, build a list of users and offer to do one-on-one phone calls to help get them set up, ready to ride, and alleviate any concerns they may have. This will be their first interaction with the service, and can impact how much they promote the service to their peers, so it's important to keep the communication open and keep a detailed record of their feedback, both positive and negative.

- Where data isn't available, begin to post information about the service change as early as possible and in as many places as possible (existing bus stops, on local websites and Facebook groups, etc.) Create an email address, feedback form, or

phone line where concerned passengers can call for more information and to get help setting up their new account.

The primary goal for this phase should be to have as many legacy passengers as possible set up with a new account before day one of operations to ensure that no one is left behind.

6.3 Ridership Transition

Even the most carefully designed service can fail if passengers of discontinued fixed route services are either unaware of newly-available on-demand options -- or worse, assume they will be excluded from them. Via takes outreach seriously in all of our services, but particularly in those which we transition from existing fixed routes. We understand that many passengers fear that if they don't have a smartphone, don't have a bank account, or live with a disability, public microtransit services will not serve them.

Great care must be taken to ensure that all services are accessible, and to communicate that accessibility to the passengers who are often most difficult to reach. We recommend a community-based approach that emphasizes in-person outreach, community information sessions, physical signage and flyers, direct mail, and video content. With proper outreach, we believe that existing transit ridership can be rapidly and successfully transitioned to on-demand alternatives and can even become it's biggest advocates.

Overall, effective community engagement is critical to the success of a service, facilitating not only ridership growth but equity of access, and in managing the complex addition of on-demand to the local transit network.

6.4 Supporting an ongoing project

Once the new service is live, it's time to leverage the great rapport you've built with the community to drive growth and continuous improvement.

1. A few weeks after launch, hold a post-mortem with the organizations and passengers you've worked with to check in on how things are going. Analyze this feedback to adjust service design or marketing and outreach materials if it's needed. Engaging in regular dialogue with the community can help preempt small issues and prevent them from turning into big ones, understand public sentiment regarding the service, and prioritize new improvements and initiatives.

2. Equally as important is continuing to keep advocacy groups and elected officials informed of the success and progress of the service. Share key performance

metrics to help drive support for eventual budget and contract renewal or expansion. The most effective materials are those that are tailored to the specific interests of each group, so consider breaking out ridership information by the voting district of a particular official, or by demographic data of a particular community an advocacy group works with. The best materials for these ongoing efforts include 2 pagers, presentations to city council, and video testimonials.

As you look towards renewal and potential expansion, consider other local stakeholders who may be strong candidates to invest in the service. Civic associations, business groups, major employers and local colleges and universities in nearby areas might consider buying into the service to help fund expansion, or utilizing the service for their own advertising.

A thoughtful and proactive approach to community engagement is well worth the effort to ensure your service meets the needs of the public, garners broad and vocal support, and even finds new avenues for funding. And, while the work is never truly over, laying a solid foundation with a comprehensive community engagement plan is always an important step in building transit services that last for years to come.

Appendix D - Customer Trip Travel Comparison - Weekday AM Rush Period

Note - Includes walk times. Does not include Community Bus Routes

Summary	Transfers	Direct	Faster
Radial	68	27	33
Grid	37	59	57

From	To ->	Downtown Terminal		Trent University		Fleming College		Peterborough Hospital		Lansdowne Place		Walmart Chemong		Willowcreek Plaza		Costco		Transfers	Direct	Faster
		Route	Time	Route	Time	Route	Time	Route	Time	Route	Time	Route	Time	Route	Time	Route	Time			
Bensfort at Collison	Old	10	20 mins	10 + 40	40 mins	10 + 7	40 mins	10 + 5	35 mins	10 + 7	23 mins	10 + 2	40 mins	10 + 11	40 mins	10 + 12	35 mins	7	1	3
	New	7 + 2	21 mins	7	42 mins	7	24 mins	7 + 8	31 mins	7	15 mins	7 + 2	31 mins	7	12 mins	7 + 5	43 mins	4	4	5
Walker at Bramble	Old	11	15 mins	11 + 42	25 mins	11 + 16	45 mins	11 + 5	30 mins	11 + 12	28 mins	11 + 2	35 mins	11	10 mins	11 + 12	30 mins	6	1	7
	New	7 + 4	36 mins	7	26 mins	7	41 mins	7 + 4	48 mins	7	32 mins	7 + 2	48 mins	7	11 mins	7 + 5	59 mins	4	4	1
Monaghan at McKellar	Old	8	25 mins	8 + 40	45 mins	8 + 7	40 mins	8 + 5	45 mins	8	10 mins	8 + 2	45 mins	8 + 11	45 mins	8 + 5	20 mins	6	2	0
	New	2	16 mins	8	39 mins	8	19 mins	8	15 mins	2	8 mins	2	26 mins	8 + 7	33 mins	8	8 mins	1	7	8
Parkhill at Monaghan	Radial	4	15 mins	4 + 40	35 mins	4 + 16	45 mins	4	10 mins	4 + 12	23 mins	4 + 2	35 mins	4 + 11	35 mins	4 + 12	30 mins	6	2	1
	Grid	9 + 6	14 mins	8	21 mins	9	26 mins	8	8 mins	8	15 mins	9 + 2	26 mins	9 + 7	49 mins	8	22 mins	3	5	7
Hunter at Rogers	Radial	11	10 mins	42	15 mins	11 + 16	40 mins	11 + 5	25 mins	11 + 12	23 mins	11 + 2	30 mins	11	15 mins	11 + 12	25 mins	5	3	4
	Grid	4	6 mins	7	18 mins	7	44 mins	4	18 mins	7	35 mins	4 + 2	38 mins	7	14 mins	4 + 5	25 mins	2	6	3
Armour at Francis Stewart	Radial	9	15 mins	42	10 mins	42 + 16	40 mins	42 + 5	30 mins	42 + 12	28 mins	42 + 2	35 mins	42 + 11	25 mins	42 + 12	30 mins	6	2	4
	Grid	7 + 4	28 mins	7	13 mins	9	34 mins	9 + 8	19 mins	7	44 mins	9 + 2	21 mins	7	23 mins	9 + 8	33 mins	4	4	4
Goodfellow at Talwood	Radial	6	15 mins	6 + 40	35 mins	6	30 mins	6 + 5	30 mins	5 + 7	33 mins	6 + 2	35 mins	5 + 11	35 mins	6 + 12	30 mins	6	2	1
	Grid	5	8 mins	6	34 mins	5	24 mins	5 + 8	15 mins	5 + 8	22 mins	6 + 2	26 mins	5 + 7	39 mins	5	8 mins	4	4	7
Ravenwood at Glenforest	Radial	4	25 mins	4 + 40	45 mins	6	23 mins	4	5 mins	4 + 12	35 mins	4 + 2	45 mins	4 + 11	45 mins	4 + 12	40 mins	5	3	5
	Grid	4	26 mins	9	29 mins	9	17 mins	4	16 mins	9 + 7	40 mins	9 + 2	32 mins	9 + 7	57 mins	9 + 5	50 mins	4	4	3
Spillsbury at Airport	Radial	7	35 mins	7 + 40	55 mins	7	7 mins	7 + 5	50 mins	7	14 mins	7 + 2	55 mins	7 + 11	55 mins	7 + 5	30 mins	5	3	1
	Grid	5	22 mins	8	46 mins	5	7 mins	8	23 mins	8	14 mins	5 + 2	62 mins	8 + 7	53 mins	5	10 mins	2	6	5
Towerhill at Hilliard	Radial	2	15 mins	1	15 mins	2 + 16	45 mins	2 + 5	30 mins	2 + 12	28 mins	2	5 mins	2 + 11	35 mins	2 + 12	31 mins	5	3	3
	Grid	2	19 mins	2	13 mins	8	42 mins	8	17 mins	8	24 mins	2	7 mins	2 + 7	51 mins	8	31 mins	1	7	4
Reid at McDonnel	Radial	2	7 mins	2 + 40	27 mins	2 + 16	37 mins	4	15 mins	2 + 12	20 mins	2	15 mins	2 + 11	27 mins	2 + 12	22 mins	5	3	3
	Grid	4	7 mins	2	19 mins	2 + 6	36 mins	4	11 mins	2	25 mins	2	8 mins	2 + 7	41 mins	2 + 5	40 mins	3	5	4
Brealey at Cherryhill	Radial	16	25 mins	16 + 40	45 mins	16	8 mins	16 + 5	40 mins	16 + 7	40 mins	16 + 2	45 mins	16 + 11	45 mins	16 + 12	42 mins	6	2	1
	Grid	6	18 mins	6	37 mins	6	8 mins	6 + 8	28 mins	6 + 7	31 mins	6 + 5	28 mins	6 + 7	48 mins	6 + 5	39 mins	5	3	6