P.O. Box 1749
Halifax, Nova Scotia
B3J 3A5 Canada

Item No. 9.1.7
Halifax Regional Council
May 26, 2020

TO: Mayor Savage and Members of Halifax Regional Council

SUBMITTED BY: Original Signed by
Jacques Dubé, Chief Administrative Officer

DATE: May 6, 2020

SUBJECT: **Strategic Transit Projects – Rapid Transit Strategy and Electric Buses**

ORIGIN

The *Integrated Mobility Plan* (IMP), approved by Regional Council in December 2017, included multiple actions aimed at investigating options for both increasing modal split, and reducing overall emissions, including higher order modes of transit such as Bus Rapid Transit (BRT) and additional ferry service, and the use of sustainable fuel.

Further, this report also originates in part from the following motion passed at the March 26, 2018 meeting of the Transportation Standing Committee:

> *"That the Transportation Standing Committee request a staff report asking Halifax Transit for a 10-year plan in response to the criteria of the Federal Public Transit Infrastructure Fund."*

LEGISLATIVE AUTHORITY

Halifax Regional Municipality Charter, R.S.N,S. 2008, subsection 69(1) enables the Municipality to provide a public transportation service.

Halifax Regional Municipality Charter, subsection 318(2): "In so far as is consistent with their use by the public, the Council has full control over the streets in the Municipality."

Halifax Regional Municipality Charter, subsection 322(1): "The Council may design, lay out, open, expand, construct, maintain, improve, alter, repair, light, water, clean, and clear streets in the Municipality."

RECOMMENDATION

It is recommended that Halifax Regional Council:

1. Suspend the rules of procedure under Schedule 3, the Community Planning and Economic Development Standing Committee Terms of Reference, and under Schedule 7, the Transportation Standing Committee Terms of Reference, of Administrative Order One, the Procedures of the Council Administrative Order.

RECOMMENDATION CONT'D ON PAGE 2…

2. Approve the Rapid Transit Strategy described in this report and direct the CAO to:

    a. develop an implementation plan including resourcing, functional planning, land acquisition strategy, and long-term capital planning, subject to securing external funding; and
    b. consider the application of mechanisms that preserve opportunities to accommodate transit infrastructure within the public right-of-way (e.g. transportation reserves, increased front yard setbacks), in the ongoing review of the Regional Municipal Planning Strategy and other planning documents as applicable;

3. Approve the Electric Bus Proposal described in this report and direct the CAO to commence with the acquisition of low carbon emission public transit buses, subject to securing external funding;

4. Direct the CAO to submit both the Rapid Transit Strategy and Electric Bus Proposal for funding through the Federal Government's Public Transit Infrastructure Fund and the Green Infrastructure Fund, as well as any additional stimulus funding streams that may become available.

5. Authorize the Mayor to send a letter of support for both the Rapid Transit Strategy and Electric Bus Proposal to the Province of Nova Scotia to stimulate discussion regarding the benefits and potential funding for these projects.

BACKGROUND

Through the Investing in Canada Infrastructure Program (ICIP), the Government of Canada has a plan to invest more than $180 billion over 12 years in infrastructure projects that will help them achieve sustainability goals under the Paris Agreement and Pan-Canadian Framework on Climate Change. In the first phase of funding in 2016, HRM received $40 million in federal and provincial funding through the Clean Water and Wastewater Fund and $31 million in federal funding under the Public Transit Infrastructure Fund (PTIF). For Phase 1 of the program, the cost share for transit funding was 50% federal and 50% municipal.

The second phase of the ICIP is underway, and in April 2018, Canada and Nova Scotia signed a bilateral agreement establishing the terms of the funding. Similar to the first phase, there are specific funding streams with designated funding and eligibility criteria. These include a Public Transit Infrastructure Fund (PTIF) stream, and a Green Infrastructure stream, which includes a Climate Change Mitigation substream.

On January 29, 2019, Regional Council declared a climate emergency emphasising that climate change is a serious and urgent threat to our community. This declaration aligns with work to develop a long-term, Municipal climate action plan, HalifACT 2050: Acting on Climate Together. The plan aligns with the special report released in October of 2018 by the Intergovernmental Panel on Climate Change which stresses the need to limit global warming to 1.5°C above pre-industrial levels within the next 12 years to prevent irreversible economic, environmental and social impacts.[1] To meet this target, HalifACT 2050 will outline equitable policies and programs pertaining to all sectors, including transportation, in an effort to reduce emissions, diversify energy sources, and demonstrate local government leadership.

The *Integrated Mobility Plan (IMP)*, approved by Regional Council in December 2017, included multiple actions aimed at investigating options for both increasing transit mode share, and reducing overall emissions, including higher order modes of transit such as Bus Rapid Transit (BRT) and additional ferry service. The applicable actions are summarized in Attachment A.

This report details two significant projects, the Rapid Transit Strategy, and the Electric Bus Proposal, that are potential candidates for ICIP funding.

[1] Intergovernmental Panel on Climate Change "Summary for Urban Policy Makers" https://www.ipcc.ch/site/assets/uploads/sites/2/2018/12/SPM-for-cities.pdf

DISCUSSION

Opportunities for Funding

Both of the projects being presented, the Rapid Transit Strategy, and the Electric Bus Proposal, represent larger capital investments than any previous single investment the Municipality has made in public transit. Either project will only be possible by partnering with other levels of government for funding. Given the role that either can play in reducing greenhouse gas emissions in the transportation sector, they are well positioned to receive support from other levels of government, as they align with key provincial and federal priorities aimed at tackling climate change and supporting public transit.

The bilateral agreement signed between Canada and Nova Scotia in 2018 established two funding streams that are relevant, the Green Infrastructure stream, and the Public Transit Infrastructure Fund (PTIF) stream.

Under the Green Infrastructure stream, the most appropriate stream for public transit/sustainable fuel projects is the Climate Change Mitigation substream. The federal portion of this substream for Nova Scotia is $171.8 million. Projects submitted under this stream require a greenhouse gas emissions assessment with a cost-per-tonne calculation. Large projects also require a climate change resilience assessment.

Under the PTIF stream, $289,589,324 of federal funding was originally earmarked for Nova Scotia. The PTIF funding is meant to be distributed based on ridership. Therefore, in Nova Scotia, it was anticipated that HRM would receive 96.4% of the funding envelope. In 2019, there was a reallocation of some funds from the public stream to the Green Infrastructure stream, shifting the federal amount available to HRM to $223 million.

The terms of the funding for both streams are:

- Limits the federal contribution to 40% of eligible expenditures for most projects;
- Allows for a limited number of rehabilitation projects (15%) that can receive up to 50% of funding; and
- Unlike Phase 1 funding (50% federal, 50% municipal), Phase 2 funding requires at least a 33.33% contribution from the province.

Projects under the Climate Change Mitigation substream must meet one of the following outcomes:

- Increased capacity to manage more renewable energy
- Increased access to clean energy transportation
- Increased energy efficiency of buildings
- Increased generation of clean energy

Projects under the public transit stream must meet at least one of the following outcomes:

- Improved capacity of public transit infrastructure
- Improved quality and/or safety of existing or future transit systems
- Improved access to a public transit system

On July 18, 2019, the federal, provincial and municipal governments announced an agreement in the amount of $25 million to implement Halifax's All Ages and Abilities (AAA) bike network (Action 72 in the *IMP*) focusing on the Regional Centre. This project was funded under the PTIF stream, and the federal and provincial funding allocations will cover 83.33% of this total project cost.

The remaining potential federal funding in the PTIF stream earmarked for Halifax is $210.5 million, which is intended to be matched by approximately $175.4 million in provincial funding, and approximately $140.4

million in municipal funding. Should all available PTIF funding be utilized, this would result in approximately $526.3 million of investment in public transit in Halifax over the next several years.

It is estimated that less than half of the available funding under the Green Infrastructure funding stream has been allocated to date. Although the terms of the two funding streams seem well defined, it is possible that in light of the COVID-19 pandemic, modifications are made to advance projects that stimulate the economy, which could include modifying the contribution rates or revising eligibility criteria. In addition, discussions are ongoing regarding potential stimulus funding opportunities.

The following two projects are being recommended as they have the greatest potential benefit in utilizing funding opportunities to implement transformational projects that align with HRM's modal split and emissions reduction targets.

Rapid Transit Strategy

The *Rapid Transit Strategy* (RTS) represents the culmination of years of strategic planning and efforts to improve sustainable transportation options and increase mobility for residents. In December 2017, Regional Council approved the *Integrated Mobility Plan (IMP)* to encourage a broader choice of urban mobility options focused on public transit, active transportation, ridesharing, and newly developing sustainable services. Exploration of higher order transit is a key component of the *IMP*. Higher order transit—often used interchangeably with rapid transit—is defined by the *IMP* as including "all forms of rapid transit typically within its own right-of-way," or separated from general vehicular traffic.

In May 2019, the Transportation Standing Committee received an information report on the *Bus Rapid Transit (BRT) Study*, a study completed by Dillon Consulting that investigated the potential to implement BRT service in HRM. The report provided an overview of the results of the Study and outlined the next steps staff would take to develop a Higher Order Transit Network Plan, with the intent to:

- Build on direction provided by the *IMP* and other policy documents to provide a broad overview of potential higher order transit, based on the findings of recently completed reports and projects.
- Outline key components and modes, illustrating the relationships, and providing recommended actions based on a cohesive multi-modal network.
- Be undertaken in parallel with planning for appropriate land use intensification around existing or proposed terminal areas.

Highlights of the Rapid Transit Strategy

The Rapid Transit Strategy (RTS), which is included in Attachment B, details the extent, modes and approach/timeline to implement a Rapid Transit system in HRM. Several HRM business units collaborated on the development of this strategy under the leadership of Planning & Development and Halifax Transit. This section provides an overview of the RTS and is followed by more detailed discussions on key areas.

The RTS proposes a BRT Network and new ferry service, both shown in Figure 1. The network is strategically aligned to serve the areas in the municipality most suitable for Rapid Transit and to align with land use plans and other sustainable transportation priorities. The RTS also provides direction to update existing land use policy to better respond to the Rapid Transit Network.

Bus Rapid Transit

The RTS recommends a network of four BRT lines, each represented by a specific colour: Purple, Green, Red, and Yellow.

- BRT service will run at high frequency throughout the day, seven days a week. On weekdays, BRT service would run every ten minutes or better from 6am–10pm.
- 120,000 people and 100,000 jobs are within 800m walking/rolling distance of BRT stations (based on 2016 census data).

- BRT lines have less frequent stops than conventional bus routes; stations are generally spaced between 500m and 1km apart at major intersections and destinations.
- Recommended features for BRT stations include shelters with lighting, real-time bus arrival information, BRT system and route maps, and level platform boarding.
- The BRT Network incorporates extensive transit priority measures, including a recommended network of transit priority lanes that allow buses to avoid traffic congestion.

Ferries

The RTS recommends three new ferry routes providing direct connections between downtown Halifax and new terminals at Mill Cove, Larry Uteck and Shannon Park.

- The ferry routes will operate like existing express bus service, with weekday service at 15-minute headways during peak periods and 30- to 60-minute headways off-peak. The level of service could increase over time given sufficient demand.
- The proposed ferry routes would provide fast, reliable service with travel times to downtown Halifax likely to be faster than travel by private vehicle or bus.
- The routes are anticipated to use multi-hull catamaran vessels with a 150 passenger capacity and a single deck, capable of operating at higher speeds while minimizing wake effects.
- Design of new terminals will be consistent with existing Halifax Transit ferry terminals, appropriately sized for the route and adapted to the site.
- The Halifax Ferry Terminal will require upgrades to support additional ferry service.

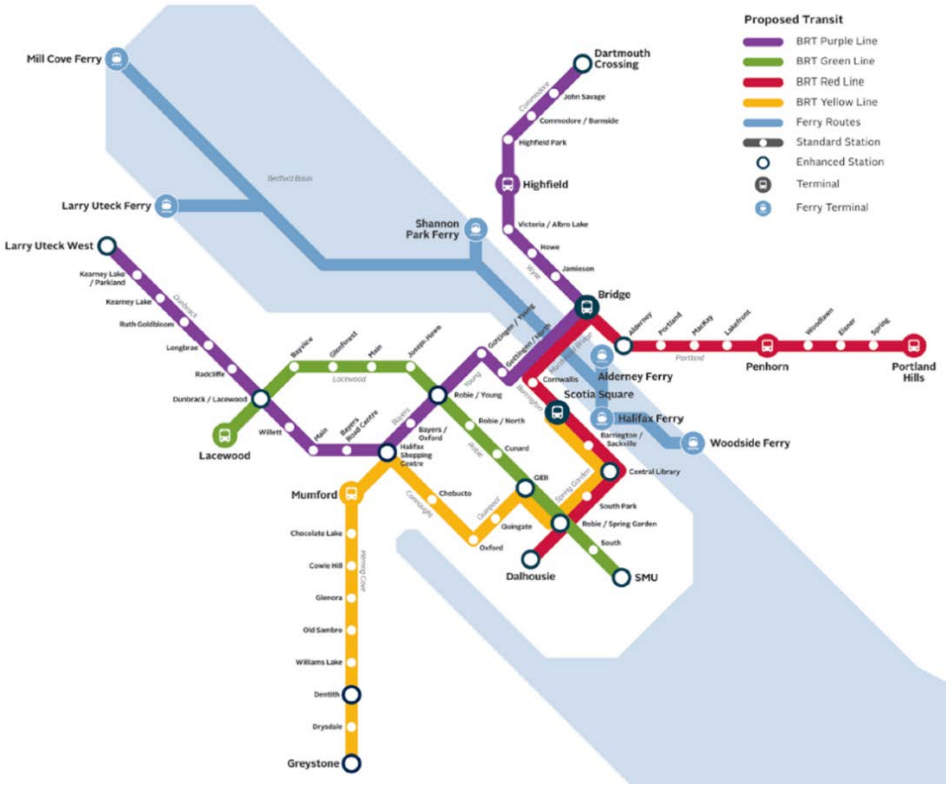


Figure 1: Rapid Transit System

Land Use

Following the *IMP*, the RTS recognizes the need to align transit and land use planning to build transit-oriented complete communities and make transportation in HRM more sustainable.

- The proposed Rapid Transit Network serves a high proportion of the municipality's existing population and employment centres. The network serves the areas where staff believe Rapid Transit can operate successfully in the near term.
- The RTS's recommendations for land use aim to accommodate growth in a way that is more compact and less car-oriented, and ultimately more affordable and sustainable.
- The RTS outlines four key policy directions for the municipality:
    1. Plan for higher-density mixed use development around Rapid Transit.
    2. Work to ensure that affordable housing and amenities are available near Rapid Transit.
    3. Improve the connectivity of local streets and the quality of active transportation infrastructure near stations and terminals.
    4. Pursue a long-term vision for Rapid Transit together with a long-term vision for land use.

Impacts of the Rapid Transit Strategy

Through the *IMP*, the Municipality has adopted a progressive new vision for transportation that focuses on the movement of people rather than vehicles, strengthens the relationship between transportation and land use decisions, and provides an opportunity to rethink and redesign our transportation system and communities. Rapid Transit is a critical step in making this vision a reality. Table 1 outlines the benefits of implementing the Rapid Transit Strategy.

Table 1: Benefits of Rapid Transit

Improves mobility options	• Provides more reliable, more frequent, faster, more connected and easier to use transit service. • Makes many types of trips possible, not just downtown commutes. • Costs significantly less to passengers than driving.
Orients land use toward transit	• Encourages development around stations and terminals, bringing more prospective riders and starting a transit-supportive cycle of development. • Promotes complete communities where residents can live, work, shop, learn and play within the community. • Reduces the need to invest in road infrastructure to support demand for auto travel.
Makes transportation more sustainable and equitable	• Helps residents reduce vehicle use or forgo vehicle ownership, decreasing greenhouse gas emissions. • Supports shifts toward more sustainable development patterns. • Builds more equitable communities by providing mobility options for those unable to access private vehicles.

There is strong alignment between the *IMP* and the RTS. This alignment is further illustrated through the results *IMP* evaluation scorecard in Attachment D.

The *Regional Municipal Planning Strategy (Regional Plan)* projects that by 2031 HRM will gain over 69,000 people and 46,000 jobs. Accommodating this growth in a financially, economically and environmentally sustainable manner will be a challenge for land use planning over the next decade. Traditional planning and development in North America, including Halifax, has engendered an unsustainable cycle of auto dependency. Investing in Rapid Transit infrastructure and service provides the private sector with the certainty needed to spur development around Rapid Transit stations and terminals, creating a new cycle of

transit-supportive development. This effect has been observed in many cities around the world including Ottawa, the early Canadian adopter of BRT, which saw over $1B of new construction around Transitway stations after adopting BRT.[2] This cycle creates more walkable and transit-oriented communities, which reduces reliance on cars, increases transit ridership, cuts greenhouse gas emissions, reduces transportation costs, improves access to jobs and ultimately helps build healthier, more equitable and sustainable communities.

A key measure of effectiveness for sustainability in the transportation system is mode share—increasing non-auto mode share (transit and active transportation) is generally indicative of improved transportation sustainability. As directed by the *Regional Plan*, the RTS uses the Municipality's transportation demand model to evaluate how the Rapid Transit system may improve transit mode share. Rapid Transit service demonstrates an increase in transit mode share of up to 2% of all commuting trips, which would help HRM meet the *Regional Plan* mode share targets. However, implementing Rapid Transit service is not on its own sufficient to meet these targets. Different growth scenarios modelled for the RTS show that supportive land use policy and infill development are crucial to improving transit mode share alongside the implementation of Rapid Transit.

Projecting the future is inherently full of uncertainty. The emergence of COVID-19 is a reminder that sustained growth should not be taken for granted. Staff will continue to monitor as more is learned about the pandemic's impact and may update recommendations based on new growth outlooks. However, accommodating growth is only one of the aims of the Rapid Transit Strategy, and the rationale for implementing it remains strong even in the face of an uncertain future.

Relative Impact of BRT and Ferry Service

The RTS proposes both BRT and ferry service. The modes serve different purposes and are suited for different areas of HRM. BRT's ability to serve linear development along travel corridors, station spacing, and ease of transferring make it the best opportunity to connect the Regional Centre and inner suburbs. The ferries' rapid travel times make them a good option to connect communities around the harbour directly to downtown Halifax.

The impact of the two modes on transit use in HRM is anticipated to differ:

- Since BRT will effectively replace several of Halifax Transit's top-performing bus routes, it is anticipated to have a large ridership (tens of thousands of boardings daily) from launch.
- Ridership on the new ferry routes is anticipated to be eventually similar to ridership on Halifax Transit's current ferry routes (over 2,000 boardings daily).
- While both BRT and ferry will draw new riders, the ferry routes are expected to have a higher proportion of new transit riders than BRT routes as they provide a new type of service.

The anticipated operating cost per passenger of offering the two services therefore also varies:

- The fare revenue estimates in the RTS assume 35% to 50% cost recovery on BRT routes, consistent with comparable corridor routes. This works out to a cost of between $2.30 and $3.20 per boarding for BRT service.
- If fares on the new ferry routes are kept the same as the fare for conventional transit, the RTS estimates cost recovery of 20% to 30%, which is lower than existing ferry service, largely due to the increased length of the new routes.[3] This works out to a cost from $5.10 to $7.70 per boarding to operate the ferry routes.

The proposed ferry service will serve fewer passengers and cost more per passenger than BRT. However, the number of new transit riders attracted by each service is expected to be more comparable. As well,

[2] National Academies of Sciences, Engineering, and Medicine 2003. Bus Rapid Transit, Volume 1: Case Studies in Bus Rapid Transit. Washington, DC: The National Academies Press.
[3] Cost recovery for ferry service in 2018-19 was approximately 55%.

expanding BRT service into areas further from the Regional Centre would cost more per boarding than the proposed BRT service due to the longer distances to travel and lower population and job densities.

Implementation

Implementing the Rapid Transit Strategy will be a complex undertaking and will require coordination among multiple stakeholders and the management of many concurrent projects involving multiple HRM business units, partner organizations, and consultants. The RTS provides a high-level implementation plan, with cost and timeline estimates.

- Staff anticipate that the complete BRT Network could be in service in seven to eight years once the RTS is funded, with the first line introduced in year three or four. The lines will likely be launched one or two at a time due to resource capacity, construction management and cash flow.
- One of the most critical aspects of BRT implementation will be building the proposed network of transit priority lanes to ensure the service can deliver the improved travel times and reliability to be successful.
- The timeline required to implement the proposed ferry service is less well established than for BRT, and could vary widely based on the level of complexity and service models. Staff estimate that the first ferry route could be operational three to four years from the time the RTS is funded.

The successful implementation of the RTS will require additional, dedicated staff resources. The activities identified in the RTS cannot be achieved as part of regular municipal programming, and should be led by a separate, but integrated, project office to ensure collaboration and prevent delays. Additional staff resources from across the organization will also be required to maintain the aggressive design and construction implementation schedule.

Considerations for BRT

Successful BRT service must offer improved travel times and a high degree of reliability to compete with private vehicles and encourage more people to use transit. Since buses share the road network with private vehicles, the best way to improve travel time and reliability is to provide buses the ability to bypass congestion. The RTS recommends two types of transit priority measures (TPMs): measures at intersections to let buses through more quickly, and transit priority lanes, which provide dedicated space for buses on the road network.

While an ideal BRT system would include transit priority on 100% of the network, challenging geography and limited street width make it nearly impossible to provide complete network priority in HRM. The RTS proposes transit priority lanes on approximately 60% of the 50km network, as illustrated in Figure 2. These lanes build on transit priority corridors identified in the *IMP*, some of which have been designed and/or will be constructed in the near future (Bayers Road, Young Street, and Robie Street). New projects are classified as being of primary or secondary importance depending on their level of complexity and impact on BRT operation.

There are also ongoing infrastructure projects on BRT routes scheduled for construction during the implementation timeline, including the Windsor Street Exchange Reconfiguration and the Cogswell Redevelopment. These projects will require completion before BRT is launched or will need to ensure sufficient traffic flow during construction to not impede the reliability of BRT service. Staff will need to coordinate to find the best way to proceed.

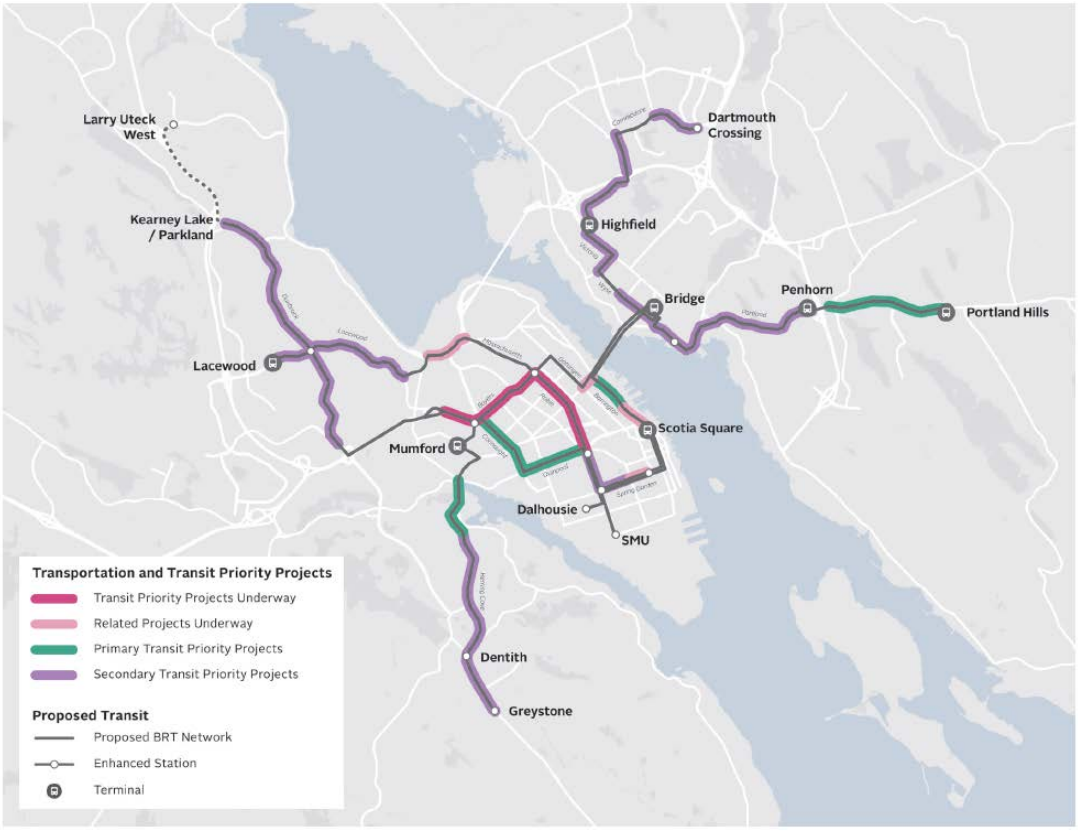


Figure 2: Infrastructure Projects and Transit Priority Projects Classified by Type

Streamlined planning and design process

The Municipality's current process for transportation projects is built on extensive functional and detailed planning for each individual corridor, with staff representatives from a diverse range of business units and external agencies. There are numerous decision points for corridor design that effect the level of transit priority provided, which impacts transit reliability across the entire network. Table 2 shows the typical approach and timelines; however, a dedicated project team will be required in order to meet the anticipated time frame for implementation. The composition and reporting structure of the project team will be decided by the Mobility Senior Management Steering Committee responsible for the implementation of the Integrated Mobility Plan. This will help to ensure key stakeholders and decision-makers are engaged at the appropriate stage of implementation in the most efficient and effective manner.

Table 2: Strategic Transportation Corridor Planning and Design Phases

Phase	**Timeframe**	**Typical Approach**
Functional Planning	6-12 months	Develop conceptual options, conduct engagement, prepare preliminary cost estimates, evaluate options and arrive at a recommended option complete with Municipal Engineer and Traffic Authority approval.
Preliminary Design (not always required)	3-12 months	Refine the functional plan and prepare the project for detailed design
Detailed Design	3-12 months	Develop a set of tender-ready designs complete with engineering certification and Municipal Engineer and Traffic Authority approval

The addition of new transit priority lanes will be done by either (i) converting existing traffic lanes or (ii) widening the roadway to create new lanes. It is important not to understate the trade-offs of creating transit priority lanes. Converting existing lanes may result in increased congestion and delay for general purpose traffic at peak periods, or the loss of on-street parking and loading which can impact residents and businesses. Creating lanes through road widening requires a greater capital investment and may impact private property, utilities, trees, and snow removal and storage. The RTS presents preliminary recommendations for which approach to take on each corridor, but more analysis will be required through the planning process to balance the trade-offs of each approach on individual corridors. In instances where the creation of transit priority lanes may have a significant impact to the street or community, recommendations informed by a functional plan will be brought back to Regional Council for consideration.

Coordination among partners

Coordination across internal business units and among multiple external partners such as Halifax Water, Nova Scotia Transportation and Infrastructure Renewal, Heritage Gas, Nova Scotia Power, and Halifax Harbour Bridges will also be critical to the success of transit priority projects. To reduce disruptions to the road network and find efficiencies, transit priority projects will be aligned with the Municipality's five-year transportation capital plan and other infrastructure recapitalization projects as much as possible.

Considerations for Ferry

The RTS outlines recommendations for new ferry service and identifies aspects of the service that need to be addressed prior to implementation. Staff are in the process of exploring options for implementation; this section discusses some of the details under consideration.

Vessels

Appropriate vessel design and navigation technology will be crucial for the new ferries to achieve competitive travel times while maintaining safety and low wake impacts. Staff will work with partners such as the Halifax Port Authority to ensure vessels meet all relevant requirements to successfully operate the service.

Staff will also explore alternatives for propulsion technology in the process of implementation, keeping in mind the need for sustainability in ferry operations. The technical feasibility review completed for the RTS recommends conventional diesel-powered vessels to match the existing ferry service's operations and maintenance. However, it also acknowledges that marine propulsion technology is evolving rapidly and alternatives, such as electric ferries, are becoming increasingly available.

Terminals

The exact location and design of new ferry terminals will need to be determined through the implementation process. HRM does not own land near the proposed route endpoints, so terminal siting will require negotiations around leasing or acquiring property. As well, terminals may benefit from being combined with other municipal facilities. If the Municipality decides to build a multi-use facility including a ferry terminal, it may be necessary to construct a temporary terminal to operate service in the short term.

The Halifax Ferry Terminal will also need to be upgraded before any new ferry routes can operate from that facility. A full rebuild of the aging terminal is recommended if multiple routes are implemented. In the short term, it may be possible to operate one new route with a smaller infrastructure investment. Staff will explore the options for terminal expansion.

Fares

The RTS's operational cost estimates assume the new ferries will charge the same fare as conventional transit. A flat fare across different modes is an attractive proposition for riders as it facilitates easier transfers and helps keep transit service affordable for residents. However, as the cost per boarding is anticipated to be higher on the new ferries due to the longer distances travelled, charging the conventional fare will lead to a lower cost recovery ratio on those routes unless it substantially increases ridership. Staff will consider fare options and will recommend a fare level to Council as part of the service implementation.

Timeline and implementation options

The RTS notes that the timeline to implement ferry service depends on the level of complexity and service model chosen. Staff will consider the potential for short-term service delivery options to establish service on ferry routes before making large investments in permanent infrastructure and service. Unlike the BRT Network in which the routes are interdependent, each of the three proposed ferry routes could operate independently. Staff envision that the Mill Cove route will be the first priority to implement, as the preliminary feasibility study identified it as having the highest potential travel demand. The Larry Uteck route could provide a "relief valve" in case demand at Mill Cove overwhelms the level of service that can be provided. Lastly, staff recommend that the Shannon Park route should be timed to align with the proposed large-scale mixed-use development for that area.

Transit Network Implications

The Rapid Transit Network builds on the network established in the *Moving Forward Together Plan (MFTP)*. Staff therefore recommend completing the full implementation of the *MFTP* while work is being done to prepare for Rapid Transit. When BRT and ferry routes are launched, the transit network will require adjustments to improve connectivity and reduce redundancy. The largest changes will be to corridor routes that overlap with BRT lines (Routes 3, 4, 5, and 9), which may be replaced or provide less frequent service. Additional consultation will occur before specific changes are recommended to Council, and the adjustments are not anticipated to result in a decrease in overall service.

A Long-term Vision for Rapid Transit

One of the goals of the Rapid Transit project is to establish a long-term (beyond 2031) strategic vision for Rapid Transit. To be effective, a long-term vision for transit – including Rapid Transit – must be considered together with a long-term vision for land use. Given the expedited timeline for the development of the Strategy and uncertainties around population and job growth, settlement patterns, capacity for intensification and shifts in transportation demand and technology, additional work is required on this vision.

The *Regional Plan* review, initiated by Regional Council on February 25, 2020, can form the starting point for this work. The review is expected to evaluate designated growth centres and transportation corridors to ensure their alignment with the Rapid Transit Strategy, and to establish a framework for a long-term study and visioning process for land use and transportation beyond 2031.

Rapid Transit Strategy – High Level Cost Implications

Capital cost estimates

An estimated $297 to $342 million, not including land acquisition, in capital funding is required to implement all four BRT lines and three ferry routes. These costs are outlined in Table 3.

Table 3: Estimated Capital Costs (based on 2020 values)

Bus Rapid Transit (All four lines)	
New expansion buses (33)[1]	$36M to $64M
Stations (130)	$62M
Transit priority lanes and intersection improvements	$86M
Property acquisition	TBD
Additional studies, functional plans and project overhead[2]	$5M
Subtotal	**$189M to $217M**
Ferry (All three routes)	
Vessels (10)	$71M
Halifax Ferry Terminal (rebuild)	$17M
Mill Cove Terminal)[3]	$6M to $18M
Larry Uteck Ferry Terminal[3]	$6M to $7M
Shannon Park Ferry Terminal[3]	$4M to $8M
Property acquisition	TBD
Additional studies, concept designs and project overhead	$4M
Subtotal	**$108M to $125M**
Total capital costs	**$297M to $342M**

[1] Estimate reflects a mix of standard and articulated buses. The range reflects the cost of diesel (lower end) and electric (higher end) buses. In alignment with the proposed fleet electrification strategy, the goal is to procure electric buses; the costs may be reflected in that strategy.
[2] Estimates include dedicated project staff and/or consulting costs.
[3] Ranges reflect cost estimates for a standalone terminal (higher end) vs. marginal costs for a terminal integrated into concurrent development (lower end of range). Mill Cove and Shannon Park standalone terminal estimates include cost of parking facilities.

The capital cost estimates include contingencies, engineering, project management and taxes, but exclude the cost of property acquisition, which will be estimated through additional planning and design phases. These costs are high-level, order of magnitude estimates which will be refined through functional planning and detailed design phases.

A portion of the capital cost estimates, particularly, a portion of the estimated $82 million identified for transit priority lanes and intersection improvements, have already been accounted for in part in the Municipality's multi-year capital budget. Specifically, a number of strategic multimodal corridors projects had already included transit priority improvements, prior to the development of the RTS. Thus, the total amount of net new capital investment is lower than what is outlined in Table 3 above. However, because the strategic multimodal corridors projects include many components in the right of way, and state of good repair, it is challenging to isolate the transit specific costs for comparison purposes.

Operating budget estimates

The estimated net new annual operating costs for all four BRT lines and three ferry routes is between $15 million and $22 million as outlined in Table 4. These estimated costs are based on 2020 values, and are anticipated to increase over time, with the main drivers of cost being wages, maintenance, and fuel. The total net new operating costs will not be realized until the full Rapid Transit Network is operational. If the net incremental costs were covered by the existing Transit area rates, the combined rate impact could be

in the range of 2.5 cents on residential properties and 9.5 cents on the commercial urban rate. These new operating costs will occur incrementally over the next eight years and may be partially offset by ongoing increases to the municipal tax base within the transit service area.

Table 4: Estimated Annual Operating Costs

Bus Rapid Transit (All four Lines)	
BRT operating costs	$29M
Operating costs reassigned from corridor routes	($18M)
Anticipated new annual fare revenue[1]	($4M to $5M)
Net new operating costs	**$6M to $7M**
Ferry (All three routes)	
Ferry operating costs[2]	$14M to $18M
Anticipated annual fare revenue[3]	($3M to $5M)
Net operating costs	**$9M to $15M**
Overall net new operating costs	**$15M to $22M**

[1] Based on cost recovery of 35% to 50%, in line with current corridor routes and assuming BRT charges the conventional transit fare.
[2] Range reflects different levels of off-peak service (60minute or 30-minute headways).
[3] Based on cost recovery of 20% to 30%, in line with ridership estimates and assuming ferries charge the conventional transit fare.

Staffing / Resourcing

As outlined in the discussion, the successful implementation of the Rapid Transit Strategy will require additional, dedicated resources. Staff recommend the establishment of a separate project office to lead implementation. Additional staff resources from across to the organization will also be required to maintain the aggressive design and construction implementation schedule. The potential numbers of staff/consultants assigned to the project team and across the organization to support implementation is expected to vary depending on the stage and required tasks from year to year. Resourcing requirements will be outlined in future annual operating and capital budgets, as applicable.

Long-Term Financial Benefit

The substantial investment in Rapid Transit will pay off with a wide range of benefits to HRM and its residents, as outlined in the discussion. In addition to the community benefits, the Rapid Transit system is also anticipated to improve the Municipality's financial well-being, though the effects are difficult to quantify and therefore have not been included in the RTS. Some financial benefits that can be realized through Rapid Transit and supportive land use policy include:

- Reduced capital spending on road expansion projects to meet increases in demand for vehicle travel.
- Lower municipal servicing costs due to a more compact development pattern.
- Increased property tax revenue from higher land values around Rapid Transit, as seen in cities around the world including Bogota, Colombia, Seoul, Korea, Boston, MA; and Eugene OR[4]

[4] Aiga Stokenberga (2014) Does Bus Rapid Transit Influence Urban Land Development and Property Values: A Review of the Literature, Transport Reviews, 34:3, 276-296, DOI:

- Higher economic productivity from reduced traffic congestion relative to a future with higher auto use.
- Better-distributed economic growth due to increased mobility for all residents.

Electric Bus Proposal

The *IMP* highlights the importance of working towards more resilient transportation systems and in turn promoting healthy communities by reducing greenhouse gas emissions (GHGs). Electric buses and other forms of sustainable transportation effectively reduce GHGs and lower long-term transportation costs. In 2016, the transport sector accounted for approximately 20% of overall community emissions in HRM. While this percentage is expected to decrease slightly by 2030 due to improved fuel efficiency standards, complete electrification of transportation is a crucial action identified in HalifACT 2050 for achieving the recommendations set out by the Intergovernmental Panel on Climate Change and addressing the climate emergency.

The Electric Bus Proposal is intended to present a high-level transformation plan of the Halifax Transit conventional fleet to a low-carbon or zero emission fleet. In addition to fulfilling recommendations from the *IMP*, this proposal also supports the recommendations of HalifACT 2050.

Halifax Transit operates 350 conventional diesel buses (40 ft and 60 ft) and two hybrid-diesel (60 ft) buses, consuming approximately 11.3 million litres of diesel fuel in the year 2019/2020. This presents an opportunity to transition to electric buses as Halifax Transit plans to procure over 180 buses between the years 2023/2024 and 2026/2027.

To date, the following GHG reduction initiatives and research have taken place:

- Acquisition of two hybrid-diesel articulated buses in 2009;
- 2010 EMP – Mini-Hybrid Cooling System, Retro-fit;
- 2013 Halifax Regional Municipality Exploratory study; Municipal Fleet Conversion to Compressed Natural Gas;
- 2016 Halifax Transit Facility Assessment for Natural Gas Vehicles;
- 2017 Halifax Transit Battery-Electric Bus Feasibility Study;
- 2018 Recommendation to Pilot Battery-Electric Buses; and
- 2019 Sustainable Fuel Study.

Halifax Transit has worked closely with the utility providers for the development of the studies mentioned above. Nova Scotia Power has set targets to reduce their GHG emissions each year for the next 20 years. Nova Scotia Power is targeting to reduce their carbon footprint to 5 megatons of CO_2 by 2040 from 7.5 megatons targeted for 2020. A detailed table with target for each year is included in Attachment E.

The 2017 Halifax Battery Electric Bus Feasibility Study explored the viability of the technology in HRM and recommended the deployment of electric buses. The report indicated that full adoption of electric buses would result in a reduction of 131,062 tonnes of GHGs and a savings in fuel costs and reduced maintenance of approximately $127 million over a 20 year period. As the technology has advanced since the completion of this report, actual reductions may be greater. Also, the report provided information about the different charging strategies and simulated six routes, indicating that 89% of Halifax Transit's routes were able to be electrified. Since then, major system changes have been deployed which have increased the opportunity to electrify more routes.

The key objectives of the Sustainable Fuel Study were to assess the feasibility and implications of various alternative fuel technologies for adoption into Halifax Transit's fleet operations. The technologies considered include the following:

- Diesel- Hybrid;
- Battery Electric Bus (BEB);
- Compressed Natural Gas (CNG), Renewable Natural Gas (RNG); and
- Hydrogen Fuel Cell Electric Bus (FCEB).

The assessment measures on each technology include:

- Gap assessment on facilities, staff training & certification, specialized tooling & maintenance equipment;
- Infrastructure requirements and energy availability;
- Performance limitations and operating efficiency;
- Total lifecycle cost (i.e. procurement, operations & maintenance, overhaul and disposal); and
- Fleet reliability.

The triple bottom line approach was employed in assessing the sustainable technologies, through the Decision Support Matrix Tool. This tool considered major relevant economic, social and environmental factors, which were quantified to help derive business decisions. As per the report, 82.8% of the Burnside Transit Center (BTC) route network can be electrified by using depot charging with the maximum battery capacity available in the market at the time of the study. A similar percentage of route network can be electrified for Ragged Lake Transit Center (RLTC). The current battery ranges do not allow for 100% of routes to be electrified.

The proposal is derived from the recommendations of previous studies and current plans in progress. It is recommended that to rapidly decline the carbon footprint of Halifax Transit's fleet, HRM begin transitioning the fleet to a BEB fleet, in a phased approach.

Infrastructure

Halifax Transit operates 352 conventional buses, from two Transit Centres, the Burnside Transit Centre (BTC) and Ragged Lake Transit Centre (RLTC). Both facilities contain administrative, operations, and maintenance functions, and are at capacity.

A project is currently underway to expand the RLTC to accommodate fleet growth. As this project is still in the design phase, it can be modified to account for the electrification of fleet. This would allow the expansion portion of the RLTC to be primarily dedicated to electric buses, which is estimated to house approximately 54 vehicles. Early consultations with Nova Scotia Power have indicated that the electrical utilities infrastructure in place can accommodate that quantity of vehicles without significant upgrades on their part. If funded, the design work for this project can be completed in the current fiscal year (2020/21), and construction can be completed in 2021/22. Additional conversion of the RLTC facility may be possible but requires further exploration.

Further electrification of the fleet can be accommodated through the complete rebuild of the BTC. The facility is approximately 40 years old, in need of significant repair, and requires major reconstruction to be more efficient and functional, regardless of fleet fuel source. This will be a significant undertaking and take several years to design and construct, and it is also anticipated that the rebuild will require the acquisition of an adjacent parcel of land.

It is recommended that to support the next phase of electric fleet procurement, BTC is reconstructed to accommodate the electrification of the fleet. The reconstruction of BTC will be performed in phases, such

that current maintenance and operations can continue at the location. To determine the complex phasing further implementation planning is required. The BTC facility is estimated to be rebuilt in approximately seven years starting with the design and planning in year 2021/22. Including new BEB capacity at the BTC would allow the electric fleet to grow significantly by 2027/28.

This proposal plans for the introduction of electric vehicles in the next two to three years, however, conversion of only a small portion of the fleet is possible until the BTC rebuild occurs. To allow for fleet conversion, the high level costing assumes that new fleet purchases, including replacement and expansion buses, will be procured as electric vehicles beginning in 2022/23.

Fleet

Progress in battery electric technology has been rapid, with major improvements in energy storage (kWh per kg). Currently there are over 300 electric buses operating in the US, with LA Metro initiating the transition of over 2,400 transit buses to BEBs. In Canada, Société' de Transport de Montreal (STM) and Société de Transport de Laval (STL) are ordering 40 BEBs by 2020, and STL committed to only electric after 2025. TransLink, Vancouver is starting a two-and-a-half-year electric bus pilot program lead by CUTRIC. York, and Waterloo are also working with CUTRIC for a BEB pilot. TTC is working on a pilot by procuring a bus from each OEM (original equipment manufacturer). Battery costs have shown a decline of about 20% per year; current battery costs for industrial heavy-duty applications have costs of about $900/kWh, and energy density of batteries has been improving at 6-8% per year. BEB's produce far fewer GHG and CACs emissions, with zero tailpipe emissions, and are limited to only the upstream electrical grid emissions. BEB implementation requires careful schedule planning and charging schedules to accommodate range requirements.

In North America there are five OEMs that provide BEB: BYD, Greenpower, New Flyer, Nova Bus, and Proterra. At this time, at least four of the five provide a vehicle that could potentially be used in Halifax. The manufacturers offer 35ft, 40ft and 60ft vehicle options, and typical passenger capacities are at par with diesel options (ranging from 50 seated to a total of 118 passengers with standees).

There are two major charging strategies employed by Canadian transit authorities:

- On-route (on-demand) or overhead charging whereby the bus connects to an overhead automated pantograph and can charge within minutes. The power supply ranges from 150 kW to 600 kW.
- Depot-charging or end-point charging in which the bus plugs into a charger while parked for a number of hours – typically a depot. The input power ranges from 175 kW to 460 kW.

Both charging strategies have associated standards being developed or have been approved by SAE International. These are:

- SAE J3105 "covers the general physical, electrical, functional, testing, and performance requirements for conductive power transfer, primarily for vehicles using a conductive ACD connection capable of transferring DC power. It defines conductive power transfer methods, including the infrastructure electrical contact interface, the vehicle connection interface, the electrical characteristics of the DC supply, and the communication system. It also covers the functional and dimensional requirements for the vehicle connection interface and supply equipment interface. There are also sub-documents which are identified by a SAE J3105/1, SAE J3105/2, and SAE J3105/3. These will be specific requirements for a specific interface defined in the sub-document "(SAE);
- SAE J3068 "covers the general physical, electrical, functional, testing, and performance requirements for conductive power transfer to an Electric Vehicle using a Coupler capable of, but not limited to, transferring three-phase AC power. It defines a conductive power transfer method including the digital communication system. It also covers the functional and dimensional requirements for the Electric Vehicle Inlet, Supply Equipment Connector, and mating housings and contacts. Moveable charging equipment such as a service truck with charging facilities are within scope. Charging while moving (or in-route-charging) is not in scope" (SAE)

Current battery pack sizes range from 76 kWh to 660 kWh. Over 80% of Halifax Transit network can be electrified by using depot charging. The on-route charging can potentially be considered to obtain 100% electrification of the Halifax Transit network.

Halifax Transit has elected to primarily adopt depot charging as it requires less changes to the routing system and renders less risk to the charging equipment as all chargers reside at a Halifax Transit depot. The associated risk and cost of the on-route chargers do not make them appealing at present. However, on-route chargers may be considered in future. With the ongoing improvements in technology, it is anticipated that an increase in the attainable range from the battery packs and further reduction in the cost are likely as the demand for the BEB and chargers increases globally.

The gap analysis performed as part of the Sustainable Fuel Study performed in 2019, show a significant gap in available codes and standards and facility needs. Though there is a gap in training, tooling and on-site equipment, it can be managed and closed in with appropriate planning and scheduling.

Operating cost comparison of Diesel fuel bus with Battery Electric Bus (BEB) is shown below:

Table 5: Operating Cost Comparison

Propulsion type	**Diesel**	**Diesel-Hybrid**	**BEB**
Vehicle Annual Kilometers (km)	55,000	55,000	55,000
Vehicle Procurement Costs	$650,000	$1,000,000	$1,200,000
Fuel Prices	0.690 $/L	0.690 $/L	0.126 $/kWh
Fuel Economy	0.57 L/km	042 L/km	1.50 kWh/km
Fuel Prices ($/Km)	**0.41 $/km**	**0.30 $/km**	**0.19 $/km**
Salvage Value	$2,000	$2,000	$8,000 + $8,100 (Battery Salvage)

BEB fleet are anticipated to result in significant operational cost savings due to reduction in fuel costs. The BEB fleet would also have lower overall maintenance costs as the BEB propulsion type is more reliable compared to diesel. There will be large savings in parts and labour, bulk fluids and consumables, however, as the technology is still evolving, these cost savings are not well documented. Nonetheless, based on reviews of vehicles currently on the market and their described (anticipated) maintenance requirements, some estimates can be made.

Table 6: Estimated Impact on Annual Operating Costs

Bus Maintenance Costs (2019/20)	
Burnside and Ragged Lake Bus Maintenance Budget	$24.6M
Estimated Variable Component of Maintenance Budget	$18.0M
Variable Maintenance Cost per conventional 40-ft diesel bus	$51k per bus
Estimated Variable Maintenance Cost per Battery Electric Bus[1]	$27k per bus
Potential Reduction in Maintenance Costs (including fuel)	**$24k per bus**
Bus Maintenance Costs (2028/29)	
Potential Reduction in Maintenance Costs (including fuel)	$28.7k per bus
Potential Annual Reduction in Maintenance Costs (for 210 BEBs)[2]	**$6.0M**

[1] 2019 alternative fuel bus analysis
[2] see procurement schedule, Table 9, below

No transit agency in North America has had BEBs in service for their complete lifecycle to review. Therefore, current estimates of cost savings are based on short term pilots and/or manufacturer maintenance recommendations and performance metrics. Despite the operating cost savings, lifecycle costs for BEBs, due to high initial capital costs, are currently higher than for diesel buses (if considered over a similar 14-year period). However, with on-going reductions in battery costs and their weight (improving fuel economy) – as described above (page 18) – the lifecycle cost for BEBs is steadily declining.

Electric Bus Proposal – High Level Costing Implications

High level cost estimates have been prepared for both the infrastructure and fleet requirements proposed.

Table 7: Phase 1: Ragged Lake Transit Center Expansion

Ragged Lake Facility	**Years**	**BEB Capacity (FFE)**		**Estimated Expenditures**		
Ragged Lake Transit Centre Expansion	1 & 2	54		$12.0M		
Fleet Enhancement	**Years**	**BEB Procurement (FFE)**		**With 5% Annual Price Decline**		**At 2020 Pricing**
Vehicle Procurement (BEB) including charging stations	3 & 4	Replacement Expansion	41 13	$64.0M	to	$73.0M
Estimated Ragged Lake Total	1 to 4	**54**		**$76.0M**	to	**$85.0M**

Table 8: Phase 2: Burnside Transit Center

Burnside Facility	**Years**	**BEB Capacity (FFE)**		**Estimated Expenditures**		
Burnside Transit Centre Replacement	2 to 7	300		$165.0M		
Fleet Enhancement	**Years**	**BEB Procurement (FFE)**		**With 5% Annual Price Decline**		**At 2020 Pricing**
Vehicle Procurement (BEB) including charging stations	5 to 8	Replacement Expansion	136 20	$159.0M	to	$210.5M
Estimated Burnside Total	2 to 8	**156**		**$324.0M**	to	**$375.5M**

Table 9: Procurement Summary

Procurement Schedule	**22-23**	**23-24**	**24-25**	**25-26**	**26-27**	**27-28**	**2022 to 2028**
Bus Location	Ragged Lake TC		Burnside TC				Halifax Transit
Replacement Buses (FFE)	30	11	46	36	32	22	177
Expansion Buses (FFE)	7	6	5	5	5	5	33
Total Procurement	**37**	**17**	**51**	**41**	**37**	**27**	**210**

Implementation of Electric Bus Proposal

Though Halifax Transit has conducted studies in the past and have gathered critical information on the topic, there are still gaps in the knowledge and consistency of information. For successful implementation of these plans a Program Manager is required, as a Fleet Transformation Coordinator. The Fleet Transformation Coordinator would be tasked to provide expert advice and support in the operation, maintenance and capitalization of Halifax Transit's future sustainable fleet comprised of alternate sustainable propulsion system buses and/ or other vehicles.

The first phase would be electrification of Ragged Lake Transit Center expansion. With the Ragged Lake expansion electrified, Halifax Transit would be able to accommodate maintenance and storage of up to 54, 40ft equivalent buses.

Burnside Transit Center is a critical location for the Halifax Transit operation with over 60% of the Halifax Transit fleet currently maintained and operated at this location. The second phase of the fleet electrification would require BTC to be rebuilt to support electric fleet. At the completion of the BTC rebuild, this location will be able to support approximately 300, 40ft equivalent buses.

The third phase of electrification would consider transformation of the RLTC to achieve 100% sustainable fuel fleet. This phase would also look at other technologies available at the time, such as hydrogen fuel cell, CNG or RNG that can be implemented for a sustainable future.

Conclusion

Both the Rapid Transit Strategy, and the Electric Bus Proposal will provide valuable, long term, benefits to the municipality, in terms of meeting the objectives of the *IMP* and broader climate change objectives. However, they require significant capital investments.

The capital costs presented in this report are high level and will be further refined as implementation plans are developed, but an estimated $710 million to $782 million is required to complete both projects. The total remaining potential investment through the PTIF program is $526.3 million, and the total remaining available funding through the Green Infrastructure fund is unknown but estimated to be several hundred million dollars. It is therefore recommended that both projects be submitted to the Province promptly for consideration under these funding streams.

If successful, this will require the Municipality to fund up to 26.7% of the projects. Although a small percentage of the costs, this still represents a significant municipal investment, of approximately $180 million to $210 million over the next eight years. Some of this funding is already accounted for in the short- and medium-term capital budget, specifically, the implementation of transit priority lanes on multi-modal corridors such as Bayers Road, which is already funded. In addition, should the Electric Bus Proposal not proceed, the projected funding for the replacement and expansion of conventional transit buses with new diesel buses, based on retiring vehicles at the end of their useful life, is anticipated to be approximately $153 million for the same time period. Further, it is possible that future funding programs, such as stimulus funding, could further reduce the municipal portion of these costs.

If successful in securing external funding for a portion of one or both projects, the next step would be to return to Regional Council with a contribution agreement for consideration.

FINANCIAL IMPLICATIONS

This report recommends providing direction to pursue the Rapid Transit Strategy and the Electric Bus Proposal for external funding opportunities but does not represent the approval of specific capital projects. Specific funding requests for implementation of the projects would be addressed through future Council decisions related to the long-term capital outlook and annual capital and operating budgets.

If approved for external funding, depending on the funding program and cost sharing requirements, there is likely to be a significant municipal contribution required to complete either of these projects. This may

require a redesign and enhancement of the existing transit tax rates and, certainly, a close examination of how to fund the significant municipal capital investments to avoid unacceptable impacts on other Council priorities. In the mid to long term, BEB lifecycle costs are expected to be comparable, or even favourable to, the diesel alternative. However, the RTS with its increased service levels will require ongoing incremental funding.

RISK CONSIDERATION

The table below reflects an assessment of the risks associated with the Rapid Transit Strategy and Electric Bus Proposal overall, and not risks for specific implementation projects or components of the projects.

RISK	LIKELIHOOD	IMPACT	RISK LEVEL	MITIGATION
Federal and/ or provincial funding is declined	Possible	Major	High	The continuation of adding transit priority measures and lanes as part of HRMs recapitalization program.
Completion of related projects takes longer than anticipated (e.g. Cogswell, Windsor Street Exchange)	Possible	Moderate	High	Opportunities to launch BRT service during the construction phase of related projects will be explored as part of the tender packages for these projects.
Cumulative impact of concurrent construction is beyond the capacity of the road network to absorb the disruptions	Possible	Moderate	High	BRT infrastructure projects will be coordinated through the Municipality's five year transportation capital plan to ensure cumulative impacts are identified and managed.
The volume and timing of infrastructure projects contained within the RTS exceed capacity of the construction industry or our integration partners	Possible	Major	High	The RTS will be promoted widely to provide contractors with advance notice of anticipated projects. The coordination of projects through the Municipality's five year transportation capital plan will also assist in mitigating contractor and integration partners capacity issues.
Staff resourcing is not scaled up to successfully manage and implement these two significant projects	Unlikely	Major	Very High	Staff will apply lessons from the last two years of project implementation through the IMP to estimate the level of resourcing required. The required resources will be identified in the 2021/2022 annual operating and capital budget.
Road expansion projects beyond the scope of the RTS reduce travel time for private vehicles and thus makes Rapid Transit less competitive	Almost certain	Moderate	Very High	Pursue opportunities to maximize investments for sustainable modes of transportation including transit and active transportation as part of these expansion projects, where it can support the Municipality's

				sustainable mode share targets.
Development and the siting of public facilities is not well aligned with the Rapid Transit Network	Possible	Moderate	High	The Rapid Transit Network will be promoted widely and across all levels of government. Municipal plans will also encourage the siting of facilities to align with the Rapid Transit Network.
Prolonged impacts from COVID-19 such as constrained municipal finances and depressed transit ridership threaten the viability of the RTS	Likely	Major	High	The current economic situation is a significant risk to the project, however, the RTS is a plan for the medium to long term, Staff will continue to monitor the impact of COVID-19. Ridership is anticipated to recover by the time the first elements of Rapid Transit service become operational in three to four years. Furthermore, projects contained within the RTS may serve as economic stimulus projects and provide access to more/new job opportunities for residents that are impacted.
Relatively new BEB technology results in unanticipated costs for maintenance, tooling, training, etc.	Possible	Moderate	Moderate	Contingency has been added to the estimated project budget to in anticipation of unknown costs.
Battery capacity is insufficient for our requirements	Possible	High	High	Continue to follow results and case studies from other North American cities, and learn from initial implementation phases to inform ongoing phases
Batteries are subject to pre-mature failures	Possible	Moderate	Moderate	Risk associated with failure can be mitigated through warranty terms.
Battery capacity does not allow for a one to one replacement of diesel buses with electric buses	Likely	Moderate	Moderate	Due to topography, nature of routes, traffic, contingency is to be built in to ensure service can be provided by the fleet.
Local industry is not ready for BEB in terms of available labour, lack of standards or regulations	Unlikely	Moderate	Moderate	This can be mitigated by working with local trade schools and the utility review board in early project stages.

COMMUNITY ENGAGEMENT

The RTS builds on key transportation and land use initiatives within the municipality, including the *Regional Plan*, the *MFTP*, the *IMP*, and the *Centre Plan*. Each of these initiatives was developed with extensive community engagement which fed into the development of the RTS. For this project, staff delivered an intensive two-week engagement process in late February and early March 2020. Engagement included nine public pop-up sessions in the different communities that would be served by the Rapid Transit Network, an online public survey on the Shape Your City platform, and two stakeholder workshops.

The pop-ups reached 939 people and the survey received 6,125 responses. Feedback was very positive. Over 90% of survey respondents voiced their support for the BRT Network. Of those who did support the network, about four in ten indicated the network could be improved, most suggesting providing BRT service to more areas such as Sackville and Bedford. A smaller portion of respondents wanted to see changes to the proposed network, and small modifications were made to the network as a result. There was also strong support for new ferry routes, with 74% of respondents indicating that the addition of one or more routes is 'very important'. The proposed Mill Cove and Larry Uteck ferry routes received the strongest support. More detail on survey responses is included in the Public Engagement Report in Attachment C.

Stakeholder workshops were also held with a total of 40 participants representing a diverse range of organizations including universities, the Nova Scotia Community College, Halifax Regional Centre for Education, Nova Scotia Transportation and Infrastructure Renewal, Develop Nova Scotia, the Royal Canadian Navy, Business Improvement Districts and not-for-profit organizations such as It's More Than Buses and the Ecology Action Centre. The discussion at the workshops was quite positive. Some participants wanted to see the BRT Network expanded and the horizon of the RTS lengthened. Stakeholders were also encouraged to provide written submissions; one submission was received.

ENVIRONMENTAL IMPLICATIONS

The RTS represents a critical shift in the move to a more sustainable transportation system and more compact and less car-oriented development. The estimated mode share gains translate to a reduction in greenhouse gas emissions of approximately 1,400 to 5,200 tonnes annually. As described in the discussion, the RTS also encourages more transit supportive land use and development patterns, which are anticipated to generate even further reductions in greenhouse gas emissions through more compact and walkable communities. However, the addition of new transit priority lanes, a factor of success for BRT, through road widening, may impact the trees and other green infrastructure where the right-of-way is limited. This trade off could have a negative impact on the ability for the Municipality to achieve the objectives under the *Urban Forest Master Plan*.

With zero-emission electric buses, tailpipe emissions are eliminated, but upstream emissions from power generation are sustained. Therefore, the annual greenhouse gas reduction is approximately 53 to 63 tonnes of equivalent CO_2 per BEB purchased. This is equivalent to reducing annual greenhouse gas emissions by 59% on a per bus basis. Electric buses also reduce air and noise pollution compared to traditional diesel buses.

With the commitment of Nova Scotia Power to reduce their reliance on fossil fuel for electricity production, over time the charging of BEBs will produce even fewer greenhouse gas emissions.

ALTERNATIVES

Regional Council could choose to approve the framework for only one of either the Rapid Transit Strategy or Electric Bus Proposal, and only pursue one project at this time.

Regional Council could choose to request modifications to either the Rapid Transit Strategy or Electric Bus Proposal prior to adoption and/or seeking external funding partners. This may necessitate additional research and a supplemental report before proceeding, depending on the requested changes.

Regional Council choose could not to approve either the Rapid Transit Strategy or Electric Bus Proposal and could request that alternative projects be brought forward for consideration for the available funding streams.

ATTACHMENTS

Attachment A – Table – Summary of Relevant IMP Actions

Attachment B – Rapid Transit Strategy

Attachment C – Rapid Transit Strategy – Public Engagement Report

Attachment D – IMP Project Evaluation Scorecard

Attachment E – GHG Reduction Targets for Nova Scotia Power

A copy of this report can be obtained online at halifax.ca or by contacting the Office of the Municipal Clerk at 902.490.4210.

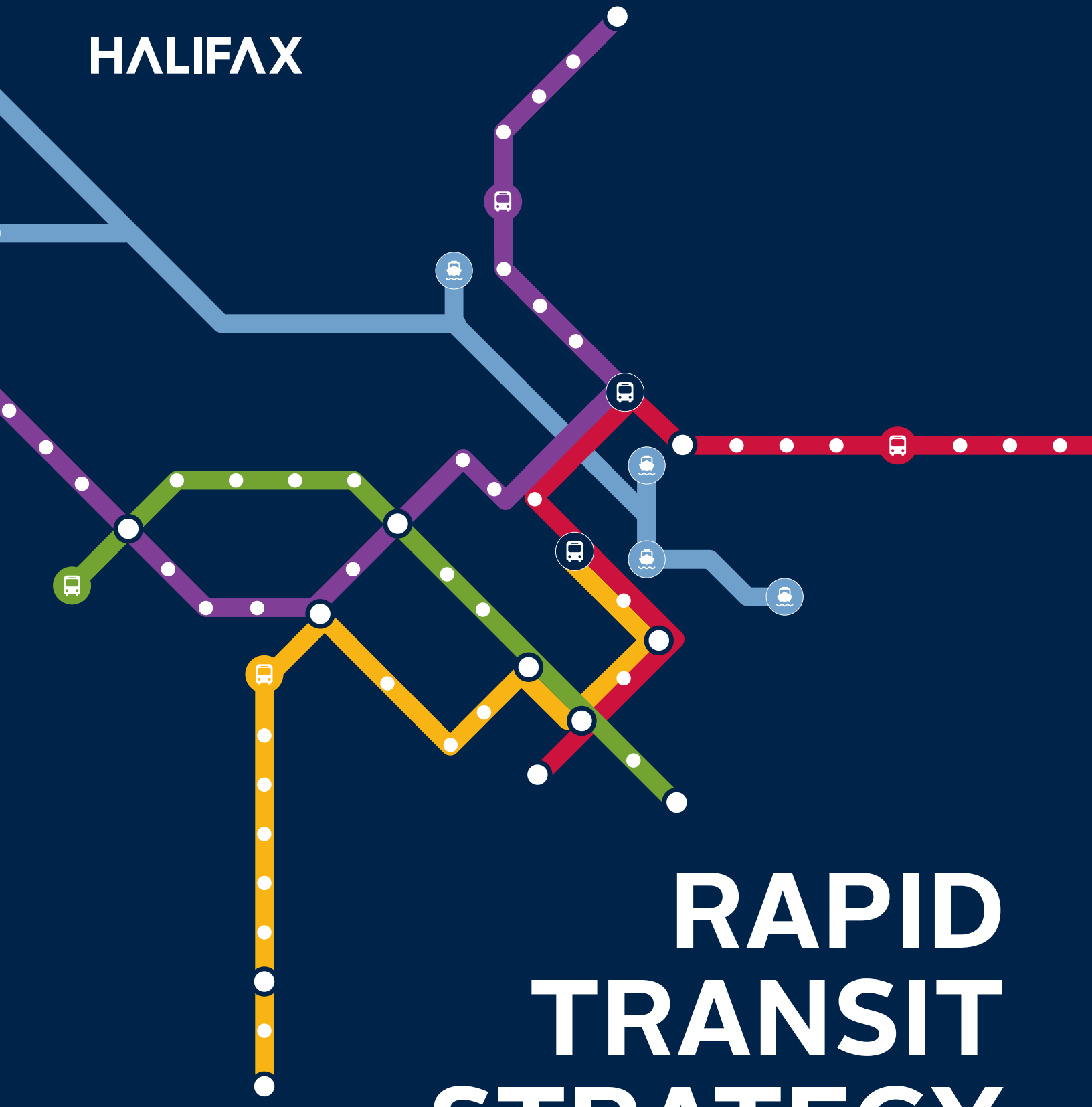
Report Prepared by: Patricia Hughes, Manager Planning & Customer Engagement, 902.490.6287

Attachment A:
Integrated Mobility Plan Actions Related to Rapid Transit Strategy (RTS)

Integrated Mobility Plan Action	**Action Status** (in the context of the RTS)
Action 90: Prioritize transit in locations, identified on the Transit Priority Corridors Maps (see Figure 20 of the IMP) through the use of transit priority measure (e.g. queue jump lanes, dedicated bus lanes).	Strategic Rapid Transit corridors are identified and prioritized as part of the *RTS*.
Action 91: Prioritize the delivery of Transit Priority Corridors, starting with but not limited to: Bayers Road (Romans Avenue to Windsor Street), Gottingen Street (North Street to Cogswell Street), Robie Street (Young Street to Inglis Street), Young Street (Windsor Street to Robie Street).	Implementation complete or pending for these key corridors. Additional strategic Rapid Transit corridors are identified and prioritized as part of the *RTS*.
Action 93: Implement the first phase of the Barrington Street Transit Priority Corridor in conjunction with the Cogswell Redevelopment project.	Barrington Street is identified as a Strategic Rapid Transit corridor. Implementation pending.
Action 96: Deliver a feasibility study of Bus Rapid Transit.	Complete (2019)
Action 97: Increase the priority of transit in the transportation network by implementing a BRT system in Halifax with dedicated bus lanes, based on the findings of the Bus Rapid Transit currently underway.	Implementation pending *RTS* approval and funding.
Action 98: Complete a rail capacity study for the Windsor Junction – Bedford – Halifax rail corridor in collaboration with rail industry stakeholders to better understand the costs and logistics of operating a Commuter Rail service in Halifax.	No longer being pursued as per Regional Council direction (2019).
Action 99. Continue to review the land use, fiscal and economic implications of higher order transit.	Higher order modes recommended as part of the *RTS*. Ongoing monitoring to continue.
Action 100: Study the feasibility of other commuter rail options for the Halifax region, including: extending commuter rail service into the core of downtown Halifax; and a Woodside – Downtown Dartmouth – Burnside rail service.	No longer being pursued as per Regional Council direction (2019).
Action 101: Conduct a feasibility study to analyze opportunities for a ferry connection between North Dartmouth and Downtown Halifax.	Preliminary feasibility study complete. Further analysis pending *RTS* approval and funding.
Action 102: Continue to monitor ridership trends and consider opportunities to upgrade sections of the network to higher order modes.	Higher order modes recommended as part of *RTS*. Ongoing monitoring to continue.
Action 121: Identify “Strategic Corridors” – existing road corridors that are key to regional traffic flow, transit, goods movement and active transportation – and develop plans to guide their development over time.	Strategic Rapid Transit corridors are identified. Functional plans for these corridors are prioritized as part of the *RTS*.

Attachment B

HALIFAX



RAPID TRANSIT STRATEGY

MAY 2020

Executive Summary

The Rapid Transit Strategy is Halifax Regional Municipality's (HRM) plan to build a Rapid Transit system by 2030.

The Strategy builds on the vision of the *Integrated Mobility Plan (IMP)*, aiming to improve sustainable transportation options and better support population growth. It invests in high-quality transit service and infrastructure, a key to improving residents' mobility and building more sustainable, affordable, and equitable communities.

Rapid Transit is fast and reliable transit service that typically operates in a dedicated right of way and can shape land use patterns by attracting development near stations and terminals. It gets you where you want to go, when you want to go, faster and more frequently—seven days a week.

The Strategy establishes a Bus Rapid Transit (BRT) Network, proposes new ferry service, and sets a direction for land use policy to align with Rapid Transit.

APPROACH

The Strategy is a collaboration across HRM, led by Planning & Development and Halifax Transit. The approach integrated best practices in transportation and land use planning, transit design and analysis, and an intensive engagement program.

The proposed network is strategically aligned to serve the areas in Halifax most suitable for Rapid Transit and to align with other sustainable transportation priorities such as active transportation.

Benefits of Rapid Transit

IMPROVES MOBILITY OPTIONS

- Provides more reliable, frequent, faster, connected, and easier to use transit service.
- Makes many types of trips possible, not just downtown commutes.
- Costs significantly less to passengers than driving.

ORIENTS LAND USE TOWARD TRANSIT

- Encourages development around stations and terminals, bringing more prospective riders and starting a transit-supportive cycle of development.
- Promotes complete communities where residents can live, work, shop, learn, and play within the community.
- Reduces the need to invest in road infrastructure to support demand for auto travel.

MAKES TRANSPORTATION MORE SUSTAINABLE AND EQUITABLE

- Helps residents reduce vehicle use or forgo vehicle ownership, decreasing greenhouse gas emissions.
- Supports sustainable shifts toward more compact development patterns.
- Builds more equitable communities by providing mobility options for those unable to access private vehicles.

BUS RAPID TRANSIT

The proposed BRT Network consists of four fixed-route bus lines which will provide all-day service, including 10-minute frequency from 6am to 10pm. Lines will have fewer stops than local routes to reduce travel times. Extensive transit priority measures are proposed to ensure BRT can reliably compete with driving. Approximately 60% of the network is proposed to have transit priority lanes.

BRT will improve freedom of movement around the municipality, complementing local and express bus routes and increasing access to employment for many residents. Over 120,000 people and 100,000 jobs are within a short walk or roll of the BRT Network.

FERRIES

The Strategy proposes three new ferry routes, each connecting a new terminal to downtown Halifax. The routes will provide 15-min service at peak hours, with travel times generally better than driving. Single-deck catamaran ferries with a capacity of 150 passengers are recommended to provide safe and comfortable higher-speed operation.

The ferries will give commuters and other travelers in communities around the terminals a reliably faster way to get to and from downtown.

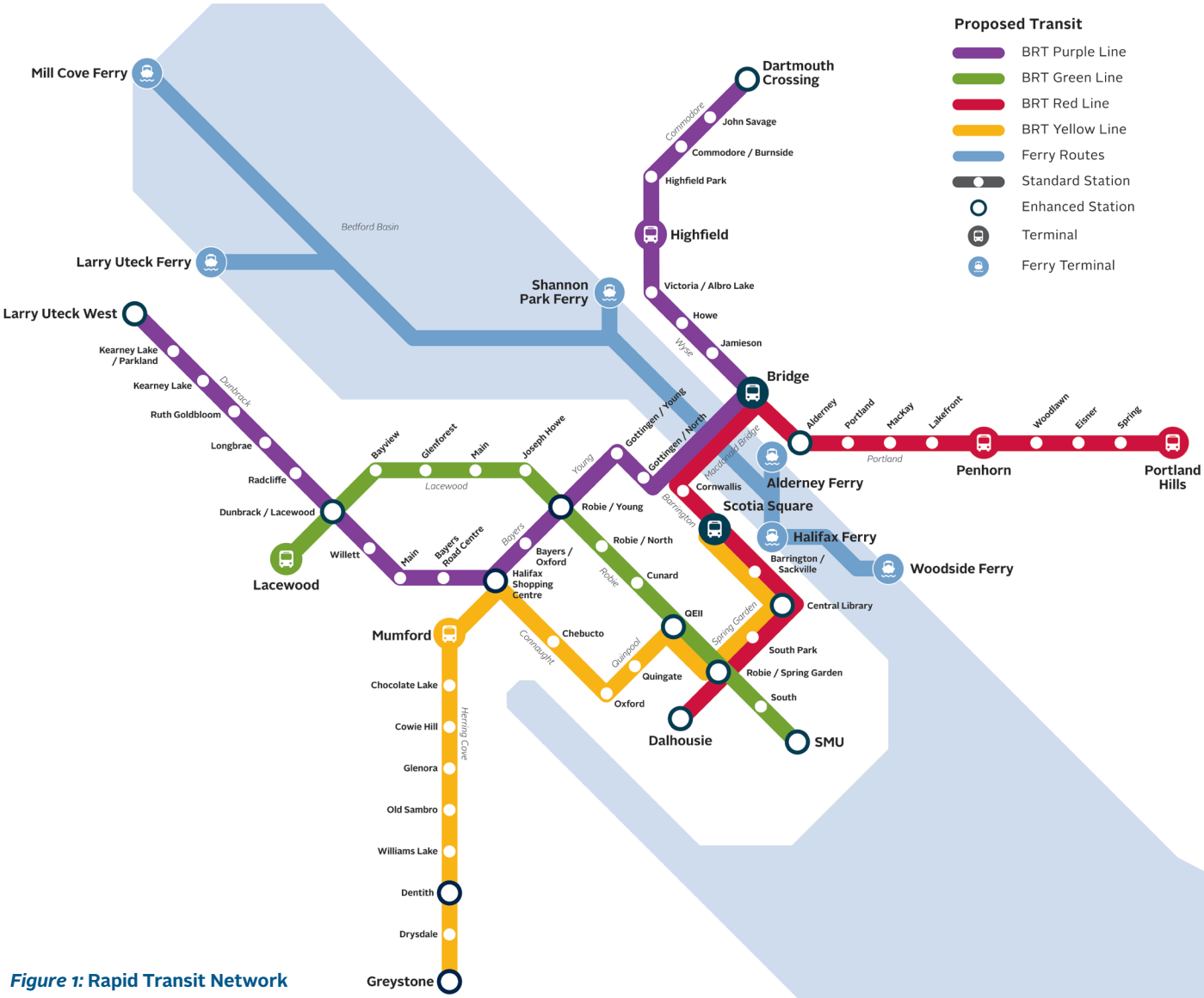


Figure 1: **Rapid Transit Network**

LAND USE

To create sustainable, transit-oriented neighbourhoods, land use policy and Rapid Transit must align. To achieve this, the Municipality will:

- Plan for higher-density mixed use development around Rapid Transit.
- Work to ensure that affordable housing and amenities are available near Rapid Transit.
- Improve the connectivity of local streets and the quality of active transportation infrastructure near stations and terminals.
- Pursue a long-term vision for Rapid Transit together with a long-term vision for land use.

IMPLEMENTATION

Delivering on Rapid Transit will be a large undertaking. It will involve several complex and interdependent activity streams, including creating transit priority lanes, purchasing new buses and ferries, and building BRT stations and ferry terminals.

BRT and ferry service are anticipated to be fully implemented in seven to eight years once funding is confirmed, with the first BRT line and ferry route launched in year three or four.

HIGH-LEVEL COST ESTIMATES

Like most transformative projects, the Rapid Transit Strategy will require substantial financial investment. Funding the Strategy will require partnering with other levels of government.

	CAPITAL INVESTMENT	ANNUAL NET OPERATIONAL COST
BRT	$189–217 million	$6–7 million
FERRY	$108–125 million	$9–15 million
NET TOTAL	$297–342 million	$15–22 million

NEXT STEPS

- Secure the necessary resourcing and funding from key partners to implement the Strategy.
- Initiate functional plans for BRT corridors and additional analysis for ferry service.
- Continue to aggressively pursue transit priority lanes on key corridors.
- Strengthen the relationship between Rapid Transit and land use planning through the *Regional Plan* review.
- Establish transportation reserve zones to preserve the right of way for strategic Rapid Transit projects.

1 INTRODUCTION

Transportation and land use decisions shape the lives of everyone across the Halifax region. Where we live and how we move are central to our quality of life and the social, economic, and environmental health of the municipality and its residents. Traditional patterns of land use and transportation decisions in Halifax, like most North American municipalities since the mid 1900s, have been focused on private vehicles.

In 2017, Halifax Regional Council endorsed a progressive new vision for the Municipality in the *Integrated Mobility Plan (IMP)*. This vision focuses on the movement of people rather than vehicles, strengthens the relationship between transportation and land use decisions, and provides an opportunity to rethink and redesign our transportation system and communities. Rapid Transit is a critical step in making this vision a reality.

The Strategy is the culmination of years of strategic planning and efforts to improve sustainable transportation options and increase mobility for residents. It aims to support population growth in a way that is more compact and less car-oriented, and ultimately more affordable and sustainable.

The Strategy:

- Establishes a Bus Rapid Transit Network, including four lines, station types and approximate locations, and a desired network of transit priority lanes (**Section 3**).
- Proposes new ferry service, including routes, approximate terminal locations and features, and vessel type (**Section 4**).
- Establishes policy direction for long-term land use patterns to support growth near Rapid Transit and for a future Rapid Transit vision coordinated with land use planning (**Section 5**).

Rapid Transit Project Goals

The Rapid Transit project set out three goals. This Strategy achieves two of the three and lays out a clear plan to achieve the third.

1. **Design a Rapid Transit Network to meet or exceed *Regional Plan* mode share targets**
2. **Encourage supportive land use patterns aligned with the Rapid Transit Network**
3. **Establish a long-term strategic vision for Rapid Transit**

   To continue through the Regional Plan review (see **Section 5***)*

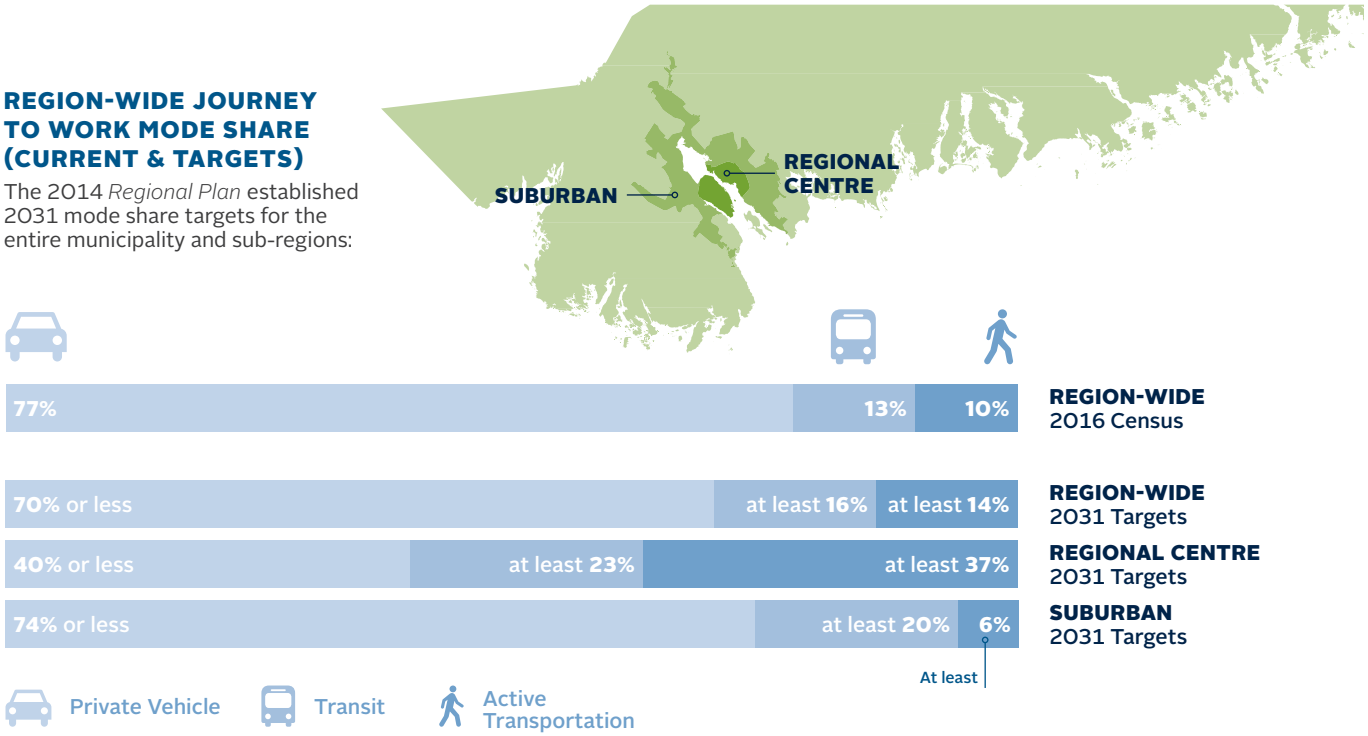


***Figure 2: Regional Plan* journey to work mode share targets**

1.1 What is Rapid Transit?

Rapid Transit is a fast and reliable transit service that typically operates in a dedicated right of way and can shape land use patterns by attracting development near stations and terminals. Examples of a dedicated right of way include transit priority lanes for buses and the Halifax Harbour for ferries.

The modes of transit included in this strategy are Bus Rapid Transit (BRT) and new ferry service. Rapid Transit services will complement other types of transit service, each serving different purposes.

BUS RAPID TRANSIT

BRT is fast, frequent, all-day bus service which allows people to move around the municipality easily and reliably. BRT lines will make a limited number of stops at major destinations and intersections, allowing buses to move people around more quickly than regular transit service. These lines will operate in transit priority lanes wherever possible to avoid congestion and improve travel times and reliability.

FERRIES

The proposed ferries will offer fast, direct connections across the Bedford Basin to downtown Halifax and between Shannon Park and downtown Halifax using vessels capable of higher speeds than current Halifax Transit ferries. The new ferry service is intended to initially be focused on peak commuting hours, but could evolve over time subject to demand.

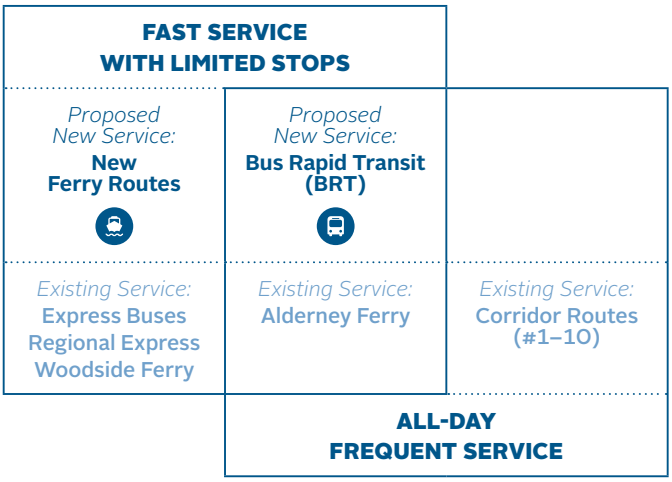


***Figure 3:* Existing and proposed service types**

	BUS RAPID TRANSIT	PROPOSED FERRIES	EXPRESS ROUTES	CONVENTIONAL BUS SERVICE
PURPOSE	Provide high-quality, frequent service to dense urban and suburban areas	Serve commuters traveling between downtown and areas around the harbour	Serve commuters traveling between downtown and suburban and rural areas	Provide transit service to many areas across the municipality
SCHEDULE FREQUENCY	High frequency all-day	High frequency at peak hours Some off-peak service	Peak hours only (possibly some off-peak service)	Moderate to high
STOPS	At major destinations and intersections (500m–1km spacing)	Direct downtown service from terminals	Limited, typically at origins, terminals and destinations	Every few blocks (200m spacing)
LANES	Dedicated bus lanes where possible	Halifax Harbour	Usually mixed traffic	Usually mixed traffic

Figure 4: **Comparison of Rapid Transit to other transit service types**

1.2 Why is Rapid Transit important?

IMPROVES MOBILITY OPTIONS

Rapid Transit means public transit that gets you where you want to go, when you want to go, faster and more frequently—seven days a week. Rapid Transit is built on five core transit characteristics: reliability, frequency, lower travel times, connectivity, and legibility. The Rapid Transit Network will improve on current service in all five of these characteristics.

In addition to typical commuting trips, the Rapid Transit Network can be easily used for more complex travel patterns including recreational and social trips, running errands, and work trips that fall outside of peak hours and on weekends.

How the Rapid Transit Network will improve mobility:

Reliability

- Using transit priority lanes and the harbour to avoid congestion helps keep service on time.
- High frequency buses provide more opportunity to make connections.

Frequency

- Frequency of the BRT service means people do not have to rely on a schedule—they can just show up at a station and catch the next available bus.
- Frequency also means people can easily transfer to another line or route, providing access to more destinations.

Lower Travel Times

- Transit priority lanes and fewer stops mean that BRT is more competitive with auto driving times, especially in peak hours.
- The ferry service will offer a faster commute to downtown than driving for many residents.

Connectivity

- The BRT lines are connected to each other in many places, meaning easy one-transfer trips are possible to many destinations.
- The BRT and ferry will connect with local routes to serve additional areas.
- All BRT stations and terminals will be accessible and provide shelter, seating, and amenities for passenger comfort.

Legibility

- A simple network helps riders understand and fully utilize Rapid Transit.
- Named, colour-coded lines and named stations (e.g. Halifax Central Library) help riders understand how to use the network.

ORIENTS LAND USE TOWARD TRANSIT

Traditional patterns of suburban development and transportation planning reinforce a cycle of auto dependency. Approximately 81% of suburban Halifax residents drive to work, largely because their communities have been designed primarily around private vehicle use. Auto dependency leads to traffic congestion, mobility challenges for those without vehicles, and unsustainably dispersed patterns of development. As the municipality continues to grow, it must manage its growth to avoid compounding these issues.

Breaking the cycle of auto dependency and replacing it with a transit-supportive cycle helps communities become more financially and environmentally sustainable. Rapid Transit is the key. Building Rapid Transit stations and transit priority infrastructure highlights the Municipality's commitment to providing permanent, high-quality service on the network, giving developers confidence to invest in surrounding neighbourhoods.

In turn, development near a station provides more opportunities for people to live or work near Rapid Transit. This leads to new transit riders, driving up demand for transit and continuing the cycle of transit-supportive land use.

This investment in Rapid Transit must also be coordinated with land use policy to enable and encourage growth around stations and terminals. **Section 5** discusses how the Strategy will shape land use policy to emphasize walking, biking, and transit to create healthier and more attractive Rapid Transit-oriented neighbourhoods.

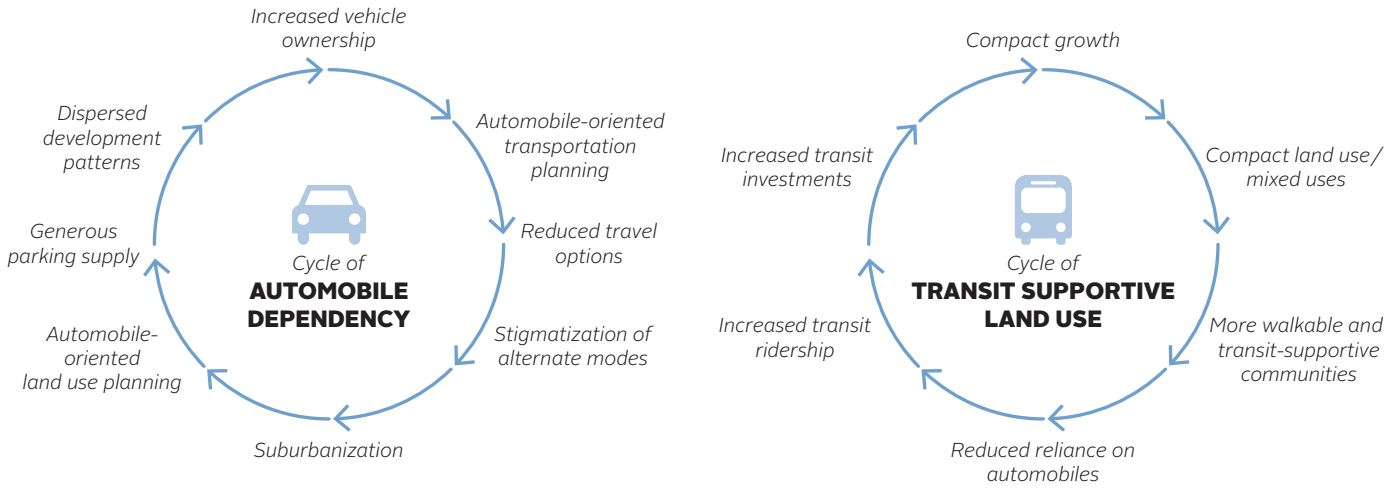


Figure 5: **Cycles of auto-dependent and transit-supportive land use**

Ridership vs coverage in transit planning

There are two key drivers of transit service design: ridership and coverage. There is a tradeoff between these goals. The more resources that are directed towards one goal, the less can be directed to the other.

- Aiming for **ridership** means serving the most people in a cost-effective and efficient manner. To do this, agencies put routes directly through the most populated areas, connect important commercial areas, and provide frequent service.
- Aiming for **coverage** means providing access to as many households in a given area that are within a certain distance (usually 500 metres) of a transit stop. Coverage routes often meander through lower-density residential neighbourhoods where an increase in service will not attract many more riders.

Halifax Transit aims to balance both of these goals with its service; however, **this strategy is about ridership.** Rapid Transit is a service model that is used to achieve ridership goals, and is not an effective tool in areas being served to meet coverage goals.

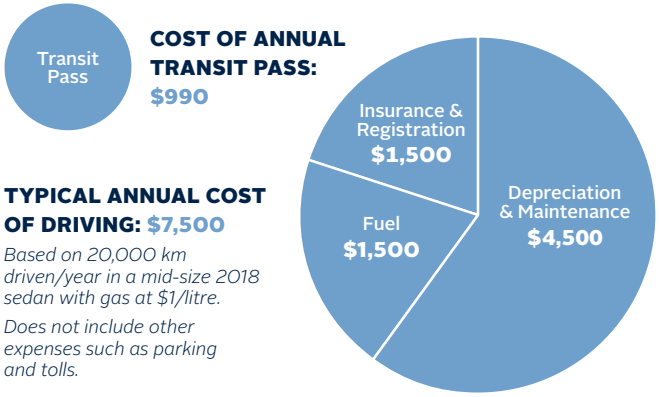
MAKES TRANSPORTATION MORE SUSTAINABLE AND EQUITABLE

In 2019, the Municipality declared a climate emergency. Urgent and profound action is required across multiple sectors including transportation to address the crisis. *HalifACT 2050*, the Municipality's proposed long-term plan to reduce emissions and help communities adapt to a changing climate, recognizes that along with transitioning to electric vehicles and renewable energy sources, shifting travel to transit and active transportation is necessary to tackle the climate crisis. The Rapid Transit Strategy, along with the *IMP* and the *Active Transportation Priorities Plan*, will play a key part in creating a more sustainable transportation system and achieving the Municipality's goals for climate change mitigation.

Over-reliance on private vehicles is a significant source of greenhouse gas emissions in the municipality. Transportation generates approximately 19% of all GHG emissions in HRM, with most coming from non-commercial vehicles. By providing a competitive travel option, Rapid Transit will help many residents reduce their auto use or forgo vehicle ownership, decreasing energy consumption and greenhouse gas emissions. Halifax Transit is also developing a fleet electrification strategy to transition to electric buses, further helping reduce emissions.

Changing land use patterns to emphasize transit-oriented development is also a move toward sustainability. More compact neighbourhoods require less road, water and sewer infrastructure, cost less to service, and generate lower greenhouse gas emissions per person than sprawling suburbs. The increased density and commercial options in transit-oriented communities will make it easier for residents to walk or roll to local amenities and destinations, further supporting a shift toward sustainable modes of travel.

Rapid Transit and the shift from car dependence also helps build more equitable communities. Auto-dependent communities typically have limited mobility options for those that are unable to access private vehicles, particularly youth, the elderly, residents living with financial strain, persons with disabilities, those who are new to the country, and other marginalized populations. Creating walkable, transit-friendly communities provides greater freedom and mobility to all residents. More mobility and lower transportation costs increase communities' connectivity and resilience to adverse events.



SOURCE: *CAA Driving Costs Calculator*

Figure 6: **Cost of transit vs. owning a vehicle**

Common questions about Rapid Transit

Why not build more roads?

The traditional approach to transportation planning aims to reduce congestion by building more roads and widening existing ones to meet demand.

However, as road capacity is increased to accommodate more vehicles, additional drivers choose to use the road, creating more traffic. This is commonly referred to as **induced demand**. Evidence from cities around the world shows that providing more space for vehicles does not ultimately reduce congestion.

The Municipality's approach, as outlined in the *IMP*, emphasizes improving mobility through more sustainable travel modes such as transit and active transportation. This approach helps manage congestion, and more importantly provides residents with more options to move around.

Why BRT and not light rail transit (LRT)?

The capital cost to build LRT is substantially higher (as much as ten times) and requires more high-density neighbourhoods than Halifax currently has to be cost-effective. BRT is much faster to build and can be deployed across more corridors, so benefits will be seen sooner and by more residents.

Well designed, efficient BRT can offer many of the same benefits of LRT and can even be a precursor to rail-based transit in the future.

1.3 Where does Rapid Transit make sense?

Transit agencies offer a variety of transit service models, including Rapid Transit, express routes, local routes, and on-demand service, each appropriate for serving different land use and travel patterns. Rapid Transit is best suited to connect high density, mixed-use areas: locations where there are many people, jobs, and activities to support all-day frequent service.

The Strategy recommends Rapid Transit in areas where it can be most efficient and cost effective. It focuses on areas with immediate high anticipated ridership to support the proposed service levels and infrastructure investments.

High ridership and reliable, low travel times lead to a cost-effective service.

Parts of the municipality not well suited for Rapid Transit may still be served well by frequent corridor routes, commuter-focused service, local routes, community-based transit, ridesharing, or a combination of these options. The Rapid Transit Network can still benefit these communities indirectly, as residents can connect to BRT or ferry routes through local bus routes or Park & Ride lots. As well, local routes or express commuter service may use the transit priority lanes created for BRT to reduce travel time and increase reliability.

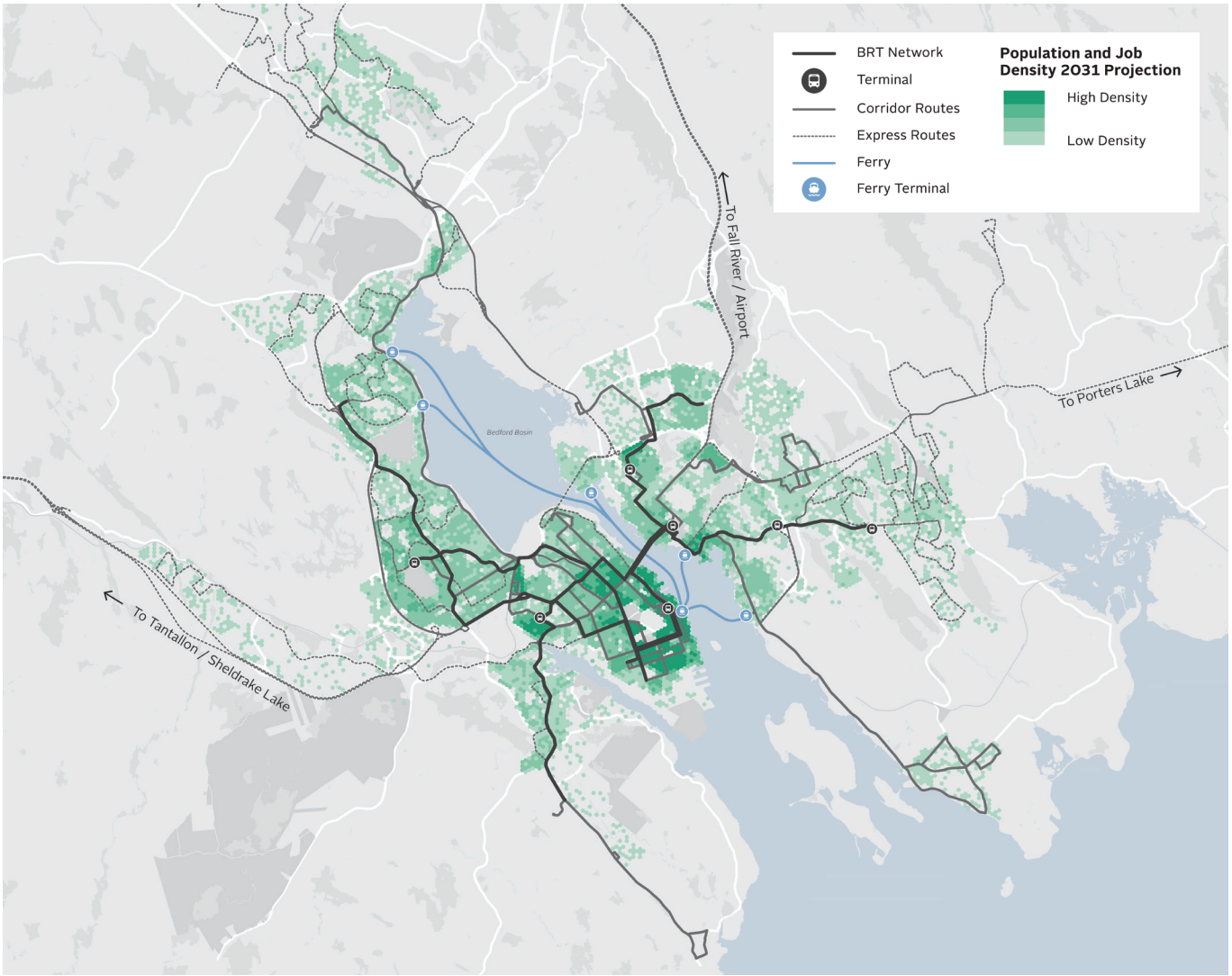


Figure 7: **Types of transit service across suburban HRM**

2 APPROACH

The Rapid Transit Strategy is the result of a collaborative project across municipal departments led by Planning & Development and Halifax Transit. It builds on a foundation of transportation and land use plans and studies completed over the last two decades. The project team's approach integrates best practices in transportation and land use planning, transit design and analysis, and an intensive engagement program.

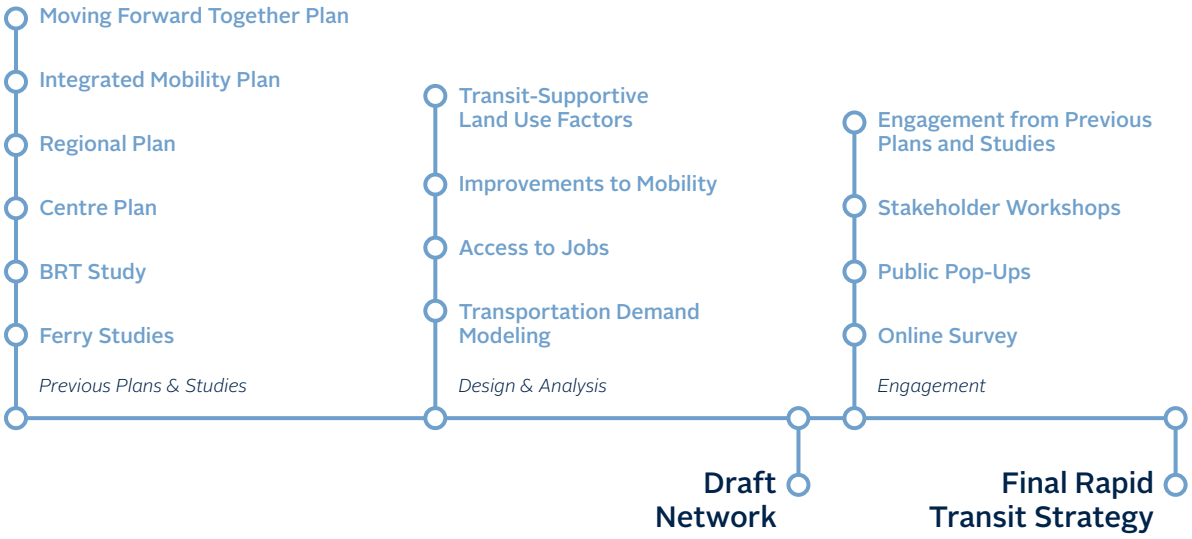


Figure 8: **Rapid Transit Strategy development process**

2.1 Previous Plans and Studies

The Strategy supports the objectives and builds on the achievements of key transportation and land use initiatives within the municipality. It is also supported by the knowledge gained from almost twenty years of studies exploring options for Rapid Transit in the Halifax region.

Moving Forward Together Plan

The *Moving Forward Together Plan (MFTP)*, guided by four transit principles, established a plan for frequent service on key corridors by creating Corridor routes 1 through 10. Though its implementation is not yet complete, the *MFTP* has been effective at promoting increased transit ridership, including an overall increase of 5% in 2018/19 and another 8% increase through the first half of 2019/20. The Strategy builds on the success of the *MFTP* and follows its principles by establishing faster, more reliable service on four high-demand lines.

Integrated Mobility Plan

The Strategy also builds on the *Integrated Mobility Plan (IMP)*, which aims to provide residents with integrated and connected travel options through a sustainable transportation network. The Strategy aligns with the *IMP's* pillars of integrated mobility, which are intended to guide transportation decision making. It also supports the *IMP's* emphasis on prioritizing alternatives to private vehicles. In addition to the primary focus of improving transit service, the Strategy supports multimodal trips through connections to active transportation. All-day frequent service on BRT lines also supports transportation demand management objectives by making it easier for people to travel outside of peak hours.

MFTP Principle	Increase the proportion of resources allocated towards high-ridership services	Build a simplified transfer-based network	Invest in service quality and reliability	Give transit increased priority in the transportation network
MFTP Actions	» Established corridor routes » Expanded express service	» Facilitated transfers on local/corridor routes » Made the overall network easier to understand	» Addressed capacity, frequency, and service span issues on existing routes » Planned for more reliable new local routes	» Invested in transit priority measures
Rapid Transit	» Upgrades the frequent service along key corridors, providing high ridership options in appropriate areas	» Improves network legibility and transfer options » Frequency allows easy transfers throughout the wider network	» Invests in highly reliable and high quality (fast, frequent) Rapid Transit lines	» Builds connected network of transit priority lanes for BRT Network » Establishes new ferry service to greater utilize the harbour

Figure 9: **Strategy's relationship to *Moving Forward Together Plan* principles**

IMP Pillar	CONNECTED	HEALTHY	AFFORDABLE	SUSTAINABLE
	Connects people, places, goods, and services	Safe, comfortable, and convenient for all ages and abilities	Investment is strategic and travel is affordable	Environmentally, socially, and economically responsible
Role of Rapid Transit	**Provide a frequent and reliable option for mobility**	**Provide safe and convenient access to amenities**	**Reduce reliance on private vehicles**	**Reduce transportation GHG emissions and enhance community resilience**
Ways to Achieve	» Serve high density population and employment corridors and nodes » Serve corridors with the capacity for sufficient land use intensification » Serve existing high ridership corridors » Serve corridors with suitable right of way to maintain speed and reliability » Locate stations to align with existing development patterns or support transit-oriented development	» Facilitate trips along the network between major trip generators with at most one transfer » Facilitate connections to stations and terminals by walking, rolling, and cycling for people of all ages and abilities	» Maximize the use of existing or planned transit priority lanes » Make targeted, cost-effective investments in the road network to improve transit travel time and reliability » Serve vulnerable populations where possible to reduce household expenses	» Align Rapid Transit with existing density and anticipated growth areas » Align long-term plans for growth with the Rapid Transit Network » Align the Rapid Transit Network with corporate climate change mitigation and adaptation initiatives

Figure 10: **Strategy's relationship to *Integrated Mobility Plan* pillars**

Land Use Plans

The *Regional Municipal Planning Strategy* (the *Regional Plan*) sets out a common vision, principles, and long-range region-wide planning policies outlining where, when, and how future growth and development should take place. Originally adopted in 2006, the *Regional Plan* provided the first comprehensive guide for future growth for the entire Municipality following amalgamation.

The *Regional Plan* established policy for a 25-year horizon, from 2006-2031, with minor reviews expected every 5 years. The first *Regional Plan* review was initiated in 2011 to make sure it still reflected the Municipality's goals for growth and development. The *Regional Plan* was readopted in 2014. The second five-year review is underway and work will continue over the next two to three years.

The *Regional Plan* is implemented through secondary municipal planning strategies and land use by-laws that apply to communities across HRM. The *Regional Centre Secondary Municipal Planning Strategy* (the *Centre Plan*) was designed to achieve the vision and guiding principles for the Regional Centre as set out in the *Regional Plan*. Based on further community engagement, the vision was refined and supported by four key core concepts of strategic growth, complete communities, pedestrians first, and human scale development.

The Rapid Transit Strategy responds to these plans and provides direction to upcoming planning efforts such as the *Regional Plan* review. By establishing where Rapid Transit will operate, land use planning can better direct growth to the areas it serves, which then reinforces the cycle of transit-supportive land use. **Section 5** explores the relationship between land use planning and Rapid Transit in more depth.

Previous Rapid Transit Studies

Previous municipal studies on Rapid Transit have explored ferry, BRT, and commuter rail.

- The idea of creating a ferry from the Bedford waterfront has been explored since at least 2003 and has been the subject of much analysis and discussion since.
- BRT has been considered since 2003, with a BRT-like MetroLink service introduced in 2005. A full BRT system including transit priority lanes has more recently been studied in depth.
- The feasibility of commuter rail was studied most recently in 2015. In 2019, Regional Council decided not to pursue commuter rail in the short term.

Two major studies provided the technical basis for the recommendations in this Strategy: the *Bus Rapid Transit Study* (2018) and the *Harbour Ferry Technical Feasibility Review* (2020). These studies provided options for each type of service along with technical analysis of their feasibility and impacts. The Strategy presents the Municipality's recommended approach based on these studies and work completed by staff.

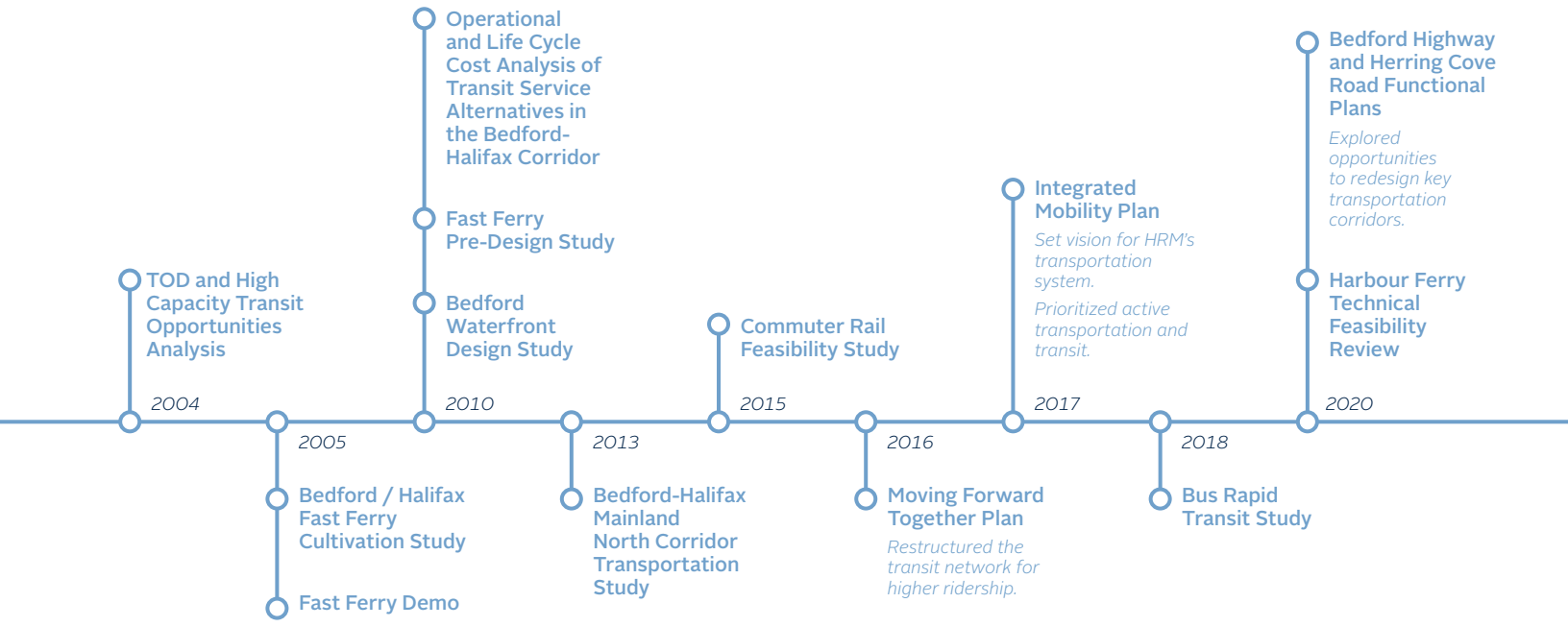


Figure 11: **Timeline of previous studies and strategies**

2.2 Design and Analysis

The project team developed draft Rapid Transit networks through an intensive design approach which took into account:

- Previous studies on BRT and ferry;
- The extensive public and stakeholder feedback collected by previous projects; and
- Factors relevant to the success of Rapid Transit, including those described below in **Figure 12**.

To create a final recommended network, the draft networks were compared to each other across these factors.

ANALYSIS OF IMPACTS

The project team analysed the potential impacts of the Rapid Transit Network compared to conventional Halifax Transit service (as per the *MFTP*). The results of these analyses are presented throughout the Strategy to explain the benefits of Rapid Transit.

This analysis considered impacts on:

- Residents' mobility: how effectively people can move around using the Rapid Transit Network.
- Access to jobs: how many jobs can be reached within a fixed time-frame by transit from any starting point.
- Mode share: the potential for Rapid Transit to change transit ridership and the proportion of travelers using transit.
- Climate change mitigation: the reduction in greenhouse gas emissions due to increased transit mode share.

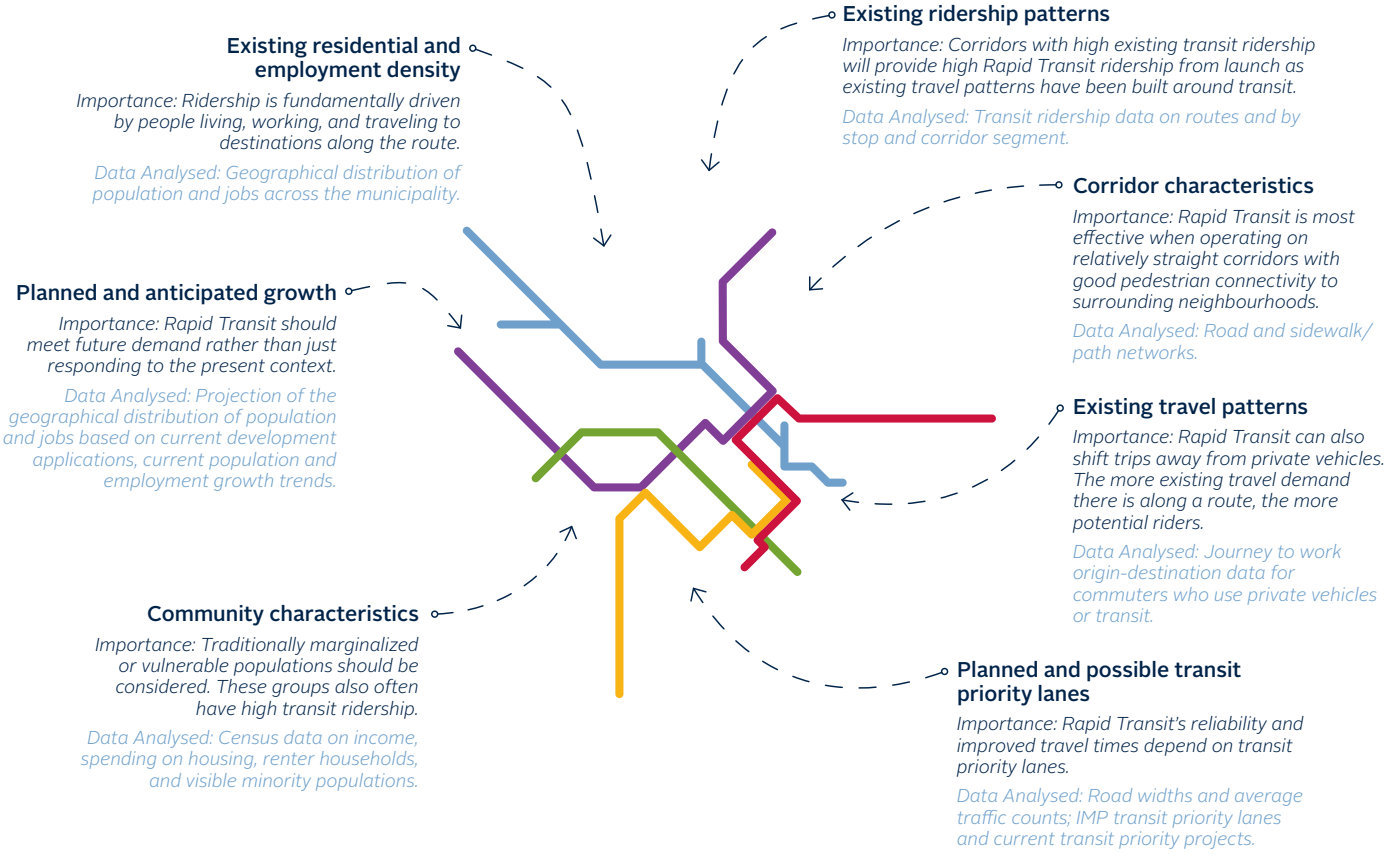


Figure 12: **Factors for Rapid Transit Network design**

INTEGRATION WITH ACTIVE TRANSPORTATION

The *IMP* recognizes the need to create multimodal transportation options with barrier-free connections to make a greater range of trips possible and convenient. For Rapid Transit, integration with other modes such as walking, rolling, and cycling are crucial as they bring passengers to and from stations.

The Rapid Transit Network aligns conveniently with the Municipality's existing and proposed bicycle network. Most stations across all four BRT lines will be located on or near the bicycle network, providing convenient and comfortable transfers across the Regional Centre. The Mill Cove and Larry Uteck Ferry Terminals would connect to a proposed multi-use path along the Bedford Highway, providing an active transportation connection for ferry commuters to reach different parts of Bedford.

The Municipality is studying shared micro-mobility options, such as bike sharing or scooter sharing, which could be installed at stations to make it even easier to combine other sustainable modes of transportation with Rapid Transit.

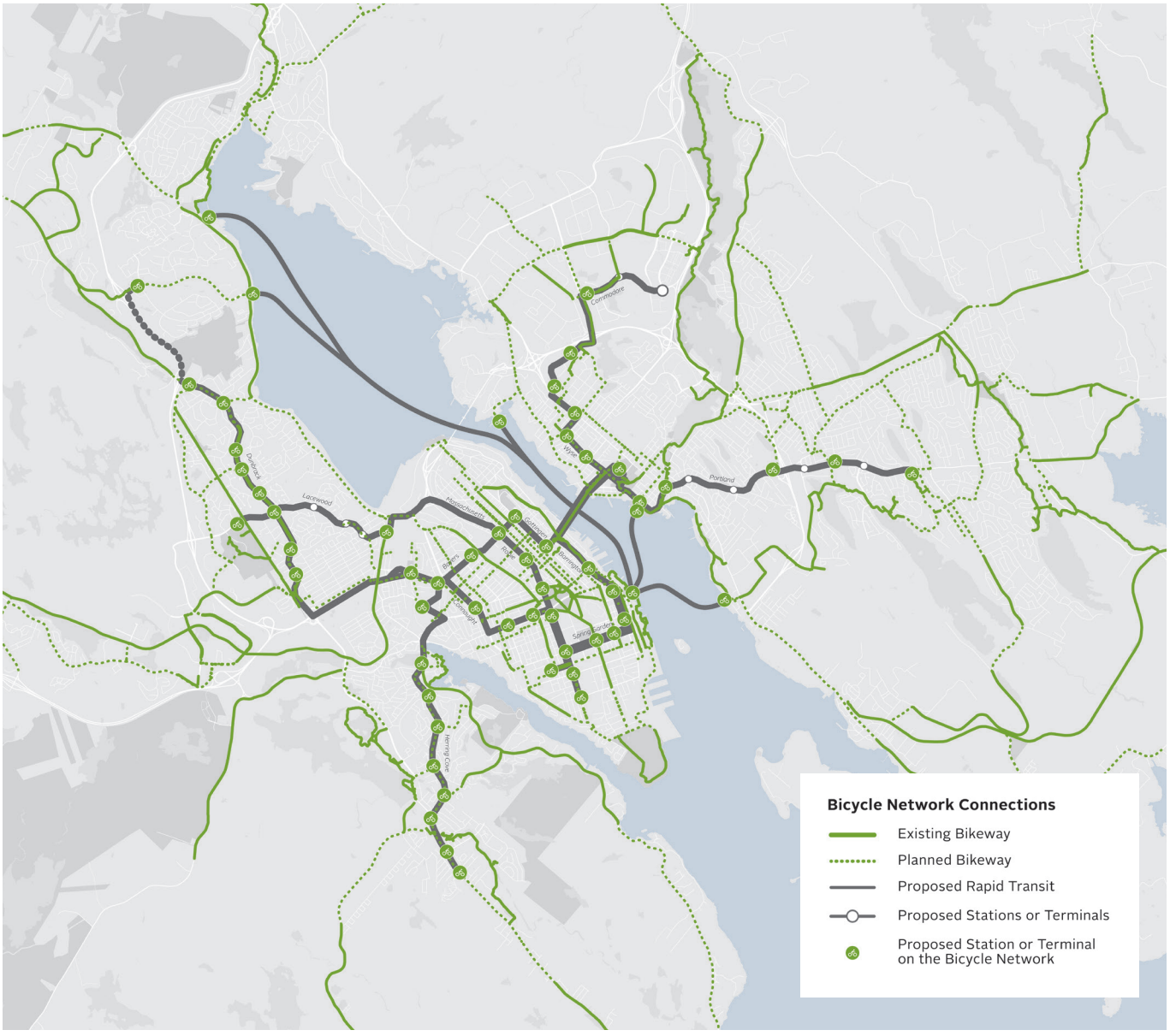


Figure 13: **Rapid Transit Network connections to bicycle network**

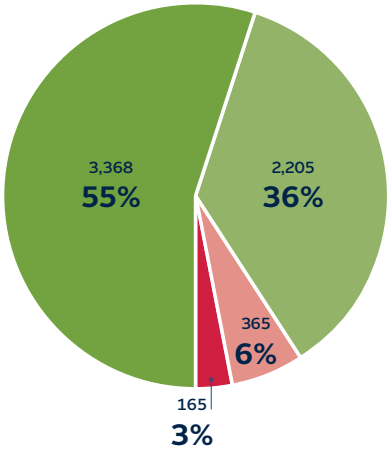
2.3 Engagement

The creation of the Rapid Transit Strategy included an intensive engagement process with stakeholders and the public. As the Strategy builds on significant work to date, the primary purpose of consultation was to identify gaps and areas of concern with the network and to gauge support for Rapid Transit. The engagement activities garnered a large amount of participation and broad support for the proposal.

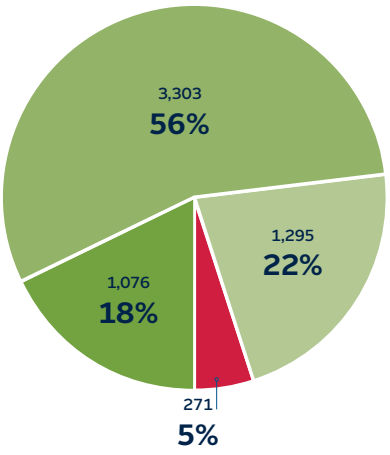
As part of the engagement process, community stakeholders were invited to two workshops in February 2020. Participants included representatives from business groups, institutions, advocacy groups, and other levels of government. A broader group of stakeholders were also invited to respond directly with suggestions or concerns by email.

The project team held nine public pop-up sessions in March 2020 in the different communities that would be served by the Rapid Transit network, and conducted an online survey in February and March 2020. The pop-ups reached over 900 people and the survey received 6,125 responses. A large amount of valuable feedback was collected, which was predominantly supportive of the project and proposed network.

Do you support the idea of creating this BRT Network?



How important do you think each ferry route is to the region?



"I believe this would be a great project fitting the size of our city. This project would help improve the commutes of everyone around HRM, as even residents of communities further away could take advantage of the bus lanes for the last portion of their trip into town. I am looking forward to seeing this plan come to life!"

– Survey respondent

Figure 14: **Public engagement insights**

Feedback from the survey, pop-ups, and stakeholder workshops contributed to an improved final network. Changes made as a result of feedback include:

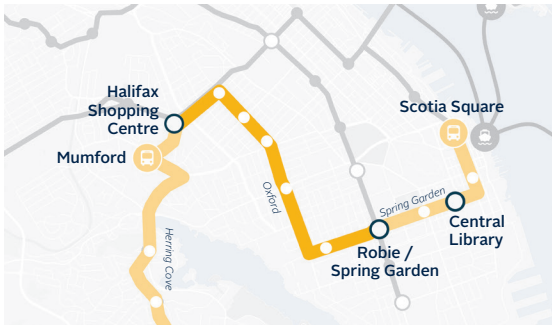
- **Yellow Line:** The draft network had two routing options for the Yellow Line between the Halifax Shopping Centre and Spring Garden Road: via Oxford and Coburg, or via Connaught and Quinpool. Approximately two thirds of survey respondents with a preference selected the Connaught-Quinpool routing, identifying factors such as access to hospitals, serving the Quinpool commercial corridor and concerns around the residential nature of Oxford Street. This routing is reflected in the final proposed network (pg 22).

- **Red Line:** As a response to the desire for Rapid Transit service to the institutional district west of Robie Street, the end of the Red Line was extended from Robie/ Spring Garden to Dalhousie University (pg 23). This route provides a direct connection between Dalhousie's Halifax campuses and to downtown Halifax and Dartmouth.

- **Purple Line:** Many respondents indicated a desire to serve areas of Bedford with BRT as well as a ferry. While the distance and disconnected road networks make it difficult to serve the entire area, the end of the Purple Line has been extended from Kearney Lake/ Parkland up to Larry Uteck Boulevard, where it will connect with Route 90 and serve residents of Bedford South (pg 20). Whether this extension will use Highway 102 or Kearney Lake Road will require further study.

- **Ferry Routes:** There was strong support for all three proposed ferry routes. Respondents supported the idea of using the harbour to reduce travel times and provide a reliable connection to downtown. The Strategy therefore recommends a phased implementation of all three routes (pg 31).

Oxford-Coburg Routing



Connaught-Quinpool Routing

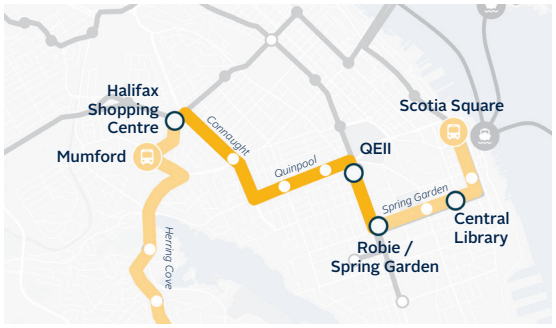
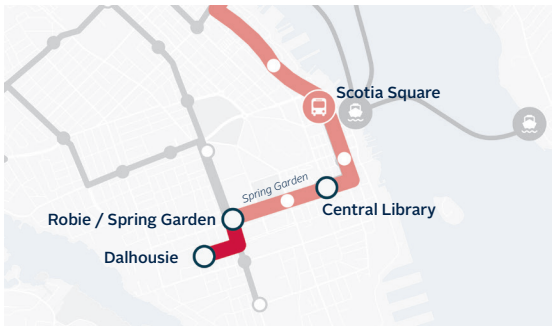


Figure 15: **Yellow line route options**

Dalhousie Extension



Larry Uteck Extension

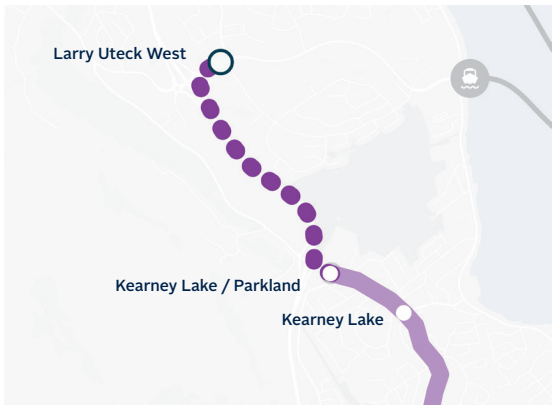
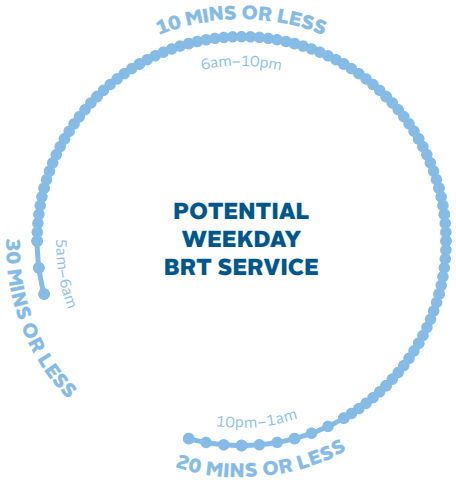


Figure 16: **Route revisions from engagement feedback**

3 BUS RAPID TRANSIT

Bus Rapid Transit (BRT) is an enhanced form of bus service that provides a fast, reliable, and convenient way to travel. BRT runs at high frequency throughout the day, and typically incorporates extensive transit priority measures (e.g. bus lanes, signal priority) that allow buses to avoid traffic congestion during busy periods.

Halifax's BRT Network will provide all-day service, including 10-minute frequency from 6am to 10pm. It will have convenient routing and transfers, and will include extensive transit priority measures and limited stops to make transit travel times more competitive with driving, especially at peak hours. The Strategy envisions that fares will be the same as conventional transit.



SATURDAYS	SUNDAYS/HOLIDAYS
30 MINS or less 5am–8am	**30 MINS** or less 6am–9am
10 MINS or less 8am–10pm	**10 MINS** or less 9am–8pm
30 MINS or less 10pm–1am	**30 MINS** or less 8pm–1am

Figure 17: **Proposed BRT schedule**

Vehicle requirements align with Halifax Transit's current buses. In alignment with the proposed fleet electrification strategy, the goal is to operate BRT with electric buses.

The simplicity of using BRT is a major strength. Passengers won't need a schedule in most instances, just the location of the nearest station and the direction of their trip. With ten minute frequencies, a bus will never be more than a few minutes from arriving.

The BRT passenger experience also benefits riders through:

- Comfort (e.g. enhanced bus shelters)
- Efficiency (e.g. off-board fare collection)
- Access (e.g. bus-level platform boarding)
- Information (e.g. real-time bus arrival signage)

BRT has been successful in cities around the world and is particularly suited to medium-sized cities like Halifax. It provides the benefits of Rapid Transit while being considerably more affordable than other forms such as light rail.

The proposed BRT Network has the potential to transform transportation in Halifax, better positioning the Municipality to achieve its mode share goals and sustainably accommodate future growth.

IMAGE *Ontario Ministry of Municipal Affairs*

3.1 The BRT Network

The proposed BRT Network consists of four lines that cover approximately 50 km, connecting peninsular Halifax and downtown Dartmouth with dense and developing suburbs on both sides of the harbour.

The network is accessible within a short distance from the homes of over 120,000 people and over 100,000 jobs. The vast majority of trips within this area are connected by at most one transfer.

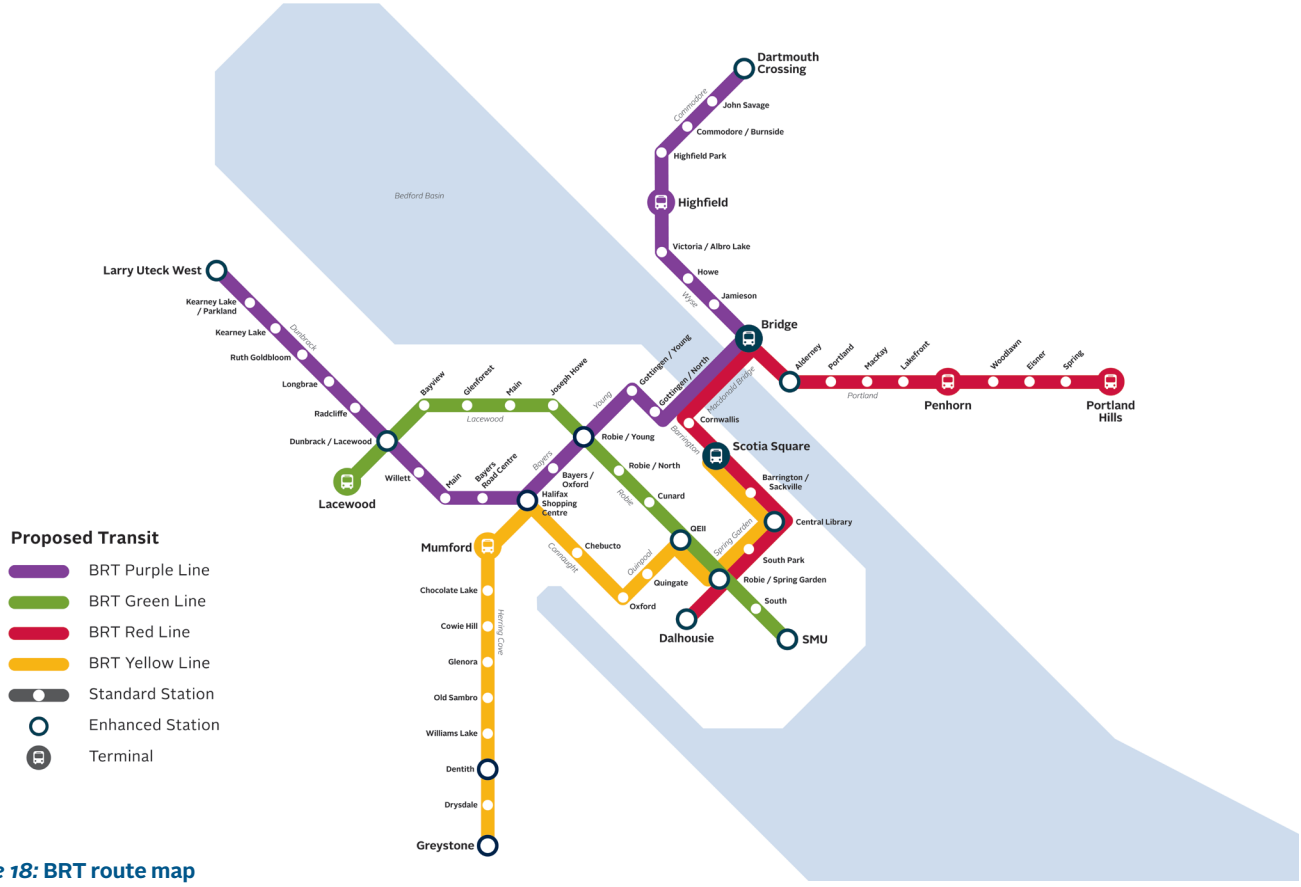


Figure 18: **BRT route map**

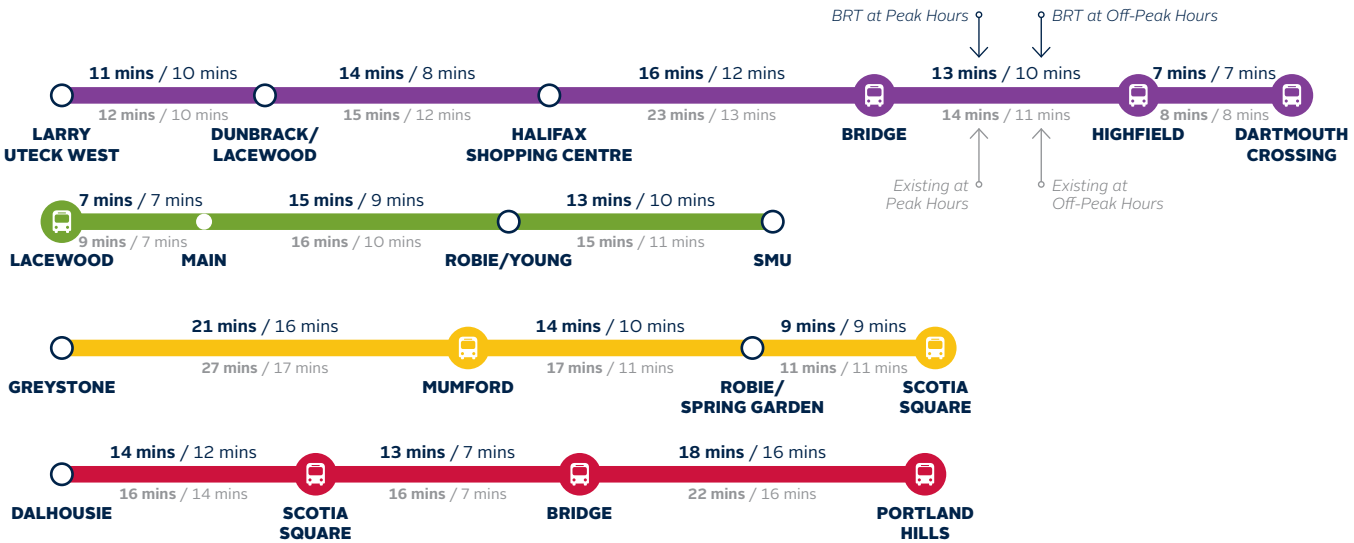
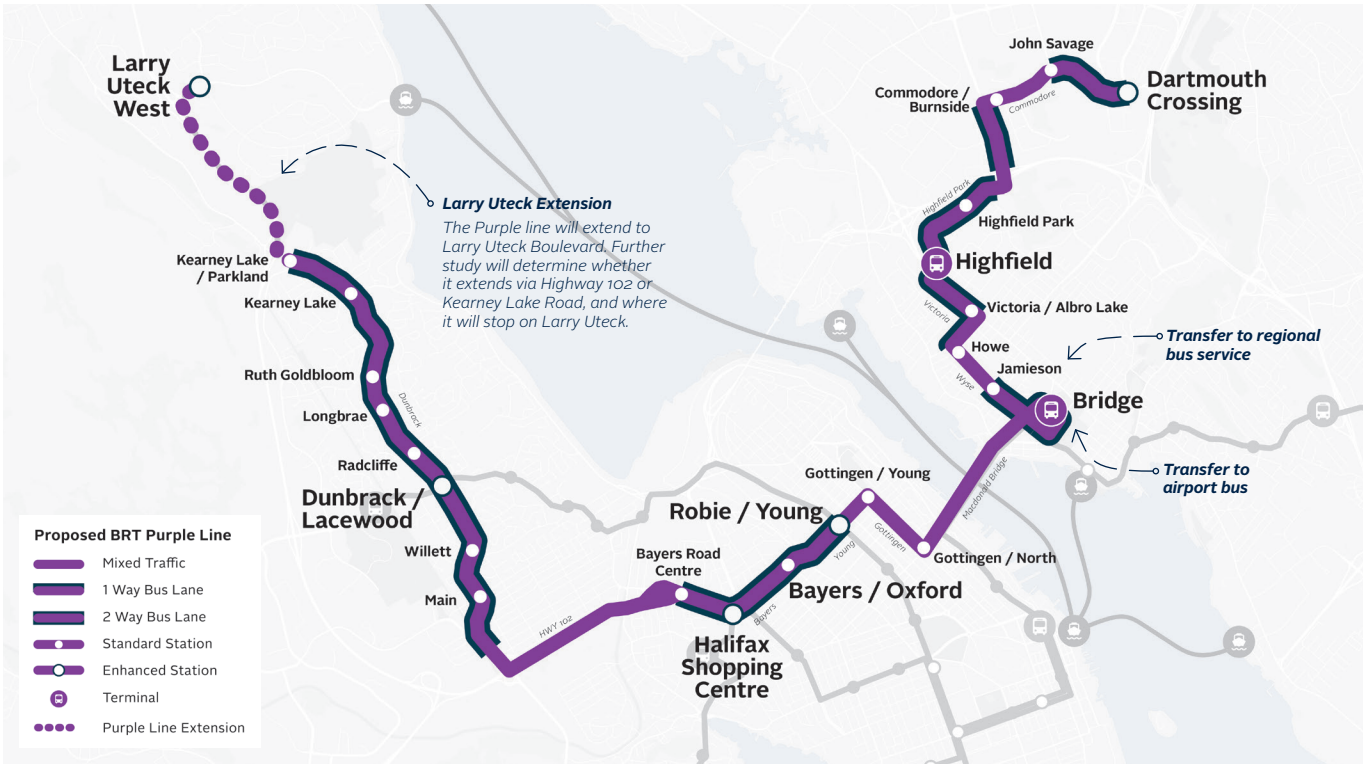


Figure 19: **Estimated BRT travel times**

PURPLE LINE

The Purple Line connects Clayton Park and Larry Uteck Boulevard with North Dartmouth and Dartmouth Crossing. It provides connections to the Yellow and Green lines for easy one-transfer rides to downtown Halifax and a connection at Bridge Terminal for a one-transfer ride to destinations throughout Dartmouth.

- Up to 26% improvement in travel time versus comparable bus routes
- 24 stations in each direction (35% fewer stops to improve travel time)
- Over 56,000 people and 35,000 jobs within 800m of Purple Line stations



Halifax Shopping Centre

Jamieson

Highfield

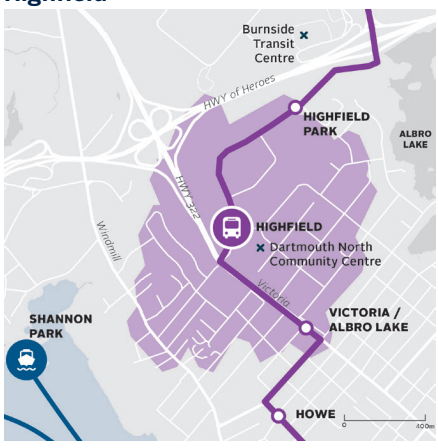
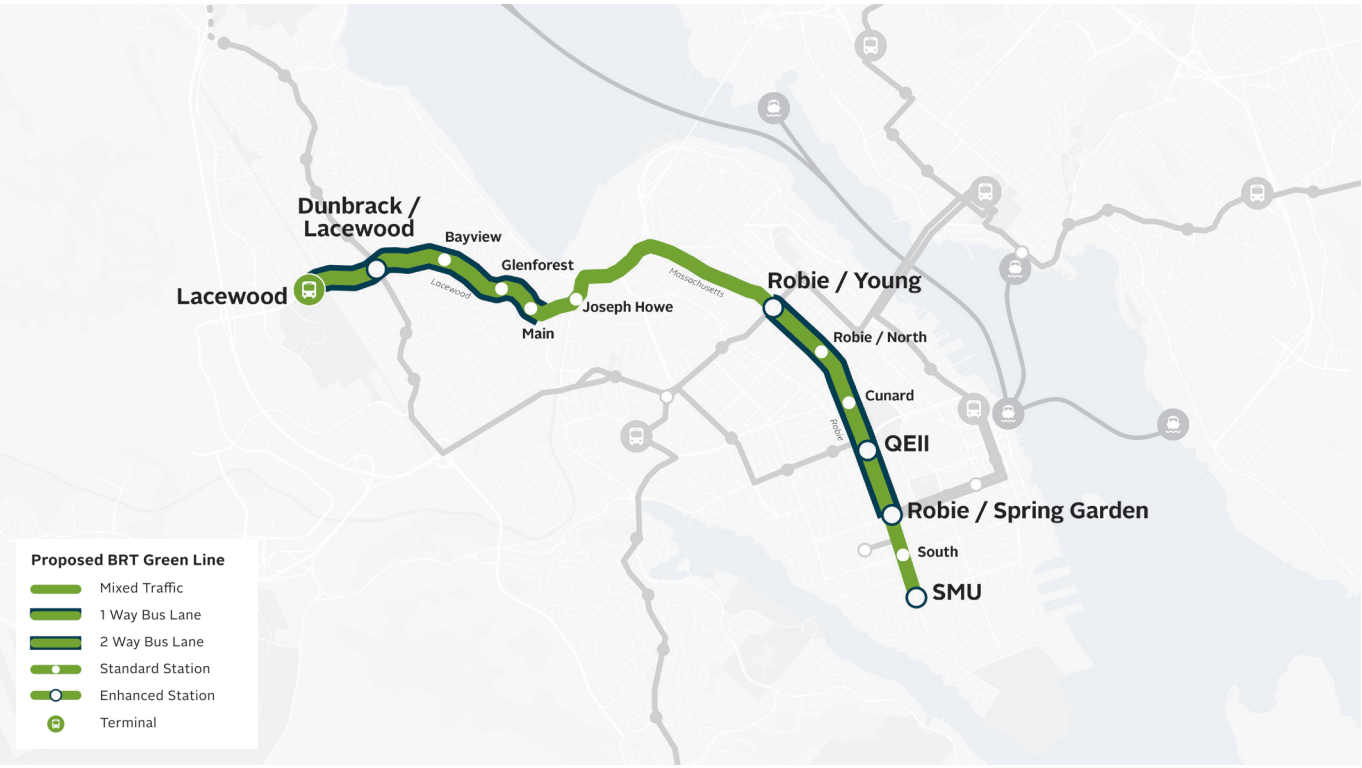


Figure 20: **Purple BRT line and 800 metre walk or roll around sample stations**

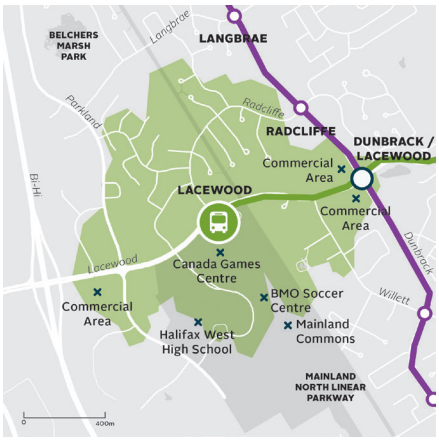
GREEN LINE

The Green Line connects Clayton Park with the southern peninsula via Lacewood Drive and Robie Street. It offers a direct connection between Lacewood Terminal and the many hospitals and universities on the peninsula, and an easy one-transfer ride to destinations via the Purple and Red Lines.

- Up to 13% improvement in travel time versus comparable bus routes
- 13 stations in each direction (52% fewer stops to improve travel time)
- Over 44,000 people and 40,000 jobs within 800m of Green Line stations



Lacewood



Robie / Young

SMU

Figure 21: **Green BRT line and 800 metre walk or roll around sample stations**

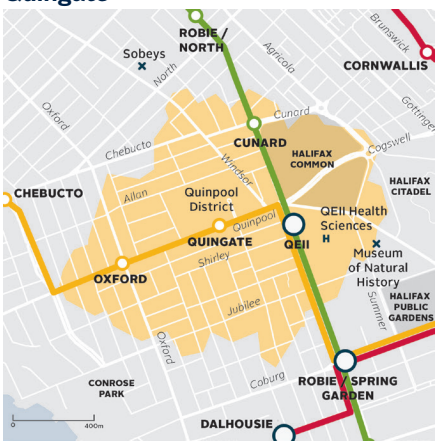
YELLOW LINE

The Yellow Line connects Armdale and Spryfield with downtown Halifax. It links many destinations on the peninsula, including the Halifax Shopping Centre, Quinpool Road, Spring Garden Road, and downtown Halifax. It also offers easy one-transfer connections to Dartmouth via the Red and Purple Lines.

- Up to 22% improvement in travel time versus comparable bus routes
- 19 stations in each direction (42% fewer stops to improve travel time)
- Over 47,000 people and 62,000 jobs within 800m of Yellow Line stations

Dentith

Quingate



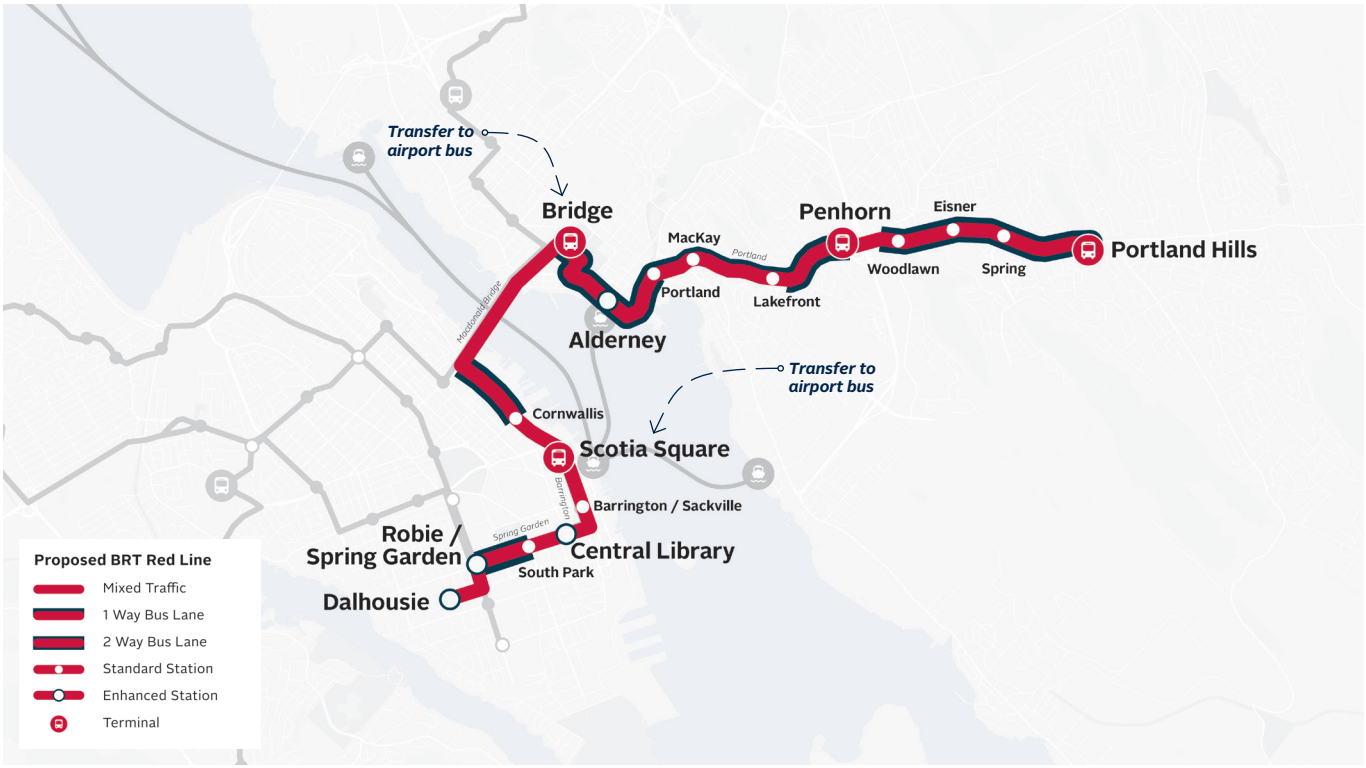
Central Library

Figure 22: **Yellow BRT line and 800 metre walk or roll around sample stations**

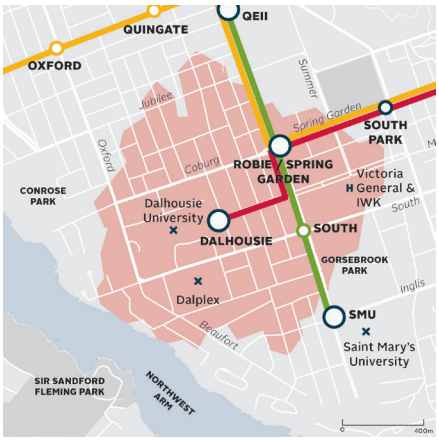
RED LINE

The Red Line connects Portland Street with downtown Dartmouth and downtown Halifax. It offers a direct connection between the Portland Hills Terminal and the downtown areas and Dalhousie, and provides an easy one-transfer connection to North Dartmouth via the Purple Line.

- Up to 17% improvement in travel time versus comparable bus routes
- 17 stations in each direction (50% fewer stops to improve travel time)
- Over 37,000 people and 61,000 jobs within 800m of Red Line stations



Dalhousie



Scotia Square

Alderney

Figure 23: **Red BRT line and 800 metre walk or roll around sample stations**

3.2 BRT Stations

A key feature of BRT service is the location and configuration of stations. BRT service makes fewer stops than regular bus routes, which improves travel time and allows for more investment in stations.

BRT stations will be designed for passenger comfort, ease of use, and visibility. Safety will be prioritized at all BRT stations and terminals. Safety measures will include lighting and may include security cameras and emergency contact systems.

All stations will be universally accessible, with safe connections for all users between sidewalks and the station. Additional features will include travel information in accessible formats and bus floor-level boarding platforms so riders with mobility assistance devices or strollers can easily board.

The BRT Network may implement all-door boarding, which can improve travel times by reducing the time a bus spends at each station. Halifax Transit is in the process of switching to the electronic fare collection necessary for all-door boarding.

The locations and designs of proposed BRT stations shown are approximate, and the exact locations and station designs will be determined through further planning and detailed design. Some stations may not be able to accommodate all features shown due to space constraints.

Standard BRT station

The standard BRT station will be a significant improvement over the current standard bus stop. While the basic design will be similar across the BRT network, each station will integrate into and connect with its surrounding area.

Enhanced BRT station

BRT stations with high ridership and at transfer points will be larger and provide more amenities than standard stations. They are also intended to become multi-use destinations rather than just places to wait. For example, stations may include small shops or a small park or plaza, they may be integrated into surrounding buildings, or they may emphasize a nearby attraction through their design.

Transit terminals

The BRT lines will also stop at Halifax Transit terminals, offering convenient transfers to many local routes. Current amenities at the terminals, such as indoor or sheltered areas and washrooms, will also serve BRT passengers. Terminals will be modified to include BRT-specific elements such as bus-level platform boarding, distinct visual signage, and real-time arrival information.

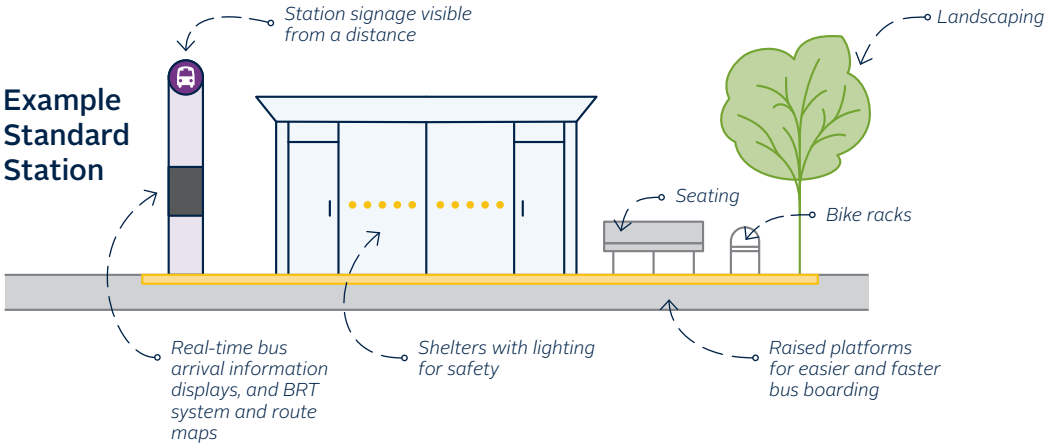


Figure 24: **BRT standard station design example**

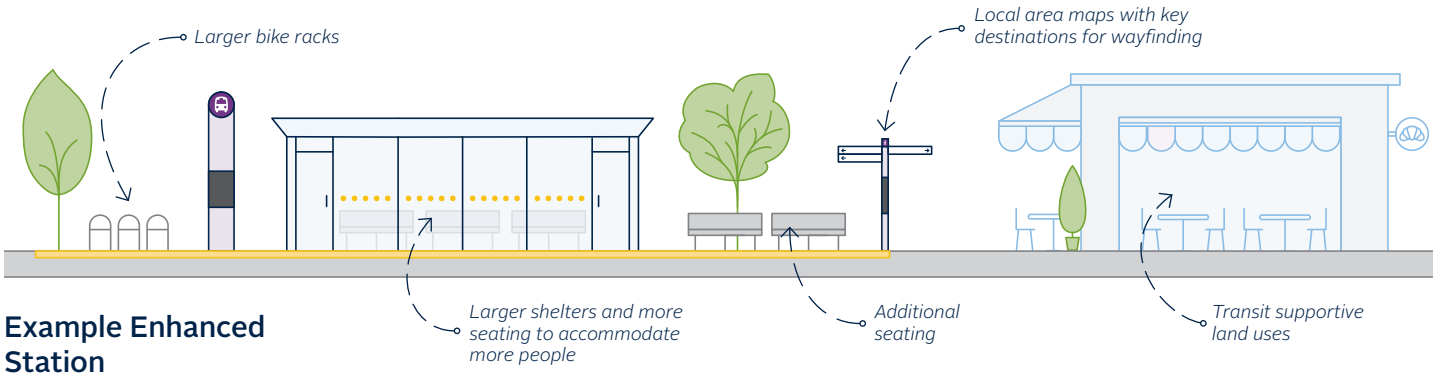


Figure 25: **BRT enhanced station design example**

3.3 Transit Priority Measures

BRT requires transit priority within the road network. This gives buses an advantage over vehicular traffic, which improves travel times and reliability. Transit priority is a core component of making BRT competitive with private vehicles and encouraging more people to use transit.

- **Transit priority lanes** are travel lanes dedicated for transit operation. Transit priority lanes enable buses to move more freely and reliably through the road network, bypassing traffic congestion that is usually at its worst during peak travel hours. Priority lanes are the most effective measure to improve bus speed and reliability during peak hours.

- **Transit signal priority** uses features including queue jump lanes and transit signal phases to reduce the amount of time buses spend waiting at intersections. Transit signal priority can give buses the ability to bypass traffic at an intersection via queue jump lanes, and proceed through an intersection before general traffic. It can also be used to detect the presence of a bus, providing a quicker or longer green light as the bus approaches. Transit signal priority is particularly important on parts of the BRT Network where buses will operate in mixed traffic.

The Strategy identifies a network of transit priority lanes to be created as part of the BRT Network. Many of these lanes are located at key pinch points in the road network that are the primary sources of delay for bus and vehicular traffic, particularly during peak hours. The aim is to provide full-time transit priority, though some lanes may permit other uses (e.g. on-street parking/loading) when overall congestion is reduced in a corridor.

Some streets that form part of the BRT Network either have too many physical constraints to implement transit priority lanes at this time or are not owned by the Municipality. On these segments, BRT will operate in mixed traffic. However, all BRT corridors should be pursued as opportunities arise for future improvements in transit priority.

Section 6.1 presents the Strategy's recommendations for the implementation of transit priority measures. Final decisions around transit priority lanes will require additional functional planning and detailed design work, and further study will be required to determine which intersections would benefit from the installation of transit signal priority.

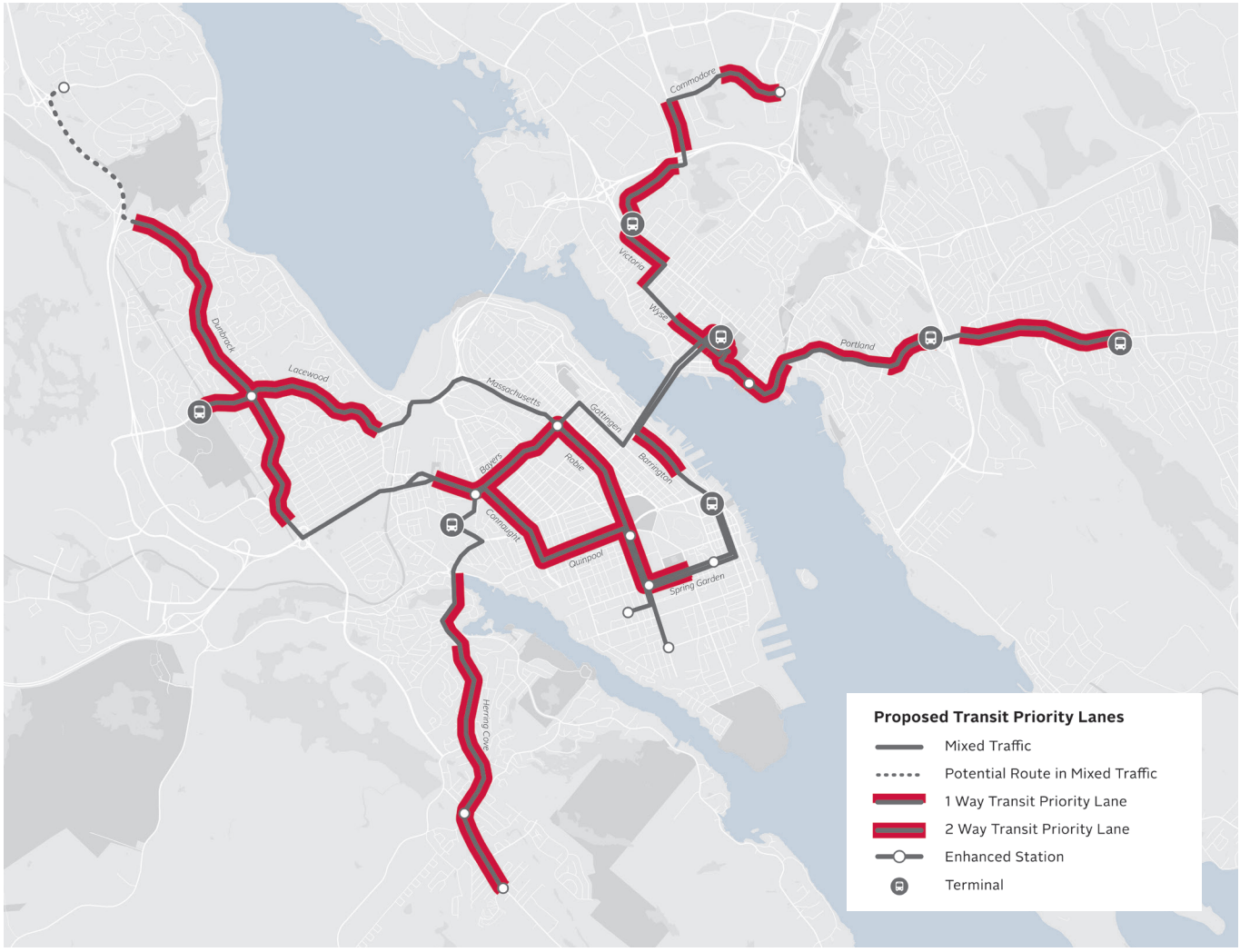


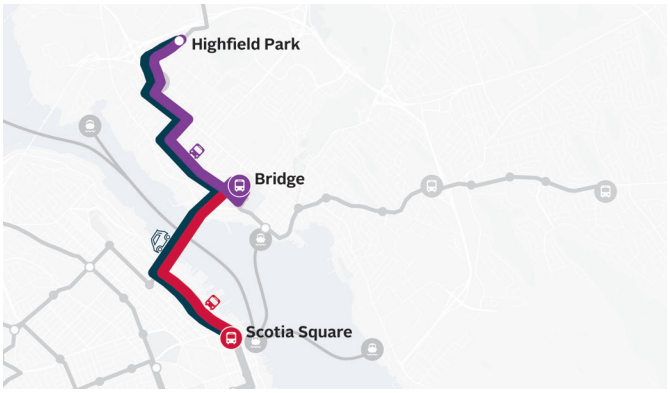
Figure 26: **Transit priority lanes**

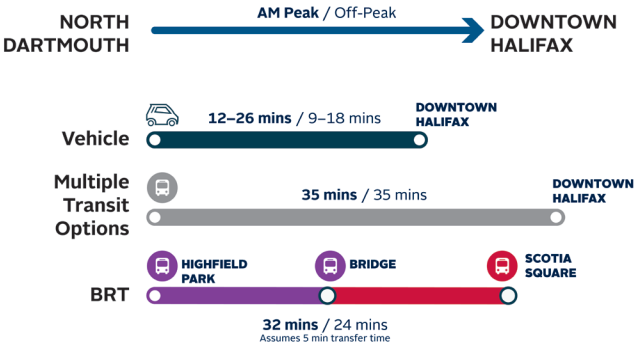
3.4 How BRT Improves Mobility

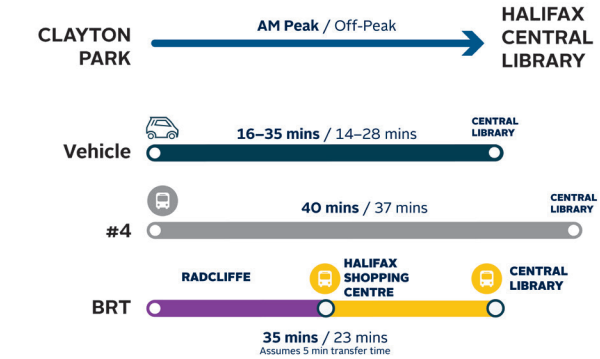
BRT improves freedom of movement around the municipality by being more reliable and more frequent, getting to destinations more quickly, and connecting to other routes more easily. More importantly, it does this all day, not just during peak hours.

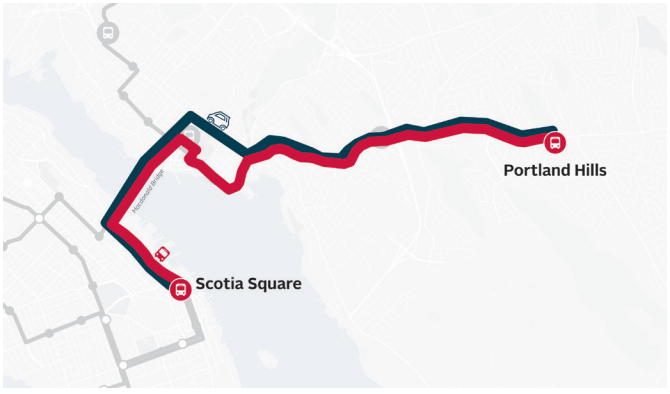
REDUCED TRAVEL TIMES

The BRT network will reduce travel times compared to current transit routes, so that traveling by BRT is more competitive with traveling by private vehicle.









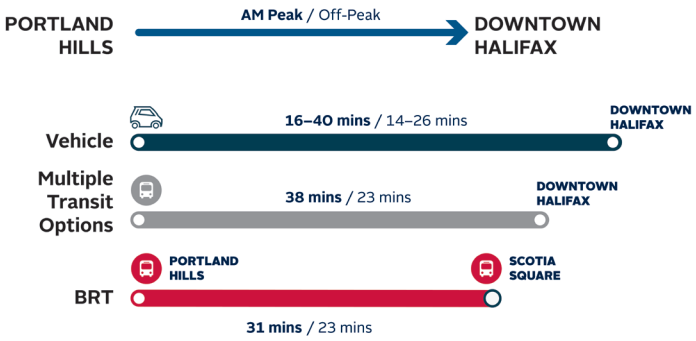
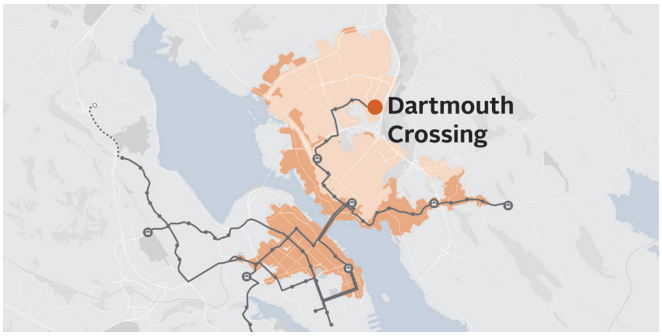


Figure 27: **BRT travel time comparisons**

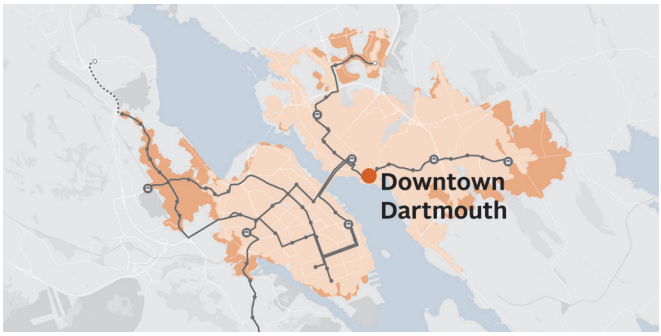
IMPROVED ACCESS

Reduced travel times and frequent service in the network increases the distance a passenger can travel by transit within the same amount of time. This can be illustrated by selecting a point in the municipality and mapping the locations that a passenger at that location can travel to within a certain timeframe.

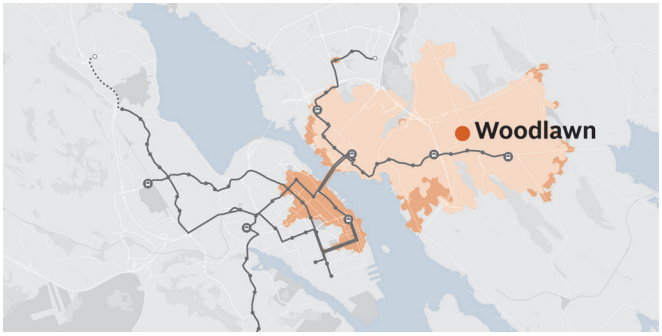
To illustrate this expansion, **Figure 28** shows the areas a passenger can access within 45 minutes by transit. This includes time spent walking or rolling, waiting at a station, and transferring. Areas are only included if the person can get there consistently between 6am and 9pm.



37,000 more people can access jobs at this location.

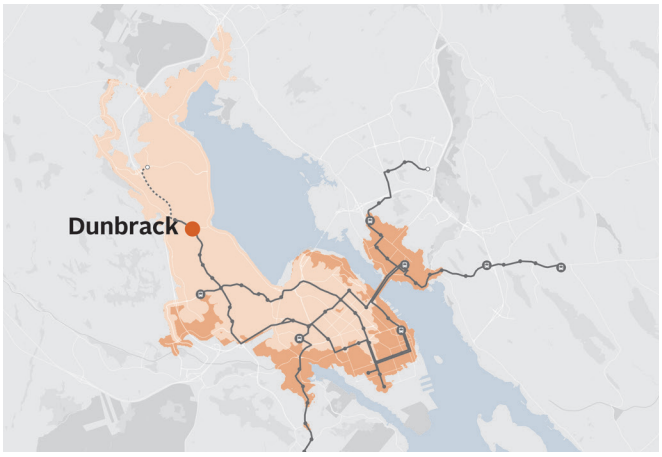


29,000 more people can access jobs at this location.

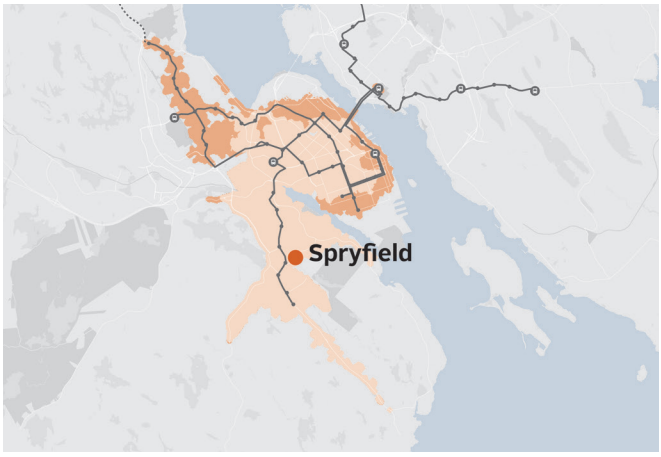


People living at this location can access 44,000 more jobs.

36,000 more people can access jobs at this location.



People living at this location can access 60,000 more jobs.



People living at this location can access 39,000 more jobs.

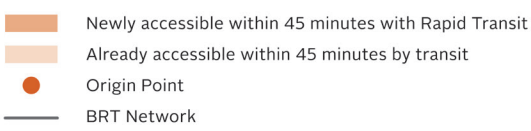
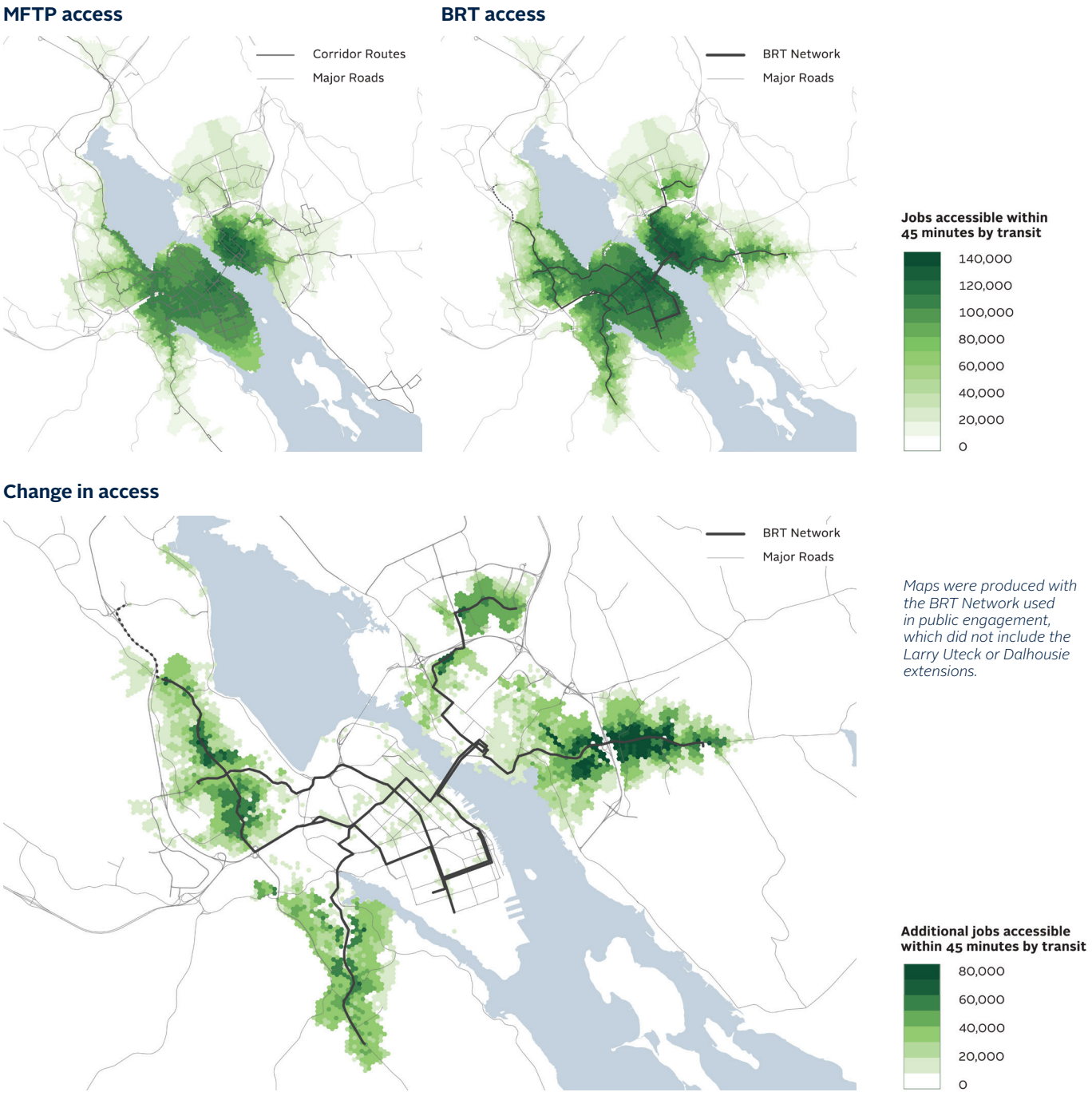


Figure 28: **Expanded access from selected origin points**

EMPLOYMENT OPTIONS

Figure 29 shows how the BRT Network improves access to jobs across urban and suburban areas. Each point on the map is shaded according to how many jobs are accessible all day within 45 minutes from that point. In some areas, the increase in employment options is dramatic: some households will see the number of jobs they can get to by transit in this time more than double.

The Halifax peninsula does not show a substantial increase in jobs accessible within 45 minutes since residents there can already get to major employment centres (e.g. downtown Halifax) by transit within that time frame. However, residents on the peninsula will also benefit from reduced travel times by being able to access more jobs within 20 or 30 minutes than they can now.



Maps were produced with the BRT Network used in public engagement, which did not include the Larry Uteck or Dalhousie extensions.

Figure 29: **Change to number of jobs accessible within 45 minutes by transit with BRT**

4 FERRIES

The Halifax region has always had a strong connection to its harbour. Ferries have linked Dartmouth and Halifax since the 1700s, and the modern ferry system was established in the 1970s by the City of Dartmouth. Given the success of existing ferry service, the high level of satisfaction among riders, and the natural advantages provided by the harbour, adding new ferry routes has been a popular idea for decades.

The Municipality has studied ferry service expansion several times in the past two decades. Investigations have revealed operational limitations including an inability to compete with driving times while maintaining safe operations and minimizing wake impacts. Recent advances in vessel design and technology have mitigated these limitations: smaller catamaran-type vessels, which can operate efficiently and safely at higher speeds, improve the feasibility of longer distance ferry routes and provide a promising service option.

The proposed ferry service offers rapid end-to-end travel for commuters and other travelers between origin terminals around the harbour and downtown Halifax. Frequency of service on the new ferry routes will be highest at peak, sailing every 15 minutes during weekday morning and afternoon peak hours. Between those times, the routes will run every 30 to 60 minutes depending on travel demand. Fares may have an added premium to reflect higher operating costs.

Expanding ferry service into the Bedford Basin could transform the way commuters from rapidly growing communities including Bedford and Sackville get to downtown, reducing pressure on the Bedford Highway and providing thousands of residents with a fast, comfortable, and sustainable way to reach their jobs, classes, or entertainment venues.

Figure 30: **Proposed ferry schedule**

IMAGE *Eric Kilby*

4.1 Proposed Ferry Routes

The Strategy proposes new ferry routes from three new terminals: Mill Cove, Larry Uteck, and Shannon Park. Routes from each of these terminals would connect directly to the Halifax Ferry Terminal in downtown Halifax. Locations shown for proposed terminals are approximate; exact locations will be determined through the implementation process.

The ferries are able to provide short travel times because they follow a direct route through the harbour and are not subject to traffic congestion. Travel times may be slightly higher on foggy days, but preliminary analysis suggests that the ferries' ability to stay on schedule will only be impacted in extremely low visibility conditions.

Mill Cove Ferry	Larry Uteck Ferry	Shannon Park Ferry
Mill Cove ↔ Downtown Halifax *around 18 minutes*	Larry Uteck ↔ Downtown Halifax *around 16 minutes*	Shannon Park ↔ Downtown Halifax *around 10 minutes*
Ferry service from Mill Cove has been proposed since the early 2000s. This route would serve existing travel demand from Bedford and Sackville and future development on the Bedford Waterfront. The terminal may have a Park & Ride facility to support ridership from a larger area.	*This route would serve the densely developed Larry Uteck area, which has grown significantly in recent years. As the waterfront area is constrained, the terminal would likely provide vehicle passenger drop-off but not parking.*	*The Shannon Park area is planned for redevelopment into a mixed residential and commercial neighbourhood. The substantial new density would create the opportunity for a transit-oriented community and provide significant ferry ridership. The route would be conditional upon and aligned with the timing of this development.*

Figure 31: **Proposed ferry routes**

4.2 Vessels

A new fleet of vessels will be required to support the three proposed ferry routes and will represent a significant capital investment in the service. Through the technical feasibility review, the Strategy has identified high-level characteristics of vessels which can provide the proposed service. Further work will establish specific procurement requirements that may vary from these descriptions.

The vessels are proposed to have a capacity of 150 passengers. They will have one enclosed deck to ensure faster loading and unloading, making ferry operations more efficient while improving passenger comfort and safety. The ferries will be universally accessible. Some space will also be provided for passengers to stow bicycles and strollers, encouraging active transportation options and family ferry travel.

VESSEL TYPE AND SPEED

Multi-hull catamaran ferries are used on most similar ferry routes around the world, and are recommended for the proposed service. Catamaran vessels can run at high speeds with low wakes, potentially traveling at 25 knots (46 km/h) in the Bedford Basin and 20 knots (37 km/h) in the Halifax Harbour. These speeds are key to short travel times and high peak-hour service frequency.

The ferries will comply with the operational regulations of the Halifax Port Authority and the Canada Shipping Act, including limits on safe speed of operation. The vessel procurement process will ensure that the vessel design will mitigate wake impact from higher-speed operation.

Different propulsion options, including electric vessels, will be considered through the implementation process. Halifax Transit will review evolving best practices and technology options to make new ferry service as sustainable as possible.

4.3 Ferry Terminals

A major investment required for the success of the new ferry routes will be the construction of new terminals and the renewal of the Halifax Ferry Terminal to accommodate additional service.

New terminals will have a similar design to existing Halifax Transit terminals, with secure passenger waiting areas, sheltered gangways, and staff to count passengers and ensure facility security. They will be universally accessible. Due to the lower vessel capacity, new terminals may be smaller than existing ones.

DEVELOPMENT AROUND TERMINALS

Mill Cove and Shannon Park offer development opportunities around the proposed terminal sites. Residential and mixed-use development around terminals would increase the potential ridership by providing homes and businesses nearby. **Section 5** further discusses the Strategy's recommendations for land use near Rapid Transit.

The Municipality will also explore opportunities to integrate terminals with public buildings in alignment with the ongoing assessment of needs for public facilities. A mixed-use municipal building like Alderney Landing could be a hub for the local community, increasing the activity in the area and making the terminal a destination.

GETTING TO THE FERRY

Active transportation and transit connections to the terminals will be prioritized to ensure potential riders can easily access the ferry. For example, terminals at Mill Cove and Larry Uteck will require active transportation connections over the CN Rail line. The terminals will become hubs for transit, served by local and express buses to bring people to and from the ferry.

The Municipality will also consider Park & Ride options at ferry terminals where there is space for parking, allowing more residents to utilize the service. Park & Ride will be considered both as an interim option as neighbourhoods around terminals are developed, and as a permanent feature. However, the priority will be to encourage ridership through transit-oriented development and connections to bus routes and active transportation.

HALIFAX FERRY TERMINAL

To accommodate an increase in ferry traffic and newly designed ferries, the downtown Halifax Ferry Terminal will require a redesign to improve accessibility, user comfort, capacity, safety, and security.

4.4 How Ferry Service Improves Mobility

The ferries will give commuters and other travelers in communities around the terminals a faster way to get around. Since the harbour effectively provides a dedicated travel way, ferry travel times will be reliably faster than using a private vehicle at peak hours.

Experience in Halifax and other harbour cities demonstrates that ferries are often a preferred mode of travel. The combination of the mode itself and the short, reliable travel times is expected to attract many people to commute via ferry.

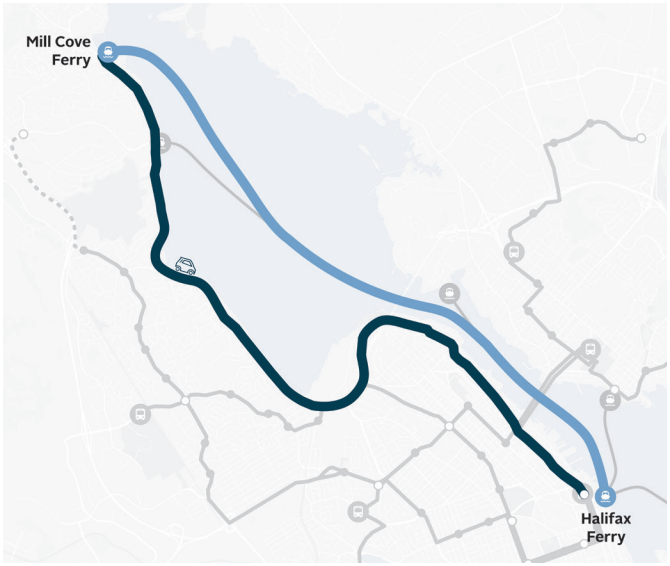
POTENTIAL RIDERSHIP

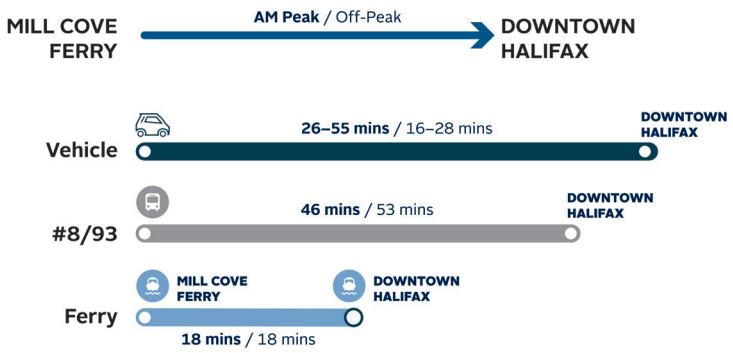
Each new ferry route could have ridership competitive with Halifax Transit's existing ferry service (2,200–3,500 boardings per day). The preliminary feasibility study's ridership projection model predicted over 2,000 boardings per day on both the Mill Cove and Larry Uteck routes, though this did not account for the additional density anticipated for the Mill Cove area nor Park & Ride, passenger drop off, or bus transfer passengers. Shannon Park will also have the potential for high daily ridership if it develops into a mixed-use community as currently proposed.

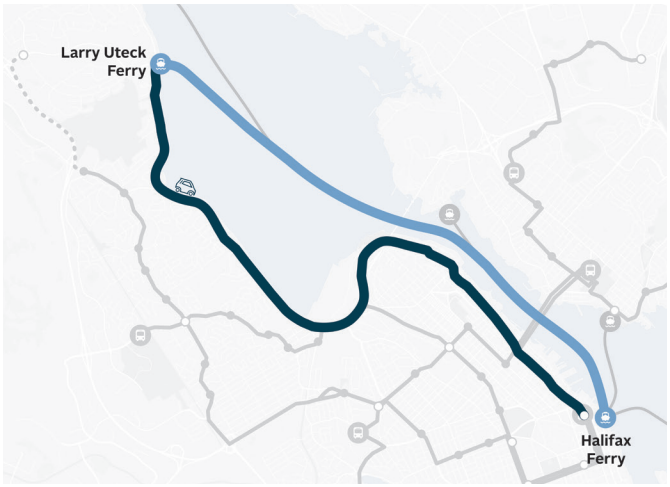
BEDFORD HIGHWAY

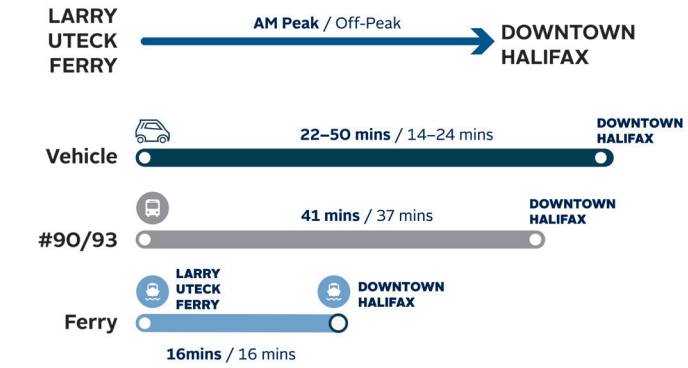
Most potential passengers of the Mill Cove and Larry Uteck ferry routes are expected to be commuters traveling between the Bedford area and downtown Halifax. For these residents, the main alternative is a trip by car or bus along the Bedford Highway, which is typically congested during weekday peak hours. The *Bedford Highway Functional Plan* (2020), which considered options to reconfigure the Bedford Highway corridor to better serve regional transportation needs, did not identify any viable solutions to increase its capacity by enough to meet current and future demand.

Unless alternatives are provided, population growth in Bedford and surrounding areas will increase congestion on the Bedford Highway, making commutes longer, increasing pollution, and impacting economic productivity. While ferries are not expected to solve congestion issues on the Bedford Highway, they will help mitigate the impact of future growth in Bedford by providing a viable travel alternative.









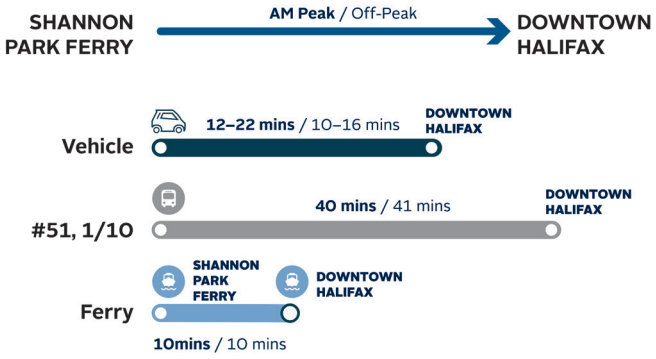


Figure 32: **Ferry travel time comparisons**

5 LAND USE

Land use and transportation are fundamentally related. Where people live and how they move about for their daily activities affects their personal finances, influences their work-life balance, and helps determine their carbon footprint. These factors are important for access to physical activity, social interaction, access to nature, and other aspects of health and well-being. At a regional scale, land use and transportation affect economic growth opportunities, environmental sustainability, and municipal finances.

The Halifax region is experiencing a period of relatively rapid population growth which is anticipated to continue in the near future. The *Regional Plan* projects that by 2031 HRM will gain over 69,000 people and 46,000 jobs. The Municipality is faced with the challenge of accommodating this growth in a financially, environmentally, and socially sustainable way.

The Regional Centre is already oriented toward transit: it is relatively dense, mixed-use, and walkable, and destinations are often close to each other along corridors. As a result, nearly half of its residents use active transportation or transit to get to work. As the municipality grows, the Regional Centre will be home to many new residents and jobs. The Rapid Transit Network aligns with the Municipality's *Centre Plan*, locating BRT stations in or near strategic growth Centres, Corridors, and Future Growth Nodes.

In comparison, suburban development in HRM has been oriented towards private vehicles. In order to safeguard the tranquility of residential neighbourhoods and optimize vehicle access, land uses were segregated, traffic was funneled onto a few wide arterial streets, and front yard parking dominated commercial streets. This development pattern discourages walking and cycling and makes public transit inefficient. That 81% of suburban residents commute by driving is not simply a result of individual preferences, but rather a consequence of years of planning for vehicles.

The region's anticipated growth offers an opportunity to create walkable, mixed-use suburban communities linked to the Regional Centre and each other by Rapid Transit. Rather than continuing with segregated land uses in widely dispersed communities, density can be integrated with supportive uses and focused around transit terminals and along strategic corridors, to help create more sustainable, transit-supportive land use patterns. To make this happen, transit investments must be coordinated with land use planning.

This section describes how the Rapid Transit Network will influence future land use planning as the Municipality moves towards its next *Regional Plan* review and develops a new plan for suburban areas.

5.1 Factors for Transit-Supportive Land Use

Understanding the relationship between settlement patterns and transit service is an important first step to achieving the high transit ridership needed to support Rapid Transit. Transit planners recognize several neighbourhood characteristics that are conducive to high ridership and efficient transit service: density, walkability, proximity, and linearity.

DENSITY

There is an obvious relationship between density and transit ridership. The more people live, work, or do activities around a transit stop, the more potential transit riders there are. This is because when more people live in dense neighbourhoods, they are also more likely to take transit, due to lower car ownership, increased traffic, or lifestyle choices. To achieve high ridership, transit needs to travel through dense neighbourhoods.

WALKABILITY

Getting to a transit stop requires walking or rolling on sidewalks, paths, or streets. While the limit to how far people will travel to access transit is different for each person, transit planners generally assume people will walk or roll up to 400–500 metres to a local bus stop and up to 800 metres to Rapid Transit.

The directness of the path to get to a station matters. Better-connected streets and pedestrian networks give people shorter paths to transit stops, encouraging higher ridership. Areas with grid-like streets, shorter blocks, and more intersections are usually better connected. As well, accessible street crossings (e.g. crosswalks, stops in close proximity to traffic signals) are important since riders must be able to access both directions of transit routes for return trips.

PROXIMITY AND LINEARITY

The more efficiently a transit route can connect neighbourhoods and destinations, the more riders it will attract and the more service it will warrant. The key elements to this efficiency are how close destinations are along the route (proximity) and how straight the route is (linearity). Connecting nearby destinations along a linear corridor takes less travel time, is less expensive and will draw more riders. To support transit ridership and efficiency, land use planning must encourage closely-spaced destinations along straight corridors.

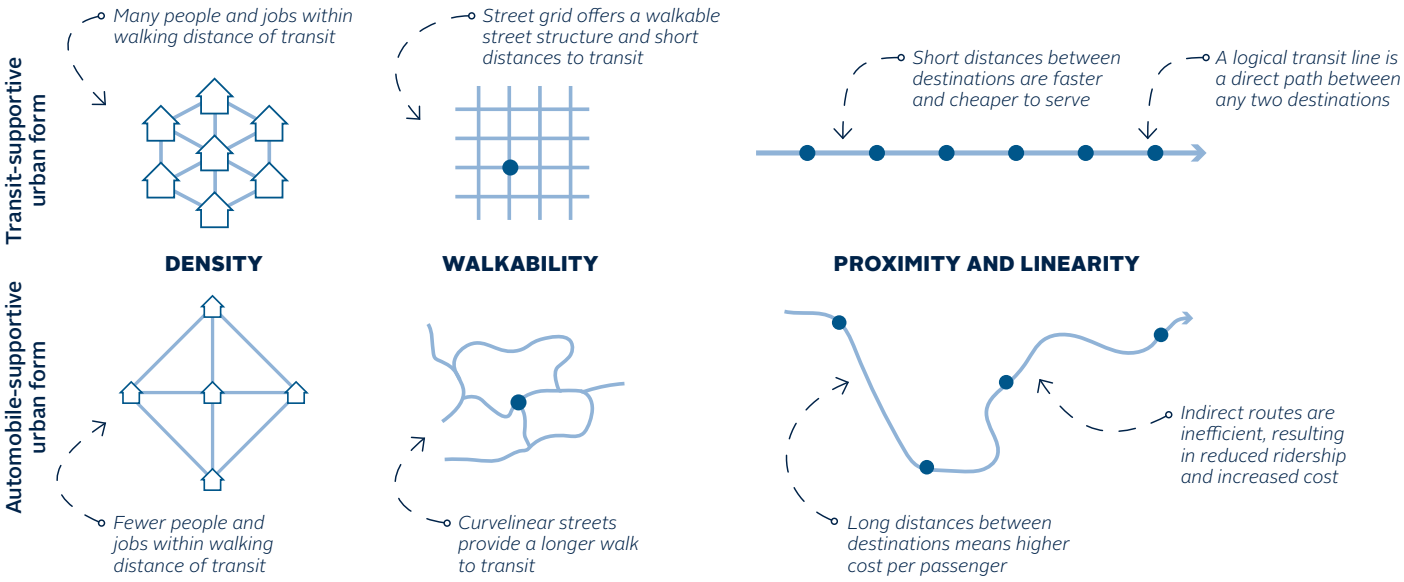


Figure 33: **Transit-supportive urban form: density, walkability, proximity, and linearity**

Human Transit. 2011. Jarrett Walker. Island Press.

How dense do neighbourhoods need to be to support Rapid Transit?

Transit ridership is the result of many factors, therefore there is not a single density threshold that will suffice for all neighbourhoods.

As a guideline, however, neighbourhoods with a density of 100 people and/or jobs per hectare can generally support Bus Rapid Transit lines.

Areas in Halifax and Dartmouth with around 100 people and/or jobs per hectare include:

- Robie Street between North and Almon
- South Park Street between South and Inglis
- Downtown Dartmouth
- Highfield Park
- Some parts of Dunbrack Street

Other areas around the Rapid Transit Network where supportive zoning is put in place are expected to gradually develop toward similar densities.

5.2 Transit-Oriented Complete Communities

The *IMP* encourages the development of complete communities. As the name suggests, a complete community is one that allows residents to live, work, shop, learn, and play within the community without depending on a private vehicle. This means the community must have a mixed range of housing options and other land uses of interest to residents (e.g., shops, services, schools, jobs, and recreation), and development must be compact enough to allow people to walk or roll to these destinations.

The benefits of a more complete approach to community design are considerable. Properly realized, complete communities accommodate people in all stages of life, with a range of abilities, and at a variety of income levels. Inviting, pedestrian-oriented buildings, spaces, and connections make active transportation comfortable and easy. Reducing the need for private vehicle use is more sustainable and affordable and reduces the land and investment required for roads and parking.

Rapid Transit and complete communities are mutually beneficial. The density and walkability of complete communities supports transit ridership. For residents, Rapid Transit provides a high-quality mobility option for longer trips, whether for work, recreation, entertainment, or visiting friends. The combination of comfortable active transportation links and convenient transit makes it easier for residents to reduce their vehicle use.

HOUSING

Many people find living in complete communities attractive whether or not they use transit, so it is important to ensure a wide mix of housing is available and affordable. For example, including larger apartments means that families can realize the benefits of complete communities. These communities must also offer housing options for lower- and moderate-income residents, so that Rapid Transit does not become accessible only to the more affluent.

COMPLETE STREETS

Complementing the mix and density of land uses, the design of streets is critical for encouraging walking, rolling, cycling, and use of transit. Streets serve both as links to facilitate movement and as places where people shop, stroll, and socialize. A complete streets approach supports people's mobility, complements adjacent land uses, and reflects the character, scale, and needs of neighbourhoods.

There is no fixed recipe for a 'complete' street. As each street differs in its role in the road network and the space available, enabling safe, convenient, and comfortable travel and access for users of all ages and abilities will look different in varying contexts.

Tools that can be employed in a complete streets approach include:

- Matching street capacity with demand
- Curb extensions
- Continuous, accessible sidewalks
- Resting places
- Street lighting
- Accessible crosswalks
- Bicycle lanes
- Accessible bus stops or BRT stations
- Transit priority lanes
- Appropriate and clear signage
- Attractive landscaping and tree planting
- Shared streets (e.g. Argyle Street)
- Well-maintained vehicle space
- Measures to slow traffic

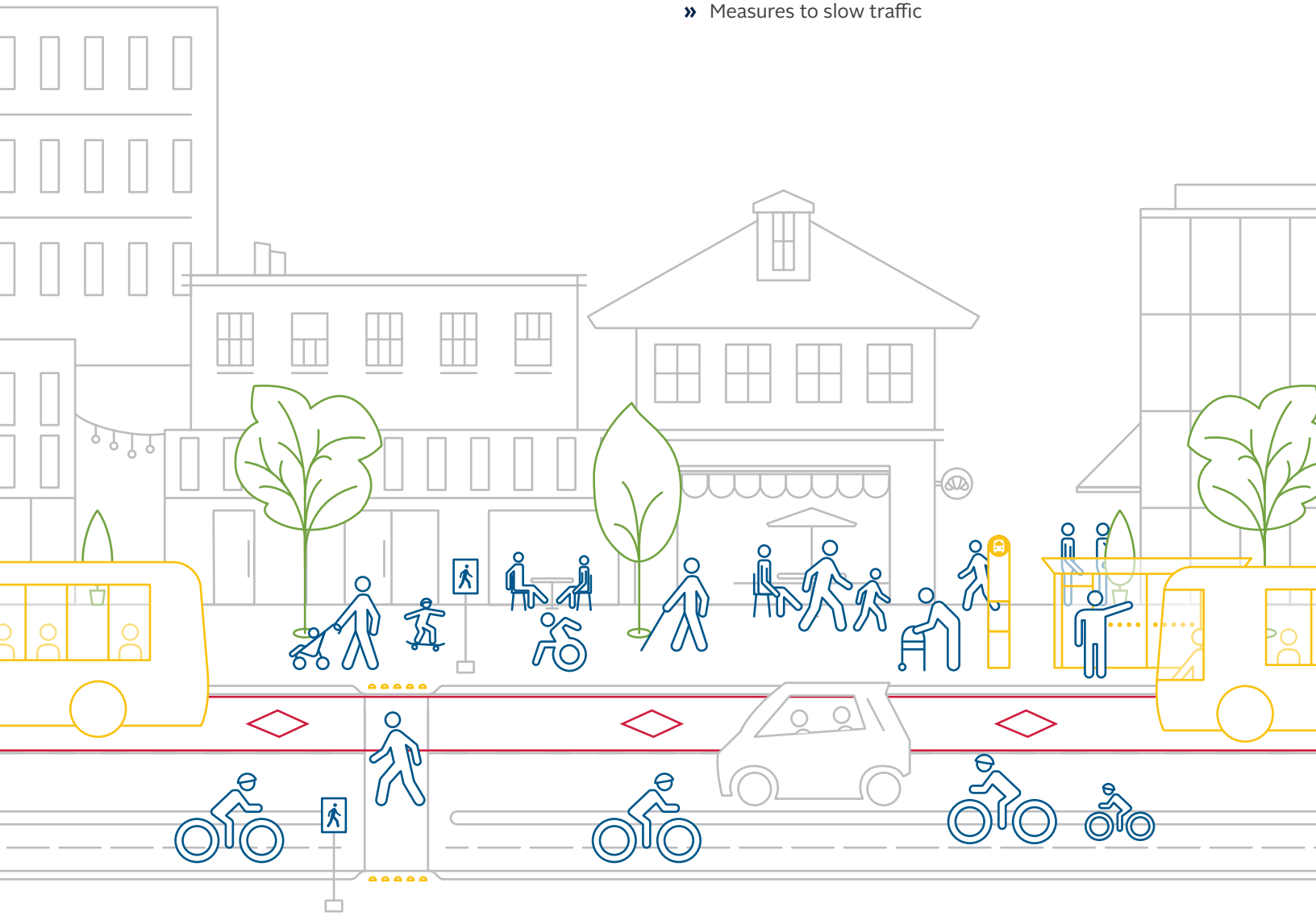


Figure 34: **Designing streets for complete, transit-oriented communities**

5.3 Aligning Growth with Rapid Transit

Promoting transit use goes beyond neighbourhood and street design. Indeed, as transit exists to serve people moving around the city, how communities are organized within the region is also crucial.

The Municipality's transportation demand model is a tool used to explore how the transportation network and settlement and employment patterns may work together to influence travel. The model simulates residents' daily travel and can estimate how different land use and transportation scenarios will impact various factors, such as transit ridership.

Three scenarios for 2031 were created and explored using the model. The scenarios, summarized in **Figure 35** and **Figure 36,** do not predict exact futures, but illustrate the potential impacts of key trends and policy choices.

- **Scenario 1 and 2**: the annual population growth rate is assumed to be 1%. New housing is distributed in the Regional Centre in accordance with the *Centre Plan*, and in the suburbs according to current development approvals and anticipated growth in high-demand areas.
- **Scenario 1:** represents a potential future where employment shifts from the Regional Centre to the suburbs, matching the overall trends between 2006 and 2016.
- **Scenario 2:** assumes the same amount of overall employment growth as Scenario 1, but shows a future where job growth is more evenly distributed between the Regional Centre and suburban areas.
- **Scenario 3:** explores a future with higher population and job growth than the other scenarios, where the extra growth is concentrated in areas near Rapid Transit.

Each land use scenario was modelled with the final network of the *Moving Forward Together Plan* and the Rapid Transit Network. In all scenarios, Rapid Transit significantly increases the transit mode share, generating hundreds of thousands more transit trips annually. The model estimates that by 2031, Rapid Transit may represent a mode shift toward transit of up to 2% of all commutes and a reduction of greenhouse gas emissions by up to 5,200 tonnes annually, without considering the impacts of different settlement patterns.

		Growth Scenario 1: **EMPLOYMENT SHIFTS FROM CENTRE TO SUBURBS**	Growth Scenario 2: **EMPLOYMENT GROWTH MORE EVENLY DISTRIBUTED**	Growth Scenario 3: **MORE GROWTH, WITH NEW GROWTH FOCUSED ON BRT**
	Annual growth rate 2020–2031	~ 1%	~ 1%	~ 1.5%
Population 414,000 in 2016	**Population growth 2016–2031**	+ 69,000	+ 69,000	+ 113,000
	New settlement patterns	» Centre Plan targets in Regional Centre » Development approvals and anticipated growth in suburbs		» Same as Scenario 1 & 2 plus new growth near BRT
Employment 227,000 in 2016	**Employment growth 2016–2031**	+ 46,000	+ 46,000	+ 58,000
	Distribution of new jobs	» Job loss in downtown Halifax » High suburban job growth	» Moderate job growth in downtown Halifax » Moderate suburban job growth	» Moderate job growth in downtown Halifax » Suburban job growth focused near BRT
	Percent of jobs in Regional Centre	42% (-7% from 2016)	47% (-2% from 2016)	47% (-2% from 2016)
	Percent of jobs in suburbs	46% (+5% from 2016)	42% (+1% from 2016)	42% (+1% from 2016)

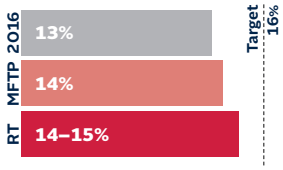
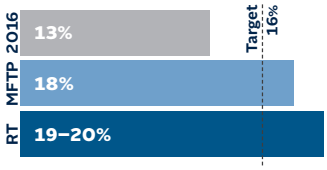
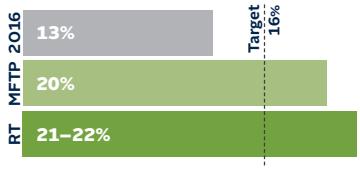
Figure 35: **Scenarios for future growth**

The results also bear out the importance of the land use–transit relationship. A future with higher growth will lead to more travel and higher overall emissions. However, increased intensification in the Regional Centre and key suburban transit corridors, as seen in Scenario 3, results in substantially higher transit use and lower per capita distance travelled in private vehicles than scenarios with less focused growth, helping mitigate environmental impacts.

Where jobs are created may also play a role. In Scenario 2, new employment is more focused in current employment nodes, many of which would be connected to Rapid Transit. This scenario results in higher transit use and lower emissions in the model than Scenario 1, in which some jobs move from the Regional Centre to suburban areas not aligned with Rapid Transit.

Implementing Rapid Transit alone will not be enough to meet or exceed HRM's mode share targets and climate change mitigation goals. In the scenarios modelled, land use has a much larger impact on mode share and emissions than the transit network changes. The Municipality must plan to align growth and employment with the factors that support transit ridership and active transportation.

Rapid Transit is the key to achieving more intensive land use and settlement patterns. Investing in Rapid Transit gives developers the confidence to invest in neighbourhoods around stations and terminals, bringing more compact growth into these areas and resulting in higher impacts to mode share and greenhouse gas emissions.

		Growth Scenario 1: **EMPLOYMENT SHIFTS FROM CENTRE TO SUBURBS**	Growth Scenario 2: **EMPLOYMENT GROWTH MORE EVENLY DISTRIBUTED**	Growth Scenario 3: **MORE GROWTH, WITH NEW GROWTH FOCUSED ON BRT**
Transit Mode Share	**Halifax region mode share**			
	Regional Centre 2016: 20% **Target: 23%**	MFTP: 21% RT: 21–23%	MFTP: 25% RT: 26–27%	MFTP: 27% RT: 27–28%
	Suburbs 2016: 13% **Target: 20%**	MFTP: 14% RT: 15%	MFTP: 20% RT: 22%	MFTP: 23% RT: 25–26%
	Comparison to *Regional Plan* targets	**FAILS**	**MEETS/EXCEEDS**	**EXCEEDS**
Private Vehicle Kilometres Travelled (VKT)	**VKT per capita, 2031 baseline**	27.7 km/day	27.5 km/day	26.2 km/day
	VKT per capita, 2031 with Rapid Transit	27.4 km/day	27.0–27.1 km/day	25.8–25.9 km/day
	Annual total VKT reduction with Rapid Transit, vs. 2031 baseline	38–45 million km/year	49–62 million km/year	36–50 million km/year
GHG Emissions	**Reduction in greenhouse gas emissions vs. 2031 baseline for scenario**	1,500–2,800 tonnes/year	3,400–5,200 tonnes/year	1,400–3,500 tonnes/year

1 *Estimates for Rapid Transit impacts are shown as a range. The lower end of the range uses a conservative version of the model that does not account for service quality improvements such as more reliable travel times, real-time arrival information, and station amenities. The higher end modifies some model parameters to try to account for some of these improvements. The model also does not account for a preference for ferries and may underestimate ferry ridership.*

Figure 36: **Model results for future growth scenarios**

5.4 Policy Directions

To address the importance of coordinating land use and transportation planning around Rapid Transit, the municipality will:

1. Plan for higher-density mixed use development around Rapid Transit.
2. Work to ensure that affordable housing and amenities are available near Rapid Transit.
3. Improve the connectivity of local streets and the quality of active transportation infrastructure near stations and terminals.
4. Pursue a long-term vision for Rapid Transit together with a long-term vision for land use.

1. PLAN FOR HIGHER-DENSITY MIXED USE DEVELOPMENT AROUND RAPID TRANSIT

To support walkable, affordable, transit-oriented communities, land use policy should designate areas for high residential and employment density along frequent transit corridors and around transit stations and terminals. The highest mixed-use densities should be directed to areas within 400 metres of Rapid Transit stations, with moderate densities up to 800 metres. This approach will support the Rapid Transit Network by encouraging the development of compact, complete communities served by frequent transit, allowing people to work, shop, and play close to where they live.

In the second *Regional Plan* review, started in 2020, the Municipality will refine its outlook on settlement patterns and infrastructure and servicing needs to accommodate growth. The review offers an opportunity to align land use policy with major infrastructure investments such as Rapid Transit.

In 2006, the *Regional Plan* designated several growth centres where development was expected to occur, some of which are now communities that will be served by Rapid Transit. The *Regional Plan* review will reexamine these growth centres and adjust intensification of development and settlement patterns to emphasize alignment with the Rapid Transit Network.

Outside the Regional Centre, key areas near Rapid Transit stations and terminals where there may be significant opportunities for development have been identified as Potential Transit-Oriented Communities (**Figure 37**). These places have the capacity to become destinations and hubs of activity, similar to the Centres, Corridors and Future Growth Nodes identified in the *Centre Plan*. The *Regional Plan* review will take into account the Potential Transit-Oriented Communities shown here as well as those indicated in Figure 10 of the *IMP*.

In existing communities around Rapid Transit stations and terminals, it is expected that change will occur incrementally as opportunities to renovate, expand, or adapt existing buildings and sites arise. Sites such as underutilized parking lots, shopping plazas, and institutional properties should be encouraged to be redeveloped following transit-oriented principles and best practices. Pedestrian supportive, mixed-use redevelopment should be encouraged through as-of-right development where possible.

The *Regional Plan* review will also identify strategic transit priority corridors to direct future infrastructure investments. These corridors will update those identified in the *IMP* to include the Rapid Transit Network. The review should also identify corridors of importance for the transit network outside of the areas served by Rapid Transit, and may establish transportation reserve zones to retain space for transit priority on these corridors.

2. WORK TO ENSURE THAT AFFORDABLE HOUSING AND AMENITIES ARE AVAILABLE NEAR RAPID TRANSIT

As proximity to frequent transit can increase the market value of land, introducing the Rapid Transit Network could exacerbate housing unaffordability and social inequity in surrounding neighbourhoods as they develop or redevelop around the network. As transit-oriented areas become more desirable and older housing stock redevelops, residents may experience financial strain from rising rents,

land values, and house prices. To mitigate these issues, the Municipality will need to consider ways to ensure that affordable housing continues to be available near Rapid Transit.

Focusing affordable housing efforts on neighbourhoods well served by transit can magnify the impact of housing investments. As shelter and transportation are the two largest household expenditures, aligning affordable housing and Rapid Transit can increase affordability for residents. This can in turn support sustainable mode-share gains, as lower-income households are able to access and use transit, and help build stronger and more resilient communities.

Affordable housing strategies include regulatory incentives and financial tools, land access and acquisition, and planning and coordination among agencies. Many of these strategies are already underway, including density bonusing through the *Centre Plan* and the coordinated efforts of the Housing and Homelessness Partnership. These efforts, as well as additional strategies such as

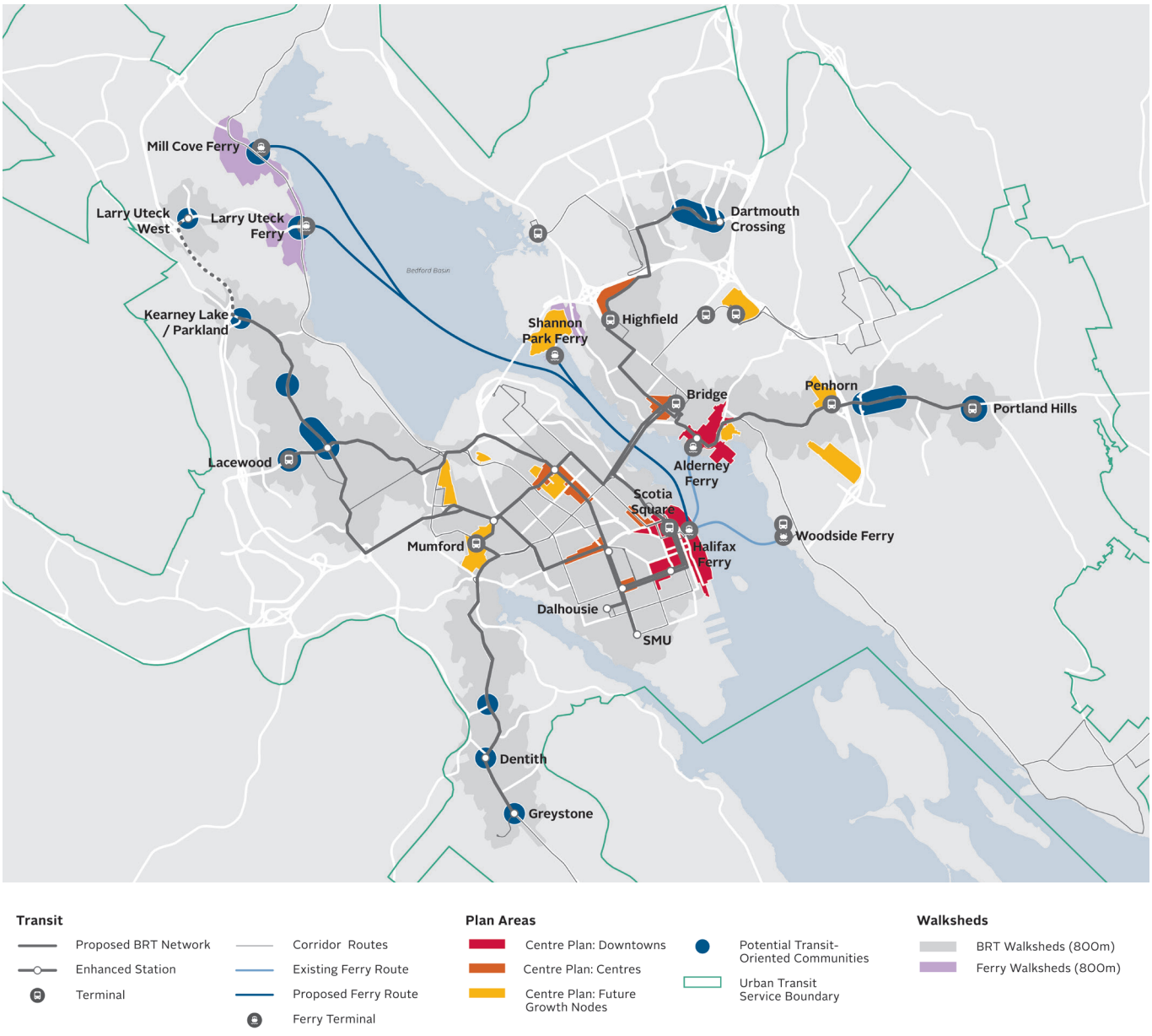


Figure 37: **Rapid Transit walksheds with Regional Centre growth areas and potential transit-oriented communities**

inclusionary zoning, new funding mechanisms, or the use of public lands, should aim to align affordable housing with the Rapid Transit Network.

Ensuring that key urban amenities such as grocery stores, drug stores, hospitals and clinics, schools, libraries, parks, and recreation centres are accessible by transit is also important for affordability, both for the public and for employees. The Rapid Transit Network has been designed with existing public and private amenities in mind. The Municipality should work with the Province, hospitals, school boards, and other institutions to locate new public facilities near Rapid Transit stations and terminals. Land use policy and regulations should also encourage privately-owned amenities to locate near Rapid Transit.

3. IMPROVE THE CONNECTIVITY OF LOCAL STREETS AND THE QUALITY OF ACTIVE TRANSPORTATION INFRASTRUCTURE NEAR STATIONS AND TERMINALS

Connecting Rapid Transit stations and terminals to pedestrian and bicycle infrastructure and well-connected local streets will help people access the network. Local street and active transportation networks with better connectivity give riders shorter paths to walk, roll, or bicycle to stations and terminals. The Municipality should take advantage of opportunities to create new connections and improve existing ones in areas around stations and terminals.

Supportive street design and high-quality active transportation infrastructure is also critical to make it safe, comfortable, and convenient to walk, roll, or bicycle to a transit station. Local streets near Rapid Transit stations should be reviewed and improved through the Municipality's Streetscaping program and other infrastructure renewal projects.

Retrofits of streets near stations should take a complete streets approach and should prioritize active transportation. Designs for streets should be sensitive to the context of the surrounding neighbourhoods and should positively contribute to the long-term vision for communities.

4. PURSUE A LONG-TERM VISION FOR TRANSIT TOGETHER WITH A LONG-TERM VISION FOR LAND USE

Momentous social and technological changes, from telecommuting to autonomous vehicles, are transforming how people move around cities. The long-term implications of these changes for transit and land use patterns are uncertain. The Municipality must plan to ensure the transportation system continues to work efficiently for people's changing travel behaviours while becoming more sustainable and equitable. The Strategy is a step in this direction.

In this context, it is vital that a long-term vision for transit, including Rapid Transit, be considered together with a long-term vision for land use. Integrated transportation and land use planning must take an iterative approach which both aligns significant future growth with Rapid Transit, and responds to changing settlement, employment, and travel patterns with appropriate transit service.

The *Regional Plan* review offers an opportunity to set up future study of additional corridors or areas that may be suitable for Rapid Transit expansion once the proposed network is implemented. The consideration of any potential service expansion should follow the factors outlined in **Section 2** of this document, based on the most up-to-date understanding of growth and land use change.

The *Regional Plan* review will also establish the framework for a long-term study and visioning process for land use and transportation beyond 2031. This process will feed into the creation of the next *Regional Plan*, intended to replace the current one at the end of its planning horizon in 2031. That plan should include a long-term vision for transit, including the next generation of Rapid Transit. The Municipality may also create a separate visioning document for the future of transit.

6 IMPLEMENTATION

The Rapid Transit Strategy is a transformative plan for more sustainable, affordable, and equitable communities. Delivering it will require a significant financial commitment, the coordination of multiple stakeholders, and the management of many project variables. Implementation will require work on numerous activity streams shared across several HRM business units and by external stakeholders, consultants, and vendors. This work will build toward a future of enhanced mobility, increased transit ridership, reduced reliance on private vehicles, reduced greenhouse gas emissions, and reduced household expenditures.

The BRT Network and the proposed ferry routes will have different challenges and opportunities throughout their implementation. BRT depends on a number of existing infrastructure projects which will benefit the network but introduce implementation constraints. The implementation of the proposed ferry routes interacts with fewer projects, but there are more unknowns around timelines and development near terminals. Due to their differing dependencies, the BRT and ferry implementation plans will be discussed separately.

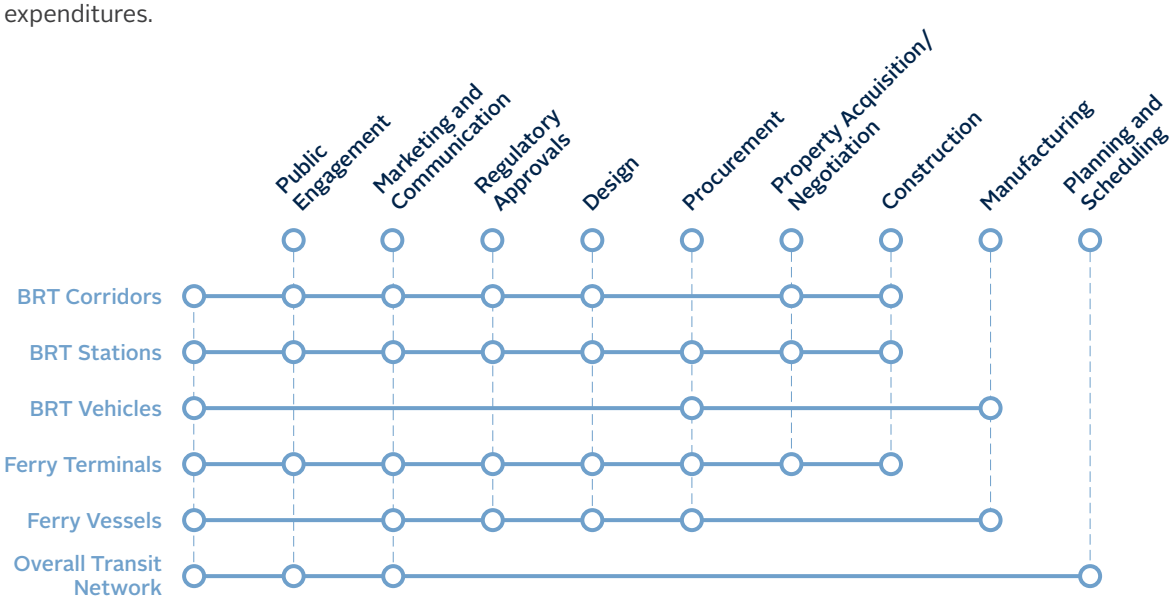


Figure 38: **Activity streams**

6.1 Bus Rapid Transit

Implementation of BRT will require vehicle procurement, station design and construction, transit scheduling and network adjustments, and infrastructure projects on BRT corridors. The Strategy anticipates BRT service to be fully operational in seven to eight years after funding is confirmed, with the first BRT line introduced in year three or four.

The BRT lines are anticipated to launch one or two at a time, with specifics to be determined as the timing of projects on BRT corridors is confirmed. As the lines are designed to work as a network, the benefit of the system will not be completely realized until all four lines are implemented.

VEHICLE PROCUREMENT

The proposed BRT service will require an estimated 33 new buses. Purchases will be handled through Halifax Transit's standard procurement process. In alignment with the proposed fleet electrification strategy, the goal is to operate BRT with electric buses.

STATION DESIGN AND CONSTRUCTION

The process of station design will start with a generalized design for the shelter and features to be included in each station. The layout then may be tweaked for individual stations to better connect them to their surroundings or respond to site constraints. Stations may require land acquisition if they cannot fit into the existing street right of way.

TRANSIT SCHEDULING AND NETWORK ADJUSTMENTS

Work to schedule the BRT lines and determine how other routes will change will begin once implementation of the *Moving Forward Together Plan* is complete. This will include engagement with the communities involved, as discussed in **Section 6.4**.

TRANSIT PRIORITY PROJECTS

As **Section 3** notes, the success of BRT is dependent on transit priority to enable the service to maintain speed and reliability. The Strategy therefore includes several transit priority corridors, designated as underway, primary, or secondary projects and shown in **Figure 39**.

As part of the direction from the *IMP*, transit priority projects for several corridors included in the Strategy are underway. Transit priority lanes on Bayers Road, Young Street, and Robie Street have been designed and are scheduled for construction starting in 2020. Existing transit routes will benefit from these lanes while BRT service is being implemented.

Primary BRT corridor projects will significantly impact transit operations in the near future, providing priority through pinch points in the network. Ideally, these projects will be completed before BRT service is launched. However, due to the size and complexity of these projects, it is anticipated that BRT service may be launched before all components of the primary transit priority network are complete.

Secondary projects are anticipated to have a smaller impact on BRT operations in the short term and may be implemented while BRT is operational. The benefits of these measures will be seen in the longer term as areas around BRT gain population and travel demand intensifies.

OTHER INFRASTRUCTURE PROJECTS

Four other major infrastructure projects on BRT corridors are planned for construction within the timeframe of the Strategy: the Cogswell Interchange Redevelopment, the Windsor Street Exchange Reconfiguration, the Spring Garden Road Streetscape Project, and the Macdonald Bridge Bikeway Connector Project.

Individual BRT lines are anticipated to launch after projects on their route are completed. If this is not feasible, projects will be coordinated to maintain the reliability of BRT service through the corridors during construction as best as possible.

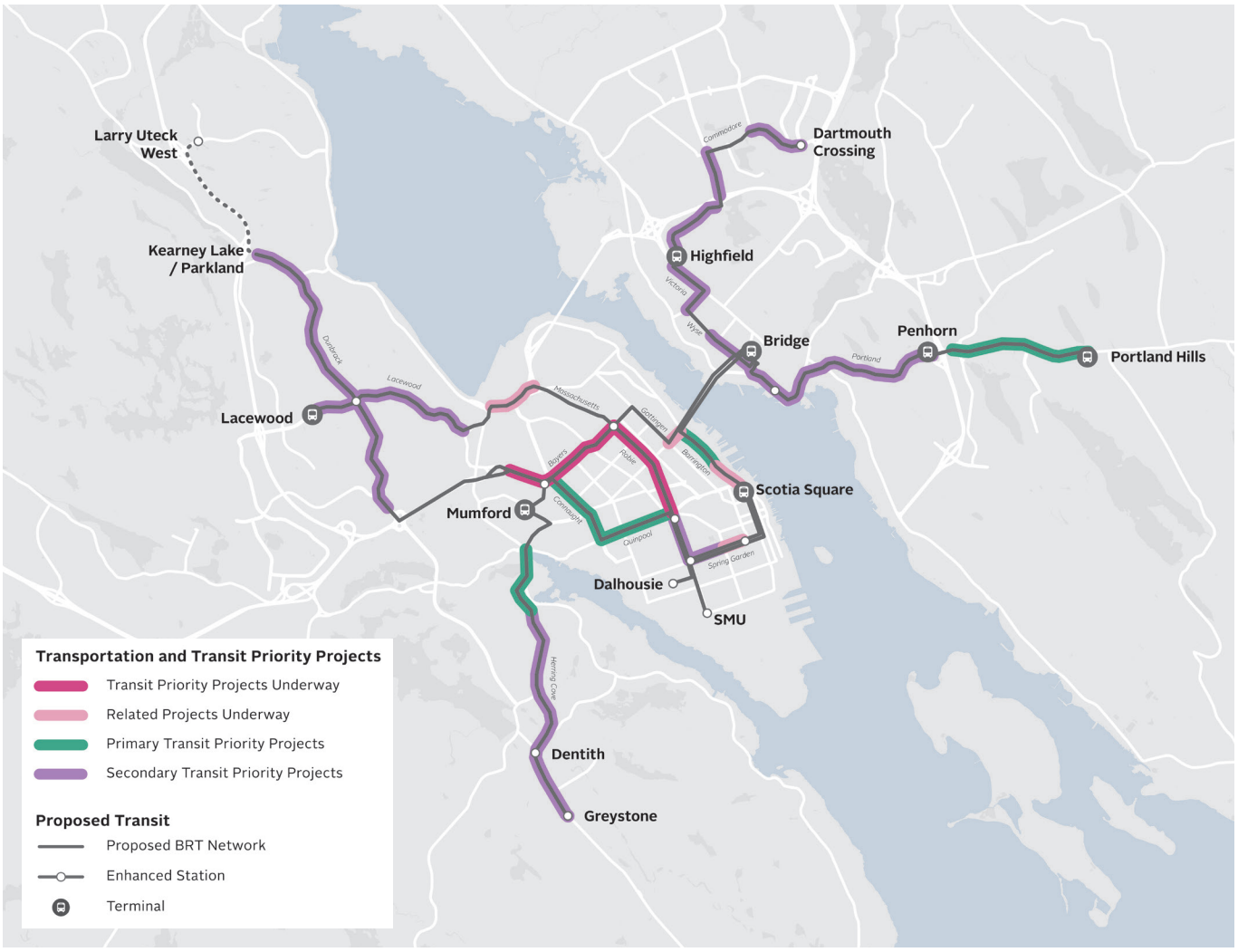


Figure 39: **Transportation and transit priority projects by category**

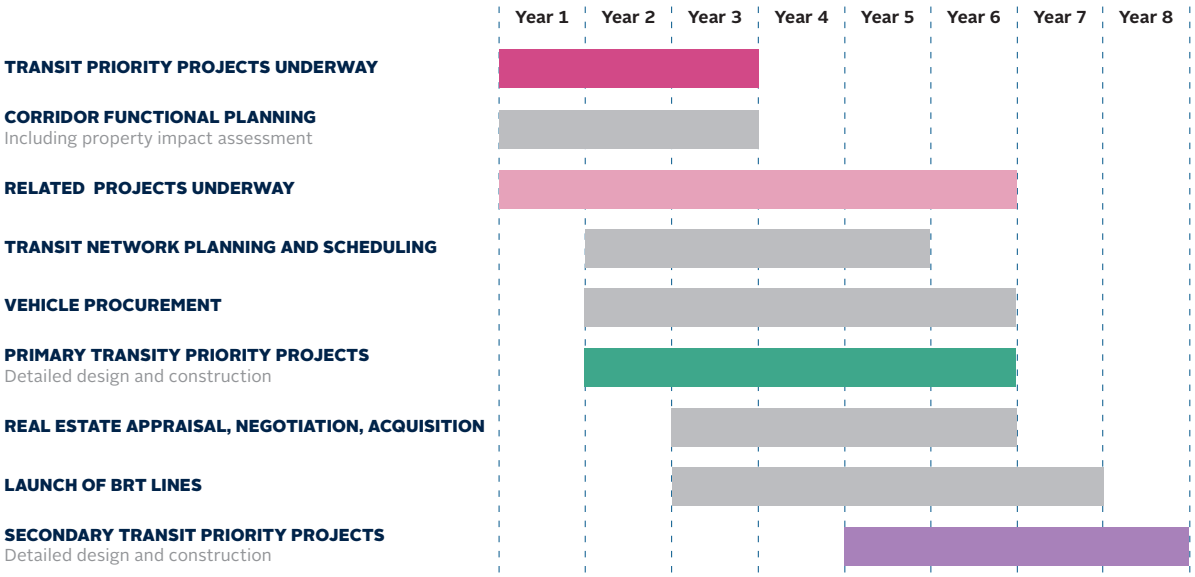


Figure 40: **Phasing for BRT implementation and related projects**

	CORRIDOR	RECOMMENDATION		RIGHT OF WAY CONSTRAINTS	POTENTIAL ROADWAY IMPACTS
		Lanes	Implementation Approach		
UNDERWAY	**Bayers** *Romans to Windsor*	Inbound & Outbound	↔ ⟳	High	Loss of one outbound traffic lane (Connaught to Windsor)
UNDERWAY	**Young** *Windsor to Robie*	Inbound & Outbound	↔ ⟳	Moderate	Loss of one inbound and one outbound traffic lane [1]
UNDERWAY	**Robie** *Young to Quinpool*	Inbound & Outbound	↔ ⟳	High	Loss of one inbound and one outbound traffic lane [1]
PRIMARY	**Connaught** *Bayers to Quinpool*	Inbound & Outbound	↔	Limited	Limited impact
PRIMARY	**Quinpool** *Connaught to Robie*	Inbound & Outbound	⟳	High	Loss of one inbound and one outbound traffic lane
PRIMARY	**Herring Cove** *Roundabout to Cowie Hill*	Inbound	↔	High	Limited impact
PRIMARY	**Barrington** *Macdonald Bridge to Cornwallis* [2]	Inbound & Outbound	↔	Moderate	Limited impact
PRIMARY	**Portland** *Baker to Portland Hills Terminal*	Inbound & Outbound	↔	Moderate	Limited impact
SECONDARY	**Robie** *Quinpool to Spring Garden*	Inbound & Outbound	↔	Limited	Limited impact
SECONDARY	**Spring Garden** *Robie to South Park*	Inbound & Outbound	⟳	Limited	Narrowing of existing traffic lanes and loss of on-street parking
SECONDARY	**Dunbrack & Kearney Lake** *Hwy 102 Exit 1 to Exit 2*	Inbound & Outbound	⟳	Limited	Loss of one inbound and one outbound traffic lane
SECONDARY	**Lacewood** *Lacewood Terminal to Dutch Village*	Inbound & Outbound	⟳	Limited	Loss of one inbound and one outbound traffic lane
SECONDARY	**Herring Cove** *Cowie Hill to Greystone*	Intermittent Inbound & Outbound	↔ ⟳	Limited-Moderate	Intermittent loss of inbound/ outbound traffic lanes
SECONDARY	**Wyse** *Albro Lake to Alderney*	Intermittent Inbound & Outbound	⟳	Limited *(east of Boland)* High *(west of Boland)*	Intermittent loss of inbound/ outbound traffic lanes
SECONDARY	**Albro Lake** *Wyse to Victoria*	Inbound	⟳	Limited	Narrowing of existing traffic lanes and loss of on-street parking
SECONDARY	**Victoria** *Albro Lake to Highfield Park*	Inbound & Outbound	⟳	Moderate	Loss of one inbound and one outbound traffic lane
SECONDARY	**Highfield Park**	Inbound & Outbound	⟳	Limited	Narrowing of existing traffic lanes and loss of on-street parking
SECONDARY	**Burnside** *Hwy 111 to Commodore*	Inbound & Outbound	⟳	Limited	Loss of one inbound and one outbound traffic lane
SECONDARY	**Commodore**	Intermittent Inbound & Outbound	⟳	Limited-Moderate	Intermittent loss of inbound/ outbound traffic lanes
SECONDARY	**Alderney**	Inbound & Outbound	⟳	Limited	Loss of one inbound and one outbound traffic lane
SECONDARY	**Portland** *Alderney to Penhorn Terminal*	Inbound	⟳	Limited	Narrowing of existing traffic lanes and loss of on-street parking

Figure 41: **Transit priority projects for the BRT Network**

1 *Robie Street / Young Street Phase 1 includes lane conversion on multiple segments to provide a continuous outbound bus lane and intermittent inbound bus lane. Phase 2 will include widening to accommodate continuous bus lanes in both directions and will be pursued following acquisition of necessary lands.*

2 *The Barrington corridor project will also require partnership with Halifax Harbour Bridges to modify the Macdonald Bridge approach ramp to allow Halifax Transit buses to access the bridge from Barrington Street.*

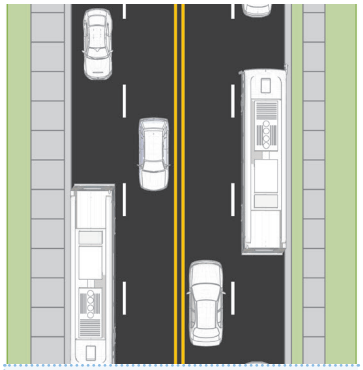
Implementation Approach

⟳ *Lane conversion* ↔ *Road widening*

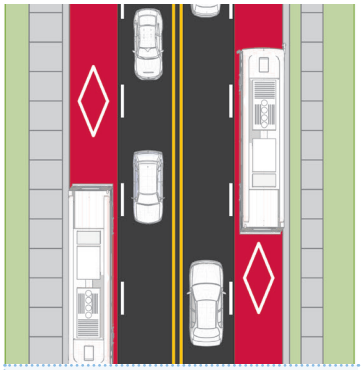
TRANSIT PRIORITY LANE OPTIONS

Transit priority lanes typically can be created by converting existing lanes or by widening streets. For cost estimation, the Strategy makes a preliminary recommendation for each transit priority corridor based on an analysis that considered existing road configuration, right-of-way width, and traffic demand. **Figure 41** shows these recommendations.

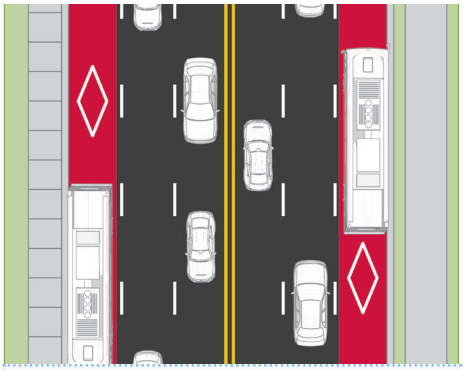
Lane conversion is the preferred approach to adding transit lanes in the BRT Network as it is both cost- and time-effective. However, there are tradeoffs to removing traffic or parking capacity. These tradeoffs will be analysed in more detail through the functional planning process for each BRT corridor. Functional plans will also determine whether transit priority lanes can permit other uses, such as parking, at times when overall congestion is reduced in a corridor.



SHARED TRAFFIC LANES: Buses and private vehicles use the same lanes.



CONVERT EXISTING LANES TO BUS LANES: This is cost effective and does not impact properties along the street, but it does reduce the number of vehicle lanes and can impact on-street parking and loading.



WIDEN THE STREET: Leaving the existing vehicle lanes in place and adding a new bus lane. This is more costly and may impact properties along the street, but reduces the impact on vehicle traffic flow.

Figure 42: **Options for creating transit priority lanes**

Functional planning and design for transportation corridors

Functional planning and design helps to determine how a corridor can be reconfigured to better serve current and future transportation needs. The functional planning process considers the surrounding communities, current and future transportation demand, and physical constraints such as topography and street width.

Functional plans in HRM focus on moving more people by sustainable modes, improving safety, and building complete streets that better connect communities. They consider how features such as transit priority lanes and improved walking and cycling infrastructure can be integrated into a street. Which elements are prioritized depends on the role the street plays in the community and transportation network.

Adding new street features such as transit priority lanes usually impacts existing elements on the street. Developing an understanding of the benefits and tradeoffs of potential changes is an important part of the functional planning process. Commonly considered factors include:

- Intersection and roadway capacity
- Right of way and property impacts
- Land use and future growth patterns
- Curbside loading
- Emergency access
- Goods movement
- Maintenance and operational needs
- Access to transit
- Transit priority
- Pedestrian and bicycle infrastructure and connectivity
- On-street parking, including accessible parking
- Universal accessibility
- Trees and green areas

The Municipality uses functional plans to guide the development of key corridors over time. Functional plans allow for integration with roadway repair and reconstruction projects, as well as projects undertaken on the street by utilities or other agencies.

Functional plans can also help the Municipality preserve or acquire the right of way required to make changes using transportation reserve zones. These zones can be included in Land Use By-laws to prevent development from taking place which would obstruct construction of transportation links.

6.2 Ferries

Implementation of new ferry service will require vessel procurement, terminal design and construction, and service plan calibration, which can be pursued concurrently with some interdependencies.

The timeline required to complete these activities is less well established than for BRT, and will vary based on the level of complexity and service models. The first ferry route is anticipated to be operational within three to four years after the Strategy is funded.

VESSEL PROCUREMENT

Section 4.3 outlines the basic requirements for ferries on the proposed routes. Halifax Transit's standard process for purchasing ferries would take several years, including determining the specific design requirements and having the vessels manufactured. To streamline the process, opportunities such as evaluating existing vessel models which meet the criteria will be explored.

As part of the determination of vessel requirements, Halifax Transit will evaluate the feasibility, efficiency, and sustainability of different propulsion options, including electric vessels.

TERMINAL DESIGN AND CONSTRUCTION

The proposed terminal areas each present challenges for construction, including access issues and property availability. Concept designs for each terminal will address these challenges. Terminal and vessel design will be coordinated to establish how vessels will dock and load passengers.

Terminal design may consider the integration of new terminals with multi-use facilities to take advantage of cost-sharing opportunities with other projects. The decision to integrate terminals into other building projects will be prioritized due to the increased coordination required and the impacts to the timeline and funding of both projects.

The new routes will also require additional docking capacity in downtown Halifax. Expansion and renovation of the Halifax Ferry Terminal will be a priority. Implementation may also include an interim measure to allow some ferry service to launch before a rebuild of the terminal is completed.

SERVICE PLAN CALIBRATION

There are challenges associated with confirming appropriate service levels (frequency and vessel capacity) for new ferry routes in growing areas with no existing ferry service. Standard modeling and ridership projections tend to underestimate the attractiveness of the service to potential passengers. Further market analysis will be conducted before the routes are launched to confirm that the proposed service plans, fares, and vessel sizes are appropriately matched to demand. After launch, it will be important to monitor ridership levels and development around terminals to refine service levels on each route.

The proposed Shannon Park ferry terminal is located in an area with considerable transit-oriented development potential that is anticipated to drive a large amount of ridership to the ferry. Therefore, the timing of launching this route will depend on the development timeline.

Work will also be done to confirm the Strategy's travel time estimates, especially in low-visibility situations. A study will monitor visibility along the routes to determine how often service will be affected by fog and rain and how this may impact the reliability of the service.

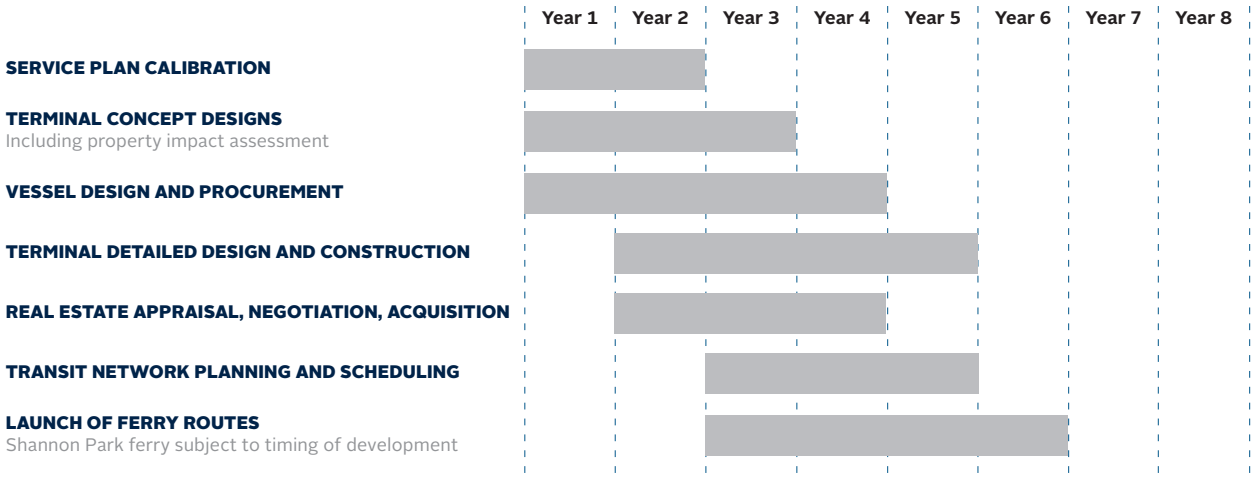


Figure 43: **Preliminary ferry phasing**

6.3 Project Delivery and Integration

The Strategy outlines an aggressive yet realistic implementation timeline that aims to have all elements operational within approximately seven to eight years. However, the implementation will need to be carefully managed to ensure the Municipality and industry has the capacity to deliver the project and to minimize delays and disruptions. Coordination among municipal departments on transportation capital planning will be essential. Special consideration must be given to the following factors.

CAPITAL BUDGET

The Municipality's ten-year capital budget outlook includes funds for street recapitalization and sidewalk renewal. As part of these programs, some of the roadways included in the BRT Network are scheduled and budgeted for renewal over the next decade. Integrating transit priority and asset renewal projects presents opportunities to reduce overall costs, pool resources, and mitigate road disruptions.

STAFF RESOURCES

Building new transit infrastructure will require additional staff and resources across the organization. Planning and implementing this proposed network will involve new responsibilities for municipal departments including Traffic Management, Road Operations and Construction, Halifax Transit, Project Planning and Design, Strategic Transportation Planning, Parks and Recreation, Communications, and Corporate Real Estate. The staffing commitment must be factored into the implementation time frame regardless of how the project is structured.

INDUSTRY CAPACITY

It is anticipated that consulting services will be required to augment municipal staff resources in many aspects of project delivery. In particular, it will be necessary to retain engineering and planning consultants to work with municipal staff on the development of functional plans and designs, detailed designs, and other technical studies. As well, consideration must be given to how the various construction projects in the Strategy will impact the construction industry, as there are a number of large-scale construction projects anticipated in Halifax over the next 10 years.

EXTERNAL PROJECTS AND ORGANIZATIONS

The implementation of the Rapid Transit Strategy needs to be integrated with municipal and external capital and development projects which impact the same parts of the street network. As well, corridor changes which include street widening will require coordination with external organizations to relocate existing utilities (power and telecom poles and wires, underground services, gas lines, and water and wastewater infrastructure). Partners typically include Halifax Water, Nova Scotia Transportation

and Infrastructure Renewal, Heritage Gas, Nova Scotia Power, Halifax Harbour Bridges, and communications companies. Consideration should be given to partner organizations' project timelines, staffing resources, and budget availability.

ROAD DISRUPTIONS

Implementation of the Strategy must take into consideration the potential for road disruption caused by construction projects within and outside the Rapid Transit corridors. A staged approach to construction and consideration for integration with other projects will be necessary to minimize disruptions to the transportation network.

6.4 Transit Network Implications

The Rapid Transit Network builds on the transit network established by the *Moving Forward Together Plan*. The *MFTP* will continue to guide Halifax Transit on the design of the transit network. While the Rapid Transit Strategy does not anticipate a full network redesign, the introduction of BRT and new ferry routes will require routing and service adjustments to improve connectivity and reduce redundancy in the network.

Aligning the transit network with Rapid Transit will require further analysis and engagement. Halifax Transit will ensure that revised routes and schedules continue to provide high quality, cost-effective service. Further engagement with local communities on all proposed changes will also occur to ensure any changes reflect the needs of the communities.

Route type	**CORRIDOR** (1–10)	**LOCAL** (20–99)	**EXPRESS** (100-series)	**REGIONAL EXPRESS/ RURAL** (300/400-series)
Purpose	Frequent, all-day service along high demand routes	All-day service connecting to more frequent routes at terminals	Limited-stop service between residential communities and downtown at peak	Connect rural communities with the urban area
Potential impacts	» The Rapid Transit Network builds on the success of Corridor routes, and they will see the greatest change. » Corridor routes whose routing overlaps most with BRT lines (3, 4, 5, and 9) will likely be replaced by BRT or adjusted to provide less frequent service. » Corridor routes which serve areas not covered by BRT (1, 6, 7, and 8) are unlikely to change routing but the level of service may be adjusted.	» Most Local routes will integrate with the BRT network without much change. » Local routes that serve a crosstown function may be modified to better integrate with the BRT Network. » Local routes running near new ferry terminals will likely be adjusted to serve the new terminals.	» Substantial changes to Express routes are not anticipated in the near term. » Some Express routes may see reduced travel times by taking advantage of the transit priority lanes created for BRT. » In the long term, Halifax Transit will continue to evaluate the utility of Express routes in the context of changing travel patterns and the impacts of Rapid Transit.	» No changes anticipated. » Some routes may see reduced travel times by using new transit priority lanes.

6.5 Costs and Funding

Like most transformative projects, the Rapid Transit Strategy will require substantial financial investment.

- An estimated **$297M to $342M in capital funding** is required to implement all four BRT lines and three ferry routes. The range reflects the degree to which new ferry terminals can be integrated with other development projects and whether the proposed upgrade to electric buses is included.

- The Strategy represents an estimated net increase in Halifax Transit's **annual operational costs of $15M to $22M** depending on the level of service for the ferry routes and how much new revenue is generated through fares.

These are high-level estimates that will be refined as the project advances. The capital cost estimates include contingencies, engineering and project management costs, and taxes. They do not include land acquisition costs, which will be developed as part of the functional planning and detailed design process.

PARTNERSHIP OPPORTUNITIES

The capital investment needed to build the Rapid Transit Network is higher than any previous single investment the Municipality has made in public transit, and will only be possible by partnering with other levels of government for funding.

The federal and provincial governments have both announced meaningful efforts to tackle the climate crisis and are targeting transportation as a key component of those efforts. Canada is working to reduce greenhouse gas emissions to 30% below 2005 levels by 2030 under the Pan-Canadian Framework for Clean Growth and Climate Change. Nova Scotia has recently established the Sustainable Development Goals Act, aiming to make the province net-zero by 2050. The Rapid Transit Strategy is key to achieving these federal and provincial priorities.

One potential source of funding for much of the Rapid Transit Strategy is the Public Transit Infrastructure Fund (PTIF), which the federal government has established to fund transformational transit infrastructure projects like Rapid Transit. The second phase of PTIF is well aligned to potentially fund a large portion of the implementation of the Rapid Transit Strategy.

FUTURE BENEFITS

Section 1.2 details the numerous social, economic and environmental benefits that Rapid Transit will have in HRM as it improves mobility options, orients land use toward transit and makes transportation more sustainable and equitable. The long-term and often indirect nature of these benefits makes it difficult to assign them a dollar value, but they are no less real.

Some of the ways in which the Municipality will see the benefits of Rapid Transit and supportive land use policy include:

- Reduced capital spending on road expansion projects to meet increases in demand for vehicle travel.
- Lower municipal servicing costs due to a more compact development pattern.
- Increased property tax revenue from higher land values around Rapid Transit lines.
- Higher economic productivity from reduced traffic congestion relative to a future with higher auto use.
- Better-distributed economic growth due to increased mobility for all residents.
- Improved public health from higher rates of walking, rolling, and bicycling in conjunction with transit use in complete communities.
- Reduced greenhouse gas emissions leading to some mitigation of the climate crisis.
- Lower household transportation costs.

ESTIMATED CAPITAL COSTS

Bus Rapid Transit (4 Lines)	
New expansion buses (33) [1]	$36–64 M
Stations (130)	$62 M
Transit priority lanes and intersection improvements	$86 M
Property acquisition	TBD
Additional studies, functional plans, and project overhead	$5 M
Subtotal	**$189–217 M**
Ferry (3 Routes)	
Vessels (10)	$71 M
Halifax Ferry Terminal (rebuild)	$17 M
Mill Cove Terminal [2]	$6–18 M
Larry Uteck Ferry Terminal [2]	$6–7 M
Shannon Park Ferry Terminal [2]	$4–8 M
Property acquisition	TBD
Additional studies, concept designs, and project overhead	$4 M
Subtotal	**$108–125 M**
TOTAL CAPITAL COSTS (EXCLUDING PROPERTY)	**$297–342 M**

ESTIMATED ANNUAL OPERATING COSTS

Bus Rapid Transit (4 Lines)	
BRT operating costs	$29 M
Operating costs reassigned from corridor routes	($18 M)
Anticipated new annual fare revenue [3]	($4–5 M)
Net new operating costs	**$6–7 M**
Ferry (3 Routes)	
Ferry operating costs [4]	$14–18 M
Anticipated annual fare revenue [5]	($3–5 M)
Net operating costs	**$9–15 M**
OVERALL NET NEW OPERATING COSTS	**$15–22 M**

1 *Estimate reflects a mix of standard and articulated buses. The range reflects the cost of diesel (lower end) and electric (higher end) buses. In alignment with the proposed fleet electrification strategy, the goal is to procure electric buses; the costs may be reflected in that strategy.*

2 *Ranges reflect cost estimates for a standalone terminal (higher end of range) vs. marginal costs for a terminal integrated into concurrent development (lower end of range). Mill Cove and Shannon Park standalone terminal estimates include the cost of parking facilities.*

3 *Based on cost recovery of 35% to 50%, in line with current corridor routes and assuming BRT charges the conventional transit fare.*

4 *Range reflects different levels of off-peak service (60 minute or 30 minute frequencies).*

5 *Based on cost recovery of 20% to 30%, in line with ridership estimates and assuming ferries charge the conventional transit fare.*

PUTTING THE COST IN PERSPECTIVE

The Rapid Transit Strategy proposes a considerable capital investment. Previous municipal plans have also included large capital investments in the municipality's transportation network to accommodate increases in travel demand associated with projected growth.

- The *Regional Plan* included a list of road network projects with an estimated cost of $750 M. These projects would have been cost-shared between all three orders of government. The *IMP* determined that for an investment of $190 M in alternate transportation modes, some of these infrastructure projects could be postponed or reduced in scope.

- The *IMP* identified approximately $130 M of investments in transit improvements, including $50 M for commuter rail (based on estimates at the time) and $65 M for transit priority corridors. The Strategy represents a shift of this investment from commuter rail to BRT and ferries.

Investing in Rapid Transit and other key projects (e.g. the Regional Centre All Ages and Abilities bike network) can help accommodate new growth while foregoing more costly road infrastructure projects identified in the *Regional Plan*.

As well, some of the proposed capital investments identified in the Strategy are already planned for. The Municipality's multi-year capital budget includes estimated amounts for strategic multimodal corridors aligned with the Strategy's transit priority corridors. The amount of new capital investment proposed is therefore lower than the total estimated in the Strategy.

6.6 Measuring Success

The Rapid Transit Strategy sets ambitious goals for the success and impact of its proposed transit services. The Municipality will measure progress toward these goals by taking advantage of existing monitoring programs established by the *Integrated Mobility Plan* and by Halifax Transit.

- Halifax Transit will monitor the success of the BRT lines and ferry routes through its quarterly and annual performance measures reports, supported by data taken from automated vehicle location (AVL) and passenger counter (APC) systems.
- The Municipality will monitor the impact of Rapid Transit through the ongoing *IMP* evaluation program, which monitors twelve performance indicators relevant to the Rapid Transit Strategy. One additional indicator will be added to measure Rapid Transit-oriented growth.

	GOAL	INDICATOR (from Halifax Transit)
RIDERSHIP	Improve ridership of replaced corridor routes on BRT lines	Average daily boardings on BRT lines and corridor routes
	Meet target of 2,000 daily boardings on each ferry route	Average daily boardings on ferry routes
	Increase overall transit ridership	Annual system ridership
TRAVEL TIMES	Meet travel time targets outlined in the Strategy on the BRT lines	Average round-trip time on BRT lines
	Meet travel time targets outlined in Strategy on ferry routes	Average round-trip time on ferry routes
RELIABILITY	Meet 90% standard for on-time performance on BRT lines	On-time performance on BRT lines
	Meet 90% standard for on-time performance on ferry routes	On-time performance on ferry routes
	Improve overall reliability	Overall system on-time performance

Figure 44: **Halifax Transit reporting goals and indicators**

GOAL	RELATED IMP INDICATORS	MEASURED EVERY:
Exceed IMP mode share targets	» Transit mode share of travel to work by subregion	5 years
Give transit priority in the transportation system	» Kilometres of transit priority corridors (including ferry)	1 year
	» Number of transit vehicles on transit priority corridors	
	» Number of intersections with transit priority measures	
Reduce transit travel times	» Average commute time by [transit] mode	5 years
	» Average network-wide transit operating speed	1 year
Direct growth to areas served by Rapid Transit	» Number of residential units and businesses in transit-oriented communities	1 year
	» **New Indicator:** Percent of residents and jobs within 800m of Rapid Transit stations and terminals	5 years

Figure 45: **Rapid Transit-related *IMP* goals and indicators**

GOAL	RELATED IMP INDICATORS	MEASURED EVERY:
Build connected, complete communities around Rapid Transit stations	» Percent of streets with sidewalks by sub-region	1 year
	» Length and connectivity of new bicycle routes, sidewalks, and greenways	
Build public support for Rapid Transit	» User perception of transportation infrastructure improvements on strategic corridors	1 year
	» User perception of walking, bicycling, and taking transit as a transportation option	2 years
Reduce the need for vehicle ownership	» Vehicle ownership per capita	1 year

Figure 46: **Rapid Transit-related *IMP* goals and indicators (cont.)**

6.7 Next Steps

The Rapid Transit Strategy represents another consequential shift forward for the municipality. It builds on the direction set by the *Integrated Mobility Plan* to provide sustainable transportation options, improve residents' mobility, and create more affordable and equitable communities. To achieve its vision will require a high level of resources, integration with external stakeholders, and significant capital and operating funds.

The critical next steps for the Municipality to take are:

1. **Secure the necessary resources and funding from key partners to implement the Strategy.** The scale, scope, and schedule of the Strategy cannot be achieved with the Municipality's existing budget and staff resources. Prior to starting implementation, external funding must be secured.

2. **Initiate functional plans for BRT corridors and additional analysis for ferry service.** While significant technical analysis was undertaken to develop the Strategy, additional studies are required to refine the service plan. As the timeline is driven by already-planned major construction projects, implementation can focus on additional planning and analysis in the short term.

3. **Continue to aggressively pursue transit priority lanes on key corridors.** In addition to the corridors identified in the Strategy, the Municipality should work with provincial partners to explore the potential for transit priority on the Macdonald Bridge and segments of Highway 102. As well, innovative measures such as transit-only streets should be explored and piloted on highly-constrained corridors which are key to transit reliability.

4. **Strengthen the relationship between Rapid Transit and land use planning through the *Regional Plan* review and the forthcoming *Suburban Plan*.** These planning initiatives should reinforce the Strategy's directions for land use planning. The development of transit-oriented design guidelines could further enhance development outcomes to reinforce sustainable mode share goals.

5. **Establish transportation reserve zones to preserve the right of way for strategic Rapid Transit projects.** The Municipality can use the results from functional plans on transit corridors to develop a land acquisition strategy to ensure there are sufficient space and funds for the transit priority necessary to support the Rapid Transit Network and potential future Rapid Transit.

APPENDIX

GLOSSARY

Accessible: Planning, design, and programming that enables access by people with a variety of physical and mental abilities.

Active Transportation: Human-powered, personal travel chosen as an alternative to motorized travel and includes: walking, running, hiking, the use of a wheelchair, bicycling, cross-country skiing, skateboarding, canoeing, rowing, or kayaking.

All Ages and Abilities (AAA): Planning, design and programming that enables use by people of all ages and with a variety of physical abilities.

Barrier-free: Design that enables access by people with or without a variety of physical and mental abilities.

Bikeway: Routes or paths used for bicycling.

Bus Rapid Transit (BRT): A high-quality bus system that provides transit riders with fast, frequent, comfortable, higher capacity service. Where possible, it uses transit priority lanes. Off-board fare collection and level boarding improve accessibility and reduce time spent at stops.

Commuter Rail: Local train service oriented to peak-hour trips to work or school, usually using existing tracks.

Complete Communities: Communities that include a range of uses and housing options to accommodate people in all stages of life and at a variety of income levels. Complete communities provide a place for residents to live, work, shop, learn, and play. These communities contain mixed uses and compact development that enables people to safely and conveniently access the goods and services they need in their daily lives, all within a short journey and without the need to depend on a personal vehicle.

Complete Streets: An approach to planning, design, operations, and maintenance of roads, sidewalks, landscaping and rights of way that enables safe, convenient, and comfortable travel and access for users of all ages and abilities regardless of transportation mode (e.g. on foot, on a bicycle, using transit, in a private vehicle). It recognizes that public streets are also places that can serve a social, economic, and ecological function.

Curb Extensions: A treatment that increases the width of a sidewalk while also reducing the width of a street to shorten pedestrian crossing distance, improve visibility, reduce traffic speeds, and improve off-street amenities. Curb extensions, which can be located on intersection corners as well as at mid-block, are commonly referred to as 'bump-outs' or 'neck downs'.

Density: A measure of the number of people or housing units occupying a given area of land. The measure may reflect the general character of the housing types in a neighbourhood.

Employment Centre: Concentrated areas of offices and businesses that result in a large number of workers relative to surrounding areas. Ideally, employment centres should resemble traditional downtowns or town centres which are compact and walkable and offer a mix of activities. However, many business parks are also employment centres due to the large number of jobs compared with their surroundings.

Goods Movement: The transportation of freight by road, rail, ship or air, between communities (regional/national/international) or within communities (local/pick-ups/deliveries).

Greenhouse Gasses (GHG): Any gaseous compound in the atmosphere (e.g. carbon dioxide CO_2) that is capable of absorbing infrared radiation, thereby trapping and holding heat in the atmosphere.

Induced demand (on roads): As road capacity is increased to accommodate more vehicles (through widening and expanding roads), additional drivers choose to use the road, creating more traffic and eventually heavier congestion.

Land Use: The classification of the natural and built environment, as it exists or as prescribed by policy or regulation.

Light Rail Transit (LRT): An electric railway system characterized by its ability to operate single vehicles or short trains along exclusive rights of way at ground level, on aerial structures, in subways, roadway medians, or in segregated street lanes. Unlike commuter trains, LRT trains have more frequent stops and normally must be segregated from conventional railway vehicles.

Mixed-use: Different activities and building occupancies that are arranged close to one another. These different uses may be located on the same site, in the same building or along the same street.

Mobility: The ability to travel and move around easily and efficiently.

Mode Share: The proportion of people using a given type of transportation, such as private vehicles or transit.

Mode Shift: A measurement of how many people (usually as a proportion) change their mode of daily travel

Park & Ride: Parking lot located at a transit terminal or stop, enabling people to leave their private vehicles there and continue their journey using transit.

Peak Hours: The times during a weekday when traffic is highest as many people travel to and from work. For transportation modeling and transit service purposes, the AM peak is 6am–9am, and the PM peak is 3pm–6pm.

Rapid Transit (RT): Transit service separated partially or completely from general road traffic and therefore able to maintain higher levels of speed, reliability, and vehicle productivity than can be achieved by transit vehicles operating in mixed traffic.

Right of way: A strip of public land including and bordering a street, road, pathway, or railway.

Shared Street: Streets where the formal distinctions between spaces dedicated to pedestrians, cyclists, and motorized vehicles have been removed, and which is shared by everyone.

Strategic Corridor: Transportation corridors that are important based on their role in the surrounding communities and to traffic operations, transit, goods movement, or active transportation.

Transit-Oriented Development / Transit-Oriented Community: An approach to development that focuses a complete community around a transit terminal or within a transit corridor, with emphasis on higher residential densities, walking distance and a mix of uses, facilities, and activities.

Transit Priority Corridor: A street in the transportation network that features measures to give increased priority to transit vehicles, such as dedicated bus lanes.

Transit Priority Measures (TPM): Tools that municipalities and transit agencies use to reduce delays, improve reliability and increase the average operating speed. There are many different types of TPMs and, in many cases, they are used together to create a city-wide network. Some of the most common TPMs include: traffic signal priority, queue jumps, bus lanes and transitways that are separated from motor vehicles (e.g. busways, railways).

Transportation Demand Management (TDM) : A strategy aimed at reducing peak hour congestion by providing people with choice in how, when, and whether they commute to work.

Transportation Network: All routes and modes of travel throughout the region and how they are connected.

Transportation Reserve Zones: Lands, typically abutting transportation corridors, that are designated in a Municipal Planning Strategy and zoned for long-term street or pathway needs. Reserve zones can enable the establishment and enforcement of development restrictions that avoid encroachment on lands that may be used for future transportation projects.

Walkable: Refers to a single route or a network of routes, between points, that is relatively short, barrier-free, interesting, safe, well-lit, comfortable, and inviting to pedestrian travel.

Walkshed: The area within a short walk or roll of a transit stop, station, or terminal. For conventional bus routes, areas within a 400 or 500 metre walk or roll of a stop are generally considered within the walkshed. For Rapid Transit stations, walksheds include areas within 800 metres.

PROJECT TEAM

HALIFAX TRANSIT

Patricia Hughes, *Manager, Planning & Customer Engagement*
Dave Espeseth, *Acting Supervisor, Service Design & Projects*
Stephen McCarthy, *Coordinator, Project Planning*
Morgan Cox, *Coordinator, Project Planning*

PLANNING & DEVELOPMENT

Tanya Davis, *Strategic Transportation Planning Program Manager*
Kate Green, *Regional Policy Program Manager*
Mike Connors, *Transportation Engineer*
Leen Romaneh, *Planner I*
Leah Perrin, *Planner III*
Marcus Garnet, *Planner III*
Iain Grant, *Urban Design Technician*

CONSULTANT GROUPS

Dillon Consulting
WSP Canada Inc.
O2 Planning + Design

HALIFAX

Attachment C

Rapid Transit Strategy

Public Engagement Report

HALIFAX

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Project Background

Rapid Transit Strategy

Halifax Regional Municipality (HRM) is developing a strategy to establish a Rapid Transit Network.

Rapid Transit (sometimes referred to as Higher-Order Transit) is service that is typically separated partially or completely from general traffic to maintain higher levels of speed and reliability than can be achieved by transit vehicles operating in mixed traffic.

The goal of the Rapid Transit Network is to get people where they want to go, when they want to go, faster and more frequently – seven days a week.

Rapid Transit can be a key part of the municipality's shift to a more sustainable transportation system. Investing in Rapid Transit can help households reduce their transportation costs and reduce greenhouse gas emissions, which helps to preserve our environment and meet the municipality's' ambitious goals for climate change mitigation.

The Strategy includes two types of transit:

1. **Bus Rapid Transit (BRT)** is rubber-tired rapid transit service that often includes features such as dedicated bus lanes, off-board fare collection, and enhanced stops to provide high-quality, frequent and reliable bus-based service. The Strategy proposes four new BRT lines:
   - Dunbrack to Dartmouth Crossing (Purple Line)
   - Herring Cove to Spring Carden (Yellow Line)
   - Lacewood to Robie (Green Line)
   - Portland to Downtown (Red Line)

2. Additional **Ferry** service which could offer fast, direct connections to downtown Halifax using vessels capable of higher speeds than the current ferries. The Rapid Transit Strategy proposes connections between Downtown Halifax and Mill Cove, the foot of Larry Uteck Boulevard, and Shannon Park.

The strategy will also look at connections between transit and land use, encouraging development near stations so that new growth is transit-oriented and sustainable.

Engagement Program

An intensive two-week public engagement program was undertaken to give residents the opportunity to review the Rapid Transit Strategy and provide feedback. The objectives of the engagement were to:

- Inform residents what Rapid Transit is and what it could mean for the region
- Gauge the level of public support for Rapid Transit
- Gain feedback on specific aspects of the strategy to support decision-making
- Understand and respond to public and community stakeholder concerns and preferences

Engagement Opportunities

The Rapid Transit Strategy engagement plan was centred on these two components:

- Survey, including background content on the Rapid Transit Strategy
- Pop-up in-person sessions at locations throughout HRM, especially in neighbourhoods that would be serviced by the new network

Communications Strategy

Residents were encouraged to participate in the Rapid Transit Strategy Survey and pop-up sessions which were promoted by way of:

- Social media posts and advertisements (Facebook, Twitter, Instagram)
- Shape Your City online engagement platform
- Website
- HRM Digital Screen Network

Engagement Results

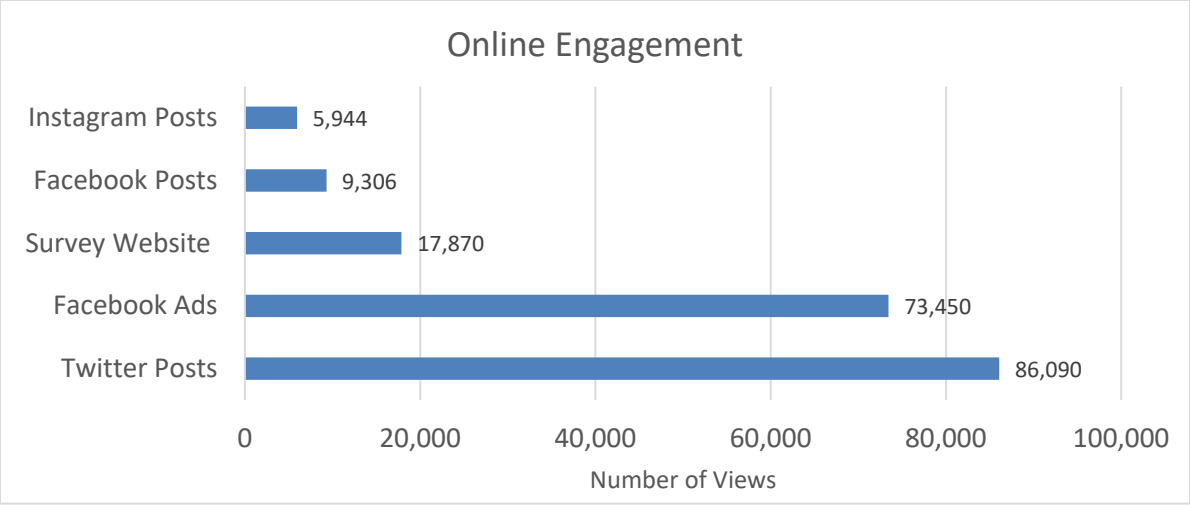
Pop-up Sessions

A total of nine pop-up sessions were held around the municipality. Staff were on hand to provide information and answer questions from the public. Nine poster boards were displayed with information about the proposed BRT and ferry routes, stop amenities, and plan details.

The pop-up sessions engaged a total of 939 people throughout HRM.

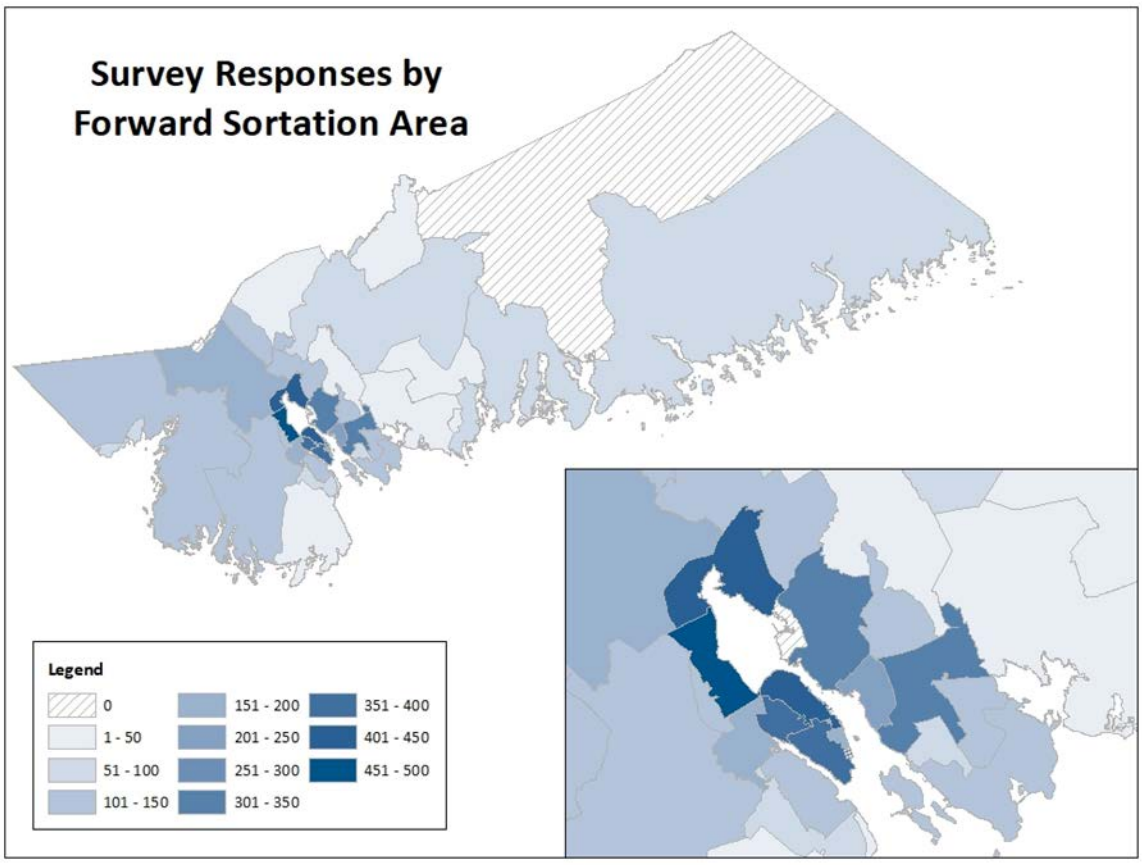
Social Media

A successful social media campaign was launched to inform residents about the Rapid Transit Strategy, provide information about the pop-up sessions, and invite residents to complete the survey. Twitter and Facebook posts made a big impression, resulting in an impressive number of visitors to the Shape Your City platform.



Survey Respondents Results

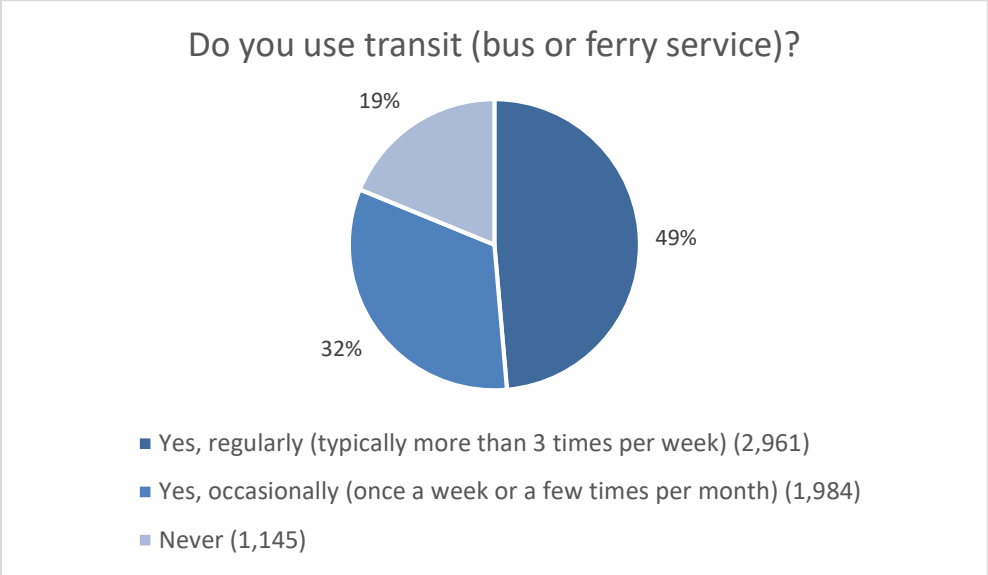
We heard from 6,125 people. 4,856 respondents gave a postal code within HRM, 79 gave a postal code in Nova Scotia but outside HRM, and 1,190 did not provide a postal code. The results below provide a breakdown of each question by the numbers, as well as some patterns based on where respondents live and how often they use transit.

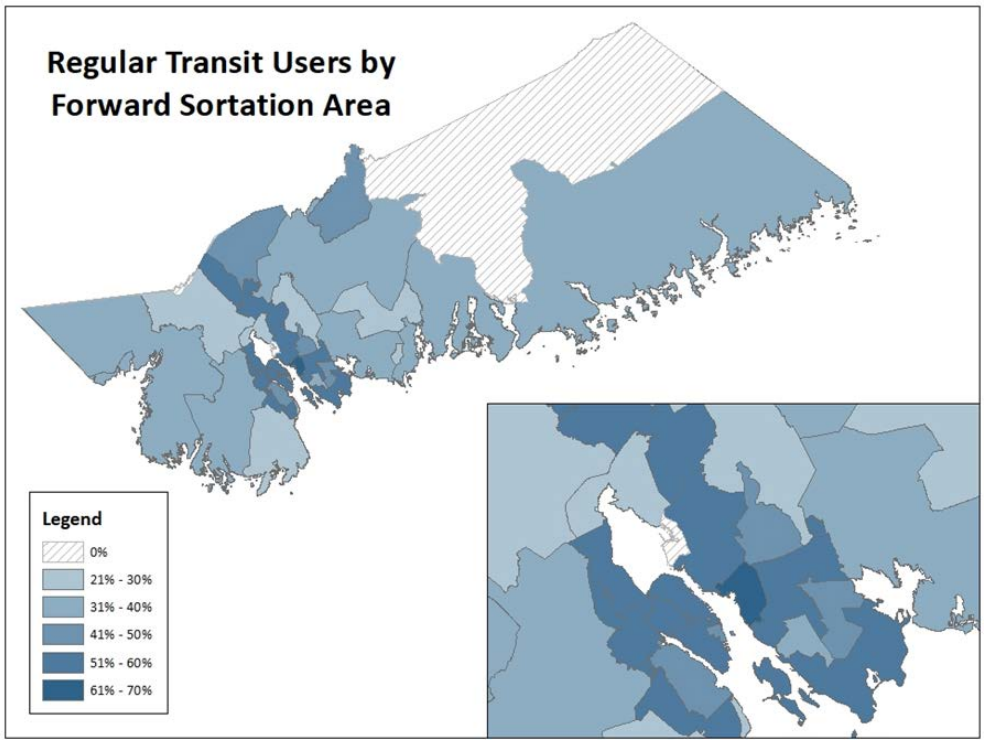


Survey Results

How Respondents Use Transit

The majority of survey respondents who are regular transit users live in areas surrounding the Bedford Basin, with a higher concentration in areas such as Dartmouth, Sackville, and peninsular Halifax.



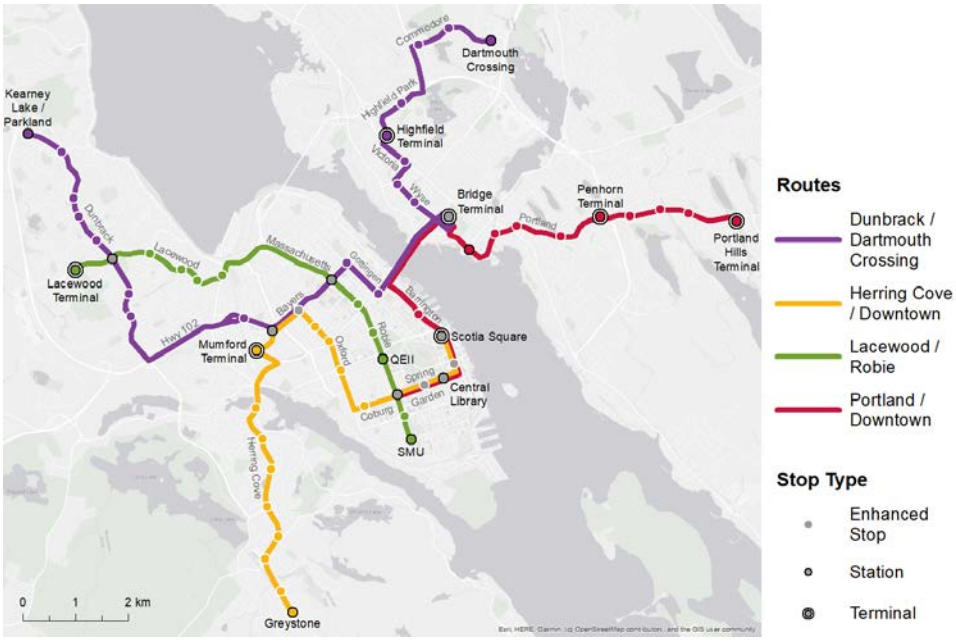


Support Level for BRT

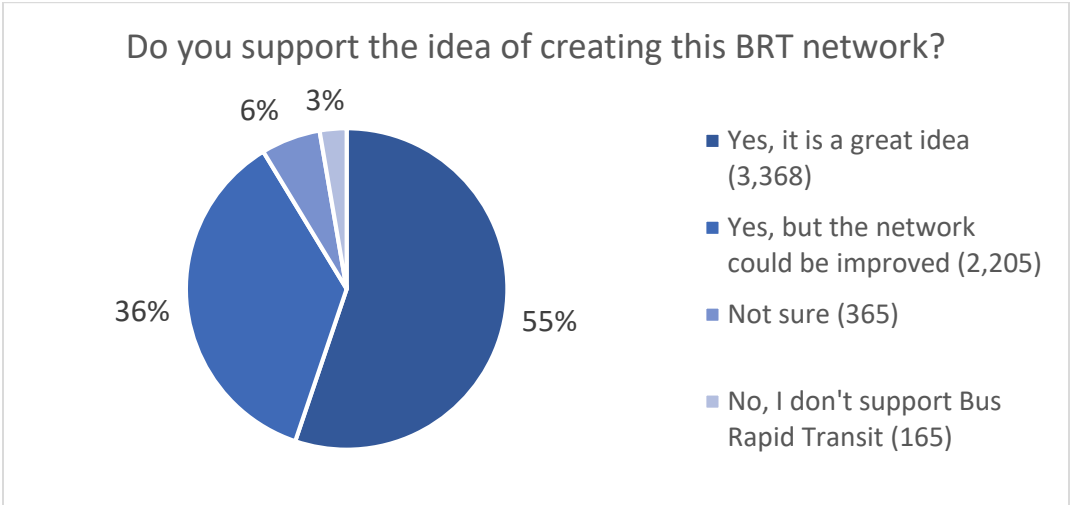
The core of the proposed Rapid Transit network is Bus Rapid Transit (BRT). We are proposing that the BRT service will have:

- Frequent, all day service: every 10 minutes or better, seven days a week.
- Fewer stops than a local route, with shelters at all stops.
- Dedicated bus lanes on parts of the route for more reliable service.

The map below shows the four proposed BRT routes with potential locations for the stops on each route.



The graph below illustrates the overall high level of support for the creation of the BRT Network.



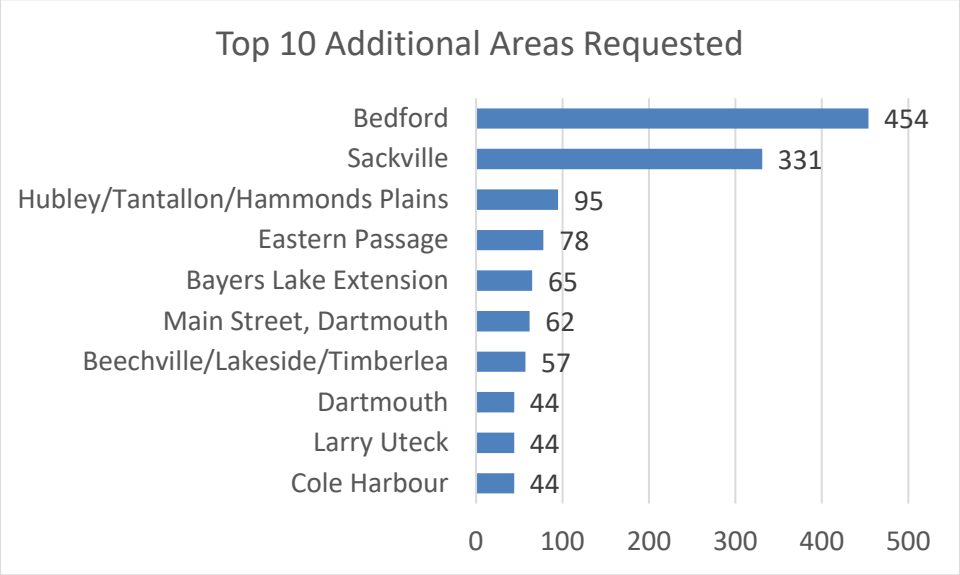
Suggested Improvements

We received 2,787 responses to the question, “If you think the network could be improved, or you don't support BRT, tell us why”. The following table conveys the most common feedback heard from respondents about each proposed route:

Purple line	• Respondents felt some concern about the proposed route being too long, and some suggested splitting it into two. • Some respondents expressed their desire to continue the route up into Bedford. • There was some disagreement among respondents about the directness of the route – some desired the route to travel via the Mackay bridge, while others preferred that the route go through downtown.
Yellow line	• Respondents expressed their desire for a more direct route to downtown, and recommended bypassing the Mumford Terminal / Bayers Rd. detour and continuing more directly to Spring Garden Rd.
Green line	• Some respondents were supportive of an extension to the Bayers Lake area, particularly in view of the new community outpatient centre in Bayers Lake.
Red line	• Most respondents were pleased with the routing, although some expressed concern about congestion on Portland St. or suggested an alternative corridor in Dartmouth. • There were mixed feelings about Gottingen St. not being used between North and Cogswell. Some respondents expressed desire for a rapid transit route on this corridor, while others didn’t like the volume of buses.

Additional Areas of Service

We heard a lot of demand for BRT service in areas outside the scope of the proposal. Some areas were grouped together during analysis. Here are the top 10 areas where respondents asked for additional BRT service:



Yellow Line Route Preference

Participants were presented with two route options, shown in the maps below, for the Yellow BRT line. Option 1 would provide BRT service more directly to Dalhousie University and the University of King's College by travelling along Oxford Street and Coburg Street. Option 2 is a faster route which would provide BRT service to the QEII Health Sciences Centre facilities by travelling on Connaught Avenue, Quinpool Road and Robie Street. The route not served by BRT will be served by a frequent local bus route.

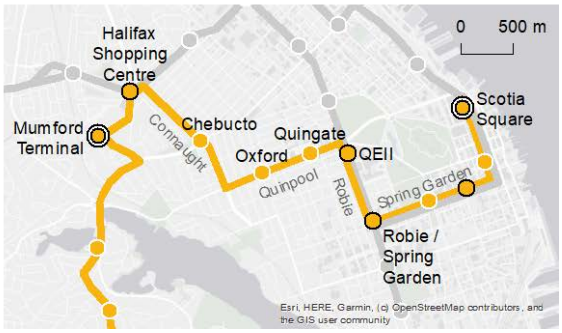
Participants were asked, "Which option do you prefer for BRT service?"

Option 1: Oxford/Coburg

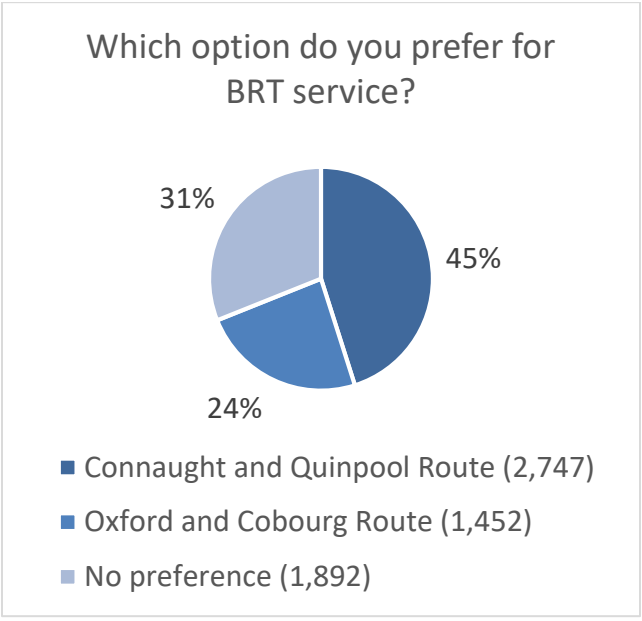
Mumford to Spring Garden at Robie: 14–19 min

Option 2: Connaught/Quinpool

Mumford to Spring Garden at Robie: 8–16 min

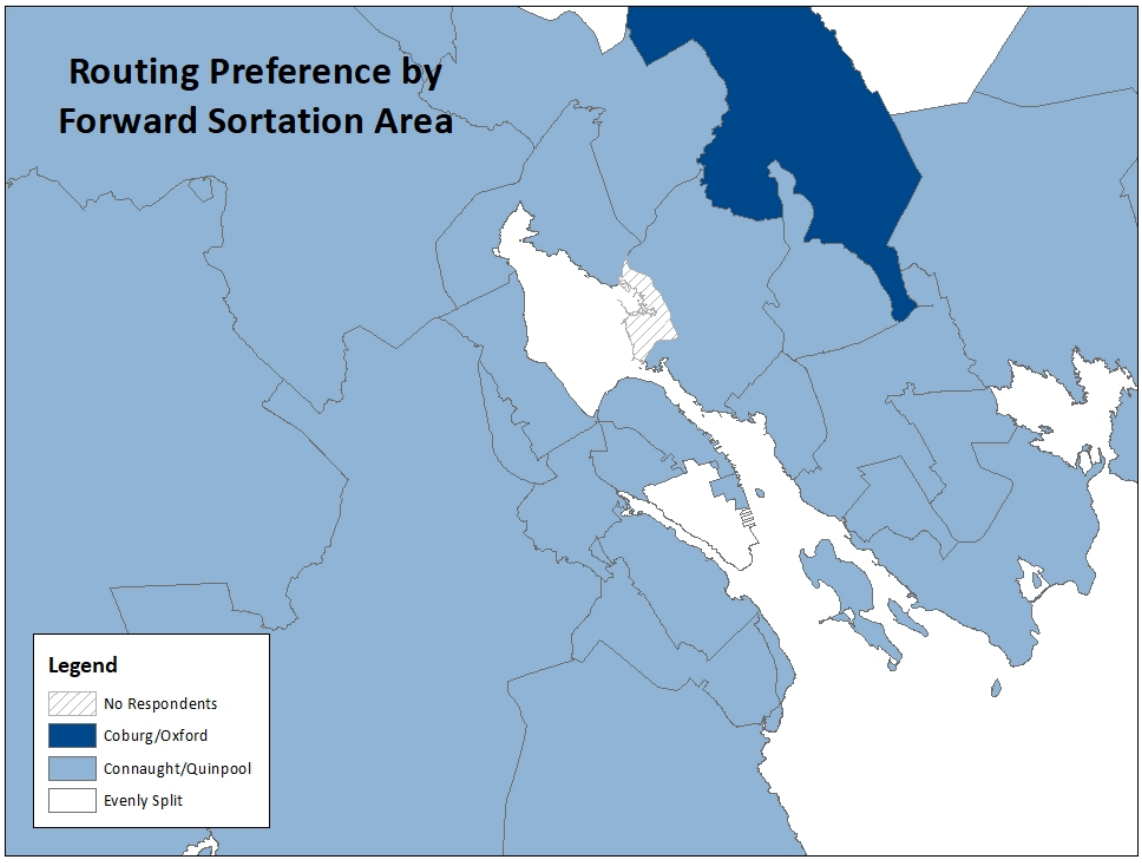


Most respondents were in favour of Option 2: Connaught and Quinpool. Respondents wanted service to QEII and the Quinpool Road commercial area.



Respondents in favour of Option 1: Oxford/Cobourg were focused on servicing students attending Dalhousie/Kings and SMU. Some expressed desire for a more direct route to downtown.

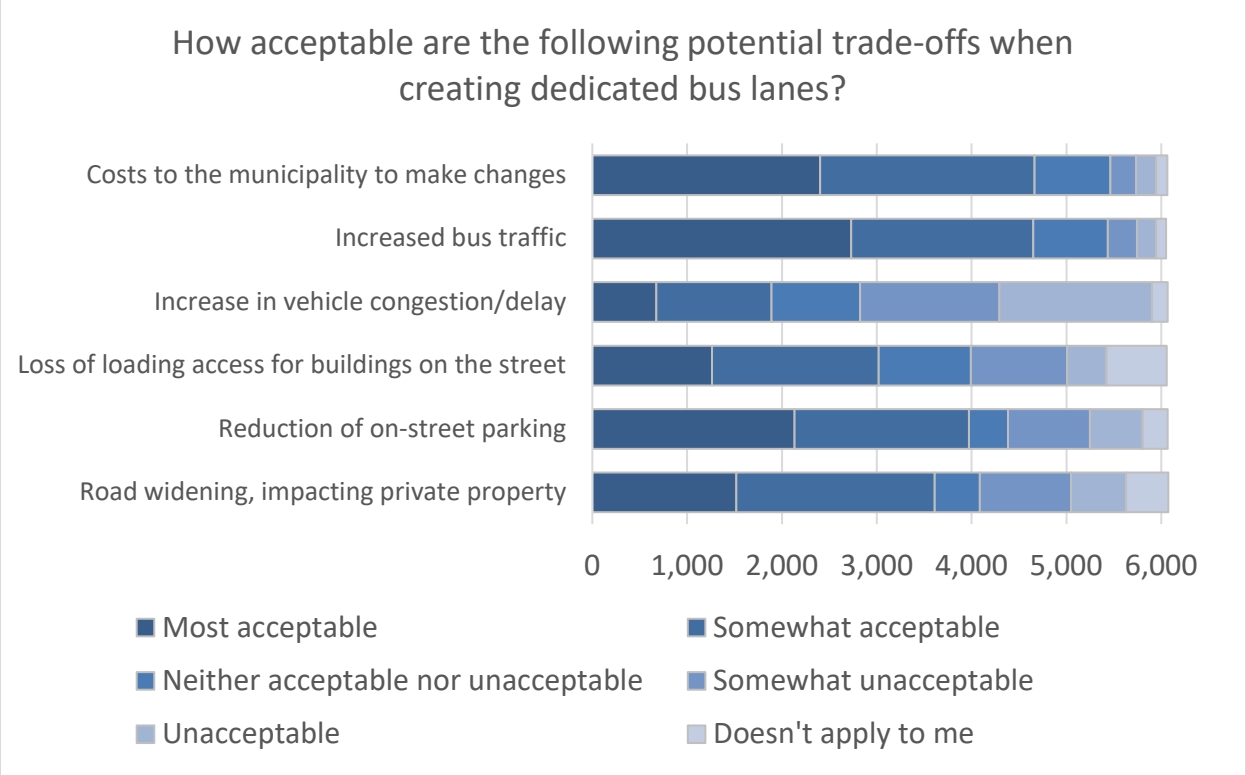
Geographically speaking, residents on the southern Halifax peninsula were split almost evenly on their preferred route. Residents of the Armdale and Spryfield neighbourhoods (which the line runs through) were in favour of Option 2: Connaught and Quinpool.



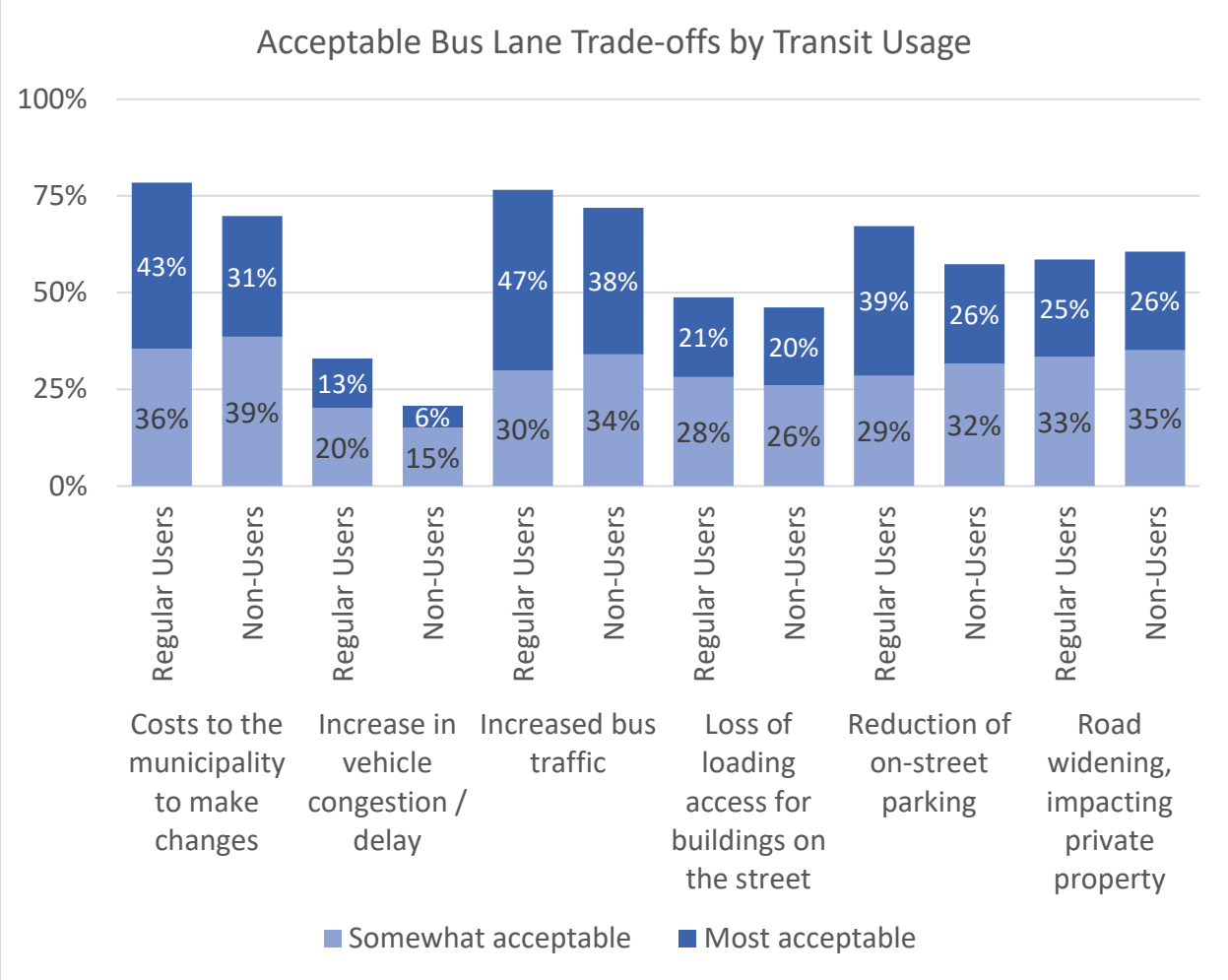
Bus Lane Trade-Offs

Dedicated bus lanes are a key part of BRT service. They allow buses to operate more reliably and improve transit travel times, making BRT more competitive with vehicles. Bus lanes are typically created by converting existing traffic or parking lanes, or by widening roads. Both options may create trade-offs.

Overall, most respondents felt that increasing bus traffic, costs to implement the lanes, and reduced on-street parking were the most acceptable trade-offs. Most respondents felt that increasing vehicle congestion to create bus lanes was the least acceptable trade-off.

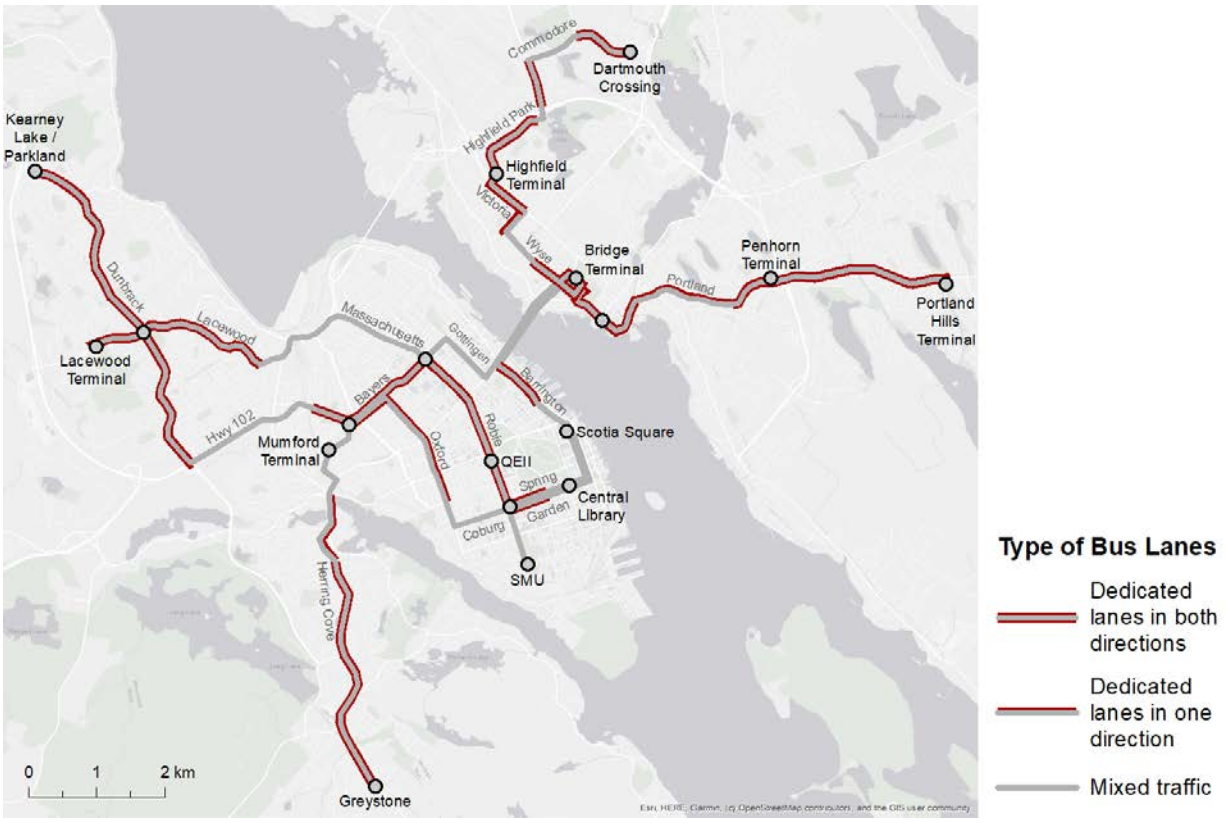


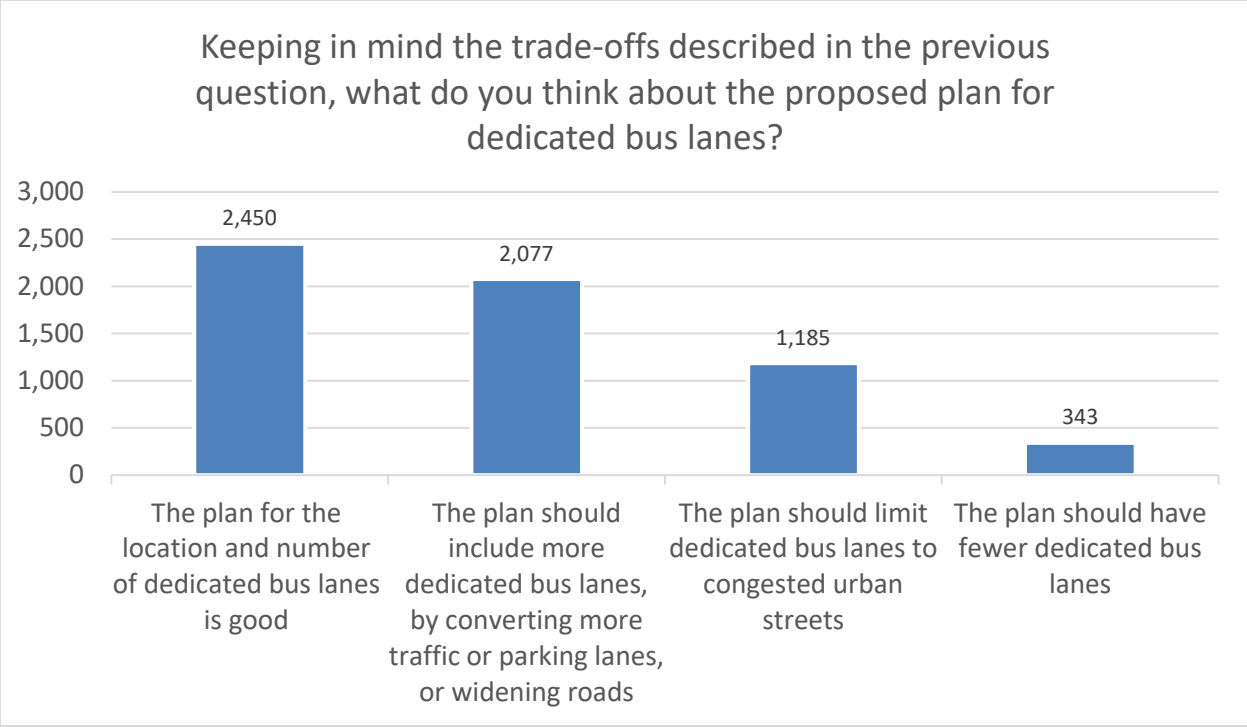
When comparing responses from those who are regular transit users and those who do not use transit, the answers look a bit different. Respondents felt that the cost to the municipality to make changes was largely an acceptable trade-off, regardless of whether they were transit users. Mainly, the loss of on-street parking and increasing vehicle congestion were of greater concern to non-bus users.

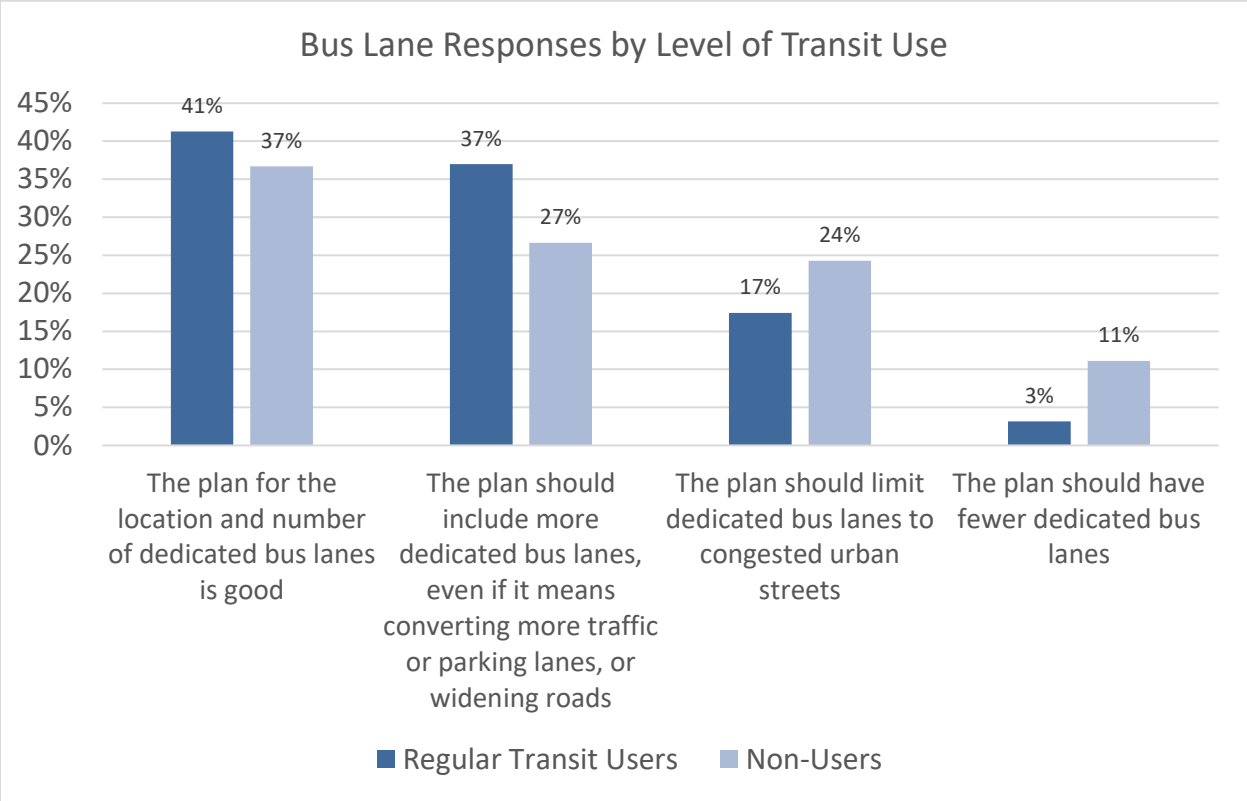


Proposed Network of Bus Lanes

The majority of respondents supported the use of bus lanes in the proposal. Three quarters of respondents felt there was an adequate number of bus lanes in the proposal or that the plan required additional bus lanes. This sentiment carried over whether respondents were regular, occasional, or non-transit users.

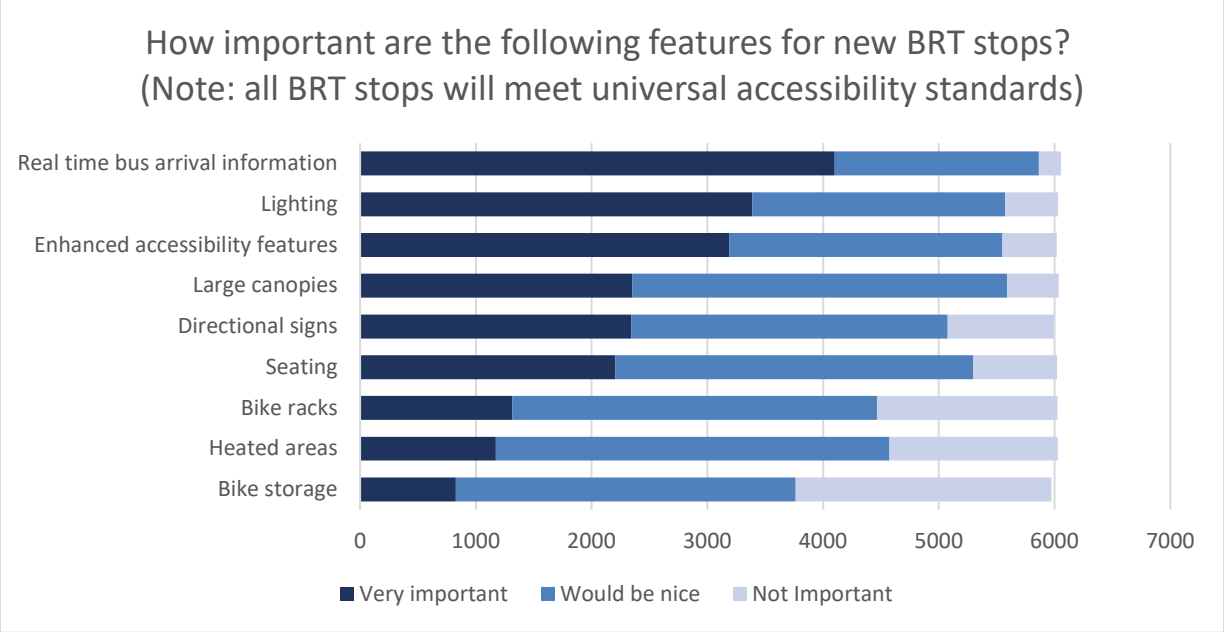



Keeping in mind the trade-offs described in the previous question, what do you think about the proposed plan for dedicated bus lanes?
3,000
2,500
2,000
1,500
1,000
500
0
2,450
2,077
1,185
343
The plan for the location and number of dedicated bus lanes is good
The plan should include more dedicated bus lanes, by converting more traffic or parking lanes, or widening roads
The plan should limit dedicated bus lanes to congested urban streets
The plan should have fewer dedicated bus lanes

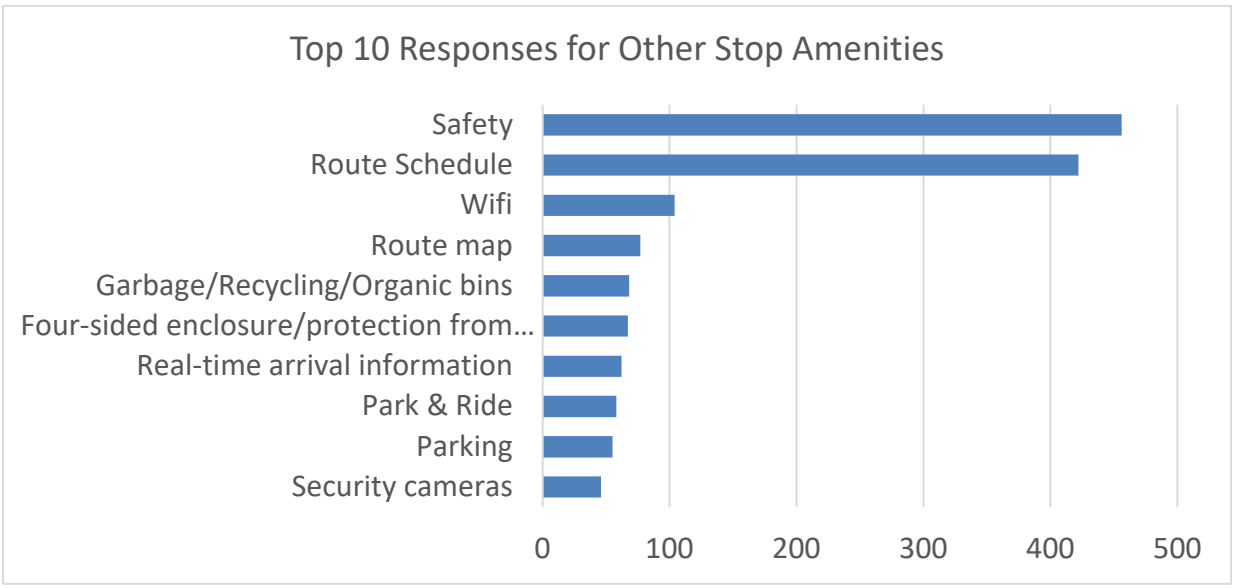

Bus Lane Responses by Level of Transit Use
45%
40%
35%
30%
25%
20%
15%
10%
5%
0%
41%
37%
37%
27%
17%
24%
3%
11%
The plan for the location and number of dedicated bus lanes is good
The plan should include more dedicated bus lanes, even if it means converting more traffic or parking lanes, or widening roads
The plan should limit dedicated bus lanes to congested urban streets
The plan should have fewer dedicated bus lanes
Regular Transit Users
Non-Users

BRT Stop Amenities

BRT stops typically include more features than a regular bus stop to improve rider experience. Participants were asked to rate the importance of certain stop amenities. The responses are listed below. In the comments, many respondents explained that if BRT buses arrive every 10 minutes, heated areas would not be a high priority.

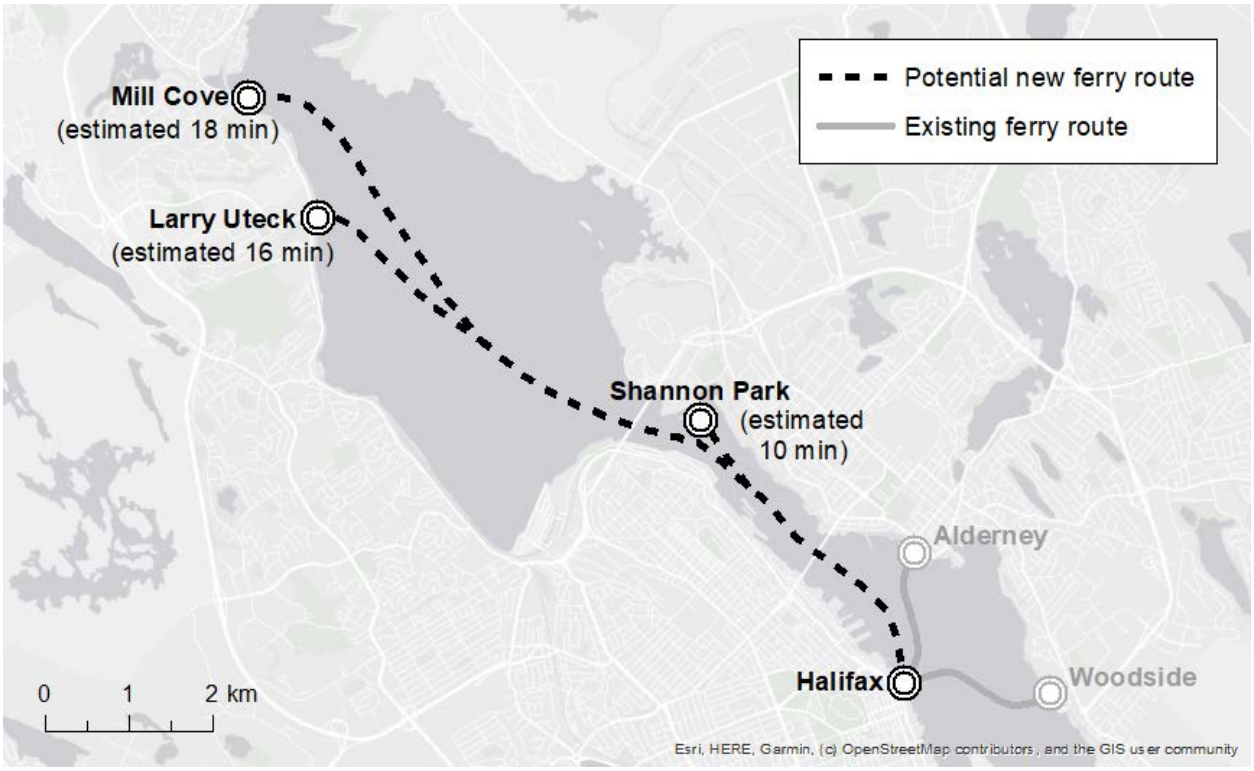


Others prioritized stop amenities to increase personal safety. These suggestions included lighting, security cameras, and emergency alarm systems.

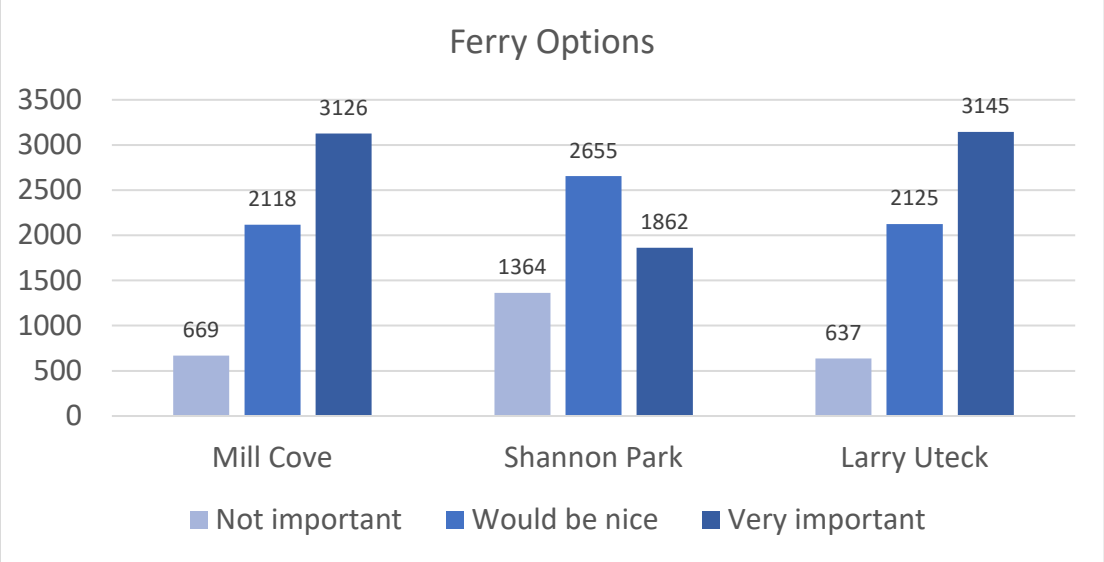


Ferry Route Options

Respondents were asked about the proposed ferry routes, which would connect riders to locations near Bedford to downtown, or Shannon Park to downtown, with travel times ranging from 10 to 18 minutes.



The overall support was very high for the proposed Larry Uteck and Mill Cove routes, and both routes were rated roughly evenly as being “very important”.

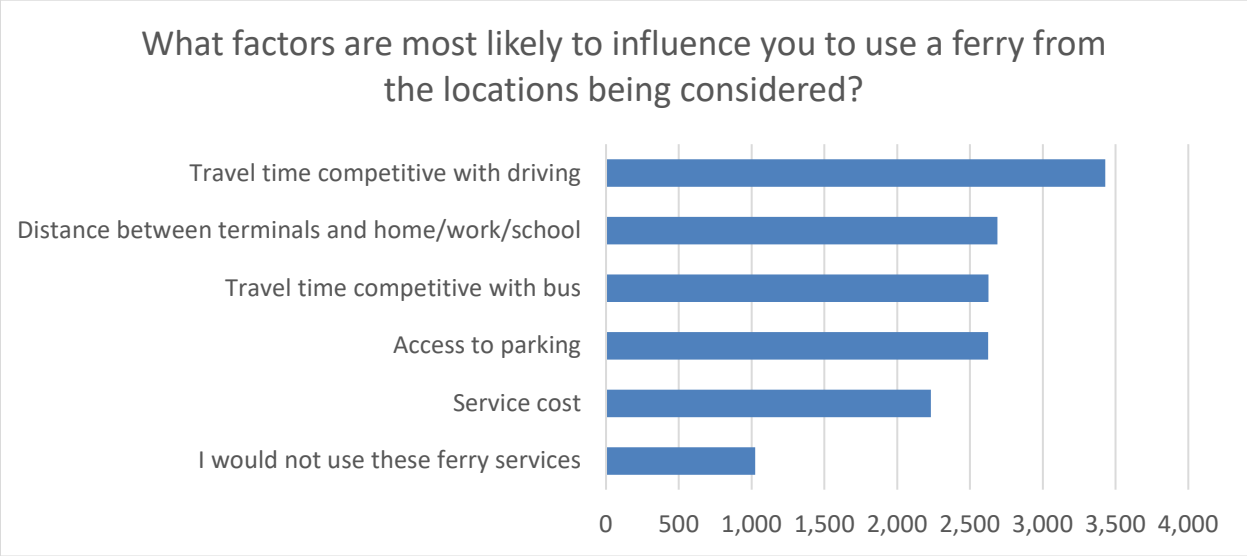


The following table highlights the most common feedback heard from respondents about each proposed ferry route:

Larry Uteck	• Respondents felt there are many people living in the surrounding area to support a ferry route. • There were some concerns about the area being congested with existing Transit routes • Respondents wondered about accessing the land beyond the existing railroad tracks • There was some concern about adequate land available in the area for Park & Ride facilities
Mill Cove	• Respondents cited existing and potential development in the area as positives • Most felt there was adequate land for Park & Ride facilities – some suggested a portion of the Sobeys parking lot (and noted the need for a pedestrian connection) • Many felt this location could provide a local tourism opportunity including shops or a market • Many felt this location could service people from Sackville, Fall River, Hammonds Plains, and even Larry Uteck
Shannon Park	• Respondents felt that this location made sense if development in the area will grow to support it • People could see the potential for a connection to Burnside, with appropriate transit connections • Respondents questioned the effect on local traffic if a Park & Ride is installed there • Some respondents expressed hesitation about having additional ferry service in Dartmouth • Some respondents expressed a desire for a cross-harbour connection from Bedford to Dartmouth

Factors That Would Influence Ferry Use

Overall, most participants reported they would take the proposed ferry routes if the travel time was competitive with driving. Responses were nearly equal across the next three responses, including distance between terminals and origin/destination, travel time competitive with bus, and access to parking. Finally, respondents reported that service cost would influence their decision to use the proposed ferry service.



Other Comments about the Proposed Rapid Transit Network

Participants shared additional valuable feedback and suggestions regarding the proposed Rapid Transit Network. One consistent desire from passengers was electronic fare payment options. Ideas ranged in scope from a reloadable card to paying for tickets via debit or credit card. Additionally, respondents expressed their desire for broader availability of ticket purchasing, which is currently limited to a small number of retailers. Halifax Transit has a project underway to implement an electronic fare solution.

Many respondents expressed their desire for a rail system, rather than BRT. There have been multiple investigative studies on this topic, but staff received direction from Regional Council in 2019 to no longer pursue commuter rail. Other rail-based transit such as Light Rail Transit (LRT) are considered to be cost prohibitive at this time.

Feedback was also received about existing routes, including those that have some transfer difficulties. This feedback has been passed along to Halifax Transit's Planning and Scheduling staff for their review.

More than one-quarter of the comments in this section of the survey expressed appreciation for the Rapid Transit Strategy, and for Halifax Transit as a whole.

Next Steps

We are grateful to all survey respondents and pop-up session attendees for giving your time and feedback to help shape this important project.

Staff are anticipating presenting the final Rapid Transit Strategy to Regional Council in 2020.

To ensure you receive ongoing information about Halifax Transit projects and news, please follow us on our municipal social media channels (@hfxgov, @hfxtransit) and register online at shapeyourcityhalifax.ca.

For more information about the Rapid Transit Strategy, please visit:
https://www.shapeyourcityhalifax.ca/rapid-transit

Integrated Mobility Plan Evaluation Scorecard
Attachment D

Project Title: Rapid Transit Strategy **Date:** May 8, 2020

Description: Implementation of a BRT service and expanded ferry network **Analyst(s):** Mike Connors

		Scoring Rationale	Score (/3)
Pillars	Connected	• Rapid transit significantly improves access to high quality transit service • Rapid transit better facilitates multi-modal connections to improve trips by active transportation and private auto • Rapid transit makes connections to key destinations across HRM including major employment centres, libraries, community centres, and recreational facilities. • Rapid transit improves access to transit for vulnerable populations.	3
	Healthy	• Rapid transit better facilitates multi-modal connections to improve trips by active transportation. A significant proportion of residents will be able to access the new rapid transit services by a short walk, roll, or bike ride. • High quality transit service will encourage more residents to choose transit over driving, reducing vehicle-kilometres traveled by private auto and exposure to collision risk	3
	Sustainable	• High quality transit service will encourage more residents to choose transit over driving, reducing vehicle-kilometres traveled by private auto and greenhouse gas emissions. • Transit oriented land use patterns supported by rapid transit are more environmentally and economically sustainable and are key to HRM's ability to meet climate change targets.	3
	Affordable	• It is expected that nearly all residents in the areas with direct access to rapid transit services will have the ability to rely less on private automobiles for travel, resulting in potentially significant reduced household spending on transportation. • Capital / operating costs for rapid transit services are significant and will require increased municipal investment in transit. Relative to the ability of rapid transit to increase transit mode share, it is anticipated that the additional investment will be wise. However, rapid transit services will not necessarily be cost-neutral.	2
Other Impacts	Mode Choice	• Rapid transit has the potential to shift mode share from private auto to transit. Modeling indicates that region-wide transit mode share could increase by up to 2%, with higher mode share increases anticipated in areas directly served by rapid transit services.	3
	Land Use	• Rapid transit will strongly encourage transit-oriented development patterns, including compact mixed use 'complete communities' near transit terminals and stops. • Rapid transit supports the goals of the Centre Plan and Regional Plan to increase development focus in the Regional Centre by connecting downtowns, centres, corridors and future growth nodes.	3
	Experience	• Rapid transit services will provide a high-quality user experience. User friendly features at BRT stops and terminals will improve comfort, convenience, and safety. Ferry service is well regarded for its unique user experience – expanding it with additional routes will make travel by ferry accessible to a wider range of residents.	3
		TOTAL Score (/21)	**20**

Attachment E:
GHG Reductions Targets for Nova Scotia Power

Year	Low	Base	High
2015	8.8	8.8	8.8
2016	8.54	8.54	8.54
2017	8.28	8.28	8.28
2018	8.02	8.02	8.02
2019	7.76	7.76	7.76
2020	7.5	7.5	7.5
2021	7.4	7.3	7.3
2022	7.3	7	7
2023	7.2	6.8	6.8
2024	7.1	6.4	6.4
2025	7	6	6
2026	6.8	5.8	5.8
2027	6.6	5.6	5.6
2028	6.2	5.2	5.2
2029	5.9	4.9	4.9
2030	5.5	4.5	4.5
2031	5.54	4.5	4.45
2032	5.4	4.5	4.4
2033	5.35	4.5	4.35
2034	5.3	4.5	4.3
2035	5.25	4.5	4.25
2036	5.2	4.5	4.2
2037	5.15	4.5	4.15
2038	5.1	4.5	4.1
2039	5.05	4.5	4.05
2040	5	4.5	4

Megatons CO_2e Emissions