Société de transport de l'Outaouais

Backgrounder
Complementary Study
Summary and recommendations

The dedicated public transit project that will connect Gatineau's west end to the Gatineau and Ottawa downtowns has undergone more than ten (10) years of studies: the feasibility study (2011-2013), the opportunity study (2013-2017) and the complementary study (2018-2021).

The purpose of the complementary study was, among other things, to identify the optimal solution (mode and circuit) for meeting the transportation needs of residents in Gatineau's west end for the next 30 to 50 years in a context of population growth, road congestion and the importance of interprovincial exchanges. The solution needed to reflect current political commitments to the electrification of transportation, sustainable mobility and integrated planning of transportation and land use development, from a local and metropolitan point of view.

This report, tabled in 2021, is a summary of the key stages of the complementary study, and describes how the solution identified as optimal meets the study's main objectives. The proposed recommendations will help orient and expand on the next steps in the analysis, development, detailed engineering and implementation of this project, all of which are expected to extend over a ten-year period.

As with all major long-term projects, the dedicated public transit project will continue to evolve and adjust as it develops. As a result, some of the information in this report is out of date, and will be reassessed in the upcoming pre-project phases:

- the project timeline;
- the integration of the dedicated public transit system in downtown Gatineau (rue Laurier) and Ottawa, and on the Portage Bridge;
- project cost estimates (design, construction, testing and start up). Given that these were indexed using an annual inflation rate of 2%, they will have to be revised because the inflation rates for 2021 and 2022 for the construction sector ended up being higher. In addition, the costs have to be revised upwards to take into account the fact that the initially anticipated timeline had to be extended.

Certain elements had to be redacted because of their sensitivity, such as information that could compromise future calls for tenders or lead to land speculation.

The complementary study is the outcome of collaboration among the STO and the different project partners: Quebec's ministère des Transports et de la Mobilité durable (MTMD), the National Capital Commission (NCC), Ville de Gatineau and the City of Ottawa.

SUPPLEMENTARY STUDY FOR THE DEVELOPMENT OF A HIGHER-ORDER PUBLIC TRANSIT SYSTEM IN GATINEAU'S WEST END

6-STEP REPORT

CONCLUSIONS AND RECOMMENDATIONS

VERSION 02 – FINAL

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CONCLUSIONS AND RECOMMENDATIONS

PRESENTED TO:

SOCIÉTÉ DE TRANSPORT DE L'OUTAOUAIS

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EXECUTIVE SUMMARY

PROJECT OBJECTIVE

To identify a preferred higher-order transit system for the western part of the City of Gatineau, the Société de transport de l'Outaouais (STO) and its partners have established that the optimal scenario should meet the following goals and objectives:

- Offer transit service that is reliable, rapid and is competitive to the use of the private automobile;
- Ensure that major trip generators throughout the region are well connected including the core areas of Gatineau and Ottawa;
- Connect to other high order transit modes including the existing Rapibus system;
- Respond to the City of Gatineau's objectives as identified in its Revised Land Use and Development Plan (*Schéma d'aménagement et de développement révisé* [SADR]).
- Contribute to the economic and social development of the Gatineau-Ottawa metropolitan area.

JUSTIFICATION OF THE NEED AND NECESSITY OF INTERVENTION

According to data from the City of Gatineau, population growth is currently stronger than initially anticipated for the 2031 projections and the development of the western Gatineau. This will lead to an increase in the travel demand in the medium and long term and there will be some considerable strain placed on the transportation network.

Western Gatineau's road network has reached its capacity since 2014 and critical thresholds since 2019, even with the addition of des Allumettières Boulevard just over a decade ago. Bus transit networks, especially in the core areas of Gatineau and Ottawa, are also reaching their capacity and will limit the STO to offer a frequent and reliable service. Thus, with this projected increase in population and jobs in western Gatineau, the transport network will no longer be able to meet the mobility needs of Western Gatineau. This future demand (2031) is expected to significantly increase travel times for both users of transit and private automobiles. For example, the travel time by car between Aylmer and Downtown Ottawa is expected to increase by at least 45%, notwithstanding that these travel times will be even more unreliable since the road network is very sensitive and fragile to any disturbance.

All regional partners agree to meet this increase in travel demand by prioritizing sustainable mobility rather than significantly increasing road capacity. The strategic plans of all the main regional players favour a complete multimodal solution integrating the structure of public transport networks and the facilities for active modes with sustainable land-use planning policies and practices in order to reduce dependence on self-driving and, in a broader sense, to reduce the need to travel as well as the distances to be covered.

A high order public transport system could provide the equivalent of all the expected growth in travel in order to maintain good travel conditions for all modes. However, the public transit network, as it currently exists, cannot accommodate this number of additional trips due to the saturation of reserved lanes and the limited available capacity to add buses in Downtown Gatineau and Ottawa.

In fact, **doing nothing for the public transport network by 2031 (scenario reference 0 status quo improved) would not meet the mobility needs** of western Gatineau since the existing road network and buses operating in reserved lanes are not sufficient to meet demand, even with the implementation of public transit projects currently planned in the region, including those in and around the western sector of the City of Gatineau. This approach does not effectively support the projected development of western Gatineau since it:

- Is not enough to support the equivalent of the total growth in the movement of people travelling to and from western Gatineau (measured at the Gatineau Park screen line);
- The capacity of the bus transport system would be exceeded, most notably in the core areas of Gatineau and Ottawa;
- Contributes to further aggravate travel conditions on the already saturated road network, which worsens conditions for travel by car and public transport.

The need for high order transit is therefore clearly felt, in order to connect the west of Gatineau to the two city centres, to allow better connections to travel generators outside the core area, to better connect transit and ensure better regional integration. High order transit, closely paired with active transportation infrastructure to promote intermodal connections, also meets several municipal and governmental objectives in terms of land use planning, sustainable development and the fight against climate change, to name but a few examples.

It is not only a question of resolving the issues of transporting large volumes of users during peak periods, both to the large concentrations of destinations such as the city centres of Gatineau and Ottawa, as well as to secondary and peripheral destinations, but also to offer a competitive alternative to the automobile for trips outside peaks and for trips within the sector under study which is today less well served by public transit. Thus, with a robust, reliable, frequent service throughout the day and well linked to the local network, it will be possible to meet current and future demand, but also to offer new opportunities to users: time difference travel, efficient use of public transport for reasons other than "home - work" and "home - study," etc.

The addition of a high order public transport system in western Gatineau will improve the competitiveness of public transport in the coming decades, which makes it possible to meet the objectives defined by all partners.

OPTIMAL SCENARIO

A total of eight scenarios were evaluated: four routes in Gatineau crossed with two insertion options in Downtown Ottawa:

- T1 (service to Aylmer and Plateau by tram);
- H1 (service to Aylmer by BRT and Plateau by tram on boulevard du Plateau);
- H2A (service to Aylmer by tram and Plateau by BRT on boulevard du Plateau);
- H2B (service to Aylmer by tram and Plateau by BRT on boulevard des Allumettières);
- Ottawa with a tunnel under Sparks Street;
- Ottawa at grade on Wellington Street (with or without circulation);
- * Scenario B1 (service to Aylmer and Plateau by BRT) was ruled out during the study since it was deemed non-viable.

The overall assessment of these scenarios included several aspects including routing options, location of stations, local accessibility and location of traffic lights, definition of pedestrian and bicycle networks, location of park-and-ride lots, location of the garage, the quality and efficiency of the service offered and the impact on existing infrastructure. The performance of these was analyzed in terms of mobility and accessibility, land use planning and impacts on the environment and health. They were also subject to risk analysis, cost estimation, benefit-cost analysis and multiple account evaluation.

It is the comparison of all these results that led to the identification of an optimal scenario, namely the all-tram network (scenario T1) which has two branches in the west of Gatineau (North through the Plateau and South through Aylmer) and a common segment east of Saint-Raymond Boulevard including through the downtowns of both Gatineau and Ottawa.

- North Branch: Vanier / du Plateau / Saint-Raymond;
- South branch: des Allumettières / Wilfrid-Lavigne / Aylmer / Alexandre-Taché;
- Common segment: Alexandre-Taché / Lucerne / Railway right-of-way / Laurier / Portage Bridge / Ottawa terminus

The total length of the system is approximately 24 km in length, which includes 8 km for the du Plateau branch, 10.5 km for the Aylmer Branch and 5.5 km for the common segment east of Saint-Raymond Boulevard. A total of 36 stations (37 with the Wellington surface option) are currently planned, although their number and location could change. Major interconnection points will be offered including with the Rapibus at UQO and du Portage stations, O-Train Line 1 at Lyon and Parliament stations, between both western branches at Saint-Raymond and with major transfer terminals.

Figure-Executive Summary 2 shows a typical layout. Stations will be typically located at intersections and with universally accessible platforms located on the far side of intersections. Passengers would access platforms by using crosswalks at traffic signals. Specific layouts will be determined during the preliminary design phase.

The vehicles would be low-floor urban tramway trains and could be similar to the models used in Ottawa, Waterloo or Toronto. The indicative design used 45 m long trains carrying approximately 300 passengers each, but different vehicle types and lengths could

be considered as the design, ridership projections and the vehicle market evolves. A vehicle maintenance facility will be required, and it seems that the preferred option would be in the western portion of Aylmer based on an analysis of various sites.

Indicative service frequencies could be in the order of:

- Peak periods: 6 minutes on each branch, 3 minutes on the common segment;
- Other periods: 10 minutes on each branch, 5 minutes on the common segment;
- The service would typically span from 5 AM to 1 AM (20 operating hours per day), but these could be adjusted.

The implementation will require a major reconfiguration of the STO's bus network, especially within the west of Gatineau, but also a review of which bus lines will serve Ottawa was undertaken, including modification of routes from the Hull sector. Bus terminals will be added or upgraded at des Allumettières, Rivermead and du Plateau. Some changes will also be required to some OC Transpo routes, especially to those serving downtown Gatineau. Vehicle park and ride facilities will be maintained at Rivermead and des Allumettières and a new one added at Vanier, while the Saint-Dominque park and ride would be closed. Bicycle parking would be offered at most stations.

In response to the objectives of promoting sustainable mobility and intermodality, the project also includes infrastructure dedicated to active modes. Indeed, one of the main objectives is to plan the system in such a way as to offer the flexibility sought by many residents to not only go to work or school but also be able to use it for many other travel needs (daycare, grocery, meetings, entertainment, access health services, etc.). Promoting intermodality for local trips, i.e., the possible use of several modes of transport (including one mode of collective transport) during the same trip, has added value for the environment and health. This will require integration of land use planning to the high-order system's design.

The addition of a higher-order transit system will improve the transport offer in the sector and support future growth (residential, commercial, offices and leisure) without, however, generating it. The project will help to densify and concentrate this development around the structuring axis, which will promote the achievement of the objectives of the Revised Planning and Development Plan of the City of Gatineau (SADR) regarding the implementation of local shops and services and densification along high-level transport corridors (reference to the areas focused on public transport of the SADR).

The tramway is an essential tool to meet the expected demand in the study area. Indeed, it increases considerably over time. Forecasts for 2031 show that the two tramway branches (north and south) will have around 15,000 users during the morning peak period and 17,000 users during the afternoon peak period or around 50,000 users per day[1]. Looking towards 2051, we can expect, compared to 2031, an average growth of around 18% on the two tram lines. As mentioned previously, the strong instability of car travel times, caused by high-capacity highways, could also create an additional attraction to public transit and potentially generate an increase in ridership on the network (modal shift).

The preferred scenario (T1) allows a modal shift of many motorists to public transport. By comparing scenario T1 with scenario 0 (improved status quo 2031), this scenario makes it possible to attract in public transport:

- During the morning rush hour: nearly 3,000 new users;
- During the afternoon peak period: nearly 4,000 new users;
- Nearly 2,500,000 additional users per year [1].

PLANNING OPTIONS IN DOWNTOWN GATINEAU

Additional studies are required at the concept design stage to better assess the impacts on the wider city centre and possible mitigation measures in order to identify the final optimal choice between two planning options which both offer an adequate compromise between traffic conditions and the operation and performance of public transit.

1 The daily estimate is based on the proportion of trips during off-peak periods of the STO network according to the 2011 origin-destination survey. The structuring mode offers much better travel conditions during off-peak periods and it could have a much greater potential than estimated here.

They offer a quality public transport offer while allowing a reduction in the number of buses in the city centre (noise, etc.) and freeing up spaces for the enhancement of the city centre through user-friendly facilities and quality in particular to contribute to the achievement of the development objectives of the City of Gatineau by making possible the animation of the facades along the south of Laurier Street and along the north of the street (Saint-James block). The addition of significant vegetation along the Laurier Street axis would contribute to the achievement of the partners' objectives regarding the reduction of heat islands in the city centre.

- **Laurier Street fully closed:** tramway dedicated space with full removal of private vehicle traffic between Eddy and de Maisonneuve in order to prioritize urban spaces and active mode facilities.
- **Laurier Street partially closed:** tramway dedicated space with partial removal of private vehicle traffic only between Laval and Maisonneuve in order to maintain access to the Zibi development south of Laurier Street.

INSERTION OPTIONS IN DOWNTOWN OTTAWA

Additional studies are required at the concept design stage to better assess the impacts on the wider city centre and possible mitigation measures in order to identify the final optimal choice between two planning options which both reduce significantly the number of buses in downtown Ottawa.

- **The option of tunnelling under Sparks Street** is favoured because of more efficient interchanges for trips not destined to downtown Ottawa in addition to less impact on other modes of transportation. However, this option is more expensive and comes with higher risks. Indeed, it would be important to better specify the volume, the tunnel construction methods as well as the connection methods to the O-Train in order to better define the anticipated capital costs;
- The **at-grade option on Wellington Street (with or without traffic)** also remains interesting because of its lower costs of around $700M and its opportunity to improve the quality of the urban fabric in front of the Parliament of Canada. On the other hand, this option presents challenges of coordination with plans for the Judicial and Parliamentary precincts. Depending on the variant chosen (with or without traffic), the impacts on traffic or on Confederation Boulevard design standards differ. This option also presents higher risks of possible interruptions in the event of events (demonstrations, major events, etc.).

CAPITAL COST

The capital costs, shown in Table-Executive Summary 1 Summary 1, are presented in 2032 dollars, assuming an indexation (2021-2032) based on the forecast inflation curve provided by the Quebec Ministry of Finance, and excluding financing costs.

Summary Table 1,

Table-Executive Summary 1 Capital Cost estimate – T1 Scenario

Scenario T1		Gatineau Total M$	Portage Bridge Total M$	Ottawa Total M$	Sub-total Total M$	Taxes net of rebates Total M$	Total Total M$
Tunnelling under Sparks St.	min.	$2,663.9	$296.7	$872.9	$3,834.5	$191.2	**$4,025.7**
	max.	$2,663.9	$296.7	$1,265.8	$4,227.4	$210.8	**$4,438.3**
at-grade insertion option on Wellington Street		$2,663.9	$296.7	$320.8	$3,282.4	$163.7	**$3,446.1**

Note 1: To simplify the presentation, the amounts for each item have been rounded to tenths in isolation, according to the detailed data in the source cost estimate file.
Note 2: Class D Estimate -20% to +100% margin of error
Note 3: The tax rate net of rebates is 4.9875% in Quebec. This rate has been used conservatively throughout the project as it is higher than that of Ontario.

SCHEDULE

With the numerous updates to the project, a master project schedule was developed considering the various steps that will be required and includes planning, obtaining approval, an environmental assessment, construction and commissioning of the system. Based on an evaluation of the different steps in the process, it is estimated that construction could commence around 2027–2028 with substantial completion in 2032–2033 and commissioning in 2033. The full system could be operational in 2033 or 2034 when it would be ready for revenue service.

Table-Executive Summary 2 Master Project Schedule

ACTIVITY		DURATION	YEAR
1.	Preparatory Studies	1 year	2021–2022
2.	Preliminary Design	2 years	2022–2024
3.	Environmental Impact Assessment	2 years	2023–2025
4.	Detailed design	2 years	2026–2028
5.	Construction	5 years	2027–2032
6.	Commissioning	0.5 - 1 year	2032–2033
7.	Opening (revenue service)	-	Spring 2034
8.	Adjustments	1 - 2 years	2034–2035
[redacted]	[redacted]	[redacted]	[redacted]

MEETING THE OBJECTIVES OF THE PROJECT

The all-tram T1 scenario has been identified as the optimal scenario to serve the western part of the City of Gatineau since it:

Contributes to the achievement of the city of Gatineau's objectives as identified in its Revised Land Use and Development Plan (*Schéma d'aménagement et de développement révisé* SADR):

- Opportunities for transit-oriented-development (TOD);
- Opportunities for densification and redevelopment along transport corridors with a high level of service (residential, offices, leisure and shops and local services);
- Serving the major existing and planned activity centres;
- Opportunity to enhance downtown Gatineau;
- For the north branch, the corridor planned on du Plateau Boulevard makes access to the transit corridor more attractive, user-friendly and safe for several residential and other projects (commercial/mixed, public facilities);
- For the southern branch, the section planned on Lucerne Boulevard and the railway right-of-way offers the opportunity to redevelop Alexandre-Taché Boulevard between Saint-Dominique and Montcalm streets;
- Thirteen (13) stations have a strong potential to induce the development of an adjacent urban public space;
- Compliance with the assignment of traffic lanes on the two branches.

Promotes sustainable mobility and intermodality by meeting current and future needs for the next 30 years:

- Reliable, efficient and competitive public transport service offer for the use of self-driving (travel time);
- Residual transmission capacity that makes it possible to meet demand forecast for the post-2031 horizon;
- Provides 2 m wide sidewalks over the entire length of the route including in many areas where there are no sidewalks today;
- Presence of a cycling facility along the entire length of the route;
- Efficient service to downtown Gatineau and Ottawa and the metropolitan area and its main travel generators;
- Significant increase in the modal share in sustainable modes, suggesting an increase in the distances travelled on foot and by bicycle;
- Allows a very significant reduction in the number of buses in downtown Ottawa: 70% less than current volumes, which is consistent with the urban redevelopment projects in this sector and the tripartite agreement for a period of five years was signed in 2017 between the City of Ottawa, the City of Gatineau and the STO;
- Reducing greenhouse gas emissions and other atmospheric pollutants with a fleet of 100% electric vehicles and a modal shift to public transport;
- Improves the health and quality of life of Gatineau residents.

Improves the integration of regional transport networks:

- Efficient connections with the existing Rapibus BRT network;
- Efficient connections with the existing O-Train LRT network in Ottawa. In a metropolitan vision of transport, the project also offers Ontario users efficient travel conditions to reach major travel generators in Québec;
- Efficient connections with the STO local bus networks, including the creation of major transfer hubs at key locations;
- Efficient connections with the local networks of OC Transpo and TransCollines local bus networks.

Contributes to the economic and social development of the region from a metropolitan perspective:

- Accessibility to public transit is greatly improved for all western Gatineau;
- The decrease in demand for cars in favour of sustainable modes will lead to savings of more than one million hours of travel per year for Gatineau residents in 2031, in addition to the 1.4 million hours saved for public transport users (also in 2031);
- Allows households to reduce their transport-related expenses;
- Strengthens public transport service to the disadvantaged sectors of the Plateau and Vieux-Aylmer from/to the city centre and makes the industrial sector to the northwest of the Plateau more accessible;
- Twenty-six (26) stations of the 34 stations located on the Quebec side are located less than 400 m from existing commercial areas.

Minimizes environmental, heritage and human impacts:

- There is no encroachment in sensitive areas in Gatineau Park and fewer required property acquisitions.
- No overhead wires in sensitive areas through battery operation (heritage areas and downtown Gatineau and Ottawa);
- Visual and acoustic attenuation measures will be implemented in sensitive areas.

REGIONAL COLLABORATION

The STO and WSP wish to underline the great collaboration of all the partners in a very complex and unique governance context in Canada. We would like to thank the partners for their support and sustained involvement which greatly contributed to the study.

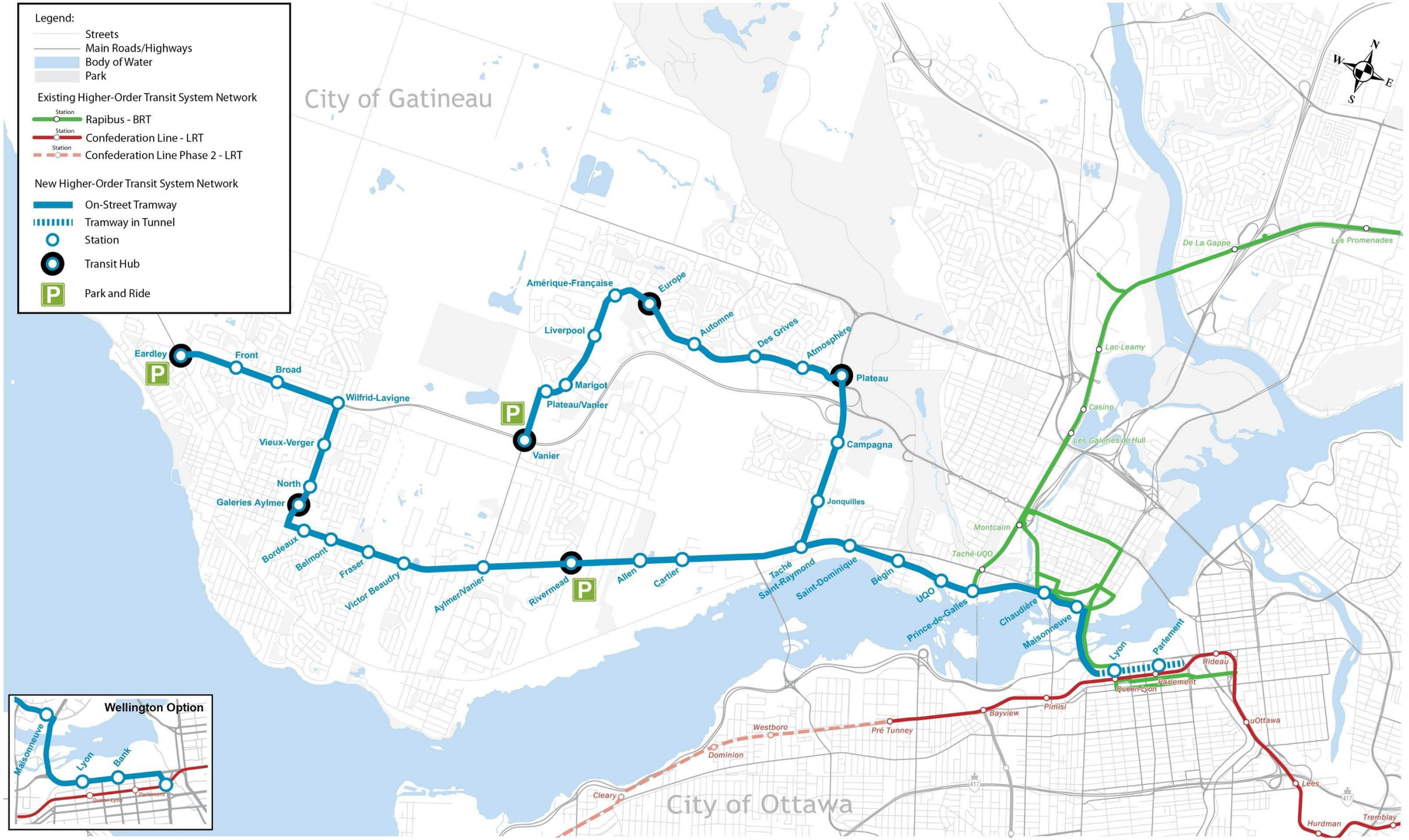

Figure-Executive Summary 1 Proposed higher-order transit system network

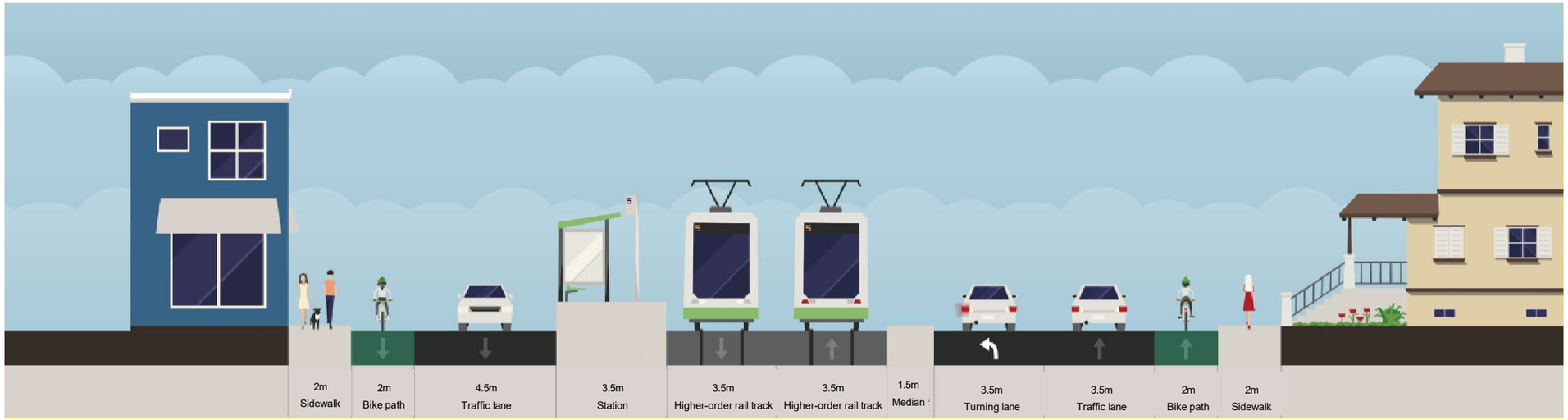

Figure-Executive Summary 2 Typical cross section at intersections

Figure-Executive Summary 3 Planning concept on boulevard du Plateau

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APPENDIX

1 INTRODUCTION

1.1 VISION

For its higher-order transit system project in the western part of the City of Gatineau, the Société de transport de l'Outaouais (STO) and its partners have agreed on the following vision:

"To implement a higher-order public transit system that will meet the short, medium and long-term travel needs of the residents of western Gatineau, improve the quality of life of citizens, contribute to economic and social development and promote sustainable mobility in the context of the Gatineau-Ottawa metropolitan region."

1.2 PROJECT OBJECTIVES

To materialize this vision, three main objectives were established to guide the development of the study solutions:

1. To meet current and 30 years future mobility needs :
   a. Offer transit service that is reliable, performing and is competitive to the use of the private automobile;
   b. Ensure that principal trip generators throughout the metropolitan region are well connected including the core areas of Gatineau and Ottawa;
   a. Connect to other existing high order transit modes including the Gatineau Rapibus and the Ottawa O-Train.
2. Respond to the City of Gatineau's objectives as identified in its Revised Land Use and Development Plan (*Schéma d'aménagement et de développement révisé* SADR);
3. Contribute to the economic and social development of the metropolitan region.

1.3 BACKGROUND

Population growth, particularly in the western portion of the City of Gatineau in recent years, generates traffic congestion on the road network and increases demand for public transit services to downtown Gatineau and Ottawa, particularly at the Gatineau Park and Ottawa River crossings. Note that the road network has in fact already been at capacity since 2014 and has been approaching critical levels since 2019.

This situation, which has been observed for several years, is addressed in the planning documents of the various regional authorities. Indeed, the Société de transport de l'Outaouais (STO), the City of Gatineau and other regional stakeholders on both sides of the Ottawa River are addressing this issue, both in terms of land use planning and mobility (STO Strategic Plan 2017-2026, Sustainable Mobility Plan, Land Use and Development Plan, etc.). All of these strategic plans agree to promote the use of public transit and the reduction of individual automobile use for all types of travel (work, study, recreation, access to services, access to businesses, etc.) as well as to support the regional development envisaged by optimizing the quality of life of the population.

However, in order to succeed in influencing mobility behaviour in favour of public transit, it is essential to adapt the infrastructure so as to offer a reliable, attractive and competitive alternative to car use, both in terms of the services offered and the type of mode (bus or tramway) implemented, both during peak periods and throughout the day, in order to attract users that were less well served in the past. This approach is also in line with the orientations supported by the Government of Quebec in its Sustainable Mobility Policy – 2030, presented in April 2018, for efficient, safe, sustainable, equitable travel integrated into the environment and compatible with human health and ecosystems.

The STO has already begun this process with the introduction of the Rapibus in 2013. This 12.5 km Bus Rapid Transit (BRT) service offers residents of the east end of the city a more direct and efficient service to downtown Gatineau. However, the bus network in downtown Ottawa is nearing its capacity threshold for taking more and more buses, limiting the growth of the service. Moreover, this service is only intended for users in the eastern part of the city, so the western sector is still lacking a higher-order public transit system that meets the needs of its growing population, which is facing congestion in a transit system that is deteriorating year after year. Since travel in the region is closely linked to interprovincial travel, the success of such a higher-order network also depends on its connection with the Ontario side. Currently, the STO offers bus routes that go directly to Ottawa, increasing the number of buses on its downtown road network, all in a context where the City of Ottawa wants to limit the presence of buses on its territory. The STO and the cities of Gatineau and Ottawa signed a Memorandum of Understanding in May 2017 to reduce the number of STO bus in downtown Ottawa. In addition, the City of Ottawa and OC Transpo are currently developing a Light Rail Transit (LRT) system with a tunnel through the city centre, which will reduce bus ridership in the downtown area.

The STO has already commissioned an initial opportunity study for a higher-order public transit system in the western part of the City of Gatineau. This study, which began in 2011, assessed the needs and solutions for the implementation of a higher-order service, mainly by attempting to identify, in accordance with the estimated needs, the corridor(s) to be used and the resulting impacts. The recommended options targeted two higher-order corridors, namely Boulevard des Allumettières and Boulevard Aylmer/Alexandre-Taché, with river crossings via the Champlain and Portage bridges. However, due to the resulting increase in bus volumes and the changing development patterns of the cities of Gatineau and Ottawa, the STO and OC Transpo, this study, finalized in 2017, no longer fully meets the expectations of all parties involved.

It should also be noted that municipal, provincial and federal political will is currently trending more and more towards electrification of transport, sustainable mobility and integrated transportation and land use planning. This context therefore presents a window of opportunity for federal and provincial funding for higher-order public transit systems. To this end, in June 2018, Gatineau's council took a position in favour of a rail-based mode.

1.4 MANDATE

In this context, the STO decided to conduct a study complementary to the 2011 opportunity study (completed in 2017) for a higher-order public transit system in the western part of the City of Gatineau. The purpose of this study is to update the previous study with the most recent data and to adapt it in light of new orientations by refining the analyses already carried out, by verifying the nature of the needs of this sector and by evaluating the feasibility and relevance of implementing a high-capacity higher-order mode in a metropolitan vision. To do this, the STO retained the services of WSP.

As part of its mandate, WSP must study in greater detail the advisability of implementing a higher-order inter-sectorial public transit system that would meet the needs of residents in the short, medium and long terms in the West Gatineau region, ensure efficient service to the downtown areas of Gatineau and Ottawa and to the metropolitan region and its main trip generators and better link the region's public transit systems. This complementary study is financed by the Quebec government's Public Transit Infrastructure Fund Financial Assistance Program (Programme d'aide financière du Fonds pour l'infrastructure de transport en commun – PAFFITC), which oversees federal and provincial contributions. The resulting project could be subsidized by the federal government through the Invest in Canada infrastructure program.

This study aims to:

1. **Refine** the analyses to clarify and update the identification of needs and constraints;
2. **Strengthen** the case for intervention;
3. **Design and compare** various potential scenarios to highlight the one that offers the best balance of transportation potential, costs and impacts, including rail (light rail) options and comparing them to the status quo (scenario 0);
4. **Validate** the technical feasibility of the selected scenario;
5. **Identify** the scenario with the greatest potential to achieve the project vision and objectives;
6. **Describe** the technically recommended scenario;
7. Final report and recommendations.

1.5 REPORT 6 OBJECTIVES

The purpose of this report is to document and summarize the progress of all the major stages of the study, while presenting how the solution deemed optimal meets the major objectives of the study, including the advantages and the associated benefits. This final report also includes recommendations intended to guide, over the next ten years, the next stages of development and realization of this *Higher-order public transit system in Gatineau's west end*.

The following are discussed in the next sections:

- Context of the Study;
- Summary of the main stages of the study:
  - Report 1: Needs and constraints;
  - Report 2: Identification of solution;
  - Report 3: Impact evaluation and performance of solutions;
  - Report 3B: Complimentary studies of downtown Ottawa options;
  - Report 4: Downtown Gatineau optimisation and comparative evaluation of all scenarios;
  - Report 5: Optimal scenario description.
- Meeting objectives and recommendations.

The elements described on the following pages represent the reasons, choices and decisions that led to the identification of the optimal recommended scenario. The description of this scenario indicates the direction in which the additional further detailed studies should be oriented. However, the project is still at an early stage and new data could still influence certain decisions.

1.6 CONTEXT OF THE STUDY

It should be noted that the study took place over three years (2018-2021). Consequently, the status or description of certain infrastructures, reference documents or other, presented in the following sections, may have changed since the first reports. Certain information and data presented in a first report have sometimes been updated in a subsequent report. Where applicable this has been referenced.

Due to its geographical location, this project is a complex and unique. Indeed, rare are the public transit projects which, in addition to covering two different cities, also cover two provinces and the Federal National Capital Region where interventions on federal property are subject to the National Capital Commission approval process. All the technical work presented below was therefore the subject of review, discussions and exchanges with several stakeholders that formed the project governance committees led by the STO. Among these are the Quebec Ministry of Transport (MTQ), the City of Gatineau, the City of Ottawa, OC Transpo, the National Capital Commission (CCN), Public Services and Procurement Canada (PSPC) including representatives of parliamentary and judicial committees.

This complementary study, begun in August 2018, has ended three years later. It was affected by the COVID-19 pandemic, which caused a temporary decline in the use of public transit in all cities in Canada and elsewhere in the world. On the other hand, in the perspective of answering mobility needs increase through sustainable development and fight against climate change, the need for a higher-order public transit system for Gatineau's west end remains valid and relevant. Thus, it is presumed that, like most public transit projects that have been maintained across the country, volumes and growth will be reached, as we emerge from this global health crisis, in the long-term horizon.

Forecasts mentioned in this document could therefore take a few more years to materialize depending on potential changes in travel habits and teleworking increase. However, as other public transport projects (extensions of the REM and the metro in Montreal, tramway in Quebec City and Longueuil), this *Complementary study for the Higher-order public transit system in Gatineau's west end* is based on the fact that these forecasts remain valid in the long term. More specifically, the need to offer a competitive, reliable and frequent public transit network, both during peak periods and during off-peak periods, remains justified based on the expected population growth in Gatineau and its various users mobility and accessibility needs (workers, students, tourists and access to health, leisure and general services). This need is also aligned with all government levels objectives in terms of mobility and sustainable transport and urban development.

It should also be noted that during the preparation of this study, it turned out that the demographic growth of the study area evolved more rapidly than anticipated, which accentuates the importance of the residual capacity of the future higher-order transit system of the Gatineau's west end.

Increasing the use of public transport is a pillar of a sustainable society, since:

- It is a vector of economic development, because it makes it possible to reduce dependence on the automobile and the consumption of non-renewable resources and, by the same token, brings a reduction in greenhouse gas emissions and gross household expenditure on transport. Its nature of priority service also helps support the functioning of society in times of crisis.
- It is a vector of a healthy lifestyles since public transit customers very often walk to get to the network and to their destination. The practice of active transportation (walking and cycling) is also proven to be an effective way to increase the practice of physical activity and obtain the beneficial effects on health.
- It contributes to general population health improvement:
  - Modal shift has a considerable impact on the quality of living environments, through its outcome on air quality. Air pollution has significant effects on the health of populations, especially children and the elderly, who are the populations most sensitive to air quality;
  - Also, road transport noise can induce chronic stress, and exposure to this noise is often associated with sleep and concentration problems. The effects of air pollution and noise can be combined;
  - Finally, motorized transport is responsible for 44.8% of greenhouse gas (GHG) emissions which contribute to climate change and its impacts on health.

However, studies indicate that for this modal shift to sustainable transport (walking, cycling and public transport) to occur, the services offered must be:

1. Reliable and efficient;
2. High frequency;
3. Comfortable and easy to access;
4. Competitive to individual automobile use;
5. Focused on the specific needs of the aimed users groups.

2 SUMMARY OF THE STUDY STAGES

The purpose of this study is to define the optimal solution for meeting the needs of residents in the short, medium and long terms in the West Gatineau region to ensure efficient service to the metropolitan area, including the downtown areas of Gatineau and Ottawa and its other main trip generators, while linking to other existing higher-order transportation systems in the region. All of this must be in accordance with municipal, provincial and federal policies and plans, as well as with the major future projects of the greater region.

The present study was divided into five main stages as illustrated in the Figure 2-1.

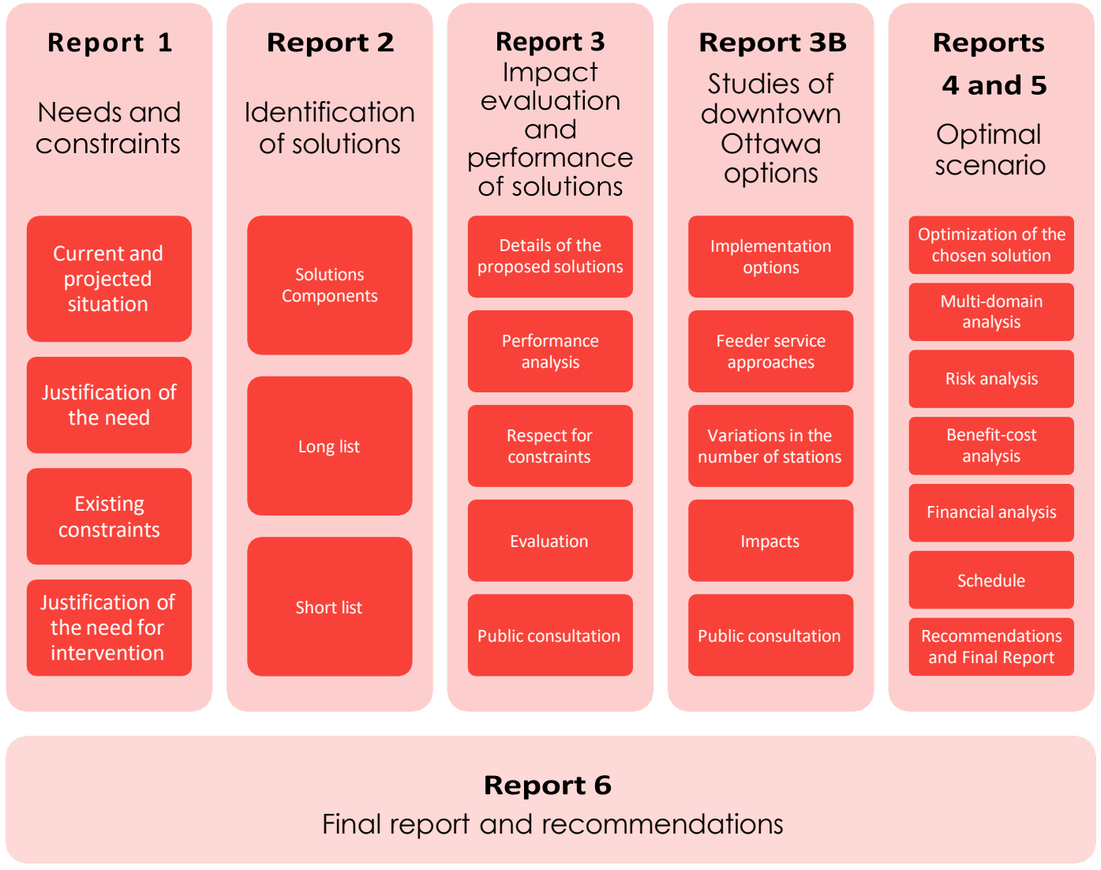


Figure 2-1 Steps in the follow-up study

Given the multidisciplinary nature of all the reports that make up this study, they have been conceived and presented so as to provide two levels of information:

- The report for each stage has a summary of the points and issues raised,
- [redacted]

2.1 REPORT 1 – NEEDS AND CONSTRAINTS

The main purpose of this first deliverable, [redacted], was to update and refine the needs and constraints described in the previous studies by updating the basic data and inputs. It should be noted that some of the data presented in this chapter has, in part, evolved over the course of the next few steps, but its documentation contributes to the overall understanding of the project.

The main themes addressed in this first stage of the study are as follows:

- The current and future situation in the study area:
  - Strategic, political, territorial and demographic context;
  - Mobility (travel, public transit, active transportation, road network and road safety).
- The summary of the identified needs;
- The many constraints for:
  - Transit operations: capacity and connectivity thresholds;
  - Connections with the Rapibus network;
  - Crossing the Ottawa River and connecting to the O-Train;
  - Generic constraints – insertion of a higher-order mode template;
  - Buried networks and infrastructure;
  - The human and natural environment.
- Justification of the need for intervention.

2.1.1 CURRENT AND FUTURE STATUS OF THE STUDY AREA

CHARACTERISTIC

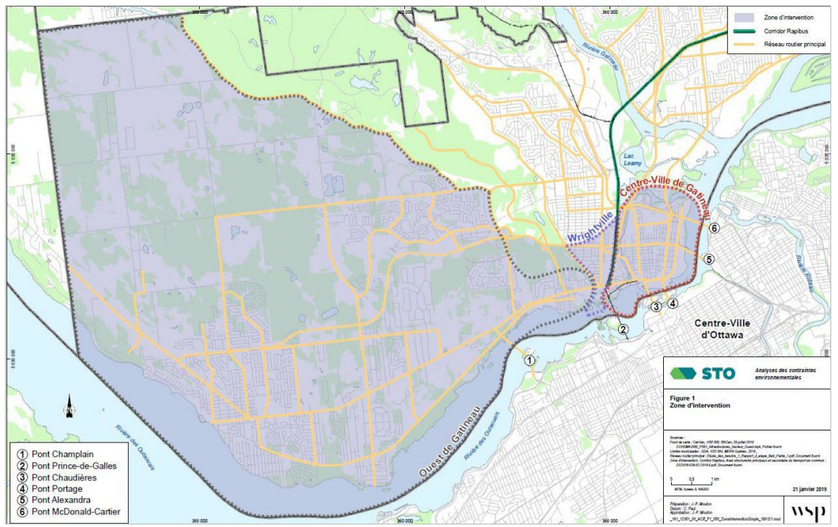


Figure 2-2 Study area

As illustrated in Figure 2-2, the study area is located in the western sector of the City of Gatineau and is bounded by:

- the Ottawa River to the south and east, including connections to Ottawa;
- the western boundary of the City of Gatineau to the west;
- Chemin de la Montagne and Gatineau Park that define Gatineau downtown to the north;
- This study area is also located within the unceded traditional territory of the Anishinaabe people.

This territory is divided into eight sectors, with 91,000 residents (35% of Gatineau's population), including 72,500 west of the Lac-des-Fées Parkway. The demographic forecasts for 2031 and 2051 indicate that the population increase will be more significant in the study area (+30% towards 2031 and +33% for 2031-2051) than elsewhere in Gatineau (+18% towards 2031 and +26% for 2031-2051). According to data from the City of Gatineau, population growth is currently stronger than initially anticipated for the 2031 projections and the development of the western Gatineau which stresses the importance of the residual capacity of the higher-order foreseen transit system.

In terms of activity clusters, growth in jobs and post-secondary students in Gatineau should be 22% by 2031. More specifically, growth in the study area is expected to be slightly higher (28%) and will be spread over four poles of activity. The two main ones, downtown and Lac-des-Fées will develop considerably, while the growth of the other two poles, namely the Plateau and the Park, will be smaller. The diffuse aspect of the future distribution of jobs and postsecondary students within Aylmer and the Plateau highlights a need for service to the outskirts and not just to the city centre. Future public transport services will have to cover and serve the territory as a whole and not converge only on city centres.

In Ottawa, the number of jobs and post-secondary students will increase by 29%, and the study area will experience similar growth (+31%). The University of Ottawa, downtown and Tunney's Pasture will continue to be the most important activity clusters.

LAND AND MOBILITY PLANNING

The future development of this study area is dependent on multi-level territorial planning (local, regional and metropolitan). It is indeed part of the planning strategies of several institutional stakeholders at various levels of jurisdiction: federal (NCC and PSPC), provincial (Quebec/Ontario) and municipal (Gatineau/Ottawa and associated transit agencies). All the main strategic documents listed below were applicable and adopted at the time of stage 1 (in 2018). Note that since then, some have been revised.

FEDERAL– NATIONAL CAPITAL COMMISSION

- The Plan for Canada's Capital, 2017–2067.

PROVINCIAL – QUEBEC – GOVERNMENT OF QUEBEC

- Ministry of Transportation Strategic Plan, adopted in 2017;
- Government Sustainable Development Strategy 2015-2020;
- Sustainable Mobility Policy – 2030: Transporting Quebec Towards Modernity, published in April 2018.

PROVINCIAL – ONTARIO– GOVERNMENT OF ONTARIO

- Provincial Policy Statement adopted in 2014.

MUNICIPAL – VILLE DE GATINEAU/CITY OF GATINEAU

- The Revised Land Use and Development Plan (*Schéma d'aménagement et de développement révisé* – SADR), adopted in 2015;
- Gatineau's Sustainable Transportation Plan (Plan de déplacements durables de la Ville de Gatineau) adopted in 2013;
- The Master Plan for Gatineau's bicycle network (Plan directeur du réseau cyclable de la Ville de Gatineau) adopted in 2018.

MUNICIPAL – SOCIÉTÉ DE TRANSPORT DE L'OUTAOUAIS

- Strategic Plan 2017-2026 adopted in 2017.

MUNICIPAL – CITY OF OTTAWA

- The City of Ottawa's Official Plan adopted in 2003;
- The City of Ottawa's Transportation Master Plan adopted in 2013.
- Ottawa's Cycling Plan adopted in 2013;
- Downtown moves: Transforming Ottawa's streets adopted in 2013.

Report 6: Conclusions and recommendations

Historically, the response to an increase in travel demand was to build a new road or bridge. However, in the current context of the fight against climate change, all levels of government now agree to promote sustainable mobility by prioritizing:

1 Integration of transport planning with land use planning;
2 Increasing access to reliable and efficient sustainable modes of transport to reduce:
   - Trips made with single-occupancy vehicles;
   - Greenhouse gas emissions;
   - Gross household expenditure on transport.
3 More efficient connections and cohesion between the Gatineau and Ottawa transportation systems;
4 The creation of user-friendly living environments that contribute to economic vitality.

As for the various major and future projects that have been identified, these are likely to have positive impacts on the use of a public transit system to answer user's mobility needs, provided that their integration and connection are efficient. In return, the addition of a higher-order transit system, will be able to support future growth (residential, commercial, offices and leisure) by densifying and concentrating this development along the higher-order transit axis, which will promote the achievement of sustainable development objectives and those of SADR's land use planning with regard to the establishment of local shops and services and densification along higher-order transit corridors (reference to TOD within the SADR).

MOBILITY AND ACCESSIBILITY

Accessibility to and from Aylmer, Le Plateau, Val-Tétreau and Hull Island is generally good. This area is crossed by two major roads that connect them to Ottawa, the Gatineau sector, Pontiac and Upper Gatineau (Highway 5 and Boulevard des Allumettières/Highway 148). However, these routes cross sensitive areas, including Gatineau Park and the urbanized sectors of Val-Tétreau and Hull Island. Widening these roadways to accommodate the specific increase of vehicular demand during peak periods cannot be done without major sacrifices and would contravene the City of Gatineau's land use and development plan and the provincial government's sustainable mobility policy.

The local bus network serves all sectors of the study area. The main offering is concentrated in the peak periods and oriented towards the centre of Ottawa and the heart of Hull Island. However, there is a complementary offer for trips to secondary destinations within the study area. This offer is more modest outside peak periods, particularly for trips within the study area. The Aylmer sector has a loop shuttle, a few lines serving the CEGEP in the Mont-Bleu district and line 800 that provides a link between Aylmer and the Rapibus corridor. That said, bus travel times are not currently competitive with automobiles.

The data from the origin destination survey led by the TRANS committee illustrates that just under half of the trips originating in the Study Area remain within the Study Area, demonstrating in part its self-sufficiency in employment, education, commerce and services. Cars are the preferred means of travel (both for internal and external trips within the Study Area). The lack of pedestrian-(sidewalk) and cyclist-friendly development can be identified as a barrier to better local accessibility.

— Interprovincial traffic accounts for 6% of all movement in the greater Gatineau-Ottawa area. In absolute terms, 206,100 trips are made each day over the Ottawa River, including 48,000 by bus. A quarter of these interprovincial trips are made by the residents of the Study Area.
— The car (single occupancy vehicle) remains the main means of transportation during the day;
— During the morning peak period, 45% of trips to downtown Ottawa (central Ottawa) from Aylmer, Le Plateau and Hull Island are made by public transit. However, this modal share is anecdotal for trips within the study area;
— Internal movements within the study area represent nearly 1 in 2 trips, which indicates that most residents equally remain within the study area or regularly leave their neighbourhoods to access services and employment centres outside their neighbourhoods;
— Public transit service is good during peak periods and in the direction of peak, particularly to the downtown areas of Gatineau and Ottawa, while it is more modest during off-peak periods, especially for trips within the study area;
— Existing transportation infrastructure is fully utilized, and public transit ridership has increased by 10% in the last five years (2013-2018);
— The road network is already at capacity since 2014, and the bus network is approaching critical operational thresholds which is limiting the possibility of adding more buses to answer the demand especially in the downtown areas. These networks will not be able to support future demand at their main points of convergence (Gatineau Park crossing and interprovincial bridge crossings);
— Bus speeds are poor in downtown Ottawa and Gatineau due to the lack of continuous, robust preferential measures and increased car volumes.

TRAFFIC

In order to validate the impact of the implementation of a high capacity higher-order mode to serve the western study area of the City of Gatineau, it is also important to analyze the current traffic conditions and to understand to what extent they have changed since the previous study. The main objective of this section is therefore to present the overall traffic conditions on the major arterial roadways, at the screenlines of the interprovincial bridge crossings and at various intersections, for the 2014 et 2031 horizons. The 2051 projection data were determined later, in Report 3, and therefore presented within that section.

- Vehicular flows are commuting on the major routes and have increased significantly at the screenlines along Chemin Vanier and Gatineau Park between 2005 and 2011. However, vehicle occupancy rates decreased during this period (1.22 to 1.10 passengers per vehicle);
- Travel times by car between Boulevard Wilfrid-Lavigne and downtown Ottawa are comparable for the routes via Chemin Aylmer and Champlain Bridge or Boulevard Alexandre-Taché and Chaudières or Portage Bridge, i.e. between 26 and 33 minutes, while those via Boulevard des Allumettières and Boulevard Maisonneuve and Portage Bridge are between 25 and 32 minutes;
- Many intersections present congested traffic conditions during the 1) morning rush hour: Aylmer/Vanier; Aylmer/Rivermead; Aylmer/Samuel-de-Champlain; Lucerne/Samuel-de-Champlain; Alexandre-Taché/Montcalm; Alexandre-Taché—Laurier/Eddy; Laurier/Maisonneuve—Portage Bridge; Allumettières/Maisonneuve; Allumettières/Wilfrid-Lavigne; Saint-Raymond/Cité-des-Jeunes; and 2) in the evening rush hour: Aylmer/Vanier; Aylmer/Samuel-de-Champlain; Lucerne/Samuel-de-Champlain; Alexandre-Taché—Laurier/Eddy; Laurier—Maisonneuve/Portage Bridge; Allumettières/Maisonneuve; Saint-Raymond/Cité-des-Jeunes; Allumettières/Wilfrid-Lavigne;
- With respect to the roundabouts in the sector, the study also shows that the most problematic roundabout from a traffic standpoint remains the Saint-Joseph roundabout, given the higher traffic on the Saint-Joseph and Allumettières boulevards.

The additional analysis, done through this current study, shows that, in the analysis area and since 2011, vehicular demand has increased while no significant changes have been made to the road network. This situation has led to a deterioration in traffic conditions compared to the situation in 2011. The increase in demand has also had an impact on the length of congestion periods and the increase in delays at certain intersections and in total travel times.

SAFETY

The safety profile is based on inventoried collision data covering the period between September 2015 and August 2018 in the study area. For these years, the overall observations are similar, with a higher number of collisions during the winter and less pronounced peaks during the summer period.

In all, nearly 2,964 collisions occurred during the study period, regardless of the type of user or the severity of the collision. The majority of these collisions occurred in the vicinity of downtown Gatineau, where the density of streets, intersections and activities is higher and the reasons for travel are numerous and diversified.

Intersections are where collisions are most likely to occur. In fact, 91% of injury collisions and 75% of property damage collisions only occur at intersections.

- All modes combined, there is a high preponderance of collisions on the Allumettières corridor in its eastern portion, near the city centre, although with lower severity, reflecting intersection management using roundabouts and higher traffic flows than elsewhere in the study area;
- The Alexandre-Taché route has the highest number of intersections, but still has the lowest number of collisions per kilometre;

- For collisions involving a fatality, only one occurred in the corridors as defined in the current study, on Chemin d'Aylmer at the intersection with Chemin Fraser;
- The two intersections with the highest combined rate, Allumettières/Saint-Joseph and Alexandre-Taché/Eddy, have a relatively low severity index (vast majority are property damage collisions only);
- Collisions at roundabouts in the study area generally have one of the lowest severity ratings, regardless of the number of crashes that occur there;
- To the west of Gatineau Park, the only intersection in the study corridors with a severity index greater than 2 (which indicates a higher collision rate with injuries) is located at Principale/Frank Robinson, although the accident rate is lower than several other intersections in the study area.

TRAVEL PROJECTION

The results show that in the peak time travel direction, capacity is almost reached at present on all bridges crossing the Ottawa River, as well as for the routes crossing Gatineau Park. An increase in vehicular travel demand across the Ottawa River screenline is also expected by 2031 due to anticipated population growth. However, no additional vehicular capacity is expected by 2031 (or by 2051) across the Ottawa River or Gatineau Park. Thus, the increase in travel demand combined with a stagnation of vehicle capacity to cross will imply a deterioration of traffic conditions anticipated with a V/C of 1.24 on all bridges (equivalent to a demand 24% higher than the capacity). In concrete terms, this translates into:

- During peak periods, vehicle capacity has already been reached for the Gatineau Park/Ottawa River crossing in 2014;
- The situation where future demand (2031) is assigned on the existing road network shows that travel times by car increase considerably (almost 45% additional time to link Aylmer and Parliament Hill), leading, beyond the overall increase in the number of trips on the transportation network, to an emphasized modal shift towards public transit. However, the public transit system, as it currently exists, cannot accommodate this number of additional trips (saturation of reserved lanes);
- The modal shift to the bus will therefore occur, but will be low in 2031, ranging between 0 and 3% on the various screenlines in the morning peak period, since the quality of the offered service will be very difficult to achieve. Indeed, even if the service is improved in a progressive manner, the degraded traffic conditions will disrupt the services offered (travel time and reliability);
- Stretch of peak periods, with some departures being brought forward or delayed avoiding traffic.

2.1.2 SUMMARY OF IDENTIFIED NEEDS

In order to validate the feasibility and justify the implementation of a high capacity higher-order mode to serve the western sector of the City of Gatineau, it is necessary to identify the needs of this sector, but also to verify how these needs are reconciled with municipal, regional and provincial issues. These needs must be met for the short-, medium- (2031) and long-term (2051) horizons. These must also address the key objectives of the study:

1. Meet mobility needs today and for the next 30 years;
2. Contribute to the achievement of Gatineau's objectives as set out in its Revised Land Use and Development Plan (Schéma d'aménagement et de développement révisé – SADR);
3. Contribute to the economic and social development of the region from a metropolitan perspective.

To do this, we reviewed the entire strategic context (baseline situation and those that would emerge in 2031 and 2051) and summarized the main following guidelines.

MOBILITY: MEETING NEEDS FOR THE NEXT 30 YEARS

Constantly changing socio-economic needs force cities and towns to reinvent, progress and evolve to ensure their success. The response to the mobility needs of populations, here as elsewhere, is not immune to this challenge.

The intent of the Land Use and Development Plan is to maintain the development of the western sector of the City of Gatineau. To do this, the existing road network must be addressed. Indeed, growth in the western sector is limited by the saturation at capacity, at peak periods, of its existing road network. Major changes would be difficult to make, however, since there is little right-of-way available to create new road links. In addition, the will of the various levels of government is aligned with sustainable mobility. In this sense, the contribution of public transit provides an avenue of response to the sector's mobility challenges. Indeed, sustainable transport must be able to capture all of the projected growth in travel in order to maintain good travel conditions as there will be no significant increase in road capacity and active modes cannot play a major role for a large proportion of the population because of the distances to be travelled. If no measures are put in place to improve infrastructure in the Western Sector, the anticipated development in the West may not materialize and may be redirected to other areas in Gatineau, Ottawa or the periphery.

For this contribution to be constructive, the public transit system and its higher-order link in the west will have to achieve the following objectives:

- Capture the growth in travel in the study area:
  - The population of the study area is expected to increase from 91,000 to 121,000 between 2011 and 2051 (+33%). According to data from the City of Gatineau, population growth is currently stronger than initially anticipated for the 2031 projections and the development of the western Gatineau which stresses the importance of the residual capacity of the higher-order foreseen transit system. This population growth will increase travel demand by 45% (24,000 to 35,000 trips) between 2011 and 2031. Note that data for 2051 was determined in Report 3.
- In the morning peak period: Increased public transit service between west Gatineau and downtown Ottawa and Gatineau (Hull Island) in order to provide a minimum of efficient travel (and thus considering no modal shift from other modes):
  - 3,600 people per hour in 2031 crossing Gatineau Park (2,650 in 2014 | +36%)[2];
  - 6,150 people per hour in 2031 for the Ottawa River crossing (4,500 in 2014/+ 37%).
- In the afternoon peak: for the most critical point (the crossing of the Ottawa River and its approaches), the public transit system must ensure the efficient movement of at least 6,500 people per hour by 2031 (and thus considering no modal shift from other modes);
- Provide favourable conditions for the use of public transit. The implementation of a higher-order transit system, of this scale, as well as a significant number of accompanying measures and policies, should make it possible to reach, and even exceed, the targets of the Quebec government's sustainable mobility policy, including a 20% reduction in travel time to work. This is not only to reduce travel times, but also to support the densification of areas to allow more people to move closer to their workplaces;
- Contribute to the achievement of the objectives of the SADR by carrying out integrated land use and sustainable mobility planning;
- Adding buses to existing routes can only be a very short-term solution as it will overload an already saturated road network. We need to make sure to focus on:
  - Reliability in travel time by public transit;
  - Service with a capacity that meets user needs;
  - A simplified offer;
  - Reliable, user-friendly and frequent service.
- Create synergy with the surrounding public and active transportation networks:
  - Connect the western Gatineau network with the Rapibus and the O-Train Confederation line[3];
  - Improve the comfort and quality of the cycling and pedestrian network to promote this alternative to using a car to get to a transit station.

2 This screenline includes both internal and external trips.

3 This premise is also valid for the entire STO network destined for Ottawa.

LAND-USE PLANNING: CONTRIBUTING TO THE ACHIEVEMENT OF THE OBJECTIVES OF GATINEAU'S SADR

The identification of land use planning needs is closely linked to the objectives set out by Gatineau in its Revised Land Use and Development Plan (SADR). It also considers recent urbanization trends and a survey of development projects (residential, mixed-use, public or community facilities, etc.) approved or under consideration in the intervention area.

It should be noted at the outset that Guideline 1 of the "Managing growth to increase the economic efficiency and competitiveness of Gatineau" Plan, which deals with land use planning and urban development management, is based on the Smart Growth model. The higher-order public transit project in the western part of the City of Gatineau meets various needs if we consider several of the ten principles on which the smart growth model is based: "Offering a variety of transportation choices" (direct response to this need); "Ensuring compact development" (important contribution to this need); "Creating neighbourhoods that encourage walking" (an important contribution to this need); "Consolidate and foster development within existing communities" (response to needs arising from better integration between land use planning and transportation, in particular public and active modes of travel).

It should be noted that in these broad objectives and given the heterogeneous nature of the existing urban fabric of the western sector, the project must aim as much to offer opportunities for the transit-oriented-development (TOD) and opportunities for densification and redevelopment, while serving the existing and planned major poles.

Regarding the main objectives underlying orientation 1, the needs associated with the project are identified as follows:

"STRUCTURING THE TERRITORY BY CONSOLIDATING EXISTING CLUSTERS AND CREATING NEW CLUSTERS ALONG RAPID TRANSIT CORRIDORS"

In general, the project responds to the need to favour an urban structure based on sustainable mobility throughout the western territory of the City of Gatineau.

In light of the real estate project review, which reveals significant potential for new housing[4]—particularly in downtown Gatineau (e.g. the Zibi project), Le Plateau district, the western section of Boulevard des Allumettières (including the "la Porte de l´Ouest" project) and the Chemin Aylmer area—the project is likely to meet a number of urban higher-order needs at the more local neighbourhood and urban village levels:

- The main downtown Gatineau cluster: The consolidation of the downtown area, particularly in terms of the densification of the built environment, the concentration of offices and institutional, cultural and commercial activities, and especially with regard to its optimal public transit service[5];
- The mixed secondary Allumettières cluster: Continued development of this area to include a variety of urban functions, including offices and medium to high density residential buildings. The planning of this mixed-use cluster—and by extension the Le Plateau Urban Village, including the heart of the village—has been designed so that it can be "connected" to an anticipated rapid transit corridor in the Boulevard des Allumettières route. It should be noted that the SADR stated that the final choice of this corridor should be consistent with the present study;
- The tertiary pole of the urban core of Vieux-Aylmer: The consolidation of this urban core, particularly its institutional, tourist, cultural and heritage character, can be promoted to different degrees by the higher-order public transit project, depending on its location. Its route may serve Old Aylmer directly or be further back (e.g. Boulevard des Allumettières), but it may still contribute to better service for the entire western part of the Aylmer sector. Nevertheless, the project may constitute a constraint with regard to the protection and enhancement of Old Aylmer. There is therefore a need to consider, in a sensitive way, its integration in various aspects: (development, technology, impacts on the neighbourhood, etc.) with this environment and its heritage and landscape components that give it a strong identity;
- Transit Oriented Zones (TOZ): The higher-order public transit project responds directly to the purpose of these planning sectors, especially if the preferred corridor corresponding to Boulevard des Allumettières, on which the Lac-des-Fées (type 1) and the Wilfrid-Lavigne, Broad, Front and Eardley (type 2) TOZs in the Explorers urban village is centred;
- Village centres: The project can meet a need to consolidate certain village centres, particularly in terms of concentration and mix of uses (local businesses and services, community and recreational activities), densification and urban form. For some urban villages, these centres are located directly, or in proximity, to a potential corridor for the future higher-order public transit system, namely the urban villages of Du Parc, Les Golfs (Chemin Aylmer), Lac-des-Fées and Le Plateau.

"MANAGING URBANIZATION ACCORDING TO LAND DEVELOPMENT PRIORITIES"

This second objective, which subdivides Gatineau's territory according to three development priorities, closely complements the previous one.

For Priority 1 areas, "Growth within the urban structure's clusters," which are essentially the clusters and TODs mentioned above, the proposed implementation of a public transit system generally meets the expected needs. Opportunities for development and redevelopment will be encouraged in these areas, given the benefits in terms of human mobility. The project can help facilitate the achievement of the density targets proposed for each of the clusters concerned according to their hierarchy by concentrating the development along the higher-order transit axis.

For Priority 2 sectors, "Redevelopment of urbanized sectors and consolidation of living environments in the urban consolidation area," the project reinforces opportunities to enhance the existing urban network. Either that the real estate projects identified (for example near Aylmer Road) are improved by optimizing the unoccupied or underused gaps in their plot in connection with the higher-order transit project (bicycle supports, benches, vegetation, etc.). In addition, the higher-order public transit corridor can encourage the reconfiguration of this urban network (public and private spaces) to make it more "fluid" and thus facilitate the connection of pedestrians and cyclists to and from this corridor.

Finally, the intervention zone includes a priority 3 sector, "Development of urban expansion areas subject to specific conditions" in its western end, along the urbanization perimeter. The Plan emphasizes, among other things, that the expansion areas are dedicated to the creation of complete neighbourhoods. The project is likely to contribute to this objective by increasing the level of public transit service in the area while enhancing the area's potential for densification.

CONTRIBUTING TO ECONOMIC AND SOCIAL DEVELOPMENT FROM A METROPOLITAN PERSPECTIVE

Accessibility is an important indicator for measuring the impact of transport networks on land development. Instead of just measuring travel time or capacity, accessibility measures the opportunity to travel (e.g. the number of jobs accessible in 45 minutes). Indeed, mobility accessibility is considered to be the ease with which the destination, where the desired activities are located, can be reached depending on the place of origin and the various transport alternatives offered.

IMPROVING PUBLIC TRANSIT ACCESSIBILITY TO PROMOTE SECTOR REVITALIZATION, ACCESSIBILITY AND SOCIAL INCLUSION

Population mobility is a basic need for development (employment, education, etc.). However, this mobility comes at a societal price, which varies according to the options chosen to travel. At one end of the spectrum, the use of the single-occupancy vehicle is the most expensive, especially since the money spent on this by households generally ends up outside the region (car manufacturing, fuel, etc.). At the other end of the spectrum, more vulnerable people may be left on the margins of society by restricted accessibility to mobility or also be negatively affected by increased accessibility to mobility which then increases the attractiveness of certain sectors. (ex.: gentrification). In addition, opportunities to travel promote access for residents to jobs, places of study and services and shops. Conversely, mobility allows employers to access a large labour pool and merchants to attract customers. Increasing the size of these pools allows more residents to participate in regional social and economic activity (social inclusion).

4 [redacted] a total of 14,249 new housing units are estimated by 2031 for the Hull—Aylmer sectors in the intervention zone. Of this number, a large majority of units (77%, or 10,990 units) are planned for the Aylmer sector, in particular 4,525 units (41%) in the Le Plateau neighbourhood, 3,484 units (32%) in the Chemin Aylmer area (mainly between Old Aylmer and the Champlain Bridge) and 2,420 units (22%) along Boulevard des Allumettières at its western end. The Hull sector could accommodate 3,259 units, in particular 1,432 units (43%) in connection with the Zibi project.

5 City of Ottawa has similar objectves for its downtown core.

Improving accessibility can be achieved by either increasing the number of destinations, improving mobility conditions or both. Improving travel conditions through public transit can provide access to a greater number of destinations (services, jobs, shops, civil society, etc.) at an affordable price. This increase in public transit accessibility improves social inclusion, especially in areas with a greater concentration of low-income households. Often it can be difficult to access jobs, especially outside of the centres and usually outside of peak periods. Within the study area, there is a concentration of lower income households near Hull Island and other areas east of Gatineau Park, although there are also lower income households west of the Park. It should also be noted that this accessibility not only promotes social inclusion but can also benefit employers, who can access a larger pool of employees. Improved public transit thus increases the number of neighbourhoods where it is easier to live without a car.

AVOIDING THE ADVERSE EFFECTS OF ACCESSIBILITY IMPROVEMENTS

Improved accessibility conditions and the number of destinations can create negative effects, including the gentrification of neighbourhoods. The presence of a higher-order public transit mode combined with other factors (urban renewal, etc.) can lead to these negative and undesirable effects, but this depends essentially on the rate of growth in the region, the number of TOD (Transit Oriented Development) neighbourhoods in the region, etc. For example, the Toronto area has seen a concentration of higher-income residents near subway lines and a concentration of lower-income residents in neighbourhoods that are further away from the subway. Part of this is explained by the limited number of TOD neighbourhoods in the region. In the study area, Hull Island and some of the surrounding neighbourhoods are more at risk of this phenomenon due to their walkability, proximity to downtown Ottawa and good public transit accessibility. These effects can be mitigated by other policies of the various levels of government, but also by the development of new TOD neighbourhoods in order to reduce the pressure on neighbourhoods that are more likely to be gentrified.

PROMOTING LOCAL BUSINESSES

The development of transit-oriented neighbourhoods requires much more than a higher-order transit infrastructure. In order to allow as many households as possible to reduce the number of vehicles, they own and thus reduce travel costs, it is important to ensure that users can access as many destinations as possible close to their place of residence or take advantage of them along their journeys and not just for work and study. Many neighbourhood areas, especially west of Gatineau Park, are often more than a kilometre from the nearest local business or service. The structure of the public transit network can allow for this type of use, both by placing them at multimodal hubs in the west or elsewhere along the higher-order axis.

2.1.3 SUMMARY OF IDENTIFIED CONSTRAINTS

The implementation of a project on the scale of a high capacity higher-order mode to serve the western sector of the City of Gatineau cannot be done without impacts on the insertion environment, traffic conditions, on-street parking, etc. It is therefore important to clearly identify the existing constraints so that an action and risk management plan can be developed, to the degree possible at this stage of the study, to deal with the decisions that will have to be made (additional cost, accommodation, mitigation, sharing agreements, etc.).

OPERATION: CAPACITY AND CONNECTIVITY THRESHOLD

Regarding the bus lanes currently in place in the study area, the following conclusions can be drawn, considering current (2018) bus traffic volumes:

- With 86 to 114 buses/hour/direction, the dedicated lanes on the Portage Bridge meet or exceed the capacity of the BRT lanes in the northbound direction (60 to 80 buses/hr/direction). Depending on capacity constraints, a change of mode would be preferable;
- With more than 40 buses/hour, the reserved lanes on Boulevard Alexandre-Taché, between Saint-Raymond and Boucherville, meet the limits of the reserved roadside lanes and are already approaching the capacity threshold for (BRT-type) reserved lanes, including the implementation of bus priority measures (BPM);
- With close to 40 buses/hour, the reserved lanes on Chemin Aylmer between Vanier and Saint-Raymond exceed the capacity of the existing reserved lanes and meet BPM's implementation criteria, such as bus priority signals or other priorities at traffic lights where traffic could encroach, in order to improve the capacity of the current facilities;
- With its 44 buses/hour, the Rapibus is already equipped as a BRT (capacity around 80 bus/hr/direction) and does not require any specific improvements based on capacity constraints;
- With volumes of less than 40 buses/hour, the other dedicated lanes in the intervention area (capacity around 40 bus/hr/direction) do not meet the criteria for implementing a BRT or BPM and do not require any specific improvements based on capacity constraints;
- It should also be noted that bus volumes on Boulevard Alexandre-Taché, in sectors where no reserved lane is currently in place, are high enough to meet the criteria for implementing BRT-type reserved lanes, since more than 40 buses/hour travel there.

In addition, considering that bus traffic volumes are expected to increase significantly in the study area by 2031 and 2051, there will be a need to upgrade the following critical infrastructure to meet demand:

- The Portage Bridge and the routes extending into downtown Ottawa where buses already run on shared lanes over several segments;
- The streets of downtown Gatineau between the Rapibus and the Portage Bridge where buses already run on shared lanes over several segments;
- Boulevard Alexandre-Taché and Chemin Aylmer where standards lateral reserved lanes are not sufficient for the volume of buses already using it.

The following sensitive points should be considered:

- **Portage Bridge:** With the implementation of a high-capacity, higher-order transit system, improvements or solutions would be required to address the capacity issue of the dedicated lanes. Carpooling is possible, but puts additional pressure on the capacity of the dedicated lanes, while active modes already benefit from a bike lane in both directions;
- **The reserved lanes on Boulevard Alexandre-Taché:** With the implementation of a high-capacity, higher-order transit system, improvements would be required to eliminate the discontinuity of the eastbound dedicated lane. The extension of the westbound lane will also be essential;
- **Champlain Bridge:** The Champlain Bridge was not retained as an option. However, preferential measures at the bridge approaches could benefit existing services. Carpooling is possible;
- **Downtown Gatineau:** The main roads in downtown Gatineau are already heavily used by buses. The addition of a higher-order transit system would increase the pressure on infrastructure capacity and the development of dedicated lanes would become necessary, where they are not already present. Due to the configuration of the downtown area, the removal of some on-street parking, or even a revision of the geometry, may be necessary. Potential sharing of dedicated lanes with carpools is possible, but puts additional pressure on lane capacity;
- **Downtown Ottawa:** Service to the Lyon station or other chosen drop-off point must be taken into account [redacted]. While carpooling could potentially be possible, bus volumes suggest that this is not the preferred option as the only connection point;
- **Roundabouts on Boulevard des Allumettières:** Although there are currently no dedicated lanes on this section of Boulevard des Allumettières, there are several examples of dedicated lanes being built on the approach to or at roundabouts (Brussels, Nantes, etc.);
- **Potential common sections between the Rapibus and the western system:** Bus traffic is already quite high. The addition of a high-capacity and higher-order western mode would increase pressure on arterial roads. Some dedicated lanes are already present, which could be upgraded to increase capacity, and additional dedicated lanes could be added where they are lacking. However, the downtown area is already busy and there are many intersections, which may affect the capacity of the dedicated lanes. In the case of an LRT choice, buses could share lanes over short distances. However, it is not recommended to share lanes with other modes on a large portion of the network.

Report 6: Conclusions and recommendations

CONNECTION WITH THE RAPIBUS NETWORK

From a geographic point of view and in terms of service, the implementation of a new higher-order mode in the western sector of the City of Gatineau must be connected to the main higher-order route of the existing network in Gatineau, i.e. the Rapibus serving users in the eastern part of the City. The installation of a future higher-order public transit mode serving the west will therefore have to result in:

- Physical integration with the Rapibus—either at a common station and/or on the roadways, using the same infrastructure when approaching city centres;
- Connectivity of services with the Rapibus—allow, or even impose, transfers between these two routes.

Based on the review of the built environment and existing infrastructure, the obvious physical connection point between the two networks is located near the western end of the existing Rapibus route, just before accessing downtown Gatineau. The western end of the Rapibus network includes two stations: Montcalm and Taché-UQO. In both cases, integration at both the road and station level is possible, regardless of the mode chosen: BRT or LRT.

Transfers are usually a sensitive topic as they change habits, but they can be advantageous in certain situations. Specifically, they make it possible to rethink the structure of the system, to continue to offer an efficient service for all STO users and to optimize the use of resources. However, the implementation of transfers must be well thought out and adapted to the users and, ultimately, every user will have a limit to the number of transfers they are willing to make in order to reach their destination.

CONNECTION WITH THE O-TRAIN

The success of a higher-order mode of public transit in the region also depends on its connection with the network on the Ontario side, i.e. the City of Ottawa's O-Train, in service since September 2019. As with the Rapibus, this linkage with the O-Train must also be analyzed from a physical point of view as well as for the service offer.

For operational reasons related to the residual capacity of the Confederation Line, it is not possible to insert trains from the STO into the Confederation Line tunnel without affecting the OC Transpo O-Train service. The capacity of the Confederation line is closely linked to that of the tunnel, which is governed mainly by the capacity of vehicles, the maximum frequency of train passage and the boarding and disembarking times of passengers at the busiest stations.

- Since Bayview station is the culminating point of the entire network, it offers almost no residual capacity to feed STO users into other networks. It could, however, provide a complementary connection to destination clusters to the west and south of Ottawa (e.g. the airport and Carleton University);
- The Tunney's Pasture and Pimisi stations offer very little residual capacity to feed STO users into other networks;
- Lyon station has significant residual capacity and appears to be a possible feeder point for STO users. In addition, many users would be near their destination at this location;
- Given the structure of the planned network, stations east of Lyon also have significant residual capacity for a feeder service or access to the University of Ottawa and other major destinations.

OTTAWA RIVER CROSSING

The study area has access to six existing crossing points (from west to east):

- The Champlain Bridge;
- The Prince of Wales Bridge (renamed Chef-William-Commanda in 2021);
- The Chaudières Crossing;
- The Portage Bridge;
- The Alexandra Bridge;
- The Cartier-Macdonald Bridge.

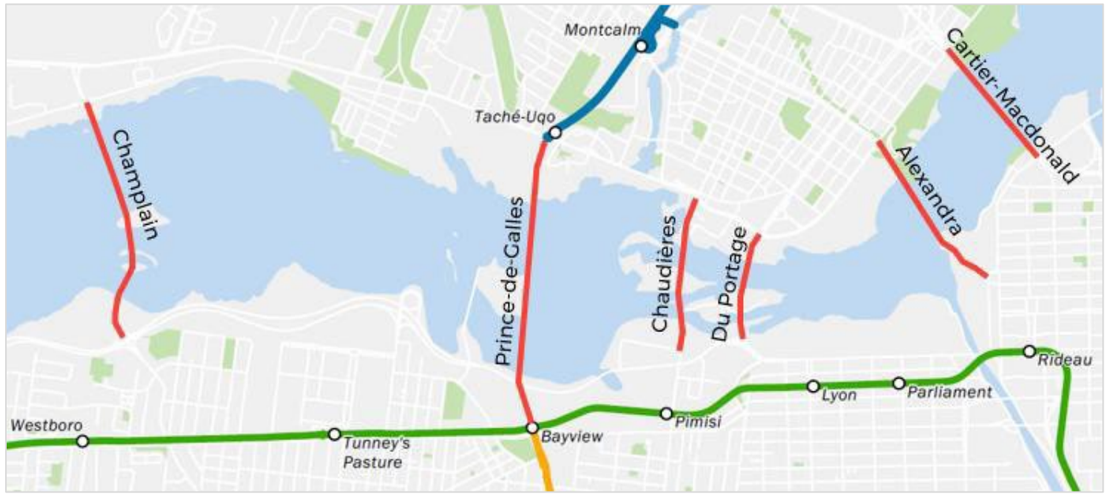


Figure 2-3 Location of the six interprovincial bridges

The Champlain and Cartier-Macdonald bridges were not considered because of their off-centre location, which respectively either did not provide good service to the downtown Gatineau location or would require a significant detour to return to downtown Ottawa. However, these two links have been identified as an opportunity for complementary service. The Champlain Bridge presents an interesting opportunity to link the western Ottawa clusters to the western part of Gatineau by bus by taking advantage of the existing reserved lanes with the potential for an additional service via the Tunney's Pasture Station. As for the Macdonald-Cartier Bridge, it would be relevant for complementary service to the eastern clusters or for the return of buses that are out of service.

As for the Chaudières Crossing Bridge, although close to the heart of downtown Gatineau, its service is, however, incomplete compared to its neighbour (Portage Bridge), which is closer to the main travel generators. In addition, the possible inclusion of infrastructure on its own site would have significant impacts on the buildings of the islands crossed and several heritage buildings. In fact, the redevelopment of this lane / bridge is planned, by the cities of Gatineau and Ottawa and the Zibi project, as a street with a bicycle link (represents a reduction in road capacity). In addition, the Pimisi station only offers very low capacity for a drawdown of STO users. However, this is still suitable for local bus routes.

The three-remaining links: the Prince of Wales, Portage and Alexandra Bridges, were then reassessed under three main headings (refer to Figure 2-3 and Figure 2-5 and Figure 2-6) :

- Bridge structural analysis;
- Bridge approaches review (both Quebec and Ontario side);
- Connection with the nearest O-Train station.

Following this reassessment, the Portage Bridge stands out as the optimal link to provide an effective structuring link between the two shores, with a transfer connection to Lyon station and possibly Parliament station.

Report 6: Conclusions and recommendations

ALEXANDRA BRIDGE

Given the announcement (2021) of the construction of a new bridge, major structural repair work would no longer be required since planning for the addition of a structural link could be integrated into this future project.

However, the complexity of the approaches to the bridge remains, especially on the side of the Ottawa shore due to the cramped nature of the available physical space (river, rock wall, Major's Hill Park, Château Laurier). Security related to the presence of the American Embassy and traffic impacts that are difficult to mitigate on the axes of Sussex Drive and Mackenzie Avenue.

In addition, this bridge is less practical in terms of service for most Gatineau users because of the additional travel time and the distribution of final destinations which are located more in the heart of Ottawa.

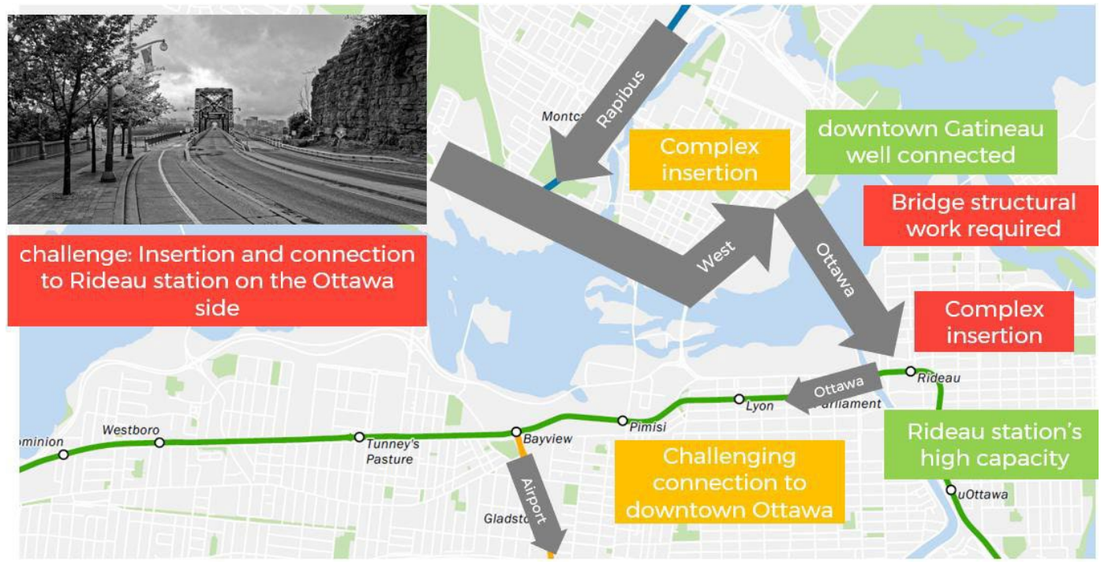


Figure 2-4 Alexandra Bridge findings and tie-in with Rideau Station

Finally, the connection via the Alexandra Bridge was ruled out. Indeed, although having a geographical location that seems interesting, it involves a detour to access downtown Ottawa and also very significant integration challenges when approaching the bridge, especially on the Ottawa side. In addition, although having a reception capacity, the creation of a connection to the Rideau station is a major technical challenge (proximity to level and underground access, the deepest station and the sector has soil conditions difficult).

PRINCE OF WALES BRIDGE (RENAMED CHIEF-WILLIAM-COMMANDA IN 2021)

The connection via the Prince of Wales Bridge was the earliest study premise. However, after analysis, it turns out that the residual capacity available on the O-Train network (depending on the busiest section which is between Bayview and Lyon stations in the eastbound direction) would not be sufficient to accommodate all customers coming from Gatineau, while maintaining a residual capacity to answer Ottawa's needs for the coming decades. In order for the O-Train to accommodate Quebec connections at Bayview station, the City of Ottawa would have to significantly increase its service offering on the entire Confederation line just to be able to meet peak customer demand on this single stretch of two stations.

In addition, this solution does not allow users from the west to reach their destinations located in downtown Gatineau. This also does not allow the creation of a direct link between the two city centres of Gatineau and Ottawa.

This solution has potential to connect certain secondary poles (i.e. the airport) or if the structuring corridor from Gatineau was extended to downtown Ottawa (without using the Confederation line).

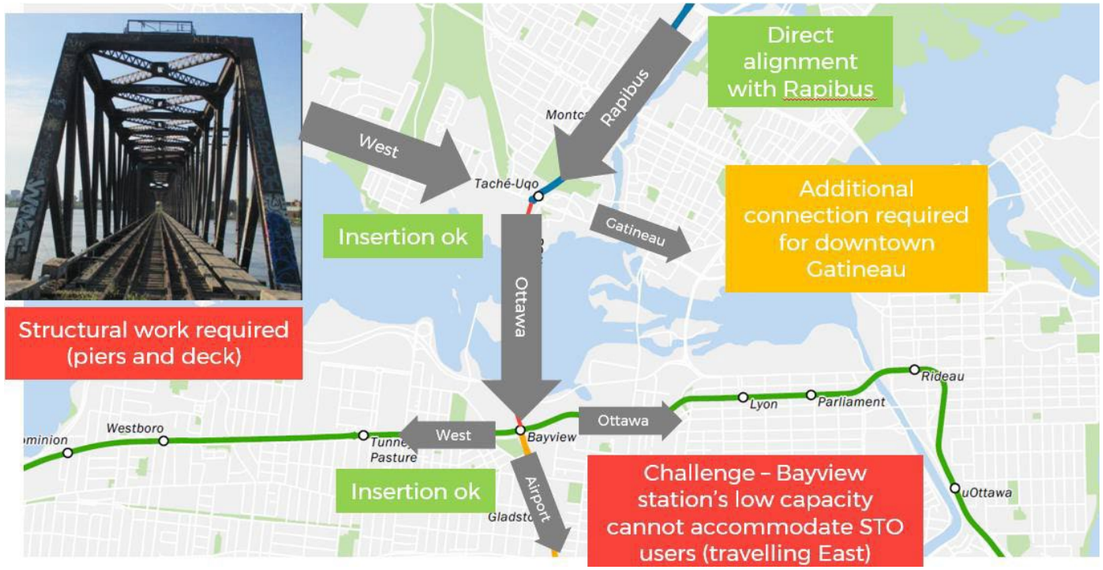


Figure 2-5 Findings on the Prince of Wales Bridge and Docking at Bayview Station

Finally, the connection via the Prince of Wales Bridge was ruled out since it does not serve destinations in downtown Gatineau. In addition, the Confederation line Bayview station low residual capacity is non-viable and non-functional to be used as a main connection point for the higher-order network.

The City of Ottawa has since announced, in 2021, its intention to renovate this bridge and give it a temporary vocation as a multi-use trail as a link between Gatineau and the City of Ottawa for pedestrians, cross-country skiers and cyclists.

PORTAGE BRIDGE

Given its centralized geographical location between the two city centres, the Portage Bridge is the one that better serves these two major destinations.

The Portage Bridge is also the one closest to the Confederation Line 1 Lyon station, intended as the connection station during the planning of the O-Train network by Ottawa.

However, access to the Lyon station is not direct and represents a development challenge. The addition of a rail line or dedicated bus lanes (surface or underground insertion option) will require discussions with the City of Ottawa and the NCC to determine the shape of the development in downtown Ottawa.

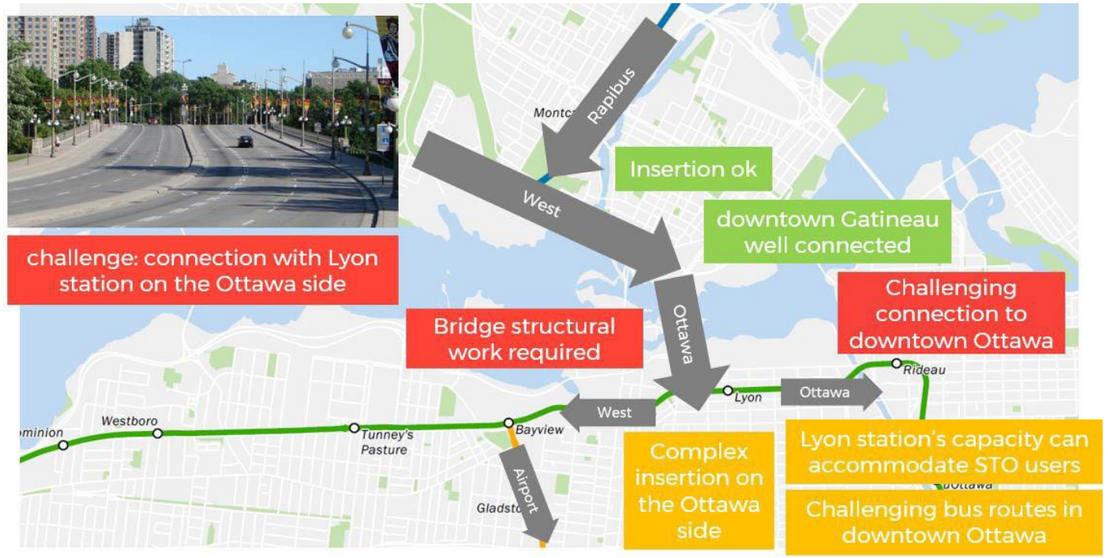


Figure 2-6 Portage Bridge Findings and Docking with Lyon Station

TYPICAL LAYOUT OF A HIGHER-ORDER MODE

From a technical standpoint, the insertion of a BRT/LRT in a central location, with a physical divider preventing general traffic from crossing this infrastructure, remains the most effective option in terms of user safety, traffic management and operation of the public transit system. However, this type of insertion is generally space intensive. The other options (two-way reserved lanes on the side of the road or reserved lanes on the side), while offering certain advantages depending on local constraints, are considered more as fallback options when the basic solution in a central location proves impossible or too restrictive to implement.

As a result, we are assuming the implementation of a higher-order corridor for public transit in a central exclusive right-of-way. This type of insertion poses relatively few problems in the current section, but it is complicated when approaching intersections by the need to set up a station and to manage all conflicting turning movements independently.

In order to illustrate various potential scenarios for the insertion of a central higher-order corridor, a small number of templates have been prepared from among all possible variants. These templates are generated by applying the design assumptions used for this project and are composed of the usual elements (travel lane, turn lane, station platform, green island, bicycle corridor, on-street parking). These templates are adapted to the current conditions of some of the analyzed segments.

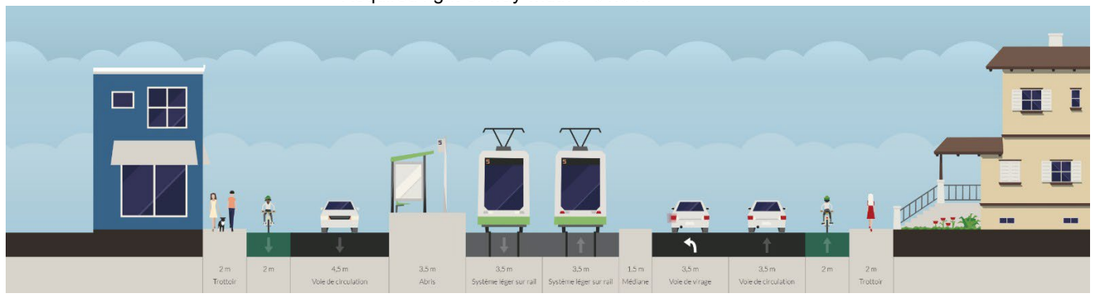
As each segment analyzed has its own particularities, it becomes impossible to show all possible variants. The following examples of insertion templates illustrate the above design principles, applied in a single lane per direction roadway context:

BASIC template

1 lane per direction - at station with left-turning way and cycling path
Required right-of-way width = 26.4 m

DESIRABLE template

1 lane per direction - at station with left-turning way and cycling path
Required right-of-way width = 31.5 m



In general, the insertion of an BRT/LRT in the current section into the urban fabric is relatively easy (sufficient physical space available on the planned routes), with the exception of rare segments for which mitigation options are possible. On the other hand, inserting stations and turning lanes can prove to be much more complex, especially if more generous facilities are desired.

However, there do not seem to be any major insurmountable constraints for these developments, but sometimes difficult choices will have to be made (move the station, expropriate a lot, remove a traffic lane, relocate the cycle path on another route, remove the parking, etc.).

UTILITIES AND NETWORKS

The presence of infrastructure networks near or under a high-capacity public transit route represents a risk because of the impact that breakdowns or maintenance of these networks can have on the maintenance of service and the reliability of network operations. It is therefore advisable to plan, as far as possible, to avoid any potential conflict by taking the following actions:

- Travel: This action applies to all pipes that are longitudinal and below the corridor alignment;
- Rehabilitate by insertion or sheathing: This action is mainly applied in the case of large-diameter sewer pipes located at significant depths (longitudinal) where relocation may be complex or impossible;
- Cover the utility with another conduit: This action applies to pipes that cross under the corridor right-of-way. A one- or two-piece field-assembled steel jacket can be installed around these pipes. This typically allows replacing without needing to significantly impact the LRT above;
- Replace—same location: This action applies to pipes that are in poor condition and that cross under the corridor right-of-way. These pipes will be replaced to ensure a minimum 40-year life span, which is the life span of the higher-order corridor. The owner of the structure should normally be involved;
- Relocate—overhead networks: This action applies to aboveground urban utilities that conflict with the new street template. These moves are required only when the equipment cannot be integrated into the proposed template (e.g. in an island).

Given that approximately half of the segments under study have technical constraints with one or more infrastructure networks, collateral costs are to be expected for the addition of a higher-order mode in the existing built environment.

HUMAN AND NATURAL ENVIRONMENT

Because of its size and diversity, the study area includes, in varying degrees and concentrations, all possible environmental constraints:

- Various soil types;
- Presence of fauna and flora;
- Presence of natural environments (e.g. Gatineau Park, Ottawa River and its banks, wetlands);
- Presence of heritage buildings (14 buildings);
- Presence of landscapes and panoramas (visual line) with identity;
- Presence of residential areas (noise constraints applicable);
- Presence of protected woodland (e.g. Boucher Forest);
- Presence of contaminated soil in the vicinity;
- Presence of special status species.

Because of this diversity and its geographic location, an intervention in the study area will undoubtedly entail an approval process with various authorities: federal, provincial (Quebec and Ontario) and municipal (cities of Gatineau and Ottawa) regulatory requirements.

The route and final choice of technology will determine the exact approval process that will be applicable, and therefore the timelines involved. In general, the following general constraints can already be identified:

- Chemin d'Aylmer and Boulevard Alexandre-Taché have heritage and urban fabric constraints;
- Boulevard des Allumettières presents constraints mainly regarding the natural environments that still exist along the vacant lots and the Boucher Forest.

However, it is already possible to conclude (even in the simplest approval scenario) that these applications for authorization will have a significant impact on the project's implementation schedule. Indeed, in addition to the time required for official review by the authorities, there are also numerous field data collections that will have to be undertaken in the next stage of the project progress. These collections often have restrictions on the times of the year when they can be made.

2.1.4 JUSTIFICATION OF THE NEED FOR INTERVENTION

According to the information gathered and described in the previous sections, the study area has experienced strong growth in recent years and this growth is expected to increase over the next thirty years, which will lead to a significant increase in travel demand, but which will have to deal with existing infrastructures that are already saturated or close to it. Moreover, there are no roadworks planned to increase capacity. This increase in travel demand will have a significant impact on the existing road network, which has already been at capacity for several years, as well as on public transit infrastructures, with the Portage Bridge reserved lane already saturated and the Alexandre/Taché lane expected to be saturated by 2023. The presence of natural obstacles combined with the common desire of regional planning authorities to promote sustainable mobility (reduction in the use of solo cars and the desire to avoid adding new roads) means that a significant deterioration in travel conditions can be anticipated for all users if nothing is done to remedy the situation.

It should be noted that only the Aylmer-Taché route currently benefits from preferential measures for buses to get to downtown Gatineau and that any addition of service on a parallel route (Allumettières and St-Raymond) will meet with increasing traffic congestion, which will adversely affect its performance and make it less attractive. This observation can also be applied to the various bridges connecting the downtown areas of Gatineau and Ottawa, where only the Portage Bridge benefits from preferential measures for buses. Thus, a simple redeployment of public transit services on several routes will not be sufficient to meet future mobility needs and performance objectives, in addition to having to deal with a limit on the desired number of buses in downtown Ottawa.

Table 2-1 Summary of the projected situation for 2031

Population	Jobs	Real estate projects	Travelling demand	Infrastructure demand
↑	↑	↑	↑	↑
Gatineau + 18% in 2031 + 26% in 2051 Gatineau's West end + 30% in 2031 + 33% in 2051	Gatineau + 22% Gatineau's West end + 28% Ottawa + 29% Important clusters – Ottawa U – Tunney's Pasture – City centers	Gatineau – desired densification of the city center – Zibi Development Ottawa – desired densification of the city center – Lebreton Flats	Self-driving + 17 to 31% Public transit + 20 to 40% **Site** Natural barriers – Gatineau Park – Ottawa River	Western Gatineau's road network and reserved lanes reaching capacity High increase in car travel time +30-35% towards downtown Gatineau +40-45% towards downtown Ottawa

According to data from the City of Gatineau, population growth is currently stronger than initially anticipated for the 2031 projections.

Improving the use of the public transit system is therefore one way of adequately meeting this growing demand for travel. To accommodate the mobility of these new residents and jobs, the existing road network and bus services will not be sufficient to accommodate the 33% population growth by 2051. In fact, analyses show that the higher-order road network has already reached its capacity, both on the routes through Gatineau Park and across the Ottawa River, and that the current bus network has already reached its operational capacity on the Portage Bridge and will reach it as early as 2023 on the main Alexandre-Taché route, despite the reserved lanes that have been built. With the projected increase in population and jobs in the west end of Gatineau, the current networks will no longer be able to fully ensure their higher-order role in the organization of mobility.

In order to meet these needs, a comprehensive multi-modal solution will be required that integrates the structure of public transit networks, infrastructure for active modes, land use and mobility policies and practices that support sustainable modes to reduce reliance on the single-rider automobile and in a broader sense to reduce the need to travel.

In order to achieve this objective, the public transit system offered must:

- Be reliable, efficient, comfortable and competitive;
- Offer a pleasant and user-friendly experience;
- Capture travel growth;
- Adequately serve the two downtown areas and the main outlying clusters, directly or via transfers.

In addition, the preferred solution should aim to achieve the targets of the Quebec government's Sustainable Mobility Policy – 2030, namely the reduction of home-work travel times and the reduction of household travel expenses.

Based on the current problematic situation in terms of mobility, a projected situation that will lead to a sharp deterioration in travel conditions for all modes of transportation between the west end and downtown Gatineau as well as between the two downtown areas, and the desire of the various levels of government to promote sustainable mobility, there is a clear need to implement a higher-order public transit system to link the west end of Gatineau to the two downtown areas, provide better connections to the outlying clusters, link the public transit systems and ensure better regional integration. Indeed:

- Doing nothing for the public transport network by 2031 is not an option. In fact, relying solely on public transit projects currently planned in and around the west of the city of Gatineau (improved status quo)
  - is not sufficient to support the equivalent of the total growth in passenger travel for the Gatineau Park screenline crossings;
  - does not lead to improvements in transit travel times from the study area to downtown Gatineau and Ottawa;
  - does not offer, as per actual conditions, more competitive travel times by public transit than by car;
  - raises a major issue of high level of service offer with conventional buses and, consequently, of capacity on the Portage Bridge by public transport between Ottawa and Gatineau;
  - does not allow to efficiently support the projected development in the Gatineau's west end sector.
- Improving public transit service by adding a higher-order public transit system in Gatineau's west end of would therefore improve the competitiveness of public transit in the medium and long term and support urban development in this sector of the city.

In addition, it is not only a matter of solving the transportation issues of large volumes of users during peak periods, both to the major destination centres of Gatineau and Ottawa and to the secondary and outlying sectors, but also of offering a competitive alternative to cars for off-peak trips and for trips within the study area, which are currently the poor relations of the public transit system. Thus, with a robust, reliable, frequent service throughout the day and complemented by a local service network, it will not only be possible to meet current and future demand, but also to offer new opportunities to users: shifting travel times, using public transit for reasons other than home-work and home-study, etc.

2.1.5 MAIN FINDINGS OF REPORT 1

OBJECTIVES

The objective of this study is to assess the feasibility of implementing a higher-order public transit link to serve the western part of Gatineau. To inform the search for solutions and identify targets and constraints, it is important to highlight what a higher-order mode is. In this sense, the desired characteristics of a higher-order mode are the following:

- A quality service offer;
- Close integration of mobility and land use planning;
- Dedicated and continuous reserved lanes along the entire route, with priority measures at intersections;
- Two modes of public transit are being considered to serve the clientele of the West Gatineau region on the higher-order service: buses, a rail mode (tramway or light rail transit system [LRT]), or even a combination of the two systems;
- Frequent service in the order of 5 minutes or less during peak periods on major sections;
- A system with the potential to offer large travel capacity;
- Reliable and competitive travel times compared to single-rider vehicles;
- A system that is resilient in varied conditions (strikes, widespread power outages, toxic spills, water main breaks, gas main breaks, major weather events, street closures, utility work, etc.);
- Good linkage and complementarity with other existing and planned higher-order public transit modes to improve regional connectivity (Rapibus, Ottawa LRT);
- Universal accessibility for users;
- A signature and brand image distinct from regular services;
- Integration with walking, cycling, carpooling, carsharing, taxis and other modes of access;
- Electric propulsion, to meet the Quebec government's targets for sustainable mobility and the fight against climate change.

CONSTRAINTS

REGULATORY AND ORGANIZATIONAL

- The development of an on-street tramway/LRT mode will require the modification of the Quebec Highway Safety Code since several required provisions are not included (e.g. tramway traffic on-street). The Ontario Highway Traffic Act includes provisions related to tramway traffic;
- Numerous approvals and processes will be required during the evolution of the project.

PUBLIC TRANSIT

- It appears difficult to add trains to the Confederation Line tunnel.

CONNECTION TO OTTAWA

It emerges that the Portage Bridge is the optimal link to offer an efficient structuring link between the two banks, with a drawdown on Lyon station and possibly Parliament station. However, this will require major reinforcement (or reconstruction) for a rail mode.

INSERTION AND INFRASTRUCTURE

Solutions should minimize their impact on:

- Land acquisitions (especially when these require the total acquisition of the lot and/or the demolition of buildings); *
- Relocation of complex and expensive infrastructure.

ENVIRONNEMENT

Solutions should minimize their impact on:

- Greenhouse Gas emission;
- The sensitive natural environments present;
- The heritage buildings present and the urban landscape;
- Noise and quality of life for nearby residents;
- The built environment;
- Special status species.

Report 6: Conclusions and recommendations

PRINCIPLES FOR A SOLUTION

- The system must not add an additional constraint to STO customers to reach the city centres of Gatineau or Ottawa, either for those coming from west Gatineau or elsewhere on the network, particularly Rapibus customers;
- The system is intended to connect the west end of Gatineau and:
  - Serve existing and projected trip generators in downtown Gatineau well;
  - Serve existing and projected trip generators in downtown Ottawa well, with or without a transfer to the Ottawa LRT;
  - Serve the outlying clusters (Hull Periphery and Gatineau East, as well as Ottawa South, East and West) well, either directly or via transfers, although these connections may be less efficient than to the two downtown areas.
- The higher-order transit system shall efficiently connect with the existing Rapibus BRT network and with the existing O-Train LRT network in Ottawa
- The system must be able to capture at a minimum the current demand plus the equivalent of the projected growth in travel in West Gatineau (20 to 40%), in order to avoid a further deterioration in travel times;
- The right-of-way insertion must allow for adequate facilities for private vehicle traffic, pedestrians and cyclists as provided for in the SADR and the Master Plan for the cycling network of the City of Gatineau.
- The system must reduce greenhouse gas emissions (provincial target of 37.5% reduction in transportation emissions below 1990 levels) and fuel use (provincial target of 40% reduction in transportation petroleum consumption below 2013 levels)
- The solution must work to improve the overall and local road safety record;
- The solution must allow the commissioning of a structuring public transit axis system in western Gatineau in the medium term (about 10 years);
- Solutions must not significantly increase the number of buses currently operating in downtown Ottawa. Bus volume must be like the volumes of the May 2017 tripartite agreement to reduce STO bus ridership in downtown Ottawa
- In addition, any structuring system must attempt to resolve the balance between the proximity of the and the performance of the service;
- To cover the territory west of Gatineau, two main corridors, one to the north and one to the south, are required to support the implementation of a higher-order service:
  - the Aylmer-Taché route to the south;
  - the Allumettières/Plateau route to the north.
- The BRT, light rail or a hybrid of the two (BRT on one route / light rail on the other) can, as per preliminary results, respectively carry the expected ridership and reach the main project targets.

2.2 REPORT 2 – IDENTIFICATION OF SOLUTIONS

Based on the needs, constraints and justifications for the need for intervention identified in the previous step, it was then important to draw up and evaluate a long list of potential solutions in order to identify a short list of solutions that best met the objectives set.

This second deliverable therefore focused on developing and identifying solutions with the public transit infrastructure and services needed to achieve the Study's vision and objectives. These solutions must both meet the objectives and needs identified for the 2031-2051 horizon, while avoiding, or even solving, the identified constraints.

In addition to meeting the vision, objectives, needs and constraints of the study, the short list of solutions was intended to provide a strong contrast between different options. To this end, the short list must:

- Include a maximum of five solutions;
- One of these five alternatives is an improved status quo. This scenario 0 will be the reference scenario of the study. This solution is intended to be a gradual improvement of public transit services in western Gatineau (addition of priority measures, adjustment of service to serve developing sectors, improvement of active transportation access to public transit stops, etc.). This alternative is based on the orientations of the City of Gatineau's SADR, but this alternative does not include a higher-order mode of transportation in the west, as this is the subject of the present study;
- All alternatives must include two main service routes to properly address the needs of the study area, namely Aylmer and Plateau sectors (as found in the previous 2017 study);
- At least one alternative must be operated exclusively by bus (BRT). The latter is the solution recommended by the previous opportunity study. The latter will be improved as needed to meet the main constraints identified in this mandate;
- At least two solutions must include a rail mode;
- One of the solutions must be the tramway solution proposed by the Mayor of Gatineau. The latter will be improved as needed to meet the main constraints identified in this mandate;
- Eventually (maximum by 2041 to comply with the same objectives as the STO's entire fleet), the chosen solution must be 100% electric.

To do this, we proceeded according to the following main steps:

- The first step defines a toolbox to determine the components available to generate the long list of solutions. The main components are evaluated independently to identify their potential. The toolbox allows for restricting the size of the long list and making it easier to understand. The main components evaluated are:
  - serving the west: examining potential corridors;
  - interprovincial connections: the means available to connect the two sides and their connections with the Ottawa LRT.
  - the modes of transport of the higher-order mode;
- The second step then generates the long list of solutions using the available components;
- This long list is then evaluated in terms of advantages and disadvantages.
- The short list is then formed using the most promising solutions within the set parameters.

2.2.1 SOLUTIONS NOT CARRIED FORWARD

Informed by a brainstorming exercise, a variety of approaches were considered. However, several of these were discarded at the outset, either for reasons of feasibility or because they did not meet the basic objectives established for the project. These include:

TRILLIUM LINE EXTENSION IN GATINEAU

Whether it is a variant of the extension to the Rapibus or to downtown Gatineau, this idea has been ruled out. In both cases, major investments are required (rehabilitation of the Prince of Wales Bridge) and these investments provide little benefit to the mobility needs of users in the western sector. In the very long term, if the Rapibus were to be converted into an LRT or if another tramway line were to be implemented in Gatineau, this connection could be more interesting as a secondary connection.

TUNNEL CROSSING OF THE RIVER

This idea was discarded due to the depth that would be required to cross the Ottawa River, which is very costly. The Ottawa-side stations would then be very hollow in the heart of downtown (at least 50 m deep). In addition, given the distance required to descend to the level below the river on the Quebec side, the system would have to begin its descent after the UQO on Boulevard Taché to also tunnel into downtown Gatineau. Given the significant length of tunnel required, the installation costs would be very high, whereas it is possible to use existing bridges. This means that insertion on the Ottawa side must be in a tunnel and cannot be on the surface (the length required to go up to grade is incompatible with the existing urban fabric in Ottawa).

RIVER CROSSING WITH A NEW BRIDGE

This idea has a significant impact on the Ottawa River landscape (views of the Judicial and Parliamentary precincts from the riverside) with a link to the downtown core of Ottawa (location to be determined between Metcalfe and Bank). Moreover, this option seems excessive when it is possible to use one of the existing bridges.

DOWNTOWN CONNECTORS

A downtown collector would be the only network to cross the river and connect Gatineau and Ottawa city centres together. Any interprovincial trip would require a transfer. This is an interesting idea for serving travel between city centres. That said, it does not meet the mobility needs of users in the western sector, the majority of whose trips either originate or terminate outside the city centres. This solution may complement a higher-order mode but does not replace it.

INDEPENDENT TRANSPORT SYSTEM BETWEEN CITY CENTRES

The idea would be to create an independent transportation system to better connect the downtown areas, either as a complement to other STO and OC Transpo services or as a replacement. In both cases, riders would have to make a transfer in order to use this new independent system. Since this constraint provides few benefits, this idea has little potential as a higher-order mode for the purposes of this study.

HEAVY TRANSPORT SYSTEM

The idea of a high-speed system (overhead or underground) was ruled out as being oversized for the number of passengers/trips identified per hour per direction in the peak period (PPHPD) for the western sector (in the order of 5 to 10,000 PPHPD). The cost-service ratio would therefore be disproportionate. Furthermore, it is not aligned with the study's objectives of having a transportation route integrated with urban development and including frequent stations serving all neighbourhoods. An insertion of this nature also has a greater impact than one might think on the surface. Indeed, entrance buildings with elevators are required at ground level to access stations, the approaches to get on/off extend over long distances, universal accessibility is more complex, etc.

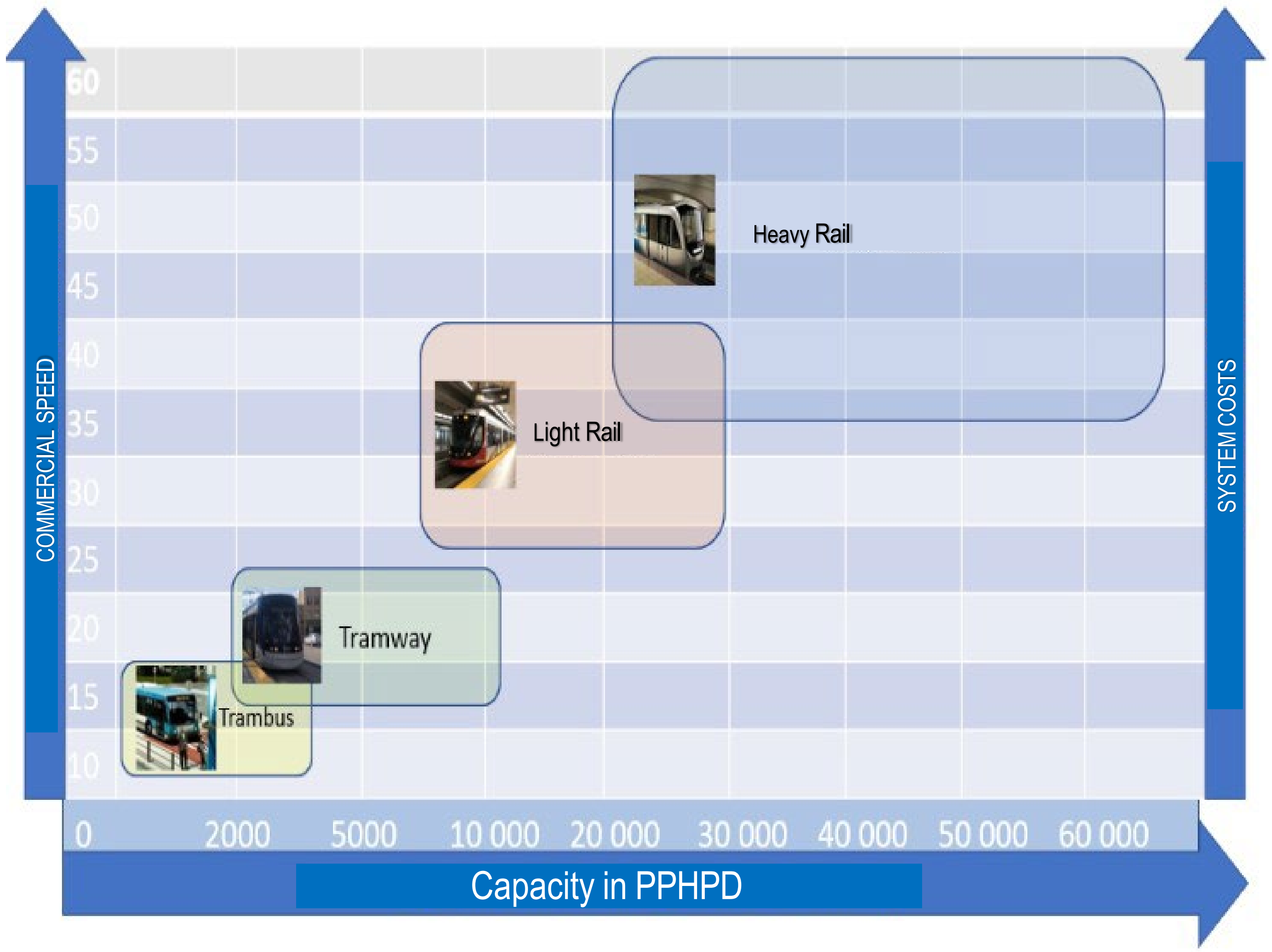


Figure 2-7 Rail mode type by peak period passenger capacity per hour per direction (PPHPD)

2.2.2 IDENTIFICATION OF SELECTED COMPONENTS

Based on the analyses, the following components were selected to form a complete solution:

SERVING THE WEST OF GATINEAU

Three options were analyzed for serving the west, including local route variants:

- An east-west route via Aylmer/Alexandre-Taché with a branch serving Le Plateau via St-Raymond/Plateau

Figure 2-8 Serving the West: East-West axis via Aylmer/Alexandre-Taché with a branch serving Plateau via St-Raymond/Plateau

– Two east-west routes: south on Aylmer/Alexandre-Taché and north on Allumettières/Plateau

Figure 2-9 Serving the West: two East-West axis via Aylmer/Alexandre-Taché on the South and via Allumettières/Plateau on the North

– Two east-west routes: south on Aylmer/Alexandre-Taché and north on Plateau/Gamelin/Montclair/Rapibus

Figure 2-10 Serving the West: two East-West axis via Aylmer/Alexandre-Taché on the South and via Allumettières/Plateau on the North

The following observations can be made regarding service to the west:

– The use of Boulevard des Allumettières between Chemin Vanier and Boulevard Saint-Raymond is only feasible in the case of a high-performance express service on the Allumettières corridor from end to end, focusing more on travel time at the expense of service proximity;
– The use of the Gamelin/Montclair route will allow for better service to a portion of the Hull periphery sector from the Le Plateau sector, without, however, directly linking the main cluster of this sector, which is the CEGEP. It should be noted that, in addition to the main higher-order mode, the STO is already planning to improve its network from the west to the outskirts of Hull, by setting up a possible reserved lane on St-Raymond across Gatineau Park with the *Study for the implementation of preferential measures for bus (MPB) along boulevard St-Raymond* currently in progress.

Alternatives for extending the higher-order network are possible for the routes serving the Le Plateau sector, i.e. using Vanier to Aylmer or extending onto Allumettières to the Parc-O-Bus or to Old Aylmer via Wilfried-Lavigne. The suitability of these extension options has been clarified in subsequent stages.

INTERPROVINCIAL LINKS

Due to its geographical location and its proximity to the Lyon station of the Ottawa O-Train network, the Portage Bridge is the optimal link to provide an efficient higher-order connection between the two sides, with a feeder service to Lyon station and possibly to Parliament station. However, several ways of arranging and operating this link remain possible:

– Use by buses only:
  – given the limited bus capacity in downtown Ottawa, it appears that a large majority of buses crossing the bridge must be articulated or bi-articulated. In the longer term, this will require restructuring the STO's network by adding transfers, if necessary, to provide service with longer buses.
– Use by buses and a tramway/LRT:
  – this includes an LRT/tramway mode from the west as well as continued use of bus routes from elsewhere in Gatineau, including the Rapibus corridor. Given the different vehicle configurations and operating constraints, it seems appropriate to have stations at different locations for buses and trains in both Gatineau and Ottawa.
– Tramway/LRT use only:
  – this alternative could require major transfers from Rapibus services in downtown Gatineau. For this reason, it appears that this alternative would require an extension through downtown Ottawa to better serve the final destinations.

The extension of the higher-order service to downtown Ottawa becomes an important element of the system's success, so as not to create additional transfers that are highly detrimental to east and westbound ridership to the downtown heart of Ottawa. Secondary routes could use other links (Champlain, Alexandra, Chaudières, Trillium extension on Prince of Wales, Cartier-Macdonald), which would offer a range of choices to users depending on their destination and alleviate operating constraints in the two downtown areas.

HIGHER-ORDER NETWORK MODE

Three alternatives are retained for the operation of the West Gatineau higher-order transit system:

– Tramway/LRT rail mode;
– Bus/BRT mode operated with articulated or bi-articulated vehicles;
– Hybrid tramway/bus mode with one mode of operation on each corridor, minimizing trunk lines over short distances, when no other alternatives are available. Combined operation is not recommended over several kilometres given the challenges of station layout, maintenance and operation.

Each of these alternatives presents challenges. However, all of them are feasible, although the bus variant presents greater challenges.

2.2.3 LONG LIST OF SOLUTIONS

According to the elements presented above and the analyses carried out, it is thus possible to generate a catalogue of coherent potential solutions that meet the main objectives set, though without considering all of their impacts and their relevance. The objective of this exercise is to systematically generate all physically possible combinations by combining the individual solution elements available, namely:

- The West Gatineau route;
- The Gatineau Park crossing;
- Service to downtown Gatineau;
- Servicing the Hull periphery;
- The bridges used;
- The feeder service to the Ottawa LRT;
- Serving downtown Ottawa;
- The mode of operation.

The elements available for combination in order to generate solutions for the implementation of a higher-order service in the west end of Gatineau and in connection between the downtowns of Gatineau and Ottawa are the following:

MODES OF OPERATION OF THE HIGHER-ORDER TRANSIT SYSTEM

Three modes of operation of the western higher-order transit system are considered in this study to compose the alternatives:

T Electric tramway that crosses the Ottawa River and connects to downtown Ottawa;

B Bus Rapid Transit (BRT) service operated by articulated or bi-articulated electric buses that crosses the Ottawa River and connects to downtown Ottawa;

H Hybrid – Tramway on one route and BRT on the other.

MODE OF OPERATION BY ROUTE

The possible modes of operation on the Aylmer/Alexandre-Taché/Laurier and Plateau/Allumettières routes are as follows:

TRAM rail mode;

BRT mode by bus;

TRAM and **BRT** hybrid modes, one route is operated by a rail mode (TRAM) and one route is operated by a bus mode (BRT).

MODE OF OPERATION ON THE PORTAGE BRIDGE

The bridge used for the higher-order mode is the Portage Bridge. However, the western system is not the only one that travels to Ottawa: transit services in the Gatineau (including the Rapibus) and Hull areas also travel over the Portage Bridge. Depending on the solution, a single mode or a combination of modes is considered for the implementation of a higher-order service on the Portage Bridge. The possible modes on the Portage Bridge are as follows:

TRAM railway mode crossing the bridge;

BRT mode by bus crossing the bridge, for example a Western BRT and/or Rapibus lines;

TRAM and **BRT** Cohabitation of tramway and bus on the Portage Bridge.

Thus, by combining the different variable elements presented above, it is possible to generate the following solutions (see maps and descriptions in the following pages for more details):

Table 2-2 Long list of solutions

SOLUTION	METHOD OF INTERVENTION	ITINERARY	MODE OF OPERATION BY ROUTE		USE OF THE PORTAGE BRIDGE
			Aylmer to centre	Le Plateau to centre	
B1	BRT	1	BRT	BRT	BRT
B2	BRT	2	BRT	BRT	BRT
B3	BRT	3	BRT	BRT	BRT
T1	TRAM	1	TRAM	TRAM	TRAM and BRT
T2	TRAM	2	TRAM	TRAM	TRAM and BRT
H1	TRAM and BRT	2	BRT	TRAM	TRAM and BRT
H2	TRAM and BRT	2	TRAM	BRT	TRAM and BRT
H3	TRAM and BRT	1	TRAM	BRT	TRAM and BRT

ALL-BUS SOLUTIONS

SOLUTION B1: AYLMER/ALEXANDRE-TACHÉ + PLATEAU/ST-RAYMOND BRT

- BRT on two routes:
  - Allumettières/Wilfrid-Lavigne/Aylmer/Alexandre-Taché/Laurier and local variants;
  - Vanier/Plateau/St-Raymond/Alexandre-Taché/Laurier and local variants.
- Use of the Portage Bridge to feed into Lyon station and potential extension to the east of downtown;
- Operated with two separate services:
  - Le Plateau—downtown Gatineau—Ottawa (Lyon) line;
  - Aylmer—downtown Gatineau—Ottawa (Lyon) line.
- Rapibus:
  - Rapibus on current route to Alexandre-Taché and on Allumettières/Maisonneuve;
  - Possibility of using Alexandre-Taché;
  - Use of the Portage Bridge to feed into Lyon station;
  - Operated with two separate services:
    - East—downtown Gatineau—Ottawa (Lyon) line via Allumettières/Maisonneuve;
    - East—UQO—downtown Gatineau—Ottawa via Alexandre-Taché line.
- Complementary network:
  - Additional service and feeder services in the Aylmer, Le Plateau, Val-Tétreau and Hull periphery sectors;
  - Use of the Champlain Bridge to feed into Tunney's Pasture station;
  - Use of the Alexandra Bridge to feed into Rideau Station and for eastern destinations such as the university;
  - Lines to Hull periphery via Aylmer/Rapibus and Plateau/St-Raymond.

B2 SOLUTION: AYLMER/ALEXANDRE-TACHÉ + PLATEAU/ALLUMETTIÈRES BRT

- BRT on two routes:
  - Allumettières/Wilfrid-Lavigne/Aylmer/Alexandre-Taché/Laurier and local variants;
  - Allumettières/Plateau/Allumettières/Maisonneuve and local variants.
- Use of the Portage Bridge to feed into Lyon station and potential extension of the tramway to the east of downtown;
- Operated with two separate services:
  - Le Plateau—downtown Gatineau—Ottawa (Lyon) line;
  - Aylmer—downtown Gatineau—Ottawa (Lyon) line.
- Rapibus:
  - Rapibus on current route to Alexandre-Taché and on Allumettières/Maisonneuve;
  - Possibility of using Alexandre-Taché;
  - Use of the Portage Bridge to feed into Lyon station;
  - Operated with two separate services:
    - East—downtown Gatineau—Ottawa (Lyon) via Maisonneuve line;
    - East—UQO—downtown Gatineau—Ottawa via Alexandre-Taché line.
  - Complementary network:
  - Additional service and feeder services in the Aylmer, Le Plateau, Val-Tétreau and Hull periphery sectors;
  - Use of the Champlain Bridge to feed into Tunney's Pasture station;
  - Use of the Alexandra Bridge to feed into Rideau Station and for eastern destinations such as the university;
  - Lines to Hull periphery via Aylmer/Rapibus and Plateau/St-Raymond.

B3 SOLUTION: AYLMER/ALEXANDRE-TACHÉ + PLATEAU/GAMELIN/RAPIBUS BRT

- BRT on two routes:
  - Allumettières/Wilfrid-Lavigne/Aylmer/Alexandre-Taché/Laurier and local variants;
  - Vanier/Plateau/Gamelin/Moussette/Montclair/Rapibus and local variants.
- Use of the Portage Bridge to feed into Lyon station and potential extension of the tramway to the east of downtown;
- Operated with two separate services:
  - Le Plateau—downtown Gatineau—Ottawa (Lyon) line;
  - Aylmer—downtown Gatineau—Ottawa (Lyon) line.
- Rapibus:
  - Rapibus on current route to Alexandre-Taché and on Allumettières/Maisonneuve;
  - Possibility of using Alexandre-Taché;
  - Use of the Portage Bridge to feed into Lyon station;
  - Operated with two separate services:
    - East—downtown Gatineau—Ottawa (Lyon) via Maisonneuve line;
    - East—UQO—downtown Gatineau—Ottawa via Alexandre-Taché line.
- Complementary network:
  - Additional service and feeder services in the Aylmer, Le Plateau, Val-Tétreau and Hull periphery sectors;
  - Use of the Champlain Bridge to feed into Tunney's Pasture station;
  - Use of the Alexandra Bridge to feed into Rideau Station and for eastern destinations such as the university;
  - Lines to Hull periphery via Aylmer/Rapibus, Plateau/St-Raymond and Plateau/Gamelin.

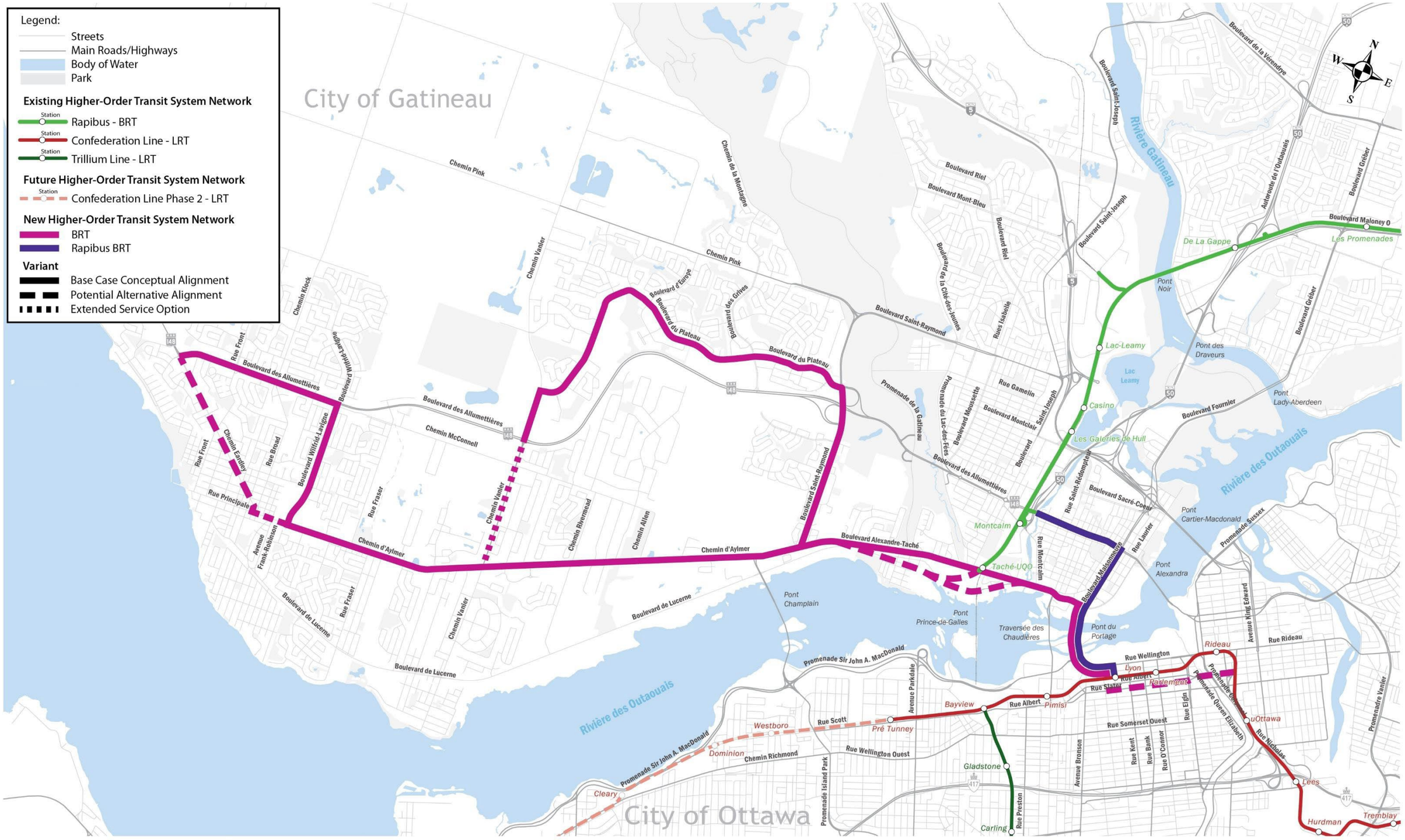


Figure 2-11 B1: Aylmer/Alexandre-Taché + Plateau/St-Raymond BRT

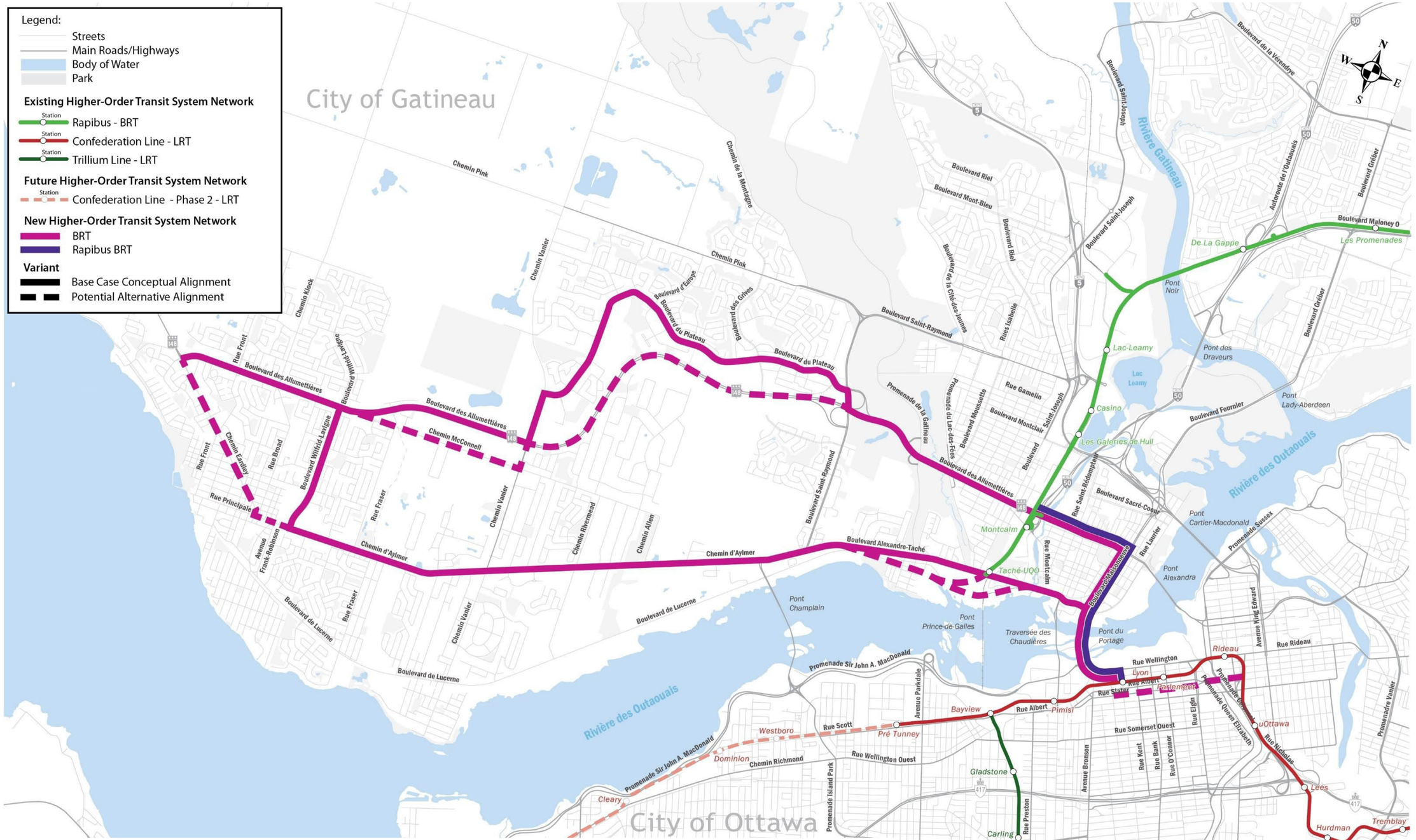


Figure 2-12 B2: Aylmer/Alexandre-Taché + Plateau/Allumettières BRT

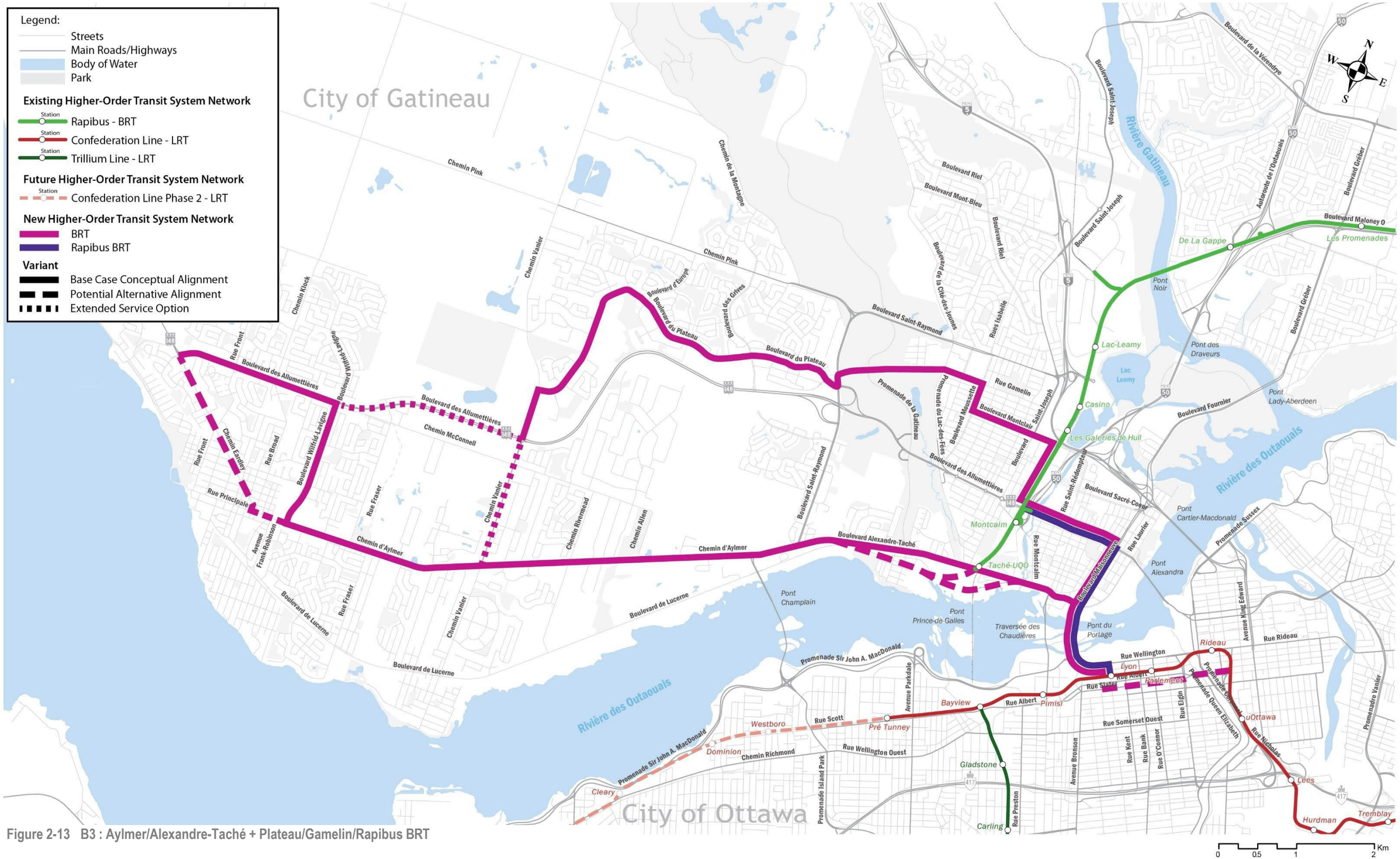


Figure 2-13 B3 : Aylmer/Alexandre-Taché + Plateau/Gamelin/Rapibus BRT

Report 6: Conclusions and recommendations

ALL-TRAMWAY SOLUTIONS

T1 SOLUTION: AYLMER/ALEXANDRE-TACHÉ + PLATEAU/ST-RAYMOND TRAMWAY

- Tramway on two routes:
  - Allumettières/Wilfrid-Lavigne/Aylmer/Alexandre-Taché/Laurier and local variants;
  - Plateau/St-Raymond/Alexandre-Taché/Laurier and local variants.
- Use of the Portage Bridge to feed into Lyon station and potential extension of the tramway to the east of downtown;
- Operated with two separate services:
  - Le Plateau—downtown Gatineau—Ottawa (Lyon) line;
  - Aylmer—downtown Gatineau—Ottawa (Lyon) line.
- Potential garage location: along Chemin d'Aylmer and secondary storage area near Vanier/Plateau.
- Rapibus:
  - Rapibus on current route to Alexandre-Taché and on Allumettières/Maisonneuve;
  - Use of the Portage Bridge to feed into Lyon station;
  - Operated with two separate services:
    - East—downtown Gatineau—Ottawa (Lyon) via Maisonneuve line;
    - East—UQO line with transfer to the tramway.
- Complementary network:
  - Additional service and feeder services in the Aylmer, Le Plateau, Val-Tétreau and Hull periphery sectors;
  - Use of the Champlain Bridge to feed into Tunney's Pasture station;
  - Use of the Alexandra Bridge to feed into Rideau Station and for eastern destinations such as the university;
  - Lines to Hull periphery via tramway/Rapibus or St-Raymond.

T2 SOLUTION: AYLMER/ALEXANDRE-TACHÉ + PLATEAU/ALLUMETTIÈRES TRAMWAY

- Tramway on two routes:
  - Allumettières/Wilfrid-Lavigne/Aylmer/Alexandre-Taché/Laurier and local variants;
  - Allumettières/Plateau/Allumettières/Maisonneuve and local variants.
- Use of the Portage Bridge to feed into Lyon station and potential extension of the tramway to the east of downtown;
- Operated with two separate services:
  - Aylmer—Le Plateau—downtown Gatineau—Ottawa (Lyon) line;
  - Aylmer—downtown Gatineau—Ottawa (Lyon) line.
- Potential location of the garage: along Chemin d'Aylmer or near Vanier/Allumettières.
- Rapibus:
  - Rapibus on current route to Alexandre-Taché and on Allumettières/Maisonneuve (on same corridor as tramway);
  - Use of the Portage Bridge to feed into Lyon station;
  - Operated with two separate services:
    - East—downtown Gatineau—Ottawa (Lyon) via Maisonneuve line;
    - East—UQO line with transfer to the tramway.
- Complementary network:
  - Additional service and feeder services in the Aylmer, Le Plateau, Val-Tétreau and Hull periphery sectors;
  - Use of the Champlain Bridge to feed into Tunney's Pasture station;
  - Use of the Alexandra Bridge to feed into Rideau Station and for eastern destinations such as the university;
  - Lines to Hull periphery via tramway/Rapibus or St-Raymond.

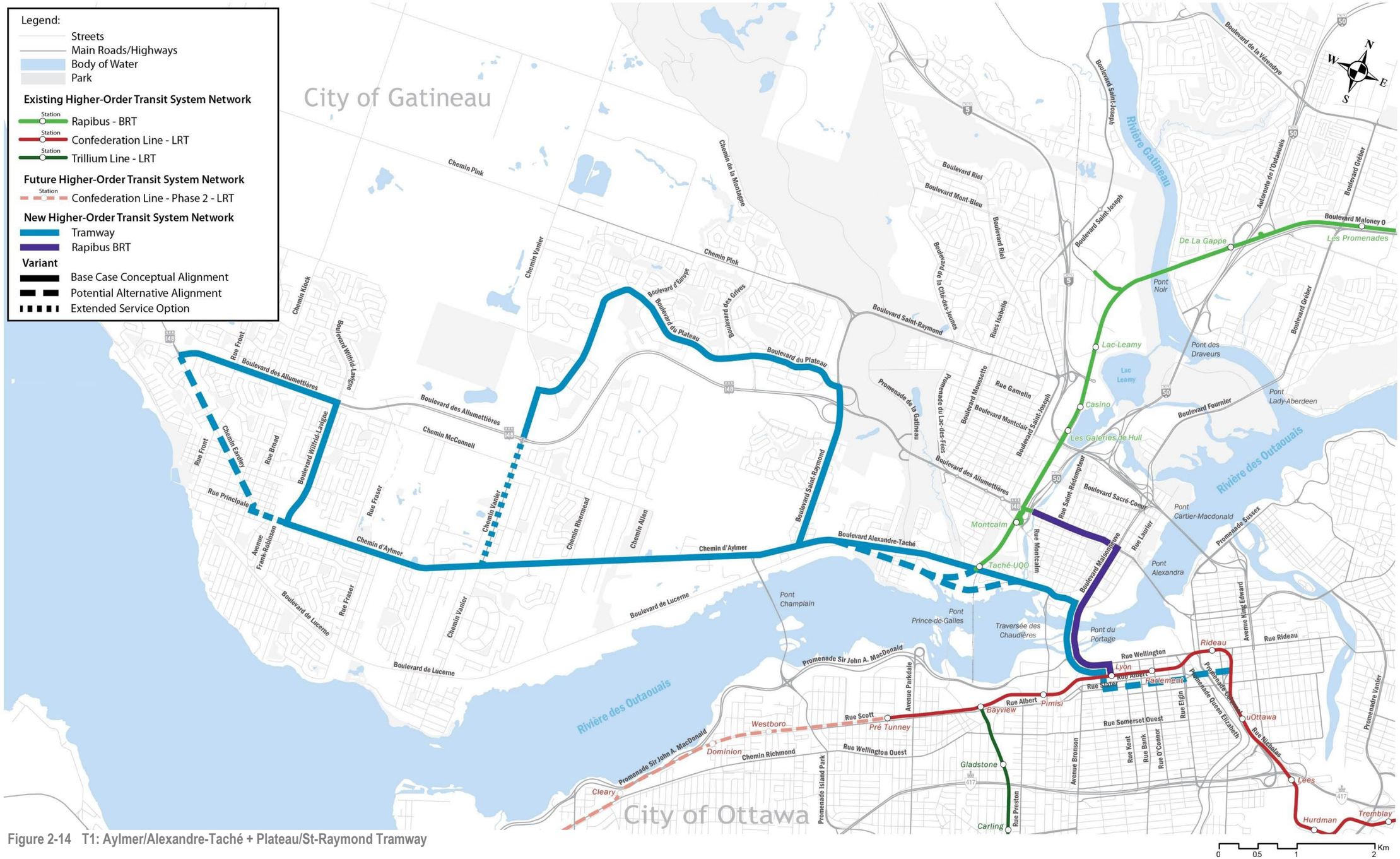


Figure 2-14 T1: Aylmer/Alexandre-Taché + Plateau/St-Raymond Tramway

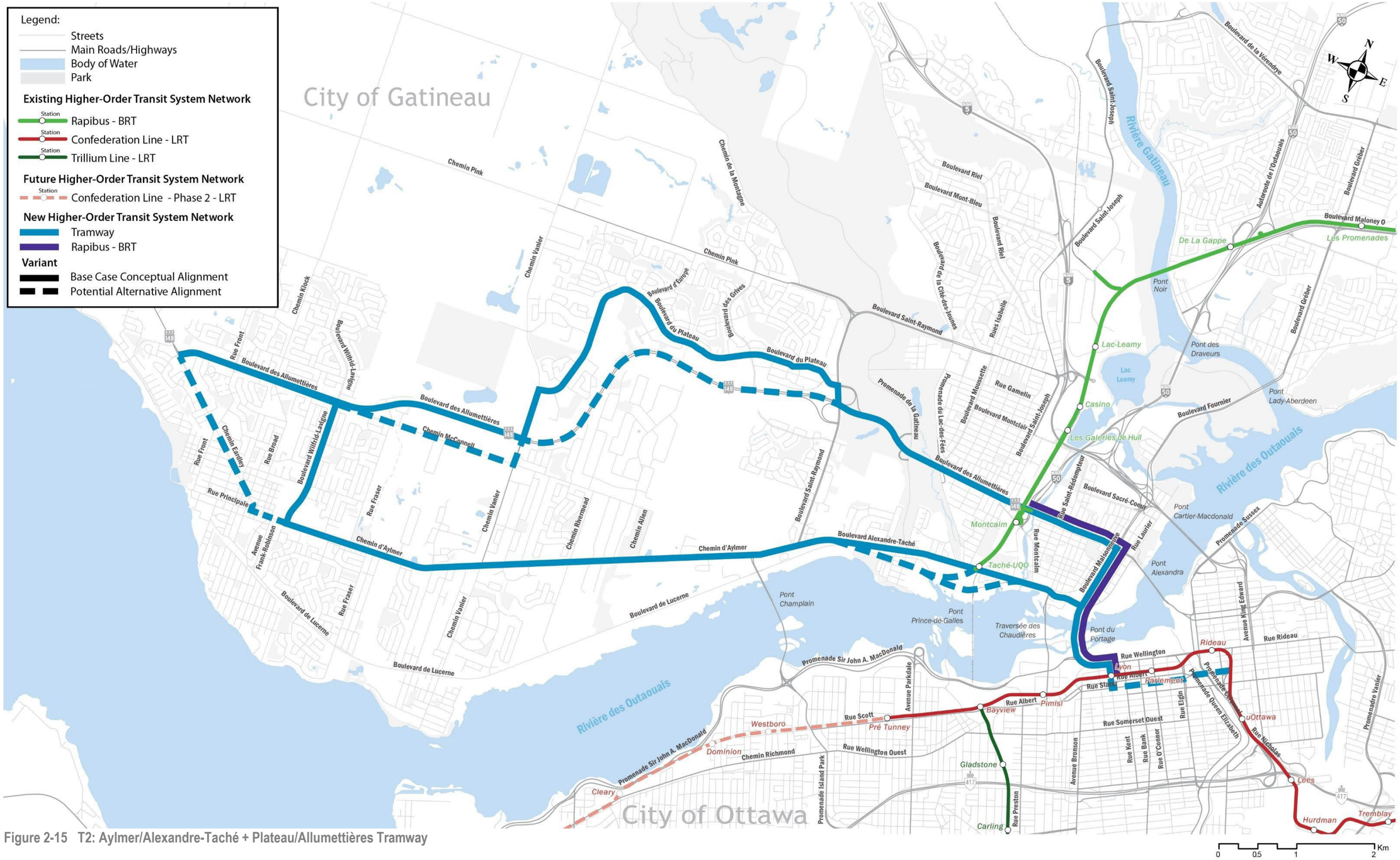


Figure 2-15 T2: Aylmer/Alexandre-Taché + Plateau/Allumettières Tramway

HYBRID SOLUTIONS

SOLUTION H1: AYLMER/ALEXANDRE-TACHÉ BRT + PLATEAU/ALLUMETTIÈRES TRAMWAY

- Two routes:
  - BRT for Allumettières/Wilfrid-Lavigne/Aylmer/Alexandre-Taché/Laurier and local variants;
  - Tramway for Allumettières/Plateau/Allumettières/Maisonneuve and local variants.
- Use of the Portage Bridge to feed into Lyon station and potential extension to the east of downtown;
- Operated with two separate services:
  - tramway: Aylmer—Le Plateau—downtown Gatineau—Ottawa (Lyon) line;
  - BRT: Aylmer—downtown Gatineau—Ottawa (Lyon) line.
- Potential location of the garage: near Vanier/Allumettières.
- Rapibus:
  - Rapibus on Alexandre-Taché to avoid combining the tramway/BRT on the Allumettières and Maisonneuve boulevards and to facilitate transfers with the Rapibus on Chemin d'Aylmer;
  - Use of the Portage Bridge to feed into Lyon station;
  - Operated with one service:
    - East—UQO—downtown Gatineau—Ottawa (Lyon) line.
- Complementary network:
  - Additional service and feeder services in the Aylmer, Le Plateau, Val-Tétreau and Hull periphery sectors;
  - Use of the Champlain Bridge to feed into Tunney's Pasture station;
  - Use of the Alexandra Bridge to feed into Rideau Station and for eastern destinations such as the university;
  - Lines to Hull periphery via Aylmer/Rapibus or St-Raymond

H2 SOLUTION: AYLMER/ALEXANDRE-TACHÉ TRAMWAY + PLATEAU/ALLUMETTIÈRES BRT

- Two routes:
  - tramway for Allumettières/Wilfrid-Lavigne/Aylmer/Alexandre-Taché/Laurier and local variants;
  - BRT for Allumettières/Vanier/Plateau/Allumettières/Maisonneuve and local variants.
- Use of the Portage Bridge to feed into Lyon station and potential extension to the east of downtown;
- Operated with two separate services:
  - BRT: Aylmer—Le Plateau—downtown Gatineau—Ottawa (Lyon) line;
  - tramway: Aylmer—downtown Gatineau—Ottawa (Lyon) line.
- Potential location of the garage: along Chemin d'Aylmer.
- Rapibus:
  - Rapibus on current route: Allumettières and Maisonneuve;
  - Use of the Portage Bridge to feed into Lyon station;
  - Operated with two services:
    - downtown Gatineau—Ottawa (Lyon) via Maisonneuve line;
    - East—UQO line and feeder service to the tramway.
- Complementary network:
  - Additional service and feeder services in the Aylmer, Le Plateau, Val-Tétreau and Hull periphery sectors;
  - Use of the Champlain Bridge to feed into Tunney's Pasture station;
  - Use of the Alexandra Bridge to feed into Rideau Station and for eastern destinations such as the university;
  - Lines to Hull periphery via Allumettières and St-Raymond.

H3 SOLUTION: AYLMER/ALEXANDRE-TACHÉ TRAMWAY + PLATEAU/ST-RAYMOND/VANIER BRT

- Two routes:
  - tramway for Allumettières/Wilfrid-Lavigne/Aylmer/Alexandre-Taché/Laurier and local variants;
  - BRT for Vanier/Plateau/St-Raymond and local variants.
- Use of the Portage Bridge to feed into Lyon station and potential extension to the east of downtown;
- Operated with two separate services:
  - BRT: Vanier—Plateau—St-Raymond line;
  - tramway: Aylmer—downtown Gatineau—Ottawa (Lyon) line.
- Potential location of the garage: along Chemin d'Aylmer.
- Rapibus:
  - Rapibus on current route: Allumettières and Maisonneuve;
  - Transfer required to tramway at Allumettières or downtown Gatineau or UQO station;
  - Operated with two services:
    - downtown Gatineau—Ottawa (Lyon) via Maisonneuve line;
    - East—UQO line and feeder service to the tramway.
- Complementary network:
  - Additional service and feeder services in the Aylmer, Le Plateau, Val-Tétreau and Hull periphery sectors;
  - Use of the Champlain Bridge to feed into Tunney's Pasture station;
  - Use of the Alexandra Bridge to feed into Rideau Station and for eastern destinations such as the university;
  - Lines to Hull periphery via Tramway/Rapibus and St-Raymond.

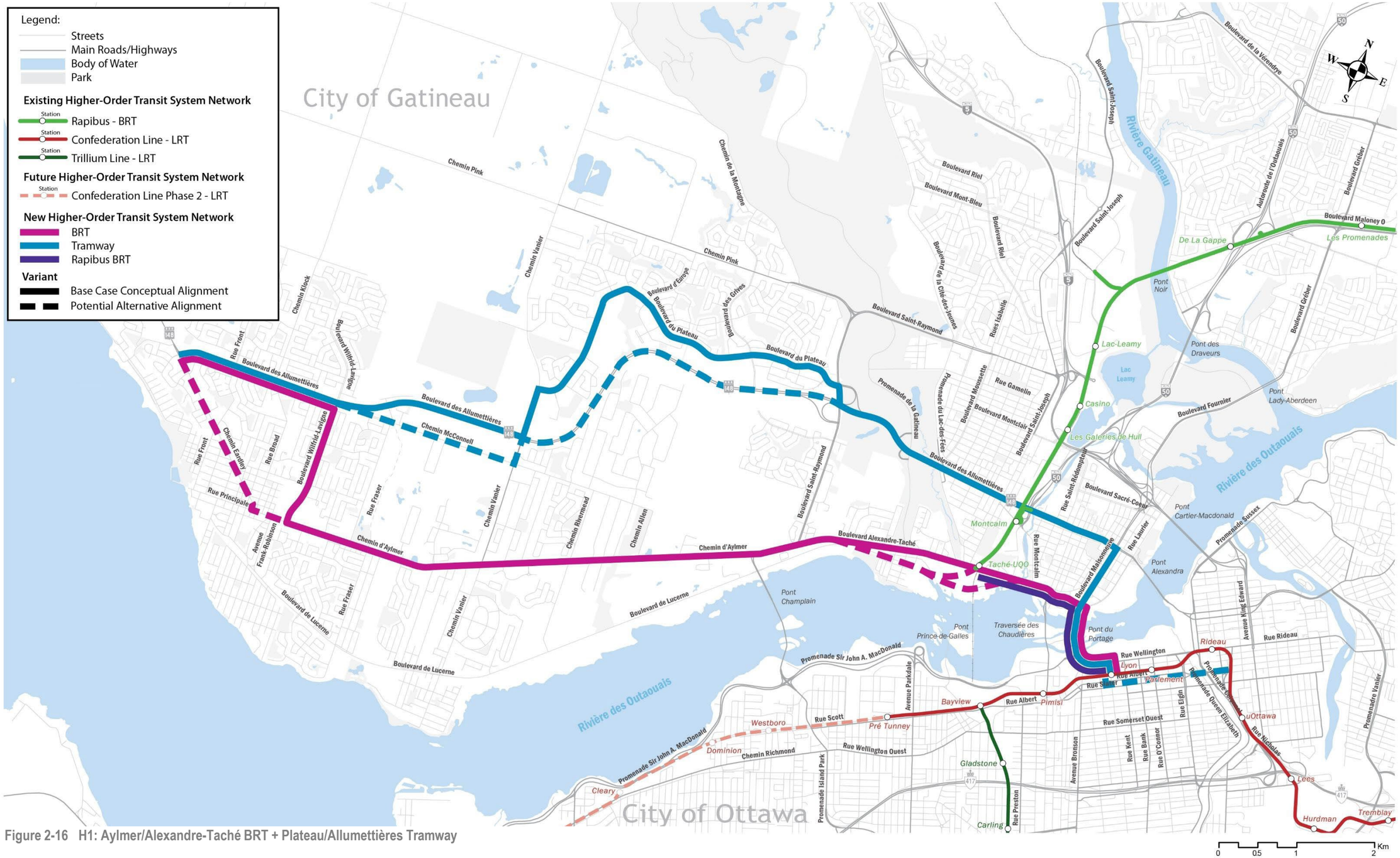


Figure 2-16 H1: Aylmer/Alexandre-Taché BRT + Plateau/Allumettières Tramway

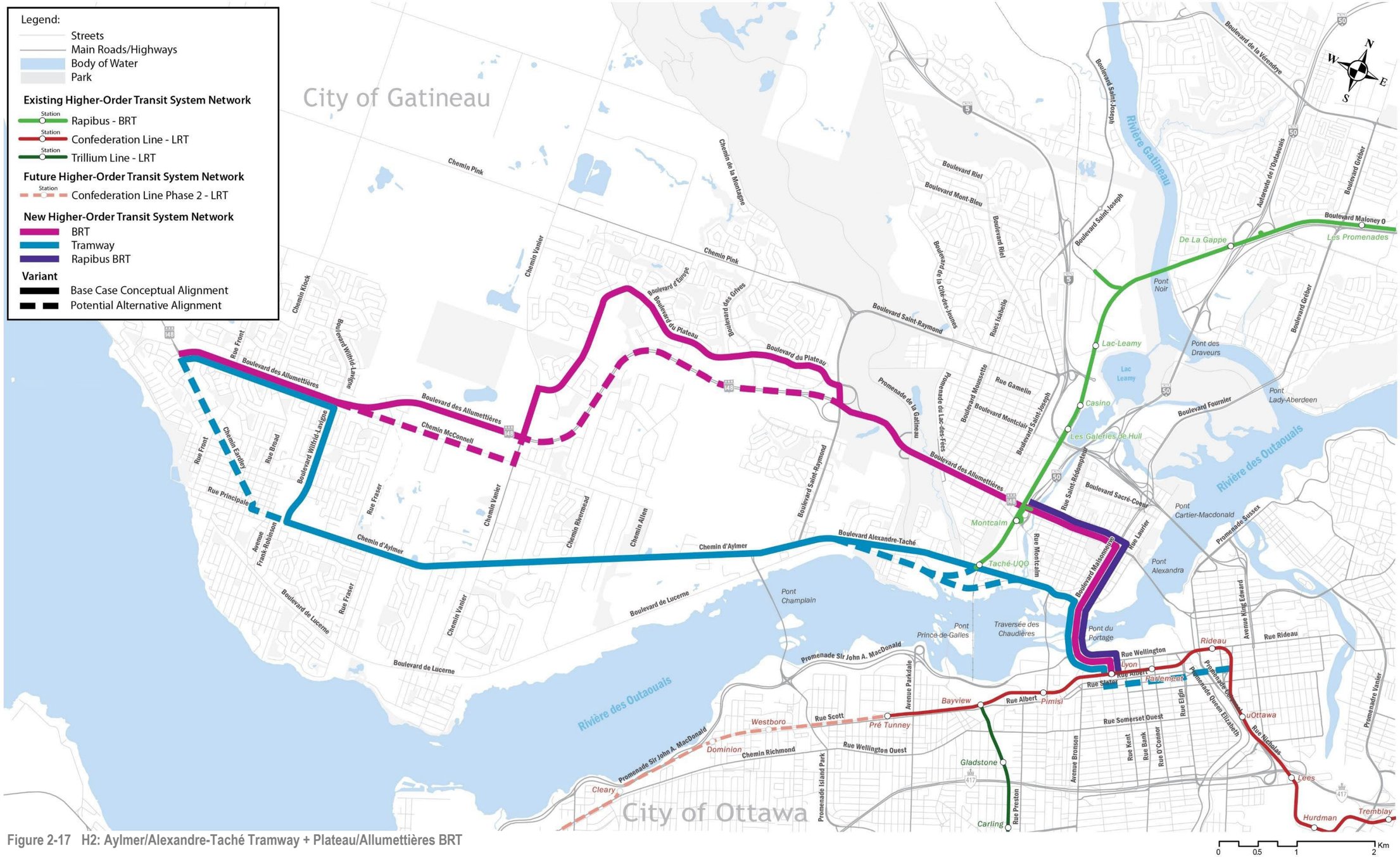


Figure 2-17 H2: Aylmer/Alexandre-Taché Tramway + Plateau/Allumettières BRT

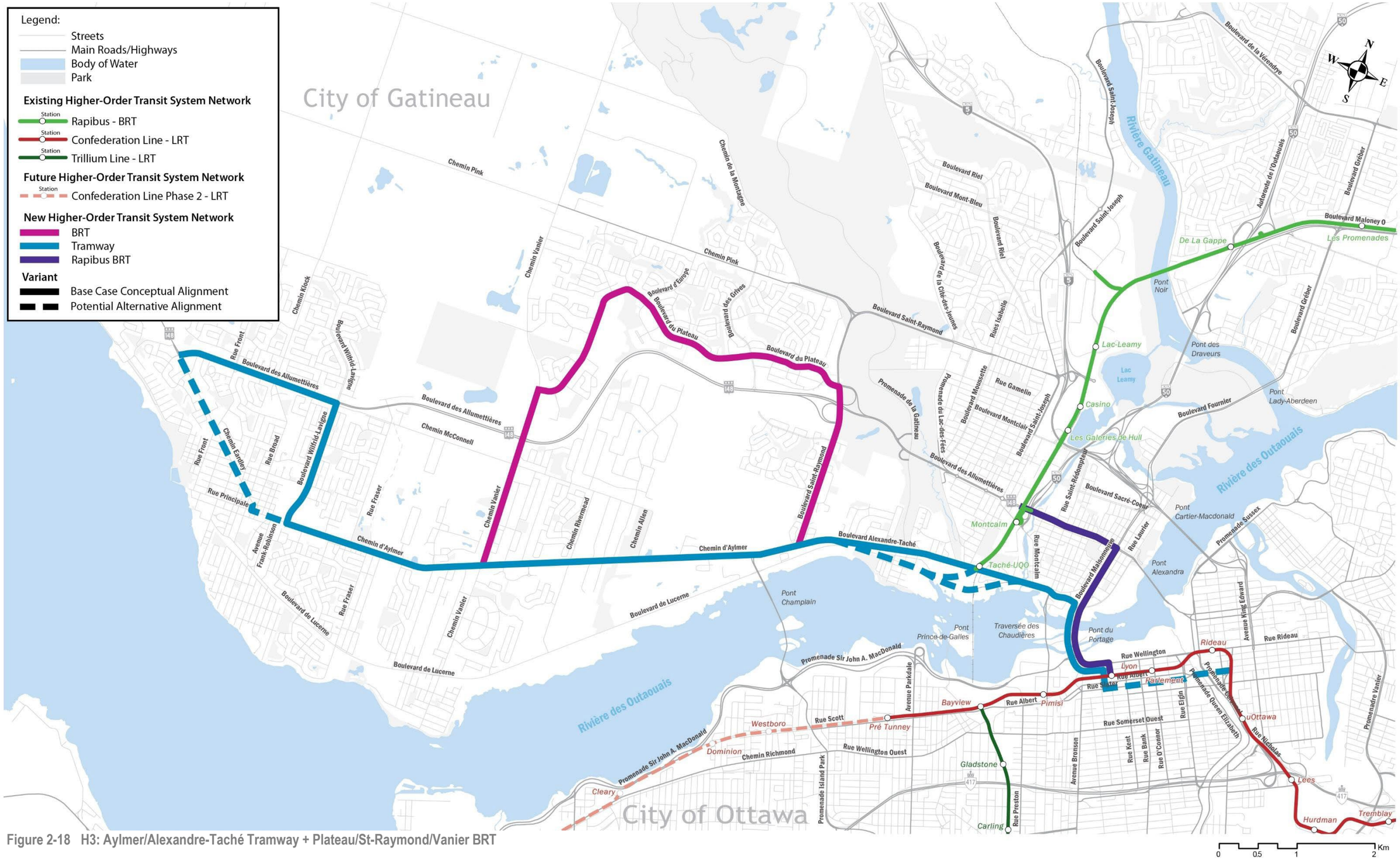


Figure 2-18 H3: Aylmer/Alexandre-Taché Tramway + Plateau/St-Raymond/Vanier BRT

2.2.4 SHORT LIST OF SOLUTIONS

As a reminder, the intention was to establish the short list according to the following parameters:

- Scenario 0: Reference scenario (improved status quo);
- Scenario 1: Search for the best all-bus/BRT option by comparing options B1, B2 and B3;
- Scenario 2: Search for the best all-rail/LRT option by comparing options T1 and T2;
- Scenario 3: Search for the best option with a rail component by comparing options H1, H2 and H3 with the rail option not selected for scenario 2;
- Scenario 4: search for the best option among those not selected.

The scenario evaluation tables presented below are based on the following legend:

++	Meets the objectives well No/few constraints
+	Partially meets the set objectives Generates constraints of measured magnitude
+/-	Fulfils a small portion of the set objectives Creates significant constraints
-	Works against the set objectives Creates major constraints

SCENARIO 0: REFERENCE SCENARIO

- The reference scenario, referred to here as Scenario 0 – Improved status quo, is the situation projected by the STO if no higher-order link is implemented in western Gatineau. The measures presented below are also an integral part of the other scenarios evaluated, as long as they are not found on a route used by the higher-order link, which would then replace the measure in scenario 0 with the one proposed in the higher-order scenario considered.
- The physical and operational measures from Scenario 0 are illustrated on the map at the end of this section on Report 2. Although some of these measures are outside the scope of our study or are mainly traffic related, they may have an impact on the overall mobility conditions and will therefore be included in our future baseline scenario.

SCENARIO 1: SEARCH FOR THE BEST ALL-BUS OPTION

As indicated in the colour code summary below, Option B1 is selected for Scenario 1 of the short list. Option B3 being the second most interesting solution, it will be used for comparison and selection of other scenarios.

Overall assessment of B1

This solution has the lowest cost due to its shorter length while offering a very good coverage of the territory. However, this solution does not reduce the volume of buses in downtown Ottawa at all and will in fact result in progressive increases in the number of transfers in order to control volume in the medium and long terms. The most efficient variant, particularly in terms of coverage per km of network and without major constraints, although the service to Hull is not as good as with B2.

Overall assessment of B2

This alternative would require greater investment than the bus-only alternatives and would capture fewer nearby riders than other alternatives, particularly in the area west of the Lac des Fées Parkway. In fact, this solution does not capture the Manoir des Trembles sector as well, but on the other hand, it allows for better connections between the communities of the Lavigne and Le Plateau sectors, in addition to offering greater flexibility in serving the sector south of McConnell. This solution does not reduce the volume of buses in downtown Ottawa and will even result in progressive increases in the number of transfers in order to control volume over the medium and long terms.

Overall assessment of B3

This alternative would require greater investment than the other bus-only options. In addition, it captures fewer users living nearby than B1. This variant serves the Hull periphery better than other variants but fails to directly serve the CEGEP and other clusters in the area. This variant has advantages, but for smaller Origin-Destination pairs than the destinations to downtown Gatineau and Ottawa. This solution does not reduce the volume of buses and will require a progressive increase in the number of transfers to reduce the volume of buses. Interesting alternative, but the crossing of Rue Gamelin through Gatineau Park may not be feasible due to issues related to the natural environment and alignment with NCC orientations. The advantages of this option to destinations in the Hull periphery can also be achieved with the addition of a dedicated lane on St-Raymond, as provided for in the baseline scenario.

Table 2-3 Evaluation Scenario 1

SCENARIO 1 ALL-BUS SOLUTION	B1 AYLMER/TACHÉ + SAINT-RAYMOND/PLATEAU	B2 AYLMER/TACHÉ + ALLUMETTIÈRES	B3 AYLMER/TACHÉ + PLATEAU/GAMELIN
Potential market in Gatineau	++	++	++
Proximity to generating clusters	++	++	++
Travel time to/from certain destinations	+	+	+
Quality of service offered to users	++	++	++
Quality of higher-order modes linkage	+	++	++
Land Use Planning	+	++	++
Operational issues	++	++	++
Number of buses in downtown Ottawa	-	-	-
Scope of the work	++	+	+
Physical insertion and natural environment	++	+	-
Institutional constraints	++	++	-

SCENARIO 2: SEARCH FOR THE BEST ALL-TRAMWAY OPTION

As indicated in the color-coding summary below, option T1 is chosen for scenario 2 of the shortlist. Option T2 will be used for comparison and selection of other scenarios.

Overall assessment of T1

This solution has the lowest cost due to its shorter length while offering a very good coverage of the territory. It addresses several issues, including bus traffic in downtown Ottawa. The most efficient variant, especially in terms of ratios/km and with good coverage of the territory.

Overall assessment of T2

This solution would require the largest investment and capture fewer nearby users than the other variant. This solution presents operational issues on the common tramway-Rapibus routes in downtown Gatineau and Ottawa and would require major adjustments to the Rapibus service to maintain this service. In addition, this scenario presents environmental issues when crossing Gatineau Park.

Table 2-4 Evaluation of Scenario 2

SCENARIO 2 ALL-TRAMWAY SOLUTION	**T1** AYLMER/TACHÉ + SAINT-RAYMOND/PLATEAU	**T2** AYLMER/TACHÉ + ALLUMETTIÈRES
Potential market in Gatineau	++	++
Proximity to generating clusters	++	++
Travel time to/from certain destinations	+	+
Quality of service offered to users	+	+
Quality of higher-order modes linkage	+	++
Land Use Planning	+	++
Operational issues	+	+/-
Number of buses in downtown Ottawa	++	++
Scope of the work	-	-
Physical insertion and natural environment	+	+
Institutional constraints	++	+

SCENARIO 3: SEARCH FOR THE BEST OPTION WITH A RAIL COMPONENT

This search must compare options H1, H2, H3 and the rail option not selected for scenario 2. As indicated in the color code summary below, option H2 is selected for scenario 3 of the short list. The H1 hybrid solution is the second most interesting solution.

Overall assessment of H1

Relatively balanced variant, but less efficient than H2. In fact, this solution puts the system with the highest capacity (tramway) on the corridor with the lowest demand (the Allumettières/Plateau route), in addition to creating constraints for tramway/Rapibus cohabitation. This alternative reduces the volume of buses in downtown Ottawa, but not significantly, if the tramway and BRT go to downtown Ottawa. This variant is of interest for comparison with H2, to evaluate the impacts/gains of a tramway vs. a BRT on the northern or southern routes of the study area.

Overall assessment of H2

This solution makes it possible to adapt the system to the higher density of demand on the Aylmer-Taché corridor and avoids the problems of tramway/Rapibus cohabitation on Allumettières. This option offers the best service/performance compromise for users by minimizing transfers. This solution drastically reduces the volume of buses in downtown Ottawa. The most balanced variant at a reasonable cost.

Overall assessment of H3

This solution makes it possible to adapt the system to the higher density of demand in the Aylmer – Taché corridor and avoids the problems of tramway/Rapibus cohabitation. However, this option forces transfers for users from Le Plateau, thus greatly reducing the quality of service for this sector. This option allows for a drastic reduction in the volume of buses in downtown Ottawa. Although the least expensive option, it is very disadvantageous for riders in the Le Plateau – Manoir des Trembles sectors.

Overall assessment of T2

This solution would require higher investments while providing few additional benefits compared to other hybrid solutions. This solution drastically reduces the volume of buses in downtown Ottawa. This alternative is less attractive and more costly than alternatives H1 and H2, which operate a BRT corridor.

Table 2-5 Evaluation Scenario 3

SCENARIO 3 SOLUTION WITH A RAIL COMPONENT	**T2** TRAMWAY – AYLMER/TACHÉ + ALLUMETTIÈRES	**H1** BUSES: AYLMER/TACHÉ + TRAMWAY: PLATEAU/ALLUM.	**H2** TRAM: AYLMER/TACHÉ + BUS: PLATEAU/ALLUM.	**H3** TRAM: AYLMER/TACHÉ + BUS: PLATEAU/ ST-RAYMOND
Potential market in Gatineau	++	++	++	++
Proximity to generating clusters	++	++	++	++
Travel time to/from certain destinations	+	+/-	+	+
Quality of service offered to users	+	+	+	-
Quality of higher-order modes linkage	++	++	++	+
Land Use Planning	+	+	+	+
Operational issues	+/-	+/-	+	+
Number of buses in downtown Ottawa	++	+	+	++
Scope of the work	-	+/-	+/-	+/-
Physical insertion and natural environment	+	+	+	++
Institutional constraints	+	+	+	+

SCENARIO 4: SEARCH FOR AN ADDITIONAL OPTION

The following sections present the assessment of the relevance of the options not retained to date (bus options B2 and B3 and rail options T2, H1 and H3), in order to identify the most interesting solution for scenario 4 of the short list of solutions.

As there is a wide variety of solutions, with all-bus, all-tramway and hybrids, it is difficult to make a uniform assessment of them based on the selection criteria used previously. Thus, the choice of the fourth scenario is based more on an evaluation of its relevance in relation to the three other scenarios already selected and the differences it represents, in order to study its impacts in detail and to highlight its specificities in relation to the other three scenarios.

Solution B2

At first glance, Option B2 is attractive because of its low economic cost. However, it has a lower overall added value in serving Hull than B3 and the western part of the City (west of Gatineau Park) than B1. This alternative does not reduce the volume of buses and will require progressive increases in the number of transfers to reduce the volume. This option represents the all-bus alternative to the H2 hybrid option. It will therefore have the same overall performance and impact for a lower cost and will thus not add much value. This option is therefore not retained.

Solution B3

Option B3 is also attractive because of its economic cost and improved service to destinations in the Hull periphery. However, it has a major constraint in the Rue Gamelin crossing of Gatineau Park due to the fragmentation of the natural environment and the NCC's intended use of this sector. In short, if the performance of this option was exceptional, it would be appropriate to look more closely at possible mitigation measures for the fragmentation of Gatineau Park's natural environment; but this is not the case.

In fact, the need for a high-performance link, but not necessarily a high-density service in terms of demand, between the Old Aylmer/Le Plateau sector and the Hull periphery can be addressed by adding a reserved lane on Saint-Raymond, which is already provided for in the baseline scenario. Moreover, this gain is made at the expense of travel times for users from Le Plateau and Manoir des Trembles to the downtown areas, which are considered a priority destination. This alternative also does not reduce the volume of buses in downtown Ottawa and will require potential increases in transfers to reduce volume.

This option would provide interesting additional elements for analysis elements, particularly for the service to Hull periphery. However, its major constraints mean that it cannot be retained. This option is therefore not retained.

Solution T2

Being the option with the most kilometres of rail to be installed, it is the most expensive. Unfortunately, the benefits of service and quality of service are not commensurate with this high construction cost.

Option H2 already partially addresses the issue of covering the territory on two complete corridors (Aylmer and Allumettières), but in view of concentrating investments on the most promising corridor. Option T2 would provide little additional relevant information for a cost/benefit ratio that is necessarily less attractive than H2. This option is therefore not retained.

Solution H3

This alternative drastically reduces the number of buses in downtown Ottawa and is the least expensive of the options with a rail component. However, Option H3 requires all Le Plateau and Manoir des Trembles users to transfer to the priority destinations in the downtown areas. This was deemed to have a significant negative impact on the quality of service in this sector, particularly to downtown Gatineau.

Although this option is very different from the other options considered, its constraints on users make it irrelevant in terms of quality of service. This option is therefore not retained.

Solution H1

This option was retained for the next steps of the study.

This option provides for a tramway on the Allumettières/Plateau route and a BRT on the Aylmer/Taché route (the opposite of Solution H2). Boulevard des Allumettières has a generous right-of-way and little underground infrastructure, which facilitates the development of a higher-order route and reduces construction costs.

Although not as efficient in operation as Option H2, this option represents a different service opportunity than the others (fewer stations and a focus on faster travel times on the Allumettières corridor)

In addition, the Allumettières route is currently included in the City of Gatineau's Revised Land Use and Development Plan as the higher-order public transit route in the western part of the City. Although not previously selected, this option still presents a balanced profile and is worthy of consideration since it is in relative proximity to several development areas.

Indeed, this option is mainly of interest for comparison with H2, in order to evaluate the impacts and gains of a tramway vs. a BRT on the northern or southern corridors of the study area. Thus, by comparing H1 and H2, it will be possible to evaluate in detail the interest of operating one of the two corridors with a less expensive mode than the tramway and, in such a case, which of the two corridors would be the most appropriate.

2.2.5 *MAIN FINDINGS OF REPORT 2*

As a conclusion to Report 2, the evaluation of the long list identified the short list of 5 selected scenarios (see maps on the following pages for more details):

- All the scenarios include two main service routes to meet the needs of the sector, namely the Old Aylmer and Le Plateau sectors;
- All scenarios are based on an at-grade insertion integrated into the urban development;
- All scenarios will be operated with electric vehicles;
- All scenarios integrate active modes with sidewalks and bicycle lanes.
- **Scenario 0 (improved status quo):** An evolving scenario that includes the implementation of planned related projects and service frequency improvements but does not include a higher-order public transit infrastructure. That said, this solution requires a shift to very large buses in the future and will require transfers;
- **Scenario 1 (all buses):** The B1 bus solution, which includes a branch on Aylmer/Alexandre-Taché and another serving Le Plateau via Saint-Raymond. That said, this solution requires a move to very large buses in the future and will require transfers. For the remainder of the analysis, this scenario will be referred to as the **all-bus scenario**;
- **Scenario 2 (all tramway):** The T1 tramway solution, which includes a branch on Aylmer/Alexandre-Taché and another serving Le Plateau via Saint-Raymond with a joint BRT-LRT operation of the Portage Bridge and the connection to Lyon station. For the remainder of the analysis, this scenario will be referred to as the **all-rail scenario**;
- **Scenario 3 (hybrid):** Alternative H2, which includes a tramway/LRT to the south and a BRT to the north. That said, this alternative requires moving to very large buses in the long run and will require transfers, but not as quickly as B1 or H1, with a joint BRT-LRT operation of the Portage Bridge and the connection to Lyon station. For the remainder of the analysis, this scenario will be referred to as the **hybrid scenario with rail on Aylmer/Taché**;
- **Scenario 4 (hybrid):** Variant H1, which includes a tramway/LRT to the north and a BRT to the south. That said, this alternative requires moving to very large buses in the long run and will require transfers, but not as quickly as B1, with a joint BRT-LRT operation of the Portage Bridge and the connection to Lyon station. For the remainder of the analysis, this scenario will be referred to as a **hybrid scenario with rail on Allumettières/Plateau**.

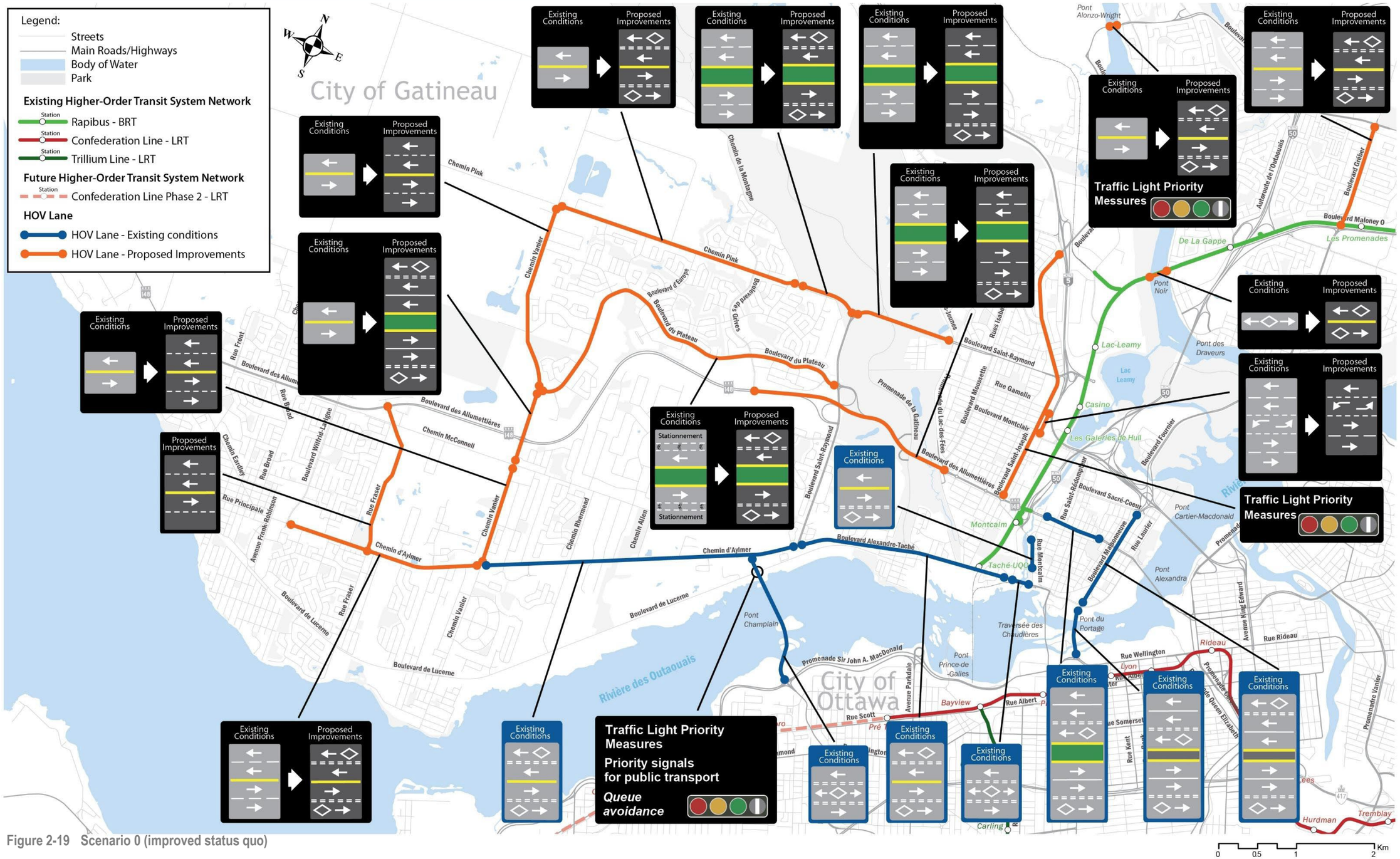


Figure 2-19 Scenario 0 (improved status quo)

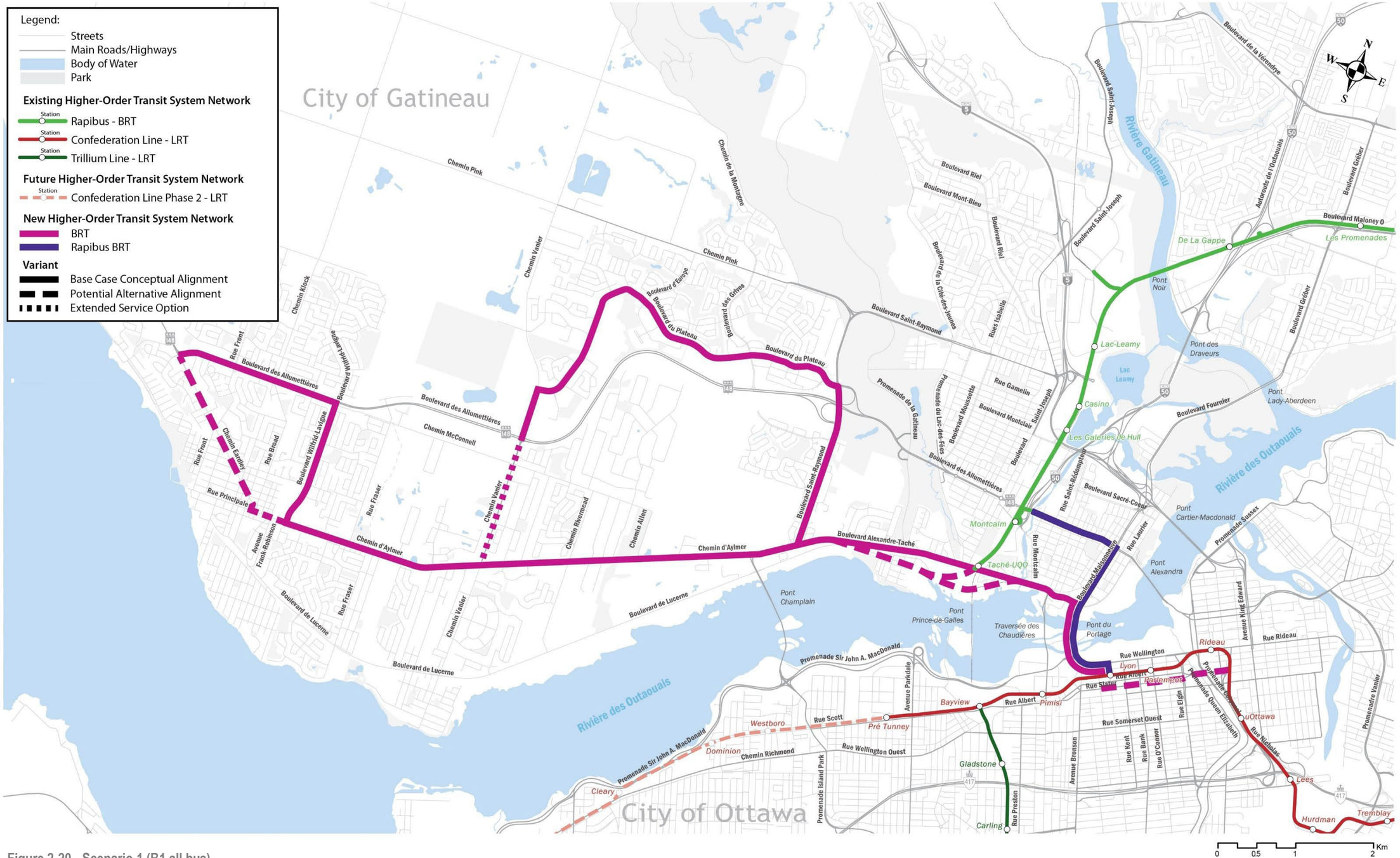


Figure 2-20 Scenario 1 (B1 all bus)

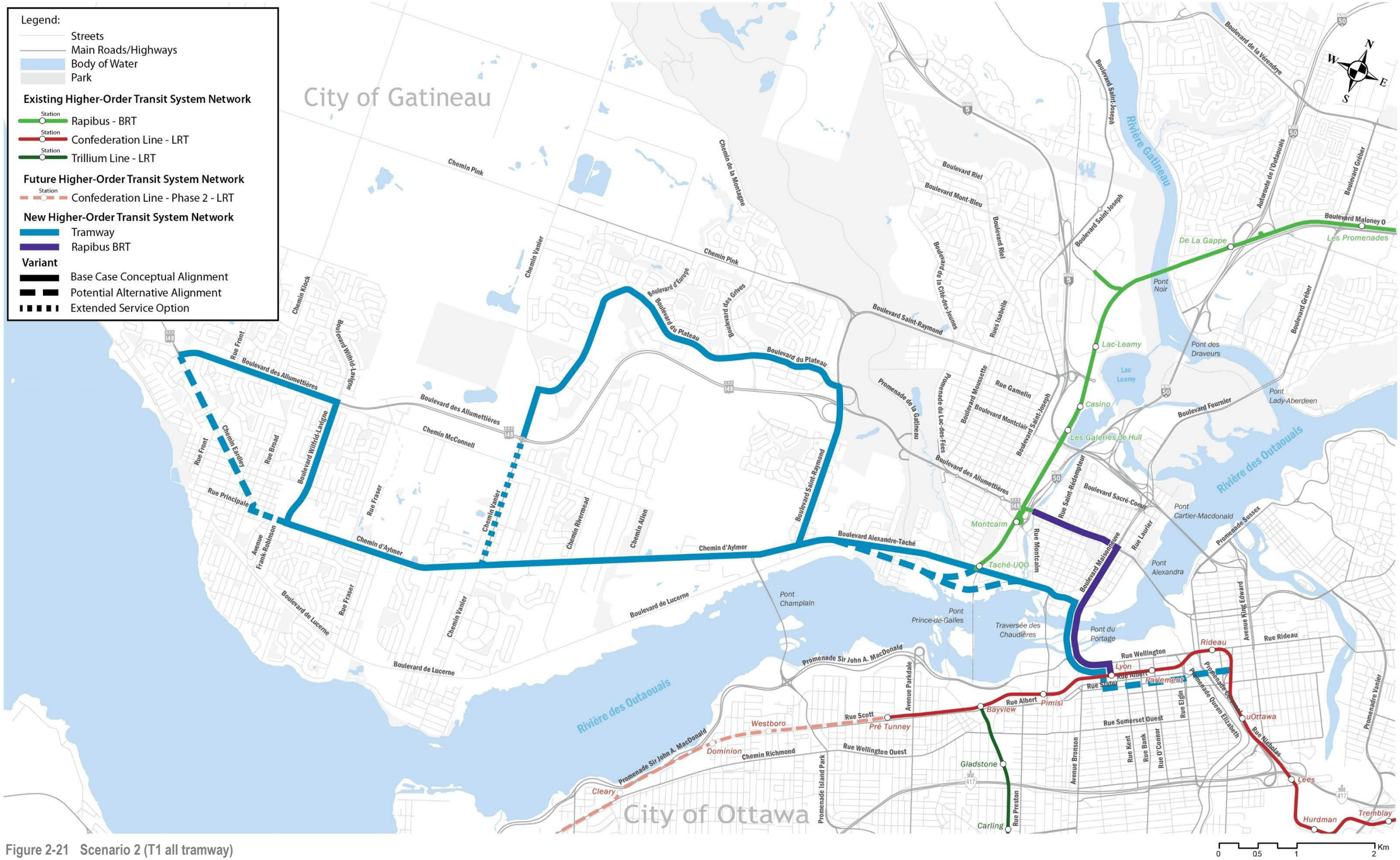


Figure 2-21 Scenario 2 (T1 all tramway)

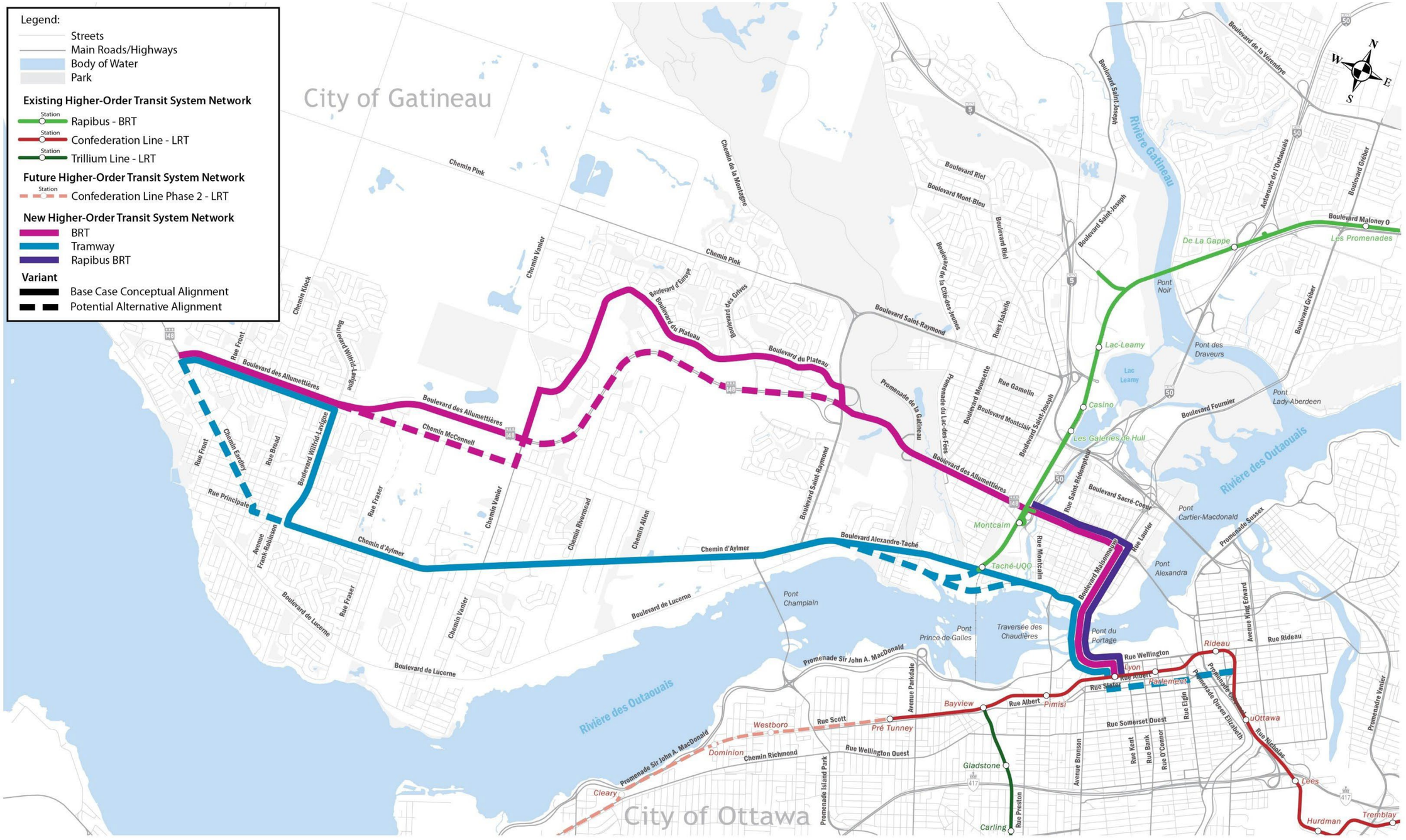


Figure 2-22 Scenario 3 (H1 hybrid)

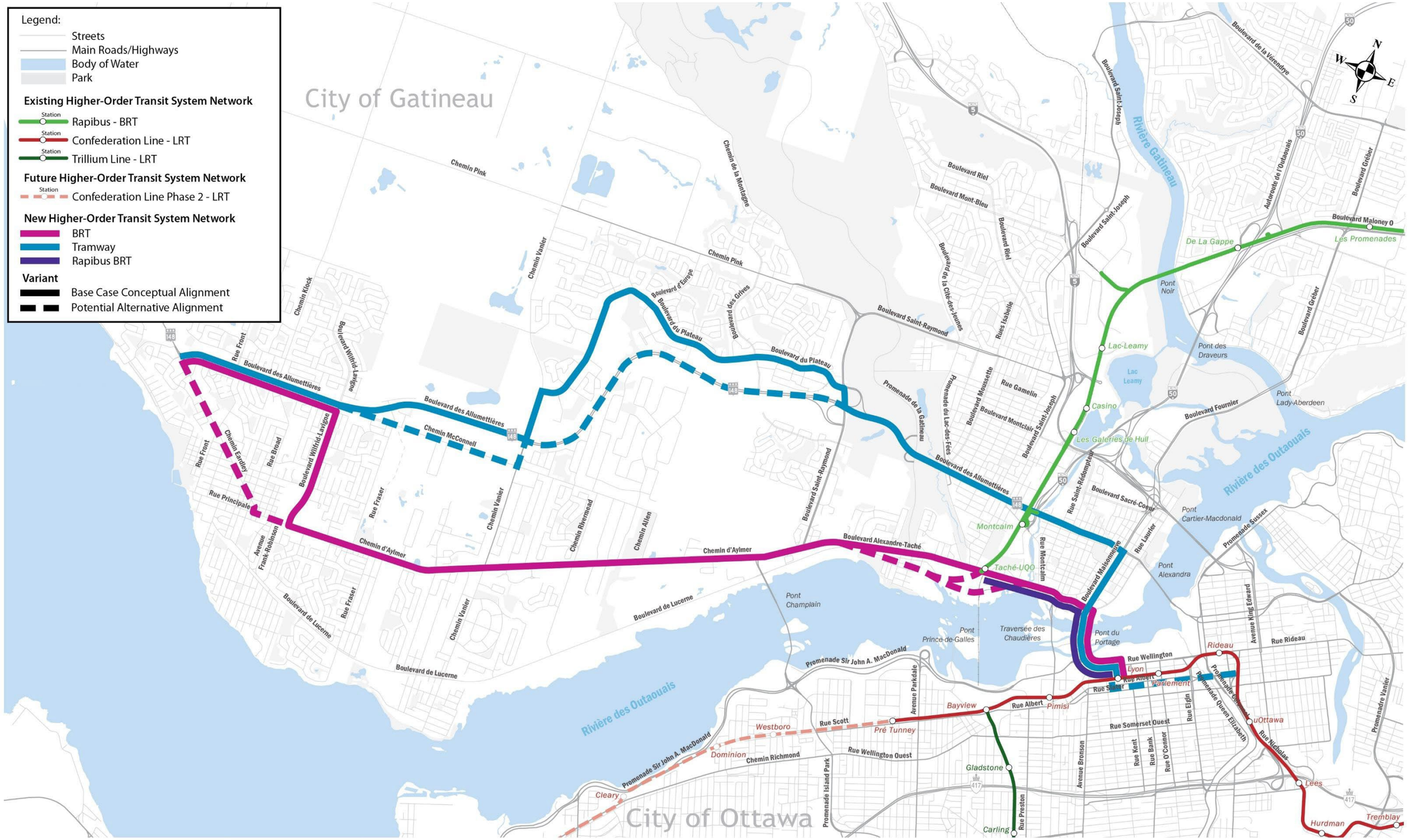


Figure 2-23 Scenario 4 (H2 hybrid)

2.3 REPORT 3 – IMPACT & PERFORMANCE ASSESSMENT OF SOLUTIONS

Following the two previous reports, this third step aims at detailing and evaluating the performance of each of the five selected scenarios according to the identified evaluation criteria and verifying their conformity with the previously identified objectives, needs and constraints. This stage was the subject of a public consultation, the report of which is available in the appendix. The goal is to give a first overview of the most and least promising scenarios in preparation for their comparative analysis at the next step. More specifically:

1 Each of the five scenarios selected was first detailed and explored in greater detail according to the following elements:
   - Routing variants and extension options;
   - Location of the stations;
   - Local accessibility and location of traffic light intersections;
   - Pedestrian and bicycle networks;
   - Park-and-ride lots;
   - Potential location of the garage;
   - Identification of the proposed service;
   - Public transit offer:
     - Restructuring of the local bus network;
     - Service offered (efficiency).
   - Insertion and implementation measures:
     - Impacts on underground and overhead utilities.

2 This was followed by an analysis of each of the scenarios to define their performance and identify their impacts according to the following three main categories:
   - Mobility and accessibility;
   - Land Use Planning;
   - Impacts on the environment and health.

3 These performances and impacts were then compared to the constraints and targets set to validate their relevance and/or propose, if necessary, possible mitigation measures to be studied if the scenario is deemed optimal;

4 A preliminary review of the risks and capital and operating costs were also conducted to provide additional insights on each scenario.

In addition to the basic alignments of the scenarios selected in Report 2, the final alignments of the scenarios were optimized and confirmed according to the following elements:

- For equal performance (accessibility and network operation), the Allumettières/Wilfrid-Lavigne routing variant was chosen over the Chemin Eardley variant in Old Aylmer, mainly to minimize/avoid the necessary acquisitions and expropriations (applicable to all scenarios);
- For the same performance (accessibility and network operation), the variant of the routing via Lucerne and the former railway right-of-way between the Saint-Dominique and Montcalm streets was chosen rather than the one on Boulevard Alexandre-Taché, also in order to avoid the necessary acquisitions and expropriations (applicable to all scenarios);
- Data related to travel demand for Le Plateau-Aylmer origin-destination pairs do not justify extending the higher-order route on the southern portion of Vanier Road, between Boulevard des Allumettières and Chemin d'Aylmer. The needs of this sector can be adequately addressed via the local bus network (Scenarios B1, T1);
- The analysis of the Boulevard des Allumettières alignment variants (McConnell and Plateau segments) clearly illustrates the divergence in function between these routes, which have very different attributes, with a focus on performance (travel time) on the Allumettières route compared to a convergence of the users on the McConnell and Plateau routes (accessibility and attractiveness). Thus, in order to compare the performance of these two major components, it is proposed to retain the following routes for the scenarios to be analyzed:
  - H1: A tramway route that is as close as possible to the users on the McConnell—Vanier—Plateau route, in order to meet the main objective of the project, which is to serve the population, businesses and services of the West Gatineau area;
  - H2A: BRT route that is as close as possible to the users on the McConnell—Vanier—Plateau route, in order to meet the project's main objective, which is to serve the population, businesses and services of the western Gatineau area;
  - H2B: Creation of a new BRT scenario focusing on the performance of the northern branch in terms of travel time on the continuous Allumettières route, at the expense of customer proximity, in order to be able to analyze in detail customer response and service accessibility constraints.

Quebec side: The short list was therefore revised, and the following six scenarios will be considered for this stage:

- **Scenario 0 (improved status quo):** An evolving scenario that includes the implementation of planned related projects and service frequency improvements but does not include a higher-order public transit infrastructure. That said, this solution requires a move to very large buses in the future and will require transfers;
- **Scenario B1:** All-bus scenario with a branch on Aylmer/Alexandre-Taché and another serving Le Plateau via Boulevard Saint-Raymond;
- **Scenario T1:** All tramway scenario with a branch on Aylmer/Alexandre-Taché and another serving Le Plateau via Saint-Raymond;
- **Scenario H1:** Hybrid Tramway/BRT scenario that includes a tramway/LRT to the north on the Allumettières—McConnell—Vanier—Plateau—Allumettières—Maisonneuve route and a BRT to the south on the Allumettières—Wilfrid-Lavigne—Aylmer—Lucerne—Laurier route;
- **Scenario H2A:** Hybrid Tramway/LRT scenario that includes a BRT to the north on the Allumettières—McConnell—Vanier—Plateau—Allumettières—Maisonneuve route and a tramway/LRT to the south on the Allumettières—Wilfrid-Lavigne—Aylmer—Lucerne—Laurier route;
- **Scenario H2B:** Hybrid Tramway/LRT scenario that includes a BRT to the north on the Allumettières—Maisonneuve route and a tramway/LRT to the south on the Allumettières—Wilfrid-Lavigne—Aylmer—Lucerne—Laurier route.

Ottawa side: the following two options were retained for this stage (although these were subsequently modified following the supplementary study in Report 3B):

- **At-grade on Wellington Street:** insertion on the north side of the street up to Elgin Street, including a two-way bicycle path and 3 stations;
- **Tunnel under Sparks Street:** underground insertion up to Elgin Street, including three stations.

2.3.1 IMPLEMENTATION MEASURES COMMON TO ALL SCENARIOS

LOCATION OF THE GARAGE

[redacted]

[redacted]

PARK-AND-RIDE LOTS

The implementation of a higher-order service is also intended to attract a greater number of users from outside the city to take public transit, in addition to offering an efficient service to users whose origin or destination is located near the route. If the constraints of some of these users force them to use the car as a means of access, it is a question of accommodating them in such a way as to maximize the attractiveness of the system while minimizing the impact of parking in the residential areas near the stations.

MULTIMODAL HUBS

In order to promote the integration of the various public transit networks, several multimodal hubs are proposed (note that this aspect having evolved slightly, the final version can be consulted in Figure 3-12):

- Allumettières/Eardley Terminus:
- Aylmer Galleries:
- R vermead:
- Vanier:
- Europe:
- P ateau:
- Prince-de-Galles:
- Rapibus/Allumettières:
- Gatineau Downtown:
- ttawa Downtown:

2.3.2 MEASURES TO IMPLEMENT SCENARIO 0

This scenario corresponds to the current situation optimized with the addition of new reserved lanes, the addition of sections of reserved lanes to ensure their continuity, the addition of preferential measures at traffic lights, etc., so as to optimize the performance of the existing network as much as possible, without, however, involving the implementation of a higher-order system.

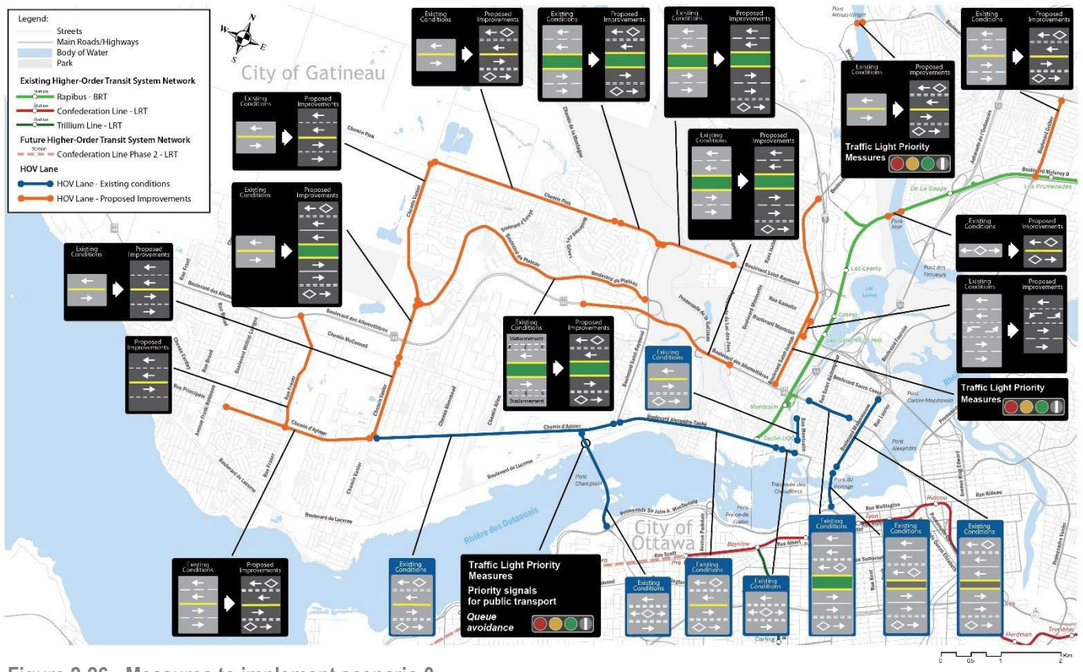


Figure 2-26 Measures to implement scenario 0

The main measures in favour of public transit in Scenario 0 are:

- Chemin d'Aylmer/Rue Principale: Conversion of a lane into a dedicated lane between Chemin Vanier and Boulevard Wilfrid-Lavigne;
- Chemin Vanier Sud: Widening of 4 lanes and addition of a reserved lane on the side per direction, section between Chemin McConnell and Boulevard du Plateau;
- Boulevard du Plateau: Addition of a reserved lane between Chemin Vanier and Boulevard Saint-Raymond by removing the on-street parking;
- Chemin Pink Est: Adding reserved lanes on the side of the road between Chemin Vanier and Chemin de la Montagne by widening the road;
- Chemin Pink Est: Addition of a reserved transit lane between Chemin de la Montagne and Saint-Raymond;
- Boulevard de Lucerne: Eastbound queue jump at Place Samuel de Champlain;
- Boulevard des Allumettières: Addition of a dedicated lane on the eastbound shoulder between Boulevard Saint-Joseph and Promenade du Lac des Fées;
- Boulevard Saint-Raymond: Addition of a dedicated eastbound shoulder lane between the Pink and Cité-des-Jeunes boulevards.

Beyond these physical and operational measures, no other infrastructure or reorganization of the public transit offer is planned.

2.3.3 MEASURES TO IMPLEMENT SCENARIO B1

The main elements of scenario B1 are summarized in the figure below:

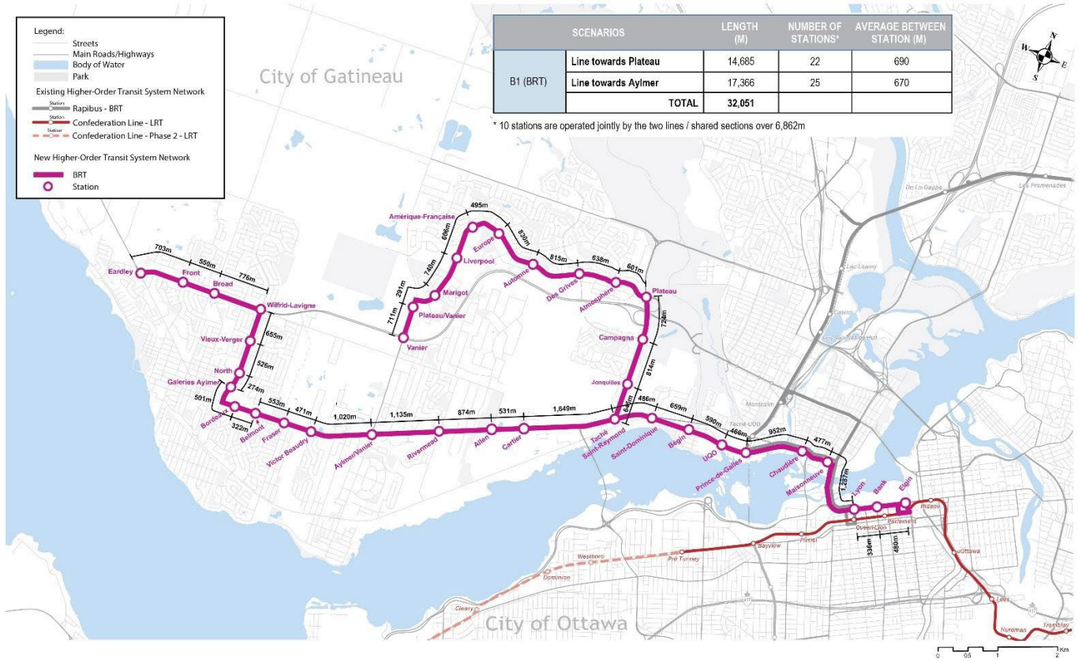


Figure 2-27 Scenario B1 – Route/Stations

ROUTE AND OPERATION

WESTERN HIGHER-ORDER LINK

- BRT on two routes with a shared section:
  - South branch: Allumettières/Wilfrid-Lavigne/Aylmer/Alexandre-Taché;
  - Northern branch: Vanier/Plateau/Saint-Raymond/Alexandre-Taché;
  - Shared section: Alexandre-Taché/Lucerne/Emprise ferroviaire/Laurier/Portage/Wellington/Elgin/Queen/Metcalfe.
- Operated with two separate services:
  - Le Plateau—downtown Gatineau—downtown Ottawa branch;
  - Aylmer—downtown Gatineau—downtown Ottawa branch.
- The higher-order service will be operated with the following frequencies:
  - Peak hours: 2 minutes on each channel, 1 minute on the shared section;
  - Other times: 10 minutes or less on each branch, 5 minutes on the shared section;
  - Start and end of services: 20 minutes on each branch, 10 minutes on the shared section.

RAPIBUS

The following changes to Rapibus services are proposed to harmonize with the BRT:

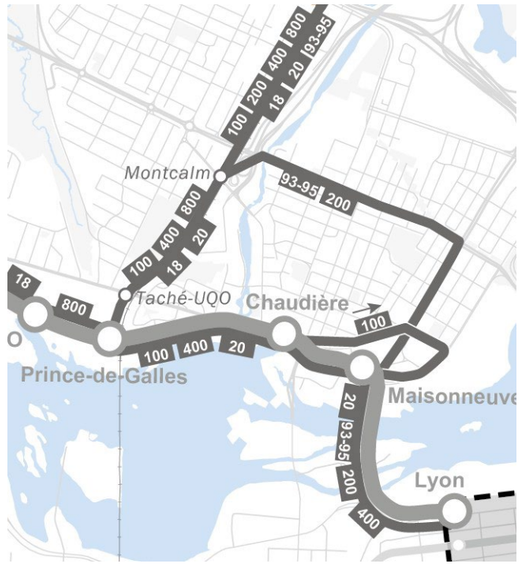
MAP	RAPIBUS ROUTE
	Line 100: Rapibus to Prince of Wales, then BRT corridor. Loop via Portage and Hôtel-de-Ville Line 200: Status quo Line 400: Rapibus to Prince of Wales, then BRT corridor to Ottawa Line 800: Status quo Line 18: Status quo Line 20: Rapibus to Prince of Wales, then BRT corridor to Ottawa Lines 93-95: Status quo

Figure 2-28 Scenario B1 – Proposed Rapibus routes

FEEDER NETWORK

In downtown Ottawa, all buses terminate at Lyon Station, except for the Western BRT, which travels through Wellington to the Elgin Terminal:

- Rapibus routes (200-400, 93 and 95) make the loop via Lyon—Albert—Bay;
- Other routes from Gatineau make the Kent—Queen—Lyon loop.

In order to promote efficient feeder service, multimodal hubs are planned at the following stations, in addition to the possible transfers whenever a local STO line intersects with a BRT station:

- Allumettières/Eardley Terminus;
- Galeries Aylmer;
- Rivermead;
- Vanier;
- Europe;
- Plateau;
- Prince of Wales.

Figure 2-29 Scenario B1 – Reorganization of the STO local network

STATIONS

A total of 37 stations are located along the more than 25 km of BRT infrastructure in Scenario B1, with an average interstation of 680 m. Details by line are shown in the table below.

Table 2-7 Scenario B1 – Average length and interstation of service on the Le Plateau and Aylmer lines

SCENARIOS		LENGTH (m) to operate	LENGTH (m) to build	NUMBER OF STATIONS*	AVERAGE INTERSTATION (M)
B1-(BRT)	Line to Le Plateau	14,685	7,823	22	690
	Line to Aylmer	17,366	17,366	25	670
	TOTAL	**32,051**	**25,189**		

* Ten (10) stations are operated jointly by the two lines / joint route over 6,862 m

TRAFFIC LIGHT INTERSECTIONS

In total, nearly 66 traffic light intersections will be set up along the more than 25 km of the B1 scenario (an average of one junction every 380 m), in order to provide adequate local accessibility while maintaining high performance for the higher-order service.

BICYCLE AND PEDESTRIAN NETWORKS

To accompany the implementation of the higher-order service, numerous measures for pedestrians and cyclists will be implemented in order to facilitate and secure access to the stations and to link the existing networks, in particular the installation of sidewalks on both sides of the corridor, except along the Allumettières route in its western portion. In all, nearly 12 km of sidewalks and 9 km of bicycle paths and lanes will be added along the route of the higher-order service, covering 94% of the project's length.

INSERTION AND IMPLEMENTATION MEASURES

In order to implement a higher-order bus service on the B1 route, the following insertions and implementation measures are recommended. Note that the layouts of Laurier Street, the Portage Bridge and the Ottawa sector were subsequently refined and modified as part of the study optimizations, see sections 2.4.13 and 2.5.1.

Table 2-8 Scenario B1 – Insertion and proposed implementation measures by segment

ROUTE	FROM	TO	INSERTION	IMPLEMENTATION ACTION
South Branch				
Allumettières	Eardley	Wilfrid-Lavigne	central	Installation of "New Jersey" barriers on the two central medians for safety reasons
Wilfrid-Lavigne	Allumettières	Principale	central	Removal of on-street parking
Ch. d'Aylmer /Alexandre-Taché	Wilfrid-Lavigne	Saint-Dominique	central	
North Branch				
Vanier	Allumettières	Plateau	central	
Plateau	Vanier	Saint-Raymond	central	Removal of on-street parking
Saint-Raymond	Plateau	Alexandre-Taché	central	Widening and strengthening of the Allumettières viaduct Construction of a footbridge for active modes of transport parallel to the viaduct
Shared section				
Lucerne	Saint-Dominique	Belleau	on the south side	Removal of on-street parking One-way traffic west of Lucerne
Emprise ferroviaire	Belleau	Montcalm	on its own	Replacement of the railway bridge over Brewery Creek and the Prince of Wales Bridge railway right-of-way
Taché/Laurier	Montcalm	Maisonneuve	on the north side	Removal of one lane per direction Reinforcement of the Place du Portage parking lot slab and closure of the westbound exit
Portage Bridge	Maisonneuve	Wellington	on the east side	Extension of pedestrian tunnels under the roadway (Ottawa)
Wellington	Portage Bridge	Elgin	on the north/central side	Significant traffic reduction/pedestrianization on Wellington
BRT loopback	Elgin—Queen—Metcalfe		on the side	Removal of one lane of traffic/parking
Ottawa Bus Loops				
Loop is in Ottawa	Kent/Queen/Lyon		on the side	Removal of one lane of traffic/parking
West Loop in Ottawa	Lyon/Albert/Bay		on the side	Removal of one lane of traffic/parking

2.3.4 MEASURES TO IMPLEMENT SCENARIO T1

The main elements of scenario T1 are summarized in the figure below.

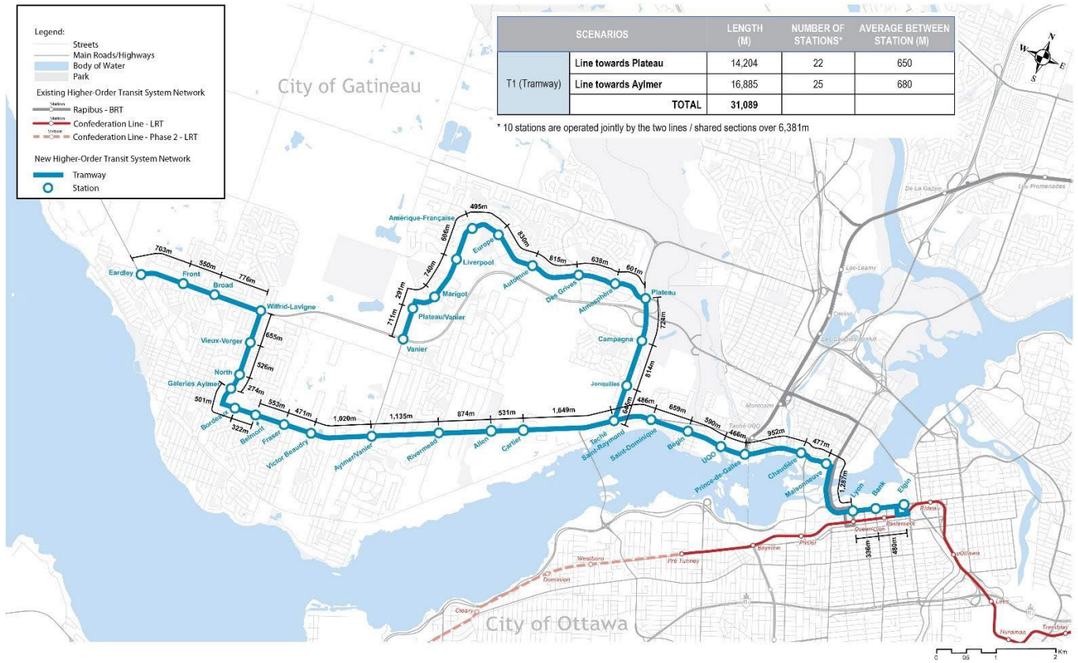


Figure 2-30 Scenario T1 – Route/Stations

ROUTE AND OPERATION

WESTERN HIGHER-ORDER LINK

- Tramway on two routes with a shared section:
  - South branch: Allumettières/Wilfrid-Lavigne/Aylmer/Alexandre-Taché;
  - Northern branch: Vanier/Plateau/Saint-Raymond/Alexandre-Taché;
  - Shared section: Alexandre-Taché/Lucerne/Railroad embassy/Laurier/Portage/Wellington.
- Operated with two separate services:
  - Le Plateau—downtown Gatineau—downtown Ottawa branch;
  - Aylmer—downtown Gatineau—downtown Ottawa branch.
- The higher-order service will be operated with the following frequencies:
  - Peak hours: 6 minutes on each channel, 3 minutes on the shared section;
  - Other times: 10 minutes on each channel, 5 minutes on the shared section;
  - Start and end of services: 10 minutes on each channel, 5 minutes on the shared section.

RAPIBUS

The following changes to Rapibus services are proposed to harmonize with the tramway:

MAP	RAPIBUS ROUTES
 Figure 2-31 Scenario T1 – Proposed Rapibus routes	Line 100: Status quo Line 200: Status quo Line 400: Must go through Wellington instead of Taché to avoid Chaudière station Line 800: Must finish at Prince of Wales Line 18: Must finish at Prince of Wales instead of Tunney's Pasture Line 20: Status quo Line 93-95: Status quo

FEEDER NETWORK

In downtown Ottawa, all buses terminate at Lyon station:

- Rapibus routes (200-400, 93 and 95) make the loop via Lyon—Albert—Bay;
- Other routes from Gatineau make the Kent—Queen—Lyon loop.

In order to promote efficient feeder service, multimodal hubs are planned at the following stations, in addition to the possible transfers whenever a local STO line intersects with a BRT station:

- Allumettières/Eardley Terminus;
- Aylmer Galleries;
- Rivermead;
- Vanier;
- Europe;
- Plateau;
- Prince of Wales.

Figure 2-32 Scenario T1 – Reorganization of the STO local network

STATIONS

A total of 37 stations are located along the more than 24 km of tramway infrastructure of scenario T1, with an average interstation of 670 m. Details by line are shown in the table below.

Table 2-9 Scenario T1 – Average length and interstation of service on the Le Plateau and Aylmer lines

SCENARIOS		LENGTH (m) to operate	LENGTH (m) to build	NUMBER OF STATIONS*	AVERAGE INTERSTATION (M)
T1- (LRT)	Line to Le Plateau	14,204	7,823	22	650
	Line to Aylmer	16,885	16,885	25	680
	TOTAL	**31,089**	**24,708**		

* Ten (10) stations are operated jointly by the two lines / joint route over 6,381 m

TRAFFIC LIGHT INTERSECTIONS

In all, nearly 66 traffic light intersections will be set up along the more than 24 km of the T1 scenario (an average of one junction every 375 m), in order to provide adequate local accessibility while maintaining high performance for the higher-order service.

BICYCLE AND PEDESTRIAN NETWORKS

To accompany the implementation of the higher-order service, numerous measures for pedestrians and cyclists will be implemented in order to facilitate and secure access to the stations and to link the existing networks, in particular the installation of sidewalks on both sides of the corridor, except along the Allumettières route in its western portion. In all, nearly 12 km of sidewalks and 9 km of bicycle paths and lanes will be added along the route of the higher-order service, covering 94% of the project's length.

INSERTION AND IMPLEMENTATION MEASURES

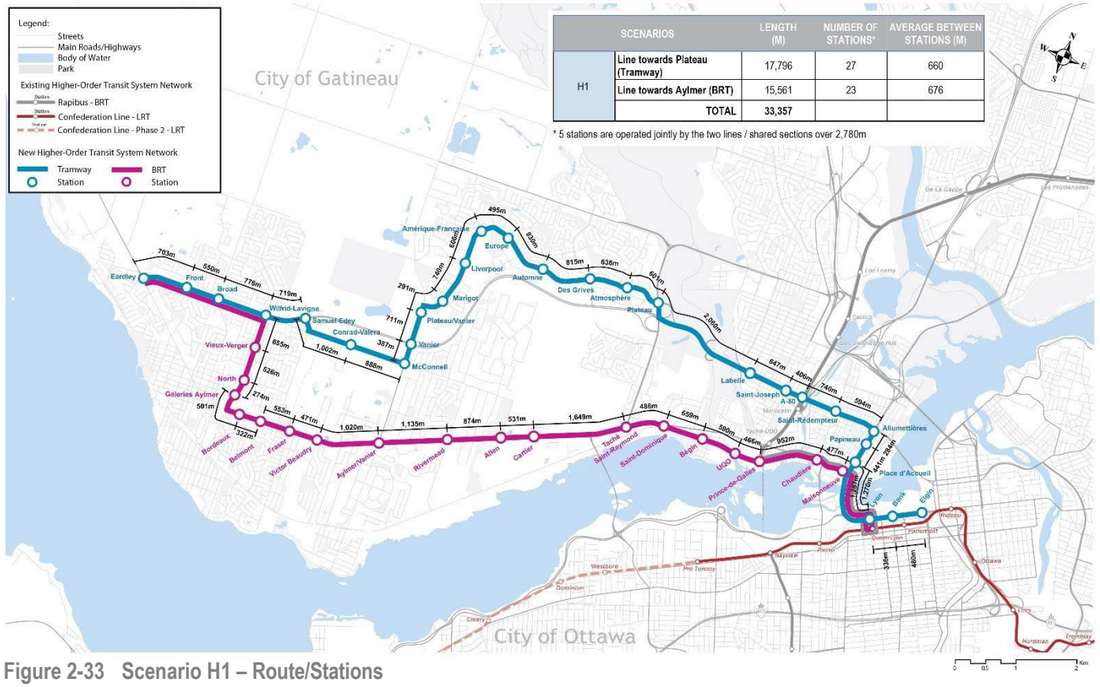
In order to implement a higher-order service operated by tramway on the T1 scenario route, the following insertions and implementation measures are recommended. Note that the layouts of Laurier Street, the Portage Bridge and the Ottawa sector were subsequently refined and modified as part of the study optimizations, see sections 2.4.13 and 2.5.1.

Table 2-10 Scenario T1 – Insertion and proposed implementation measures by segment

ROUTE	FROM	TO	INSERTION	IMPLEMENTATION ACTION
South Branch				
Allumettières	Eardley	Wilfrid-Lavigne	central	Installation of "New Jersey" barriers on the two central medians for safety reasons
Wilfrid-Lavigne	Allumettières	Principale	central	Removal of on-street parking
Ch. d'Aylmer/Alexandre-Taché	Wilfrid-Lavigne	Saint-Dominique	central	
North Branch				
Vanier	Allumettières	Plateau	central	
Plateau	Vanier	Saint-Raymond	central	Removal of on-street parking
Saint-Raymond	Plateau	Alexandre-Taché	central	Widening and strengthening of the Allumettières viaduct Construction of a footbridge for active modes of transport parallel to the viaduct
Shared section				
Lucerne	Saint-Dominique	Belleau	on the south side	Removal of on-street parking One-way traffic west of Lucerne
Emprise ferroviaire	Belleau	Montcalm	on its own with a lateral platform	Replacement of the railway bridge over Brewery Creek and the Prince of Wales Bridge railway right-of-way
Taché/Laurier	Montcalm	Maisonneuve	on the north side	Removal of one lane per direction Reinforcement of the Place du Portage parking lot slab and closure of the westbound exit
Portage Bridge	Maisonneuve	Wellington	on the east side	Reconstruction of Portage Bridge and other associated structures to support tramway loads Extension of pedestrian tunnels under the roadway (Ottawa)
Wellington	Portage Bridge	Elgin	on the north/central side	Significant traffic reduction/pedestrianization on Wellington
Ottawa Bus Loops				
Loop is in Ottawa	Kent/Queen/Lyon		on the side	Removal of one lane of traffic/parking
West Loop in Ottawa	Lyon/Albert/Bay		on the side	Removal of one lane of traffic/parking

2.3.5 MEASURES TO IMPLEMENT SCENARIO H1

The main elements of the H1 scenario are summarized in the figure below.



SCENARIOS		LENGTH (M)	NUMBER OF STATIONS*	AVERAGE BETWEEN STATIONS (M)
H1	Line towards Plateau (Tramway)	17,796	27	660
	Line towards Aylmer (BRT)	15,561	23	676
	TOTAL	33,357		

* 5 stations are operated jointly by the two lines / shared sections over 2,780m

Figure 2-33 Scenario H1 – Route/Stations

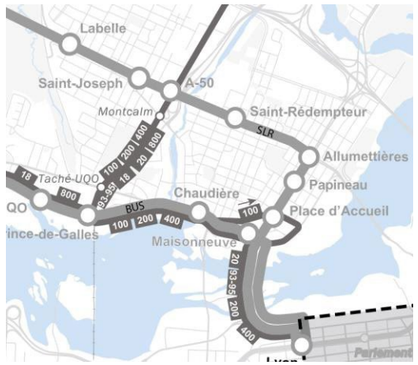
ROUTE AND OPERATION

WESTERN HIGHER-ORDER LINK

- BRT on Allumettières/Wilfrid-Lavigne/Aylmer/Alexandre-Taché/Lucerne/rail right-of-way/Laurier/Portage/Wellington/Lyon/ Albert /Bay route;
- Tramway on the Allumettières/Samuel-Edey/McConnell/Vanier/Plateau/Allumettières/Maisonneuve/Portage/Wellington route;
- Operated with two separate services:
  - Tramway route: Aylmer—Le Plateau—downtown Gatineau—downtown Ottawa;
  - BRT route: Aylmer—downtown Gatineau—downtown Ottawa;
  - Joint operation on the section:
    - Allumettières (between Eardley and Wilfrid-Lavigne) with 4 shared stations;
    - Portage—Wellington (between Laurier and Lyon) with 1 shared station.
- The higher-order service will be operated with the following frequencies:
  - Peak hours:
    - BRT: 2 minutes;
    - Tramway: 6 minutes.
  - Other times: BRT and tramway: 10 minutes;
  - Start to finish services, BRT and tramway: 10 minutes.

RAPIBUS

The following changes to Rapibus services are proposed to harmonize with the BRT:

MAP	ANALYSIS
 Figure 2-34 Scenario H1 – Proposed Rapibus Routes	Line 100: Rapibus to Prince of Wales, then BRT corridor. Loop via Portage and Hôtel-de-Ville Line 200: Rapibus to Prince of Wales, then BRT corridor to Ottawa Line 400: Rapibus to Prince of Wales, then BRT corridor to Ottawa Line 800: Status quo Line 18: Status quo Line 20: Rapibus to Prince of Wales, then BRT corridor to Ottawa Line 93-95: Rapibus to Prince of Wales, then BRT corridor to Ottawa

FEEDER NETWORK

In downtown Ottawa, all buses terminate at Lyon Station, including the western BRT:

- BRT West and Rapibus routes (200-400, 93 and 95) make the loop via Lyon—Albert—Bay;
- Other routes from Gatineau make the Kent—Queen—Lyon loop.

In order to promote efficient feeder service, multimodal hubs are planned at the following stations, in addition to the possible transfers whenever a local STO line intersects with a BRT station:

- Allumettières/Eardley Terminus;
- Aylmer Galleries;
- Rivermead;
- Vanier;
- Europe;
- Plateau;
- Prince of Wales;
- Rapibus/Allumettières.

Figure 2-35 Scenario H1 – Reorganization of the STO local network

STATIONS

In all, 45 stations will be located along the more than 30 km of BRT and tramway infrastructure in Scenario H1, for an average interstation of 650 m. It should be noted that, given the two modes, stations currently planned as combined stations may have to be separated for operational reasons. Details by line are shown in the table below

Table 2-11 Scenario H1 – Average length and interstation of service on the Le Plateau and Aylmer lines

SCENARIOS		LENGTH (m) to operate	LENGTH (m) to build	NUMBER OF STATIONS*	AVERAGE INTERSTATION (M)
H1	Line to Le Plateau	17,796	17,796	27	660
	Line to Aylmer	15,561	12,781	23	676
	TOTAL	**33,357**	**30,577**		

* Five (5) stations are operated jointly by the two lines / joint route over 2,780 m

TRAFFIC LIGHT INTERSECTIONS

In all, nearly 81 traffic light intersections will be set up along more than 30 km of the H1 scenario route (an average of one intersection every 375 m), in order to provide adequate local accessibility and ensure high performance for the higher-order service.

BICYCLE AND PEDESTRIAN NETWORKS

To accompany the implementation of the higher-order service, numerous measures for pedestrians and cyclists will be implemented in order to facilitate and secure access to the stations and to link the existing networks, in particular the installation of sidewalks on both sides of the corridor, except along the Allumettières route in its western portion. In all, nearly 17 km of sidewalks and 11 km of bicycle paths and lanes will be added along the route of the higher-order service, covering 87% of the project's length.

INSERTION AND IMPLEMENTATION MEASURES

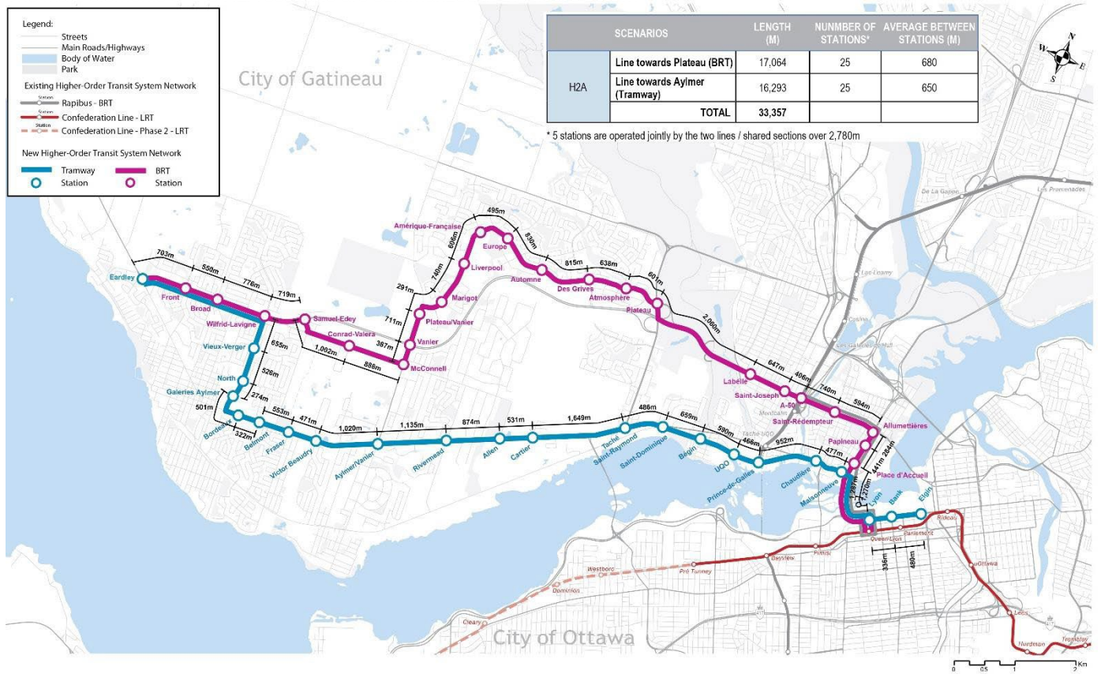
In order to implement a higher-order service on the H1 scenario route, the following insertions and measures are recommended. Note that the layouts of Laurier Street, the Portage Bridge and the Ottawa sector were subsequently refined and modified as part of the study optimizations, see sections 2.4.13 and 2.5.1.

Table 2-12 Scenario H1 – Insertion and proposed implementation measures by segment

ROUTE	FROM	TO	INSERTION	IMPLEMENTATION ACTION
North Branch Tramway				
Allumettières	Eardley	Samuel-Edey	central	Safety: Installation of "New Jersey" barriers on the two central medians
Samuel-Edey	Allumettières	McConnell	central	Widening of the street to 4 lanes and realignment with the new Fraser route
Wilfrid-Lavigne	Allumettières	Principale	central	Removal of on-street parking
Vanier	McConnell	Plateau	central	Widening of the street to 4 lanes
Plateau	Vanier	Saint-Raymond	central	Removal of on-street parking
Allumettières	Saint-Raymond	Maisonneuve	central	New access viaduct to Allumettières Reinforcement of the Lac-des-Fées overpass New bicycle path at the Lac-des-Fées overpass New Rapibus/Tramway interchange station with widening of the viaduct and vertical circulation
Maisonneuve	Allumettières	Laurier	central	New vertical circulation between the tram station and the pedestrian paths of the office buildings Reinforcement of the Place du Portage and Palais des Congrès parking slab
Portage Bridge	Maisonneuve	Wellington	east side	Reconstruction of Portage Bridge Extension of pedestrian tunnels under the roadway (Ottawa)
Wellington	Portage Bridge	Elgin	north side	Significant reduction in traffic on Wellington
BRT South Branch				
Allumettières	Eardley	Wilfrid-Lavigne	central	Uses tramway infrastructure
Wilfrid-Lavigne	Allumettières	Principale	central	Removal of on-street parking
Ch. d'Aylmer/A.-Taché	Wilfrid-Lavigne	Saint-Dominique	central	
Lucerne	Saint-Dominique	Belleau	south side	Removal of on-street parking One-way traffic west of Lucerne
Emprise ferroviaire	Belleau	Montcalm	clean site	Replacement of the railway bridge over Brewery Creek and the Prince of Wales Bridge railway right-of-way
Taché/Laurier	Montcalm	Maisonneuve	north side	Removal of one lane per direction Reinforcement of the Place du Portage parking lot slab and closure of the westbound exit
Portage Bridge	Maisonneuve	Wellington	east side	Uses tramway infrastructure
Wellington	Portage Bridge	Lyon	north side	Uses tramway infrastructure
Loop in Ottawa	Lyon/Albert/Bay		side	Removal of a traffic lane
Ottawa Bus Loops				
Loop in Ottawa	Kent/Queen/Lyon		on the side	Removal of a traffic lane

2.3.6 MEASURES TO IMPLEMENT SCENARIO H2A

The main elements of the H2A scenario are summarized in the figure below:



	SCENARIOS	LENGTH (M)	NUNMBER OF STATIONS*	AVERAGE BETWEEN STATIONS (M)
H2A	Line towards Plateau (BRT)	17,064	25	680
	Line towards Aylmer (Tramway)	16,293	25	650
	TOTAL	33,357		

* 5 stations are operated jointly by the two lines / shared sections over 2,780m

Figure 2-36 Scenario H2A – Route/Stations

ROUTE AND OPERATION

WESTERN HIGHER-ORDER LINK

- Tramway on the Allumettières/Wilfrid-Lavigne/Aylmer/Alexandre-Taché/Lucerne/ rail right-of-way /Laurier/Portage/Wellington route;
- BRT on the Allumettières/Samuel-Edey/McConnell/Vanier/Plateau/Allumettières/Maisonneuve/Portage/Wellington/Lyon/Albert/Bay route;
- Operated with two separate services:
  - BRT route: Aylmer—Le Plateau—downtown Gatineau—downtown Ottawa;
  - Tramway route: Aylmer—downtown Gatineau—downtown Ottawa;
  - Joint operation on the section:
    - Allumettières (between Eardley and Wilfrid-Lavigne) with 4 shared stations;
    - Portage—Wellington (between Laurier and Lyon) with 1 shared station.
- The higher-order service will be operated with the following frequencies:
  - Peak hours:
    - BRT: 2 minutes;
    - Tramway: 6 minutes.
  - Other times: BRT and tramway: 10 minutes;
  - Start to finish services, BRT and tramway: 10 minutes.

RAPIBUS

The following changes to Rapibus services are proposed to harmonize with the BRT:

MAP	RAPIBUS ROUTES
 Figure 2-37 Scenario H2A – Proposed Rapibus Routes	Line 100: Status quo Line 200: Status quo Line 400: Must go through Wellington instead of Taché to avoid Chaudière station Line 800: Must finish at Prince of Wales Line 18: Must finish at Prince of Wales instead of Tunney's Pasture Line 20: Status quo Lines 93-95: Status quo

FEEDER NETWORK

In downtown Ottawa, all buses terminate at Lyon Station, including the Western BRT:

- Western BRT and Rapibus routes (200-400, 93 and 95) make the loop via Lyon—Albert—Bay;
- Other routes from Gatineau make the Kent—Queen—Lyon loop.

In order to promote efficient feeder service, multimodal hubs are planned at the following stations, in addition to the possible transfers whenever a local STO line intersects with a BRT station:

- Allumettières/Eardley Terminus;
- Aylmer Galleries;
- Rivermead;
- Vanier;
- Europe;
- Plateau;
- Prince of Wales;
- Rapibus/Allumettières.

Figure 2-38 Scenario H2A – Reorganization of the STO local network

STATIONS

In all, 45 stations will be built along the more than 30 km of BRT infrastructure in scenario H2A, for an average interstation of 650 m. It should be noted that, given the two modes, stations currently planned as joint stations may have to be divided for operational reasons. Details by line are shown in the table below.

Table 2-13 Scenario H2A – Average length and interstation of services on the Le Plateau and Aylmer lines.

SCENARIOS		LENGTH (m) to operate	LENGTH (m) to build	NUMBER OF STATIONS*	AVERAGE INTERSTATION (M)
H2A	Line to Le Plateau	17,064	14,284	25	680
	Line to Aylmer	16,293	16,293	25	650
	TOTAL	**33,357**	**30,577**		

* Five (5) stations are operated jointly by the two lines / joint route over 2,780 m

TRAFFIC LIGHT INTERSECTIONS

In total, nearly 81 traffic light intersections will be set up along more than 30 km of the H2A scenario route (an average of one junction every 375 m), in order to provide adequate local accessibility and high performance for the network.

BICYCLE AND PEDESTRIAN NETWORKS

To accompany the implementation of the higher-order service, numerous measures for pedestrians and cyclists will be implemented in order to facilitate and secure access to the stations and to link the existing networks, in particular the installation of sidewalks on both sides of the corridor, except along the Allumettières route in its western portion. In all, nearly 17 km of sidewalks and 11 km of bicycle paths and lanes will be added along the route of the higher-order service, covering 87% of the project's length.

INSERTION AND IMPLEMENTATION MEASURES

In order to implement a higher-order service on the H1 scenario route, the following insertions and measures are recommended. Note that the layouts of Laurier Street, the Portage Bridge and the Ottawa sector were subsequently refined and modified as part of the study optimizations, see sections 2.4.13 and 2.5.1.

Table 2-14 Scenario H2A – Insertion and proposed implementation measures by segment

ROUTE	FROM	TO	INSERTION	IMPLEMENTATION ACTION
BRT North Branch				
Allumettières	Eardley	Samuel-Edey	central	Uses tramway infrastructure
Samuel-Edey	Allumettières	McConnell	central	Widening of the street to 4 lanes and realignment with the new Fraser route
Wilfrid-Lavigne	Allumettières	Principale	central	Removal of on-street parking
Vanier	McConnell	Plateau	central	Widening of the street to 4 lanes
Plateau	Vanier	Saint-Raymond	central	Removal of on-street parking
Allumettières	Saint-Raymond	Maisonneuve	central	New access viaduct to Allumettières Reinforcement of the Lac-des-Fées overpass New bicycle path at the Lac-des-Fées overpass New Rapibus/Tramway interchange station with widening of the viaduct and vertical circulation
Maisonneuve	Allumettières	Laurier	central	Reinforcement of the Place du Portage and Palais des Congrès parking slab
Portage Bridge	Maisonneuve	Wellington	on the east side	Uses tramway infrastructure
Wellington	Portage Bridge	Elgin	on the north side	Uses tramway infrastructure
Loop in Ottawa	Lyon/Albert/Bay		on the side	Removal of a traffic lane
South branch Tramway				
Allumettières	Eardley	Wilfrid-Lavigne	central	Concrete barrier to be provided on two central platforms for security reasons.
Wilfrid-Lavigne	Allumettières	Principale	central	Removal of on-street parking
Ch. d'Aylmer/ Alexandre-Taché	Wilfrid-Lavigne	Saint-Dominique	central	
Lucerne	Saint-Dominique	Belleau	on the south side	Removal of on-street parking One-way traffic west of Lucerne
Emprise ferroviaire	Belleau	Montcalm	on its own and on a side platform	Replacement of the railway bridge over Brewery Creek and the Prince of Wales Bridge railway right-of-way
Taché/Laurier	Montcalm	Maisonneuve	on the north side	Removal of one lane per direction Reinforcement of the Place du Portage parking lot slab and closure of the westbound exit
Portage Bridge	Maisonneuve	Wellington	on the east side	Reconstruction of Portage Bridge Extension of pedestrian tunnels under the road (Ottawa)
Wellington	Portage Bridge	Elgin	on the north side	Significant traffic reduction
Ottawa Bus Loops				
Loop in Ottawa	Kent/Queen/Lyon		on the side	Removal of a traffic lane

2.3.7 MEASURES TO IMPLEMENT SCENARIO H2B

The main elements of the H2B scenario are summarized in the figure below:

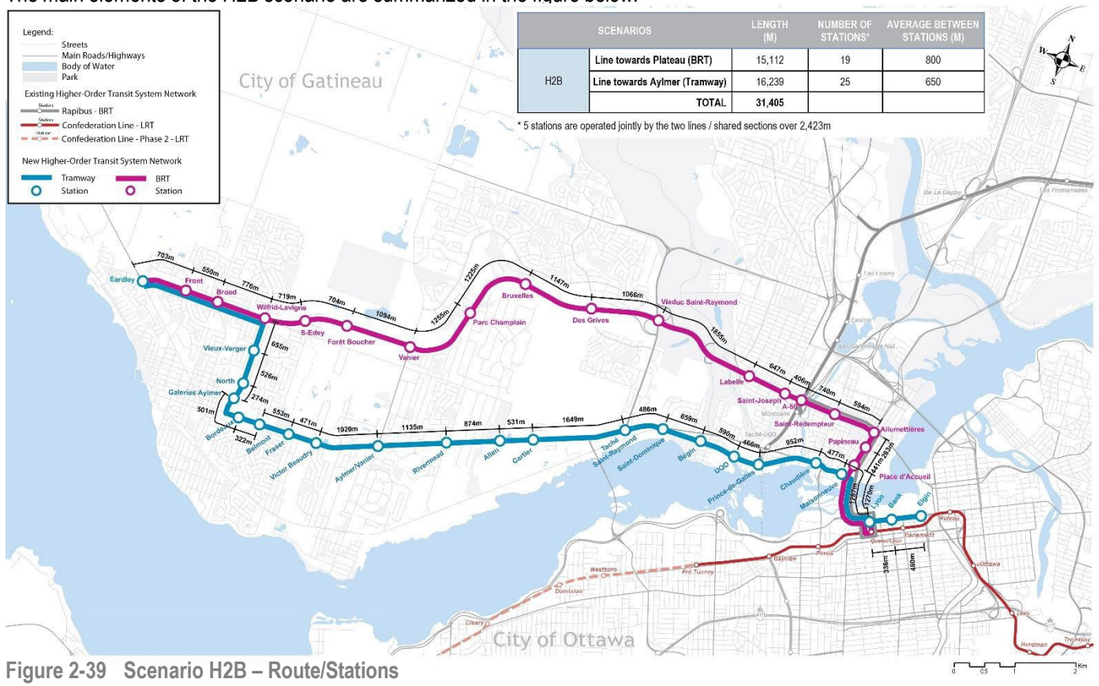


Figure 2-39 Scenario H2B – Route/Stations

ROUTE AND OPERATION

WESTERN HIGHER-ORDER LINK

- Tramway on the Allumettières/Wilfrid-Lavigne/Aylmer/Alexandre-Taché/Lucerne/rail right-of way /Laurier/Portage/Wellington route;
- BRT on the Allumettières/Maisonneuve/Portage/Wellington/Lyon/Albert/Bay route;
- Operated with two separate services:
  - BRT route: Aylmer—Le Plateau—downtown Gatineau—downtown Ottawa;
  - Tramway route: Aylmer—downtown Gatineau—downtown Ottawa;
  - Joint operation on the section:
    - Allumettières (between Eardley and Wilfrid-Lavigne) with 4 shared stations;
    - Portage— Wellington (between Laurier and Lyon) with 1 shared station.
- The higher-order service will be operated with the following frequencies:
  - Peak hours:
    - BRT: 2 minutes;
    - Tramway: 6 minutes.
  - Other times: BRT and tramway: 10 minutes;
  - Start to finish services, BRT and tramway: 10 minutes.

RAPIBUS

The following changes to Rapibus services are proposed to harmonize with the BRT:

MAP	ANALYSIS
 Figure 2-40 Scenario H2B – Proposed Rapibus Routes	Line 100: Status quo Line 200: Status quo Line 400: Must go through Wellington instead of Taché to avoid Chaudière station Line 800: Must finish at Prince of Wales Line 18: Must finish at Prince of Wales instead of Tunney's Pasture Line 20: Status quo Line 93-95: Status quo

FEEDER NETWORK

In downtown Ottawa, all buses terminate at Lyon Station, including the Western BRT:

- Western BRT and Rapibus routes (200-400, 93 and 95) make the loop via Lyon—Albert—Bay;
- Other routes from Gatineau make the Kent—Queen—Lyon loop.

In order to promote efficient feeder service, multimodal hubs are planned at the following stations, in addition to the possible transfers whenever a local STO line intersects with a BRT station:

- Allumettières/Eardley Terminus;
- Aylmer Galleries;
- Rivermead;
- Vanier;
- Europe;
- Plateau;
- Prince of Wales;
- Rapibus/Allumettières.

Figure 2-41 Scenario H2B – Reorganization of the STO Local Network

STATIONS

In all, 39 stations will be located along the nearly 29 km of BRT and tramway infrastructure in scenario H2B, for an average interstation of 710 m. It should be noted that, given the two modes, stations currently planned as combined stations may have to be separated for operational reasons. Details by line are shown in the table below.

Table 2-15 Scenario H2B – Average length and interstation of service on the Le Plateau and Aylmer lines.

SCENARIOS		LENGTH (m) to operate	LENGTH (m) to build	NUMBER OF STATIONS*	AVERAGE INTERSTATION (M)
H2B	Line to Le Plateau	15,112	12,689	19	800
	Line to Aylmer	16,239	16,293	25	650
	TOTAL	**31,405**	**28,982**		

* Five (5) stations are operated jointly by the two lines / joint route over 2,423 m

TRAFFIC LIGHT INTERSECTIONS

In all, nearly 58 traffic light intersections will be set up along almost 29 km of the H2B scenario route (an average of one intersection every 500 m), in order to provide adequate local accessibility while maintaining high performance for the higher-order service.

BICYCLE AND PEDESTRIAN NETWORKS

To accompany the implementation of the higher-order service, numerous measures for pedestrians and cyclists will be implemented in order to facilitate and secure access to the stations and to link the existing networks, in particular the installation of sidewalks on both sides of the corridor, except along the Allumettières route in its western portion. In all, nearly 12 km of sidewalks and 8 km of bicycle paths and lanes will be added along the route of the higher-order service, covering 78% of the project's length.

INSERTION AND IMPLEMENTATION MEASURES

In order to implement a higher-order service operated by tramway on the H1 scenario route, the following insertions and implementation measures are recommended. Note that the layouts of Laurier Street, the Portage Bridge and the Ottawa sector were subsequently refined and modified as part of the study optimizations, see sections 2.4.13 and 2.5.1.

Table 2-16 Scenario H2B – Insertion and proposed implementation measures by segment

ROUTE	FROM	TO	INSERTION	IMPLEMENTATION ACTION
BRT North Branch				
Allumettières	Eardley	Maisonneuve	Central	Installation of "New Jersey" barriers on the two medians for safety reasons between Eardley and the Lac-des-Fées viaduct Development of three stations with level walkways (forêt Boucher, parc Champlain, Bruxelles) Construction of a footbridge for active modes of transportation parallel to the Lac-des-Fées overpass Construction of a Rapibus—BRT interchange station with widening of the Rapibus viaduct and installation of vertical walkways between the platforms
Maisonneuve	Allumettières	Laurier	central	
Portage Bridge	Maisonneuve	Wellington	on the east side	Uses tramway infrastructure
Wellington	Portage Bridge	Elgin	north/central sides	Uses tramway infrastructure
Loop in Ottawa	Lyon/Albert/Bay		on the side	Removal of a traffic lane
South branch Tramway				
Allumettières	Eardley	Wilfrid-Lavigne	central	Concrete barrier to be provide on two central platforms for security reasons.
Wilfrid-Lavigne	Allumettières	Principale	central	Removal of on-street parking
Ch. d'Aylmer/A-Taché	Wilfrid-Lavigne	Saint-Dominique	central	
Lucerne	Saint-Dominique	Belleau	on the south side	Removal of on-street parking One-way traffic west of Lucerne
Emprise ferroviaire	Belleau	Montcalm	on its own with a lateral platform	Replacement of the railway bridge over Brewery Creek and the Prince of Wales Bridge railway right-of-way
Taché/Laurier	Montcalm	Maisonneuve	on the north side	Removal of one lane per direction Reinforcement of the Place du Portage parking lot slab and closure of the westbound exit
Portage Bridge	Maisonneuve	Wellington	on the east side	Reconstruction of Portage Bridge and other associated structures to support tramway loads Extension of pedestrian tunnels under the roadway (Ottawa)
Wellington	Portage Bridge	Elgin	on the north/central side	Significant traffic reduction/pedestrianization on Wellington
Ottawa Bus Loops				
Loop in Ottawa	Kent/Queen/Lyon		on the side	Removal of a traffic or parking lane

2.3.8 CAPITAL COSTS

A class D estimate (-20 / + 100%) was carried out for each of the scenarios, considering the most realistic quantities, unit costs and percentages. However, since this estimate was subsequently revised and modified according to the progress of the study, the reader is therefore invited to directly consult the final information in section 2.5.6 and section 3.15.

The following key comments can be made following a preliminary analysis of the overall costs of the scenarios and their breakdown by homogeneous items:

- The cost of network deviations is very high, as it assumes that the networks along the BRT/Tramway will be diverted and buried and that there is a great deal of uncertainty regarding the presence of these networks, their precise location and condition and therefore the cost of relocating them;
- The cost of the structures is very high, as many reconstructions of structures have been planned, and this is conservative given the preliminary level of analysis in this study. For example, in cases where widening was required or where the additional loads associated with the passage of the tramway seemed technically difficult to manage by reinforcing the existing structures.
- For all of the scenarios, the cost of land acquisition is relatively low for a project of this magnitude, reflecting the efforts made during the integration exercise to limit impacts on adjacent properties. However, because of the use of the value recorded on the assessment roll (the only data officially available at this stage of the study), the costs will be re-evaluated upwards, since the market value of the land is higher than the value recorded on the roll (see step 4);
- For the same length of track, the installation of a tramway makes the project considerably more expensive, in the order of 50% for the all-tramway T1 scenario compared to the all-bus B1 scenario;
- The implementation of a tramway on the Allumettières/Maisonneuve corridor generates significant additional costs related to the engineering structures and the Rapibus/Allumettières multimodal hub;
- The long hybrid scenarios (H1 and H2A) are more expensive than the all tramway T1 scenario, in the order of 5% to 8%;
- The short hybrid H2B scenario reduces the average linear cost by using the Allumettières route for the most part, which requires less underground infrastructure work;
- Depending on the precision level of the present estimate, apart from B1, which stands out, the other scenarios are too close for the cost estimate to be discriminating;
- Given the size of the project and certain unknowns, the value considered for risks (10%) and contingencies (25%) will be reassessed upwards (see step 4)

2.3.9 MAINTENANCE COSTS

Note that this aspect was dealt with later in the study, see section 2.5.7.

2.3.10 OPERATING COSTS

Note that this aspect was dealt with later in the study, see section 2.5.7.

The operating costs are evaluated for 2031 on the basis of the estimated annual service hours for the various lines and the size of the rolling stock fleet, as well as the hourly rates for the various operating and maintenance items:

- Driving costs (drivers);
- Vehicle maintenance costs (parts, labour and administration);
- Energy/fuel costs.

The table below summarizes the operating costs for all the scenarios studied.

Table 2-17 Annual operating costs

	SCENARIOS					
	SC 0	B1	T1	H1	H2A	H2B
Total annual operating costs	$35.151 million	$36.205 million	$34.492 million	$34.537 million	$35.342 million	$34.080 million
Difference with scenario 0	-	+3.0%	-1.9%	-1.7%	+0.5%	-3.0%

The operating costs of Scenario 0 are assessed based on current operating costs weighted by a projection factor corresponding to the average increase in vehicle hours.

- The scenarios studied have relatively similar operating costs (6% difference between the cheapest and the most expensive scenario);
- Scenario H2B has the lowest operating costs: $34.1 million per year;
- Scenario B1 has the highest operating costs of $36.2 million/year (mainly due to the very high number of hours produced to ensure the frequency of both BRTs at 2 minutes during peak periods). This scenario has an extra annual operating cost of:
  - nearly $863,000/year compared to the H2A scenario (the second most expensive scenario);
  - $1.7 million/year compared to T1 and H1 (the fourth and third most expensive scenarios, respectively);
  - more than $2.1 million/year compared to H2B (the least expensive scenario).
- Scenarios T1 and H1 have similar operating costs, in the order of $34.5 million/year.

Given that more passengers are transported, all of the scenarios for implementing a higher-order mode (B1, T1, H1, H2A and H2B) have a lower cost per user than scenario 0.

2.3.11 RISKS ACCORDING TO THE SCENARIOS CONSIDERED

An initial risk analysis was carried out for the overall project and for each of the scenarios, including a workshop with all the partners.

At this stage, the risk analysis has not detected any major variations in the risks of the global scenarios under study on the Gatineau side since the risks identified are not of a specific nature to the scenarios, but rather of a specific nature. general nature typically applying to infrastructure projects.

However, as this risk analysis was subsequently improved according to the progress of the study, the reader is therefore invited to directly consult the final information in section 2.5.5 for greater clarity.

2.3.12 IMPACTS AND PERFORMANCE OF THE SCENARIOS STUDIED

The table on the following page summarizes the impacts and performance of each scenario according to the various evaluation criteria identified.

Overall assessment of B1

The scenario performs well in terms of the number of trips attracted by sustainable modes, but the main issue for the scenario is the lack of long-term capacity for the post-2031 horizon. The very large number of buses required at key network points could penalize the reliability of the bus operation and exceed the thresholds of the May 2017 Memorandum of Understanding aimed at reducing STO bus ridership in downtown Ottawa.

Overall assessment of T1

The scenario stands out for its average performance in terms of the number of trips attracted by sustainable modes, and this alternative has significant potential to capture the growth in demand for the post-2031 horizon. The number of trips attracted is lower because of the imperfect connection with the Rapibus; it should be noted that this element could be optimized by increasing the frequency of Rapibus trips between the Montcalm and UQO-Taché/Prince-de-Galles stations.

Overall assessment of H1

The scenario stands out for its high performance in terms of the number of trips attracted by sustainable modes, and this alternative has significant potential to capture the growth in demand for the post-2031 horizon, but it depends almost entirely on the tramway mode. The number of trips attracted is significant, given the optimal connection with the Rapibus. However, the main problem is that the tramway mode is placed on the route with the lowest demand (Allumettières/Plateau) instead of on Chemin d'Aylmer and Rapibus, which have much higher demand. However, this scenario demonstrates the benefit of a better link between the Rapibus and the western higher-order mode. The more limited residual capacity of the BRT portion could theoretically be resolved by converting this route to light rail in order to adapt to changing clientele and needs. However, according to the examples of several past projects, this potential for conversion has been difficult to achieve because of implementation difficulties (how to maintain the higher-order service already in service with construction work sometimes taking more than one or two years).

General assessment of H2A

The scenario stands out for its high performance in terms of the number of trips attracted by sustainable modes, but this alternative has limited potential to capture the growth in demand for the post-2031 horizon, which must be met by the tramway mode. The connection with the Rapibus is not optimal, but this could be remedied by increasing the frequency of Rapibus trips between the Montcalm and UQO-Taché/Prince-de-Galles stations. The more limited residual capacity of the BRT portion could theoretically be resolved by converting this route to light rail in order to adapt to changing clientele and needs. However, according to the examples of several past projects, this potential for conversion has been difficult to achieve because of implementation difficulties (how to maintain the higher-order service already in service with construction work sometimes taking more than one or two years).

General assessment of H2B

The scenario stands out for its low performance in terms of the number of trips attracted by sustainable modes. The lower performance of this scenario demonstrates the added value of the proximity service offered by the Boulevard du Plateau crossing, even though there are benefits for people living in northwest Aylmer. The connection with the Rapibus is not optimal, but this could be remedied by increasing the frequency of Rapibus trips between the Montcalm and UQO-Taché/Prince-de-Galles stations. The more limited residual capacity of the BRT portion could theoretically be resolved by converting this route to light rail in order to adapt to changing clientele and needs. However, according to the examples of several past projects, this potential for conversion has been difficult to achieve because of implementation difficulties (how to maintain the higher-order service already in service with construction work sometimes taking more than one or two years).

Table 2-18 Summary of impacts, performance and costs of scenarios

Note that this table has subsequently evolved and changed according to the evolution of the study and the change of orientation for a multidomain analysis, see section of Report 4 and Table 2-35 for the final performance assessment of the scenarios at study.

	EVALUATION CRITERIA	SCENARIOS					
		0	B1	T1	H1	H2A	H2B
MOBILITY AND ACCESSIBILITY							
Quality of the link with other higher-order public transit systems	Quality of the link with Rapibus and Ottawa LRT	Very poor performance due to poor linkage with the Rapibus.	High performance due to a good link with Rapibus and O-Train	Average performance due to sub-optimal link with Rapibus, despite a better link with the O-Train	High performance due to a good link with Rapibus and O-Train	Average performance due to a non-optimal link with Rapibus for southern users, despite a better link with the O-Train.	
	Number of transfers required for users.	Very high performance as no additional transfer is required.	Average performance given the need to make transfers for the vast majority of western residents who do not live within walking distance of the higher-order network				
Accessibility analysis: Quality of service to major clusters, including city centres and outlying clusters	Quality of service to key clusters (downtown Gatineau and Ottawa and outlying clusters)	Poor performance as there is no improvement	Average performance. Better accessibility to some important clusters.				
	Comparison of travel times by car and public transit	No significant improvement in transit travel times	Significant improvement in public transit journey times compared to cars.				
Provides adequate transport capacity	Screenline transport capacity for all modes (auto and public transit)	Insufficient capacity for road mode on several screenlines (Gatineau Park, Ottawa River and Gatineau River).	Insufficient capacity for road mode on several screenlines (Gatineau Park, Ottawa River and Gatineau River). Residual capacity is available for public transit across Gatineau Park and marginally across the Ottawa River in 2031.	Insufficient capacity for road mode on several screenlines (Gatineau Park, Ottawa River and Gatineau River). Residual capacity is available for transit across Gatineau Park and the Ottawa River in 2031.			
	Adequate capacity of the higher-order network to carry the expected number of users at critical points in the network (at the main screenlines: Gatineau Park, Hull Island, Ottawa River and Gatineau River).	Insufficient capacity on Boulevard Alexandre-Taché and the Portage Bridge.	Insufficient capacity on the Portage Bridge in the future.	Residual capacity available at all key points in the public transit system.	Residual capacity available at all key points in the transit network, but for the Portage Bridge growth must be fully accommodated by the post-2031 tramway.		

	EVALUATION CRITERIA	SCENARIOS					
		0	B1	T1	H1	H2A	H2B
Number of passengers transported throughout the system by sustainable modes (public transit and carpooling)	Number of passengers transported by sustainable modes (public transit and carpooling).	Morning and afternoon peak periods: 0 users (reference) Change in modal share of public transit in the region: 0% (AM) +0% (PM) Number of added trips with a public transit component (single or bimodal) (reference): +0 (AM) + 0 (PM)	Morning and afternoon peak periods: +4,750 users (reference) Change in modal share of public transit in the region: +1.7% (AM) +2.0% (PM) Number of trips added with a public transit component (single or bimodal): +3,312 (AM) + 4,937 (PM)	Morning and afternoon peak periods: +3,580 users (reference) Change in modal share of public transit in the region: +1.5% (AM) +1.9% (PM) Number of added trips with a public transit component (single or bimodal): +2,497 (AM) + 3,879 (PM)	Morning and afternoon peak periods: +4,570 users (reference) Change in modal share of public transit in the region: +1.8% (AM) +2.1% (PM) Number of trips added with a public transit component (single or bimodal): +3,420 (AM) + 4,736 (PM)	Morning and afternoon peak periods: +4,220 users (reference) Change in modal share of public transit in the region: +1.8% (AM) +2.1% (PM) Number of trips added with a public transit component (single or bimodal): +3,172 (AM) + 4,398 (PM)	Morning and afternoon peak periods: +3,750 users (reference) Change in modal share of public transit in the region: +1.4% (AM) +1.8% (PM) Number of trips added with a public transit component (single or bimodal): +2,803 (AM) + 3,783 (PM)
System operation and operation resilience	Operations of the higher-order system (reliability, avoidance of empty trips, travel time, ease of operation, flexibility of operation, etc.)	No improvement over the existing system.	Increased reliability with higher-order infrastructure but limited by the significant number of buses that complexify the operation in both city centres.	Increased reliability with higher-order infrastructure, but no improvement for the Rapibus lines like the other scenarios.	Increased reliability with higher-order infrastructure. In addition, these scenarios add a section of BRT in downtown Gatineau that can be used by the Rapibus lines (increased reliability for all of the STO's high-order services).		
	Resilience to anthropogenic and major events (water supply or other service failures, strikes, demonstrations, widespread power outages, toxic spills, etc.)	No improvement over the existing system.	Average performance despite a mode that can be deviated, but viability requires validation of whether bi-articulated buses can operate in Gatineau.	Average performance despite a proven vehicle and mode, but no alternative route to divert a portion of the clientele in case of unforeseen events.	High performance, the alternative route allows a portion of the clientele to be diverted in case of unforeseen events, but the number of vehicles will limit the possibility of replacing the entire service during peak periods.		
	Viability of the operation in downtown Ottawa (bus and/or LRT)	Operation not viable due to too many buses (95 to 100 articulated buses required in peak hours). These thresholds would be exceeded even with bi-articulated buses.	Operation not viable due to the number of buses exceeding agreement and reaching capacity as early as 2031 (120-135 articulated buses required in peak hours). These thresholds would be exceeded even with bi-articulated buses.	Viable operation due to reduction in the number of buses (55 to 74 articulated buses required in peak hours) and compliance with STO–OC Transpo agreement.	Operation with a number of buses exceeding the agreement (87 to 100 articulated buses required in peak hours), but possibility of reducing this volume with obligatory transfers to the tramway.	Operation with a number of buses exceeding the agreement (82 to 93 articulated buses required in peak hours), but possibility of reducing this volume with obligatory transfers to the tramway.	Operation with a number of buses exceeding the agreement (83 to 94 articulated buses required in peak hours), but possibility of reducing this volume with obligatory transfers to the tramway.
Intermodality	Walking and cycling access to the higher-order public transit system (people within walking and cycling distance and connectivity/permeability).	Very poor performance given the lack of facilities for active modes on the routes considered.	Addition of sidewalks and bicycle facilities. Variant with the best degree of coverage.		Addition of sidewalks and bicycle facilities. Variant with the 3rd and 4th best degree of coverage due to the long segments on Allumettières.		Addition of sidewalks and bicycle facilities. Variant with the 5th best degree of coverage due to the long segments on Allumettières.
	Quality and connection with the STO's local bus routes and other networks (TransCollines and OC Transpo).	Non-discriminatory, allows for linkage with the local STO, OC Transpo and TransCollines networks.					

	EVALUATION CRITERIA	SCENARIOS					
		0	B1	T1	H1	H2A	H2B
LAND-USE PLANNING							
Service to the main activity clusters	Assessment of western activity clusters that can be served in proximity to the higher-order system	Poor performance as there are no service improvements.	Average performance given that the scenario does not serve the northern portion of Hull Island already covered by the Rapibus.		High performance due to better coverage of the northern portion of Hull Island.		
	Possibility of creating user-friendly living environments (opportunities to create public squares, etc.)	Does not allow for significant improvement in the west.	Allows for the creation of user-friendly environments at several stations (13 identified).		Allows for the creation of user-friendly environments at several stations (15 identified).		Allows for the creation of user-friendly environments at several stations (11 identified).
Allows for the development of the west (sector service with potential) and complements other planned interventions	Service offered in areas with development potential.	No major services added.	Variant serving all sectors with a very significant service potential.				
			Medium – less important structuring outcome due to bus mode	High — structuring outcome although less east of Gatineau Park	High — Better service and higher structuring outcome east of Gatineau Park		Medium – less important structuring outcome since there are no service in Plateau
	Complementarity with other projects planned for the corridors (e.g. transportation, revitalization of a sector).	No significant effect with this scenario.	Good complementarity facilitating the development of clusters in the west.				
Consistency with regional planning	Compliance with the various plans and strategies identified	Very poor consistency.	Moderate consistency given increased service to clusters, but no reduction in the number of buses.	High consistency due to increased service to clusters, with fewer buses.	Very high consistency given increased service to clusters and maintenance of the number of buses.		High consistency given increased service to clusters and maintenance of the number of buses.
Decrease in household spending on transport	Depending on the number of users and people near the higher-order routes and ease of access (possibility of having fewer vehicles).	Poor performance.	Average performance. Decrease in household expenditure due to modal shift and coverage of clusters to reduce car dependency but need for densification and other policies to have a very significant impact.				
Local and regional development	Effect on local development – Vitality of businesses and services in the area	Low – no increased coverage.	High – good coverage of local service and commercial centres.				
	Effect on regional development (economic benefits for the region: temporary and permanent according to BC2 analyses).	No effect since no higher-order route	Non-discriminatory - According to the analyzes of the firm BC2, the project does not necessarily generate economic benefits. However, the reliability, speed and efficiency of the service provided are factors that tend to increase economic development.				
IMPACTS ON THE ENVIRONMENT AND HEALTH							
Fighting climate change	Greenhouse Gas emissions variation.	Reduction of GHG emissions related to the electric fleet	GHG levels are very similar between the scenarios. These offer little reduction in GHG tonnes/day or GHG passenger kilometres compared to scenario 0 since all buses are electric in the reference scenario 0.				
	Variation in pollutant emissions (NOx, particulate matter, SOx, CO)	Reduction of pollutants emitted in connection with the reduction of vehicle emissions.	Small reduction in pollutants emitted compared to scenario 0.				

	EVALUATION CRITERIA	SCENARIOS					
		0	B1	T1	H1	H2A	H2B
Impact on natural environments	Encroachment in sensitive natural environments (threatened species, woodlands, wetlands, vegetation, wildlife, etc.)	Smallest area affected (minimal intervention).	Smaller encroachment scenarios and few biological and physical constraints.		Greater encroachment and more biological and physical constraints due to the crossing of the park.		Greater encroachment and more biological and physical constraints due to the crossing of the park, the scenario with the most flood zones crossed.
	Fragmentation of natural environments	Low – No change in fragmentation					
Quality of life for nearby residents	Assessment of impacts on residents (noise and vibrations)	No significant changes – no impact.	Noise: adding buses on the former railroad right-of-way increases noise, but this is mitigated if buses are fully electric. Vibration: average performance index compared to other scenarios.	Noise: addition of trains on the old railroad right-of-way increases noise, but this is mitigated given the electric mode. Vibration: highest performance index compared to other scenarios.			
Heritage and landscape	Assessment of compatibility on heritage sites and sectors	High performance as there is no modification.	Poor performance due to proximity of sites and encroachments on land.				
	Assessment of the impact on the urban landscape	High performance as there is no modification.	Average performance given the potential to degrade some environments, but with mitigation potential.				
[redacted]	[redacted]	[redacted]	[redacted]		[redacted]		[redacted]
	[redacted]	[redacted]	[redacted]		[redacted]		[redacted]
	[redacted]	[redacted]	[redacted]		[redacted]		[redacted]
Improving the road safety report	Evaluation of elements that could improve the road safety record	Average performance – index of 0.47 (0 = best possible)	Average performance – index of 0.49 (0 = best possible)		Average performance – index of 0.51 (0 = best possible)		
Improving the health report	Modal shift to sustainable modes (public and active transportation)	No significant improvement.	Significant increase in the modal share of sustainable modes, suggesting an increase in walking and cycling distances.				

2.3.13 MAIN FINDINGS OF REPORT 3

Considering the definition of the scenario components and the evaluation of their performance and impacts, it is possible to anticipate certain findings, although their confirmation depends on the subsequent multi-criteria and benefit-cost analyses.

- Scenario 0 with its bus mode in reserved lanes is not enough to meet demand and therefore does not capture the expected growth in trips either. In addition, the large number of buses required contributes to further exacerbate traffic conditions on the already saturated road network, which worsens conditions for travelling by car and public transport. This situation therefore does not make it possible to effectively support the planned development of the West of Gatineau. This scenario is therefore not retained.
- Scenario B1 does not capture the expected growth in trips because the number of buses required to meet demand exceeds the capacity of the Portage Bridge and that of downtown Ottawa as of 2031. This scenario is therefore not retained;
- In any case, the feasibility of the project was not questioned for the scenarios still under study, namely T1, H1, H2A and H2B. These four scenarios make it possible to set up and operate a structuring public transport system while controlling its impacts and improving its efficiency and performance. See section of Report 4 and Table 2-35 for the final performance review of the scenarios under study;
- The impacts on traffic in downtown Gatineau and Ottawa through the establishment of the structural axis are major. Both areas require further analysis and assessment of additional options. See Reports 3B and 4.

2.4 REPORT 3B – DOWNTOWN OTTAWA ALTERNATIVE STUDY SUPPLEMENT

Report 3B is a follow-up to report 3, designed to further analyze the specific questions and observations identified for downtown Ottawa that could not be addressed in the latter. Indeed, the analysis conducted for Report 3 reveals that this project has major potential impacts on downtown Ottawa. A more in-depth analysis of the options presented in Report 3, as well as other options, must be considered and analyzed to ensure that the best option is selected. Note that the option selected to serve downtown Ottawa will then be applied consistently for all of the overall scenarios in Gatineau. This stage was the subject of a public consultation, the report of which is available in the appendix.

2.4.1 CONTEXT AND EXISTING CONSTRAINTS

The downtown Ottawa street network consists of a grid of north-south and east-west orthogonal streets. Wellington Street is the only direct link to the downtown road network from the Portage Bridge, as Sparks and Queen Streets are, a little further south, blocked by a low wall on the west side of downtown Ottawa and only connect to Bronson Avenue. The surface development of a light rail system (LRT) is also restricted by the impossibility of installing stations there, given the blocks of north-south streets of short distance (75 to 80 m) in the city centre. of Ottawa. Streets in downtown Ottawa have a constant right-of-way width of 18-20 m, except for Wellington Street, which is wider at 28-30 m, widening considerably on approach from the intersection of the Portage Bridge.

Connections to the OC Transpo transit service in Ottawa are primarily on Queen Street, where local bus lines converge to transfer passengers to the newly constructed Confederation Line streetcar through its stations located under Queen Street at the corner of Lyon Street (Lyon station) and at the corner of O'Connor Street (Parliament station). Lyon station is accessible from both Queen and Lyon streets, while Parliament station is accessible from Queen and O'Connor streets. Users coming from Gatineau and going to Ottawa go mainly to the central areas of Ottawa, with an almost uniform distribution in downtown Ottawa, and secondary peripheral concentrations at Tunney's Pasture and the University of Ottawa.

The STO's existing activities are governed by a five-year tripartite agreement that was signed in May 2017 between the City of Ottawa, the City of Gatineau and the Société de transport de l'Outaouais (STO) in the goal of serving Confederation Line stations (Line 1) and channelling the flow of buses to downtown Ottawa. An additional agreement to this allowed the STO to prepare and file a plan to determine the organization of bus lines based on three routes in downtown Ottawa: two loops serving Lyon Station located to the west and a third takes Albert Street, Slater Street and the Mackenzie King Bridge. The limits imposed by this agreement present very little leeway to increase the STO's service to downtown Ottawa, which could limit its ability to increase passenger numbers.

In addition to the development of the higher-order system in western Gatineau, other projects are planned in downtown Ottawa and must be taken into consideration:

- The development of a two-way bicycle path on Wellington Street, between the Portage and Mackenzie King bridges;
- The development of one-way cycle paths on Bay Street, between Wellington and Laurier streets;
- The redevelopment of Queen Street (completed in 2018) including an improved pedestrian area surrounding the accesses to O-Train stations;
- The reconstruction of Albert and Slater Streets, eliminating reserved lanes and widening sidewalks and developing bicycle lanes;
- The redevelopment of the Sparks pedestrian mall with improvements to public and landscaped facilities and amenities
- The redevelopment of rue Lyon between rue Wellington and rue Queen with the installation of reserved lanes for northbound buses;
- Finally, these projects must also consider the symbolic importance of the presence of Parliamentary and Judicial precincts and the development of the Confederation line.

2.4.2 PREVIOUS MAIN FINDINGS OF REPORT 3

- Scenarios T1, H1 and H2: LRT on Wellington Street with stops at Lyon, Bank and Metcalfe Streets. Buses lines to use nearby streets as turning loops to end their route.
- In addition, an LRT tunnel built under Sparks Street with stations connected to the Ottawa O-Train Confederation line is retained for further analysis if the impacts of the LRT implementation on Wellington were deemed unacceptable by the stakeholders. However, it should be noted that the construction of a tunnel would be expensive and would probably reduce the cost-benefit ratio of the whole project.

2.4.3 OBJECTIVES OF THIS SUPPLEMENT STUDY

Five main objectives were identified for this supplement study:

1. Analyze the impacts and feasibility of different options, comparing:
   - different feeder service options for STO buses;
   - different options for the number of tram stations on the Ottawa side;
   - different options for the tramway insertion, either at-grade (with or without complete closure of Wellington Street) or underground (tunnel under Sparks).
2. Take into consideration the different stakeholders' objectives and constraints;
3. Analyze the impact of all these options on urban development, traffic, public transit operations and active modes for the 2031 horizon;
4. Recommend the most optimal insertion option, considering all the analyses and the stakeholders' interests;
5. Update the performance and impact analysis for the overall scenarios (Gatineau—Ottawa) including the option selected for downtown Ottawa.

To carry out this analysis, different options were analyzed and compared to identify the optimal option for:

- Existing and future STO riders;
- OC Transpo riders who could be disrupted by an influx of STO riders or benefit from better services to Gatineau;
- The project partners and citizens in general who will, in the end, live with the local impacts of this project.
- All this compared to Scenario 0: Non-higher-order mode scenario: existing geometry, but with the addition of the bicycle path on Wellington Street as per the joint City of Ottawa/NCC project (i.e., reduction of one car lane per direction for the purpose of the bicycle path);

The solution will, therefore, must meet the following requirements:

- The higher-order system will be in the heart of downtown Ottawa, and it is important to preserve downtown vitality and promote access by all modes of transportation;
- The project must respect the City and its partners' vision for the development of streets in downtown Ottawa (most relevant to the projects under consideration is the need for a continuous bicycle path on Wellington Street); The project will have to respect the vision of development of the streets of downtown Ottawa described in the study *Downtown moves: Transforming Ottawa's streets* and this including the project of development of an axis. continuous cycling on Wellington Street;
- A requirement to recognize that the area has symbolic and heritage significance as the heart of Canada's Capital. This includes a harmonious insertion into the environment while respecting its prestigious, symbolic, ceremonial and heritage character. It is also important to respect the visual perspectives and development standards of Confederation Boulevard;
- A requirement to preserve the functions of the federal government, including the proper functioning of the Judicial and Parliamentary precincts. This includes the need to ensure functional requirements (deliveries, shuttles, etc.) as well as to allow for enhanced security measures.

2.4.4 ORGANIZATION OF THE STO'S SYSTEM SERVING DOWNTOWN OTTAWA

Three feeder scenarios for the entire STO system (including service to eastern Gatineau along the Rapibus corridor) were assessed:

- No specific feeder service on the Gatineau side, STO buses offering service to downtown Ottawa by crossing the Ottawa River to provide a direct connection, including services using the Rapibus;
- A partial bus feeder service on the Gatineau side to share the load between the tramway and bus modes, while minimizing the number of buses and the impact of bus traffic in downtown Ottawa. The higher-order lines (tramway, BRT and Rapibus) are maintained in downtown Ottawa as well as a reduced number of bus lines;
- Feeding of all STO buses (including Rapibus and BRT) on the Gatineau side so that only the tramway mode would connect the two downtown areas.

Note that the partial feed scenario was developed in collaboration with the STO to define a plausible scenario for subsequent analyses. In this case, only BRT (serving Le Plateau in Scenario H2A), Rapibus and 4 other bus lines (nos. 11, 31, 86 and 87) would maintain service to downtown Ottawa. The other lines would be reduced in Gatineau at various transfer points so as not to unnecessarily overload downtown stations.

To validate the impact of each of the feeder service options, an analysis was conducted of the constraints of each of these options:

- The tramway's capacity to accommodate the passenger load transferring from buses to the tram;
- The infrastructure's capacity to accommodate a significant proportion of STO buses on the Ottawa side;
- Impact on STO ridership.

These feeder service approaches are valid for all studied insertion options.

We recommend continuing the analysis by considering a partial STO bus feeder service for the following reasons:

- An approach with no feeder service would maintain the highest level of ridership, but results in a very high level of busing in downtown Ottawa;
- While it greatly reduces the number of buses in downtown Ottawa, a full feeder service approach would have a negative critical impact on STO ridership;
- The partial feed allows a certain balance between impacts. In fact, the impact on total ridership would be less and considered acceptable by the STO, since some riders would avoid the transfer because this approach would provide Gatineau residents with a higher-order system offering a direct link to downtown Ottawa (two branches of the western higher-order system + the Rapibus). In addition, the number of buses in downtown Ottawa remains manageable.

However:

- If the tramway could accommodate a total feed, the vehicle passage rate would have to be 2 minutes or less to accommodate the demand. While this scenario could be considered at the time of the launch, it would have little room to grow to accommodate an increase in ridership. This scenario would also require significant rolling stock acquisition and operating costs to accommodate the demand for crossing the river, which is only a portion of the route. It is therefore not advisable to choose a full feeder service option that would offer limited scalable capacity over time;
- As for the downtown Ottawa infrastructure, the bus stop capacity is almost reached if no feeding occurs in the City of Gatineau. It is therefore not advisable to choose an option without any form of feeder service in Gatineau, since this scenario would offer limited growth capacity over time. A total or partial feed, as considered in this study, would make it possible to maintain a capacity reserve at the most critical station, i.e. the one located in Lyon in both directions.

The partial feed scenario therefore makes it possible to ensure a capacity that can grow over time for the tramway and downtown Ottawa infrastructure, while maintaining a good level of ridership for the STO and significantly reducing the number of STO buses in downtown Ottawa, i.e. by approximately -30% to -45% when the system launches compared with the current situation. In the longer term, the number of buses could be increased to ensure that the tramway is not left alone to handle the increase in travel demand. Despite this, the number of STO buses could be kept under control and lower than in the current situation. Note that in Scenario T1, there is no BRT from western Gatineau, thus resulting in much larger bus volume reduction across the Ottawa River, of around 70%. In such a case, fewer services could be reduced than those proposed in the H2A partial feed scenario, while limiting the number of buses serving downtown Ottawa from Gatineau.

2.4.5 NUMBER OF TRAM STATIONS IN OTTAWA

There are three options in consideration for the number of stations in Ottawa, regardless of whether an at-grade or underground tramway is chosen for the Ottawa portion. The options are as follows:

- 1-station option: Lyon;
- 2-station option: Lyon and Parliament;
- 3-station option: Lyon, Parliament and Elgin.

Each of the options was analyzed based on scenario H2A with partial feed. Using the TRANS model, the impact on the overall STO ridership and ridership at each station in Ottawa, distinguishing between destination and transfer movements, is considered in this analysis. The assessment was conducted to analyze the impact of the number of stations on the Ottawa side. This analysis shows that:

1-option station

- Shows little sensitivity to the removal of stations on the higher-order mode ridership. The modelled decrease in ridership (2%) is negligible and within the confidence interval of the model;
- Requires a transfer to the Ottawa LRT for the greatest number of riders (1,250 passengers/hour);
- Involves very large volumes of pedestrians who will be concentrated at a single station, both for destination and transfer movements to another OC Transpo service. This implies:
  - the implementation of infrastructure that is large enough to accommodate this ridership, particularly for the station platforms;
  - for all at-grade studied insertion options, attention must be paid to the various crossings of Wellington Street in the vicinity, to ensure safety and fluidity (need for a pedestrian tunnel in front of the station due to the high volumes).
- Not resilient in the event of an incident or work at Lyon station; no other station on the Ottawa side can accommodate passengers in the event of an incident or maintenance work at the single station;
- Does not seem viable and is not recommended.

2-station option

- Although less favourable than the 3-station option, this variant still allows for better public transit ridership between the two cities;
- Requires a transfer to the Ottawa LRT for a similar number of riders as compared to the 1-station option (1,230 passengers/hour);
- Implies slightly lower volumes (less important than 3-station option but more important than 1 station option). Although at a lower level, the same findings can be maintained:
  - the implementation of infrastructure that is large enough to accommodate this ridership, particularly for the station platforms (however, fewer requirements than in the 1-station option);
  - for all at-grade studied insertion options, special attention must be paid to the various crossings of Wellington Street in the vicinity, to ensure safety and fluidity (a pedestrian tunnel is required at the Lyon station, but less so at the Parliament station).
- Although less efficient than the 3-station option, this option offers relatively good coverage of the downtown area and allows demand, particularly for transfers with the O-Train Confederation line and other OC Transpo lines, to be spread over two stations. This option, although not ideal, still appears to be viable.

3-station option

- Provides the best downtown Ottawa public transit coverage and therefore the highest level of public transit ridership between the two downtowns;
- Allows for a better distribution of volumes among the three stations, particularly for transfers with the Ottawa LRT, although especially between the Lyon and Elgin stations. Parliament Station is only an intermediate station compared to the other two;
- Shows that volumes at Lyon station remain very high. For all at-grade studied insertion options, special attention must be paid to the Wellington Street crossing to ensure safety and fluidity (however, a pedestrian tunnel is required at the station, given the high volumes). This issue of crossing Wellington is not a concern for all underground studied insertion options. However, these requirements are lower compared to the other two scenarios;
- Offers the best coverage of the downtown area and allows for the best distribution of demand, particularly for transfers with the Ottawa LRT. Furthermore, the redundancy of systems and equipment provided by this option allows for greater resilience to disturbances. This option is therefore preferable.

Theoretically, the 3-station option appears to be the best option to maintain a greater modal share for public transit between the two cities, while distributing movements more evenly as they approach the stations. However, the two-station variant has little impact compared to the three-station variant, since ridership volumes are relatively unchanged from those of the three-station variant.

- The 2- and 3-station variants offer greater resilience to disruptions or partial shutdowns as well as the redundancy of systems and equipment that they provide.
- **It is therefore recommended that the analysis be continued with the 3-station option** and, if necessary, its technical feasibility will be confirmed for all studied insertion options (at grade or underground).

2.4.6 WELLINGTON AT-GRADE INSERTION OPTIONS

[redacted]

The analysis of the stations shows that the 3-station variant would be the most optimal and it is entirely feasible at-grade. While a larger right-of-way is required for the stations, further constraining development, the majority of the insertion constraints listed above can be accommodated.

The Lyon station will be the most used, both for trips to the destination and for transfers. A very significant number of pedestrians will, therefore, find themselves crossing the traffic lanes on Wellington Street from Lyon Street. Between 2,800 and 3,200 people per hour will disembark from the trams during the morning peak period, the majority of whom will want to head south. In addition to people travelling from Gatineau, between 400 and 800 people per hour (depending on the number of stations) will be heading towards Gatineau in the opposite direction of the peak. The construction of a pedestrian tunnel between the Gatineau Lyon tram station and the Lyon station under Queen Street would facilitate the movement and safety of all users and would also provide a better connection between the two Lyon stations: the Gatineau tram station and the Ottawa LRT. The path could indeed be more direct and intuitive while being sheltered from weather conditions. Note that the feasibility of this tunnel, and the exact route, if any, is not part of this study. The addition of an adjoining access on Sparks Street could be considered if this insertion option is selected. An at-grade pedestrian crossing is still necessary for users who are not transferring to or from Queen Street or streets beyond.

Layout adjustments required by tramway implementation on Wellington Street will have an impact on some of the Parliament Hill access points. While it may be possible to limit certain accesses from Wellington Street, the vehicular access to Parliament Hill should be maintained, even if it is modified. It should be noted that the vision and long-range plan are currently under review and that the circulation concept may be adjusted to accommodate some of the required vehicular routes. These constraints on the management of access to Parliament Hill will have to be analyzed in greater depth if this option of inserting the tramway along Wellington is chosen.

Two at-grade insertion options were analyzed, with variations in the case of insertion option 1:

- **Insertion option 1: Automobile traffic maintained along Wellington Street**

  This insertion option consists of maintaining automobile traffic along Wellington Street. Four insertion sub-options have been developed:

  - Variant 1A: Left turn possible to Lyon Street, but bicycle path discontinued east of Bank Street

  To maintain automobile traffic in addition to the tramway, the alternative considered here would be to remove the dedicated bicycle path east of Bank Street to leave enough space for the traffic lanes and the tramway. Depending on the available right-of-way, the space reserved for pedestrians and the number of automobile traffic lanes will vary.

  - Variant 1B: Possible left turn to Lyon Street; cycling link maintained, but in some places in a shared site

  To maintain automobile traffic in addition to the tramway, the variant considered here is maintaining a bicycle link east of Bank Street, but in the form of a development site shared with pedestrians at the right of Parliament Station (about 50 m) to leave enough space for the traffic lanes and the tramway. This variant is therefore very similar to the previous one, except for the bicycle link.

  - Variant 1C: Left turn possible towards Lyon Street; bicycle path maintained, but deviated in front of Parliament

  To maintain automobile traffic in addition to the tramway, the variant considered here would be redirecting the dedicated bicycle path on exclusive right-of-way east of Bank Street, to pass in front of Parliament rather than remain on Wellington Street.

  - Variant 1D: Left turn possible towards Lyon Street; continuous bicycle path and reduced North Esplanade in front of Parliament Station

  This variant is identical in all respects to variant 1B, except for the development of the North Esplanade and the bicycle path in front of Parliament Station (approximately 50 m)

- **Insertion option 2: Automobile traffic interrupted between Bank Street and Elgin Street; Left turn to Lyon Street prohibited, continuous bicycle path on Wellington Street**

This insertion option includes only one variant, which consists of interrupting automobile traffic (pedestrianization) between Bank Street and Elgin Street to give priority to other modes of transportation and urban development in front of Parliament.

The following table summarizes the insertion options and their level of compliance with the design criteria related to development constraints.

Table 2-19 Summary of insertion options on Wellington and compliance with design criteria

CONSTRAINTS	OPTION 1				OPTION 2
	A	B	C	D	
Continuity of the bicycle path	Interrupted	Continuous, but shared with pedestrians for 50 m	Deviated	Continuous, but width reduced locally	Continuous
Continuity of lanes for automobiles	Continuous	Continuous	Continuous	Continuous	Interrupted
Width of the North esplanade	Between 6.0 and 9.6 m	Between 6.0 and 6.5 m	Between 6.0 and 9.6 m	Between 6.0 and 6.5 m	Between 6.5 and 8.6 m
Width of south sidewalk	Between 3 and 5 m	Between 3 and 5 m	Between 3 and 5 m	Between 3 and 5 m	Between 3 and 10 m
Saving mature trees	Yes	No, 5 trees to cut down	Yes	No, 5 trees to cut down	Yes
Double avenue of trees to the north	Single west of Parliament station Double east of Parliament station	Single west of Parliament station No trees at Parliament station Double east of Parliament station	Single west of Parliament station Double east of Parliament station	Single west of Parliament station No trees at Parliament station Double east of Parliament station	Single west of Bank Double east of Bank
Single avenue of trees to the south	Yes, but only east of Kent Street	Yes, but only east of Kent Street	Yes, but only east of Kent Street	Yes, but only east of Kent Street	Yes, but only east of Kent Street

Green: Complies with the criteria Yellow: Partially complies with the criteria Red: Does not comply with the criteria

As presented in the table, none of the insertion options meet the design criteria 100% but do come close. All of them will require land acquisition to accommodate all modes. Although possible, variants 1A, 1B and 1C appear to have very little credibility from the cyclist's perspective and pose safety risks for active mode users. Since the variants for insertion option 1 are broadly similar to all other criteria, subsequent analyses in this report will, therefore, be conducted using Variant 1D for insertion option 1.

The Wellington Street insertion analyses, whether for the variants of insertion option 1 or insertion option 2, show that space is available to implement a 3-station scenario, which is the recommended scenario in terms of the number of stations, despite the challenges related to the location of the Elgin Station.

It is therefore recommended to continue the comparative analysis of all insertion options by keeping:

- Insertion **option 1, variant 1D, with a 3-station option;**
- Insertion **option 2, with a 3-station option**.

URBAN INTEGRATION – BATTERY-POWERED TRAMWAY

Even if the overhead contact line (OCL) supports have improved over time and are less visually intrusive, the fact remains that these OCL have a visual impact on the landscape, both for the aboveground and underground options. Since the Ottawa sector is considered a sensitive area (heritage environment, protected visual landscape, ceremonial route of Confederation Boulevard, etc.), mitigation measures are possible to minimize this impact (long pole versus short pole or under cable connection, use of existing light poles, etc.). Also, in recent years, both tram and battery technologies have improved. It is now possible to have trams with dual technology (OCL and battery) and for which the battery autonomy is sufficiently large to allow part of the route to be run without OCL (around 1 to 2 km depending on the current technology). In addition to the visual benefit, the battery operation in some locations also limits the right-of-way required, i.e. the space needed for the OCL supports. This also eliminates coordination/impact with other developments and infrastructure (vegetation, signage, drums, pipes and others).

100% battery-powered tramway technology is beginning to emerge more and more, but since it has not yet been tested in winter conditions, it would not be advisable to consider it in this study. It is indeed more prudent to let this technology develop further before considering it. However, depending on the speed of progress, the use of this new technology may be possible in the near future. Conservatively, we have therefore considered battery operation only on sensitive corridors with a range of 1 to 3 km. Downtown Ottawa and the Portage Bridge routes are the areas targeted, particularly because they are among the views to be protected by the National Capital Commission.

This approach for the Wellington at-grade insertion option would, however, require the addition of a charging station at Elgin Station (end of line). An intermediate charging station would also be required at the Lyon station. Since Wellington Street is sometimes closed due to events, a validation should be done on the need or not to have a second charging station before these closures. Incidents could also cause the closure of Wellington Street, which could also result in the need for an intermediate charging station.

URBAN INTEGRATION – URBAN PLANNING

Wellington Street, as Confederation Boulevard, has a status that is intended to be different from other adjacent streets. The proposed solutions must take this special status into account.

- The incremental cost related to the Confederation Boulevard development standards was addressed using a unit cost for street development (item 6) that was higher than the average cost for the entire network;
- A provision of [redacted] has been added to the at-grade solution to account for other interventions that may be required outside the project boundaries but imposed by the project. As these other interventions are not yet known, only a provision can be provided. For example, work may be required on a perpendicular street (north end of perpendicular streets that must be transformed into a cul-de-sac), redevelopment of secondary streets (minor road work, signage, etc.);

An exercise to illustrate the implementation of the landscaping of these insertion options was carried out for illustrative purposes.

Figure 2-42 Wellington Street at-grade option – alternative to maintaining vehicular traffic in front of Parliament

Figure 2-43 Wellington Street at-grade option – alternative to setback of vehicular traffic in front of Parliament

Figure 2-44 Wellington Street at-grade option – Elgin Street Terminal Station

2.4.7 TUNNEL INSERTION OPTION

In addition to the at-grade insertion options, tunnel development in downtown Ottawa was considered. This insertion option could reduce pressure on the road system in downtown Ottawa by limiting the number of buses and capacity reductions in the road system while improving transfers between the Ottawa LRT and STO services. However, the construction cost, technical feasibility and physical constraints must be considered to determine whether this insertion option is advantageous.

This mandate attempts to validate whether a tunnel insertion option could be considered in downtown Ottawa to accommodate the tramway mode. The purpose here is not to determine the exact alignment (vertical and horizontal) and infrastructure of a tunnel insertion option, but rather to consider the implications of this insertion option in terms of feasibility, potential constraints and impacts on riders, residents and the existing built environment. The purpose is to identify the issues related to creating a tunnel for the needs of the tramway mode, to identify the opportunity to pursue this consideration or to eliminate it if the challenges seem insurmountable.

The following assumptions were used for this analysis:

- Preliminary analyses conducted in Step 3 identified the Sparks Street route as a potential location for a railway tunnel;
- The long-term must be considered. Even more than for an at-grade insertion option, once the tunnel is commissioned, modification becomes very difficult and expensive to undertake. It is therefore important to plan for the long term since a later extension of the tunnel could be extremely complicated or even require complete closure for an extended period;
- Stations must have two independent accesses to meet station safety and evacuation requirements in the event of a fire or other incidents (NFPA standard);
- Ottawa LRT stations are used as a design model, since Queen Street is similar in width to Sparks Street, and similar elements are located at the same level. For example, the mezzanine level of STO stations is planned to be at the same level as that of Ottawa stations in order to facilitate traffic between the two systems (but it remains to be seen how the tunnels will be connected under existing buildings);
- Transfers between the STO's tramway and Ottawa's LRT are made in such a way as to limit vertical transitions for riders and must ensure an intuitive route. Thus, the vertical alignment preferred for the Sparks tunnel is similar to that of the O-Train Confederation line under Queen.

The station analysis shows that the 2-station scenario would be the most optimal. The right-of-way appears to be sufficient to locate stations anywhere along the route. The distances between stations must also be large enough to cover the territory effectively. Furthermore, and to facilitate transfers with the Ottawa LRT Confederation line, it is proposed that the stations be located in parallel with those of the Ottawa LRT. A third station would be possible further east on O'Connor Street. However, given the underground constraints, the costs and especially the proximity of the latter to Parliament station (about 100 m), it does not seem appropriate to build it. However, an underground pedestrian tunnel, from Parliament Station to Elgin Street, could be considered to bring people closer to their east destinations.

A cross-section and longitudinal section analysis was performed to identify the issues and constraints that could emerge when constructing the tunnel. That said, this study is done at a high level to identify potential constraints. The choice of the tunnel insertion option will require more studies to validate the technical elements (geotechnical, construction methods, impacts on adjacent buildings, utilities, etc.) and establish the details of this option. The analysis of the insertion demonstration plan shows that the tunnel insertion option appears to be feasible since there are no identifiable major elements indicating the infeasibility of the work. This does not mean that there are no issues or constraints, but that subsequent analyses will have to identify them.

The design parameters used in this analysis:

- The natural elevation change (around 15 m) in the topography minimizes the transition zone between the surface and the subsurface: the train entering the cliff. The rock is relatively close to the surface, about 2 to 4 m from the ground, depending on the location. The tunnel should, therefore, be built on stable ground.
- Between the Portage Bridge exit and the tunnel entrance, the tramway will pass through the greenspace adjacent to the Garden of the Provinces and Territories Park and near the monument to the victims of communism currently under construction. Special care must be taken during the design and construction of the tunnel to minimize the impact on the monument and the park. This may mean moving as far away as possible from the monument to the victims of communism and redesigning and/or relocating the landscaping and the pedestrian, cycling and road routes. Redevelopment of this green space is to be planned;
- The right-of-way under Sparks Street is approximately 17 to 18 m, which is sufficient for the construction of a tunnel and the stations, but limits the insertion options in terms of the type of station and tunnel to be built and the developments, including stations, given the limited underground right-of-way;
  - For this reason, access to the stations will have to be from existing related buildings. Beyond adjustments to buildings to create access points, agreements will be required with the owners to create these accesses, to validate the technical feasibility of modifying existing buildings and to keep them available according to the tram's hours of operation. An agreement will also be required to create a pedestrian tunnel between Sparks Street and Queen Street for riders transferring between both systems;
- Several underground infrastructure is present:
  - Under Sparks Street: these are fairly close to the surface and may not affect the construction of the tunnel and stations. If necessary, some of them could probably be relocated, especially for the construction of the entrance and vertical passages;
  - On the approach to Kent Street, the Place de Ville delivery dock and East Memorial Building infrastructure are located under Sparks Street. [redacted] The tram tunnel will have to pass below it while keeping a sufficient distance between the delivery platform structure and the tunnel;
  - Under Kent Street: there is a storm sewer, federal utilities, combined sewer storage tunnel (CSST), which has just been recently completed in 2020, and the tramway tunnel will have to avoid them in order to continue its route. Some of this infrastructure can be relocated, but some cannot be relocated because of its importance. Public Services and Procurement Canada (PSPC) has made a preliminary assessment that it would be possible to relocate buried infrastructure, but more studies are needed to assess the scope of the project.
- The tunnel route will pass near the West Memorial Building, whose long-term vocation is not defined since it is in the process of being rehabilitated. In the short term, however, this building will be used as temporary offices for the Supreme Court during its rehabilitation. Because of this proximity and the importance of the activities taking place at the Supreme Court, it will be necessary to assess impact during construction. Construction-related vibrations may affect the activities that will take place in this building;

The tunnel seems to be a feasible option for the STO's tramway. The at-grade developments would be little affected by the tunnel insertion option.

2.4.8 UPDATE OF CAPITAL COSTS

A second estimate (class D -20 / + 100%) was carried out to integrate the insertion options retained for the portion of the Ottawa shore. However, since this estimate was subsequently revised and modified according to the progress of the study, the reader is therefore invited to directly consult the final information in section 2.5.6 and section 3.15.

Some assumptions have been re-evaluated compared to those in Report 3, namely:

- Professional services and project management are estimated by considering 30% of the cost of civil works cost (all items except vehicle and land acquisition);
- A 35% contingency reserve on top of the total cost;
- An additional 20% risk reserve on top of the total cost to account for the level of detail in this study and details not yet known;
- [redacted]
- Cost inflation to 2026 of 2.1% per year, assuming 7 years for 2019 estimates for the Gatineau component and 6 years for 2020 estimates for the Ottawa component.

WELLINGTON AT-GRADE INSERTION OPTIONS (WITH OR WITHOUT CIRCULATION)

These costs relate only to the portion between the Portage Bridge intersection with Laurier and the eastern end of the route on Elgin Street. The cost also includes the pedestrian tunnel as well as the redevelopment of other streets where development is required: Lyon Street (Queen to Wellington) as well as the redevelopment of Wellington Street between the two branches of Elgin Street (Confederation Square). The costs of the two variants, with or without circulation, are identical. The capital cost estimate for this insertion option is in the order of $ 585M.

TUNNEL INSERTION OPTIONS

The cost estimate for the tunnel includes an estimate based on broken down costs, as in the case of the at-grade insertion options and a comparative analysis (benchmark) for the tunnel and station elements (1.2 km of tunnel and 2 stations). At this point, the tunnel cost estimate is based on a benchmark analysis, as the tunnel details are not sufficiently developed to allow for a more detailed breakdown of the costs of this option. However, this analysis provides an order of magnitude of the potential costs of a tunnel. These costs will have to be assessed in more detail in a future study when, if selected, the tunnel insertion option will be explored in more detail. The capital cost estimate for this underground insertion option has been evaluated, based on comparative projects, from a minimum range of $1,045 M to a maximum range of $1,452 M.

2.4.9 IMPACT OF INSERTION OPTIONS ON RIDERSHIP

Ridership in scenario 0 is lower than in all other scenarios because the service offered is much less attractive than that offered with the addition of a higher-order system combined with a good bus feeder network in Gatineau. As a result, the proposed frequencies are lower and capped since operationally speaking it is difficult to increase them due to the saturation of the environment to accept more buses. Buses are also full during peak periods.

Compared to the Scenario 0, all the higher-order system insertion options, at-grade or in a tunnel, offer better ridership. However, the difference between the three insertion options is insignificant. Indeed, the performance of the system (speed and reliability of travel times, level of supply and capacity) being globally similar in the 3 insertion options (although differences, not taken into account by the model, may exist, especially in the case of the tunnel insertion option concerning the quality and proximity of connections), ridership remains significantly similar. While the tunnel insertion option is a little faster, the time difference between this option and the surface insertion options on Wellington is not significant enough to affect ridership. The tunnel itself is only a small portion of the total journey for most users.

However, it should be noted that the quality and proximity of the tunnel station connection may have a positive effect on ridership, but this cannot be estimated in the model.

2.4.10 IMPACT OF INSERTION SCENARIOS ON TRAFFIC CONDITIONS

Traffic volume projections and traffic analyses from an operational perspective of downtown Ottawa revealed that the introduction of STO's higher-order transit service there would result in a net decrease in traffic volumes in 2031 (compared to scenario 0 status quo improved). It would also provide an overall improvement in traffic from an operational standpoint at all analyzed intersections from the modal shift induced by the introduction of the heavy mode. According to the flow rates projected for 2031, the Wellington at-grade insertion option (with traffic) and the tunnel insertion option has much less negative impact on traffic conditions than the Wellington surface insertion option without traffic. traffic due to the reallocation of traffic volumes. The reallocation of flows following the closure of Wellington Street in Option 2 results in a deterioration of traffic conditions at the Booth/Albert intersection for all approaches as well as for some turning movements within the study area: the eastbound right-turn at the Lyon/Wellington intersection during the AM peak period and the westbound approach at the Bank/Queen intersection during the PM peak period.

Traffic conditions at the intersections analyzed along Queen Street, Albert Street, Slater Street and Laurier Avenue improve for the most part or remained the same as in the baseline scenario, despite the increased traffic volumes along these corridors. However, it should be noted that there are potential traffic impacts beyond the roadway network delineated in this study, as the traffic operations analysis using Synchro software only included eighteen intersections strategically selected to represent the downtown roadway network as well as the surrounding intersections affected by the changes associated with the insertion options. As a reminder, the Aimsun model was used to calculate the V/C ratios on the road sections in the Greater downtown area and the Synchro traffic operations analysis identified the impacts on the key intersections.

Therefore, impacts on intersections that were not analyzed along corridors experiencing increased flows following the vehicular reallocation induced by the reduced capacity of Wellington Street (e.g. Albert and Slater Streets) are not verified. Once an insertion option is selected for more detailed design stages, additional analysis will be required at the downtown Ottawa intersections to assess the full impacts and identify required mitigation measures.

In fact, drivers tend to choose a path based on the anticipated conditions for each of the path alternatives, or based on the immediate network conditions, in a more efficient manner than the model. The AIMSUN model models lane and intersection capacities based on a calibration exercise of existing volumes at a specific point in time; driver behaviours and different friction points may cause capacity constraints not seen by the model. For example, the actual traffic reallocation from Wellington Street under Option 2 could be higher than projected in the model. Drivers will tend, for example, to anticipate possible congestion on certain corridors due to high pedestrian flows and therefore take a different route. This would likely result in a reallocation of vehicles to the Albert and Slater routes that exceeds the model's projections. This reallocation could help with pedestrian/vehicle reconciliation on Wellington Street. The review and interpretation of the projected results will need to consider the limitations outlined below.

The study found that the three insertion options analyzed result in a 20% reduction in traffic volumes in the modelled area during the morning and afternoon peak hours due to the modal shift to the new tramway. As a result, traffic conditions at most downtown intersections improve over the baseline scenario, with some deterioration in traffic flow due to certain reallocation patterns resulting from the ad hoc reduction in roadway capacity, particularly on the Portage Bridge.

With the at-grade option on Wellington (with private vehicle traffic allowed) and the tunnel insertion option, most of the reallocated traffic demand offsets the reduction in traffic demand induced by the modal shift; however, the at-grade option on Wellington (with circulation) results in increased traffic volumes along the Queen Street, Albert Street, Slater Street and Laurier Avenue corridors, the north-south traffic decreases allow for optimized intersection scheduling so that, for the most part, there is minimal degradation in service levels with a few turning movements, approaching capacity for the analyzed intersections.

The level of analysis performed was intended to verify the feasibility of the proposed concepts by assessing the impacts at each of the preselected intersections. More detailed traffic analyses are still required in the next phases of the project, both for the intersections and the entire network. This includes determining and confirming the levels of service, possible mitigation measures (local and/or regional) and the overall interaction of serial intersections along the corridor and in the network.

Scenarios 1, 2 and 3 are therefore all feasible from a traffic point of view (no unacceptable impacts). Therefore, the traffic analysis results do not rule out one of the higher-order insertion options but confirm the need to implement a higher-order public transit system between Gatineau and Ottawa to significantly reduce vehicle traffic in downtown Ottawa.

2.4.11 PROJECT COMPATIBILITY WITH INTERPROVINCIAL LOOP

A potential public transport service is being considered with the implementation of an interprovincial loop connecting the downtowns of Ottawa and Gatineau using the Portage and Alexandra bridges as well as Wellington and Laurier streets, the latter is similar to the previous ideas of technological loop and / or connector of city centres.

The project is at a relatively embryonic stage of development in terms of its content and form, for example:

- One-way or two-way loop operation?
- Detailed layout on streets and bridges (own site, shared roads, etc.)?
- Route between Alexandra Bridge and Wellington Street (Sussex, Mackenzie, via Bye Market)?

The development of this interprovincial loop single lane, planned on Wellington Street, would allow maintaining most of the accesses to Parliament Hill, thus minimizing the impact on traffic. However, the exercise, carried out within the framework of this study for the insertion of the STO higher-order axis, demonstrated the full potential of pedestrianization of this emblematic street between Bank and Elgin streets, with minimal impacts, however. on the circulation on a global scale. It would therefore be relevant, in our opinion, to study this approach to pedestrianization of part of Wellington Street as part of the interprovincial loop project, even if the final decision STO higher-order axis would be in a tunnel under Sparks Street.

Thus, the two STO higher-order system insertion options are compatible with the implementation of a potential tramway interprovincial loop; double tracks if shared with the STO higher-order system at-grade on Wellington or single track if the tunnel insertion option is chosen.

- For the at-grade insertion option on Wellington Street, the shared use of the rails between the two networks will require an integrated technical operation system.
- As with the Sparks tunnel insertion option, the interprovincial loop could be operated completely independently. However, it could bring a plus-value to set up a physical connection between the two systems, at the Portage/Laurier intersection for example, to allow vehicles to access/exit the interprovincial loop.

Thus, in both cases, standardization of the rolling stock would be necessary although their length could vary in each system.

2.4.12 ANALYSIS OF THE PERFORMANCE AND IMPACTS OF A TRAMWAY INSERTION OPTION IN OTTAWA

In summary, for the insertion options under consideration, the main conclusions are as follows:

- Scenario 0 (improved status quo 2031) offers good conditions for cyclists and accessibility by car but does not offer an adequate solution to meet the demand of public transport users. This scenario is ruled out as it is deemed non-viable because it doesn't meet the required public transport capacity. It also presents unsustainable traffic volume and conditions in downtown Ottawa. The possible modal shift through the implementation of a higher-order network helps resolving partially this problem;
- At-grade insertion on Wellington (with circulation) offers good conditions for public transit, but some compromises are required for other modes to maintain all the functions of the street (cyclists, pedestrians, quality of development, etc.);
- At-grade insertion on Wellington (without circulation) offers good conditions for public transit and is an opportunity to enhance the street design and pedestrian experience, but at the expense of accessibility by car;
- Sparks tunnel insertion offers the best conditions for all modes, including excellent conditions for public transit users, without an increase in the quality of the street design, but at the expense of a very high cost for the construction of a tunnel and its stations.

The analysis of performance and impacts shows that while the insertion options do not all perform equally well in each of the criteria, overall, the three insertion options perform well and much better, from the point of view of public transit, than scenario 0 where no higher-order mode is implemented.

Table 2-20 Summary of performance and impact analysis of insertion options

CRITERIA	SCENARIO 0	**At-grade insertion on Wellington** 3- station option		**Sparks tunnel insertion** 2- station option
	Bicycle path on Wellington Street without higher-order transit service	with car circulation	without car circulation (Bank-Elgin)	
Ridership and customer experience	-	+	+	++
Urban realm and streetscape	+	-	++	+
Pedestrians	-	~	++	+
Cyclists	+	-	+	+
Automobile accessibility	++	-	--	++
Traffic	-	+	~	++
Public transit performance	--	+	+	++
Cost (for the purpose of comparison)	N/A	**$585 million**	**$585 million**	**$1,085 - 1,452 million**

Legend: - -Very Negative - Negative ~ Neutral + Positive ++ Very Positive

2.4.13 MAIN FINDINGS OF THE 3B REPORT

Based on the technical results and the partners' positions, two insertion options remain viable. They both significantly reduce bus traffic in downtown Ottawa:

- **At-grade insertion on Wellington (with or without circulation):** continuous bicycle path, 3 stations and a pedestrian tunnel to connect the Lyon tram station and the O-Train Confederation Line station. The without circulation variant includes removal of car circulation between Bank and Elgin Streets to convert that segment to a pedestrian use.
- **Tunnel insertion option under Sparks Street:** Tunnel with 2 stations and 2 pedestrian tunnels connecting to the O-Train Confederation Line stations.

RECOMMENDATION

- [redacted]
- To minimize landscape and heritage impacts, the portion of the tramway system on the Portage Bridge to the Ottawa terminus (or tunnel entrance) will be operated by battery power.
- Additional studies will be required at the draft-design stage to determine the final choice of insertion for the Ottawa sector.

2.5 REPORT 4 – IDENTIFICATION OF THE SELECTED SOLUTION

Following the previous studies and analyzes, the two main objectives of this Report 4 are:

1 Further analyze the specific issues and findings in downtown Gatineau.

   Indeed, the analysis conducted for Report 3 reveals that this project has major impacts on downtown Gatineau. A more in-depth analysis of the options presented in Report 3, as well as other options, must be considered and analyzed to ensure that the best option is selected. Note that the recommended option selected will then be applied to all scenarios on the Quebec since they all include the Laurier-Taché segment.

2 Comparative assessment to identify the technically recommended solution according to the following decision tools:
   - Multi-domain analysis (MDA), sometimes also known as multi-account analysis;
   - Risk analysis;
   - Benefit-cost analysis (BCA).

2.5.1 DEVELOPMENT OPTION IN DOWNTOWN GATINEAU

As the Ottawa downtown area, the Gatineau downtown area required more in-depth analyzes and the search for additional options to resolve the major issues identified in previous reports. Layout options These were analyzed and compared in order to identify the optimal option for achieving the project objectives. The purpose is to identify the optimal development option for serving downtown Gatineau in order to apply it uniformly to all the overall scenarios in Gatineau and then proceed with the planned comparative analysis in Step 4 of the complementary study.

Three development options for the implementation of the higher-order route were developed and studied, specifically for the downtown Gatineau sector:

- **Scenario 0 (Enhanced Status Quo Reference)**: Projected 2031 Existing Conditions (including the planned bicycle path redesign). No higher-order public transit route;
- **Development Option 1 – Laurier Street open**: implement the tramway on the north side of Laurier Street, between Rue Montcalm and the Portage Bridge, and maintain two-way vehicular traffic along the entire route;
- **Development Option 2 – Laurier Street closed**: implementation of the tramway in an exclusive right-of-way, removal of vehicular traffic between Eddy Street and the Portage Bridge to optimize urban development and active transportation on Laurier Street (maintain vehicular capacity towards Ottawa via reallocation of travel patterns for access to the Portage Bridge by straight-ahead movement from Maisonneuve);
- **Development Option 3 – Laurier Street partially closed**: implementation of the tramway in an exclusive right-of-way, removal of vehicular traffic between the Eddy and Laval streets to optimize urban development and active transportation on Laurier Street, but with maintenance of vehicular access from Laurier to ZIBI between Rue Laval and Boulevard Maisonneuve (maintenance of vehicular capacity to Ottawa via reallocation of travel patterns for access to the Portage Bridge by straight-ahead movement from Maisonneuve);

Thus, according to the previous analyses, the following findings can be established:

- With the road network already at capacity since 2014, the difficulties currently observed in downtown Gatineau will worsen substantially in the future if no measures are put in place. The addition of a project for a higher-order public transit route partly solves this problem via the modal shift it involves;
- **Scenario 0**: Due to its reserved lanes approach, this scenario is not viable for public transit operations. Indeed, the large volumes of buses are very difficult to operate and do not even meet the demand;
- Although future traffic conditions will be difficult on Boulevard des Allumettières and in the Rue Montcalm area, they are not caused by the implementation of the higher-order route (T1, H1, H2A and H2B) since they are generally identical or slightly better than those of Scenario 0 (improved status quo);
- **Development option 1 Laurier Street open**: The twinning of maintaining the vehicular traffic on Laurier and the addition of a higher-order public transport route creates major problems in the city centre. Firstly, the physical constraints at the Eddy / Laurier crossroads (distance between the two heritage buildings) proscribe the implementation of all program (vehicle traffic lanes and active mode infrastructure) without having to demolish at least one of the two heritage buildings or reducing the safety of users by providing infrastructure under the minimal safe width. Secondly, the Laurier / Maisonneuve intersection management remains saturated, despite several optimizations already integrated. From a technical point of view and according to the parameters set by the study (conservation of heritage buildings), this development option should be ruled out since it is non-functional. This development option is considered unsustainable.
- Since their analysis results are very similar, it is **recommended to retain both development options 2 and 3**, with Laurier Street closed or partially closed to vehicular traffic, since they both offer an adequate compromise between the quality and significant opportunities of urban development, the addition of vegetation, the operation and performance of public transport as well as traffic conditions. The results of the additional studies planned at the preliminary design stage, as for those listed below, should contribute to identify the final optimal choice:

  1 Review of the metropolitan trucking network (NCC);

  2 Local buses network review, for both STO and OC Transpo lines that are foreseen being maintained in this area. A parallel ongoing study is already started on the matter “Study of preferential measures for buses - Terrasses de la Chaudière and Montcalm station”;

  3 Detailed traffic analyzes for the extended downtown Gatineau area municipal and provincial road network, especially to identify mitigation measures regarding the anticipated negative impacts (boulevard des Allumettières / Alexandra bridge route);

  4 Metropolitan traffic analysis between the two city centres and in coordination with future projects on both sides of the river, including the Chaudière crossing and Portage Bridge and their respective approaches.

  5 Discussions with partners (Ville de Gatineau, PSPC, residents and property owners) will also be required for coordination purposes with their respective ongoing projects which may lead to optimizations. The parallel study in progress “Study of preferential measures for buses - Terrasses de la Chaudière and Montcalm station” is already initiating these coordination efforts in connection with, among others, the renovation project of the Terrasses de la Chaudière, the pedestrian crossings and the realignment of traffic in this area.

URBAN INTEGRATION – BATTERY-POWERED TRAMWAY

Similar to the Portage Bridge and downtown Ottawa portion, an overhead wireless development has been planned for the downtown Gatineau area (from approximately Rue Montcalm), given the importance and potential of this area (anticipated aesthetic quality of public spaces). However, this approach for the development option requires the addition of two charging stations at the Chaudières and Maisonneuve stations.

URBAN INTEGRATION – URBAN PLANNING

As in the case of the at-grade insertion scenario on Wellington Street (without traffic) in Ottawa, development options 2 and 3, with Laurier Street closed or partially closed to vehicles, offer a unique opportunity to make a major shift in downtown Gatineau. In fact, they offer an opportunity to improve the design of public spaces, to better connect the Laurier, promenade du Portage and ZIBI routes into a more homogeneous downtown, to create facades facing the street and to add vegetation to reduce the heat islands in the downtown area.

An exercise to illustrate the implementation of the landscaping of these insertion options was carried out for illustrative purposes.

Figure 2-45 Laurier Street Closed Development Option – Portage/Laurier Area Development

Figure 2-46 Laurier Street Closed Development Option – Focus on Portage/Laurier Area Development

Figure 2-47 Laurier Street Closed Development Option – Portage Station Development

Report 6: Conclusions and recommendations

Studies on the choice of materials, urban design and landscaping will be necessary in the pre-project phase to ensure that the infrastructure is well integrated into their surroundings. To this end, an exercise has already been carried out on Boulevard du Plateau and downtown Gatineau on Laurier Street to illustrate what the public space could look like with the insertion of the tramway and the enhancement of the related spaces thus freed up.

A larger-scale exercise to enhance the downtown area, including the Saint-James block, should be undertaken in collaboration with the City of Gatineau.

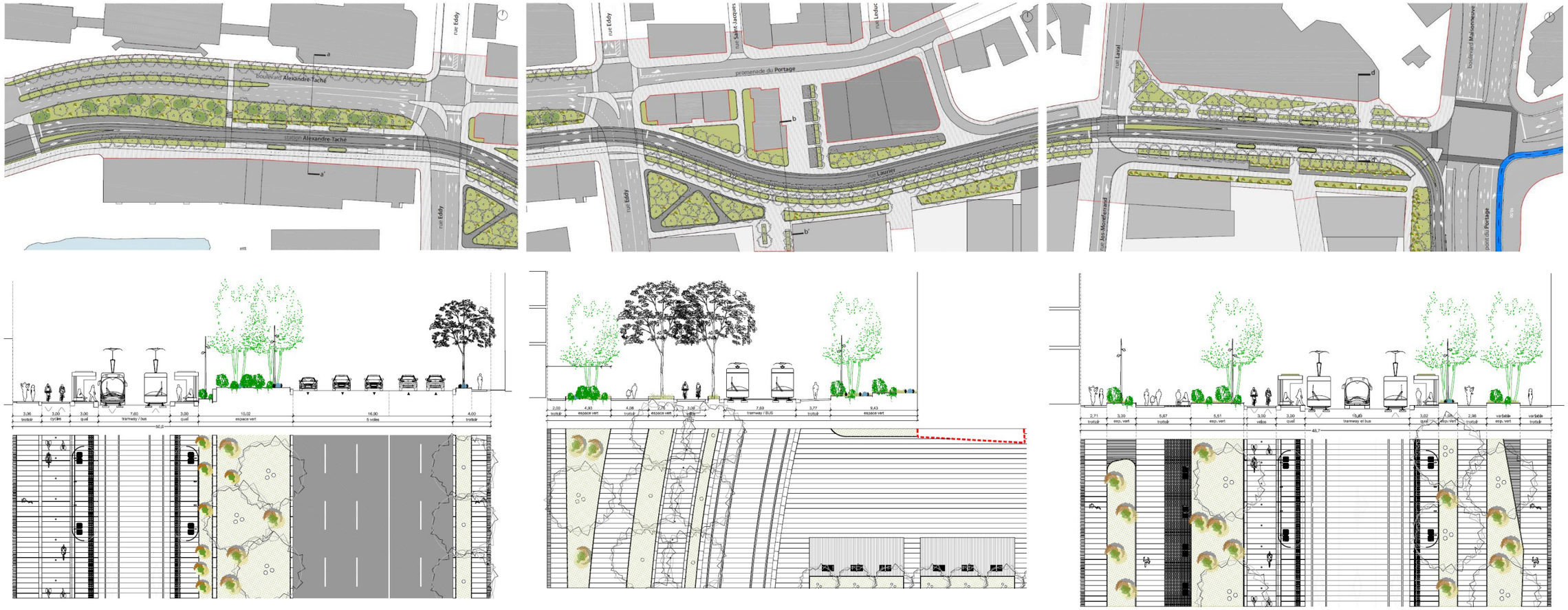


Figure 2-48 Laurier Street Closed Development Option – Landscaping Concept

2.5.2 UPDATE OF SCENARIOS FOR COMPARISON

As a reminder, a total of eight scenarios are still being studied, including four routes in Gatineau crossed with two options in Ottawa.

These are the ongoing assessments of scenarios:

- T1 (tram service to Aylmer and Le Plateau);
- H1 (service to Aylmer by BRT and to Le Plateau, from Eardley, by tram via Boulevard du Plateau);
- H2A (tram service to Aylmer and BRT service to Le Plateau, from Eardley, via Boulevard du Plateau);
- H2B (tram service to Aylmer and Le Plateau, from Eardley, by BRT via Boulevard des Allumettières).

These scenarios are all cross-referenced with the two options in Ottawa, namely:

- A tunnel under Sparks Street;
- An at-grade development on Wellington Street (2 with two possible variants).

2.5.3 PREPARATION FOR THE MULTIPLE ACCOUNT EVALUATION

A multicriteria evaluation was initially planned at Step 4 of this current study. However, as agreed by all stakeholders during the study development, this multicriteria analysis has been replaced by a multiple account evaluation since considered more suitable to meet the needs of the study in terms of benchmarking scenarios.

In order to prepare and feed this multiple account exercise, a preliminary performance compilation of each scenario was made by WSP (as mentioned previously, the in-depth multicriteria evaluation was discarded). This global assessment is a first draft, a working document, which aimed to launch discussions during multiple account evaluation workshops.

All aspects were then discussed in detail throughout several exchanges between all stakeholders, hence, to refine the content and develop the multiple account evaluation.

To meet the need of this new evaluation, certain criteria and sub-criteria required modification and restructuration (compared to those previously presented in Report 2). Table 2-21 illustrates the final portrait of this restructured criteria list. Changes made are shown in red.

Tableau 2-21 Final account and criteria list for the multiple account evaluation

DOMAINS	CRITERIA
PERFORMANCE REPORT	
1. Mobility and Accessibility	1.1 Connection with other public transit systems
	1.2 Promote accessibility (users service)
	1.3 Promote ridership and ensure residual capacity
	1.4 Provide a well operated and resilient network
	1.5 Promote intermodality (active modes)
	1.6 Mitigate impacts on vehicular traffic
2. Land use/growth management	2.1 Serve the main activity clusters
	2.2 Promote the project structuring effect
	2.3 Coherence with regional planning
	2.4 Reduce household spending on transport
	2.5 Promote economic development
3. Environment and Health	3.1 Fight against climate change
	3.2 Reduce air pollution
	3.3 Conserve biodiversity and natural environments
	3.4 Ensure the quality of life of nearby residents
	3.5 Preserving the heritage and the landscape
	3.6 Limit the impact on the land environment
	3.7 Improve the road safety record
	3.8 Improve the population's health
OTHER STUDIED DOMAINS	
A. Project cost	A.1 Capital cost
	A.2 Maintenance and operating cost
B. Stakeholders Level of Support	B.1 NCC Level of Support
	B.2 City of Ottawa Level of Support

2.5.4 MULTI ACCOUNT EVALUATION

The multiple account evaluation was based on the data of the previous analyzes performance results. This comparative evaluation examines the different scenarios advantages and disadvantages as per the identified evaluation criteria, grouped by areas, namely Mobility and accessibility, Land use planning, and Environment and health, to which are then added the areas Costs and Partner support. The multiple account evaluation allows all partners to interpret decision-making information according to their respective priorities rather than proceeding with criteria weighting. For such, the previously established criteria, in report 2 stage, have been restructured into the following five reference areas:

1 Areas corresponding to the performance review:
   - Mobility and accessibility
   - Land Use Planning
   - Impacts on the environment and health

2 Other areas assessed:
   - Costs
   - Stakeholders Support

- At the end of the AMD and according to the results of the Performance Review as well as those of the two related areas Cost and Partner Support (see the tables below), the following key findings were formulated:
- Quebec side
   - Scenario T1 has a better performance record than the other scenarios.
      - The tramway mode higher residual capacity offers a growth potential to ensure that the system can adjust to maintain its level of service to meet future demand;
      - By avoiding crossing the Gatineau Park, this scenario minimizes the impacts of adding infrastructure to a natural environment, despite its already existing fragmented condition;
      - With its tram mode, this scenario offers the biggest reduction of buses on Portage Bridge and downtown Ottawa.
   - Scenario T1 is supported by the City of Ottawa. Moreover, no partner is opposed to this scenario.
   - Scenario H2B does not perform as well as scenarios H1 and H2A, which in turn perform worse than scenario T1.
- Ontario side
   - On the Ontario side, the Tunnel Under Sparks scenario has a superior performance.
   - The Tunnel scenario is also supported by the City of Ottawa.
   - In the absence of additional funding for the Tunnel Under Sparks scenario, the Wellington scenario will be preferred. More detailed analyses will be required, particularly to distinguish between the two variants on the Ontario side of Wellington Street (with or without traffic). These analyses should make it possible to refine the level of impact of each of the two variants on traffic on Wellington Street and on access to the Judicial and Parliamentary precincts.

The multi-account analysis found that Scenario T1 has superior benefits over the other scenarios and has an average capital cost. In Ottawa, the two main alternatives of the tunnel under Sparks Street and an at-grade development on Wellington Street are both feasible, although the tunnel has superior performance.

The following tables can be interpreted using this legend:

Symbol	Multiple Account Evaluation Legend
↑	The indicator value is very favorable and possibly determining for the considered option
●	The indicator value is favorable for the considered option
●	The indicator value is neutral for the considered option
●	The indicator value is unfavorable for the considered option
●	The indicator value is potentially blocking for the considered option

QUEBEC SIDE MULTIPLE ACCOUNT EVALUATION SUMMARY

Table 2-22 Performance review of the Quebec side multiple account evaluation

	T1	H1	H2A	H2B
Mobility and Accessibility	1	2	2	3
Land Use Planning	2	1	1	3
Impacts on the environment and health	1	2	2	3
MULTIPLE ACCOUNT EVALUATION SUMMARY	1	2	2	3

Table 2-23 Costs and Stakeholders support review of the Quebec side multiple account evaluation

		T1	H1	H2A	H2B
Cost		2	3	3	1
Stakeholders Support	NCC				
	City of Ottawa	↑	●	●	●

ONTARIO SIDE MULTIPLE ACCOUNT EVALUATION SUMMARY

Table 2-24 Performance review of the Ontario side multiple account evaluation

	Wellington WITHOUT circulation	Wellington WITH circulation	Sparks Tunnel
Mobility and Accessibility	3	2	1
Land Use Planning	2		1
Impacts on the environment and health	2	3	1
MULTIPLE ACCOUNT EVALUATION SUMMARY	2	3	1

Table 2-25 Costs and Stakeholders support review of the Ontario side multiple account evaluation

		Wellington WITHOUT circulation	Wellington WITH circulation	Sparks Tunnel
Cost		1	1	3
Stakeholders Support	NCC			
	City of Ottawa			↑

GLOBAL SUMMARY – COMBINED SCENARIOS

Table 2-26 Global Summary – Combined Scenarios

LEGEND :
Maximum Performance

ONTARIO SIDE			QUEBEC SIDE			
			1	2	2	3
			T1 (2,447 G$)	H1 (2,718 G$)	H2A (2,620 G$)	H2B (2,156 G$)
2	Wellington WITHOUT circulation (0,585 G$)		1 2	2 2	2 2	3 2
			-8.1%	+0.12%	-2.85%	-16.89%
3	Wellington WITH circulation (0,585 G$)		1 3	2 3	2 3	3 3
			-8.1%	+0.12%	-2.85%	-16.89%
1	Sparks Tunnel (1,269 G$)		1 1	2 1	2 1	3 1
			+12.67%	+20.89%	+17.92%	+3.79%

(1) Percentage Calculation : Difference between the cost of a scenario and the average cost of all scenarios ($3.293G)

2.5.5 RISK ANALYSIS

Since the identified risks were mostly generic and typical of any major infrastructure projects, the risk analysis was not discriminating between the studied scenarios on the Gatineau side (T1, H1, H2A and H2B). That said, some common risk items include:

- The identified design risks, which are considered “moderate”, are mainly related to scenario T1 and hybrid scenarios. During construction and commissioning, the material and labour availability and cost are judged to be “moderate” risks which should be addressed. Specific mitigation measures could include construction work monitoring by the Project Office, pre-purchases of specific equipment and ongoing discussions with appropriate construction firms so that they can integrate the Project into their planning. Rolling stock delivery times are another risk that should be managed properly in order to avoid delays, especially if the construction works meet the established deadlines. Likewise, the impacted existing public utilities should be surveyed on the site, in close collaboration with all stakeholders, to discover any undocumented public utilities and/or to reduce unforeseen conditions.
- Construction and commissioning could also experience delays for various reasons, including work not in accordance with the detailed design, Project scope change during construction, delays by contractors, budget underestimation related to inflation or fluctuation of material cost such as petroleum products or steel. In addition, the construction of major infrastructure such as higher-order tramway project within an already built environment impacts will impact the city centres as well as the residents and businesses. Disturbances during the construction and commissioning phase that will happen over a few years cannot be totally avoided but hey can be mitigated by measures such as service maintenance plans.
- Regarding maintenance and operation, the main risk factors are related to the performance of the chosen solution that could potentially not achieve the prescribed standards and expectations (travel time). In this event, the corrective measures required for tram and hybrid scenarios could be more complex to implement than in the case of a BRT. Likewise, maintenance work required to maintain the assets could prove to be more expensive than expected (tracks, signage, rolling stock, etc.) and unforeseen costs to be incurred could be significant, if applicable. If regular maintenance work is not being adequately funded during the operation, the outlay would be higher over the years and lead to asset depreciation. Information and security management systems could also be more expensive, and complex to set up than anticipated.

For the Ottawa side, the risk analysis revealed that while some risks are similar between the two insertion options, there are also some specific differences to highlight:

- Governance issues related to stakeholders’ clear roles and responsibilities, acceptability of impacts to other modes and potential delays associated with approval by the various bodies;
- More specifically, the at-grade insertion option on Wellington Street presents issues related to Parliament Hill accesses (coordination with the Judicial and Parliamentary precincts)
- More specifically, the Sparks tunnel insertion option is considered riskier due to soil conditions investigations still to be confirmed, the funding issues, and the impacts on underground infrastructure.

Table 2-27 Summary table of risks by option

SCENARIO	WELLINGTON AT-GRADE	SPARKS TUNNEL
T1	Very low: 7 Low: 17 Moderate: 24 High: 19 Very high: 6	Very low: 6 Low: 17 Moderate: 26 High: 19 Very high: 6
H1	Very low: 7 Low: 17 Moderate: 24 High: 19 Very high: 6	Very low: 6 Low: 17 Moderate: 26 High: 19 Very high: 6
H2A	Very low: 7 Low: 17 Moderate: 24 High: 19 Very high: 6	Very low: 6 Low: 17 Moderate: 26 High: 19 Very high: 6
H2B	Very low: 7 Low: 17 Moderate: 24 High: 19 Very high: 6	Very low: 6 Low: 17 Moderate: 26 High: 19 Very high: 6

OPPORTUNITIES

In terms of opportunities, the studied scenarios offer opportunities for redevelopment (densification and revitalization) along the axis of the higher-order system, particularly in the Val-Tétreau district, Île de Hull as well as other poles in western Gatineau such as the Plateau. The improved development of the Université du Québec en Outaouais (UQO) campus is also an opportunity.

The proposed scenarios also offer significant opportunities for enhancing the two city centres of Gatineau and Ottawa through user-friendly and high-quality urban developments allowing in particular to give back a lot of space to pedestrians, to liven up the public space and to allow a significant addition of trees and green spaces.

2.5.6 CAPITAL COSTS

The complete estimate of all scenarios was done at this stage (class D, -20/+100%), see Table 2-28. Amounts do not include applicable taxes and finance charges.

The following two tables present this complete estimate which considers updates to the project and conditions as the project has evolved over the course of this study, the downtown Gatineau planning layout retained options and the downtown Ottawa insertion retained options. The detail of the item breakdown estimate is presented in Table 2-29.

Option H2B combined with the at-grade insertion on Wellington Street is the least expensive, for a total of $2,880 M. While, Option H1 combined with the Sparks tunnel insertion is the most expensive option, for a total of $4,375 M.

Note that the chosen solution capital cost estimate for further refined again in stage 5, see section 3.15.

Table 2-28 Overall cost of the scenarios for the entire route in Gatineau and Ottawa

SCENARIO			Gatineau Total $million	Ottawa Total $million	Total [1] Total $million
T1	**Wellington**		2,447.1	584.7	**3,031.8**
	Sparks Tunnel	Minimum range	2,447.1	1,085.2	**3,532.3**
		Maximum range	2,447.1	1,452.3	**3,899.4**
H1	**Wellington**		2,718.0	584.7	**3,302.7**
	Sparks Tunnel	Minimum range	2,718.0	1,085.2	**3,803.2**
		Maximum range	2,718.0	1,452.3	**4,170.2**
H2A	**Wellington**		2,620.1	584.7	**3,204.8**
	Sparks Tunnel	Minimum range	2,620.1	1,085.2	**3,705.4**
		Maximum range	2,620.1	1,452.3	**4,072.4**
H2B	**Wellington**		2,156.5	584.7	**2,741.2**
	Sparks Tunnel	Minimum range	2,156.5	1,085.2	**3,241.7**
		Maximum range	2,156.5	1,452.3	**3,608.7**

Note 1: For ease of presentation, the amounts for each item have been rounded to the nearest tenth, based on the detailed data in the cost estimate source file.

Note 2: Class D Estimate -20% to +100% margin of error

[redacted]

Item		T1 Wellington	T1 Sparks Tunnel Min	T1 Sparks Tunnel Max	H1 Wellington	H1 Sparks Tunnel Min	H1 Sparks Tunnel Max	H2A Wellington	H2A Sparks Tunnel Min	H2A Sparks Tunnel Max	H2B Wellington	H2B Sparks Tunnel Min	H2B Sparks Tunnel Max
A	Professional fees and project office	[redacted]											
B	Transit system	[redacted]											
C	Stations (2)	[redacted]											
D	Land	[redacted]											
E	Network deviation	[redacted]											
F	Urban planning	[redacted]											
G	Civil Engineering Works	[redacted]											
H	Garage	[redacted]											
I	Rolling Stock	[redacted]											
J	Related operations	[redacted]											
Total $million		[redacted]											
Contingency (35%)		[redacted]											
Risks (20%)		[redacted]											
Price indexation 2026 (2020 to 2026 at 2.1%/year)		[redacted]											
Total $million (excluding taxes)		[redacted]											

[redacted]

2.5.7 MAINTENANCE AND OPERATIONAL COSTS

The annual operating and maintenance expenses are presented in Table 2-30 for scenario 0 and each of the eight studied scenarios. The differentiated annual expenses were calculated by subtracting the amount of expenses in Scenario 0 from the amount of expenses arising from the Project. Values are presented in 2019 constant dollars on an undiscounted basis.

Regarding the operating costs, their estimate has been based on service schedules, service routes and used types of vehicles. For example, for the at-grade insertion option on Wellington, scenario H2A would imply a higher level of service than scenario 0 due to the higher passenger volume. Therefore, this scenario would increase operating costs by around [redacted]. On the other hand, the three other scenarios combined with the at-grade insertion option on Wellington, namely T1, H1 and H2B, would reduce the current operating costs of the public transit system, by around [redacted], mainly due to the decrease in service hours compared to Scenario 0. The latter is also the main factor in the variation in costs between different scenarios.

The scenarios combined with the tunnel insertion option would, alternatively, have an upward effect on operating costs in the order of [redacted]. Indeed, the tunnel portion increases the operating costs by around [redacted] compared to the at-grade insertion option on Wellington.

As for the maintenance costs, their estimate has been based on data from comparable projects recently completed. The LRT portion is based on the Waterloo LRT in Ontario, while the BRT portion is based on the Rapibus in Gatineau. For the Sparks Street tunnel portion, maintenance costs typically account for 1% of capital expenditures. The median value of capital expenditures is estimated at [redacted] for comparable projects. Therefore, the tunnel component of the Project will require [redacted] of maintenance work annually. In short, maintenance expenditures for the tunnel insertion option are between [redacted], and between [redacted] for the at-grade insertion option on Wellington.

Table 2-30 Annual maintenance and operation, in 2019 $M

Item	Sc. 0	Tunnel				Wellington			
		T1	H1	H2A	H2B	T1	H1	H2A	H2B
Annual Expenses									
Operation	35.2	38.8	38.8	39.5	38.3	34.8	34.8	35.5	34.3
Maintenance (minor and major)	0.0	23.7	25.3	25.0	24.0	16.4	18.1	17.7	16.7
Total	**35.2**	**62.5**	**64.1**	**64.5**	**62.3**	**51.2**	**52.8**	**53.2**	**51.0**
Annual Expenses delta (Proposed scenario – Scenario 0)									
Operation	0	3.7	3.6	4.3	3.1	-0.3	-0.4	0.3	-0.9
Maintenance (minor and major)	0	23.7	25.3	25.0	24.0	16.4	18.1	17.7	16.7
Total	**0**	**27.4**	**29.0**	**29.3**	**27.1**	**16.1**	**17.7**	**18.0**	**15.9**

[redacted]

Table 2-31 and Table 2-32 show the maintenance cost calculation details for, respectively, the tunnel insertion option and the at-grade insertion option on Wellington. As noted, these costs were calculated according to the length of the three main components of the Project (tram, BRT and tunnel) and the comparable projects unit maintenance cost.

Table 2-31 Annual Maintenance cost estimation Data and Methodology for the tunnel insertion option

Variable	Unit	Value of tunnel insertion option				Source
		T1	H1	H2A	H2B	
Length						
Tramway	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	STO
BRT	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	
Tunnel	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	
Maintenance costs						
Tramway	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	WSP (comparable projects)
BRT	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	
Tunnel	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	
Total maintenance costs						
Tramway	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	Calculations
BRT	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	
Tunnel	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	
Total	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	

Table 2-32 Annual Maintenance cost estimation Data and Methodology for the Wellington at-grade insertion option

Variable	Unit	Value of Wellington at-grade insertion option				Source
		T1	H1	H2A	H2B	
Length						
Tramway	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	STO
BRT	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	
Maintenance costs						
Tramway	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	WSP (comparable projects)
BRT	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	
Total maintenance costs						
Tramway	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	Calculations
BRT	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	
Total	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	

2.5.8 BENEFIT-COST ANALYSIS

Since the project is a public transport project, the methodology used is essentially based on the benefit-cost analysis (BCA) guide published by the Quebec Ministry of Transport (MTQ, 2016)[6]. According this guide, the objective of a BCA is to determine the option that achieves the greatest economic benefit, that is, the one that maximizes the return on investment for the society.

The monetization of benefits to society is achieved from the inputs already discussed [redacted] including: mobility [redacted], construction costs [redacted]), operating costs of the public transport system [redacted], Ottawa insertion additional studies (Report 3B) as well as the compilation of updated performances [redacted]. The benefits and costs of the Project are estimated by comparing the eight scenarios, i.e. scenarios T1, H1, H2A and H2B, each combined with one of the two insertion options in Ottawa, namely the tunnel insertion option under Sparks Street and the at-grade insertion option on Wellington Street7. The results obtained, for the eight scenarios studied, are then compared with those of the reference scenario (Scenario 0 status quo improved).

The retained assumptions of this BCA are as follows:

- As per the standard BCA procedure, project is divided in two different phases:
  - Pre-construction phase (including planning, preliminary studies, concepts and detailed design, Environmental Impact Assessment and Review and land acquisitions. This phase would start in 2022;
  - Construction work phase would be completed in 2028 with the commissioning and opening of the network;
  - Thus, the Project benefits would start to materialize in 2028.
- Analysis period: this period begins in 2022 and ends in 2057, including 30 years of operation (2028-2057) and an annualization factor of 220 days;
- Study area specific monetized inputs are prioritized;
- The benefits and costs for society are estimated in 2019 constant dollars and then discounted at a rate of 2.37%, in accordance with the MTQ benefit-cost analysis guide (2016);
- A benefit-cost analysis of this nature usually focuses on the Quebec value of a project. However, this project of implementing a higher-order public transport system in the Gatineau's wets end is a complex and unique project due to its geographic location. Indeed, rare are the public transport projects which, in addition to covering two different cities, also overlap two provinces. In this interprovincial project context where there are so many metropolitan interactions between the two shores, it was not considered useful to limit the analysis to the study area. This approach may have a marginal influence on the results since the entire Ottawa-Gatineau region is considered. However, since the benefits are attributable to all the scenarios, this was therefore not impacted the final scenarios positioning results.

NON-MONETIZABLE BENEFITS

Given that the analysis framework of the *Guide de l'analyse avantages-coûts des projets publics en transport routier* 2016 of the Quebec Ministry of Transport is very precise and specific in terms of the elements to be analyzed, it is to be noted that even though they are not addressed in the above, they are other project benefits such as public transit reliability, accessibility and comfort, intermodality and social equity. Though they cannot be monetized, these opportunities and benefits are significant:

- Reliability of the public transit system;
- Accessibility and comfort for users;
- Attractiveness and competitiveness
- Economic vitality;
- Structuring effect;
- Active modes and health benefits;
- Social equity;
- Connection with other existing higher-order public transport networks of Gatineau and Ottawa.

RESULTS

By extrapolating the calculations of monetizable benefits and costs over the analysis period, from 2022 to 2057, and applying the discount rate of 2.37%, the results of the BCA are summarized in Table 2-33. Among out of the eight studied scenarios, only H2B paired with the at-grade insertion option on Wellington is economically profitable for society according to the analyzes requested by the Benefit-cost analysis guide from the Ministry of Transports du Québec (2016), that is to say, the benefits reported by the Project exceed the costs arising from the construction and operation of the structuring transport system with a net present value of $75M. This implies a benefit-cost ratio of 1.03. As expected, the Sparks Street tunnel insertion option involves higher capital costs, so that none of the four scenarios combined with this insertion option is economically profitable, since their benefit-to-benefit ratio costs is less than one. In general, the studied scenarios combined with the at-grade insertion option on Wellington Street generally present a better benefit-cost ratio than these same scenarios combined with the tunnel insertion option. For example, scenario T1 shows a ratio of 0.70 when paired with the tunnel insertion option while its ratio is 0.90 when paired with the at-grade insertion option on Wellington.

However, it is important to remember that some benefits have not been quantified, due to the unavailability of data or the qualitative nature of these benefits. If quantified and monetized, these benefits could turn out to be relatively large, including benefits related to health, social equity, accessibility, etc. The Sparks Street tunnel insertion option has non-monetized benefits, such as reliability of the public transport system, accessibility and comfort for transport users, social equity and the benefits of transport in common, when paired with active transportation modes. If monetized, these benefits would increase the benefit-cost ratio significantly. The at-grade insertion option also has non-monetized advantages in terms of improving the urban development of the heart of the national capital with its possibilities of pedestrianization and addition of green spaces to emphasize the symbolism of this location.

6 Ministère des Transports du Québec, 2016 (Quebec Ministry of Transportation). *Guide to benefit-cost analysis of public road transport projects*. Lien : https://www.transports.gouv.qc.ca/fr/entreprises-partenaires/entreprises-reseaux-routier/guides-formulaires/documents-gestionprojetsroutiers/guideaac-methodologie.pdf

7 Since the at-grade Wellington option's variant (with or without circulation) has little impact on the public transit demand, the analysis was, therefore, made with only the "with traffic" variant.

Table 2-33 Summary of Benefit-Cost Analysis (2019 values in $M discounted at a rate of 2.37%, 2022-2057)

Advantages	Category	Tunnel				Wellington			
		T1	H1	H2A	H2B	T1	H1	H2A	H2B
Economic Benefits		*1 636*	*1 472*	*1 786*	*1 775*	*1 691*	*1 497*	*1 789*	*1 797*
Safety Benefits		*56*	*48*	*63*	*60*	*62*	*49*	*65*	*63*
Environmental Benefits		*365*	*360*	*375*	*372*	*371*	*361*	*376*	*374*
Total benefits (TB)		2 057	1 881	2 224	2 207	2 123	1 906	2 230	2 233
Capital Costs (CAPEX)		2 753	2 954	2 881	2 538	2 236	2 437	2 364	2 021
Variation of operational costs (OPEX)		483	512	518	479	284	312	318	280
Residual value (VR)		210	240	234	197	156	186	180	143
Total benefits of project with residual value (ATP = TB + VR)		2 267	2 121	2 458	2 404	2 279	2 093	2 410	2 376
Project total cost (PTC = CAPEX + OPEX)		3 237	3 465	3 399	3 017	2 520	2 749	2 683	2 301
Net Value (VAN = ATP - PTC)		-969	-1 344	-941	-613	-241	-656	-272	75
Benefit-cost ratio (BCR)		0,70	0,61	0,72	0,80	0,90	0,76	0,90	1,03

SENSITIVITY ANALYSIS

The purpose of the sensitivity analysis is to test the results of the BCA towards variation of certain model parameters that involves some uncertainty. Parameters that are subject to this sensitivity analysis include: discount rate, capital expenditure, discount factor and accident costs.

The benefit-cost ratio is used as the main variable to compare the different results of the sensitivity analysis presented in Table 2-34. Note that when the sensitivity parameters vary, the discount rate remains unchanged at 2.37%. Thus, we can see that the discount rate has a significant influence on the results: the benefit-cost ratio for the most advantageous scenario, i.e. H2B-Wellington, decreases from 1.03 to 0.68 when the rate increases by 2.37%. at 5%. With respect to capital expenditures, these influence the results of AAFC in a significant way. When costs exceed 25% of initial value, i.e. the average of the range considered, none of the eight scenarios analyzed is economically profitable for society.

The annualization factor also significantly influences the BCA results. When the assumption of 180 days/year instead of 220 is used, time savings as well as VKP during peak periods simultaneously decrease. This explains the significant drop in the benefit-cost ratio for all eight scenarios.

Finally, BCA's results are hardly sensitive to changes in accident costs. When the accident costs are reduced to the amounts estimated by MTQ (2016) using the human capital method ($2.9 M for the cost of fatal accidents instead of $4.4 M and $711 k for the cost accidents with serious injuries instead of $ 1.1M and $ 90.2k for the cost of accidents with minor injuries), the benefit-cost ratio decreases from 1.03 to 1.02.

Table 2-34 Sensibility Analysis results on benefit-cost ratio

Item	Value	Tunnel				Wellington			
		T1	H1	H2A	H2B	T1	H1	H2A	H2B
Discount rate	2.37%	0.70	0.61	0.72	0.80	0.90	0.76	0.90	1.03
	5%	0.46	0.40	0,47	0.53	0.59	0.50	0.59	0.68
Capital expenses	25% more than initial value	0.58	0.50	0.60	0.66	0.74	0.62	0.74	0.85
	25% les than initial value	0.89	0.78	0.92	1.01	1.16	0.98	1.15	1.33
Annualization factor	180 days/year instead of 220	0.59	0.52	0.61	0.67	0.76	0.64	0.76	0.87
	260 days/year instead of 220	0.81	0.70	0.84	0.92	1.05	0.88	1.04	1.20
Accident costs	Average accident cost using the human capital method (fatal = 2.9 M$; seriously injured = 711 k$; minor injuries = 90.2 k$) *	0.70	0.61	0.72	0.79	0.90	0.76	0.89	1.02
	Average cost of accidents by willingness-to-pay method plus difference between this one and the human capital method (fatal = 5,9 M$; seriously injured = 1,5 M$; minor injuries = 184,8 k$)	0.71	0.62	0.73	0.80	0.91	0.77	0.91	1.04

Green: above Benefit cost ratio

Red: below Benefit cost ratio

* the lower values are very slightly lower (some are even equal due to rounding)

2.5.9 MAIN FINDINGS OF REPORT 4

The analyzes results summary is presented in next page Table 2-35.

The H1 and H2A scenarios are similar and both present a higher performance than T1 and H2B in the area of land use planning, given the service to the northern portion of the Hull island, and have the best connection with the Rapibus and east of Gatineau. However, despite its significant benefits, they have some disadvantages such as encroachments in Gatineau Park, due to boulevard des Allumettières widening (between the Lac-des-Fées Bridge and rue Champlain), the highest capital costs, and insufficient residual capacity in the medium and long-term.

The H2B scenario is the lowest-cost scenario and has several advantages, especially its good service to the north of the Hull Island. However, this scenario does not serve the Plateau sector as well and has some disadvantages such as encroachments in Gatineau Park, due to boulevard des Allumettières widening (between the Lac-des-Fées Bridge and rue Champlain), the highest capital costs, and insufficient residual capacity in the medium and long-term.

This lack of residual capacity in the medium and long-term, which greatly affects the hybrid scenarios, is linked to the increased reliance on BRT. In fact, given the capacity of very limited reception of the bridge and the Ottawa's downtown streets, the increase in demand will generate additional connection on the Quebec side in order to limit the number of buses on the Portage Bridge and in downtown Ottawa.

Scenario T1 has a higher cost per km but due to its shortest route, its overall cost remains in the average of the other scenarios. This scenario emerges as the best performing in the areas of Mobility and accessibility and Environment and health, and closely follows scenarios H1 and H2A on the land use planning area. This scenario also presents one of the best benefit-cost balances due to high benefits, but at a lower cost than the H1 and H2A scenarios. In addition, it's significantly higher residual capacity for the post-2031 horizon is a decisive advantage (the only scenario to have sufficient residual capacity in the medium and long-term).

Although all the scenarios are efficient and they all meet the main objectives of the study, namely sustainable mobility, reduction of greenhouse gas emissions and better connection with regional transport networks, the T1 scenario stood out by offering greater viability and certain net advantages such as:

- A higher transportation residual capacity that allows more flexibility to answer the mid and long-term users demand as well as to develop other higher-order system in the Gatineau-Ottawa metropolitan region.
- No encroachment into sensitive areas of Gatineau Park and less impact on the land environment;
- A very significant reduction in the number of buses in downtown Ottawa (70% fewer than the current number).

2.5.10 DOWNTOWN OTTAWA INSERTION OPTION

The Sparks Street tunnel insertion option is favoured due to its more efficient connection with the LRT O-Train network than benefit destinations beyond downtown Ottawa, and for its lesser impact on other transportation modes. However, this option is more expensive and comes with higher risks. Indeed, it would be important to determine the tunnel size, the foreseen construction methods as well as the new link impact to the already built O-Train in order to refine the anticipated capital costs.

The at-grade insertion option on Wellington Street (with or without traffic) remains interesting due to its lower costs with an economy of a $700M and its opportunity to improve the urban space quality in a prime location such as Parliament Hill. On the other hand, this option presents challenges of accesses in coordination with the ongoing Judicial and Parliamentary precincts redevelopment projects. Depending on the chosen variant (with or without traffic), the impacts on traffic and/or on Confederation Boulevard design standards differ. This option also presents higher risks of possible interruptions during special events such as special festivities or public events.

Results of additional studies, as per those listed below, should lead to a final optimal choice.

1. Detailed traffic studies for all downtown intersection to identify impacts and potential mitigation measures
2. Coordination with currently undergoing projects of Judicial and Parliamentary precincts
3. Establish the governance structure and buy-in from all partners to carry out the work;
4. Coordination with the potential interprovincial loop: insertion methods and technological compatibility;
5. Pedestrian tunnel Detailed study between STO Lyon Station and O-train LRT station.

2.5.11 DOWNTOWN GATINEAU DEVELOPMENT OPTION

It is **recommended to retain both development options 2 and 3**, with Laurier Street closed or partially closed to vehicular traffic, since they both offer an adequate compromise between the quality of urban spaces, the operation and performance of public transit as well as traffic conditions.

- These two development options offer better conditions for circulation and operation of public transit, as they make it possible to manage the Maisonneuve/Portage intersection by prioritizing the movement straight ahead for access to the Portage Bridge.
- They also offer an opportunity to free up space for the enhancement of the city centre through friendly and high-quality facilities, in particular helping to achieve the City of Gatineau's development objectives by animating the north facade of the ZIBI buildings and the south facade of the Saint-James block. The significant addition of vegetation along the Laurier Street axis would contribute to the achievement of the partners' objectives regarding the city centre heat islands reduction;
- However, they have impacts on the trucking network that will require a review of the metropolitan-wide trucking network.
- They also result in a slight rearrangement of traffic on the Allumettières / Alexandra route, thus adding some specific constraints on this already congested axis, particularly at the roundabouts near Saint-Joseph.
- Given the importance and potential of this sector, a battery operation has been planned from Montcalm Street (no aerial grid) to contribute to the anticipated aesthetic quality of public spaces.

Results of additional studies, as per those listed below, should lead to a final optimal choice.

1. Review of the metropolitan trucking network (NCC);
2. Local buses network review, for both STO and OC Transpo lines that are foreseen being maintained in this area. A parallel ongoing study is already started on the matter "Study of preferential measures for buses - Terrasses de la Chaudière and Montcalm station";
3. Detailed traffic analyzes for the extended downtown Gatineau area municipal and provincial road network, especially to identify mitigation measures regarding the anticipated negative impacts (boulevard des Allumettières / Alexandra bridge route);
4. Metropolitan traffic analysis between the two city centres and in coordination with future projects on both sides of the river, including the Chaudière crossing and Portage Bridge and their respectives approaches.

Discussions with partners (Ville de Gatineau, PSPC, residents and property owners) will also be required for coordination purposes with their respective ongoing projects which may lead to optimizations. The parallel study in progress "Study of preferential measures for buses - Terrasses de la Chaudière and Montcalm station" is already initiating these coordination efforts in connection with, among others, the renovation project of the Terrasses de la Chaudière, the pedestrian crossings and the realignment of traffic in this area.

Table 2-35 Studied Scenarios Performance review summary

Item		T1	H1	H2A	H2B
Brief description		Fully operated with an urban tramway mode on two branches - North via Saint-Raymond/du Plateau; - South via le chemin d'Aylmer. The system meets and has a common segment East of St-Raymond	Hybrid operation with two distinct branches - North: Urban tramway on Allumettières/du Plateau; - South: BRT on Alexandre-Taché/d'Aylmer.	Hybrid operation with two distinct branches - North: BRT on Allumettières/du Plateau; - South: Urban tramway on Alexandre-Taché/d'Aylmer.	Hybrid operation with two distinct branches - North: BRT on Allumettières; - South: Urban tramway on Alexandre-Taché/d'Aylmer.
Capital cost as per Ottawa pairing option ($2026 in million)	At-grade on Wellington	Rank 2 3,031.8	Rank 4 3,302.7	Rank 3 3,204.8	Rank 1 2,741.2
	Sparks Tunnel	Rank 2 3,532.3 to 3,899.4	Rank 4 3,803.2 to 4,170.2	Rank 3 3,705.4 to 4,072.4	Rank 1 3,241.7 to 3,608.7
Risk Analysis	Quebec side	No significant differences between the scenarios			
	Ottawa insertion option	Rang 1: Even tough deemed less risky, Wellington at-grade still has some risks related to Parliament Hill access in coordination with Judicial and Parliamentary precincts as well as being more sensitive to interruptions in case of special events Rang 2: Sparks tunnel deemed riskier due to soils conditions and construction methods still yet to be defined			
Multi account evaluation	Quebec side	Rank 1 - A higher transportation residual capacity that allows more flexibility to answer the mid and long-term users demand. - No encroachment into sensitive areas of Gatineau Park - Lesser impact on Land; - Lower impact on traffic circulation - Buses volume reduction of 70% in downtown Ottawa	Rank 2 - Generally lower benefices in Mobility and accessibility, and in Impacts on the environment and health areas - Better performance in Land Use Planning area - Most expensive option - Similar evaluation to H2A.	Rank 2 - Generally lower benefices in Mobility and accessibility, and in Impacts on the environment and health areas - Better performance in Land Use Planning area - Costs higher than T1 and H2B. - Similar evaluation to H2A.	Rank 3 - Generally lower benefices in all areas (lesser quality service of Plateau) - Most economical option
	Ottawa insertion option	Rank 1: Sparks tunnel is favoured due to it better connection with the LRT O-Train and its lesser impacts on other transportation modes. But this option is the most expensive one. Rank 2: Wellington offers an increase opportunity to improve the urban spaces with a lesser cost but has bigger impact on vehicular traffic and built environment			
Benefice-cost Analysis (BCA) Benefit cost ratio (BCR) Net Value (VAN) in $2019		Rank 2 Wellington: 0.90 | VAN -241 M$ Tunnel: 0.70 | VAN -969 M$	Rank 3 Wellington: 0.76 | VAN -655 M$ Tunnel: 0.61 | VAN -1,344 M$	Rank 2 Wellington: 0.90 | VAN -272 M$ Tunnel: 0.72 | VAN -941 M$	Rank 1 Wellington: 1.03 | VAN +75 M$ Tunnel: 0.80 | VAN -613 M$

Note: Wellington includes two different variants, with or without traffic. Since there are no significant differences between both variant options, the short version of "Wellington" was used to lighten the table presentation.

3 REPORT 5 – DESCRIPTION OF THE CHOSEN SOLUTION

The description of the elements presented in the following section do represent the project developed for the purposes of the study and to confirm its feasibility. This description represents the direction in which more detailed studies should continue in later stages. However, the project remains young and the additional studies and technical data that will follow could most likely influence some aspects and details.

3.1 ROUTING

As shown in Figure 3-1, the proposed tramway is located on two routes, with a section in common, to the downtown areas of Gatineau and Ottawa:

- Northern branch: Vanier/Plateau/Saint-Raymond;
- South branch: Allumettières/Wilfrid-Lavigne/Aylmer/Alexandre-Taché;
- Shared section (between Saint-Raymond station and the Ottawa terminus): Alexandre-Taché/Lucerne/railway right-of way/Laurier/Portage Bridge/Ottawa terminus via Sparks with tunnel.

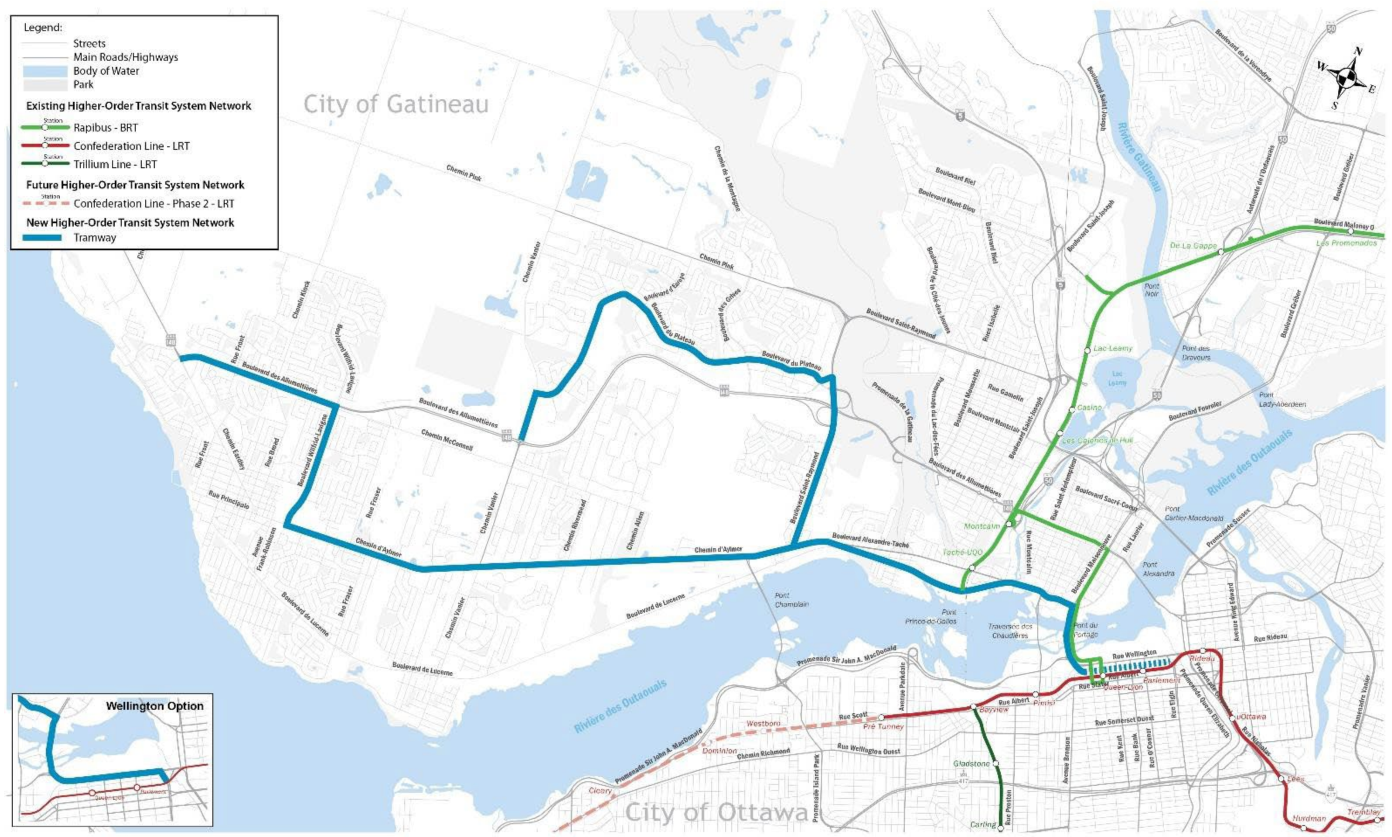


Figure 3-1 Basic scenario all tramway T1

Table 3-1 Basic all-tramway scenario T1 – length of infrastructure

		Length of infrastructure to be built (m)	Length of both lines in operation (m)
All tramway T1 scenario	North Branch (Le Plateau)	7,965	13,245
	South Branch (Aylmer)	10,595	16,145
	Shared section towards city centres	5,550	-
	TOTAL	**24,110**	**29,390**

The rail mode chosen is a "light" category of the "urban tramway" type, with speeds similar to those of cars. The insertion is integrated into the urban development (no fences or barriers except on the Allumettières section because of the posted speed of 70 km/h) and based on an approach of sharing the right-of-way with other modes of transportation (cars, cyclists and pedestrians). From a technical point of view, the insertion of an urban tramway in a central location, with traffic light control when general traffic has to cross this infrastructure, remains the most efficient option in terms of user safety, traffic management and operation of the public transit system.

The layout of the tramway is therefore based on an at-grade insertion and a central right-of-way. This type of insertion poses relatively few problems in the current section. The management of intersections is, however, more complex in terms of the location of stations and the management of turning movements. These aspects have been addressed and are discussed in subsequent sections. In summary, the plotting is based on the following premises:

- The higher-order route is laid out as a central right-of-way on the Gatineau side (except in specific cases due to site conditions as such as Lucerne Boulevard segment and Portage Bridge);
- Stations are usually positioned downstream of intersections:
  - The residual space is thus recovered for the construction of left-turn lanes upstream of the intersections. This will allow for better control and safety readability of the movements of all users;
  - In some rare cases, the limited physical space available, the location of a major trip generator, a major transfer location or other factors may prompt the location of platforms upstream of the intersection.
- The assignment of traffic lanes was done in accordance with the City of Gatineau's Land Use and Development Plan (SADR):
  - In the rare cases where the limited physical space available has forced the removal of roadways, these areas have been studied locally to measure the impacts.
- On the Quebec side, cycling facilities are planned along the entire length of the higher-order route, in accordance with Gatineau's bicycle network plan adopted in 2018:
  - In the rare case of limited physical space (e.g., St-Raymond Viaduct) or different planning (i.e. downtown Ottawa), an effective alternative was sought (e.g. two-way roadside path);
  - Wherever possible and relevant, the new bike path will be linked to the existing or planned City of Gatineau bike network. By virtue of vehicular flows and detailed sector analysis, physical separations may be required.
- 2m wide sidewalks on both sides with safe pedestrian crossings at intersections to access all stations including consideration for universal accessibility (physical and cognitive);
- To minimize impacts (encroachments and acquisitions) on the built environment, roadside parking, where it exists, is rarely retained;
- The preliminary design of each segment to date has considered all the data currently available (see previous reports) to validate the feasibility of implementation in relation to local and environmental constraints and specific mobility and accessibility issues.

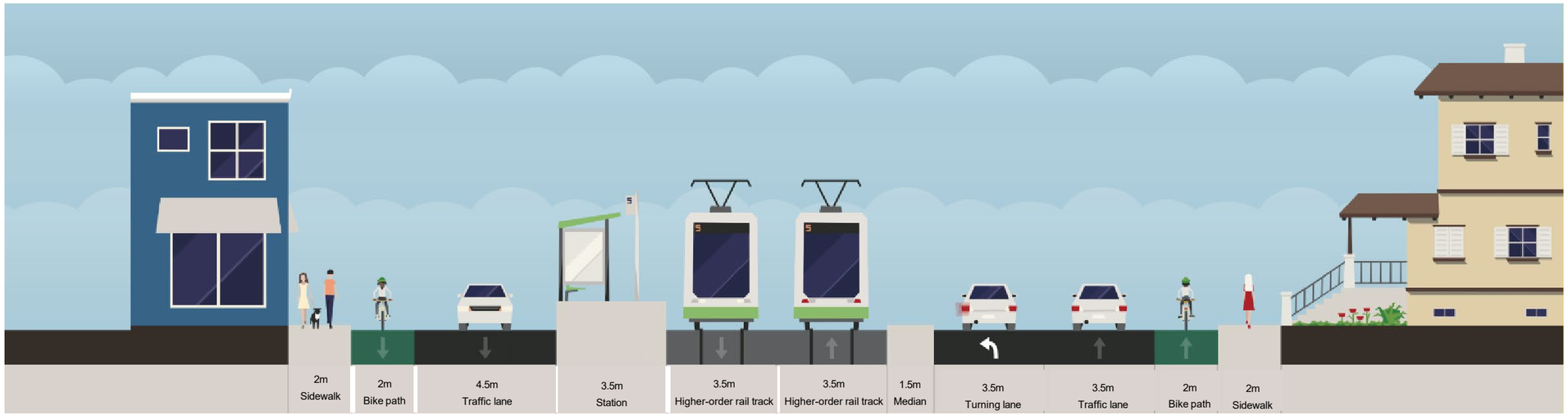


Figure 3-2 Typical cross-section intersection insertion

Figure 3-3 Development concept on Boulevard du Plateau

3.2 ROLLING STOCK – URBAN TRAMWAY

The urban tramway will be operated by a conductor since it will operate on city streets, although the technological situation could continue to evolve and some sections in automatic mode could be considered. The vehicle considered for the purposes of the study is a low-floor urban tram with overhead power supply via an overhead contact line (OCL), with a width of about 2.65 m, a length of about 48 m and a capacity of ~300 passengers. The rolling stock used could be like that of Ottawa, Toronto or Waterloo, although other models will be considered as the market develops and technology evolves. The refinement of the project could consider vehicles of different dimensions or could foresee longer vehicles and/or the possibility of platform extensions. Vehicles are typically fitted with bike racks inside and could also be fitted with cross-country ski racks in winter.

Figure 3-4 Confederation Line Light Rail, Ottawa

Figure 3-5 ION Line Light Rail, Waterloo

3.3 STATIONS

Le concept architectural des stations devra faire l'objet d'une attention toute particulière lors de l'avant-projet, afin de s'assurer d'avoir des infrastructures bien intégrées à leur environnement.

3.3.1 TYPICAL PLATFORM LAYOUT

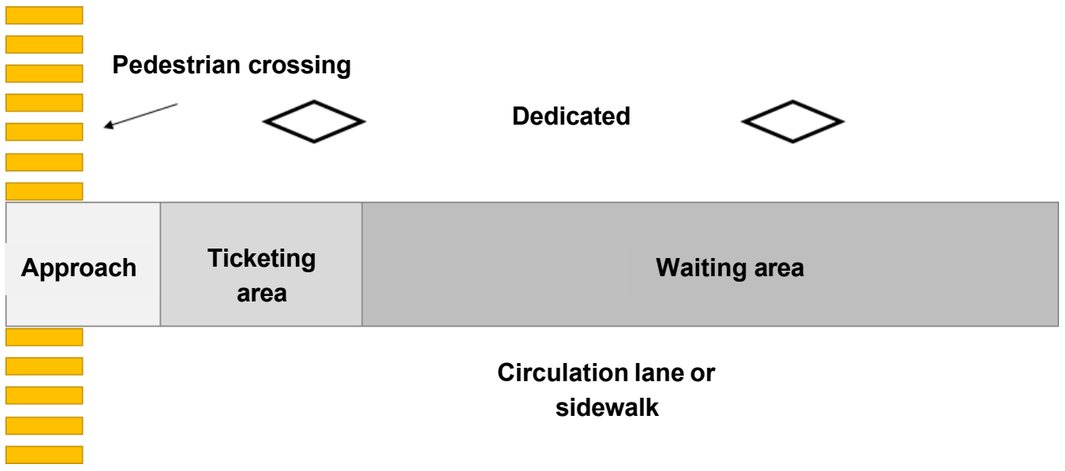


Figure 3-6 Identification of the zones of a station

As illustrated in the figure above, the station platforms, in and of themselves, are composed of three distinct areas, namely:

- **The approach or ramp:** This area is included between the pedestrian crossing and the ticketing area and could be developed into a universally accessible ramp when required to access the elevated portion of the platform;
- **Ticketing area:** This area includes all facilities for users to purchase tickets but may also include signage. The STO could consider adding turnstiles or other ticket control devices, although an honour ticketing system could be used;
- **Waiting area:** This area is the most important in terms of space. Approximately 20 m to 50 m long, depending on the length and the number of vehicles stopping at a time, this area is semi-enclosed, without doors and will be lined with glass panels and will typically include the following elements:
  - A shelter for users offering weather protection;
  - Benches and/or seats;
  - Signage elements such as the name of the station, the direction, signs;
  - Garbage and recycling bins;
  - Pedometer strips to direct the visually impaired;
  - Proper lighting to create an engaging and safe environment;
  - A supplementary heating system.

Outside the station, but intrinsic to its operation, pedestrian crossings are part of the station experience. They must be designed to allow safe and efficient circulation of users between the sidewalk and the platforms and to anticipate the effects of mass traffic when trains disembark. Bicycle parking spaces will be provided near station where possible. Though, all stations (or most of them) should be equipped with bicycle racks. Their location will be identified according to each station more detailed study and planning.

In order to be easily accessible to the majority of users, stations must be aligned in a straight line so as to avoid gaps between the platform and the rolling stock in the event of a curve and thus facilitate the transition between the platform and the vehicle, in the case, for example, of the front wheels of a wheelchair or a pushchair. The gap between the rolling stock and the platform should therefore not exceed 5 cm horizontally and 2 cm vertically, with cross slopes of less than 2%, both on station platforms and on the access pavements to them. The final levelling of the platforms is regulated by the design of the details of the edge height, the shape of the ramp or, for example, by lowering the road/railway.

LYON - MODULE DE SERVICE

Figure 3-7 Examples of tram station shelters in Lyon

3.3.2 LOCATION OF T1 STATIONS

A total of 36 stations are located along more than 24 km of tramway infrastructure, with an average inter-station length of 688 m. The nine stations in the common section of the city centres are operated jointly by the two branches.

Table 3-2 Station Locations – Scenario T1

SCENARIO		LENGTH (M)	NUMBER OF STATIONS	AVERAGE INTERSTATION (M)
T1 (Tramway)	North Branch (Le Plateau)	7,965	12	664
	South Branch (Aylmer)	10,595	15	706
	Shared section towards city centres	5,550	9	694
	TOTAL	**24,110**	**36**	**688**

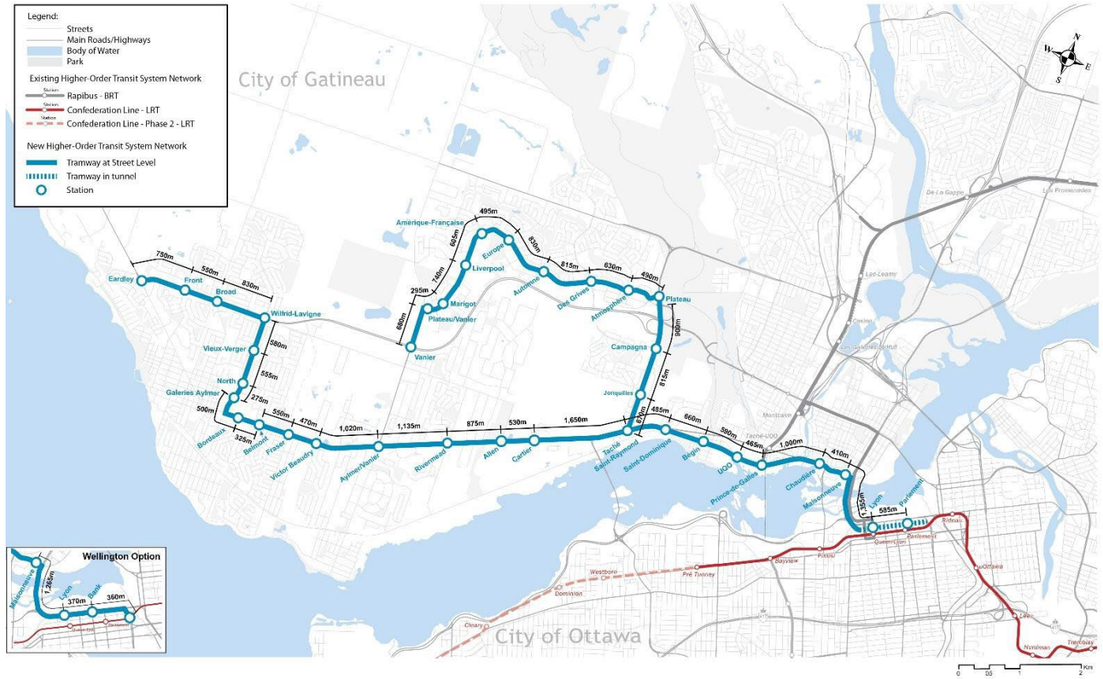


Figure 3-8 Proposed stations for the implementation of the T1 tramway scenario

3.4 INTERMODALITY

To promote sustainable mobility and intermodality objectives, the project also includes active mode infrastructure. Indeed, the goal is to coordinate the different transportation modes infrastructure to offer flexibility to meet the users demands variations in their travel needs (daycare, grocery store, meeting, school, show, training, etc.). Promoting intermodality for local trips, i.e. offering the possibility to use different modes of transport during the same trip, with public transport being one of them, has added value for the environment and health.

On a large scale, this intermodality is based on the connection and coordination between the various public transit networks, whether between higher order versus local and via user-friendly and efficient connections at transfer hub locations.

On a smaller scale, since all public transit users are primarily pedestrians and / or cyclists, the quality of stations accessibility is crucial (collective and sustainable transport planning First and Last Mile theory). Promoting this intermodality is done by planning user-friendly, safe and easy-to-access facilities so that the user can grasp its full potential. The key element is having an interface that minimizes the inconveniences associated with mode change.

The study did address intermodality at a high-level design by providing nearly 12 km of sidewalks as well as 9 km of bike paths along the route, thus covering 94% of the project's linear (sidewalks not required on one of the two sides along Boulevard des Allumettières between Chemin Eardley and Boulevard Wilfrid-Lavigne). This network will offer important connection points to existing networks and various surrounding neighbourhoods.

However, a more detailed analysis remains to be done as part of the next project stage. This includes studying the detailed needs of pedestrians and cyclists such as.

- Detailed review of existing and future park-and-ride dedicated infrastructure to ensure safe stations access by pedestrians and cyclists;
- Detailed of existing and future park-and-ride and transfer hubs bike parking facilities (secure shelter protected from bad weather, lockers, repair stations, etc.).
- A detailed review of bicycle parking potential locations at higher-order stations (shelter protected from bad weather, lockers, bicycle stations, etc.) i.e., land available or to be acquired;
- Integration of bicycle racks / spaces in the tram wagons design;
- Additional measures for pedestrians and cyclists are recommended beyond this higher-order project scope. These additional measures require coordination with partners and include, among other things:
  - Ensure north-south sidewalks are provided to safely connect neighbourhoods to stations;
  - Ensure the bike paths continuity and connectivity to facilitate either stations and/or destination access;
  - Provide a new multifunctional path through the University site (UQO) to connect the north neighbourhood to the UQO station;
  - Redevelop the public space in the Terrasses de la Chaudière area.

3.5 TYPICAL INSERTION BY SEGMENT

The study's analyses were organized based on a segmented breakdown of potential routes. This approach is applied in particular with regard to insertion parameters, the impact on existing networks and human and biological environments, and road safety. As illustrated in the figure below, the route of the selected scenario, i.e. all T1 tramway, is composed of the following segments:

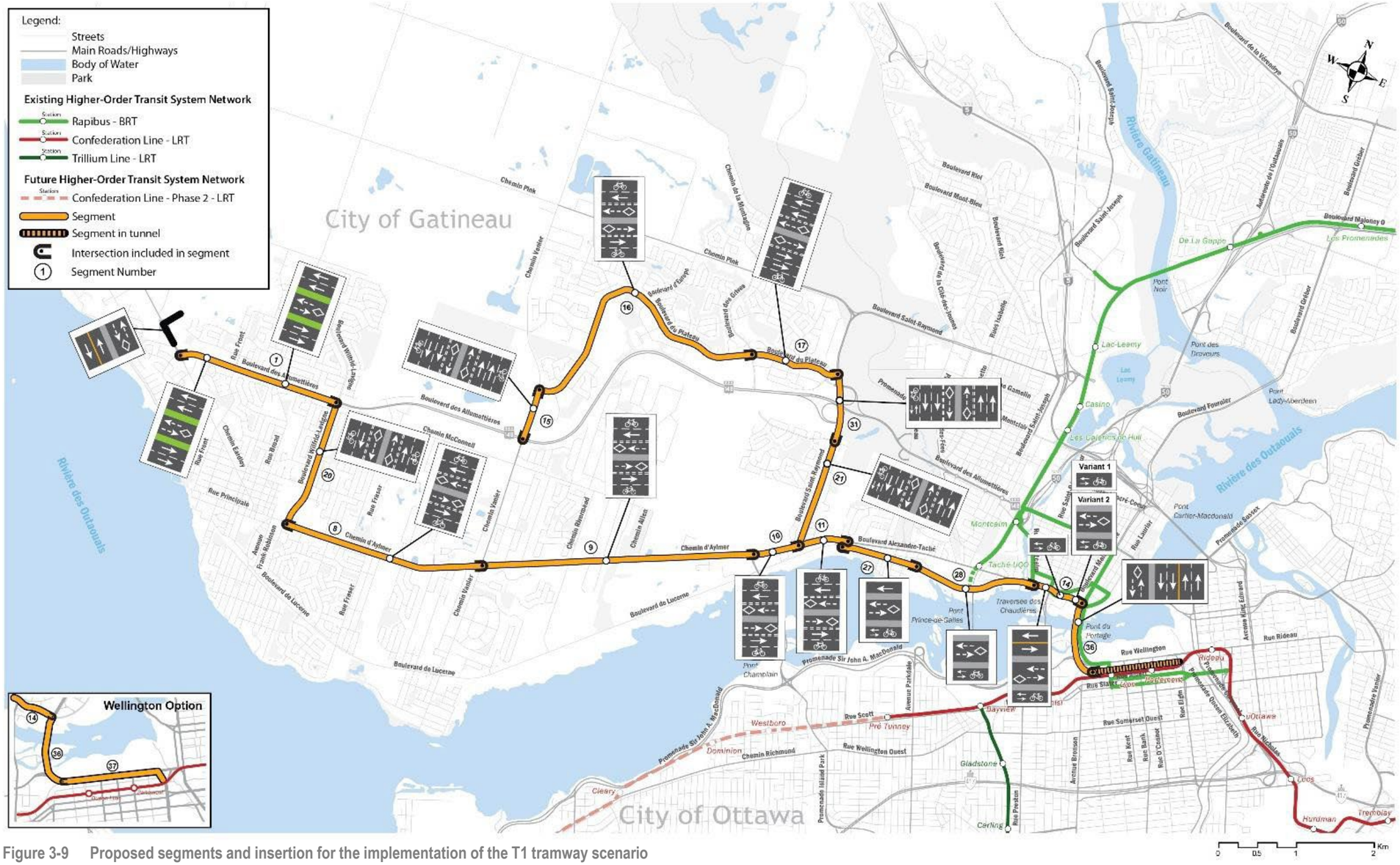


Figure 3-9 Proposed segments and insertion for the implementation of the T1 tramway scenario

The following, more detailed, insertions and implementation measures are recommended.

Table 3-3 Tramway insertion and proposed implementation measures by segment

Segment	Route	from	to	Insertion	Implementation action
North Branch					
15	Vanier	Allumettières	Plateau	central	
16 and 17	Plateau	Vanier	Saint-Raymond	central	Removal of on-street parking Replacement of roundabouts with traffic light intersections [redacted]
31 and 21	Saint-Raymond	Plateau	Alexandre-Taché	central	Reinforcement and reconfiguration of the Saint-Raymond Viaduct lanes and addition of a footbridge for active modes of transportation parallel to the viaduct
South branch					
1	Allumettières	Eardley	Wilfrid-Lavigne	central	Installation of “New Jersey” barriers on the two central medians for safety reasons
20	Wilfrid-Lavigne	Allumettières	Principale	central	Removal of on-street parking
8.9 and 10	Aylmer/ Alexandre-Taché	Wilfrid-Lavigne	Saint-Raymond	central	Closure of some intersections
Shared section					
11	Alexandre-Taché	Saint-Raymond	Saint-Dominique	central	
27	Lucerne	Saint-Dominique	Belleau	on the south side	Removal of on-street parking One-way traffic west of Lucerne
28	Emprise ferroviaire	Belleau	Montcalm	on its own with a lateral platform	Replacement of the railway bridge over Brewery Creek and the Prince of Wales Bridge railway right-of-way Creation of a bus terminal near the Prince of Wales Bridge
14	Taché/Laurier	Montcalm	Eddy	on the south side	Removal of one lane per direction
	Taché/Laurier	Eddy	Maisonneuve	on the north side	Traffic suppression Reinforcement of the parking lot slab at Place du Portage and redesign of the westbound exit to Promenade du Portage Ability for buses to use the tramway right-of-way in the westbound direction
36	Portage Bridge	Maisonneuve	Wellington	on the west side	Reconstruction of Portage Bridge and other structures to support tramway loads Extension of pedestrian tunnels under the road Ability for buses to use the tramway right-of-way in both directions (additional studies required to determine the final location of the tram route on the bridge)
Tunnel	Sparks	Portage Bridge	Metcalfe	in tunnel	Crossing of the green space west of the Provinces and Territories Park at the southern end of the Portage Bridge Construction of a tunnel under Sparks Street to accommodate the tramway, probably at an elevation similar to the O-Train tunnel
37 (option)	Wellington	Portage Bridge	Elgin	on the north side	Variant with or without traffic (additional studies required)

3.6 SAFETY AND TRAFFIC

Although the insertion of a tramway into the urban fabric increases the road accident risks associated with the management of different modes and movements, it is nevertheless the central insertion that is considered the safest in terms of facilities for pedestrians and cyclists. Risk assessment is based on a multitude of elements contribute to the safety of a road: its geometry, its use, its signalling elements, and the behaviour of users. The improvement of safety depends on extremely detailed elements which are not yet defined at this stage and which will have to be analyzed in the subsequent phases (exact timing of the traffic lights, exact position of the bus stops, pedestrian access routes, precise phasing of the traffic lights, etc.).

However, an initial analysis was made in the context of this study, regarding the main safety issue of left turns that cross the tramway infrastructure. It is important that this movement be protected by lights to limit conflicts. This analysis also considered the need to add traffic light intersections between the stations to ensure adequate accessibility for residents and the various neighbourhoods crossed to avoid fracturing the urban fabric. The introduction of this new mode in the region will result in behavioural changes for all users (pedestrians, cyclists, public transit users and motorists).

To promote the user safety feeling, we recommend standardizing the intersection layout so that users fully understand the priorities given to each mode (urban tram, pedestrians, cyclists, and motorists). The figure below shows the existing traffic signal intersections to be retained or new traffic signals to be considered.

The following figure indicates the intersections equipped with traffic lights, both existing to maintain and new.

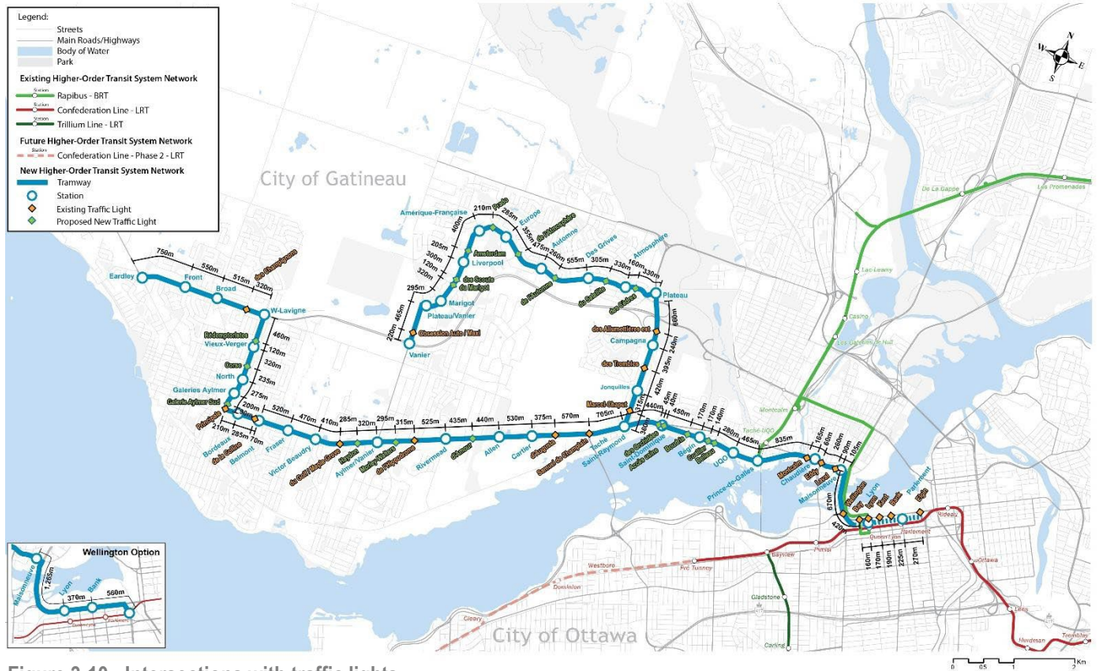


Figure 3-10 Intersections with traffic lights

3.7 POSSIBLE OPTIONS AND VARIANTS

As mentioned, and described previously in sections 2.5.10 and 2.5.11, the results of the additional studies planned at the pre-project stage should lead to identify the best approach among the development options in downtown Gatineau and among the insertion options in downtown Ottawa.

3.8 URBAN NETWORKS

As mentioned, and described previously in section 2.13, several interventions are to be planned along the entire route to minimize, or even avoid, conflicts with existing underground and overhead infrastructures.

3.9 REQUIRED STRUCTURES

Each structure along the route was identified and evaluated for the addition of the tramway tracks. This evaluation was made according to the various standards and rules in effect at the time of the study for each of the structures, depending on whether they are dedicated to the use of the higher-order route or shared with road traffic.

Regarding engineering structures, the implementation of a tramway on the Aylmer and Le Plateau branches will result in the following main measures. It should be noted that detailed structural studies will be required in the preliminary design phase in order to define more precisely the extent of the work to be carried out on each structure.

Table 3-4 Structures affected or required for the implementation of the tramway

SEGMENT	MEASURE
North Branch	
17	Culvert in the ruisseau des Fées, ± 150 m long
31	Reinforcement and reconfiguration of lanes and addition of a bicycle path at the Saint-Raymond Viaduct
21	Relocation of the retaining wall along the Château residences (east side).
South branch	
8, 9 and 10	Various retaining walls
Shared section	
28	Reconstruction of the bridge over Brewery Creek
	Reconstruction of the bridge over the Prince of Wales railway
14	Reinforcement of the slab and reconstruction of the Portage IV garage exit portal
36	Bronson Channel Bridge and Portage Bridge Reconstruction
	Reconstruction of the bridge over the escape tunnel
Sparks Tunnel	New structures across the park between the Portage Bridge and the tunnel portal (structures at the service road crossing, bike paths and retaining walls)
	Tram tunnel under Sparks, with 2 stations, entrances and pedestrian connections to O-Train stations

3.10 FREQUENCY AND SERVICE

The tramway would operate with two separate services:

- Le Plateau North Branch — downtown Gatineau and Ottawa;
- Aylmer South Branch – downtown Gatineau and Ottawa.

The tramway could be operated with frequencies in the order of:

- Peak hours: 6 minutes on each branch, 3 minutes on the shared section;
- Other periods: 10 minutes on each branch, 5 minutes on the shared section;
- A service from 5 a.m. to 1 a.m. (20 hours of operation per day) but could be extended.

The trams will be turned around at the three terminals (Aylmer, Le Plateau and Ottawa) by reversing the direction of traffic with lane changes downstream or upstream of the terminal station, depending on the space available. The ultimate service frequency used for the design of the intersections, track layout and equipment will have to be determined at a later stage.

Although typically more robust than bus facilities, the rail mode is more susceptible to disruption in the event of a breakdown. Hence the importance of minimizing the risk of a shutdown by obtaining a priority power supply, by planning to avoid the presence of pipes under the network and by establishing a preventive plan for temporary alternative service.

3.11 PUBLIC TRANSIT OFFER

Scenario T1 allows for a drastic reduction in the number of buses in downtown Ottawa, a 70% reduction from current volumes, while maintaining a significant residual of capacity to handle post-2031 demand growth. The various possibilities for expanding the network and the constraints that these could pose for the development will also have to be studied in a later phase.

Refer to Figure 3-13, at the end of section 3.12, for the complete higher-order network components.

3.11.1 CONNECTION WITH OTHER HIGHER-ORDER NETWORKS

One of the main project objectives was to provide high-quality connections between all higher-order networks namely the new western higher-order route with the Rapibus and Ottawa O-Train, and the Rapibus-O-Train.

RAPIBUS

Since the downtown Gatineau are is with rails within the T1 scenario, diverting the Rapibus lines to Laurier Street was not considered. Indeed, it is rather envisaged maintaining the current principle of operation, that is to say a Rapibus line (less volume) ending on the Quebec side (would be slightly extended from the current UQO station to the future Prince-de-Galles station) and the other Rapibus lines (larger volumes) going to downtown Ottawa via Allumettières and Maisonneuve boulevards. This maintenance of Rapibus services to city centres makes it possible to maintain the current number of connections for users in the eastern sector of the City of Gatineau while securing the reliability of their travel time. Chaudières station is expected to be the main hub of downtown Gatineau.

Although not currently planned, the preliminary design will need to examine the potential implications on the tunnel, the Portage Bridge and downtown Gatineau in order to plan a development compatible with a conversion of the Rapibus to rail or the development of another tramway line in Gatineau. Although not planned, this analysis is important in order to confirm certain design parameters for components that would be very difficult to change following the implementation of the tramway (e.g. platform and station sizing).

O-TRAIN

The implementation of a higher-order route will increase the frequency and reliability of service to the west and the Ottawa side. Since scenario T1 ends underground on the Ottawa side, the connection with the O-Train Confederation line will be very fluid. Transfers will be possible at Lyon and Parliament stations. The addition of a pedestrian tunnel at the Parliament Terminal to Elgin Street would provide easier access to destinations further east, such as the University of Ottawa, the Byward Market and the Rideau Centre.

In a metropolitan vision of transport, the T1 scenario connecting Gatineau to Ottawa also offers Ontario users a large transport capacity to meet their interurban mobility needs, either to or from transport hubs located on the Quebec side.

RAPIBUS- O-TRAIN

In order to avoid an additional transfer for riders in eastern Gatineau, Rapibus buses will access downtown Ottawa via the Portage Bridge (shared traffic with the tramway on dedicated lanes, although stops will not be shared). The main connection point with the O-Train Confederation Line will be the Lyon station. Transfers will be possible near the station's entrances at the Lyon/Queen intersection.

3.11.2 CONNECTION WITH LOCAL BUS SYSTEMS – STO AND OC TRANSPO

Given the size of the study area, many users will use local buses to get to the higher-order service. The aim is to evaluate the feeder and integration options for the various services to optimize coverage and quality of service, while maintaining reasonable operating costs.

Four objectives were developed in collaboration with the STO in order to undertake the reorganization of the network:

- Objective 1: Maintain current coverage;
- Objective 2: Support and feed the higher-order network;
- Objective 3: Ensure continuity in public transit travel;
- Objective 4: Contribute to the reduction of the number of buses in downtown Ottawa.

A high-level analysis validated the feasibility of reorganizing the bus networks according to the following principles:

- A portion of the STO's buses will feed into the tramway in downtown Gatineau to reduce the number of buses running in downtown Ottawa;
- A reorganization of STO and OC Transpo bus services in downtown Gatineau to adapt to the constraints related to the implementation of the tramway/BRT on Laurier Street;
- A redistribution of STO line services through Ottawa on the three planned routes to better balance bus volumes per route.

REORGANIZATION OF THE STO'S LOCAL NETWORK IN WESTERN GATINEAU

A reorganization of the STO's local bus network in western Gatineau is proposed, structured around two lines that support the higher-order network and seven feeder lines. In order to promote the integration of the various public transit networks, several multimodal hubs are proposed, with the following characteristics, see Figure 3-11:

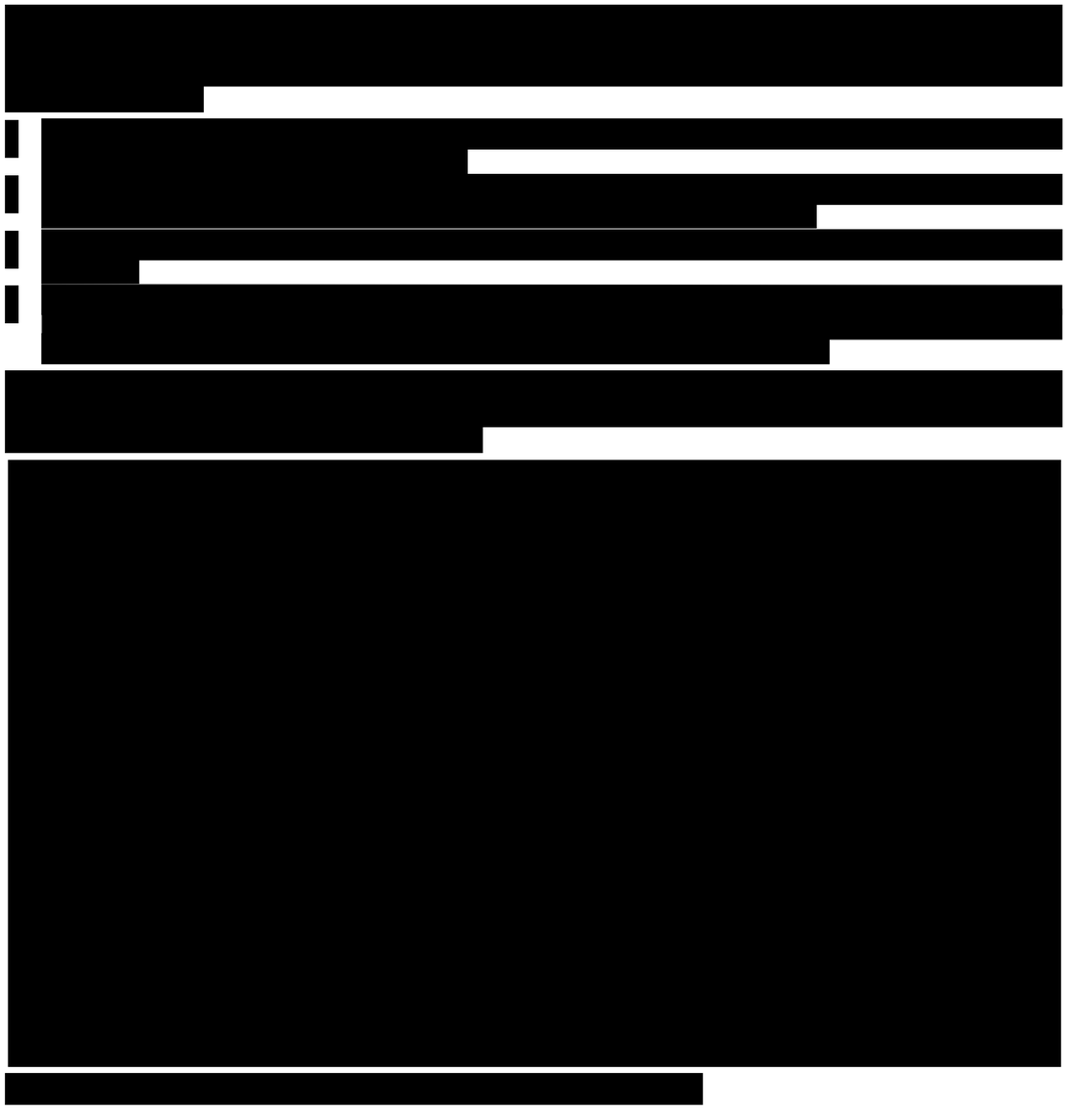
- des Allumettières /Terminus:
  [redacted]
- ylmer Galleries:
  [redacted]

- Rivermead Park-and-ride:
- Vanier Park-and-ride:
- Europe:
- Plateau:
- Prince of Wales:
-

Gatineau downtown:

- Ottawa downtown:

3.11.3 EXAMPLE OF A MAJOR MULTIMODAL HUB DESIGN



3.12 PARK-AND-RIDE LOTS

The implementation of a higher-order service is also intended to attract a greater number of users from outside the city to take public transit, in addition to offering an efficient service to users whose origin or destination is located near the route. If the constraints of some of these users force them to use cars as a means of access, it is a question of accommodating them in such a way as to maximize the attractiveness of the system while minimizing the impact of parking in the residential areas near the stations. However, a balance with land use planning is required to encourage the establishment of activities near the stations. Any new site will also need to facilitate its subsequent conversion to another use.

In order to meet the demands of users wishing to use the public higher-order transit system, it is very important to establish an order of priority for access to the various stations. The priorities retained by the present study are the following:

1. Accessibility for active modes. To do this, pedestrian and bicycle structures must be provided to adequately serve the nodes of the higher-order network, including safe bicycle parking near stations;
2. Ensure good service from the local bus network to the stations of the higher-order network;
3. Allow and regulate on-street parking around stations;
4. Implement park-and-ride lots, strategically positioned to attract customers from outlying areas.

[redacted]

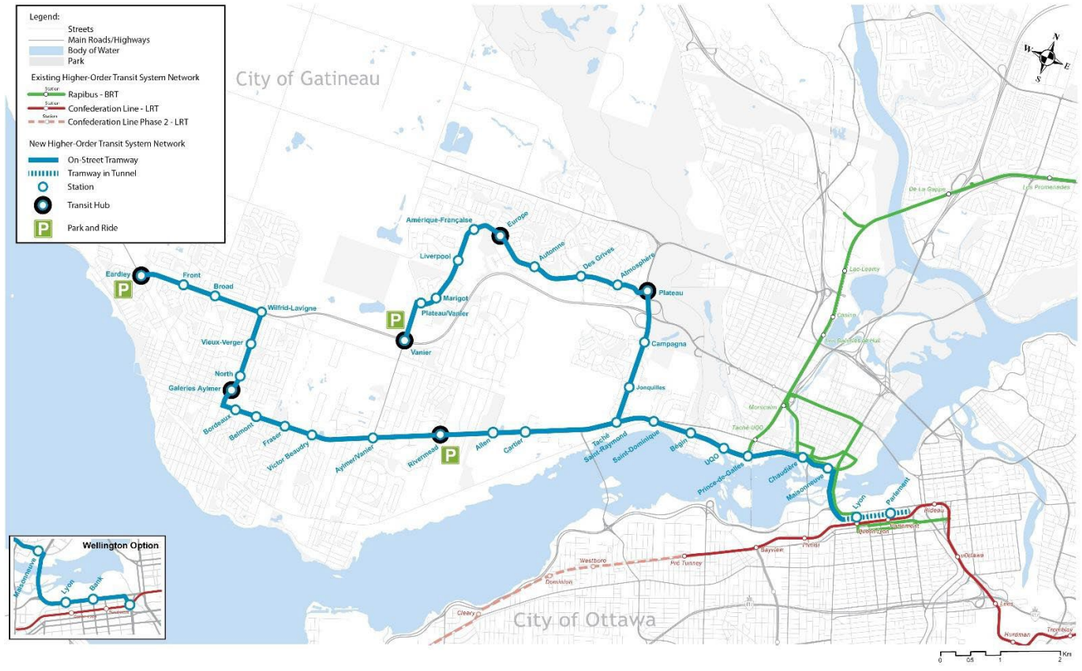


Figure 3-13 Complete higher-order network components

3.13 LOCATION OF THE MAINTENANCE AND STORAGE FACILITY

[redacted]

3.14 REMINDER OF ANALYSIS RESULTS

3.14.1 ACCESSIBILITY

As a reminder, mobility accessibility is the ease with which the destination, where the desired activities are located, can be reached based on the place of origin and the various transportation alternatives available.

It should also be noted that the travel times generated by the models and the calculations of car / transit travel time ratios are theoretical (based on perfect conditions). These results can vary a lot in real conditions, especially when the road network is at capacity, as is already the case on several axes in the Gatineau's west end. Indeed, when at capacity, a road network becomes very sensitive and fragile to any disturbance, even minor (rain, snow, clashes, etc.). Auto journey times are more strongly affected by this situation than a higher-order public transit located on its dedicated site. Considering that the modelling tools are not able to simulate this variability and sensitivity, the results obtained must be considered as being a public transit minimum competitive performance compared to car travel. We could therefore assume that the public transit system performance could only be better in real conditions. This better performance could also increase customer interest and potentially generate increased ridership on the network.

The map below also shows the accessibility on foot or by bicycle to the various planned stations of the higher-order mode. It is noted that a significant proportion of residents will be within walking distance of a station.

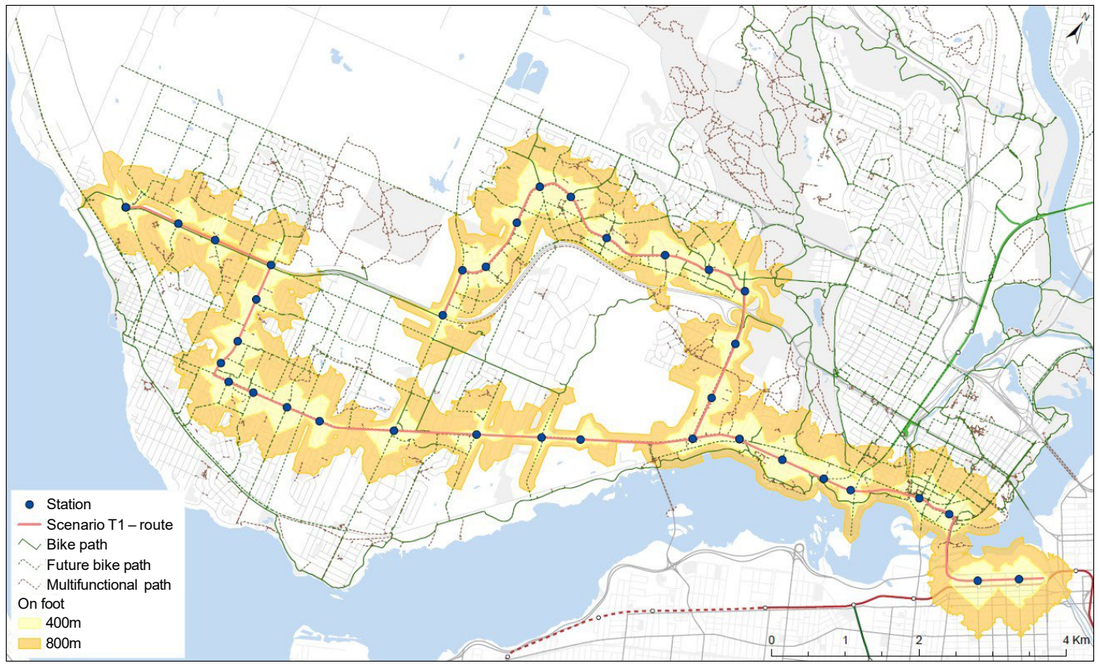


Figure 3-15 Stations and network accessible on foot within 400 and 800 m radius

3.14.2 TRAVEL EFFICIENCY – PUBLIC TRANSIT

ESTIMATED TRAVEL TIME ON THE TRAMWAY

Table 3-5 Estimated tram travel time – South Branch

South Branch (Aylmer)				
From	To	Distance between stops (m)	Time between stops (min)	Cumulative time (min)
Eardley	Front	750	2	2
Front	Broad	550	1	3
Broad	Wilfrid-Lavigne	830	2	5
Wilfrid-Lavigne	Vieux-Verger	580	1	6
Vieux-Verger	North	555	1	7
North	Aylmer Galleries	275	1	8
Aylmer Galleries	Bordeaux	500	2	9
Bordeaux	Bélimont	325	1	11
Bélimont	Fraser	550	1	12
Fraser	Victor Beaudry	470	1	13
Victor Beaudry	Aylmer/Vanier	1020	2	15
Aylmer/Vanier	Rivermead	1135	2	17
Rivermead	Allen	875	1	19
Allen	Cartier	530	1	20
Cartier	Taché/Saint-Raymond	1650	2	22
Taché/Saint-Raymond	Saint-Dominique	485	1	23
Saint-Dominique	Bégin	660	2	25
Bégin	UQO	590	2	27
UQO	Prince-de-Galles	465	1	28
Prince-de-Galles	Chaudière	1000	2	30
Chaudière	Maisonneuve	410	2	32
Maisonneuve	Lyon	1355	3	35
Lyon	Parlement	585	2	36

Note: Stop times at traffic lights have been considered. The purpose of these tables is to give an idea of the travel time on the tram from several points on the network. Operations further studies will refine these estimates.

Table 3-6 Estimated tram travel time – North Branch

North Branch (Le Plateau)				
From	To	Distance between stops (m)	Time between stops (min)	Cumulative time (min)8
Vanier	Le Plateau/Vanier	680	2	2
Le Plateau/Vanier	Marigot	295	1	3
Marigot	Liverpool	740	1	4
Liverpool	Amériques-Française	605	1	5
Amériques-Française	Europe	495	1	6
Europe	Automne	830	1	8
Automne	Grives	815	1	9
Grives	Atmosphère	630	2	11
Atmosphère	Le Plateau	490	2	12
Le Plateau	Louise-Campagna	900	2	14
Louise-Campagna	Jonquilles	815	2	16
Jonquilles	Taché/Saint-Raymond	670	2	18
Taché/Saint-Raymond	Saint-Dominique	485	1	19
Saint-Dominique	Bégin	660	2	21
Bégin	UQO	590	2	23
UQO	Prince-de-Galles	465	1	24
Prince-de-Galles	Chaudière	1000	2	26
Chaudière	Maisonneuve	410	2	28
Maisonneuve	Lyon	1355	3	31
Lyon	Parlement	585	2	32

Note: Stop times at traffic lights have been considered. The purpose of these tables is to give an idea of the travel time on the tram from several points on the network. Operations further studies will refine these estimates.

8 Numbers have been rounded, there could then be slight differences between cumulative versus segment time.

Report 6: Conclusions and recommendations

RIDERSHIP

Network traffic was estimated using the TRANS regional model covering the entire Gatineau-Ottawa region for typical weekday peak periods. This model was used for the 2031 horizon. However, since there are no tools that cover the post-2031 period and this is practically the horizon of the opening of the network, another projection was made for the 2051 horizon using ample data from the TRANS model, but taking into account several uncertainties (developments near the stations, the use of autonomous vehicles, economic growth and other factors).

Forecasts for 2031 indicate that the two tramways (Aylmer and Le Plateau) will have approximately 15,000 users in the morning peak period and 17,000 users in the afternoon peak period, or approximately 50,000 users per day [9]. Additional users will be added during off-peak periods (early morning, midday and evening, and weekends). Regarding ridership by station, the diagrams on the following pages show a gradual increase in ridership from Aylmer and Le Plateau, reaching a maximum load point near UQO/Prince-de-Galles (Rapibus transfer). Many passengers disembark in downtown Gatineau but are replaced by other passengers from Hull Island or elsewhere in Gatineau before the rest of the passengers disembark in downtown Ottawa for their destination or to transfer to the O-Train. In the afternoon, the opposite trend is observed.

The tramway is an essential tool to meet the study area projected transportation demand. In fact, public transit demand (tram and bus network) is expected to increase significantly from 12,500 morning users [10] in 2014 to nearly 18,000 users in 2031. Due to its lack of capacity, scenario 0 (improved status quo) won't be able to meet this demand and therefore this modal shift projection is not likely to occur. As for the T1 scenario, in addition to offering the capacity required to meet base demand, it even arouses, by offering a viable mode of mobility, new users' attraction and therefore increases the projected public transit to 21,000 morning users from the study area.

Scenario T1 allows for a modal shift of a significant number of motorists to public transit. Indeed, when comparing T1 scenario with Scenario 0 (status quo improved 2031), this T1 scenario attracts to public transit:

- In the morning peak period: nearly 3,000 new users;
- In the afternoon peak period: almost 4,000 new users;
- Nearly 2,500,000 additional users per year[11].

Expectations for the 2051 horizon, compared to 2031, are an average growth of 18% on the two tram lines, but the difference could be significant depending on several factors. For example, this could be influenced by the new technologies, the rate of population growth, the teleworking habits and other factors. Additionally, reduction and / or modification of travel trips patterns can be anticipated for the post-pandemic situation due to, yet to be known, changes in behaviour and habits (teleworking, home deliveries, etc.).

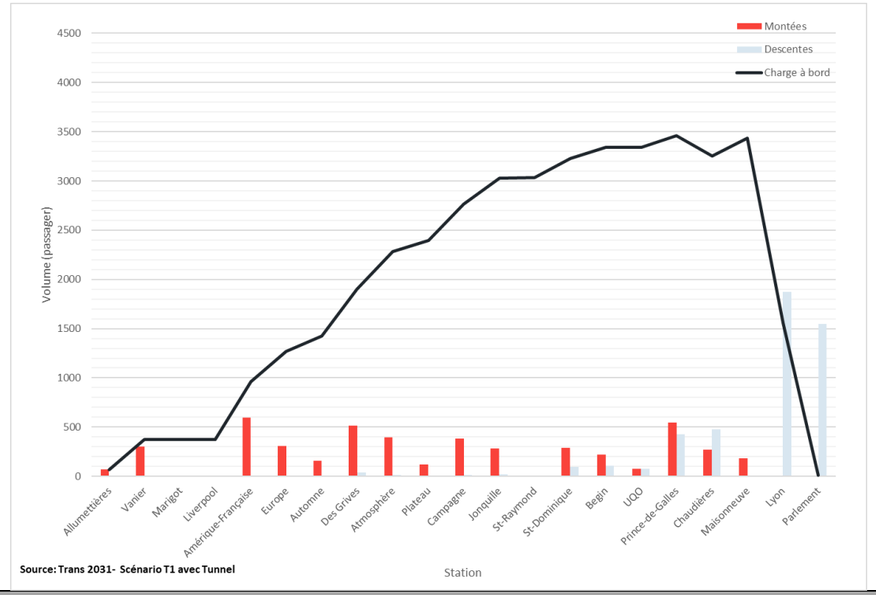
9 The daily estimate is based on the proportion of off-peak trips on the STO system according to the 2011 origin-destination survey. The higher-order mode offers much better travel conditions during off-peak periods and could have a much greater potential than estimated here.

10 Trips generated in Aylmer, Le Plateau, Hull periphery and Hull Island.

11 Assumes 50% more off-peak users on 250 equivalent days.

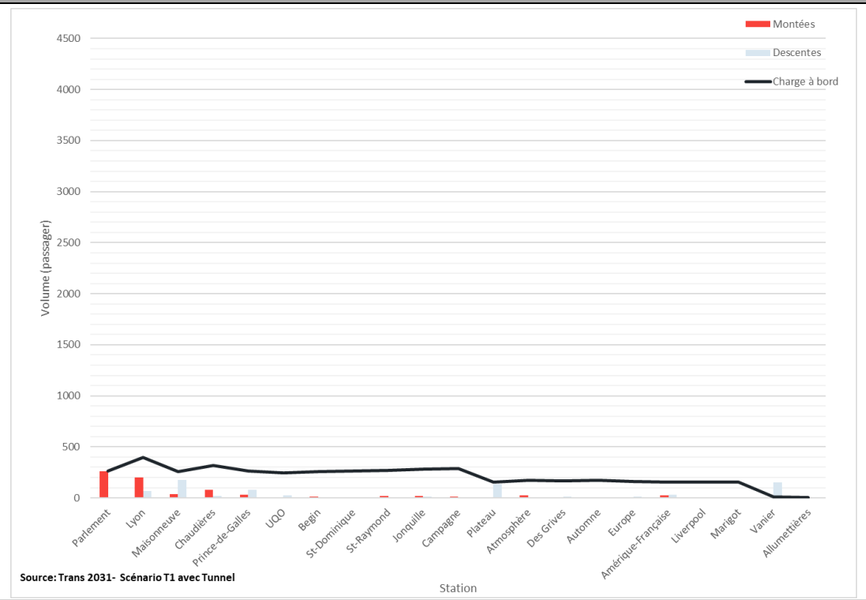
North Branch (Le Plateau) Morning peak period

Eastbound – Towards the city centres



Source: Trans 2031- Scénario T1 avec Tunnel

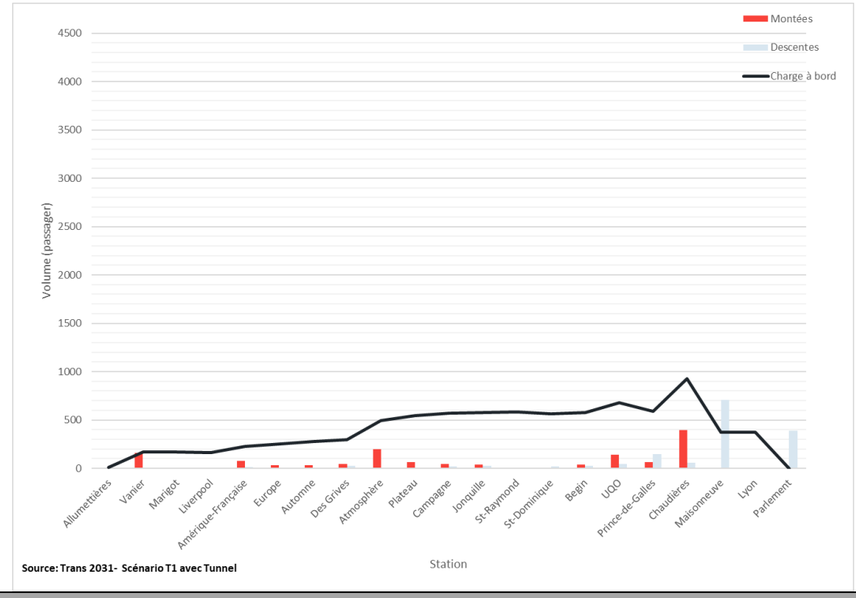
Westbound



Source: Trans 2031- Scénario T1 avec Tunnel

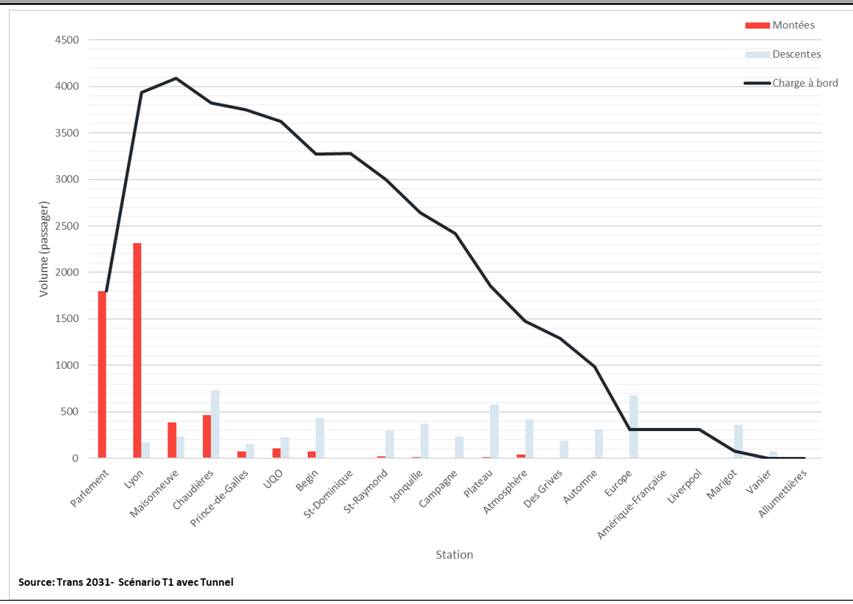
North Branch (Le Plateau) Afternoon peak period

Eastbound



Source: Trans 2031- Scénario T1 avec Tunnel

Westbound

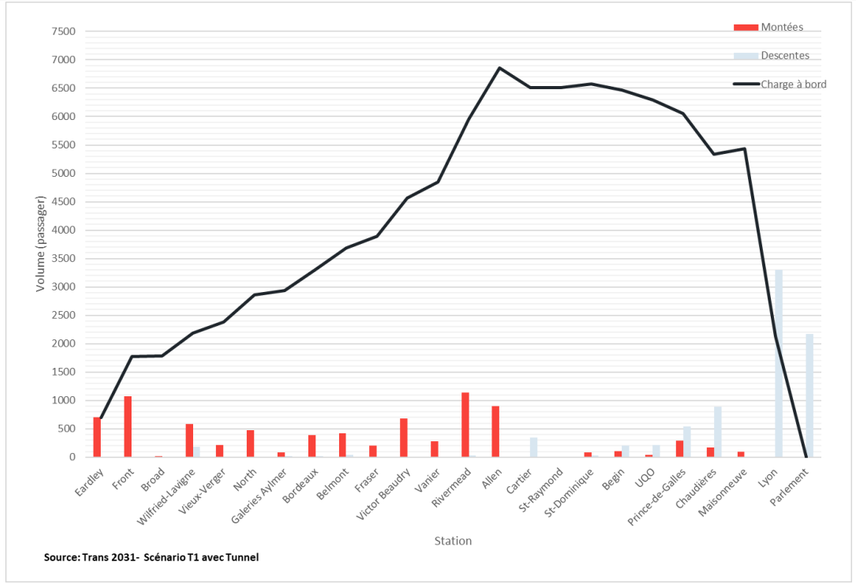


Source: Trans 2031- Scénario T1 avec Tunnel

Figure 3-16 North Branch Ridership diagrams

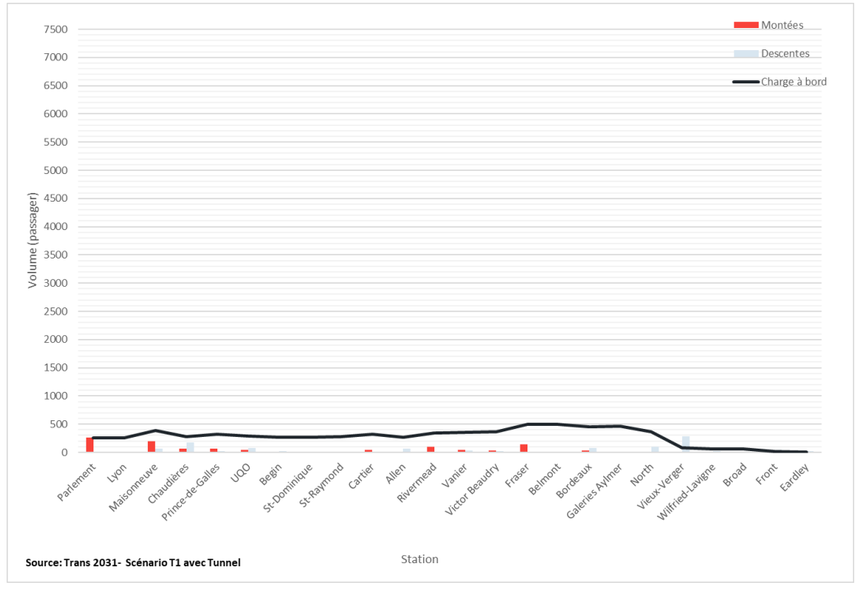
South Branch (Aylmer) morning peak period

Eastbound



Source: Trans 2031- Scénario T1 avec Tunnel

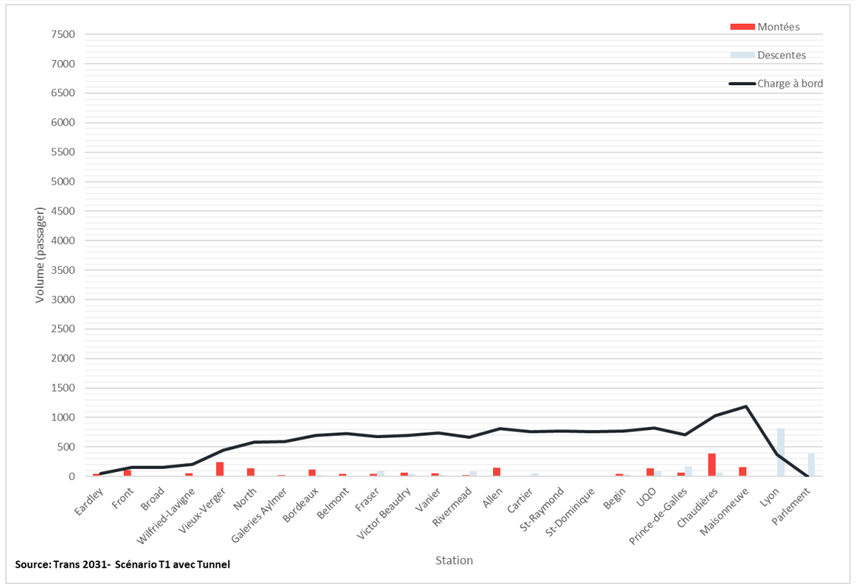
Westbound



Source: Trans 2031- Scénario T1 avec Tunnel

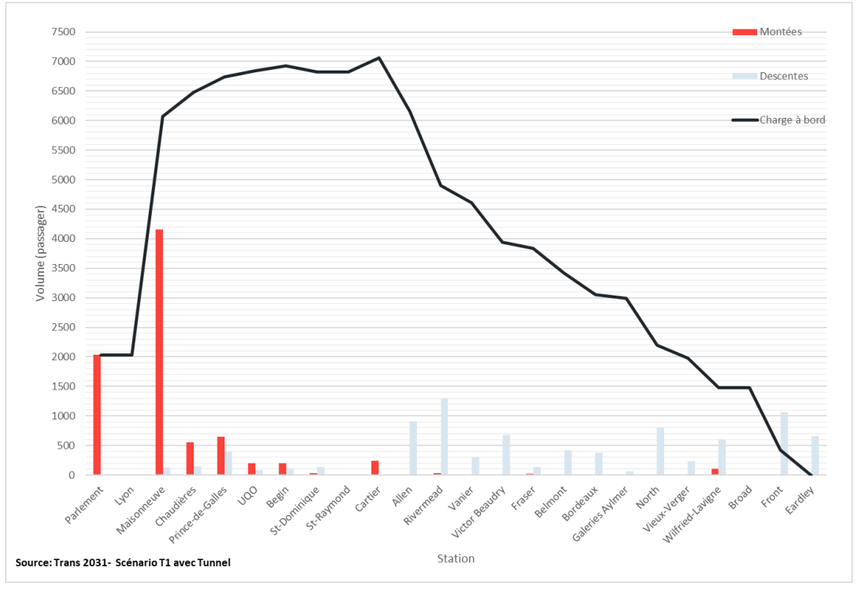
South Branch (Aylmer) afternoon peak period

Eastbound



Source: Trans 2031- Scénario T1 avec Tunnel

Westbound



Source: Trans 2031- Scénario T1 avec Tunnel

Figure 3-17 South Branch Ridership diagrams

3.14.3 MODAL SHARE DURING PEAK PERIODS

The impact on modal shares, presented in the table below, are for “TRANS” districts located inside the study area. It should be noted that some of these sectors extend beyond the study area such as “Hull Periphery” sector. The tram network is expected to increase the modal shares of public transit in the west (+ 3% to + 5% compared with the scenario 0 without tram in 2031) if we consider bimodal users (who use the public transit and another mode of transport for getting around) for the Aylmer, Plateau and Hull Periphery sectors, both during the morning and afternoon peak hours. These increases are even greater if we compare the 2014 modal shares. The changes are less important on the Hull Island (+ 1% to + 2%) since this sector attracts several trips throughout the region and the tramway mainly improves mobility in the western Gatineau sector.

Table 3-7 Projected modal shares during morning and afternoon peak periods

Area	Period	Horizon/Scenario	Car driver	Car passenger	Public transit	Bimodal	Bike
Aylmer	AM	2014	58%	21%	15%	3%	2%
		2031	57%	21%	18%	2%	3%
		2031 + T1 Tunnel	55%	19%	21%	3%	2%
	PM	2014	63%	23%	8%	3%	3%
		2031	59%	22%	14%	2%	3%
		2031 + T1 Tunnel	57%	20%	17%	3%	3%
Plateau	AM	2014	56%	18%	20%	2%	4%
		2031	56%	20%	19%	1%	4%
		2031 + T1 Tunnel	53%	18%	23%	2%	4%
	PM	2014	60%	22%	12%	2%	4%
		2031	58%	22%	14%	1%	6%
		2031 + T1 Tunnel	55%	20%	19%	1%	5%
Hull Périphérie	AM	2014	60%	17%	20%	1%	3%
		2031	59%	17%	20%	1%	4%
		2031 + T1 Tunnel	57%	16%	23%	1%	3%
	PM	2014	62%	18%	16%	1%	3%
		2031	61%	17%	18%	0%	4%
		2031 + T1 Tunnel	59%	16%	20%	1%	4%
île de Hull	AM	2014	51%	12%	32%	2%	4%
		2031	50%	12%	31%	2%	5%
		2031 + T1 Tunnel	49%	12%	32%	2%	5%
	PM	2014	53%	13%	28%	2%	4%
		2031	51%	13%	29%	1%	6%
		2031 + T1 Tunnel	49%	12%	31%	2%	6%

Note: Modal shares do not include walking and other modes (taxi, school, etc.).

3.14.4 TRAVEL EFFICIENCY – TRAFFIC

Since the road network has been at capacity since 2014, the difficulties currently observed in Gatineau Park, on the interprovincial bridges and in the downtown areas of Gatineau and Ottawa will deteriorate substantially in the future if no measures are implemented (Scenario 0 Enhanced Status Quo). The addition of a project for a higher-order public transit route partly solves this problem via the modal shift it brings.

The space in the reserved lanes (where carpooling is permitted on Chemin d'Aylmer, Alexandre-Taché and the Portage Bridge) will be reallocated to the use of the tramway's higher-order route, thus allowing for a major modal shift during peak periods. This reduction in demand for cars in favour of sustainable modes will lead to savings of more than one million hours of travel per year for Gatineau residents in 2031, in addition to the 1.4 million hours saved for public transit users over the same period.

However, the insertion of the higher-order route into the existing built environment also presents issues of traffic signal management and traffic conditions, particularly in the two downtown areas of Gatineau and Ottawa. Report 3B and Technical Note 32 mainly address this issue, respectively for the Ottawa and Gatineau downtowns. Impacts elsewhere on the network could be managed through mitigation measures (lengthening of storage lanes, addition of turn lanes, addition of traffic lights and others). However, the overall project reduces travel time for motorists and public transit, despite changes to traffic patterns in downtown Gatineau and the removal of carpool lanes, not to mention gains in travel time reliability.

3.14.5 LAND IMPACT – ACQUISITIONS AND ENCROACHMENTS

[redacted]

3.14.6 LAND OPPORTUNITY – DEVELOPMENT

The T1 scenario performs well in relation to land use planning in terms of:

1. Servicing the main activity clusters (number of clusters served and possibility of creating user-friendly living environments);
2. The development potential of the west (serving areas with potential, and complementing other projects planned on the corridors studied);
3. Consistency with regional planning;
4. The decline in household spending on transport;
5. Local and regional development.

Table 3-9 presents the service provided by scenario T1 in relation to the 11 activity clusters identified for the sector under study, i.e. the western sector of the city. The clusters considered are served by the public transit system if a station is located within 1 km of the cluster.

The main activity clusters service analysis reveals that the vast majority of existing and planned activity clusters located in the study area are well served by the tramway, including the southern portion of downtown Gatineau, the urban core of Aylmer and the majority of the village centres. However, the northern portion of downtown Gatineau is not as well served as others by the selected scenario. Although many Rapibus lines already serve a good portion of this territory, those northern portion of downtown Gatineau mobility needs remain to be considered by the STO as part of its already planned local network improvement included in their 10-year development plan that started in summer 2021.

The tram axis is also close to several sites with great potential for urban development. This indicates that several residents, jobs, businesses and services will be near the tram.

This coordination between transportation and land use planning will attract more users to these sectors where development is already planned and underway, thus allowing residents to do their shopping and go about their occupations and leisure activities without using their car. This modal shift will reduce household spending given this reduced need to use a car to get around. Chemin d'Aylmer and Boulevard Lucerne are already identified as such in the SADR. The project also contributes to achieving of one of the City of Gatineau's objectives which is to improve the specialized economic sectors accessibility by active and public transit.

However, other actions will be required regarding land use planning such as the services during off-peak periods, the development of active mode infrastructure and intermodality to encourage even more households to reduce their vehicle ownership and significantly reduce their transportation expenses. As a result, the project meets both the objectives of development opportunities for transport-oriented-development (TOD) and opportunities for densification and redevelopment, while serving the major poles existing and under planning.

T1 scenario T1 is highly coherent with the main regional strategic plans considering the urban and transportation planning, thus given its service to Gatineau poles, its west end public transit service improvement as well as its connection with the other existing public transit networks in the Gatineau-Ottawa region.

According to the BC2 external study and the literature review, the addition of a higher-order axis will improve the studied area transit offer and support future growth (residential, commercial, offices and leisure) without, however, generating it. Studies generally point out that a metro, tram or train has more positive effects on property value than a bus line. The reliability, speed and efficiency of the offered service are factors that tend to increase development.

That being said, the project will help to densify and concentrate this development around the higher-order axis, which will promote the achievement of the SADR objectives regarding the establishment of local shops and services and densification along the corridors of high level of transit service (reference to public transit focused areas of SADR). As a local example, the development along the Rapibus axis, in the Gatineau eastern sector, has increased over the years with major residential and institutional projects that are being planned and under approval review (i.e Founderie project, etc.).

Table 3-9 Scenario T1 – Land Use Performance

Performance in relation to land-use planning	T1
1. Serving activity clusters	
Downtown Main Cluster (northern portion)	
Downtown Main Cluster (southern portion)	X
Allumettières mixed secondary cluster	X
Tertiary cluster of the urban core of Old Aylmer	X
Village centre (Lac-des-Fées)	
Village centre (Du Parc)	X
Village centre (Le Plateau)	X
Village centre (Les Golfs)	X
Village centre (Lac-Deschênes)	
Type 1 TOZ (Labelle)	
Type 2 TOZ (Wilfrid-Lavigne-Broad-Front-Eardley)	X
2. West development potential	
Total number of stations in Gatineau	34
Number of stations within 400 m of plots of land with a development potential of over 10,000 m^2	16
Proportion of stations within 400 m of land parcels with development potential of more than 10,000 m^2 compared to all stations with proximity to a potential area (34)	55%
Number of stations within 800 m of land with a development potential of over 10,000 m^2	20
Proportion of stations within 800 m of land with a development potential of more than 10,000 m^2 compared to all stations	59%
3. Consistency with regional planning	
3.1 Servicing the neighbourhoods and sectors where the projects are located	
The proposed improvements—addition of a higher-order mode—will help strengthen public transit service to/from Le Plateau and Old Aylmer and make the industrial sector northwest of Le Plateau more accessible.	X
Higher-order public transit service for the city centre	X
Higher-order public transit service for several residential and other projects (commercial/mixed use, public facilities) for Le Plateau and Old Aylmer	X
3.2 Ease of access between projects and corridors	
For the Plateau line, the planned corridor on Boulevard du Plateau makes access to the public transit corridor more user-friendly and safer for several residential and other projects (commercial/mixed-use, public facilities)	X
3.3 Complementarity with Ottawa	
The T1 scenario linking Gatineau to Ottawa contributes to a 65% reduction in the number of buses in downtown Ottawa compared to current volumes, which is consistent with the urban redevelopment projects in this area and the five-year tripartite agreement signed in 2017 between the City of Ottawa, the City of Gatineau and the Société de transport de l'Outaouais (STO) In a transportation metropolitan vision of transport, the T1 scenario connecting Gatineau to Ottawa also offers Ontario users a large transport capacity to meet their interurban mobility needs, either to or from transport hubs located on the Quebec side.	X
The concept is consistent with the principles of the partners' planning documents.	High
4. Decrease in household spending on transport	
In general, access to public transit has been greatly improved for the disadvantaged sectors of Old Aylmer and Le Plateau. Accessibility to a higher-order public transit link also makes it possible to reduce gross expenditures related to transportation for all households.	High
5. Development	
5.1 Local Development	
Most commercial areas (21 of 25) are served within 400 m. 26 of the 34 stations on the Quebec side are located within 400 m of existing commercial areas.	High
5.2 Regional Development (external study by BC2)	
the addition of a higher-order axis will improve the studied area transit offer and support future growth (residential, commercial, offices and leisure) without, however, generating it. That being said, the project will help to densify and concentrate this development around the higher-order axis, which will promote the achievement of the SADR objectives regarding the establishment of local shops and services and densification along the corridors of high level of transit service (reference to public transit focused areas of SADR). The project could capture 15% of residential development forecasts for peripheral municipalities, which would then represent 806 housing units over 20 years, or 40 housing units annually. The structuring effects of the tram should be noticed in a radius of 0 to 500 meters and, more prominently, in the first 300 meters.	

Figure 3-18 shows the higher-order system stations in the vicinity of vacant City of Gatineau publicly owned land (not including land used for park purposes) and/or development projects approved or under discussion as of spring 2019 for a horizon up to 2031.

To answer the objective of creating more friendly living environments, eight stations can be identified as having a high potential for being linked with a new public place, namely those located in the mixed-use and downtown areas identified in the urban planning master plan.

3.14.7 ENVIRONMENTAL IMPACTS

AIR QUALITY IMPROVEMENT

Air quality is assessed through an analysis of greenhouse gases (GHGs) and air quality and pollutant emissions (particulate matter, carbon monoxide, nitrogen and sulphur oxides, PM2.5, CO, NOx and SO2). The calculation of GHGs based on data regarding the number of kilometres travelled by cars and different modes of public transit during the morning and evening rush hours. No estimate is included for the GHGs that will be generated during the construction of the tramway system since this is not part of the scope of the study and will be addressed for the preferred scenario retained in the impact study.

Table 3-10 24 hr GHG – total

Scenario	CO_2 equivalents	Reduction compared to the current scenario
	Tons	%
Current	3,862.8	N/A
Scenario 0	3,430.7	-11.2
Scenario T1	3,416.3	-11.6

Table 3-11 Annual GHG emissions per passenger-km

Scenario	CO_2 equivalents	Reduction compared to the current scenario
	Kg/passenger-km	%
Current	83.2	N/A
Scenario 0 (improved status quo)	58.7	-29.4
Scenario T1	58.5	-29.6

Table 3-12 Amount of contaminants emitted per 24 h -total

Year	Scenario	$PM_{2.5}$	CO	NO_x	SO_2
				Kg/day	
2019	Current	535.6	27,797.0	13,942.3	49.4
2031	Scenario 0 (improved status quo)	307.3	15,628.0	4,522.6	53.4
	Scenario T1	306.4	15,579.9	4,508.7	53.2

IMPACTS ON BIOLOGICAL AND PHYSICAL ENVIRONMENT

By avoiding sensitive areas in Gatineau Park, scenario T1 presents the best balance in terms of minimizing the impacts on biological environments without completely eliminating them. The analysis of the biological and physical environment includes an assessment of potential encroachments on many components. Potential encroachments have been estimated according to the indicative insertion plans developed in order to assess their scale.

Physical environments include the:

- Potential landslide areas;
- Contaminated land/petroleum equipment;
- Flood zones.

Biological environments include the:

- Area of interest;
- Special-status plant species;
- Amphibian and reptile species listed;
- Wetlands;
- Waterways;
- Wildlife habitat (heronry);
- Wildlife habitat at risk;
- Wildlife species at risk;
- Woodlands of interest;
- Ecoterritory/Green Corridor.

Table 3-13 Area and count of biological and physical environmental components affected by the scenarios

BIOLOGICAL	PHYSICAL		COMPONENT		TOTAL AREA (m^2)
	Area (m^2)	Count (1)	Area (m^2)	Count (1)	
Scenario 0 (improved status quo)	13,180.66	0	0	1	13,180.66
Scenario T1	65,529.83	27	629.06	31	66,158.89

The count is the number of mentions

HUMAN IMPACT – HERITAGE AND LANDSCAPE

The impact on the urban landscape was assessed by highlighting the landscape and identity elements of importance to the City of Gatineau and Ottawa that could potentially be affected by the higher-order transit system.

Scenario T1 includes heritage-sensitive segments that are included within each of the scenarios. Scenario T1 also crosses sectors of significant landscape interest or identity, such as Chemin d'Aylmer and the access to the Ottawa side via the Portage Bridge with a view of the Hill.

T1 scenario is considered to have a low impact on heritage since [redacted] are set back from the public thoroughfare on wooded land [redacted] owever, some enhancement measures, beyond the base construction work, could be considered for those sectors such as (maximizing setbacks as much as possible, coordination of landscaping and green spaces, information panels, etc.).

As for the landscape, the addition of a higher-order tramway mode could change the character of Chemin d'Aylmer, so it is important that its insertion be carefully considered. The insertion in Ottawa will also need to be carefully considered, as the alignment crosses Victoria Island and offers a view of the Judicial Precinct. The Wellington Street at-grade option is bordered by many sites of national significance (the Parliament Buildings, the Supreme Court of Canada and several others) and a UNESCO-recognized site, the Rideau Canal.

In order to minimize the impact on the landscape and heritage, the eastern section of the route beginning at Rue Montcalm (Laurier Street) and ending at the Ottawa terminus (Portage Bridge and tunnel entrance or Wellington Street) will be operated on battery power and therefore without overhead wires. With the continuous evolution of technologies, it would be wise to evaluate in detail during the preliminary project the feasibility of 100% battery operation, as is the case, for example, for the Nice tramway line 2 or the Doha tramway, although none of these systems operate in similar climates.

ACOUSTICAL IMPACT

It should be noted that the planned use of electric transport (trams and buses) has a positive noise impact compared to the use of fossil fuel powered transport (current situation). If people using the higher-order network in this study were to use cars or diesel buses instead, the noise emitted into the environment would be higher.

The acoustic impact of future tram traffic on sensitive areas near the roads used by the projected routes has been assessed (situation of scenario T1 compared to the reference scenario, i.e. scenario 0). With regard to acoustics, the level of noise annoyance remains the same when comparing the T1 higher-order scenario and the baseline condition. Noise impacts are null for the various segments, with the exception of low noise impacts estimated between Belleau and Montcalm streets. Although designated as a transportation corridor, this sector is currently very lightly trafficked, resulting in a differential in noise impacts, which are nonetheless considered low. Further studies on the possible need for mitigation measures in this sector are recommended in subsequent stages, considering that a terminus connecting with the Rapibus is also planned.

It should be noted, however, that the rail operation is noisier under tight turning conditions (metal-to-metal noise). Mitigation measures and regular maintenance are possible to reduce this impact. The Gatineau network has few of these sharp turns, which will help.

VIBRATORY IMPACT

The vibration impact study is designed on the basis of a potential global nuisance principle and considers the geological composition of the unconsolidated deposits, the speed of traffic and the distance of the buildings from the traffic. Using these criteria, an overall vibration nuisance impact is calculated. Of the scenarios under study, scenario T1 has the lowest vibration impact.

3.15 COST ESTIMATE

The capital cost estimate has further evolved as the project has been developed and refined.

As a result of discussions with partners and further review of certain aspects (including Ottawa insertion options, land acquisitions, and risks and contingencies), the estimates presented in Report 3 have been updated in Report 3B and Report 4.

[redacted]

As per these updates, the final global estimate is as follows:

Table 3-14 Cost estimates – Scenario T1

SCENARIO T1		Gatineau Total M$	Portage Bridge Total M$	Ottawa Total M$	Sub-total Total M$	Tax rate net of rebates Total M$	Total Total M$
Sparks Tunnel	Minimum range	$2,663.9	$296.7	$872.9	$3,834.5	$191.2	**$4,025.7**
	Maximum range	$2,663.9	$296.7	$1,265.8	$4,227.4	$210.8	**$4,438.3**
At-grade insertion Wellington Street		$2,663.9	$296.7	$320.8	$3,282.4	$163.7	**$3,446.1**

Note 1: For ease of presentation, the amounts for each item have been rounded to the nearest tenth, based on the detailed data in the cost estimate source file.

Note 2: Class D Estimate -20% to +100% margin of error

Note 3: The tax rate net of rebates is 4.9875% in Quebec. This rate has been used conservatively throughout the project as it is higher than that of Ontario.

Table 3-15 Estimated costs by item – Scenario T1

Item		T1 Sparks Tunnel Min. range Total M$	T1 Sparks Tunnel Max. range Total M$	T1 insertion option in surface Wellington Street Total M$
A	Professional fees and project office	[redacted]	[redacted]	[redacted]
B	Transit system	[redacted]	[redacted]	[redacted]
C	Stations (2)	[redacted]	[redacted]	[redacted]
D	Land	[redacted]	[redacted]	[redacted]
E	Network deviation	[redacted]	[redacted]	[redacted]
F	Urban planning	[redacted]	[redacted]	[redacted]
G	Civil Engineering Works	[redacted]	[redacted]	[redacted]
H	Garage	[redacted]	[redacted]	[redacted]
I	Rolling Stock	[redacted]	[redacted]	[redacted]
J	Related operations	[redacted]	[redacted]	[redacted]
Subtotal $million		$2,106.9	$2,315.9	$1,812.5
*Contingency (35%) **		$666.1	$739.3	$563.6
*Risks (20%) **		$380.6	$422.5	$322.1
Price indexation (2021-2032) as per forecast inflation curve base rate provided by MFQ		$680.8	$749.7	$584.2
Total $million (excluding taxes)		**$3,834.5**	**$4,227.4**	**$3,282.4**
Tax rate net of rebates *(4.9875%)*		**$191.2**	**$210.8**	**$163.7**
Total M$		**$4,025.7**	**$4,438.3**	**$3,446.1**

[redacted]

3.16 FINANCIAL ANALYSIS

This financial analysis presents the foreseen revenues and costs envisaged during the Project operating period as well as the total nominal and discounted associated net cost for the public sector. Since this is a public transit project, it is not subject to the Major public infrastructure projects management Directive applicable since 2014. We therefore used the methodology of the "Guide for preparing a business case by the Treasury Board Secretariat" (2011)[12]. Based on the Treasury Board's decision, we used the methodology of the 2011[13] "Business case preparation guide by Treasury Board Secretariat". Following a discussion with the MTQ and an agreement between the stakeholders, the financing costs will be addressed and calculated during the next project stages.

At this stage of the study, the financial analysis and cost estimate are based on a contractual traditional mode. The financial analysis objective is to calculate the total project cost over the project horizon, including all capital, operating and maintenance costs, as well as expected revenues. Further review to identify the final construction contractual approach should be carried out after the concept design according to the requirements of the Treasury Board Secretariat (planning file). Based on the planned construction and operation schedule and the associated expenditure curve, costs and revenues have been allocated when expected, in order to analyze the project based on its current net value as per current available information.

Although, all the required project information is not yet available at this stage for the public sector to undertake the development of a strategy on the mechanisms to finance the costs of construction (bonds issuance, cash grant, etc.), this analysis will be an important input towards the funding strategy and the calculation of short- and long-term funding costs. It also highlights the ability of the Project to be self-financing during the operating period, regardless of the impact of the capital structure and debt service payments, based on the income and cost structure.

The model input data, construction and operating costs, revenue structure and expected ridership, are all based on previous [redacted] such as Public transit operational costs [redacted] and the Benefit-Cost analysis [redacted].

The main following schedule assumptions were used to develop the financial analysis:

- Start of financial cash flows in 2022;
- The bulk of construction works occurs over a six-year period (72 months) starting in 2027;
- Some costs, although not very significant in relation to the total amount of investment costs, are incurred from 2022 (start date of the model), such as "Professional fees and Project Office" costs (around 220 M $ in nominal dollars).
- Some costs, such as "Professional fees and project office" costs were incurred before 2022. These are considered as sunk costs under the financial analysis since they are not included in the financing structure of the project.
- The operating period, revenues and associated operating and maintenance costs begin in 2033 with a 30-year analysis horizon (ending in 2062).

It should also be noted that the monthly construction cost cash flows that were sent to the STO and MTQ was generated based on the schedule assumptions mentioned above and the monthly construction expenditure curve that was developed based on the overall project schedule provided by the technical engineering and planning team of WSP.

Considering the public sector financing strategy, more specifically the long-term financing and the various public sector entities involved in the financing of the Project, this will be addressed in the next stages of the project. Indeed. More detailed analysis is required to refine the currently available technical including the cost estimates, identification of the construction contractual approach and value engineering. Once available, this additional information will allow the financing strategy study to proceed.

RETAINED SCENARIO: T1 + SPARKS STREET TUNNEL INSERTION OPTION (M$ NOMINAL)

	NPV	Nominal Value	Discount rate	Date
Capital costs	(2,198.62)	(4,227.40)	6.50 %	January 1, 2019
Maintenance and operational costs	(343.38)	(2,037.42)		
Revenues	231.30	1,426.14		
Total	**(2,310.70)**	**(4,838.68)**		

RETAINED SCENARIO: T1 + AT-GRADE WELLINGTON INSERTION OPTION (M$ NOMINAL)

	NPV	Nominal Value	Discount rate	Date
Capital costs	(1,716.10)	(3,282.40)	6.50 %	January 1, 2019
Maintenance and operational costs	(277.61)	(1,647.19)		
Revenues	242.34	1,494.20		
Total	**(1,751.37)**	**(3,435.39)**		

12 Secrétariat du Conseil du trésor, 2011. *Guide d'Élaboration du Dossier d'Affaires – Des Grands Projets d'Infrastructure publique:* https://www.tresor.gouv.qc.ca/fileadmin/PDF/faire_affaire_avec_etat/projets_infrastructure/guide_elaboration_dossier_affaire.pdf

13 Décision du Conseil du trésor depuis le 11 février 2014 : https://www.bibliotheque.assnat.qc.ca/DepotNumerique_v2/AffichageFichier.aspx?idf=163332

3.17 IMPLEMENTATION

A project of this magnitude involves many steps that take place over several years. Several factors, unforeseen events and decisions may influence its development over the years. This section is therefore simply a first version to outline the main lines to be anticipated for a project of this nature. In addition, at this opportunity study stage, several technical elements remain to be analyzed in greater depth during the preliminary project. This could influence the definition of the project and change its planning.

At the same time, the main stages of an infrastructure project remain fairly similar and constant from one project to the next. Depending on the selected implementation option, however, the total time and scheduling/overlapping of some of the activities listed below may vary slightly.

Although major projects of this nature are often carried out in an alternative mode, the range of possible variants is too wide to be able to rely on one of them at this stage since no decision has yet been made on the subject. We therefore opted for a traditional approach as a working hypothesis. This approach still allows for parallel activities (different teams working on different lots) and some overlap between major phases (the next phase can be initiated when the previous one reaches 50-75% completion, depending on the complexity of each of the sectors, disciplines and authorizations required).

Table 3-16 Framework timeline

ACTIVITY		DEADLINE	YEAR
FRAMEWORK TIMELINE			
1.	Preparatory studies	1 year	2021-2022
2.	Preliminary and final design of the project	2 years	2022-2024
3.	Environmental impact assessment and review procedure	2 years	2023-2025
4.	Detailed design	2 years	2026-2028
5.	Construction	1 to 5 years	2027-2032
6.	Commissioning (tests)	0.5 - 1 year	2032-2033
7.	Opening	-	Spring 2034
8.	Adjustments	1 to 2 years	2034-2035
[redacted]	[redacted]	[redacted]	[redacted]

3.17.1 PREPARATORY STUDIES

Following the present "*Supplementary Study for the Development of a Higher-Order Public Transit System in Gatineau's West End*," which comes after the 2017 opportunity study, it is important to deepen the analyses and proceed with the preparatory studies. The quality of the data collected during this stage is crucial since all subsequent engineering and architectural design will be based on this data. These will influence the experts' decision-making and technical choices. Incomplete data or data of inadequate accuracy could result in delays and additional costs in subsequent steps. This data will also be the description of the current situation that will serve as a reference base for the review of applications for authorizations and permits to the various authorities having jurisdiction.

Table 3-17 Implementation – Preparatory Studies

ACTIVITY		PREDECESSORS	SHORT DEADLINE	LONG DEADLINE
1.	**PREPARATORY STUDIES**			
1.1	Topographic surveys	Already underway	12 months	18 months
1.2	Collection of information from existing networks	Already underway	12 months	18 months
1.3	Environmental characterization (public lands)	Already underway	12 months	18 months
1.4	Environmental characterization (private lands)	Call for tenders and award of contracts	12 months	18 months
1.5	Geotechnical studies	Call for tenders and award of contracts	6 months	12 months
1.6	Site characterization studies ph. 1 and 2	Call for tenders and award of contracts	6 months	12 months
1.7	STO and OC Transpo local buses routes adjustments (Gatineau downtown area)	Already underway *Preferential measures for buses - Terrasses de la Chaudières and Montcalm station.*	12 months	18 months
1.8	Municipal and provincial network detailed Traffic analysis (enlarged Gatineau downtown area)	Call for tenders and award of contracts	6 months	12 months
1.9	Detailed Traffic analysis including the two city centres and any future projects on both sides of the river as well as Chaudières and Portage bridges and accesses.	Call for tenders and award of contracts	12 months	36 months
1.10	Metropolitan Interprovincial Trucking Reorganization Study (NCC)	Call for tenders and award of contracts	12 months	36 months
1.11	Ottawa insertion options detailed studies (tunnel and Wellington at-grade)	Call for tenders and award of contracts	12 months	18 months
1.12	Detailed bridge inspections to confirm proposed work	Call for tenders and award of contracts	3 months	6 months
1.13	Detailed study for the location of bike paths and parking at stations and park-and-ride	Call for tenders and award of contracts	6 months	12 months
1.14	Power supply study	Call for tenders and award of contracts	6 months	9 months
1.15	Discussion with partners to link with other projects (cost sharing)		6 months	12 months
1.16	Agreement on the overall governance structure of the project		6 months	12 months
1.17	Choice of the method of realization and launching of professional invitations to tender	Confirmation of funding and governance structure	6 months	12 months

3.17.2 PRELIMINARY AND FINAL DRAFT DESIGN

The purpose of this step is to finalize the project definition, to deepen the concepts based on the collection of field data, and to initiate the preliminary design (3D vision), with the aim of defining the acquisitions, encroachments and easements. This is the basis for the next stage of environmental impact analysis.

Table 3-18 Implementation – Preliminary and Final Design of the Project

ACTIVITY		PREDECESSORS	SHORT DEADLINE	LONG DEADLINE
2.	**PRELIMINARY AND FINAL DESIGN OF THE PROJECT**			
2.1	Preliminary design (PD)	Field data/survey plans	9 months	18 months
2,2	Identification of conflicts with utility companies (RTUs in French)	Site Survey Plans/PD	3 months	6 months
2.3	Detailed traffic analysis	PD	3 months	6 months
2.4	Identification of preparatory works (relocation of municipal and public utilities)	PD	3 months	6 months
2.5	Cost estimate		1 month	2 months
2.6	Final Preliminary Draft (FPD)	Customer decisions	9 months	12 months
Note: The Sparks tunnel, the Portage Bridge and downtown Gatineau preliminary design should include to identify the potential impacts of being compatible with a potential Rapibus rail conversion or the implementation of another tram line in Gatineau. This analysis is important to validate critical components design parameters that would be very difficult to modify, if required, once the higher-order tram is in operation (i.e. the sizing of platforms and stations).				

3.17.3 ENVIRONMENTAL IMPACT ASSESSMENT AND REVIEW PROCEDURE

The environmental impact assessment, strongly influenced by the encroachments on existing sensitive areas, is carried out simultaneously and in interaction with the preliminary design. The submission of the environmental impact study (EIA) to the Ministry of the Environment and the Fight against Climate Change (MELCC) concludes the preliminary design stage. The main stages of the environmental assessment (questions, admissibility, public hearings, environmental analysis, government authorization decree) are carried out at the final draft stage.

Under the environmental assessment process, the Minister of the Environment must, within 18 months from the filing of the environmental impact assessment study, send its recommendation to the government for a decision related to the project. This period excludes any period during which the Minister is awaiting further information including the time that may be required to prepare further studies out at his request.

Aligning the Quebec environmental assessment process with the federal and Ontario environmental assessment processes could significantly optimize the project schedule. Note that coordination has not yet been considered in Table 6-4.

Table 3-19 Implementation – Environmental Impact Assessment and Review

ACTIVITY		PREDECESSORS	SHORT DEADLINE	LONG DEADLINE
3.	**ENVIRONMENTAL IMPACT ASSESSMENT AND REVIEW PROCEDURE (QUEBEC)**			
3.1	Project Notice and MELCC instruction		≤1 month	≤ 1 month
3.2	Public consultation as per the Environmental Assessment Register	Notice to start the environmental assessment process	9 months (including 30 days of public consultation)	12 months (including 30 days of public consultation)
3.3	Public hearings (if required), environmental analysis and recommendation	Admissibility analysis by Environmental Assessment study Notice of Public Information session (PIP) (if required)	5 months	18 months (including 4 months of public hearings and if required, 30 days for the PIP)
3,4	Government decision (Decree)	Environmental Impact Assessment and environmental analysis reports	1 month	2 months
3.5	Project Notice and MELCC instruction		≤1 month	≤ 1 month

3.17.4 DETAILED DESIGN

The production volume of construction documentation will be considerable and will require the involvement of many teams working in parallel. The sequence of documentation production will need to be aligned with construction needs. In fact, documents for structures requiring long construction times (e.g. Portage Bridge and tunnel) will have to be prioritized as well as those subject to specific authorizations so as not to unduly delay the overall project.

Table 3-20 Implementation – Detailed Design

	ACTIVITY	PREDECESSORS	SHORT DEADLINE	LONG DEADLINE
4.	**DETAILED DESIGN**			
4.1	Adjustment and redefinition of the project if required	Government Decision (Order in Council)	1 month	2 months
4.2	Implementation mode/Batching		1 month	2 months
4.3	Acquisition process and easements	Government Decision (Order in Council)	6 months	5 years
4.4	Detailed design and multidisciplinary coordination		12 months	18 months
4.5	Requests for authorization and specific permits (section 22 of the MELCC, construction permits, etc.)		2 months	6 months
4.6	Work scheduling (impact on traffic maintenance)		2 months	6 months
4.7	Launching of construction tenders		2 months	6 months

3.17.5 CONSTRUCTION WORK

The volume of construction work will be considerable in the western sector of the city and will require the involvement of many teams working in parallel. Although several construction sites must progress simultaneously, it is important that the sequence of lots be well anchored, so as not to clog up the area, and to ensure a constant maintenance of reasonable detour routes.

In fact, the works requiring long construction periods (e.g., work on the Portage Bridge and the tunnel under Sparks, which will be spread over 3 to 5 years) will have to be prioritized and coordinated with the partners for better optimization of the use of public funds and in order to minimize as much as possible the impacts on residents and users of the road network.

Planning the sequence of work will also be critical in terms of preparatory work (diversions, relocation, burial, etc.) and ensuring that it is completed on time to allow construction of the final works in accordance with the announced schedules.

Joint work can potentially be also planned in coordination with partners and stakeholders to for optimal use of public funds and to minimize negative impacts and successive disruptions in a specific area.

Table 3-21 Implementation – Construction

	ACTIVITY	PREDECESSORS	SHORT DEADLINE	LONG DEADLINE
5.	**CONSTRUCTION**			
5.1	Preparatory Work	Acquisitions	6 months	18 months
5.2	Reorganization of local bus systems STO – OC Transpo		24 months	36 months
5.3	Work on several lots in parallel	Acquisitions	1 year	5 years
5.4	Inspections and correction of deficiencies		2 months	6 months
5.5	Acceptance of work		2 months	6 months
5.6	Closing the contracts of each batch		6 months	12 months

3.17.6 COMMISSIONING AND ADJUSTMENTS

Related and complementary work may also be required in coordination with partners (construction of additional sidewalks, pedestrian crossings, etc. beyond the right-of-way of the higher-order route, for example to optimize accessibility to stations).

The system testing period must not be neglected and must be long enough to address the issues and adjustments inherent in a new infrastructure of this scale (e.g. issues related to the winter season, validation of the proper functioning of equipment and system communication, etc.). The STO's internal staff must also be given the time they need to familiarize themselves with the new network. All other services related to this new route will also have to be adjusted accordingly (STO and City of Gatineau and other partners). It is important to develop the network before it is open to the public. In this respect, the tunnel is a special structure whose systems must undergo extensive testing and adjustment.

Table 3-22 Implementation – Commissioning and Adjustments

	ACTIVITY	PREDECESSORS	SHORT DEADLINE	LONG DEADLINE
6.	**COMMISSIONING AND ADJUSTMENTS**			
6.1	Tests and dry run of the tramway	Acceptance of work	6 months	12 months
6.2	Commissioning and testing of various systems		6 months	12 months
6.3	Related and complementary work by others (outside the right-of-way)		6 months	12 months
6.4	Completion of the reorganization of the local bus networks STO – OC Transpo		3 months	6 months
6.5	Reorganization of urban services (garbage collection, delivery, snow removal, cleaning)		4 months	8 months
6.6	Training required if working on the tramway route and near the OCL		3 months	6 months
6.7	Establishment of emergency plans (including tunnel)		3 months	6 months
6.8	Communications campaign		3 months	6 months

3.17.7 OPENING

Table 3-23 Implementation – Opening

	ACTIVITY	PREDECESSORS	SHORT DEADLINE	LONG DEADLINE
7.	**OPENING**			
7.1	Communications campaign		TBD	TBD
7.2	Opening		1 week	1 month

3.17.8 ADJUSTMENTS

An adjustment period of 12 to 24 months is to be expected for public transit users, the operator and users of other modes of transportation. Communication campaigns and a police presence often help to minimize the impacts of the acclimatization period (accidents, confusion, resistance to change, etc.), but time is still required to find a balance between the different users.

Table 3-24 Implementation – Opening

	ACTIVITY	PREDECESSORS	SHORT DEADLINE	LONG DEADLINE
8.	**ADJUSTMENTS**			
8.1	Various changes in response to users		12 months	24 months

3.17.9 PROJECT CLOSURE

Table 3-25 Implementation – Project closure

	ACTIVITY	PREDECESSORS	SHORT DEADLINE	LONG DEADLINE
9.	**CLOSURE**			
9.1	[redacted]		[redacted]	[redacted]

4 CONCLUSION

According to the City of Gatineau data, population growth is currently stronger than initially anticipated 2031 projections and the development of the western Gatineau sector will continue significantly in the mid and long-term. This situation leads to a travel demand increase.

Thus, with this projected increase in population and jobs in western Gatineau, the current road networks, already at capacity since 2014, will no longer be able to fully fulfill their role in the mobility structure. In fact, when this future demand (2031) is affected on current transport networks, travel times by car increase considerably (nearly 45% more time to connect Aylmer with Parliament Hill).

All regional stakeholders, however, do now agree to meet this travel demand increase by prioritizing sustainable mobility rather than significantly increasing road capacity. All major regional stakeholders strategic plans favour a complete multimodal solution integrating public transit networks and active mode infrastructure with urban planning policies and practices to reduce dependence on self-driving and, in a broader sense, to reduce the need to travel as well as the distances to be covered.

The public transit contribution provides therefore a strong means to capture all the expected growth in travel while maintaining good travel conditions. However, the public transit network, as it currently exists, cannot accommodate this number of additional trips (saturation of reserved lanes). In fact, **doing nothing for the public transit network by 2031 (scenario 0 improved status quo) is not conceivable** for the western Gatineau area since the bus reserved lanes mode is not sufficient to meet demand, even with the implementation of public transit projects currently planned in the region, including those in and around the Gatineau western sector. This approach does not effectively support the planned development of the West of Gatineau since it:

— is not enough to support the total growth of mobility needs at the Gatineau Park screen line crossings;
— resolves a major issue regarding the conventional buses high level of service required that conflicts the available capacity of the foreseen public transit connection planned to date between Ottawa and Gatineau, namely the Portage Bridge;
— contributes to further aggravating the traffic conditions on the already saturated road network, which worsens the conditions of travel by car and public transit.

The need is therefore clearly felt to set up a higher-order mode of public transit to connect western Gatineau to the two city centres, to allow better connections to the clusters located outside the centres, to connect with the existing transit networks and ensure better regional integration. This higher-order mode, closely paired with active modes infrastructure to promote intermodality, also meets several municipal and government objectives such as land use planning, sustainable development, and the fight against climate change.

Additionally, the objective should not be limited to only solving the challenges related to transport large volumes of users during peak periods, both to the large concentrations of such as the city centres of Gatineau and Ottawa, as well as secondary and peripheral destinations. The objective should be broader and offer a competitive alternative to outside peaks automobile for trips and for trips within the studied area which are not currently served well. Thus, with a robust, reliable, frequent service throughout the day and supplemented with a local bus service, it will be possible to meet current and future demand and offer new opportunities to users: travel schedule shifts, efficient use of public transit for reasons other than home - work and home - study, etc.

The addition of a higher-order public transit system in the Gatineau west end meets the objectives defined by all stakeholders by favouring a service offer improvement and the competitiveness of public transit in the mid and long-term.

4.1 MEETING THE PROJECT'S OBJECTIVES

Scenario T1 is technically identified as the optimal scenario since it meets the main objectives of the study, namely:

Contribute to the achievement of the City of Gatineau's objectives as set out in its Revised Land Use and Development Plan (SADR):

— Development opportunities for transport-oriented development zones (TOD);
— Densification and redevelopment opportunities along high level of service transit corridors (proximity shops and local services);
— Servicing the major existing and future main clusters;
— Opportunity to promote downtown Gatineau: very significant reduction of STO buses (75% less than the volumes of scenario 0 improved status quo) and anticipated reduction in the number of OC Transpo buses;
— For the northern branch, the planned corridor on Boulevard du Plateau makes access to the public transit corridor more user-friendly and safe for several residential and other projects (commercial/mixed use, public facilities);
— For the southern branch, the planned segment on Boulevard Lucerne and the railway right-of-way offers the opportunity to redevelop Boulevard Alexandre-Taché between St-Dominique and Montcalm Streets;
— Thirteen (13) stations have a high potential for creating user-friendly environments.
— Traffic lanes, on both branches, planned in compliance with SADR planning.

Enables sustainable mobility and intermodality by meeting mobility needs today and for the next 30 years:

— Reliable, efficient public transit service that is competitive travelling time with individual car use;
— Residual capacity that can meet the post-2031 users transit demand
— 2 m wide sidewalks along the entire length of the route;
— Presence of a bicycle path along the entire length of the route;
— Efficiently serve the downtowns of Gatineau and Ottawa and the metropolitan area and its main trip generators;
— Significant increase in the modal share of sustainable modes, suggesting an increase in walking and cycling distances.
— Allows for a highly significant reduction in the number of buses in downtown Ottawa: 70% less than the current volumes, which is consistent with the urban redevelopment projects in this sector and the five-year tripartite agreement signed in 2017 between the City of Ottawa, the City of Gatineau and the STO.
— Reduce greenhouse gas emissions and other atmospheric pollutants with a fleet of 100% electric vehicles and modal shift;
— Improve health and life quality of people from Gatineau;

Better integration of regional transport networks:

— Optimized connections with the existing Rapibus BRT network;
— Optimized connections with the existing Ottawa LRT O-Train network. In a metropolitan vision of transport, the project also offers Ontario users efficient travel conditions to reach major travel generators in Quebec;
— Optimized connections with the local STO (major new transfer hub);
— Optimized connections with the local OC Transpo and TransCollines networks.

Minimize environmental, heritage and human impacts:

— No encroachment into sensitive areas in Gatineau Park and less impact on the land environment;
— Battery operation in sensitive areas (heritage and city centres);
— Visual and/or acoustic mitigation measures in sensitive areas (residential).

Contribute to the economic and social development of the region from a metropolitan perspective:

- Accessibility to public transit is greatly improved for the Gatineau's west end area;
- The decrease in demand for cars in favour of sustainable modes will lead to savings of more than one million hours of travel per year for Gatineau residents in 2031, this in addition to the 1.4 million hours saved for public transit users for the same horizon;
- Reduces gross transportation costs for all households;
- The proposed improvements—addition of a higher-order mode—will help strengthen public transit service to/from Le Plateau and Old Aylmer and make the industrial sector northwest of Le Plateau more accessible;
- 26 of the 34 stations on the Quebec side are located within 400 m of existing commercial areas.

4.2 RECOMMENDATIONS

The project is in the early stages of its life cycle and will be completed over a period of about ten years. In addition to the major stages of implementation typical of an infrastructure project, the following recommendations are intended as avenues for reflection and optimization specific to this "*West of Gatineau Higher-Order Transportation System*" project.

The present "*Supplementary Study for the Development of a Higher-Order Public Transit System in Gatineau's West End*," which comes after the 2017 opportunity study, was intended to:

1. Refine and update the need justification and existing constraints identification;
2. Reinforce the justification for the need for intervention;
3. Develop and compare different scenarios to identify the one that offers the optimal balance between transportation potential, costs, impact evaluation and performance of solutions in caparaison with scnario 0 (status quo improved);
4. Validate the technical feasibility;
5. Identify the optimal scenario that offers the best meet the project objectives;
6. Optimal scenario description;
7. Final report including recommendations for next project stages.

It goes without saying that this is only the early stage of the project. Based on this current study preliminary results, detailed analysis should be carried out in coordination with other preparatory studies that will feed the concept design and further detailed engineering and construction work.

IMMEDIATE RECOMMENDATIONS FOR THE PRELIMINARY DESIGN

The following recommendations have already been shared with the Project Office to start future mandates planification:

- Discussion with Aboriginal communities
- Continuation of the process of community information meetings for awareness and social acceptability
- Final scoping of the project
  - Adjustments in accordance with field data (environment, topography and geotechnics, etc.)
  - Development in downtown Gatineau
    - Metropolitan Interprovincial Trucking Reorganization Study (NCC);
    - Adjustments to STO and OC Transpo bus routes that will be maintained in the area. An external study is currently underway *Study of preferential measures for buses – Terrasses de la Chaudière and Montcalm station*;
    - Municipal and provincial network detailed Traffic analysis and mitigation measures identification (enlarged Gatineau downtown area);
    - Traffic analysis including the two city centres and any future projects on both sides of the river as well as Chaudières and Portage bridges and accesses.
  - Insertion in downtown Ottawa
    - Wellington at-grade Insertion Option: detailed traffic studies and coordination with current development projects for the Judicial and Parliamentary precincts
    - Tunnel insertion option: further feasibility study on the volume, tunnel construction methods and connection methods to the O-Train to better define costs;
    - Establish the governance structure and buy-in from all partners to carry out the work;
    - Coordination with the interprovincial loop: insertion methods and technological compatibility.
    - Once an insertion option is selected for more detailed design stages, additional analysis will be required at the downtown Ottawa intersections to assess the full impacts and identify required mitigation measures.
- Decision on garage site and network operation strategy
- Detailed bridges inspections to confirm existing conditions and proposed work (Portage being the project most critical one);
- For both the downtown areas and the rest of the intervention area, more detailed traffic analyses are still required in the next stages of the project. This includes determining and confirming the levels of service, possible mitigation measures (local and/or regional) and the overall interaction of serial intersections along the corridor and in the network.

RECOMMENDATIONS FOR FURTHER OPTIMIZATION

As an avenue for further reflection, public funds optimization and the regional interventions coherence, we would like to emphasize the importance of discussions and coordination between partners and stakeholders to coordinate the implementation of the higher-order route with other projects already planned in the same locations (coherence, synergies, schedule coordination and potential cost sharing):

With the City of Gatineau:

- Coordination with other projects;
- Planning of preparatory work;
- Ensure to maintain the rights-of-way required for the tramway, in coordination with current and future projects.
- Replacement/rehabilitation of underground pipelines;
- Repair of roadways, bridges and viaducts, traffic lights, bicycle paths and/or sidewalks;
- Coordination with private projects in the process of being approved (especially for access);
- Scheduling of the work to minimize the impact on traffic flow;
- Definition of complementary projects to optimize accessibility to the stations (beyond the project right-of-way);
- Reorganization of urban services (garbage collection, delivery, snow removal, cleaning);
- Training required if working on the tramway route and near the OCL.

With Quebec Ministry of Transportation (MTQ):

- Coordination with other projects;
- Traffic Impacts on the circulation of the upper network and identification of mitigation measures;
- Impacts on the highways network including related bridges;
- Metropolitan Interprovincial Trucking Reorganization Study;
- Existing public transit system ridership overview towards the implementation of a new higher-order axis within a metropolitan vision

With the City of Ottawa:

- Coordination with other projects;
- Reorganization of urban services (garbage collection, delivery, snow removal, cleaning) if required;
- Redefinition of the service on the Quebec side by the local OC Transpo network;
- Chief William Commanda Bridge multi-use pathway and rehabilitation project;
- Establishment of emergency/special event plans.

With the National Capital Commission (NCC):

- Coordination with other projects;
- Metropolitan Interprovincial Trucking Reorganization Study;
- Portage Bridge (in conjunction with planned work on other two bridges, Chaudière and Alexandra);
- Wellington Street development and emergency/special event planning (if Wellington selected);
- Even if the tunnel option is retained, re-evaluate the Interprovincial Loop project to take advantage of the opportunity to pedestrianize a portion of Wellington Street identified in this study.

With Public Services and Procurement Canada (PSPC):

- Coordination with other projects;
- Rehabilitation of the Portage III and IV buildings and the Terrasses de la Chaudière (pedestrian circulation coordination);
- Rehabilitation of the Portage III and IV underground garage;
- Project *Energy Services Acquisition Program* (ESAP);
- Parliamentary and judicial cities (if Wellington insertion retained);
- Wellington Street development and emergency/special events plans (if at-grade option on Wellington is retained);
- Federal buildings for vertical access (if tunnel insertion selected);
- PSPC underground infrastructure relocation (if tunnel option is retained);
- Efficient operation of the Chaudières crossing and coordination of the planned Alexandra Bridge replacement.

With the Université du Québec en Outaouais (UQO):

- Coordination with other projects;
- Integration into the UQO campus development plan (possible integration of the station into a new building);
- Integration of the new pedestrian/bicycle access into the UQO campus development plan, to ensure service to users of the neighbourhood located north of boul. Alexandre-Taché.

With the Utility Companies (RTU):

- Coordination with other projects;
- Planning of preparatory work;
- Training required if working on the tramway route and near the OCL.

4.3 REGIONAL COLLABORATION

The STO and WSP wish to underline the great collaboration of all the partners in a very complex and unique governance context in Canada. We would like to thank the partners for their support and sustained involvement which greatly contributed to the study.

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APPENDIX

A CONSULTATION REPORT 2019

Étude complémentaire pour la réalisation d'un système de transport collectif structurant dans l'ouest de Gatineau

Rapport de consultation

Septembre 2019

STO Société de transport de l'Outaouais

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Synthèse

La STO a mandaté la firme WSP pour réaliser une étude complémentaire pour la réalisation d'un système de transport collectif structurant dans l'ouest de Gatineau. L'étude est réalisée en collaboration avec les partenaires de la STO : la Ville de Gatineau, le ministère des Transports du Québec, la Commission de la capitale nationale, la Ville d'Ottawa et OC Transpo.

Au printemps 2019, au terme de l'étape d'identification et d'évaluation des solutions possibles, cinq solutions possibles ont été retenues. C'est à cette étape importante que la STO a souhaité consulter l'ensemble de la population, afin de connaître notamment les préférences de la population quant aux scénarios et aux modes de transport à l'étude et d'alimenter ainsi l'évaluation comparative des scénarios.

Le processus de consultation et ses résultats sont résumés ci-après.

Ce que nous avons fait

Information - du 28 mai au 24 juin

- 3 soirées d'information
- 5 capsules vidéos
- Documentation en ligne
- Trousses d'information papier

Participation - du 3 au 24 juin

- Questionnaire en ligne et papier
- Atelier de réflexion
- Réception de mémoires

Comment nous vous avons rejoints

4 semaines de communication intensive

- Breffage et point de presse
- Promotion au sto.ca et au m.sto.ca
- 7 publications et campagne sponsorisée sur les réseaux sociaux
- 2 mentions dans l'Infolettre de la STO
- Notification dans l'application Transit
- Affiches et messages dans les 360 autobus de la STO et aux stations
- 5 publicités dans les journaux
- Messages publicitaires sur 4 radios

Qui nous avons rejoint

- **8 500 vues de la page Web**
- **100** participants aux soirées d'information
- **22** participants à l'atelier de réflexion
- **11** mémoires reçus
- **668 questionnaires complétés par une diversité de citoyens**
  - 71 % de résidents des secteurs concernés par l'étude, 29 % des autres secteurs
  - 73 % d'usagers du transport en commun, 27 % de non-usagers

Ce qu'ils ont pensé de la consultation publique

- **95 %** ont trouvé les termes utilisés **simples et faciles à comprendre**
- **93 %** ont jugé la **durée adéquate**
- **92 %** ont estimé qu'il était **facile de répondre** aux questions
- **91 %** jugent avoir pu **exprimer leurs préférences et leurs préoccupations**
- **91 %** ont trouvé le **questionnaire intéressant**
- **89 %** étaient **satisfaits de l'information** disponible au sto.ca

Ce que vous nous avez dit

- **Une forte majorité des répondants considère que la mise en place d'un système structurant dans l'ouest de Gatineau est nécessaire**, presque autant dans les secteurs concernés (81 %) que dans les autres secteurs (72 %).

- Parmi les 5 scénarios à l'étude, **le scénario tout rail est privilégié par près de la moitié des répondants**, étant perçu comme plus efficace, fiable, écologique, viable à long terme et rapide**.** Les scénarios hybrides sont aussi populaires, les résidents du secteur Aylmer étant plus nombreux à souhaiter les rails sur Aylmer-Taché et ceux du Plateau sur Allumettières-Plateau.

- **Les scénarios tout bus et de référence sont jugés inacceptables par 44 % et 36 % des résidents des secteurs concernés**, qui les jugent inefficaces et créant de la congestion. En revanche, le scénario tout rail est jugé inacceptable par 30 % des résidents des autres secteurs, principalement pour des raisons de coûts.

- En ce qui concerne les différentes **variantes** possibles, des préférences ressortent assez nettement. Pour des raisons d'espace disponible et d'impacts riverains, les répondants préfèrent **Allumettières/Wilfrid-Lavigne** à Eardley/Principale (48 % contre 16 %), **Allumettières** à McConnell (40 % à 26 %), **l'arrière de l'UQO** à Taché (53 % contre 24 %). En revanche, ils préfèrent **Plateau** à Allumettières (50 % contre 28 %) afin de favoriser la desserte des quartiers et l'accessibilité des stations à pied ou à vélo.

- La majorité des répondants souhaitent une **connexion entre les deux axes** Allumettières-Plateau et Aylmer-Taché, la plupart **par Allumettières** plutôt que Vanier (31 % contre 19 %).

- Les clients du secteur Hull et de l'est de Gatineau sont **majoritairement ouverts à faire une correspondance** sur le tramway à destination d'Ottawa, à condition que le parcours soit à l'abri de la congestion (50 %), que la fréquence du tramway et des autobus soit élevée (49 %), et que le temps de trajet soit plus court (42 %).

- Quant au parcours à Ottawa, **58 %** des répondants estiment que le système devrait se rendre **plus loin que la station Lyon**.

- Concernant le mode de transport, les répondants souhaitent qu'il soit **fréquent, rapide et fiable. Les deux tiers privilégient le tramway** qu'ils perçoivent comme étant plus rapide, plus fiable, à l'abri de la congestion et offrant une plus grande capacité.

- **64 à 76 %** des répondants sont prêts à accepter des **réductions de voies de circulation.** L'acceptabilité des **expropriations partielles de propriétés** varie entre **44 % et 59 %.** Quant aux **expropriations totales**, elles sont acceptables pour une minorité, soit **24 à 42 %.**

Ce que nous allons faire

- Les résultats de la consultation publique seront pris en compte dans les prochaines étapes de l'étude, notamment lors de l'évaluation comparative des scénarios.
- D'autres consultations ciblées auront lieu, notamment auprès des comités consultatifs et des résidents des quartiers impactés.
- L'étude sera déposée au courant de l'année 2020.
- Plusieurs étapes devront être réalisées par la suite, dont l'obtention du financement, l'élaboration des plans et devis et la réalisation des travaux. La mise en service du nouveau système est prévue dans un horizon de 7 à 10 ans.
- D'ici là, afin de répondre à la croissance de l'achalandage dans l'ouest comme dans l'est, la STO continue d'investir massivement dans les services et de mettre en place des mesures préférentielles pour améliorer la performance et la fiabilité de son réseau.

Mise en contexte

L'étude complémentaire

En 2017, la STO déposait une étude d'opportunité qui concluait que la combinaison des axes Allumettières et Aylmer/Taché était requise pour répondre à l'ensemble des besoins. L'étude recommandait l'implantation d'un système rapide par bus (SRB), mais identifiait un risque de saturation à long terme.

Ainsi, dans une optique d'intégration des réseaux et dans une vision à plus long terme de développement de la grande région métropolitaine de Gatineau-Ottawa, et afin d'étudier plus en détail l'option du tramway, la STO a confié en août 2018 un mandat à la firme WSP afin :

- de statuer sur le(s) mode(s) qui sera (seront) mis en place : tramway ou SRB;
- d'affiner les corridors empruntés;
- de définir l'arrimage optimal avec le Rapibus de l'est de Gatineau et le train léger d'Ottawa;
- de définir les emplacements précis des différentes stations;
- d'identifier le pont interprovincial privilégié.

Cette étude complémentaire pour la réalisation d'un système de transport collectif structurant dans l'ouest de Gatineau est réalisée en collaboration avec les partenaires de la STO :

- la Ville de Gatineau;
- le ministère des Transports du Québec (MTQ);
- la Commission de la capitale nationale (CCN);
- la Ville d'Ottawa / OC Transpo.

Elle est financée grâce à la contribution du gouvernement fédéral (50 %) et du gouvernement provincial (40 %) dans le cadre du Programme d'aide financière du Fonds pour l'infrastructure de transport en commun (PAFFITC).

Les étapes réalisées et à venir

Étapes réalisées

Les étapes réalisées jusqu'à présent incluent :

- Étape 1 : mise à jour et raffinement des besoins et contraintes identifiés lors de l'étude précédente, tant pour la période actuelle que future;

- Étape 2 : identification et évaluation des solutions possibles pour en retenir 5.

Étapes à venir

Les étapes suivantes seront réalisées dans les mois suivant la fin de la période de consultation publique :

- Étape 3 : évaluation de la performance des 5 solutions retenues pour identifier la solution qui répond le mieux aux objectifs et aux contraintes identifiées;

- Étape 4 : raffinement de la solution techniquement recommandée par l'étude et identification d'un phasage de mise en œuvre et un échéancier de réalisation.

À la suite du dépôt du rapport, au courant de l'année 2020, les étapes suivantes devront être réalisées à moyen terme afin de poursuivre la réalisation du projet, dans un horizon de 7 à 10 ans :

- Obtention de l'accord de principe du gouvernement du Québec pour le financement du projet;
- Étude détaillée du scénario retenu;
- Conception préliminaire puis détaillée;
- Obtention de l'accord final du gouvernement du Québec pour le financement;
- Appel d'offres publiques pour la construction;
- Réalisation des travaux.

Le processus de consultation

Objectifs de la consultation

La STO a souhaité consulter les résidents des secteurs concernés ainsi que de l'ensemble de Gatineau sur les cinq scénarios identifiés, afin d'alimenter l'étape d'évaluation comparative des solutions.

Les objectifs de la consultation étaient les suivants :

- Évaluer le soutien de la population pour des investissements et des mesures additionnels en faveur du transport collectif;
- Informer la population des scénarios à l'étude et des avantages et défis de chacun d'entre eux, et recueillir leur avis sur ces scénarios;
- Connaître les préférences quant aux scénarios et aux variantes de parcours à l'étude;
- Apprécier les préférences liées aux modes de transport et comprendre leurs raisons.

Activités de consultation

Le processus de consultation incluait plusieurs activités d'information et de participation :

Tableau 1 – Activités de consultation

Date	Activité
Mardi 28 mai 2019	Mise en ligne de l'information sur les scénarios à l'étude Breffage de presse
Lundi 3 juin 2019	Début de de la consultation publique : • Mise en ligne du questionnaire de consultation • Ouverture de la période de dépôt de mémoires Mise en ligne de 5 capsules vidéos explicatives Soirée d'information au Centre culturel du Vieux-Aylmer
Mardi 4 juin 2019	Soirée d'information au Centre communautaire du Plateau
Jeudi 6 juin 2019	Soirée d'information à la Maison du citoyen
Lundi 17 juin 2019	Atelier de réflexion
Lundi 24 juin 2019	Clôture de la consultation publique

Les principales activités sont décrites dans le détail ci-après.[1]

[1] À noter qu'en plus de la consultation publique, certaines parties prenantes ont été impliquées à chacune des étapes de l'étude à travers la mise en place de comités consultatifs. Les comptes-rendus sont disponibles au sto.ca.

Soirées d'information

À l'ouverture de la période de consultation, la STO a tenu 3 soirées d'information :

- Le lundi 3 juin de 16 h à 20 h au Centre culturel du Vieux-Aylmer;
- Le mardi 4 juin de 16 h 30 à 20 h 30 au Centre communautaire du Plateau;
- Le jeudi 6 juin de 16 h à 20 h à la Maison du citoyen.

Les participants pouvaient visionner les vidéos d'information, consulter les planches d'information sur l'étude, les 5 scénarios considérés, les variantes possibles et les modes de transport, et poser leurs questions aux professionnels de la STO et aux consultants de la firme WSP présents sur place.

Au total, **près de 100 personnes** s'y sont présentées.

Information sur l'étude

Toute l'information sur l'étude et la consultation se retrouvait dans la section « Consultations publiques » du site Web de la STO. Celle-ci était facilement accessible à l'adresse sto.ca/consultation.

Une trousse d'information papier incluant les mêmes informations ainsi qu'une copie du questionnaire de consultation était également disponible lors des soirées d'information, dans les quatre Points de service de la STO, et sur demande auprès du Service des relations avec la clientèle (cf. annexe 1).

Plan de communication

Afin d'encourager le plus grand nombre possible d'usagers et de citoyens à s'informer et à participer à la consultation publique, la STO a utilisé différents outils de communication :

- Images rotatives en page d'accueil du sto.ca et du m.sto.ca du 28 mai au 24 juin et bannières sur toutes les pages du sto.ca;
- Affiches et messages sur les panneaux à messages variables à bord des autobus ainsi dans les stations;
- Notification dans l'application Transit;
- 4 publications sur la page Facebook de la STO ayant rejoint entre 3 500 et 9 500 personnes chacune et obtenu un total de 2 500 engagements (clics, J'aime, commentaires et partages);
- Campagne sponsorisée du 6 au 23 juin sur Facebook, Instagram et Messenger, avec une portée de près de 25 000 personnes;
- 3 publications sur le compte Twitter de la STO, qui ont rejoint entre 2 325 et 5 500 personnes chacune et obtenu un total de 130 engagements (clics, retweets, réponses et J'aime);
- Mentions dans les éditions du 24 mai et du 19 juin de l'Infolettre de la STO, envoyées à près de 15 000 destinataires;
- Placements dans le journal Le Droit (éditions papier et électronique) le mercredi 5 juin et les samedis 15 et 22 juin ainsi que dans le Bulletin d'Aylmer les mercredis 5 et 19 juin;
- Messages radio sur Pop et Wow du 3 au 24 juin et sur Énergie et Rouge du 5 au 24 juin.

Tous ces envois et publications invitaient les personnes intéressées à consulter le site Web de la STO pour s'informer sur l'étude et participer à la consultation publique.

L'information a été largement relayée par certains élus et plusieurs associations de résidents, notamment sur leurs pages Facebook.

Par ailleurs, l'activité de presse du 28 mai et les soirées d'information ont été couvertes par les médias régionaux suivants :

- Le Droit;
- ICI Radio-Canada Ottawa-Gatineau;
- CBC Ottawa;
- TVA Gatineau;
- Bulletin d'Aylmer;
- 104,7 fm Outaouais;
- Rouge FM / Énergie.

Consultation de l'information en ligne

Au total, entre le 27 mai et le 24 juin, la page Web de la consultation a été vue **plus de 8 500 fois**.

La page hébergeant les 5 capsules vidéos a été vue plus de 2 200 fois, et ces dernières ont été visionnées entre 300 et 600 fois chacune.

Les planches et les cartes des scénarios ont été téléchargées près de 2 000 fois au total.

Questionnaire de consultation

Méthodologie

Le questionnaire de consultation a été conçu par la STO et validé par la firme BIP Recherche, qui l'a hébergé sur sa plateforme de sondage en ligne. Il était disponible du 3 au 24 juin 2019, en français et en anglais, et compatible avec les téléphones intelligents et les tablettes.

Afin d'être accessible au plus grand nombre, le questionnaire ainsi qu'une trousse d'information complète étaient également disponibles sur demande en version papier dans les Points de service de la STO. Plusieurs exemplaires ont été distribués lors des soirées portes ouvertes.

Le formulaire était composé de **42 questions, dont 14 questions ouvertes ou semi-ouvertes** permettant de recueillir les commentaires des participants (cf. annexe 2).

Le temps moyen requis pour répondre au questionnaire a été de 30 minutes.

Une fois la collecte terminée, un contrôle de validation des questionnaires a été effectué par la firme BIP Recherche pour s'assurer qu'une même personne n'ait pas répondu plus d'une fois. Les données ont été compilées dans le logiciel *Pronto* de Voxco et traitées à l'aide du logiciel *Stat-XP.*

La firme BIP Recherche s'est chargée de l'analyse quantitative des résultats ainsi que de la compilation des réponses ouvertes. La STO a ajouté une analyse cartographique des réponses et a extrait des verbatim afin de les ajouter au présent rapport.

Nombre de répondants

Au total, **668 questionnaires** de consultation ont été complétés en entier. 3 d'entre eux étaient des questionnaires papier.

Profil des répondants

Langue

83 % des participants ont complété le questionnaire en français, et 17 % en anglais.

Sexe

51 % des répondants sont des hommes, et 44 % sont des femmes. 4 % des répondants n'ont pas souhaité répondre à cette question (Q28).

Âge

La répartition des répondants par groupe d'âge est présentée dans le tableau ci-dessous. Près des trois quarts des répondants ont entre 25 et 54 ans.

Tableau 2 – Âge des répondants (n=668)

Q29. Dans quelle catégorie d'âge vous situez-vous?

Catégorie d'âge	% répondants
Moins de 25 ans	7 %
25 à 34 ans	23 %
35 à 44 ans	32 %
45 à 54 ans	19 %
55 à 64 ans	12 %
65 ans et plus	4 %
Préfère ne pas répondre	3 %

Scolarité

Près des trois quarts des répondants détiennent un diplôme universitaire.

Tableau 3 – Scolarité des répondants (n=668)

Q30. Quel est le plus haut niveau de scolarité que vous ayez complété (diplôme obtenu)?

Scolarité	% répondants
Primaire	1 %
Secondaire	6 %
Collégial	17 %
Universitaire	73 %
Préfère ne pas répondre	3 %

Occupation principale

78 % des répondants sont des travailleurs à temps plein, 7 % des étudiants, 7 % des retraités et 5 % des travailleurs à temps partiel.

Tableau 4 – Occupation principale des répondants (n=668)

Q31. Quelle est votre occupation principale?

Occupation principale	% répondants
Travailleur à temps plein	78 %
Travailleur à temps partiel	3 %
Travailleur autonome	3 %
Total – Population active	***84 %***
Étudiant	5 %
Retraité	7 %
Au foyer	1 %
Ne travaille pas et ne recherche pas d'emploi	1 %
Total – Population inactive	***13 %***
Préfère ne pas répondre	4%

Lieu d'emploi ou d'études

Pour les travailleurs et les étudiants, les lieux d'emploi ou d'études se répartissent comme suit :

Tableau 5 – Lieu d'emploi ou d'études des répondants (n=572)

Q32. Si vous êtes travailleur ou étudiant, quel est votre principal lieu d'emploi ou d'études?

Lieu d'emploi ou d'études	% répondants
Ottawa, centre-ville / Basse-Ville	42 %
Gatineau, secteur Hull – centre-ville (Île de Hull)	23 %
Total – Centres-villes	***65 %***
Gatineau, hors centre-ville	20 %
Ottawa, hors centre-ville	14 %
Autres municipalités	1 %
Total – Périphérie	***35 %***

Lieu de résidence

71 % des répondants résident dans un des cinq districts qui constituent le secteur concerné par l'étude, soit les districts d'Aylmer (10 %), de Lucerne (13 %), de Deschênes (16 %), du Plateau (20 %), et du Manoir-des-Trembles–Val-Tétreau (12 %).

29 % résident en dehors de ce secteur :

- Les autres districts du secteur Hull, soit Hull–Wright, L'Orée-du-Parc et Parc-de-la-Montagne–Saint-Raymond, représentent 10 % des participants.
- 14 % des répondants résident dans les secteurs Gatineau, Buckingham et Masson-Angers. Tous les districts de la Ville de Gatineau sont représentés.
- Enfin, 4 % des répondants résident en dehors de Gatineau, soit à Ottawa, Cantley, Chelsea, L'Ange-Gardien, Mulgrave-et-Derry, Val-des-Monts ou dans la MRC du Pontiac.

Tableau 6 – Lieu de résidence des répondants (n=668)

Q35. Où résidez-vous?

Lieu de résidence	% répondants
Secteur Aylmer (hors Plateau)	40 %
District du Plateau	20 %
Secteur Hull (hors Plateau)	22 %
Secteurs Gatineau, Buckingham et Masson-Angers	14 %
Autres municipalités	4 %

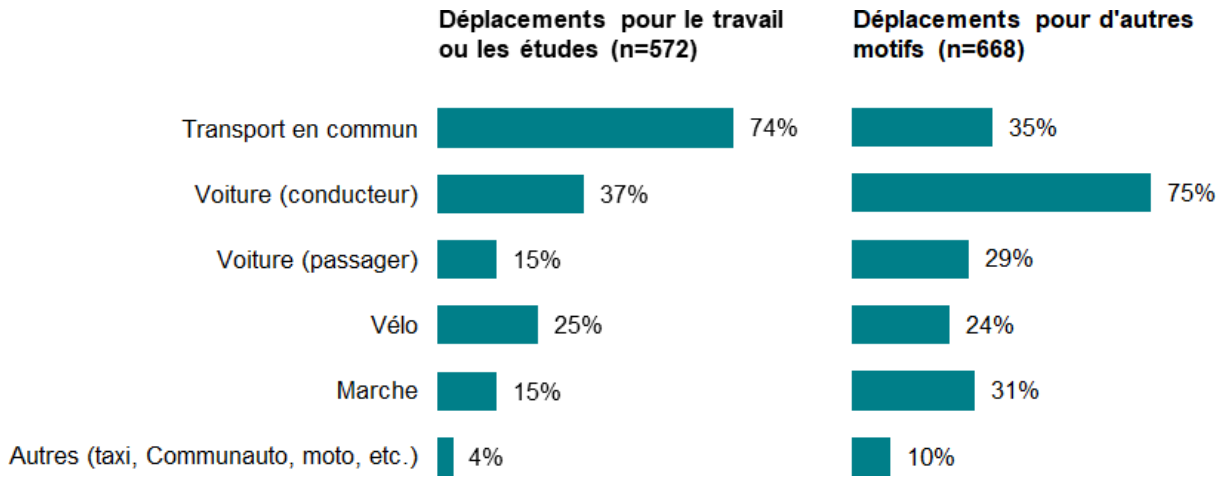
- **Utilisation du transport en commun et des autres modes de transport**

Globalement, 73 % des répondants utilisent le transport en commun quel que soit le motif, que ce soit le réseau régulier ou le service de transport adapté de la STO, d'OC Transpo ou de Transcollines, tandis que 27 % ne l'utilisent pas.

La répartition des moyens de transport utilisés le plus souvent par les répondants, pour les déplacements liés au travail ou aux études et pour les autres déplacements, est illustrée à la figure 1 ci-après.

Figure 1 – Modes de transport utilisés

Q33. Si vous êtes travailleur ou étudiant, quel(s) moyen(s) de transport utilisez-vous le plus souvent pour vous rendre à votre lieu d'emploi ou d'études? Vous pouvez sélectionner jusqu'à 4 réponses.
Q34. Quel(s) moyen(s) de transport utilisez-vous le plus souvent pour vos déplacements pour d'autres motifs que le travail ou les études? Vous pouvez sélectionner jusqu'à 4 réponses.



Présentation des points de vue exprimés

Note méthodologique / avertissement

Il est important de noter que la consultation n'est pas un sondage et qu'elle **ne repose pas sur un échantillonnage probabiliste**. De plus, **plusieurs biais** ont pu influencer les résultats :

- Le questionnaire de consultation a été rempli sur une base volontaire (autosélection);
- Peu de questionnaires papier ont été reçus en proportion de la population n'ayant pas accès à Internet;
- Les résultats peuvent être teintés par la façon dont la consultation a été relayée auprès de la population.

Les répondants ne sont donc **pas représentatifs** des citoyens ou des usagers des secteurs concernés par l'étude. Les résultats présentés ci-après correspondent donc uniquement à l'opinion des personnes ayant participé à la consultation et **ne peuvent pas être extrapolés** à l'ensemble de la population.

Les écarts significatifs pertinents entre les sous-groupes sont mentionnés pour chacune des questions. Le cas échéant, les moyennes ou pourcentages significativement supérieurs sont indiqués par le signe « + » dans les tableaux et graphiques. Les moyennes ou pourcentages significativement inférieurs sont indiquées par le signe « - ».

Partie 1 – La nécessité d'un système structurant de transport en commun

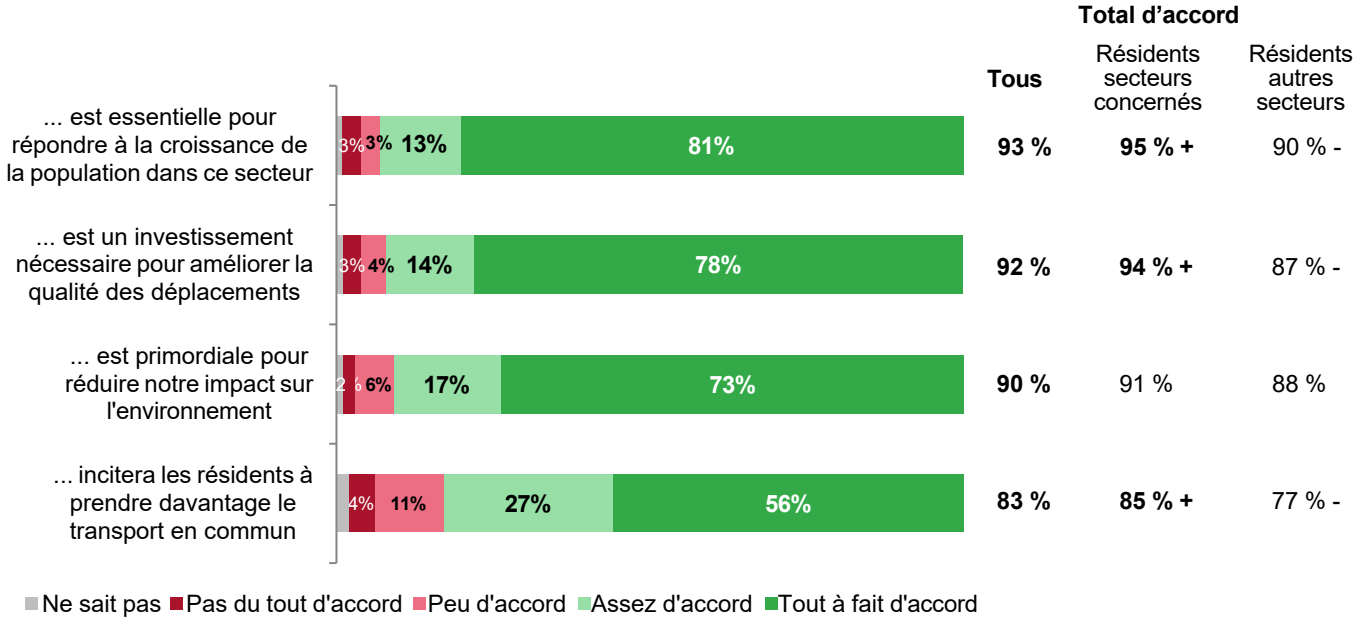
Tout d'abord, quatre questions étaient posées afin de mesurer le soutien de la population pour des investissements dans le transport en commun.

Une très forte majorité de répondants considèrent que la mise en place d'un système structurant de transport collectif dans l'ouest de Gatineau est une nécessité. En effet, le pourcentage de répondants en accord avec les quatre énoncés proposés varie entre 83 % et 93 % (tout à fait d'accord ou assez d'accord).

Pour trois des énoncés, les moyennes d'accord des résidents des secteurs concernés sont significativement plus élevées que ceux des résidents des autres secteurs, tel qu'illustré à la figure 2 ci-dessous.

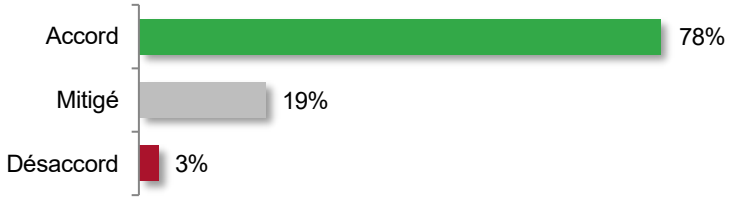
Figure 2 – Degré d'accord avec la mise en place d'un système structurant dans l'ouest (n=668)

Q1. Quel est votre degré d'accord avec les énoncés suivants?
La mise en place d'un système structurant de transport collectif dans l'ouest de Gatineau …



À partir des réponses données aux quatre énoncés, on peut établir un indice d'accord à l'égard de la mise en place d'un système structurant dans l'ouest (cf. figure 3).

Figure 3 – Indice d'accord avec la mise en place d'un système structurant dans l'ouest (n=668)



Indice	Résidents secteurs concernés	Résidents autres secteurs
Accord	**81 % +**	72 % -
Mitigé	17 %	23 %
Désaccord	2 %	5 %

Il ressort que près de quatre répondants sur cinq sont d'accord avec les quatre énoncés. Seuls 3 % sont en désaccord avec tous les énoncés. 19 % sont mitigés, soit en accord avec certains et en désaccord avec d'autres.

L'indice d'accord est plus élevé que la moyenne parmi les sous-groupes suivants :

- Les anglophones (88 %);
- Les personnes qui utilisent le transport collectif pour des motifs autres que le travail ou les études (86 %) et pour se rendre au travail/aux études (81 %);
- Les résidents du secteur Aylmer (82 %) et des secteurs concernés par le projet (81 %);
- Les diplômés universitaires (82 %).

Partie 2 – Les scénarios proposés

Au moment de la consultation publique, cinq scénarios étaient à l'étude pour la desserte de l'ouest de Gatineau :

- Le scénario de référence;
- Le scénario tout bus;
- Le scénario tout rail;
- Le scénario hybride avec rails sur Aylmer-Taché;
- Le scénario hybride avec rails sur Allumettières/Plateau.

Dans cette partie du questionnaire, les participants à la consultation étaient invités à donner leur avis sur ces cinq scénarios.

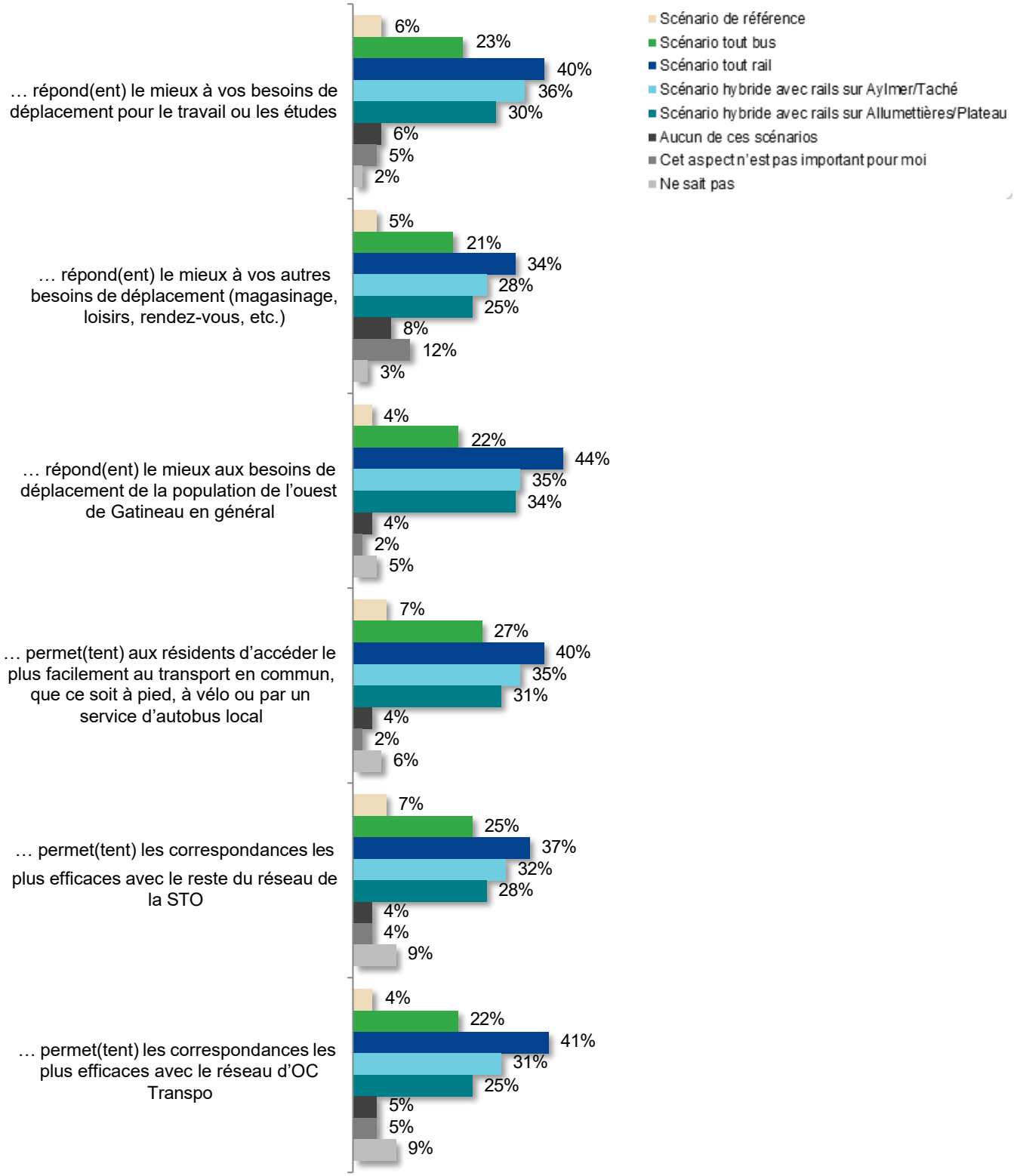
Évaluation des scénarios selon différents critères

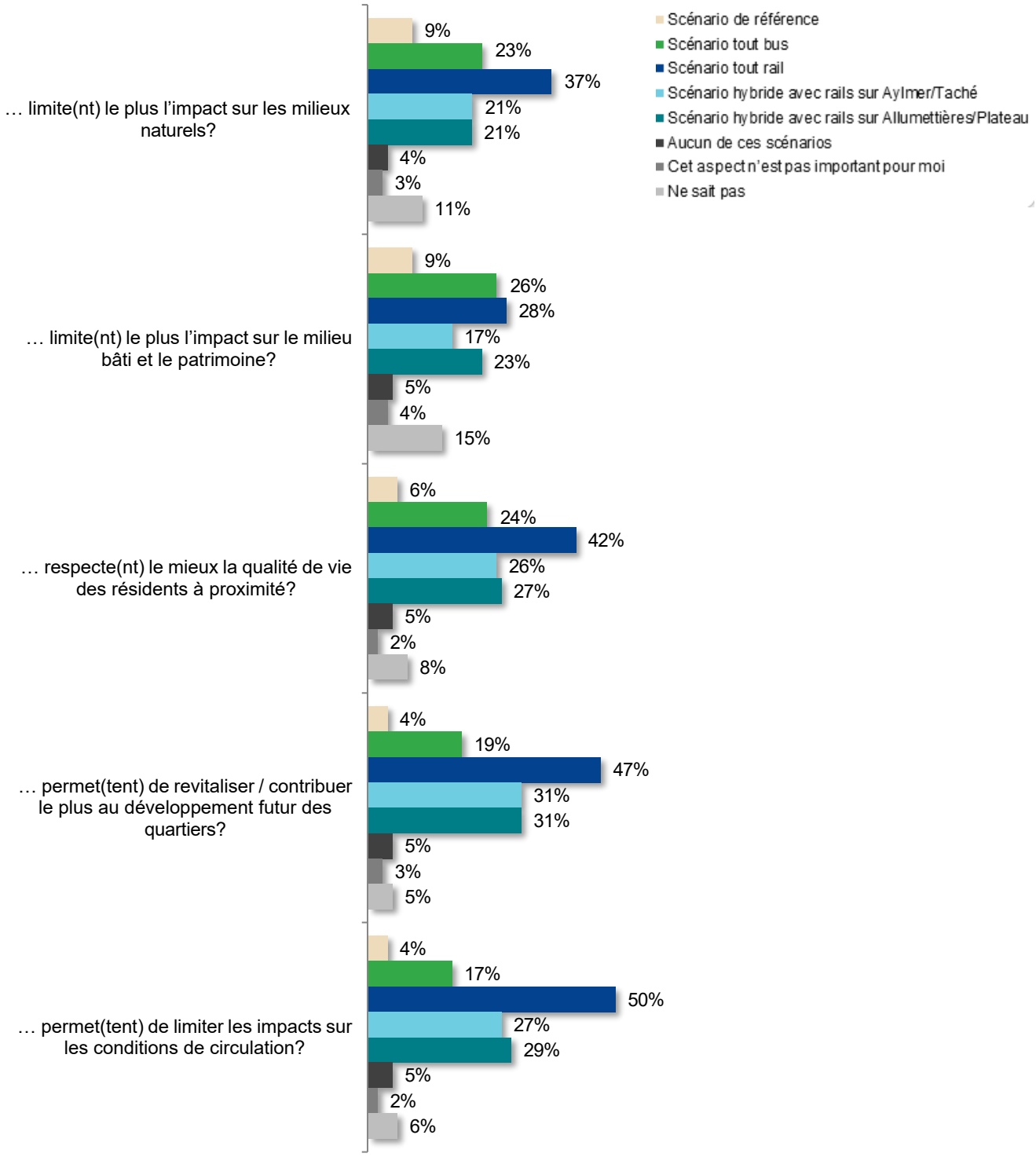
La première question les invitait à indiquer le(s) scénario(s) qu'ils privilégiaient selon 11 critères d'évaluation liés au service de transport en commun et aux impacts sur les milieux de vie.

Les résultats sont présentés à la figure 4 aux pages suivantes.

Figure 4 – Scénarios privilégiés selon les différents critères (n=668)

Q2. Pour chacun des énoncés, veuillez indiquer le ou les scénario(s) qui répond(ent) le mieux aux conditions mentionnées. Plusieurs réponses sont possibles. Au besoin, veuillez-vous référer à la description des 5 scénarios au sto.ca/consultation. Selon vous, quel(s) scénario(s) …




Scénario de référence
Scénario tout bus
Scénario tout rail
Scénario hybride avec rails sur Aylmer/Taché
Scénario hybride avec rails sur Allumettières/Plateau
Aucun de ces scénarios
Cet aspect n'est pas important pour moi
Ne sait pas
… limite(nt) le plus l'impact sur les milieux naturels?
9%
23%
37%
21%
21%
4%
3%
11%
… limite(nt) le plus l'impact sur le milieu bâti et le patrimoine?
9%
26%
28%
17%
23%
5%
4%
15%
… respecte(nt) le mieux la qualité de vie des résidents à proximité?
6%
24%
42%
26%
27%
5%
2%
8%
… permet(tent) de revitaliser / contribuer le plus au développement futur des quartiers?
4%
19%
47%
31%
31%
5%
3%
5%
… permet(tent) de limiter les impacts sur les conditions de circulation?
4%
17%
50%
27%
29%
5%
2%
6%

De façon générale, **le scénario tout rail est privilégié par le plus grand nombre de répondants quel que soit le critère**, avec des pourcentages d'appui compris entre 28 et 50 %. Il se distingue particulièrement sur les critères suivants, avec un pourcentage supérieur de 10 points ou plus au deuxième scénario privilégié :

- Permet de limiter les impacts sur les conditions de circulation (50 % contre 29 % pour le scénario hybride avec rails sur Allumettières/Plateau);
- Permet de revitaliser / contribuer le plus au développement futur des quartiers (47 % contre 31 % pour les deux scénarios hybrides);
- Respecte le mieux la qualité de vie des résidents à proximité (42 % contre 27 % pour le scénario hybride avec rails sur Allumettières/Plateau);
- Permet les correspondances les plus efficaces avec le réseau d'OC Transpo (41 % contre 31 % pour le scénario hybride avec rails sur Aylmer-Taché).

En revanche, un pourcentage moindre de répondants considèrent que c'est le scénario qui limite le plus l'impact sur le milieu bâti et le patrimoine (28 %).

Les deux scénarios hybrides reviennent généralement en deuxième et troisième position, avec une part similaire de répondants qui les privilégient, comprise entre 17 et 36 % selon les critères.

Le scénario hybride avec rails sur Aylmer-Taché se distingue toutefois quant aux critères suivants :

- Répond le mieux à vos besoins de déplacement pour le travail ou les études (36 % contre 30 % pour le scénario avec rails sur Allumettières/Plateau);
- Permet aux résidents d'accéder le plus facilement au transport en commun (35 % contre 31 %);
- Permet les correspondances les plus efficaces avec le reste du réseau de la STO (32 % contre 28 %);
- Permet les correspondances les plus efficaces avec le réseau d'OC Transpo (31 % contre 25 %);
- Répond le mieux à vos autres besoins de déplacement (28 % contre 25 %).

Quant au scénario hybride avec rails sur Allumettières/Plateau, il est privilégié en ce qui concerne la minimisation de l'impact sur le milieu bâti et le patrimoine (23 % contre 17 % pour le scénario avec rails sur Aylmer-Taché).

Le scénario tout bus arrive généralement en quatrième position, étant privilégié par 17 à 27 % des répondants selon les critères. Il est toutefois considéré comme le deuxième scénario répondant le mieux aux objectifs de limiter l'impact sur le milieu bâti et le patrimoine (26 %) et sur les milieux naturels (23%).

À noter que concernant ces deux derniers critères, un pourcentage significatif de répondants n'a pas été en mesure de se prononcer, avec respectivement de 15 et 11 % de « Je ne sais pas ».

Le scénario de référence recueille entre 4 et 9 % d'appuis selon les critères.

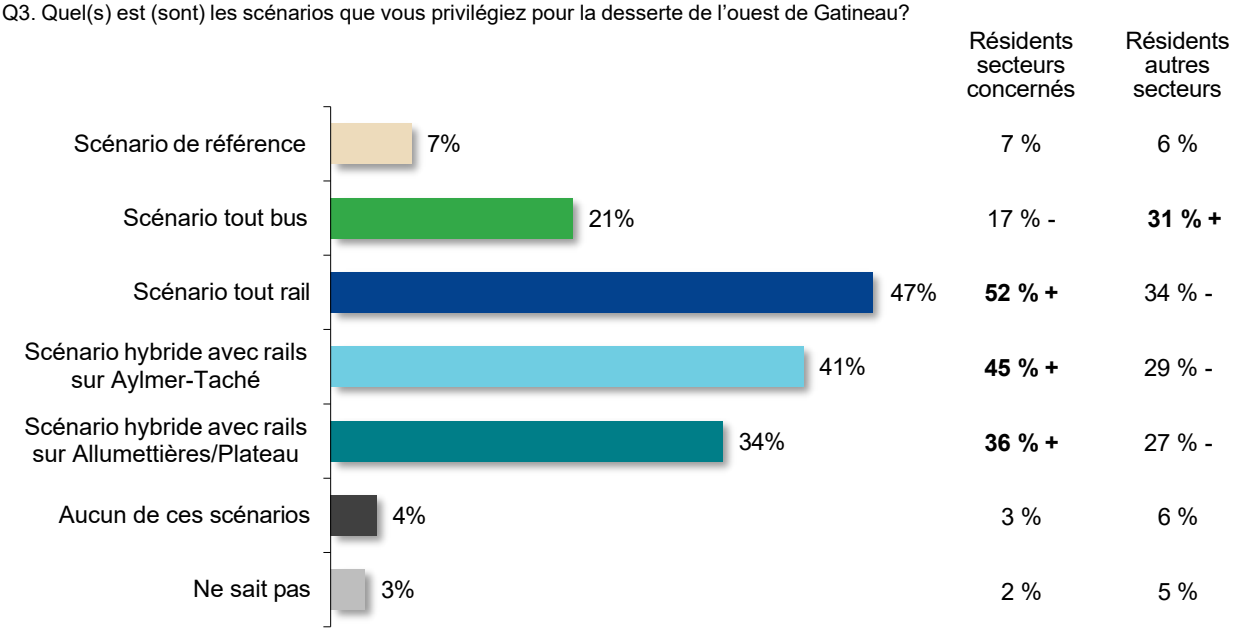
Scénarios privilégiés

Ensuite, les répondants étaient amenés à se prononcer sur le ou les scénario(s) qu'ils privilégient pour la desserte de l'ouest de Gatineau.

Les résultats sont présentés à la figure 5 ci-dessous.

Figure 5 – Scénarios privilégiés pour la desserte de l'ouest de Gatineau (n=668)

Q3. Quel(s) est (sont) les scénarios que vous privilégiez pour la desserte de l'ouest de Gatineau?



De prime abord, on constate que les trois scénarios incluant un tramway sur au moins un des deux axes se démarquent. En considérant les réponses multiples, ce sont 78 % des répondants qui ont choisi au moins un des scénarios avec rails (soit 84 % des résidents des secteurs concernés et 62 % des résidents des autres secteurs).

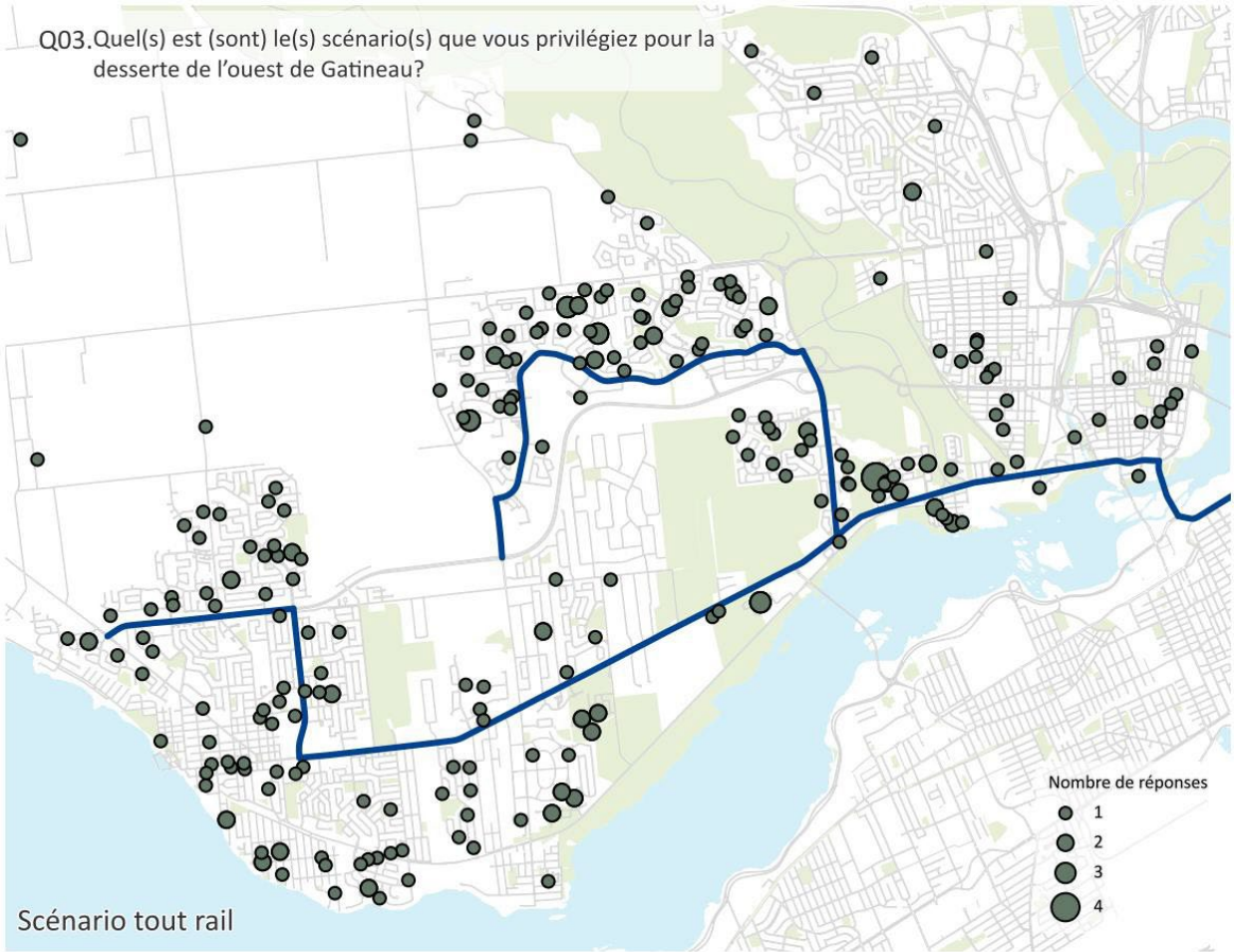
Les différences significatives ainsi que les cartographies des répondants ayant opté pour chacun de ces scénarios sont présentées aux pages suivantes.

Le scénario tout rail est privilégié par 47 % des répondants. Les sous-groupes suivants sont significativement plus nombreux à exprimer une préférence pour ce scénario :

- Les répondants qui se rendent à leur lieu de travail ou d'études à pied ou à vélo (57 %);
- Les résidents du district du Plateau (55 %) et des secteurs concernés par l'étude (52 %);
- Les hommes (53 %);
- Les répondants favorables à la mise en place d'un système de transport structurant (52 %);
- Les 35-54 ans (51 %);
- Les diplômés universitaires (51 %).

Il a été possible de cartographier les répondants qui privilégient ce scénario selon leur code postal. La carte présentée à la figure 6 ci-dessous illustre leur répartition géographique dans la partie ouest de Gatineau.

Figure 6 – Cartographie des répondants privilégiant le scénario tout rail

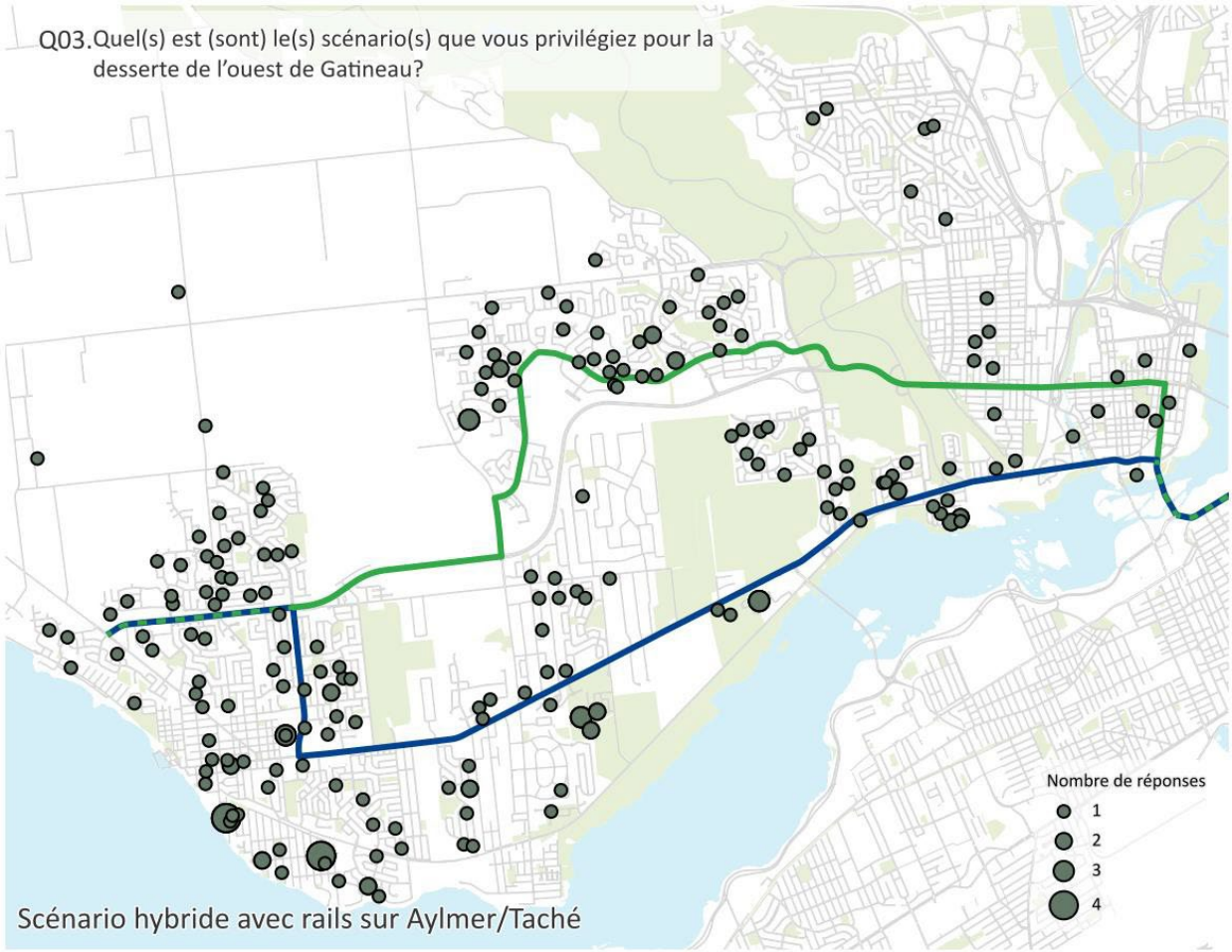


Le scénario hybride avec rails sur Aylmer-Taché recueille 41 % d'appuis, mais davantage auprès :

- Des résidents du secteur Aylmer hors Plateau (53 %) et des secteurs concernés (45 %);
- Des répondants qui sont favorables à la mise en place d'un système structurant (46 %);
- Des utilisateurs du transport en commun pour le travail ou les études (45 %) et en général (43 %);

La cartographie présentée à la figure 7 montre les lieux de résidence des tenants de cette option.

Figure 7 – Cartographie des répondants privilégiant le scénario avec rails sur Aylmer-Taché

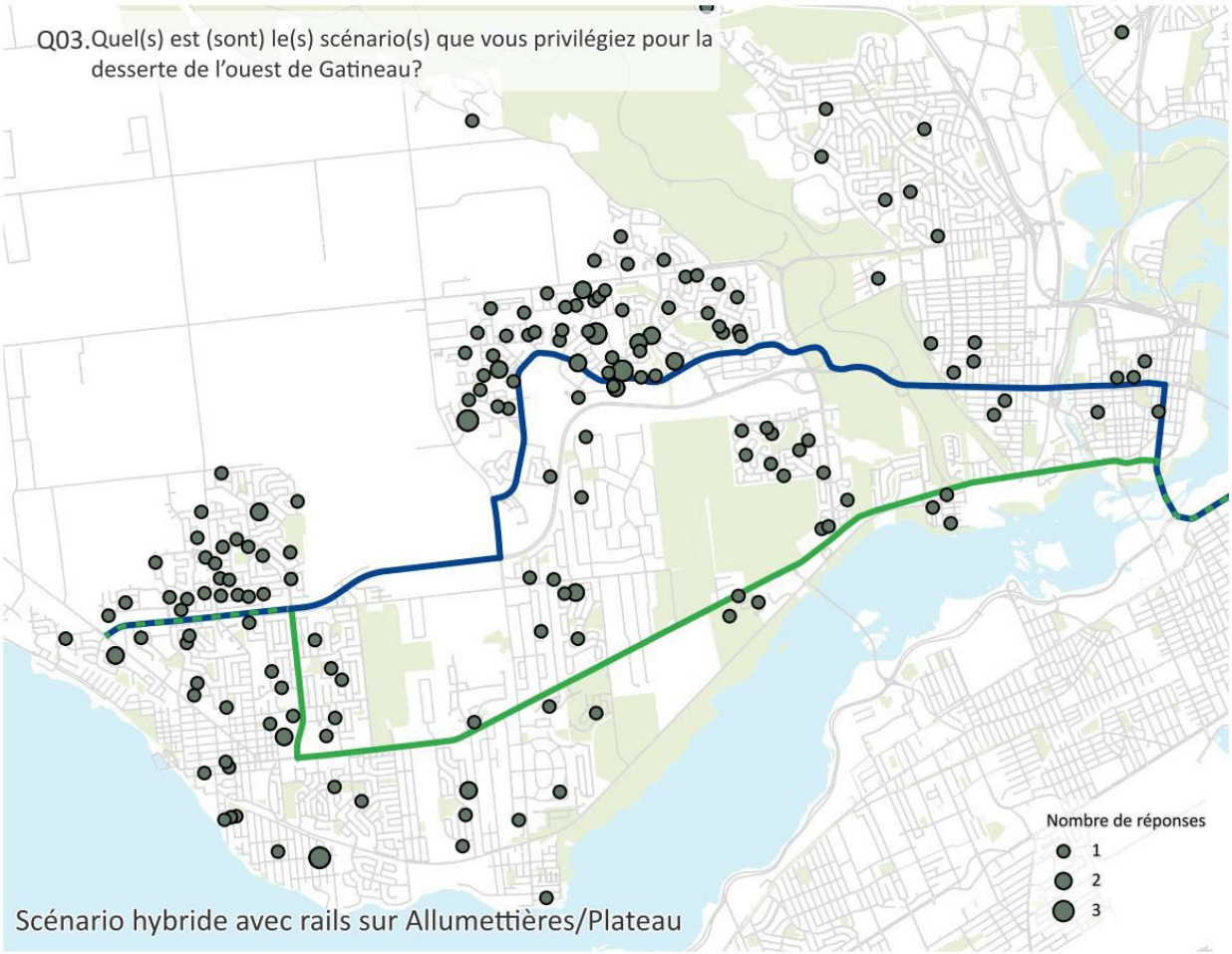


Le scénario hybride avec rails sur Allumettières/Plateau est privilégié par 34 % des répondants. Il est préféré par :

- Les résidents du district du Plateau (53 %) et de façon moins significative, ceux des secteurs concernés par l'étude (36 %);
- Les travailleurs du centre-ville d'Ottawa (47 %);
- Les femmes (40 %);
- Les moins de 35 ans (40 %).

La figure 8 présente la répartition géographique des codes postaux des répondants qui se sont prononcés en faveur de ce scénario.

Figure 8 – Cartographie des répondants privilégiant le scénario avec rails sur Allumettières/Plateau

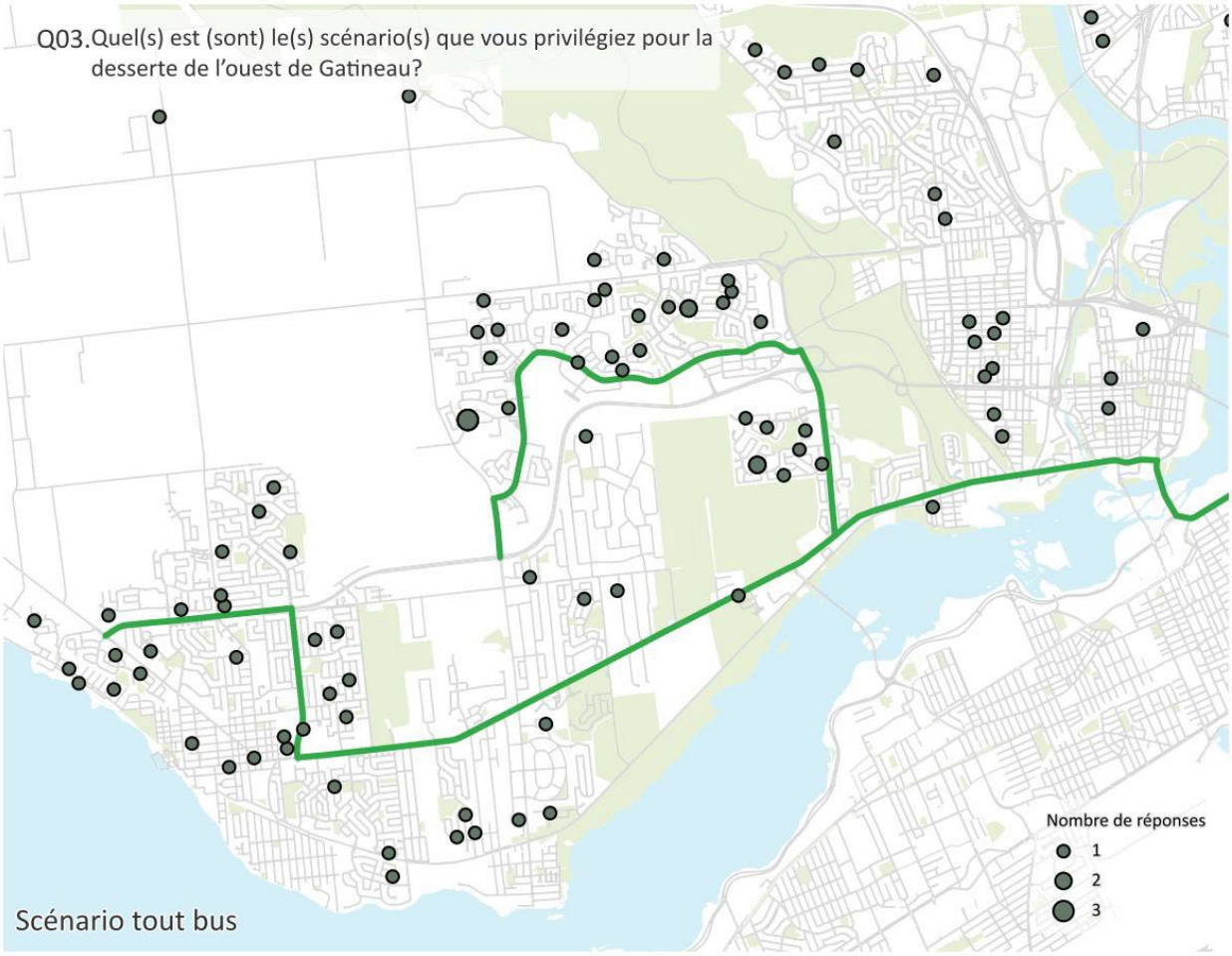


Le scénario tout bus est retenu par 21 % des répondants. Les groupes suivants y sont significativement plus favorables :

- Les répondants qui ont un avis mitigé quant à la nécessité d'un système structurant (40 %);
- Les résidents du secteur Gatineau (39 %) et des secteurs non concernés par l'étude (31 %);
- Les diplômés de niveau primaire ou secondaire (33 %) ou collégial (32 %);
- Les femmes (27 %).

La figure 9 ci-dessous illustre les lieux de résidence des tenants du scénario tout bus (partie ouest de la ville de Gatineau).

Figure 9 – Cartographie des répondants privilégiant le scénario tout bus



Le scénario de référence obtient seulement 7 % d'appuis, sans écarts significatifs selon le profil des répondants.

4 % des participants à la consultation ne privilégient aucun des scénarios proposés, et 3 % ne se prononcent pas.

Raisons de la préférence pour un ou plusieurs scénarios

Par une question ouverte, les répondants étaient invités à justifier leur préférence pour un ou plusieurs des scénarios. Les raisons mentionnées sont catégorisées dans le tableau 7 à la page suivante.

Les principales justifications évoquées pour le choix du rail sont l'efficacité et la fiabilité, la réduction de la congestion et de l'impact environnemental, et les avantages à long terme.

Les scénarios hybrides sont jugés intéressants pour leur desserte élargie, la réduction de la congestion, la réduction des temps de déplacement et les avantages apportés par la combinaison des deux modes.

Le scénario tout bus est retenu pour son moindre coût, sa flexibilité et sa desserte directe des destinations, et sa facilité d'implantation.

Tableau 7 – Raisons citées pour le choix des scénarios privilégiés (n=668)

Q4. Pour quelles raisons?

Raisons	Mentions	Scénario de référence (n=46)	Scénario tout bus (n=142)	Scénario tout rail (n=312)	Scénario hybride avec rails sur Aylmer-Taché (n=271)	Scénario hybride avec rails sur Allumettières / Plateau (n=224)
Le scénario améliore la desserte des quartiers et des destinations.	115	**15 %**	**15 %**	**14 %**	**18 %**	**21 %**
Ce mode de transport est plus efficace / fiable / sécuritaire.	107	11 %	8 %	**26 %**	**18 %**	10 %
Le système permettra de réduire / sera à l'abri de la congestion.	92	7 %	6 %	**20 %**	**17 %**	**17 %**
Le système serait plus rapide / réduirait les temps de déplacement.	88	**13 %**	**13 %**	**18 %**	**14 %**	**13 %**
Le scénario permettrait de réduire l'impact environnemental.	80	**17 %**	5 %	**20 %**	10 %	8 %
Le système est moins coûteux / offre un meilleur rapport avantages-coûts.	76	**13 %**	**34 %**	4 %	6 %	2 %
C'est une solution moderne / à long terme.	73	7 %	1 %	**20 %**	10 %	10 %
Il offre une plus grande capacité / permet de transporter plus de personnes.	57	4 %	3 %	**14 %**	8 %	8 %
Les systèmes hybrides sont avantageux (bon compromis, moindre coût, redondance en cas de panne du train, arrimage avec le Rapibus).	56	4 %	6 %	4 %	**15 %**	**13 %**
On devrait considérer d'autres options (pont Prince-de-Galles, monorail, tunnel, ancienne voie ferrée, amélioration du Rapibus, sixième pont…).	56	9 %	8 %	4 %	6 %	6 %
Le scénario hybride avec rails sur Aylmer-Taché est préférable (accès à pied, densité de population, commerces, route en ligne droite).	38	2 %	3 %	5 %	**13 %**	2 %
Le scénario hybride avec rails Allumettières/ Plateau est préférable (davantage d'espace, développements futurs).	36	0 %	3 %	4 %	3 %	**13 %**
Le système offre davantage de flexibilité.	35	4 %	**15 %**	1 %	4 %	5 %
Il est plus facile et rapide à implanter.	31	4 %	**14 %**	1 %	2 %	3 %
Il offre un meilleur confort.	29	2 %	1 %	7 %	4 %	1 %
Il favorise le développement urbain et la revitalisation des quartiers.	27	2 %	3 %	6 %	4 %	2 %
Le scénario réduit le nombre de correspondances requises.	22	9 %	10 %	1 %	2 %	1 %
Il faut aller vers le rail (nécessaire, plus attrayant).	21	0 %	0 %	6 %	4 %	3 %
Le rail est moderne, esthétique, il rehausserait l'image de Gatineau.	16	2 %	0 %	4 %	1 %	0 %
La population n'est pas suffisante pour justifier un système sur rail.	11	2 %	7 %	0 %	0 %	0 %
Autres (pas de précisions, ce n'est pas mon secteur…).	75	**15 %**	**13 %**	5 %	8 %	10 %
Aucun commentaire.	11	9 %	3 %	1 %	3 %	3 %

Voici quelques-uns des commentaires reçus :

- En faveur des scénarios avec rail

Le scénario tout rail serait souhaitable. Il est grand temps d'investir dans un projet d'envergure de mobilité durable, pour toutes les raisons qu'on connaît. Un projet à long terme qui aurait un impact positif sur la vie des citoyens et qui permettrait aux générations futures de développer de meilleures habitudes de transport.

Mon expérience de transport dans d'autres villes me permet de voir que le transport par rail est adopté plus fortement par la population. Il est moins affecté par les intempéries et les autres aléas. Il offre une capacité beaucoup plus élevé de croissance, il est plus efficace pour servir de réseau structurant et permettre les transferts. Il est aussi plus cohérent avec le modèle en place à Ottawa. Bien qu'ayant une population de seulement 250 000 habitants la région Ottawa-Gatineau devrait être vue avec une vision d'une ville de plus d'un million d'habitant et le transport par rail est essentiel comme base du réseau

Les temps de déplacements sont beaucoup plus précis et constant avec le rail. C'est ce qui selon moi va convertir le plus d'automobilistes au transport en commun.

Un système tout rail serait à la fois plus rapide, plus efficace et plus confortable. Il permet également l'empreinte environnementale la plus faible et la pollution sonore la plus faible. De plus, un système novateur sur rail permettrait de faire de Gatineau une ville exemplaire au Québec et aurait une plus-value patrimoniale importante. Un tramway pourrait devenir un symbole positif de l'Outaouais.

- En faveur du rail sur Aylmer-Taché :

Rail plutôt qu'autobus : alors que j'utilisais le métro à Montréal, je n'ai jamais pris le bus ici. Question confort, ponctualité, fréquence, etc. Il faut un système sur rail (tramway, métro léger, etc.). Taché plus qu'Aylmer : on pourra s'y rendre à pied, densifier les alentours de stations, etc. Alors que des Allumettières est dans un no man's land et favoriserait l'étalement urbain.

Aylmer/Taché représente le cœur de la vie d'Aylmer et se doit d'être desservi de la meilleure façon possible, soit par des rails. Cela permettra à l'axe Aylmer/Taché de devenir une rue importante de commerces et résidences où il fera bon vivre et se déplacer à Aylmer. Par ailleurs, le nombre de personnes résident à distance de marche de l'axe Aylmer Taché justifie l'implantation d'un système sur rails sur cet axe. Des rails pour un "power centre" sur le plateau seraient inutiles, étant donné les énormes commerces et la quantité importante de stationnement sur le Plateau. Les gens vont continuer à utiliser l'auto, car le Plateau a été conçu pour cette raison. En contrepartie, l'axe Aylmer/Taché est l'axe qui ressemble le plus aux villes européennes qui se sont

dotées d'un tramway, où il y a des commerces de proximité sur l'axe principal et des résidences en mixité.

- En faveur du rail sur Allumettières/Plateau :

Le boulevard du Plateau et Allumettières regroupent le plus d'habitants, il est central, la croissance se fera à proximité, que ce soit au sud ou au nord du boulevard des Allumettières. Par exemple, s'il y avait un projet immobilier harmonisateur au site actuel du golf Champlain, il serait proche du boulevard et le train pourrait embarquer tous les passagers. Le boulevard Alexandre-Taché est de plus trop étroit pour un système sur rail.

I think the majority of future development in the west end is going to happen north of Allumettières and it seems smartest to build the largest capacity mass transit in areas where you anticipate the most growth.

- En faveur de l'autobus :

L'autobus est plus flexible, moins cher et une panne n'interrompt pas le service sur toute la ligne comme pour le tramway.

La population actuelle d'Aylmer ne justifie pas la construction d'une ligne de tramway. Un tel projet et l'investissement massif qu'il représente contribuerait à justifier ensuite la poursuite de l'étalement urbain qui est la cause de la congestion dans le secteur. L'amélioration du service d'autobus serait beaucoup moins coûteuse et pourrait être ajustée au fil du temps alors que l'installation de rail est rigide et incite au développement de pôles résidentiels et commerciaux.

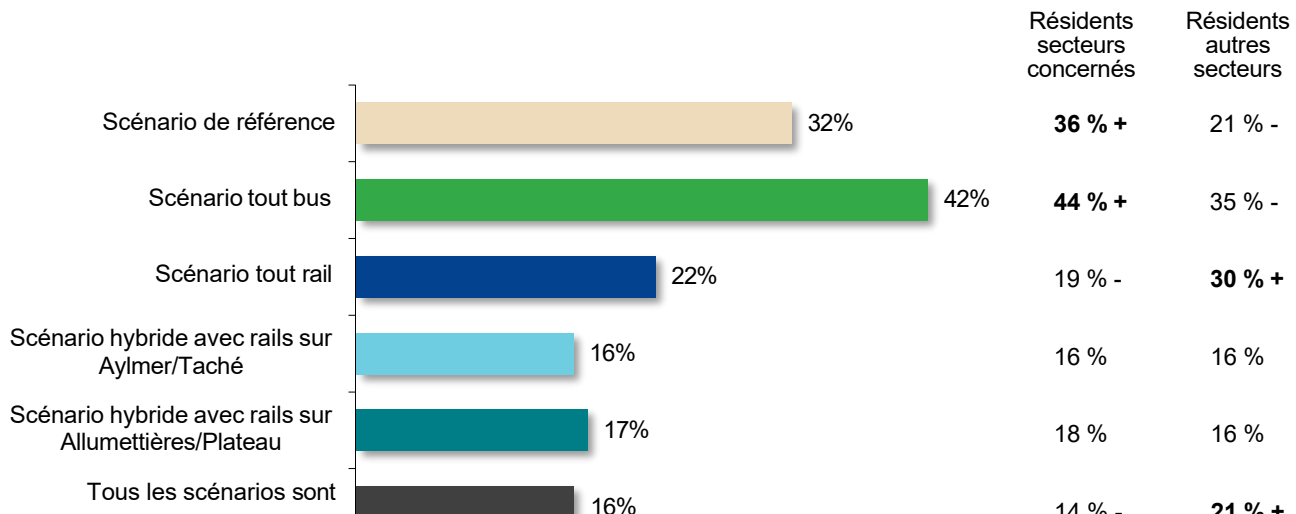
Le bus est le scénario le plus flexible et le moins coûteux. La densité de population ne justifie pas un train ou tram. On paie déjà trop cher de taxe municipale alors, limitons les dépenses et soyons réaliste.

Scénarios jugés inacceptables

Il a ensuite été demandé aux répondants si un ou plusieurs des scénarios proposés était inacceptable selon eux. Les réponses sont présentées à la figure 10 ci-dessous.

Figure 10 – Scénarios jugés inacceptables pour la desserte de l'ouest de Gatineau (n=668)

Q5. Parmi les scénarios proposés, y en a-t-il un ou plusieurs que vous jugez inacceptable(s)?

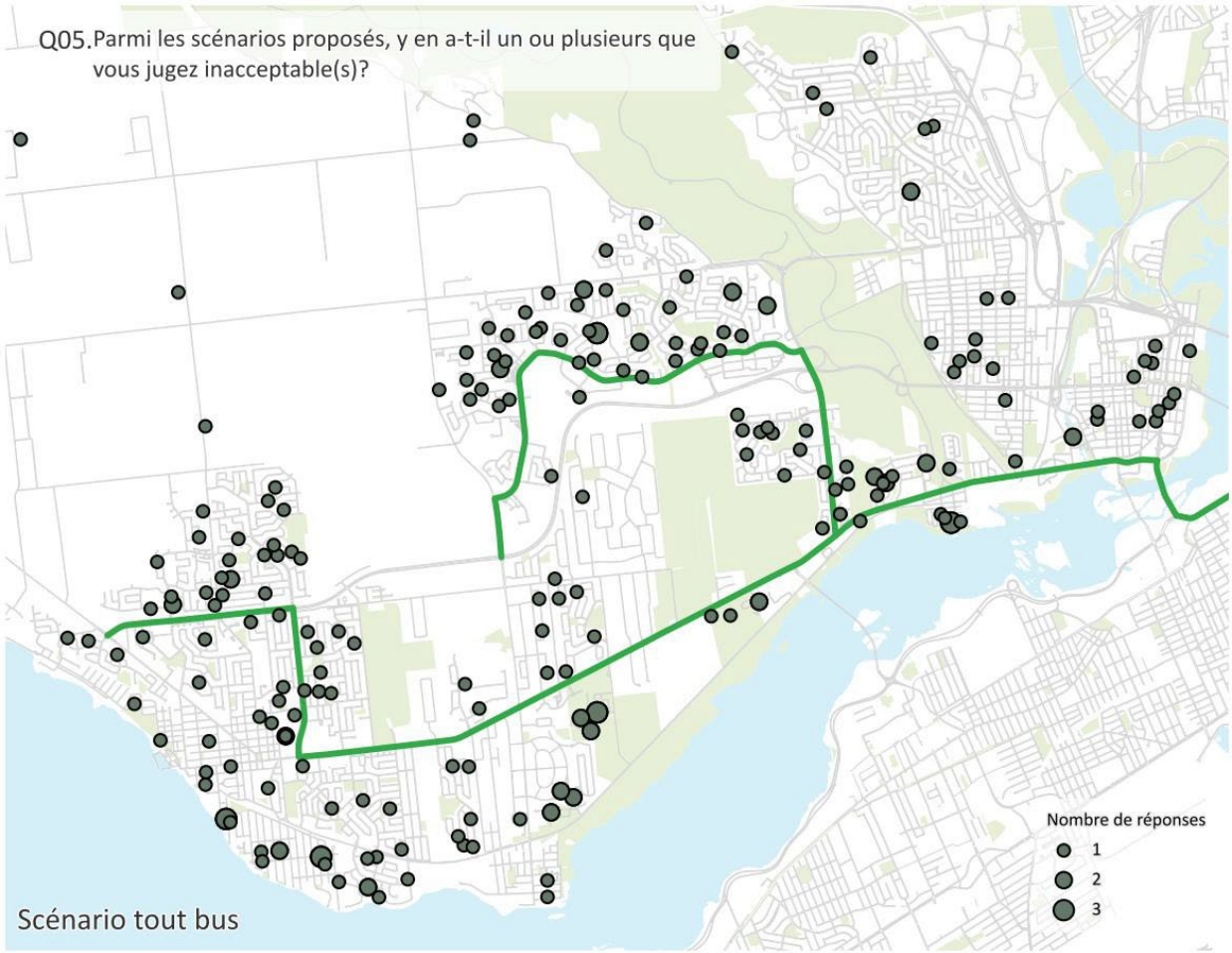


Le scénario tout bus est jugé inacceptable par 42 % des répondants. Certains groupes sont significativement plus nombreux à être de cet avis :

- Les personnes qui travaillent au centre-ville d'Ottawa (50 %);
- Celles qui sont en faveur de la mise en place d'un système structurant (48 %);
- Les hommes (48 %);
- Les diplômés universitaires (47 %);
- Les résidents des secteurs concernés par l'étude (44 %).

Les lieux de résidence des répondants qui rejettent l'option tout bus sont illustrés ci-dessous.

Figure 11 – Cartographie des répondants jugeant le scénario tout bus inacceptable

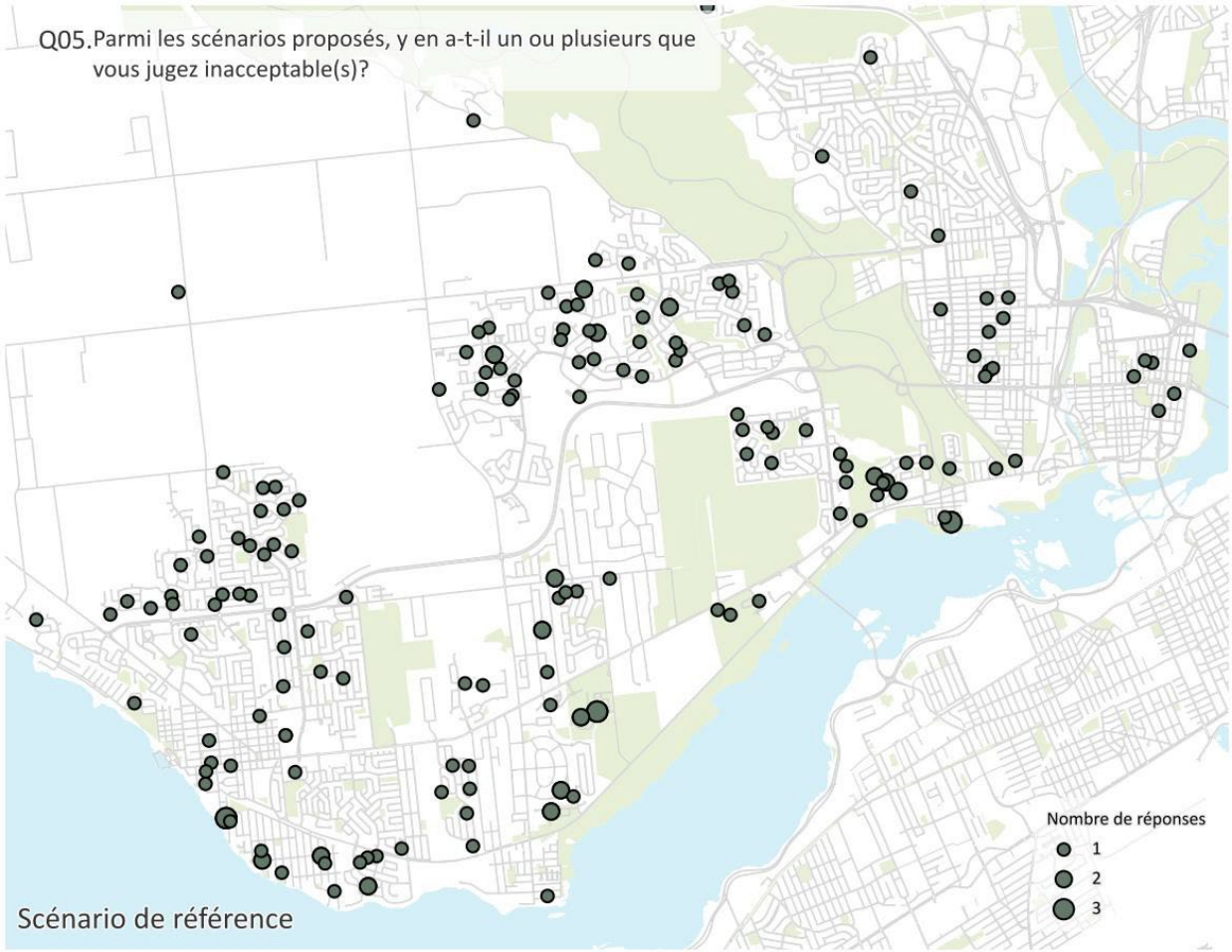


Le scénario de référence est mentionné par 32 % des répondants, et davantage par :

- Les hommes (39 %);
- Les résidents des secteurs concernés par l'étude (36 %);
- Les personnes qui sont favorables à la mise en place d'un système structurant (36 %);
- Les diplômés universitaires (35 %);
- Les francophones (33 %).

La figure 12 ci-dessous illustre la répartition géographique de ces répondants.

Figure 12 – Cartographie des répondants jugeant le scénario de référence inacceptable

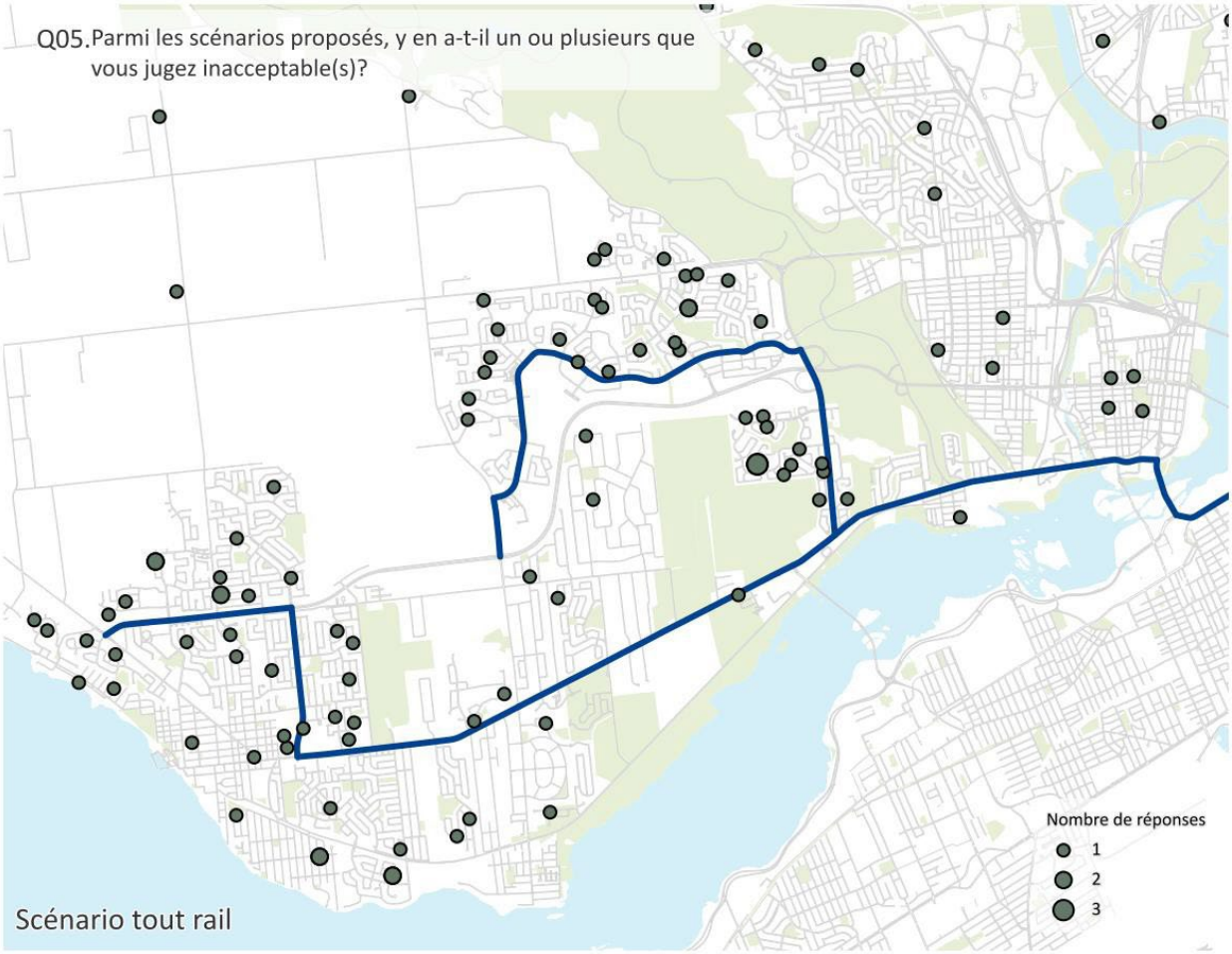


Le scénario tout rail est considéré comme inacceptable par 22 % des répondants, en particulier :

- Les répondants qui sont mitigés à l'égard de la mise en place d'un système structurant (48 %);
- Les résidents du secteur Gatineau (39 %) et des secteurs non concernés par l'étude (30 %);
- Les personnes détenant un diplôme de niveau collégial (32 %);
- Les 55 ans et plus (30 %);
- Les personnes qui se rendent à leur lieu d'emploi ou d'études en voiture (25 %).

Les codes postaux de ces répondants sont cartographiés ci-dessous (à noter que seule la partie ouest de Gatineau est illustrée).

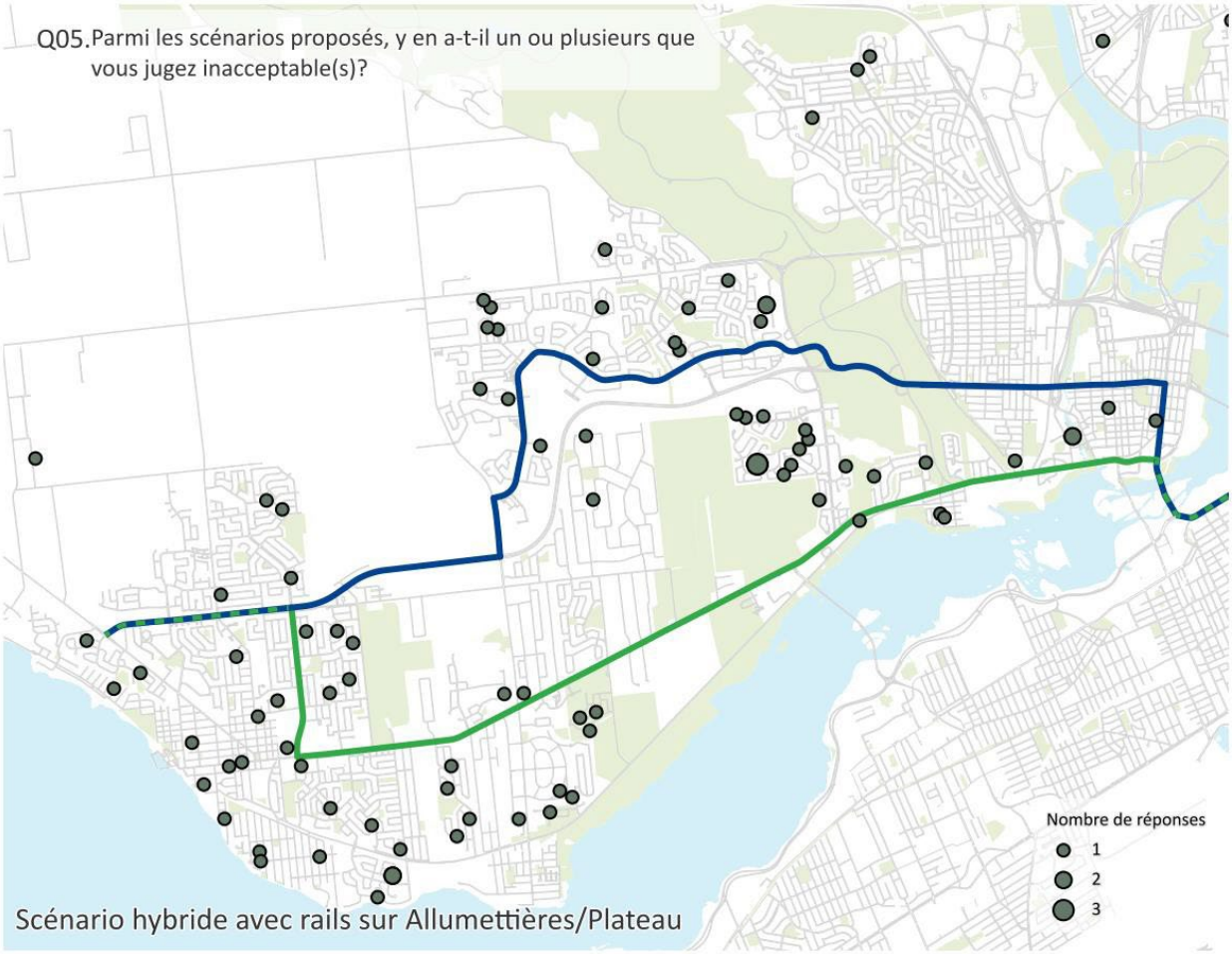
Figure 13 – Cartographie des répondants jugeant le scénario tout rail inacceptable



Le scénario hybride avec rails sur Allumettières/Plateau est rejeté par 17 % des répondants, et de façon plus significative par ceux qui sont mitigés quant à la nécessité d'un système structurant dans l'ouest (25 %).

Les lieux de résidence des répondants qui trouvent cette option inacceptable sont illustrés ci-dessous.

Figure 14 – Cartographie des répondants jugeant le scénario avec rails sur Allumettières/Plateau inacceptable

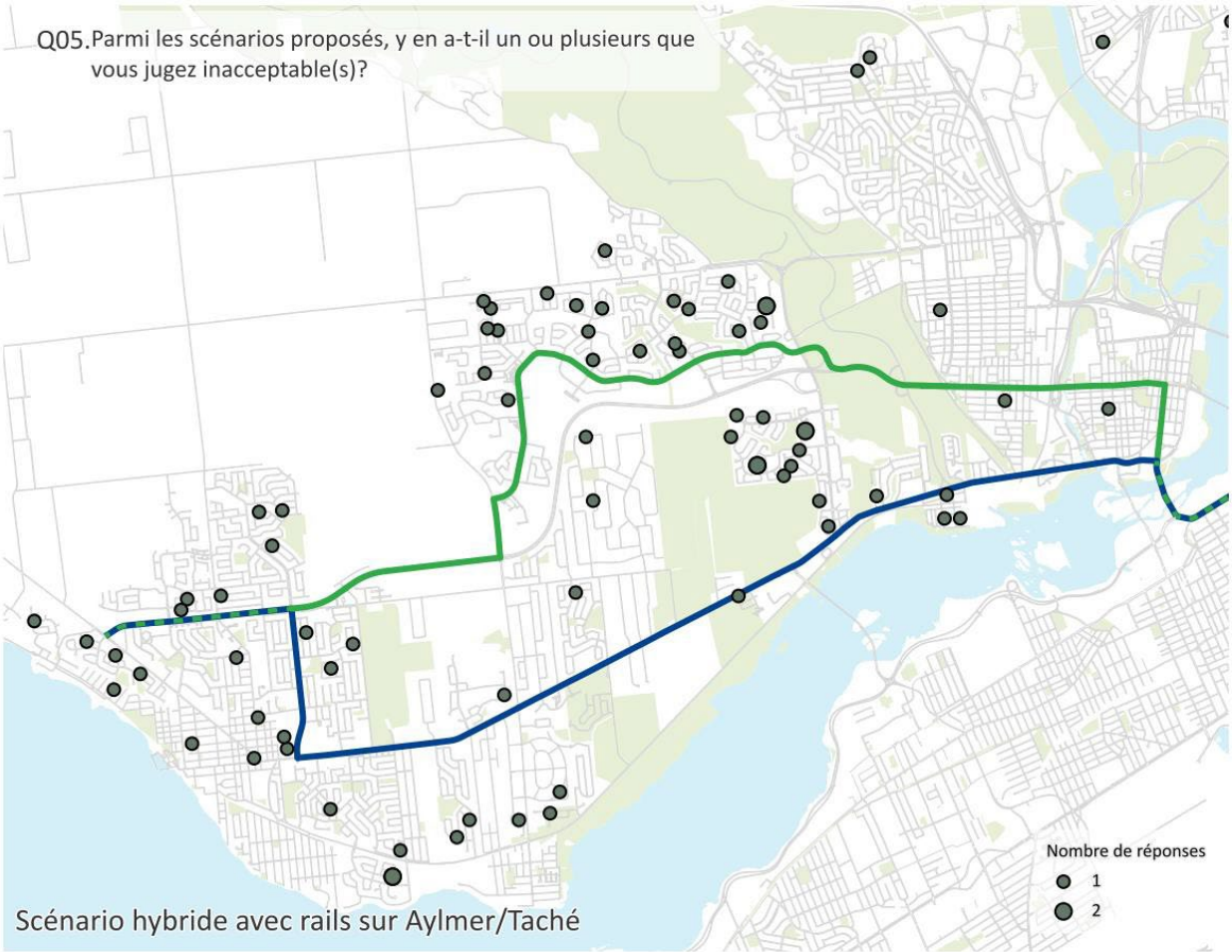


Quant au scénario hybride avec rails sur Aylmer-Taché, il est jugé inacceptable par 16 % des répondants, notamment :

- Les répondants mitigés quant à la nécessité d'un système structurant (30 %);
- Les résidents du secteur Gatineau (26 %);
- Les 55 ans et plus (24 %);
- Les personnes qui n'utilisent pas le transport en commun pour le travail ou les études (23 %) et en général (22 %);
- Les personnes qui travaillent à Gatineau hors centre-ville (22 %).

Les lieux de résidence de ces répondants sont illustrés ci-dessous.

Figure 15 – Cartographie des répondants jugeant le scénario avec rails sur Aylmer-Taché inacceptable



À noter que pour 16 % des répondants, tous les scénarios sont acceptables.

Raisons du rejet d'un ou plusieurs scénarios

Les répondants pouvaient justifier leur rejet d'un ou plusieurs des scénarios par un commentaire ouvert. Les raisons citées sont présentées à la page suivante.

On constate que les répondants perçoivent les autobus, que ce soit le scénario de référence ou le scénario tout bus, voire même les scénarios hybrides, comme étant inefficaces et pris dans la congestion ou créant de la congestion.

Ceux qui s'opposent au rail, que ce soit le scénario tout rail ou dans une moindre mesure, les scénarios hybrides, le font principalement pour des raisons de coûts.

Tableau 8 – Raisons citées pour le choix des scénarios inacceptables (n=506)

Q6. Pour quelles raisons?

Raisons	Mentions	Scénario de référence (n=212)	Scénario tout bus (n=278)	Scénario tout rail (n=150)	Scénario hybride avec rails sur Aylmer-Taché (n=106)	Scénario hybride avec rails sur Allumettières / Plateau (n=116)
Ce mode de transport n'est pas fiable / efficace / viable à long terme.	162	**49 %**	**37 %**	**15 %**	**14 %**	**16 %**
Il augmenterait la congestion / les autobus créent de la congestion.	133	**29 %**	**36 %**	**14 %**	**22 %**	**21 %**
Les coûts sont trop élevés.	85	7 %	5 %	**48 %**	**32 %**	**33 %**
Il réduirait l'accessibilité au transport en commun, il y a peu de population à distance de marche.	53	6 %	9 %	**17 %**	**14 %**	**16 %**
Le scénario ne réduirait pas les temps de déplacement (manque de rapidité du mode ou nécessité de faire des correspondances).	52	8 %	11 %	7 %	10 %	9 %
Il aurait un impact important sur l'environnement / le milieu bâti.	49	8 %	**13 %**	4 %	12 %	10 %
La construction sera longue et coûteuse / nécessitera des expropriations.	32	1 %	2 %	**15 %**	**13 %**	4 %
C'est une vision à court terme.	25	8 %	6 %	1 %	5 %	3 %
Il faut un système sur rails / il ne faut pas d'autobus.	23	6 %	8 %	0 %	7 %	8 %
La population desservie est trop faible pour justifier un tramway.	18	2 %	1 %	11 %	10 %	11 %
Le rail n'est pas flexible.	12	1 %	1 %	8 %	3 %	3 %
Il n'incitera pas les gens à utiliser le transport en commun.	11	3 %	2 %	0 %	0 %	0 %
Il faut un système hybride.	9	1 %	2 %	4 %	2 %	1 %
On devrait considérer d'autres options (ne pas retirer de voies de circulation, emprunter le pont Prince-de-Galles, construire un autre pont…).	7	1 %	1 %	3 %	5 %	4 %
Il ne doit pas y avoir de rails sur Allumettières/Plateau, c'est un axe conçu pour la voiture.	3	1 %	1 %	0 %	0 %	3 %
Autres (pas de précisions).	39	7 %	4 %	10 %	8 %	10 %
Aucun commentaire.	4	0 %	1 %	1 %	1 %	1 %

Quelques-uns des commentaires sont reproduits ci-dessous :

- Concernant le scénario de référence / le scénario tout bus

Tout bus est incompréhensible, cela ne changerait pas grand-chose sur la congestion aux heures de pointe et occasionnerait des retards qui font en sorte que comme d'autres je n'utilise pas l'autobus. Le rail sur Taché et chemin d'Aylmer dénaturerait complètement le secteur. Nous obligerait à couper de beaux arbres matures! Ce serait une catastrophe, de plus me semble qu'il y ait plus de population vers le plateau et donc une dessert sur Allumettière avec accès au hyper centre commerciale me sembles plus judicieux.

Ces scénarios (de référence et tout bus) devraient être appliqués en attendant, c'est à dire revoir les endroits pour des voies réservées et améliorer la fréquence, surtout dans les heures de pointes. Par contre, ils ne constituent pas une mesure viable à long terme. Les autobus sont déjà bondés et parfois il est désagréable et long de les utiliser. Je pense que pour convaincre plus de gens de les utiliser, on doit améliorer le confort et cela doit devenir une option significativement plus rapide que de prendre sa voiture ou même covoiturer.

À moins que vous ne vous engagiez à avoir un réseau entier de bus électriques performant, un réseau constitué strictement d'autobus est dépassé. Un réseau durable dans tous les sens du terme, et particulièrement dans le sens environnemental, doit devenir une priorité AUJOURD'HUI.

The existing bus service is highly inadequate and minor tweaks will do nothing to improve the situation. Bus only will quickly run into capacity issues, thus requiring conversion in the medium-term, which will result in years of traffic headaches during construction (worse than the status-quo), as is the case in Ottawa currently. We must learn from our neighbour's mistakes.

- Concernant les scénarios avec rails

J'ai peur que cela contribue davantage au développement immobilier dans ce secteur, qui est déjà trop important selon moi.

La population actuelle d'Aylmer ne justifie pas la construction d'un tramway qui est très coûteux vu la faible densité de population dans le secteur. Ça serait une incitation à poursuivre l'étalement urbain vers l'ouest, ce qui est la principale cause de congestion dans le secteur.

Trop massif, prendra trop de place sur le réseau routier, pas assez modulable en cas de changement ou d'imprévus, nécessite trop d'investissement en garage d'entretien, stations, etc. On va devoir faire beaucoup de correspondances.

Ça va diminuer l'accès aux voitures, vous allez utiliser les voies actuelles pour construire des rails?! Et prendre 5 ans à construire... Je veux juste pas m'imaginer le trafic pendant cette période! De plus le système sur rail à Ottawa semble avoir des difficultés...

Démontrez aux résidents plus de sections transversales. L'inquiétude est de perdre toute la végétation le long des chemins pour permettre d'ajouter le train. Surtout les résidents qui font dos à ces chemins qui ont présentement des arbres matures et des buttes pour réduire le son.

As said in my previous answer, a rail through Eardley/Aylmer would be unacceptable as it would negatively impact cultural and heritage aspects of old Aylmer and would decrease the quality of life in this area. Further, a rail along the Aylmer road closer to Taché could create more traffic (given the potential need to reduce lanes for vehicles) on an already very busy route.

All of them are unacceptable because they will require you to remove existing lanes. There is already not enough room for traffic and you propose to remove even more lanes. The only option is to build ABOVE or below, or make a NEW place for trains, NOT on already congested roads.

All scenarios involving rail (all rail and hybrid) will result in a longer commute for me as well as transfers. My experience so far waiting for any connection with the STO has been unacceptably long wait times and unreliable time tables. Any option involving transfers would result in me going back to using my car for my daily commute.

Partie 3 – Les variantes possibles

Selon les scénarios, différentes variantes de tracés et de desserte sont possibles. Une section du questionnaire était donc dédiée à recueillir l'avis des citoyens sur ces options.

Eardley/Principale ou Allumettières/Wilfrid-Lavigne

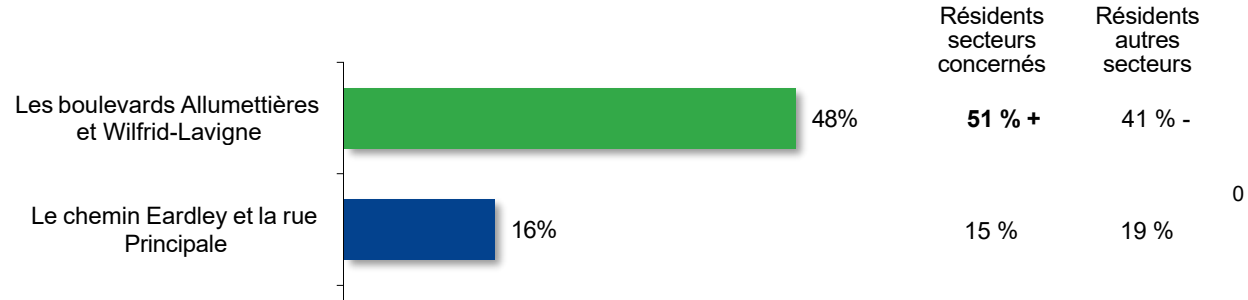
Depuis l'extrémité ouest d'Aylmer, le lien structurant pourrait rejoindre le chemin d'Aylmer soit par le chemin Eardley et la rue Principale, soit par les boulevards Allumettières et Wilfrid-Lavigne.

Les préférences des répondants sont présentées ci-après.

Figure 16 – Variante Eardley/Principale ou Allumettières/Wilfrid-Lavigne (n=668)

Q7. Depuis l'extrémité ouest d'Aylmer, le lien structurant pourrait rejoindre le chemin d'Aylmer soit par le chemin Eardley et la rue Principale, soit par les boulevards Allumettières et Wilfrid-Lavigne. La population à distance de marche est équivalente sur les deux axes. En revanche, plusieurs expropriations partielles et totales seraient nécessaires sur Eardley et Principale, alors qu'il n'y en aurait aucune sur Allumettières et Wilfrid-Lavigne.

Quel axe devrait être privilégié selon vous?



Les raisons invoquées sont très différentes selon l'axe choisi (cf. tableau 9).

Tableau 9 – Raisons citées pour le choix entre Eardley/Principale et Allumettières/W.-Lavigne (n=431)

Raisons	Allumettières/Wilfrid-Lavigne			Eardley/Principale		
	Tous (n=322)	Secteurs concernés (n=243)	Autres secteurs (n=79)	Tous (n=109)	Secteurs concernés (n=73)	Autres secteurs (n=36)
Il y aurait moins d'impacts sur les riverains et les commerçants (moins d'expropriations)	**70 %**	**72 %**	**66 %**	10 %	7 %	17 %
Il desservirait mieux les résidences et les commerces	**41 %**	**40 %**	**42 %**	**68 %**	**73 %**	**58 %**
Il y aurait plus d'espace pour aménager un système structurant	**56 %**	**59 %**	**47 %**	16 %	15 %	17 %
Il contribuerait au développement des quartiers	32 %	32 %	32 %	**42 %**	**42 %**	**42 %**
Il serait moins coûteux	35 %	35 %	35 %	12 %	11 %	14 %
Il permettrait de maintenir de l'espace pour les automobiles sur l'autre axe	30 %	33 %	19 %	27 %	30 %	19 %
Les stations seraient plus accessibles à pied ou à vélo	26 %	30 %	16 %	35 %	**40 %**	25 %
Le parcours serait plus rapide	24 %	26 %	19 %	**40 %**	33 %	**56 %**
Le tracé passerait à proximité de mon domicile	20 %	26 %	1 %	16 %	22 %	3 %
Le tracé ne passerait pas à proximité de mon domicile, j'aurais moins de nuisances	3 %	5 %	0 %	3 %	3 %	3 %
Autre	4 %	4 %	5 %	6 %	5 %	6 %

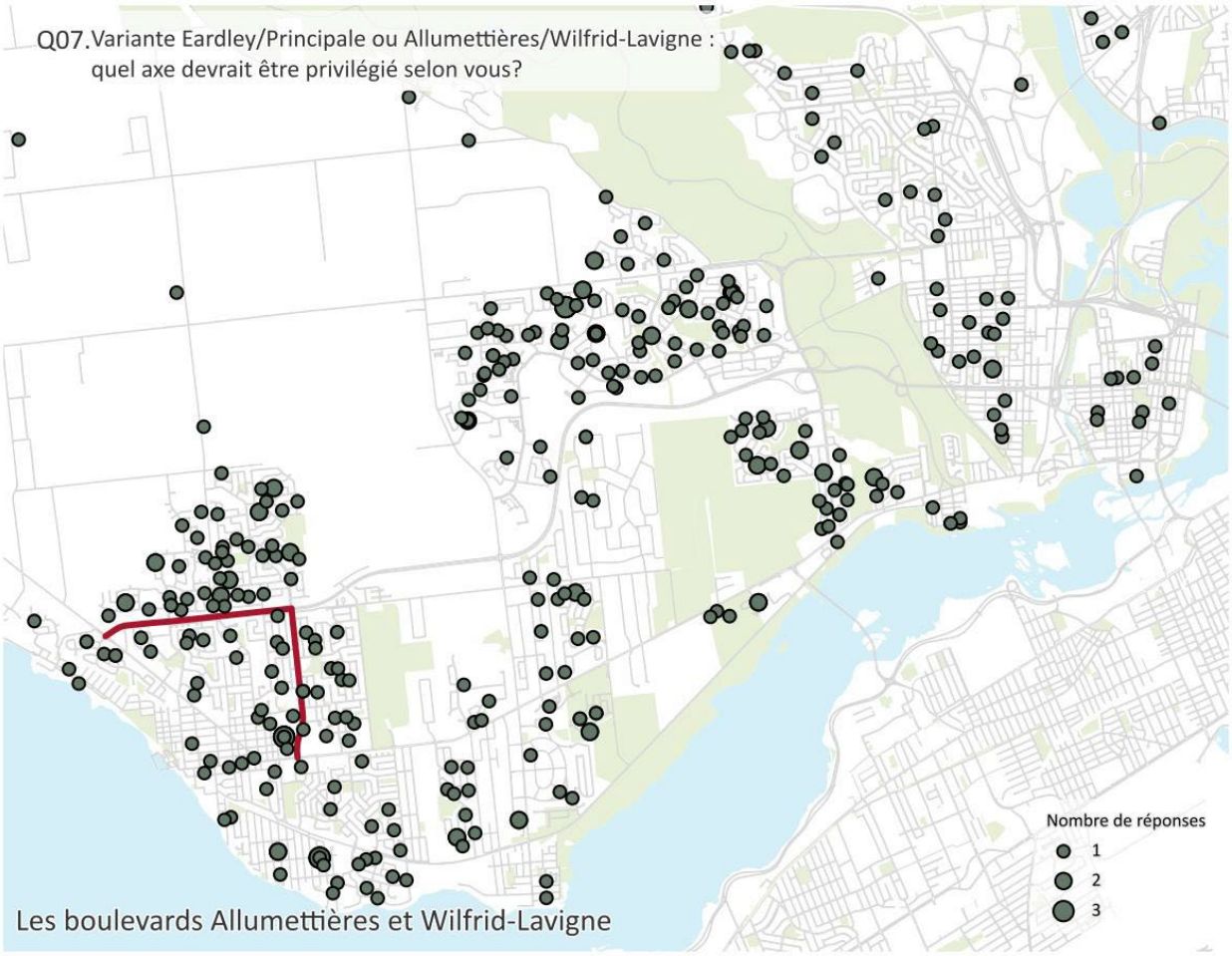
L'axe Allumettières/Wilfrid-Lavigne recueille la préférence de 48 % des répondants (dont 51 % des résidents de l'ouest). Selon eux :

- Il permettrait de limiter les impacts sur les riverains et les commerçants (70 %);
- Il laisserait plus d'espace pour aménager un système structurant (56 %);
- Il desservirait mieux les résidences et les commerces (41 %);
- Il serait moins coûteux (35 %).

Dans leurs commentaires, les répondants citent la possibilité d'éviter les expropriations et les impacts sur les quartiers patrimoniaux (13 mentions), la présence d'une plus forte densité de population (12 mentions), la présence d'écoles, d'épiceries et du CLSC (4 mentions), le risque d'inondations plus à l'ouest (2 mentions), et l'espace à laisser au transport actif sur la rue Principale (1 mention).

Les lieux de résidence des tenants de cette option (incluant ceux auxquels les deux options conviennent) sont présentés ci-dessous.

Figure 17 – Cartographie des répondants privilégiant la variante Allumettières/Wilfrid-Lavigne



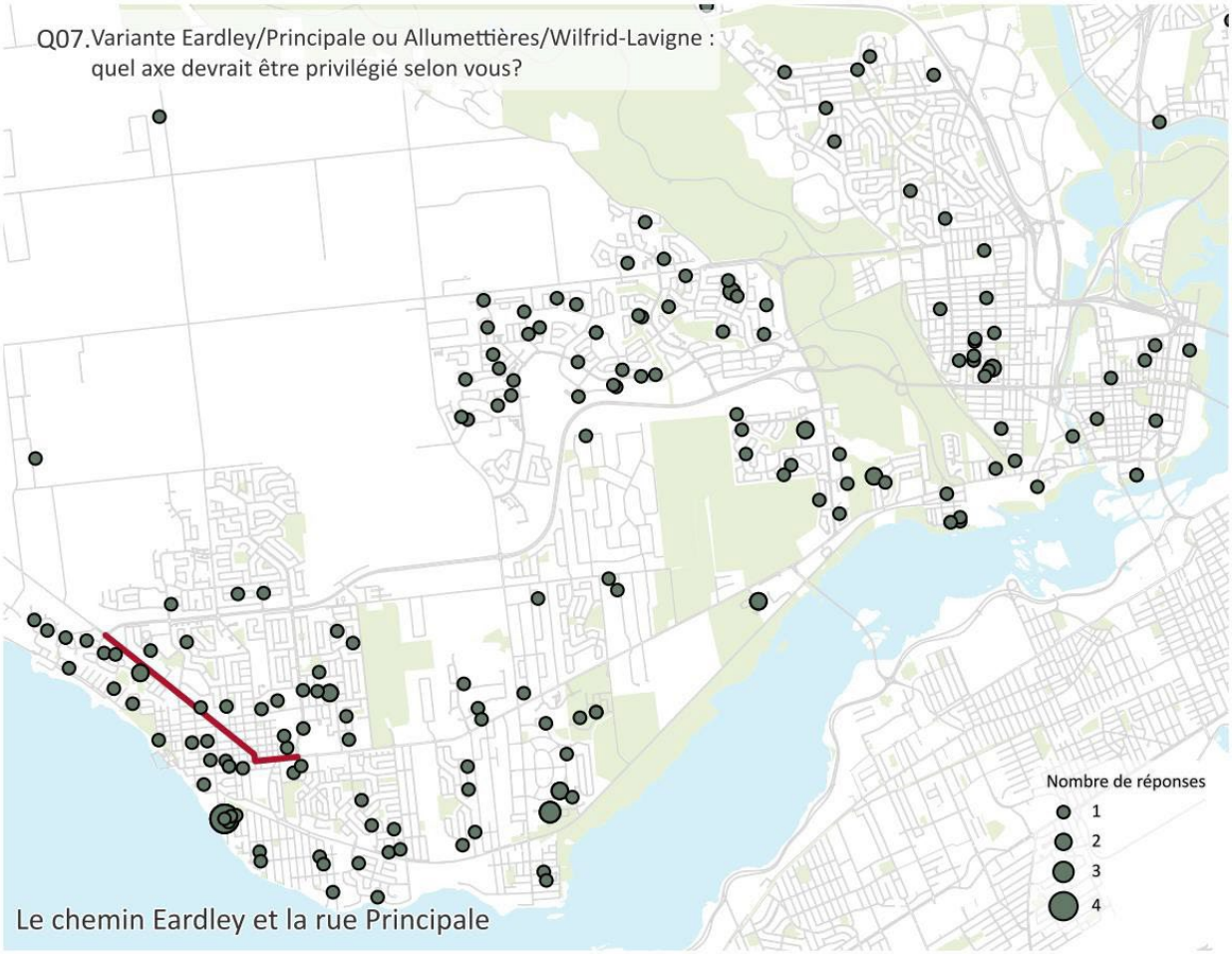
L'axe Eardley/Principale n'est privilégié que par 16 % des répondants. Les raisons les plus citées sont les suivantes :

- Il desservirait mieux les résidences et les commerces (68 %);
- Il contribuerait au développement des quartiers (42 %);
- Le parcours serait plus rapide (40 %);
- Les stations seraient plus accessibles à pied ou à vélo (35 %).

D'autres raisons sont mentionnées par les répondants, dont la desserte de la rue Principale et de la marina et l'opportunité de revitalisation du secteur (15 mentions), la desserte de communautés plus vulnérables (3 mentions), le fait que le trajet soit plus direct et les courbures plus douces (2 mentions), la possibilité de créer des quartiers TOD (1 mention), l'efficacité du rabattement (1 mention), la possibilité de desservir le secteur nord par autobus (1 mention), la présence d'une plus forte densité autour d'Eardley (1 mention), et la congestion déjà présente sur Allumettières (1 mention).

Les lieux de résidence des participants qui privilégient Eardley sont cartographiés ci-dessous.

Figure 18 – Cartographie des répondants privilégiant la variante Eardley/Principale



À noter que 20 % des répondants n'ont pas de préférence et 16 % n'ont pas d'opinion.

Allumettières ou McConnell

Entre le boulevard Wilfrid-Lavigne et le chemin Vanier, le lien structurant pourrait emprunter soit le boulevard des Allumettières, soit le chemin McConnell.

Les préférences et les raisons citées par les répondants sont présentées ci-après.

Figure 19 – Variante Allumettières ou McConnell (n=668)

Q9. Entre le boulevard Wilfrid-Lavigne et le chemin Vanier, le lien structurant pourrait emprunter soit le boulevard des Allumettières, soit le chemin McConnell. Il y a plus d'espace pour aménager l'axe structurant sur le boulevard des Allumettières, mais il y a davantage de résidents à proximité du chemin McConnell.

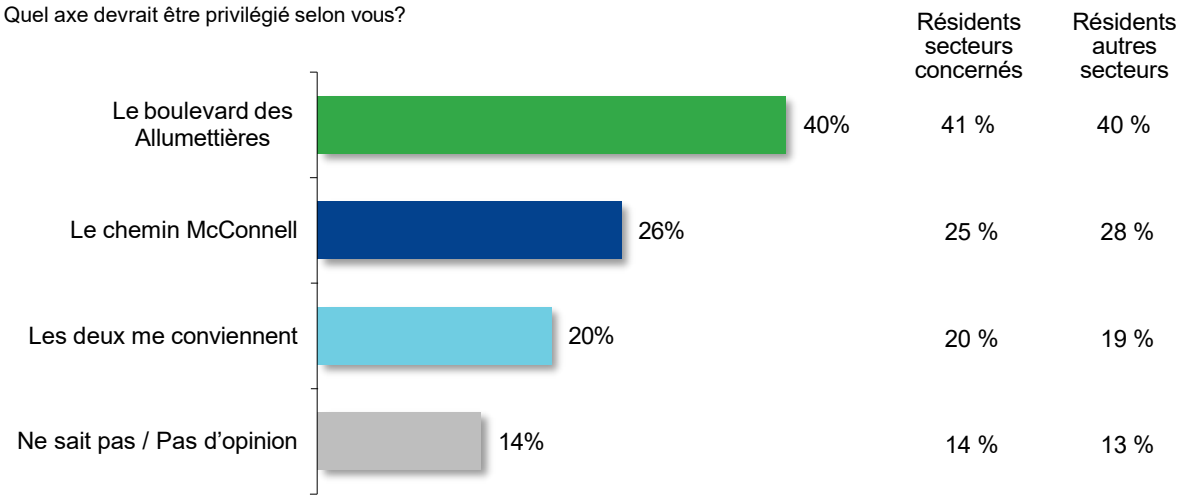


Tableau 10 - Raisons citées pour le choix entre Allumettières et McConnell (n=442)

Raisons	Allumettières			McConnell		
	Tous (n=270)	Secteurs concernés (n=192)	Autres secteurs (n=78)	Tous (n=172)	Secteurs concernés (n=118)	Autres secteurs (n=54)
Il y aurait plus d'espace pour aménager un système structurant	**65 %**	**68 %**	**59 %**	16 %	14 %	20 %
Le parcours serait plus rapide	**65 %**	**66 %**	**63 %**	12 %	10 %	17 %
Il desservirait mieux les résidences et les commerces	20 %	20 %	18 %	**64 %**	**69 %**	**52 %**
Il y aurait moins d'impacts sur les riverains (moins d'expropriations)	**47 %**	**53 %**	33 %	6 %	4 %	9 %
Il contribuerait au développement des quartiers	19 %	18 %	22 %	**48 %**	**50 %**	**44 %**
Il permettrait de maintenir de l'espace pour les automobiles sur l'autre axe	33 %	32 %	36 %	26 %	31 %	15 %
Les stations seraient plus accessibles à pied ou à vélo	17 %	17 %	17 %	**52 %**	**57 %**	**41 %**
Il serait moins coûteux	**42 %**	**41 %**	**46 %**	6 %	4 %	11 %
Le tracé donnerait un meilleur accès à la forêt Boucher	14 %	16 %	9 %	14 %	14 %	15 %
Le tracé passerait à proximité de mon domicile	9 %	11 %	1 %	4 %	6 %	0 %

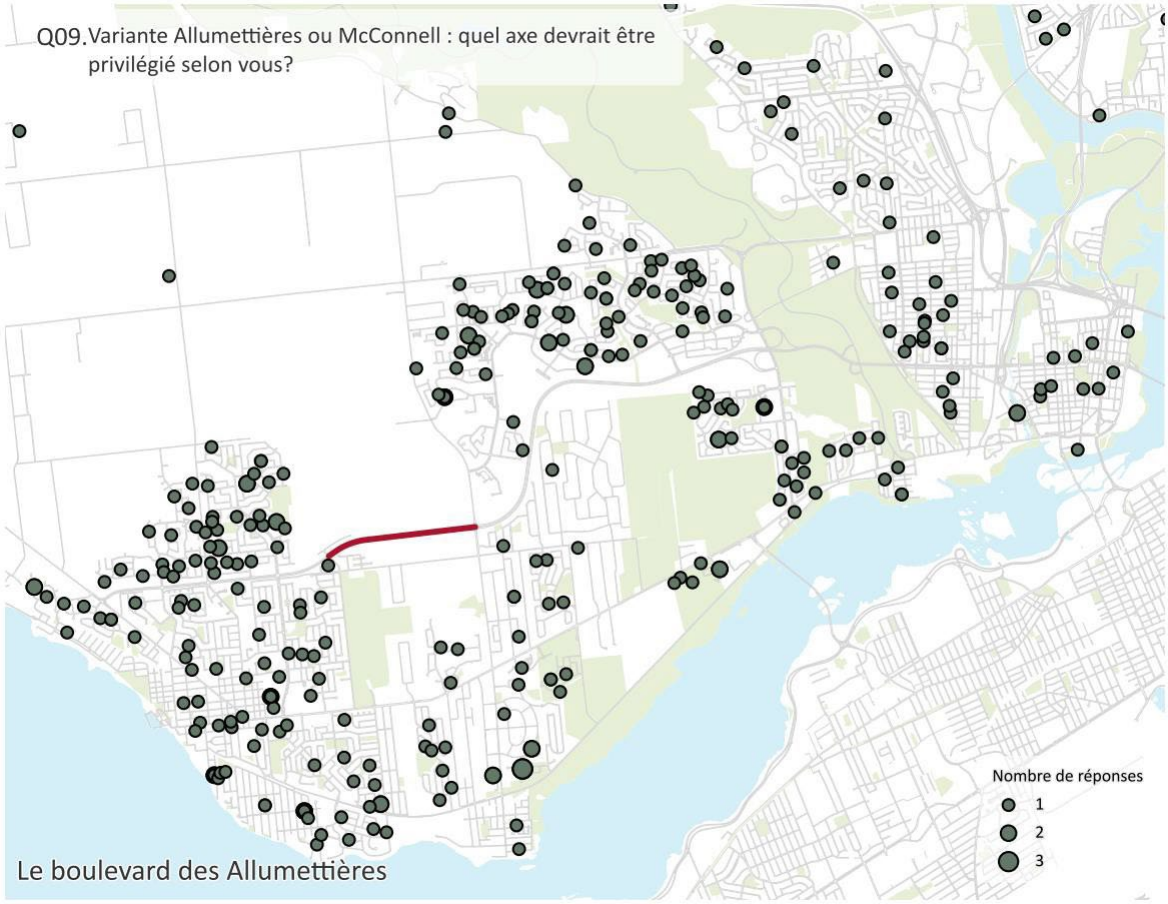
Raisons	Allumettières			McConnell		
	Tous (n=270)	Secteurs concernés (n=192)	Autres secteurs (n=78)	Tous (n=172)	Secteurs concernés (n=118)	Autres secteurs (n=54)
Le tracé ne passerait pas à proximité de mon domicile, j'aurais moins de nuisances	3 %	3 %	4 %	2 %	2 %	2 %
Autre	1 %	1 %	1 %	2 %	2 %	2 %

L'axe Allumettières est privilégié par 40 % des répondants, pour les raisons suivantes :

- Il y aurait plus d'espace pour aménager un système structurant (65 %);
- Le parcours serait plus rapide (65 %);
- Il y aurait moins d'impacts sur les riverains (47 %);
- Il serait moins coûteux (42 %).

Parmi les commentaires des répondants, on retrouve un trajet plus direct / rapide (5 mentions), de plus faibles impacts ou nuisances pour les résidents (4 mentions), l'accès facile à Allumettières (3 mentions), le faible nombre de résidences ou de commerces nécessitant une desserte en transport en commun (3 mentions), et l'espace présent sur Allumettières (2 mentions).

Figure 20 – Cartographie des répondants privilégiant la variante Allumettières

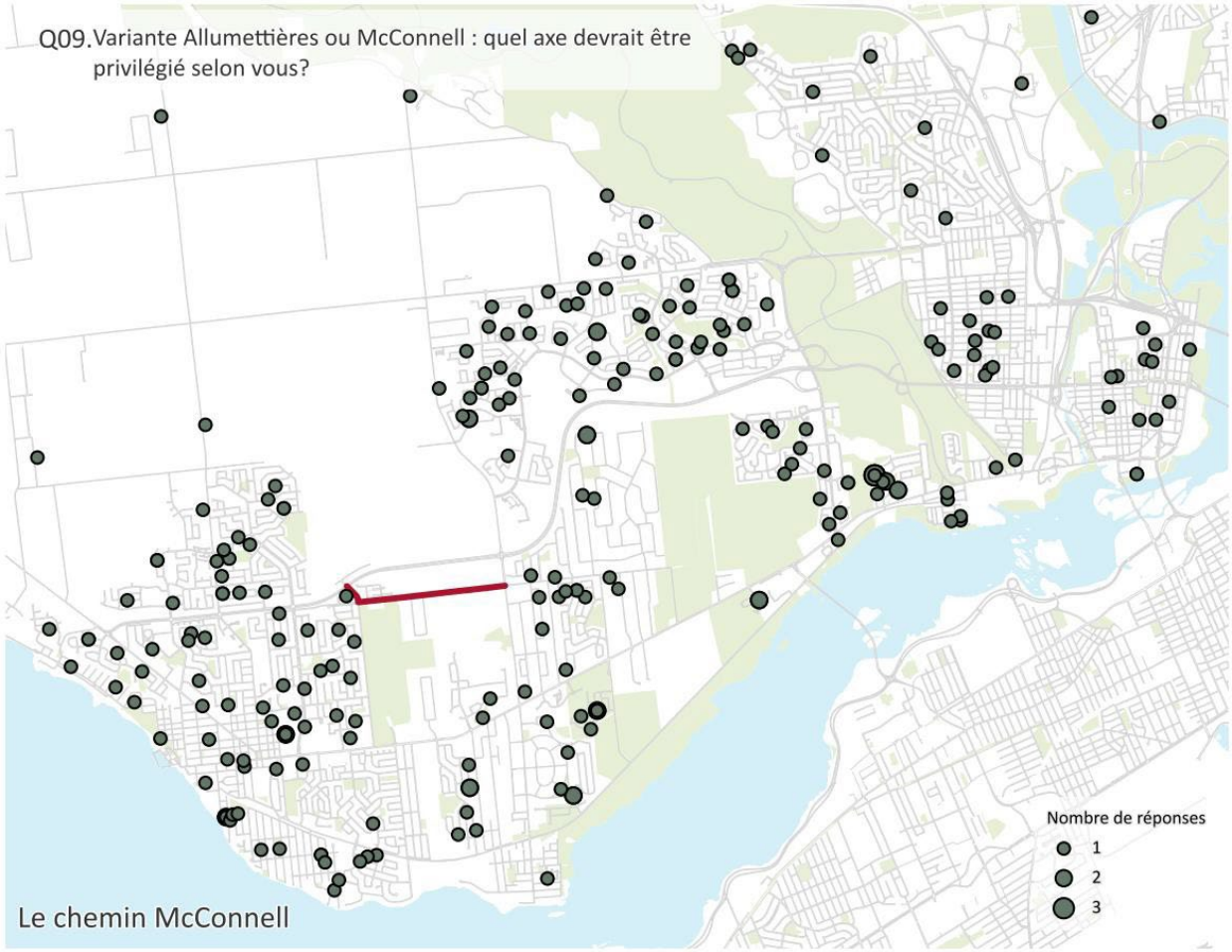


26 % préfèrent le chemin McConnell. Ils invoquent les éléments suivants :

- Il desservirait mieux les résidences et les commerces (64 %);
- Les stations seraient plus accessibles à pied ou à vélo (52 %);
- Il contribuerait au développement des quartiers (48 %).

Parmi les raisons citées en commentaires, on retrouve l'importance de desservir les résidences (16 mentions) et la nécessité de laisser Allumettières aux voitures (1 mention).

Figure 21 – Cartographie des répondants privilégiant la variante McConnell



Les deux options conviennent à 20 % des répondants. 14 % n'ont pas d'opinion.

Plateau ou Allumettières

Pour la mise en place d'un lien structurant au nord, deux options sont possibles : un lien sur le boulevard du Plateau ou sur le boulevard des Allumettières.

Les réponses sont présentées à la figure 22 et dans le tableau 11 ci-après.

Figure 22 – Variante Plateau ou Allumettières (n=668)

Q11. Pour la mise en place d'un système structurant au nord, deux options sont possibles. Un lien sur le boulevard du Plateau favoriserait la desserte locale, puisque les résidents du Plateau pourraient plus facilement accéder aux stations à pied. En revanche, un lien sur le boulevard des Allumettières serait plus rapide car il y aurait moins de stations et les véhicules circuleraient plus vite entre les stations.

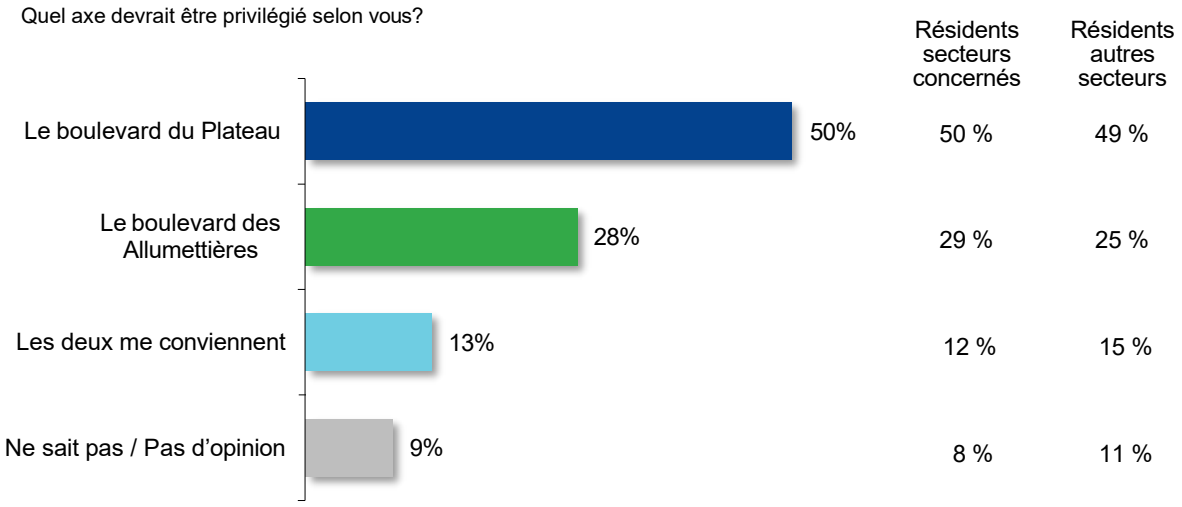


Tableau 11 - Raisons citées pour le choix entre Plateau ou Allumettières (n=520)

Raisons	Plateau			Allumettières		
	Tous (n=334)	Secteurs concernés (n=239)	Autres secteurs (n=95)	Tous (n=186)	Secteurs concernés (n=137)	Autres secteurs (n=49)
Il desservirait mieux les résidences et les commerces	**85 %**	**89 %**	**75 %**	16 %	18 %	10 %
Les stations seraient plus accessibles à pied ou à vélo	**74 %**	**77 %**	**66 %**	12 %	11 %	14 %
Il contribuerait au développement des quartiers	**62 %**	**65 %**	**54 %**	12 %	10 %	18 %
Le parcours serait plus rapide	7 %	7 %	7 %	**83 %**	**85 %**	**78 %**
Il permettrait de maintenir de l'espace pour les automobiles sur l'autre axe	31 %	32 %	29 %	31 %	35 %	20 %
Il y aurait plus d'espace pour aménager un système structurant	11 %	13 %	6 %	**48 %**	**52 %**	**37 %**
Le tracé passerait à proximité de mon domicile	28 %	33 %	14 %	9 %	10 %	4 %
Il serait moins coûteux	5 %	5 %	6 %	**36 %**	**37 %**	**33 %**
Le tracé ne passerait pas à proximité de mon domicile, j'aurais moins de nuisances	3 %	2 %	4 %	5 %	6 %	2 %
Autre	3 %	3 %	3 %	5 %	6 %	2 %

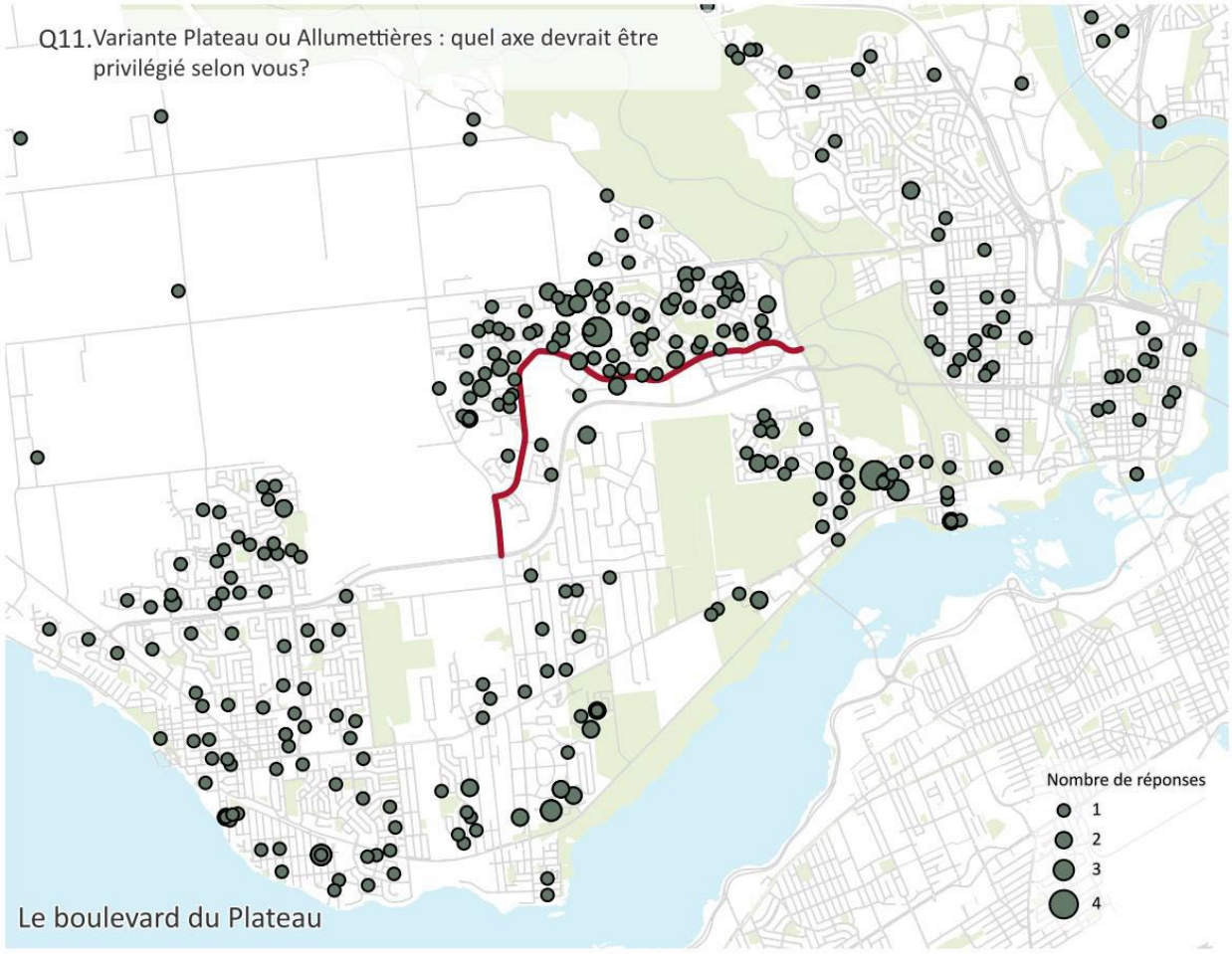
Le boulevard du Plateau se distingue assez nettement puisque 50 % des répondants le privilégient, dont 76 % des résidents du district du Plateau. Trois raisons se démarquent :

- Il desservirait mieux les résidences et les commerces (85 %);
- Les stations seraient plus accessibles à pied ou à vélo (74 %);
- Il contribuerait au développement des quartiers (62 %).

Dans leurs commentaires, les répondants mentionnent la desserte des résidences, des commerces et de bibliothèque et l'accès à pied ou à vélo (31 mentions), le potentiel de redynamisation du Plateau et de redéveloppement du centre commercial (3 mentions) et la nécessité de laisser la place à l'auto sur Allumettières (1 mention).

La cartographie des répondants privilégiant l'option Plateau, ci-dessous, met en évidence les préférences des résidents de ce quartier.

Figure 23 – Cartographie des répondants privilégiant la variante Plateau



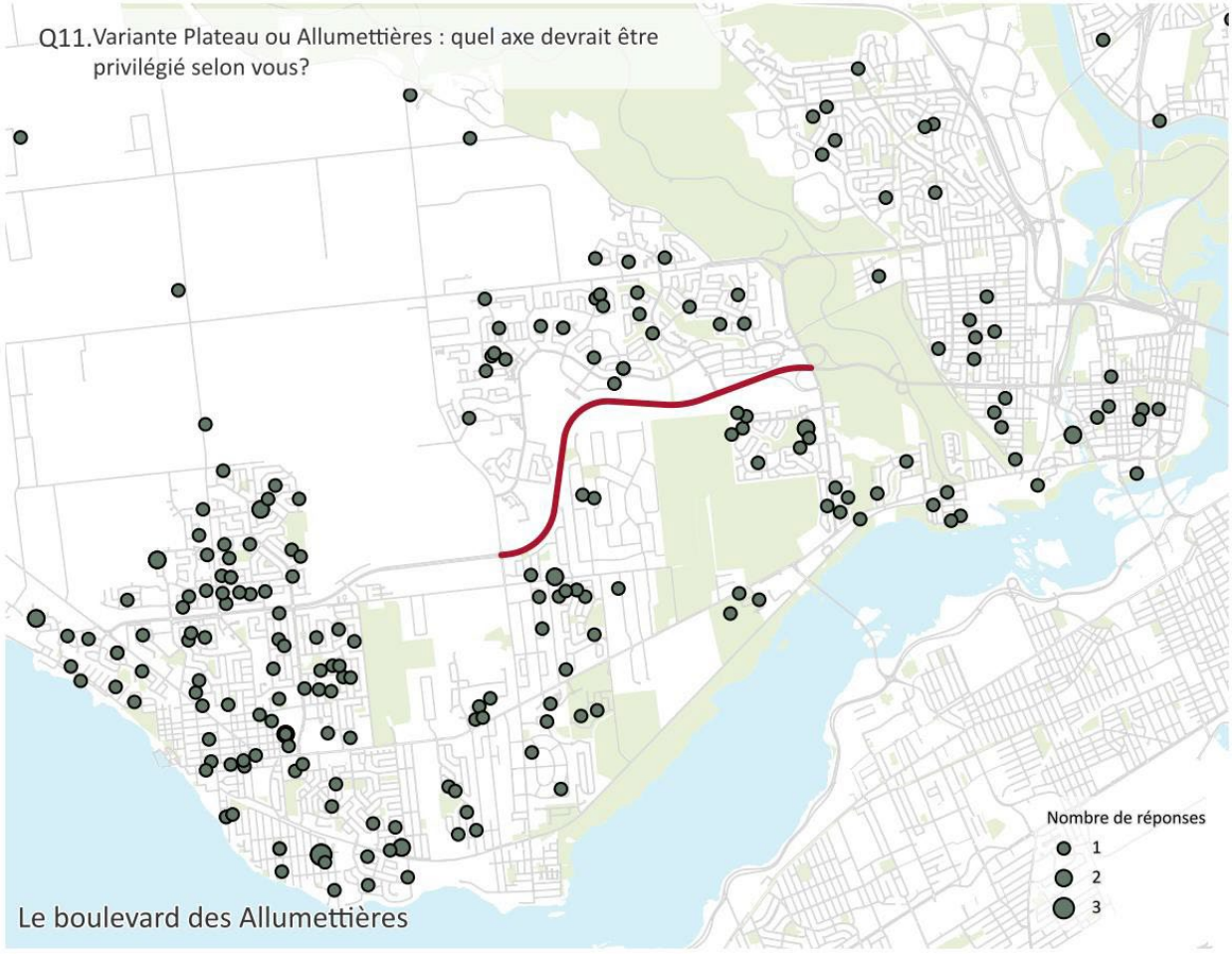
Quant au boulevard des Allumettières, il est préféré par 28 % des répondants, dont 39 % des résidents du secteur Aylmer hors district du Plateau. Les trois principales raisons citées sont les suivantes :

- Le parcours serait plus rapide (83 %);
- Il y aurait plus d'espace pour aménager un système structurant (48 %);
- Il serait moins coûteux (36 %).

En commentaires, les répondants citent la rapidité (10 mentions), la possibilité de mettre en place un système de rabattement (6 mentions), l'opportunité de redévelopper les terrains autour d'Allumettières (3 mentions), les impacts des travaux et les nuisances engendrés par la présence du lien structurant sur Plateau (3 mentions), les enjeux liés à la sécurité (présence d'enfants) et à la présence de carrefours giratoires sur Plateau (1 mention).

La cartographie ci-dessous illustre la répartition géographique des participants qui préfèrent l'option du boulevard des Allumettières.

Figure 24 – Cartographie des répondants privilégiant la variante Allumettières



À noter que 13 % des répondants n'ont pas de préférence, et 9 % n'ont pas d'avis.

Taché ou en arrière de l'UQO

Pour accéder au centre-ville de Gatineau, plusieurs options sont possibles, soit emprunter le boulevard Alexandre-Taché ou passer en arrière de l'UQO jusqu'au boulevard Saint-Joseph ou jusqu'à la rue Hanson.

Les préférences des répondants et leurs justifications sont présentées aux pages suivantes.

Figure 25 – Variante Taché ou en arrière de l'UQO (n=668)

Q13. Pour accéder au centre-ville de Hull, plusieurs options sont possibles, soit emprunter le boulevard Alexandre-Taché ou passer en arrière de l'UQO.

En passant par le boulevard Alexandre-Taché, les stations seraient plus proches des résidents situés au nord du boulevard Alexandre-Taché. Par contre, des expropriations seraient nécessaires, car l'espace disponible n'est pas suffisant pour aménager l'axe structurant.

En passant en arrière de l'UQO, le boulevard de Lucerne pourrait être mis en sens unique entre la rue Belleau et la rue Saint-Dominique. Cela permettrait de n'avoir aucune expropriation de résidences et rendrait possible le réaménagement de la rue en avant de l'école Jean-de-Brébeuf. Par contre, l'accès aux stations serait un peu plus difficile et certaines stations seraient situées dans des zones moins urbanisées et moins passantes (par exemple en arrière de la rue Millar, près du pont Prince-de-Galles). En aménageant l'axe structurant en arrière de l'UQO, le boulevard Alexandre-Taché pourrait quant à lui être réaménagé en réutilisant l'espace actuellement occupé par les voies réservées pour élargir les trottoirs et ajouter de la végétation.

Quel(s) axe(s) devrai(en)t être privilégié(s) selon vous?

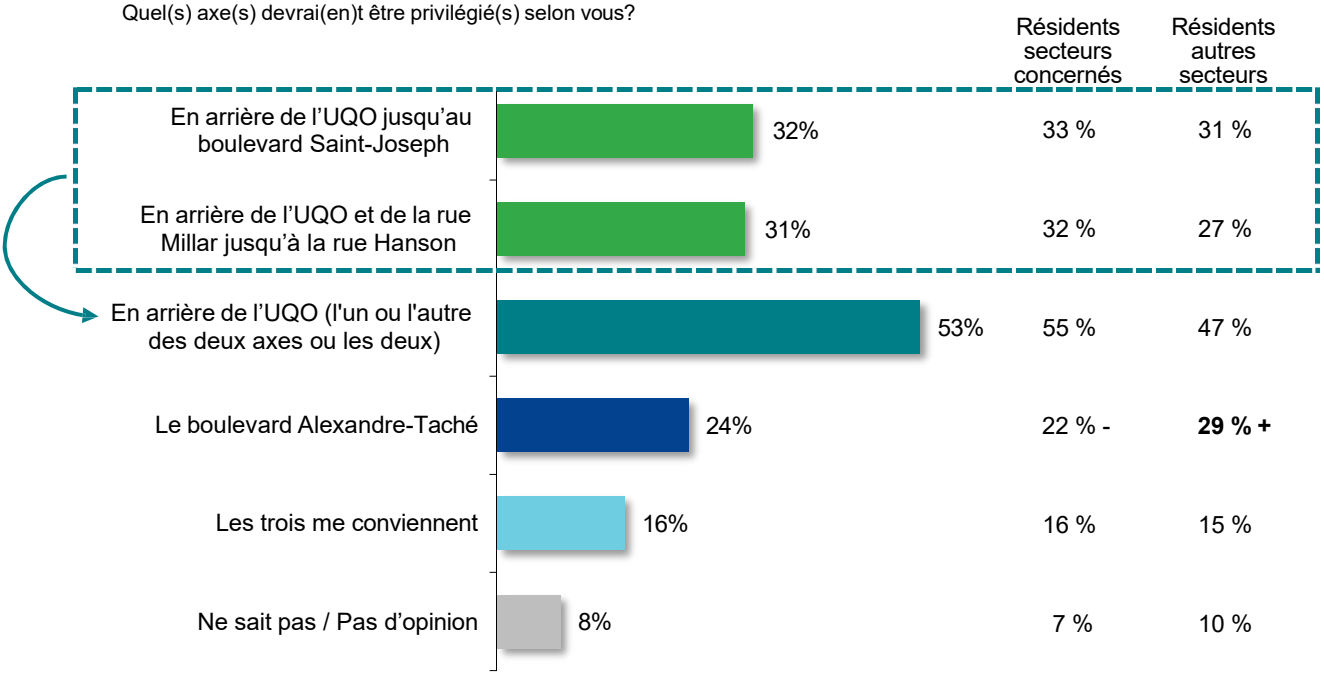


Tableau 12 - Raisons citées pour le choix entre Taché et en arrière de l'UQO (n=507)

Raisons	En arrière de l'UQO			Sur Alexandre-Taché		
	Tous (n=353)	Secteurs concernés (n=261)	Autres secteurs (n=92)	Tous (n=160)	Secteurs concernés (n=103)	Autres secteurs (n=57)
Il y aurait plus d'espace pour aménager un système structurant	**56 %**	**61 %**	45 %	17 %	17 %	16 %
Il y aurait moins d'impacts sur les riverains (moins d'expropriations)	**54 %**	**54 %**	**53 %**	20 %	25 %	11 %
Le parcours serait plus rapide	46 %	47 %	45 %	37 %	37 %	37 %
Il permettrait de maintenir de l'espace pour les automobiles sur l'autre axe	**55 %**	**56 %**	**51 %**	11 %	13 %	7 %
Il permettrait un meilleur accès à l'UQO	41 %	36 %	**52 %**	**42 %**	**50 %**	28 %
Il desservirait mieux les résidences et les commerces	15 %	17 %	15 %	**66 %**	**68 %**	**63 %**
Les stations seraient situées dans des endroits plus sécuritaires	27 %	27 %	27 %	34 %	41 %	23 %
Les stations seraient plus accessibles à pied ou à vélo	18 %	18 %	17 %	**55 %**	**61 %**	**44 %**
Il contribuerait au développement des quartiers	17 %	15 %	22 %	36 %	41 %	28 %
Il serait moins coûteux	24 %	26 %	20 %	17 %	17 %	18 %
Il y aurait moins d'impacts possibles sur la piste multifonctionnelle du sentier des Voyageurs	14 %	15 %	14 %	39 %	**44 %**	30 %
Il passerait plus loin de l'École Jean-de-Brébeuf	12 %	12 %	13 %	13 %	16 %	7 %
Le tracé passerait à proximité de mon domicile	3 %	4 %	2 %	4 %	6 %	2 %
Le tracé ne passerait pas à proximité de mon domicile, j'aurais moins de nuisances	2 %	2 %	2 %	4 %	7 %	0 %
Autre	8 %	8 %	9 %	13 %	11 %	16 %

53 % des répondants privilégient le passage en arrière de l'UQO mais sont partagés quant à la variante : 32 % souhaiteraient revenir sur Taché au niveau du boulevard Saint-Joseph et 31 % au niveau de la rue Hanson (les répondants pouvaient choisir l'une ou l'autre des options, ou les deux). Ces options sont davantage mentionnées par les résidents du secteur Aylmer (59 %).

Les raisons du choix sont similaires pour les deux variantes :

- Il y aurait moins d'impacts sur les riverains (57 % pour Saint-Joseph et 59 % pour Hanson);
- Il y aurait plus d'espace pour aménager un système structurant (respectivement 57 % et 55 %)
- Il permettrait de maintenir de l'espace pour les automobiles sur l'autre axe (respectivement 49 % et 62 %);
- Le parcours serait plus rapide (respectivement 42 % et 50 %);
- Il permettrait un meilleur accès à l'UQO (40 % pour les deux options).

D'autres raisons ont été mentionnées, dont l'avantage d'éviter la congestion sur Taché (12 mentions), la connexion possible avec le Rapibus et le pont Prince-de-Galles (11), la possibilité de réutiliser les voies réservées sur Taché pour élargir les trottoirs et ajouter de la végétation (5), la voie ferrée existante en arrière de l'UQO (4), la vue sur la nature (3), la minimisation des expropriations (2), et les travaux récemment effectués sur Taché (2).

Figure 26 – Cartographie des répondants privilégiant la variante en arrière de l'UQO jusqu'à St-Joseph

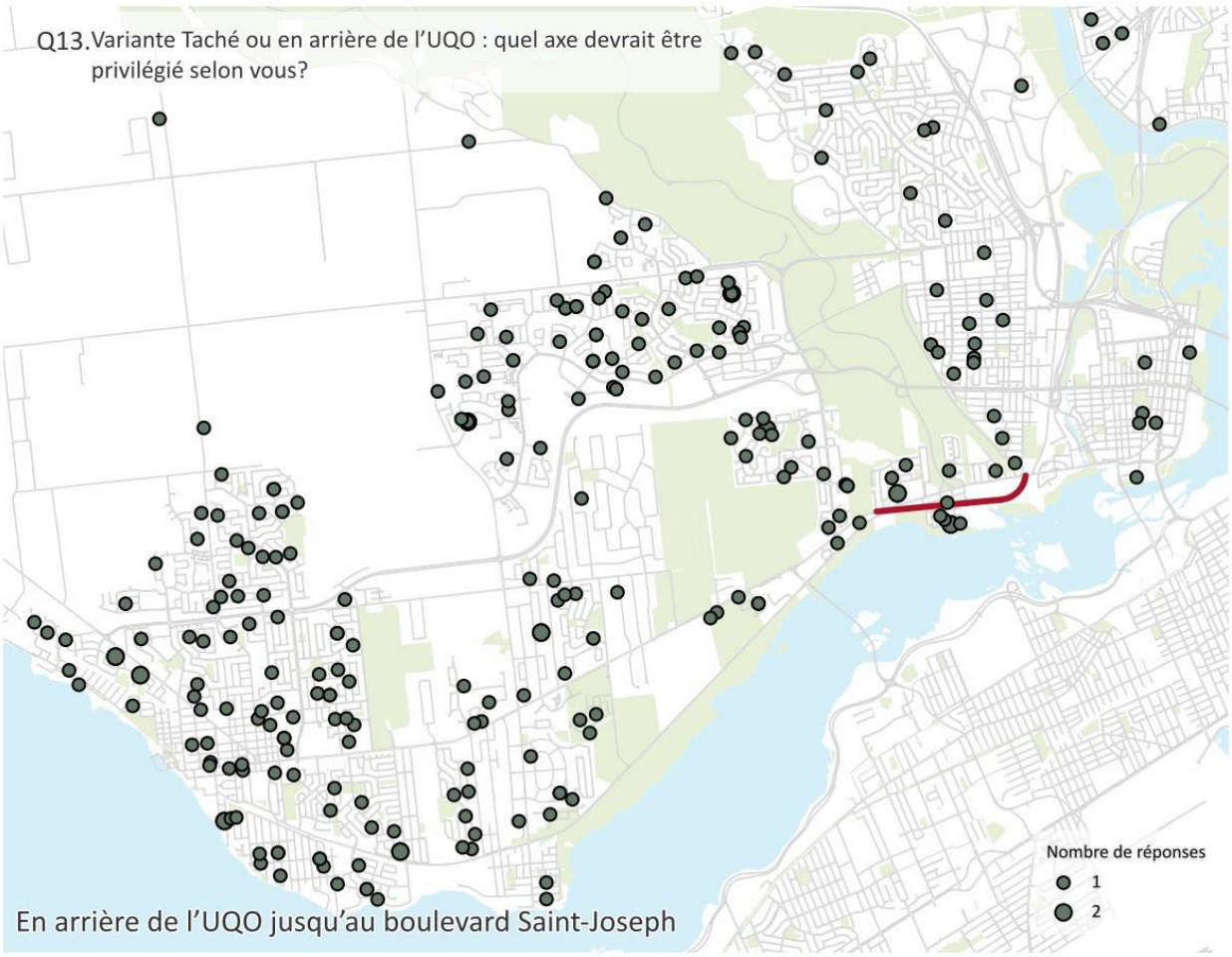
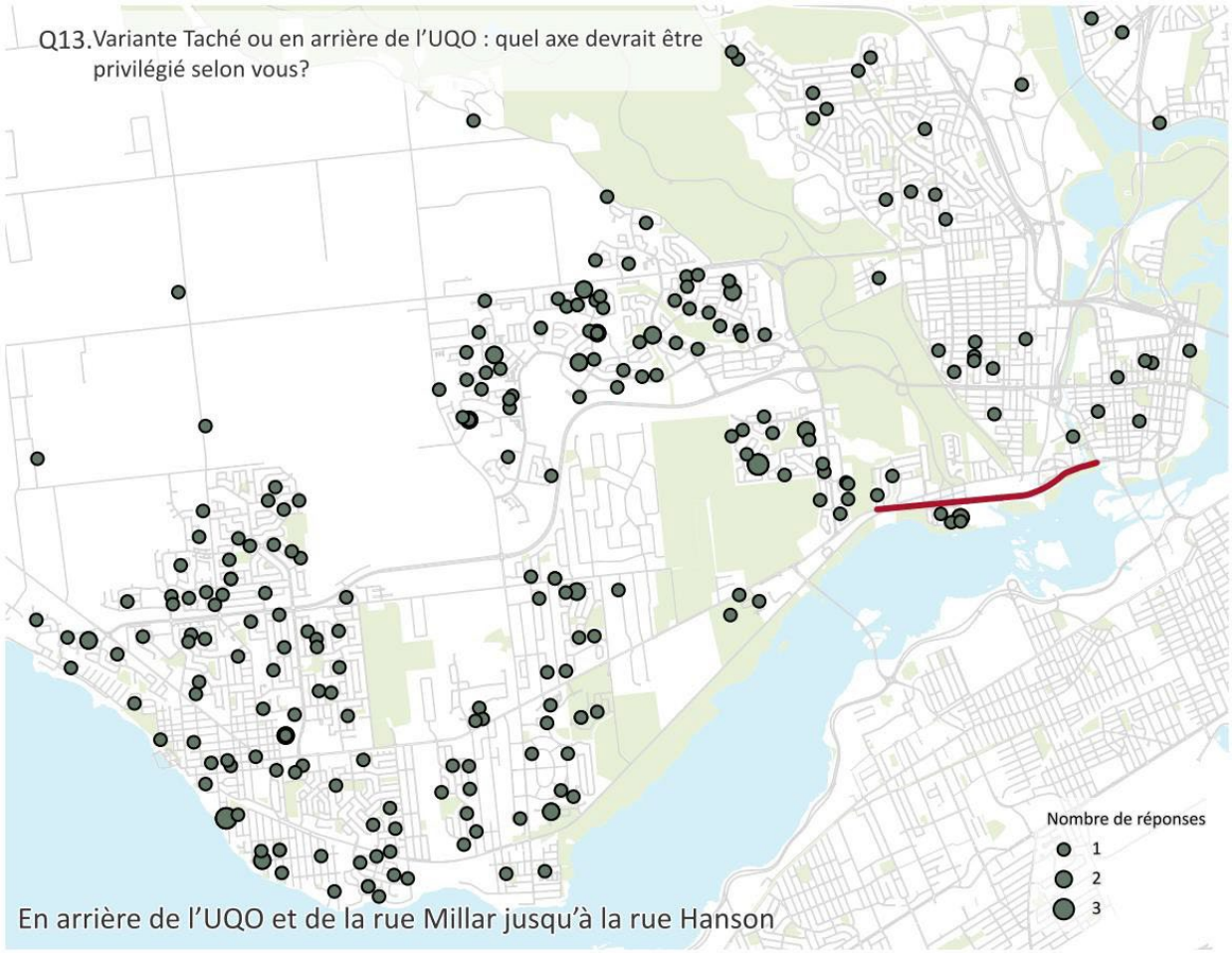


Figure 27 – Cartographie des répondants privilégiant la variante en arrière de l'UQO jusqu'à Hanson



24 % des répondants préfèrent que le lien structurant reste sur le boulevard Alexandre-Taché. Cette variante est plus populaire parmi :

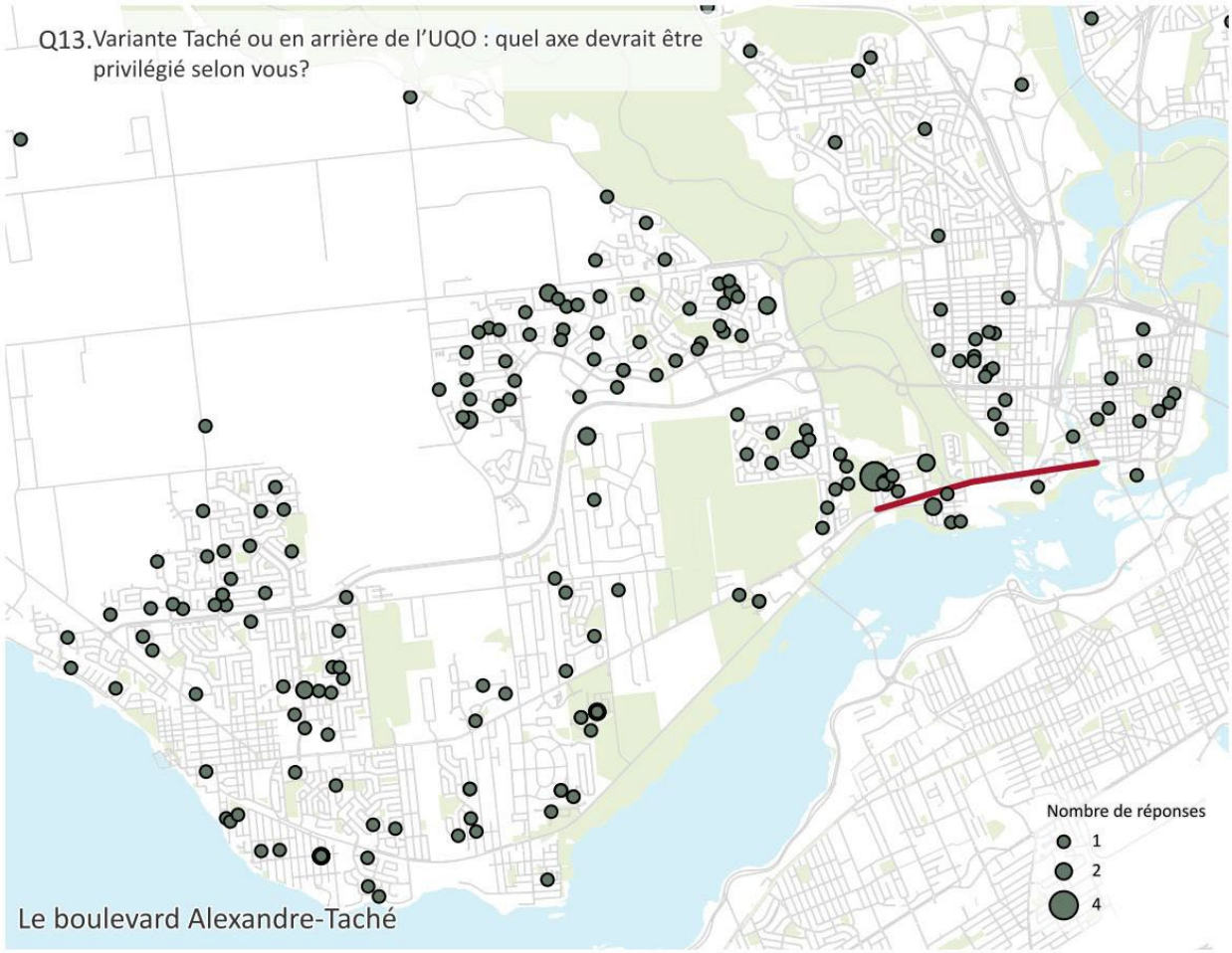
- Les étudiants (39 %);
- Les résidents du secteur Gatineau (33 %) et des secteurs non concernés par l'étude (29 %)
- Les résidents du secteur Hull (32 %);
- Les personnes se rendent à leur lieu de travail ou d'études en transport actif (31 %).

Ceux-ci justifient le choix de Taché par les raisons suivantes :

- Il desservirait mieux les résidences et les commerces (66 %);
- Les stations seraient plus accessibles à pied ou à vélo (55 %);
- Il permettrait un meilleur accès à l'UQO (42 %).

Parmi les autres raisons mentionnées, citons la proximité avec les résidents (5 mentions), l'opportunité de réaménager le boulevard Taché avec la venue du lien structurant (5), le lien avec le Rapibus et le boulevard Saint-Joseph (3), les voies réservées existantes (2), et plusieurs risques ou impacts si le tracé passait en arrière de l'UQO : le risque d'inondations (5), les impacts sur la faune et la flore (4) et sur le sentier des Voyageurs (3), sur l'école Jean-de-Brébeuf (2), sur Lucerne (2) et sur les résidences (1).

Figure 28 – Cartographie des répondants privilégiant la variante Taché



16 % n'ont pas de préférence entre les trois options, et 8 % n'ont pas d'opinion.

Connexion via Vanier ou Allumettières

Si l'on veut relier les deux axes structurants et faciliter les déplacements entre le secteur Aylmer et le district du Plateau, deux options sont possibles, soit le boulevard des Allumettières ou le chemin Vanier. Il est aussi possible de ne réaliser aucun de ces liens.

Les préférences des répondants et les raisons citées pour le choix sont présentées aux pages suivantes.

Figure 29 – Option de connexion via Vanier ou Allumettières (n=668)

Q15. Si l'on veut relier les deux axes structurants et faciliter les déplacements entre le secteur Aylmer et le district du Plateau, deux options sont possibles, soit le boulevard des Allumettières, entre le boulevard Wilfrid-Lavigne et le chemin Vanier, ou le chemin Vanier entre le boulevard des Allumettières et le chemin d'Aylmer. Il est aussi possible de ne réaliser aucun de ces liens.

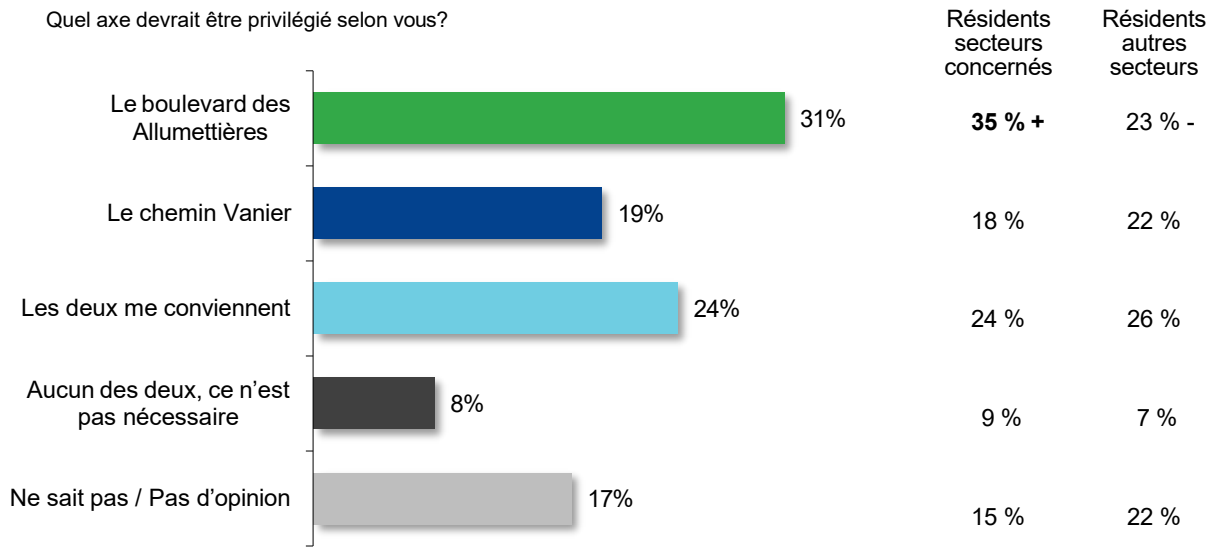


Tableau 13 - Raisons citées pour le choix entre Vanier ou Allumettières (n=338)

Raisons	Allumettières			Vanier		
	Tous (n=209)	Secteurs concernés (n=165)	Autres secteurs (n=44)	Tous (n=129)	Secteurs concernés (n=86)	Autres secteurs (n=43)
Le parcours serait plus rapide	**67 %**	**68 %**	**66 %**	29 %	30 %	26 %
Il faciliterait les déplacements vers les destinations hors centre-ville (vers les cégeps, vers la périphérie de Hull, etc.)	**41 %**	**42 %**	**34 %**	37 %	**40 %**	33 %
Il desservirait mieux les résidences et les commerces	27 %	28 %	23 %	**55 %**	**58 %**	**49 %**
Il y aurait plus d'espace pour aménager un système structurant	**48 %**	**52 %**	**34 %**	15 %	19 %	7 %
Il faciliterait les déplacements vers le centre-ville	33 %	33 %	32 %	37 %	34 %	**44 %**
Il contribuerait au développement des quartiers	21 %	22 %	18 %	**43 %**	**47 %**	37 %
Il permettrait de maintenir de l'espace pour les automobiles sur l'autre axe	31 %	33 %	23 %	21 %	24 %	14 %
Il y aurait moins d'impacts sur les riverains (moins d'expropriations)	36 %	39 %	27 %	8 %	8 %	7 %

Raisons	Allumettières			Vanier		
	Tous (n=209)	Secteurs concernés (n=165)	Autres secteurs (n=44)	Tous (n=129)	Secteurs concernés (n=86)	Autres secteurs (n=43)
Les stations seraient plus accessibles à pied ou à vélo	14 %	15 %	14 %	**40 %**	**42 %**	35 %
Il serait moins coûteux	25 %	25 %	25 %	8 %	9 %	5 %
Le tracé passerait à proximité de mon domicile	9 %	10 %	2 %	18 %	27 %	0 %
Le tracé ne passerait pas à proximité de mon domicile, j'aurais moins de nuisances	2 %	3 %	0 %	2 %	1 %	2 %
Autre	2 %	2 %	2 %	5 %	7 %	2 %

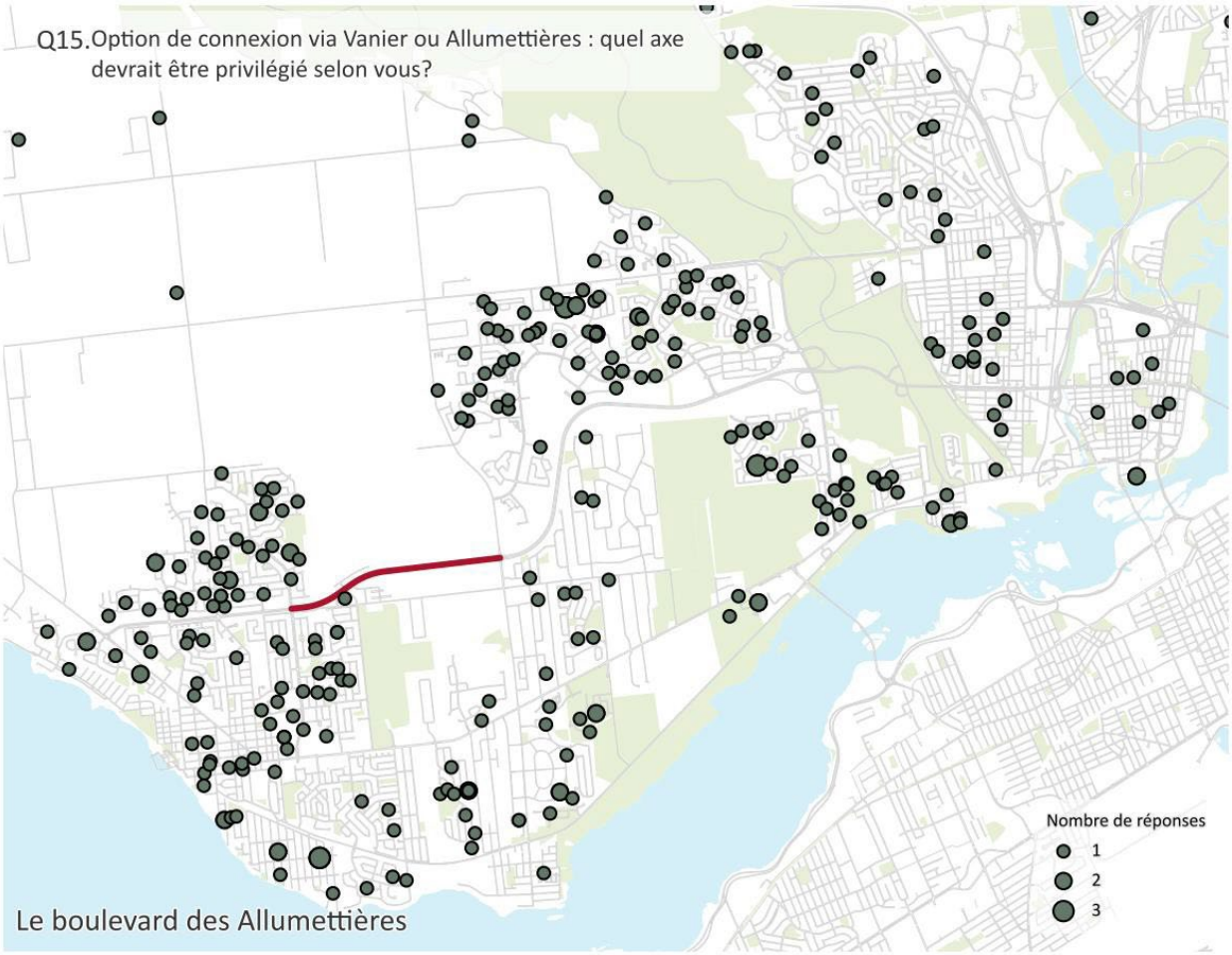
L'axe Allumettières obtient la préférence de 31 % des répondants, surtout pour les raisons suivantes :

- Le parcours serait plus rapide (67 %);
- Il y aurait plus d'espace pour aménager un système structurant (48 %);
- Il faciliterait les déplacements vers les destinations hors centre-ville (41 %).

Les répondants citent la rapidité et le lien entre Aylmer, le Plateau et les autres quartiers (9 mentions), la réduction de l'espace pour la circulation automobile et les nuisances pour les résidents si on aménageait une connexion sur Vanier (respectivement 2 et 1 mentions), et l'accès aux commerces et à l'école à l'intersection Vanier/Allumettières (1 mention).

Les lieux de résidence des répondants ayant choisi cette option sont présentés ci-après.

Figure 30 – Cartographie des répondants privilégiant l'option de connexion via Allumettières



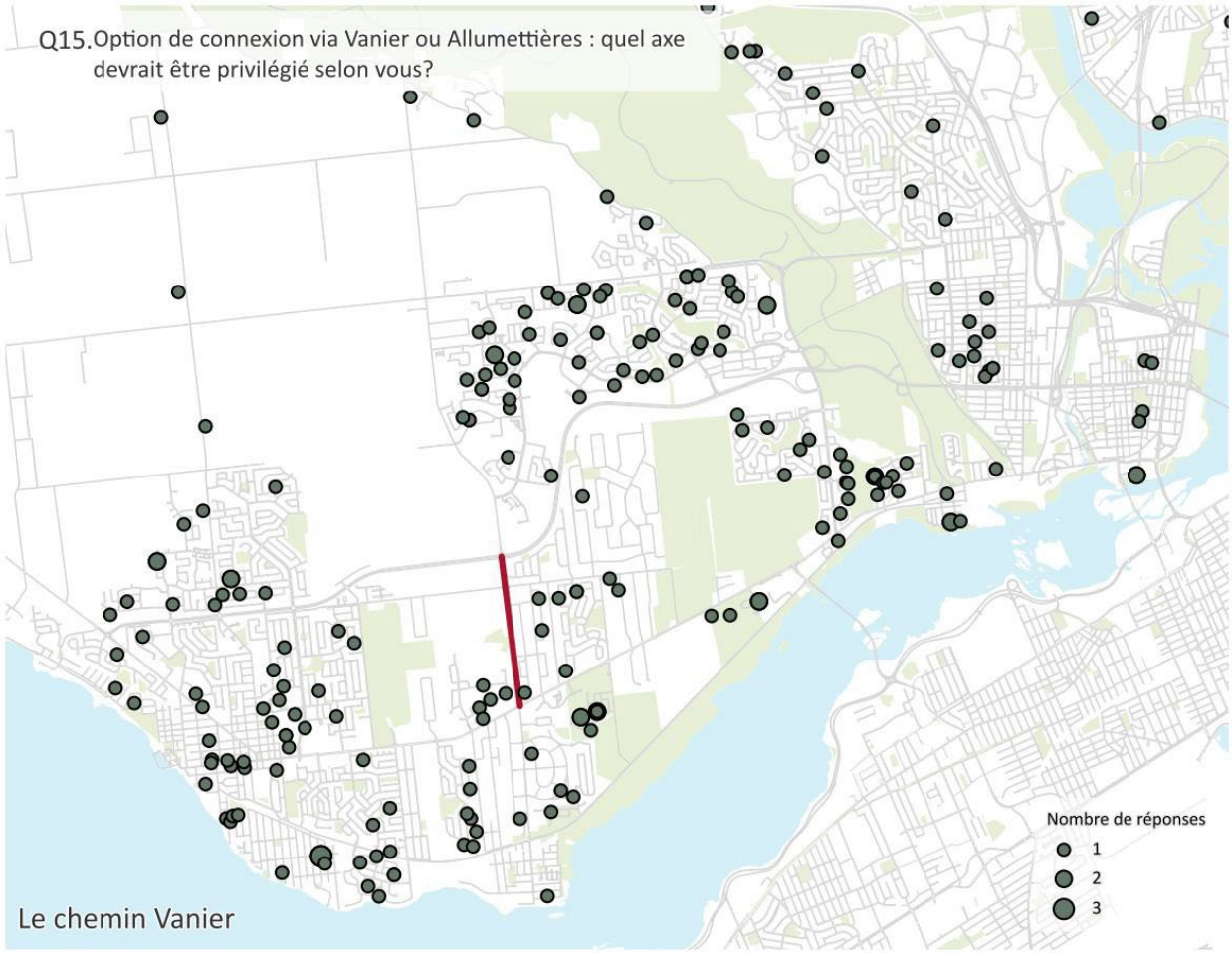
19 % privilégient plutôt le chemin Vanier :

- Il desservirait mieux les résidences et les commerces (55 %);
- Il contribuerait au développement des quartiers (43 %);
- Les stations seraient plus accessibles à pied ou à vélo (40 %).

Parmi les raisons citées en commentaires, on retrouve une meilleure desserte des quartiers (9 mentions) et la nécessité d'améliorer l'accès au transport en commun et la sécurité sur le chemin Vanier (2 mentions).

La carte ci-après illustre les lieux de résidences des répondants privilégiant la connexion via Vanier.

Figure 31 – Cartographie des répondants privilégiant l'option de connexion via Vanier



Les deux options conviennent à 24 % des répondants. 17 % n'ont pas d'opinion. Seuls 8 % sont d'avis que cette connexion entre les deux axes structurants n'est pas nécessaire.

Implications pour les services vers Ottawa

Dans les scénarios opérés uniquement par des autobus, les lignes du secteur Hull et de l'est de Gatineau continueraient de se rendre au centre-ville d'Ottawa.

Cependant, dans les scénarios où un tramway serait mis en place, deux options sont possibles : soit les lignes continuent de se rendre directement au centre-ville d'Ottawa, soit la clientèle est amenée au centre-ville de Gatineau où elle peut faire une correspondance sur le tramway à destination d'Ottawa.

Dans ce contexte, il a été demandé aux répondants à quelle(s) condition(s) la correspondance serait acceptable. **Puisque cette question concerne particulièrement les résidents des secteurs non concernés par l'étude, ce sont leurs réponses qui sont mises de l'avant.**

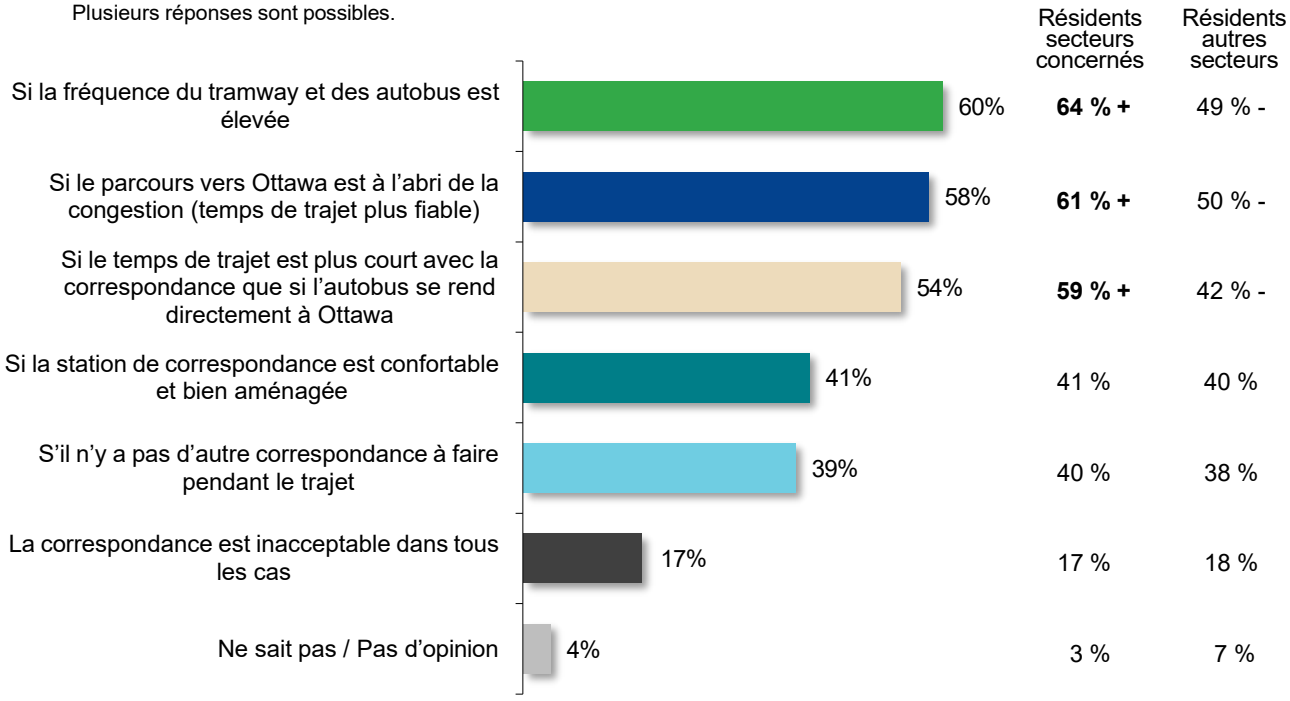
Ceux-ci considèrent que la correspondance est acceptable aux conditions suivantes :

- Si le parcours vers Ottawa est à l'abri de la congestion (50 %);
- Si la fréquence du tramway et des autobus est élevée (49 %);
- Si le temps de trajet est plus court avec la correspondance que s'il était direct (42 %);
- Si la station de correspondance est confortable et bien aménagée (40 %);
- S'il n'y a pas d'autre correspondance à faire pendant le trajet (38 %);

18 % des répondants des secteurs non concernés par l'étude considèrent que la correspondance est inacceptable dans tous les cas.

Figure 32 – Conditions auxquelles la correspondance serait acceptable (n=668)

Q17. À quelle(s) condition(s) la correspondance serait acceptable selon vous?
Plusieurs réponses sont possibles.



Dans les commentaires, catégorisés dans le tableau 14 ci-dessous, 21 % des répondants mentionnent que l'idéal est de limiter le nombre de correspondances. Toutefois, plusieurs mentionnent que la

correspondance est acceptable si le temps de parcours est plus court (12 %), que l'on assure la fluidité et la fiabilité du transport en commun (7 %), que les stations soient confortables (3 %) et que l'on minimise le temps d'attente grâce à des fréquences élevées (3 %).

À noter que plusieurs répondants ont mal compris la question et ont pensé que le système de l'ouest ne se rendrait pas directement à Ottawa.

Tableau 14 – Commentaires sur les implications pour les services vers Ottawa (n=668)

Q18. Avez-vous des commentaires spécifiques à ce sujet?

Commentaires	Mentions	% répondants
Il faut limiter le nombre de correspondances.	141	21 %
Il faut assurer la rapidité des trajets / des temps de parcours plus courts.	78	12 %
La correspondance n'est pas un problème si elle est efficace.	73	11 %
Il faut que les correspondances soient fiables / que le transport en commun soit à l'abri de la congestion.	46	7 %
Il faut considérer d'autres options (convertir le Rapibus en tramway, traverser par d'autres ponts, etc.).	26	4 %
Il faut que les stations de correspondance soient confortables.	21	3 %
Il faut que le tramway et l'autobus soient fréquents pour minimiser le temps d'attente.	19	3 %
Il faut intégrer / arrimer les réseaux de Gatineau et d'Ottawa.	19	3 %
Il faut qu'il y ait de la capacité à bord du tramway.	17	3 %
Il faut que les correspondances soient efficaces / que le système soit simple à utiliser.	17	3 %
Il faut réduire le nombre d'autobus à Ottawa.	17	2 %
Il faut s'assurer de limiter la distance de marche lors des correspondances.	4	1 %
Commentaires non reliés à la correspondance vers Ottawa (opposition au tramway, incompréhension quant au fait que le tramway se rendra à Ottawa).	41	6 %
Aucun commentaire / ne sait pas.	296	44 %

Voici quelques-uns des commentaires exprimés :

S'il faut déjà marcher ou prendre une correspondance pour se rendre à la ligne principale dans notre quartier, je ne crois pas aux bienfaits d'ajouter une autre correspondance.

The more transfers required equals fewer people riding the system. It isn't pleasant waiting for a transfer and the best vehicle is the one you are already in. I stopped riding public transit because I had a minimum of 2 transfers. Waiting between connections was the worst.

You cannot create a disequilibrium in commute options for east Gatineau. Either you consider extending the train line to east Gatineau as well, or keep the direct bus routes to Ottawa. If you add a connection stop it will have an impact on people's mobility and amount of time it takes to get to work.

Il est certain que pour les résidents des secteurs Hull et Gatineau cela est un inconvénient d'effectuer une correspondance. Surtout qu'ils ne bénéficieront pas du service de tramway dans leur quartier (doublement pénalisés).

S'il y a correspondance, trop de gens se retrouverait à devoir en faire, ce qui occasionnerait trop d'achalandage, des délais trop grands, le ralentissement des déplacements vers Ottawa (file d'attente). Les tramways seraient déjà pleins avant de traverser, et sortir tout le monde pour faire une correspondance serait très long.

As long as the transfer is fast and efficient, there's no problem. People will complain regardless however.

Faire des correspondances ne me dérange pas, quand on prend le métro à Montréal on change de ligne au besoin c'est normal. Si l'expérience est rapide, fiable, sans délais et confortable les correspondances ne sont pas un problème.

Réduire le nombre de véhicules au centre-ville d'Ottawa est très important, idéalement une super-station serait construite/aménagée près de Place du Portage et plus aucun autobus ne passerait sur le pont Portage, le transfert interprovincial se ferait uniquement par tramway, qui serait rapide, efficace, à l'heure, confortable. Si bien pensé les avantages sur la réduction du trafic au centre-ville d'Ottawa sont de BEAUCOUP supérieur aux quelques minutes, voir secondes, requises par un transfert à cet endroit.

Pour une correspondance, la clé est d'assurer une fiabilité des transports afin que les gens évitent de rater leur correspondance. La fréquence est également un élément important pour permettre aux gens d'adapter leur déplacement en fonction de leur horaire à eux et non en fonction des horaires de la STO.

Transfers are only acceptable for a rail based system (local bus to rail). If bus is chosen, I would strongly prefer one seat direct to downtown.

Depending on where the transfer takes place, it would be important to have an expectation that there would be sufficient space on the vehicles to which riders are transferring. It would not be acceptable to have one or more buses arrive at the transfer station only to have the arriving Ottawa-bound vehicle already be at full capacity. If transferring riders would often have to wait for several vehicles to pass before they could board a vehicle to complete their trip, this would be a failure.

Don't mind a transfer. Please less buses/train/etc. in downtown Ottawa. The two systems (STO & OC Transpo) should be fully consolidated.

Une station de correspondance à l'abri des intempéries me semble essentielle pour que la population continue de favoriser le transport en commun durant l'hiver.

Il est important que la transition autobus-tramway se fasse de façon fluide et très facilement et que la distance à parcourir entre les deux modes de transport soit très courte et à l'abri des intempéries et possiblement chauffé/climatisé.

Desserte du centre-ville d'Ottawa

Beaucoup de destinations à Ottawa se trouvent à l'ouest du canal Rideau, aux alentours de la station Lyon de l'O-Train. Le système structurant permettra d'effectuer facilement une correspondance sur la Ligne de la Confédération. Cependant, pour se rendre plus loin au centre-ville, les possibilités sont limitées par de nombreuses contraintes (impacts sur la circulation, les bâtiments ou les commerces, différentes vocations des rues, etc.).

Il a donc été demandé aux répondants jusqu'où le système structurant devrait se rendre à Ottawa, parmi les trois options considérées comme réalisables, soit les stations Lyon ou Parlement ou la rue Elgin.

31 % des répondants estiment que ce serait suffisant que le système structurant se rende jusqu'à la **station Lyon**. Sont plus nombreux à supporter cette option :

- Les anglophones (44 %);
- Les résidents du district du Plateau (39 %) et des secteurs concernés par l'étude (34 %);
- Les hommes (39 %);
- Les diplômés universitaires (34 %);
- Les personnes qui reconnaissent la nécessité d'un système structurant (33 %).

58 % sont d'avis que le système devrait se rendre plus loin que la station Lyon.

26 % des répondants sont d'avis que le système devrait plutôt se rendre jusqu'à la **station Parlement**, dont 32 % des personnes qui travaillent au centre-ville d'Ottawa.

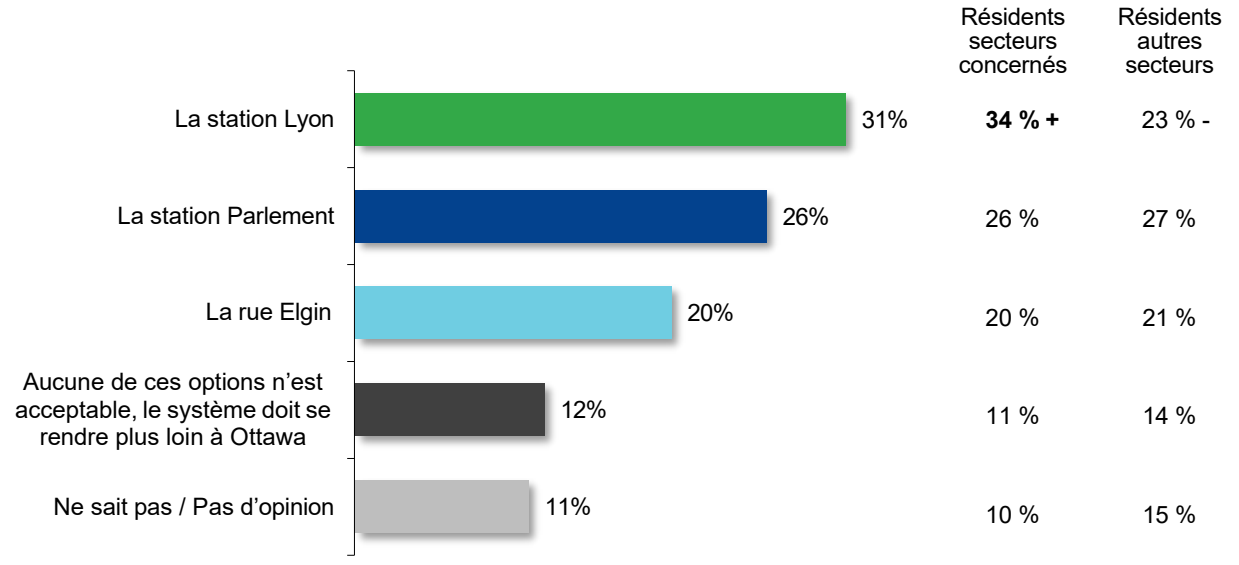
20 % croient que le tracé devrait se poursuivre jusqu'à la **rue Elgin**.

12 % sont d'avis qu'aucune de ces trois options n'est acceptable et que le système devrait se rendre **plus loin** à Ottawa. Les principales raisons citées sont que l'on devrait desservir le centre Rideau, voire l'Université d'Ottawa.

11 % n'ont pas d'opinion.

Figure 33 – Desserte du centre-ville d'Ottawa (n=668)

Q19. Parmi les choix suivants qui sont considérés comme étant réalisables, jusqu'où au minimum devrait se rendre le système structurant à Ottawa selon vous?



Les répondants pouvaient partager leurs commentaires à ce sujet. Ceux-ci sont catégorisés ci-dessous.

Tableau 15 – Commentaires sur la desserte du centre-ville d'Ottawa (n=668)

Q20. Avez-vous des commentaires spécifiques à ce sujet?

Commentaires	Mentions	Station Lyon (n=205)	Station Parlement (n=174)	Rue Elgin (n=134)	Aucune de ces options (n=79)
La station Lyon est une bonne option / un minimum.	79	**34 %**	3 %	2 %	1 %
Il faut assurer une correspondance adéquate avec la Ligne de la Confédération de l'O-Train.	73	**23 %**	**8 %**	3 %	4 %
La station Parlement est une bonne option (centrale, destinations à distance de marche).	65	2 %	**32 %**	2 %	1 %
La rue Elgin est une bonne option (couvre l'ensemble du centre-ville, près du Centre Rideau).	52	0 %	1 %	**36 %**	3 %
Il faut limiter les correspondances sur l'O-Train / éviter une deuxième correspondance / assurer le lien avec le réseau d'autobus d'OC Transpo	43	3 %	5 %	**13 %**	8 %
Le système doit se rendre jusqu'au Centre Rideau.	37	0 %	4 %	7 %	**24 %**
Le système doit se rendre le plus loin possible à Ottawa.	27	2 %	4 %	8 %	4 %
Le système doit emprunter le pont Prince-de-Galles / se rendre à la station Bayview ou Pimisi.	23	4 %	1 %	0 %	**14 %**
Le système doit éviter les lieux de congestion / ne doit pas créer de congestion à Ottawa.	17	5 %	1 %	1 %	3 %
Le système doit se rendre jusqu'à l'Université d'Ottawa.	13	0 %	1 %	2 %	10 %
Le système doit se rendre au Pré Tunney.	13	2 %	0 %	0 %	10 %
Le système devrait faire une boucle par les ponts Portage/Prince-de-Galles et Alexandra.	10	1 %	3 %	1 %	3 %
Autres suggestions (amener l'O-Train à Gatineau, ne pas se rendre à Ottawa, intégrer la STO et OC Transpo)	8	1 %	1 %	0 %	5 %
Le système doit offrir une correspondance au moins deux stations pour répartir la clientèle.	6	1 %	1 %	1 %	0 %
Il faut une intégration tarifaire (correspondance gratuite ou billets/PME acceptés).	6	3 %	0 %	0 %	0 %
La Ville d'Ottawa n'acceptera pas / ça dépendra de ce que la Ville d'Ottawa acceptera.	6	2 %	1 %	0 %	0 %
Les stations proposées seront trop achalandées.	5	0 %	0 %	1 %	4 %
Il faut desservir Sussex / King Edward.	4	0 %	1 %	0 %	4 %
Il faut réduire la circulation automobile dans le centre-ville d'Ottawa.	3	0 %	0 %	0 %	3 %
Le système doit se rendre en tunnel à Ottawa	3	1 %	1 %	0 %	0 %
Ne sait pas / pas concerné	11	0 %	0 %	1 %	0 %
Aucun commentaire	294	40 %	51 %	43 %	16 %

Voici quelques-uns des commentaires reçus à ce sujet :

Le faire terminer à côté de la station Lyon en attendant mieux est un compromis acceptable. Des provisions devraient toutefois être conservées pour faire une boucle dans les deux centres-villes via le Pont Alexandra un jour...

The two cities do not need to duplicate routes. Once passengers from Gatineau are in Ottawa, they can walk or transfer to the OC Transpo system. Imagine that the STO and OC Transpo were one organization, what would the planning look like in this situation?

Un seul terminus du côté d'Ottawa est plus qu'acceptable. C'est comme ça que ça marche partout ailleurs, notamment à Montréal. Les banlieues des rives nord et sud n'ont qu'un seul terminus connectant au réseau du Métro. Je ne vois pas pourquoi ça ne pourrait pas être comme ça ici aussi.

You could run the line under Sparks or Wellington and connect both Lyon and Parliament and that would probably be sufficient. But at a minimum the train has to go underground and grade separated to Lyon

Bien que la station Lyon est très près de mon travail, je crois qu'un arrêt qui se rendrait au milieu du centre-ville d'Ottawa (Parlement) éviterait à plus de personnes de prendre une autre correspondance sur le système d'OC Transpo.

Concentrating all drop-offs and pick-ups at one downtown station will create a huge amount of pressure at one point. Having access to STO at two downtown locations will make system less unpleasant for all commuters in those locations.

La rue Elgin est plus centrale. Il n'est pas nécessaire d'aller plus loin puisque la correspondance avec OC Transpo se fait facilement.

Pour plusieurs personnes à destination du Centre Rideau ou du Marché By, Elgin est le minimum requis pour un déplacement efficace. Il serait contre-productif de forcer une personne à aller sur l'O-Train pour un déplacement entre deux stations. Ceux-ci voudront le prendre s'ils vont plus loin dans l'est ou à l'ouest du centre-ville d'Ottawa.

Tout dépend de la décision d'imposer une correspondance pour traverser le pont Portage. Si les usagers doivent avoir une correspondance pour traverser, il faudrait couvrir le centre-ville d'Ottawa jusqu'à Elgin (sans nécessairement dépasser le canal Rideau). Dans le cas inverse, la station Lyon est suffisante - les usagers pourront embarquer dans l'O-Train.

L'idéal serait l'Université d'Ottawa. Aussi bien en profiter! ;-) Sinon, Elgin. Je ne travaille pas à Ottawa. Le peu que j'y vais est pour le CNA, le Centre Rideau, Le Marché, la rue Elgin. Donc Elgin est le minimum pour moi.

Se rendre à Rideau serait un bon compromis car uOttawa est à distance de marche de celle-ci.

Le système structurant devrait se rendre à la station Bayview via le Pont Prince-de-Galles. Je ne suis pas convaincu que ce choix n'est pas réalisable.

Partie 4 – Les modes de transport

Dans cette partie du questionnaire, on rappelait tout d'abord aux répondants que tous les modes considérés pour le système structurant seront totalement électriques et conçus selon les principes d'accessibilité universelle, et que le choix du mode n'a pas d'impact sur l'espace requis pour les aménagements. Ils étaient ensuite invités à exprimer leurs préférences.

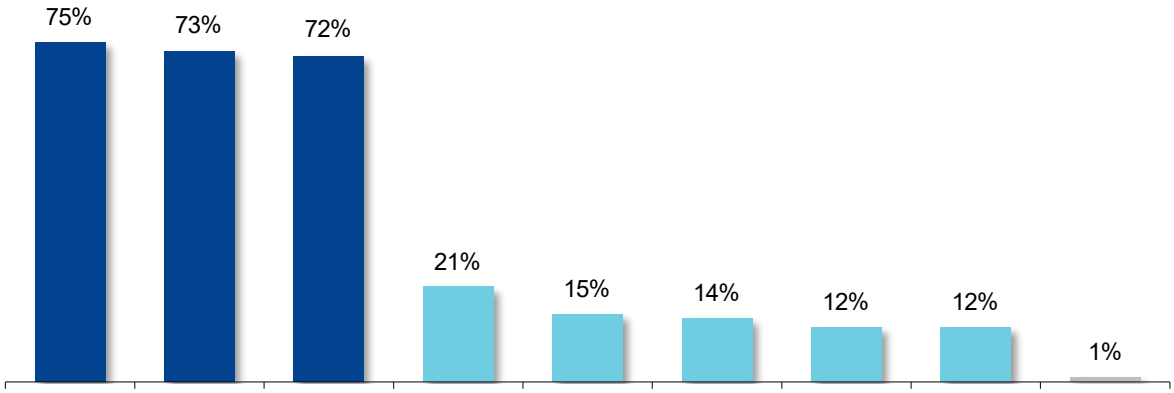
Attributs du mode de transport

Parmi une liste de 8 attributs pouvant qualifier un mode de transport, les répondants étaient invités à choisir les 3 attributs les plus important pour eux. Les résultats sont présentés ci-dessous :

Figure 34 – Attributs les plus importants dans un mode de transport (n=668)

Q21. Veuillez noter que tous les modes considérés sont totalement électriques, qu'ils seront conçus selon les principes d'accessibilité universelle, et que le choix du mode n'a pas d'impact sur l'espace requis.

Veuillez choisir parmi les adjectifs suivants les 3 attributs qui sont les plus importants pour vous dans un mode de transport :



	Fréquent	Rapide	Fiable	Confortable	Moderne	Silencieux	Peu cher à exploiter	Peu coûteux à mettre en place	Ne sait pas
Secteurs concernés	75 %	**76 % +**	73 %	**24 % +**	14 %	15 %	11 % -	9 % -	0 %
Autres secteurs	73 %	68 % -	69 %	15 % -	18 %	11 %	**16 % +**	**19 % +**	1 %

Trois attributs se démarquent clairement comme étant les plus importants.

L'adjectif « **fréquent** » est retenu par **75 %** des répondants, dont :

- 77 % des utilisateurs du transport collectif;
- 77 % des personnes qui reconnaissent la nécessité d'un système structurant dans l'ouest.

Le qualificatif « **rapide** » recueille **73 %** de mentions, avec des pourcentages plus élevés auprès :

- Les personnes qui travaillent au centre-ville d'Ottawa (81 %);
- Les résidents du district du Plateau (80 %) et des secteurs concernés (76 %);
- Les utilisateurs du transport en commun pour le travail ou les études (79 %);
- Les 35-54 ans (77 %);
- La population active (76 %).

La **fiabilité** est importante pour **72 %** des répondants, en particulier pour :

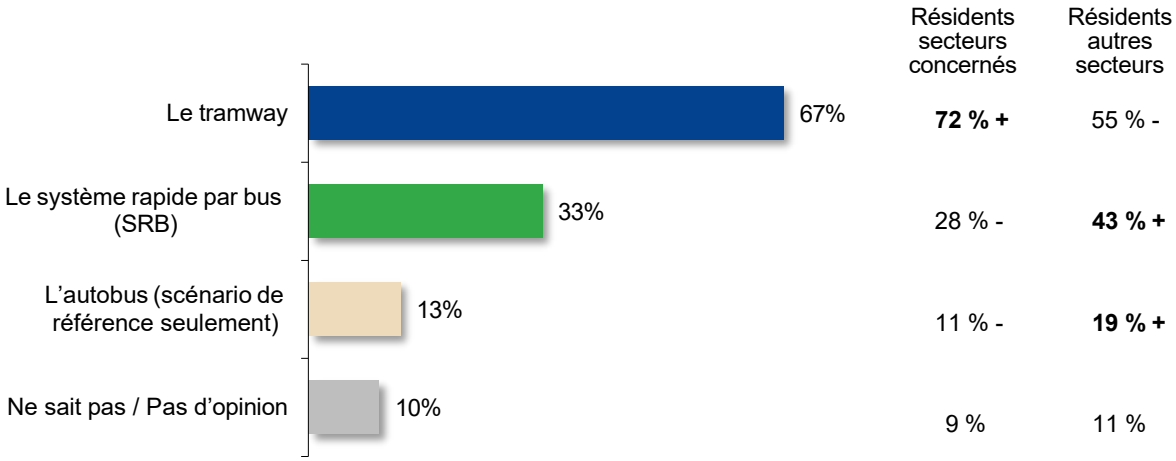
- Les moins de 35 ans (80 %);
- Les anglophones (80 %);
- Les utilisateurs du transport collectif pour le travail ou les études (75 %) et en général (74 %);
- Les personnes qui sont favorables à la mise en place d'un système structurant (75 %).

Modes préférés

Les répondants pouvaient ensuite spécifier le ou les modes de transport qu'ils privilégient parmi les trois modes considérés pour l'ouest de Gatineau : l'autobus (pour le scénario de référence seulement), le service rapide par bus (SRB), ou le tramway. Plusieurs mentions étaient possibles.

Figure 35 – Modes de transport privilégiés pour le système structurant (n=668)

Q22. Trois modes 100 % électriques sont considérés pour le système structurant dans l'ouest de Gatineau : l'autobus, le système rapide par bus (SRB) ou le tramway. Quel(s) mode(s) de transport préféreriez-vous pour le système structurant?



Les deux tiers des répondants privilégient le tramway. Il est significativement plus populaire auprès :

- Des personnes qui se rendent au travail ou aux études à pied ou à vélo (80 %);
- Des répondants favorables à la mise en place d'un système structurant dans l'ouest (77 %);
- Des résidents du secteur Hull (74 %) et des secteurs concernés (72 %);
- Des hommes (73 %);
- Des diplômés universitaires (72 %).

Le SRB est privilégié par un tiers des répondants, dont :

- 48 % des personnes mitigées quant à la nécessité d'un système structurant dans l'ouest;
- 48 % des résidents du secteur Gatineau et 43 % des résidents des secteurs non concernés;
- 45 % des personnes ayant une scolarité de niveau primaire ou secondaire et 41 % des diplômés de niveau collégial;
- 42 % des répondants qui travaillent au centre-ville de Gatineau;
- 39 % des femmes;
- 36 % des utilisateurs du transport collectif pour le travail et les études et en général.

L'autobus recueille 13 % des mentions. Il est davantage retenu par :

- Les personnes mitigées à l'égard de la mise en place d'un système structurant (26 %);
- Les résidents du secteur Gatineau (22 %) et des secteurs non concernés (19 %);
- Les répondants ayant une scolarité de niveau primaire ou secondaire (22 %) et collégial (20 %);
- Les personnes qui travaillent à Gatineau hors centre-ville (20 %);
- Les femmes (16 %).

À noter que 10 % des répondants n'ont pas d'opinion sur le mode de transport.

Raisons de la préférence

Les répondants pouvaient expliquer leurs préférences grâce à une question ouverte. Les commentaires sont catégorisés ci-dessous.

Tableau 16 – Commentaires sur les modes de transport (n=668)

Q23. Pour quelles raisons?

Commentaires	Le tramway (n=447)	Le SRB (n=218)	L'autobus (n=86)
C'est un mode de transport plus rapide.	**28 %**	**26 %**	**10 %**
C'est un mode plus fiable.	**22 %**	**10 %**	7 %
Il n'est pas pris dans la congestion.	**20 %**	9 %	**10 %**
Il offre une plus grande capacité.	**20 %**	6 %	3 %
Il est plus confortable.	**16 %**	2 %	0 %
Il est plus moderne.	**15 %**	1 %	0 %
Il est moins coûteux à mettre en place.	4 %	**18 %**	**19 %**
Il est écologique / moins polluant.	**12 %**	3 %	3 %
C'est une solution à long terme.	**10 %**	2 %	0 %
C'est un mode plus efficace.	8 %	6 %	2 %
C'est un investissement avantageux et durable.	8 %	3 %	0 %
Il permet une meilleure accessibilité / desserte des quartiers / Il offre une meilleure connexion avec Ottawa.	5 %	7 %	9 %
Il est plus silencieux.	7 %	1 %	0 %
Il est plus facile à mettre en place et à gérer.	1 %	8 %	7 %
Il est plus flexible.	1 %	7 %	7 %
Le tramway est trop coûteux.	1 %	6 %	9 %
L'autobus est suffisant / Il suffit d'améliorer le système.	0 %	6 %	**14 %**
C'est un mode structurant.	3 %	2 %	2 %
C'est plus sécuritaire.	2 %	1 %	2 %
La densité de population est trop faible pour un tramway.	0 %	3 %	3 %
Une combinaison des deux modes est préférable.	2 %	4 %	2 %
Il améliore la qualité de vie des citoyens.	2 %	0 %	0 %
Autre	4 %	9 %	13 %
Aucun commentaire	5 %	8 %	9 %

Voici quelques-uns des commentaires reçus :

- En faveur du tramway

Je crois que nous sommes rendus à l'étape supérieure en termes de transport en commun, c'est-à-dire le tramway. Un tramway est beaucoup plus rapide, sa capacité de charge est beaucoup plus grande et est plus silencieux qu'un bus. Prenons exemple sur le tramway de Toronto.

C'est moderne, silencieux et écologique. Il y a plus de sièges et l'accessibilité universelle est plus présente (accès plus facile)

I believe this is the most reliable method of transportation in terms of frequency and can be easily and relatively cost-neutrally made electric. It also may result in cost-savings for the STO in terms of bus vs. tram operators and a reduction in diesel fuel costs and avoided carbon price costs.

C'est structurant, on aura un meilleur retour sur l'investissement en terme touristique, immobilier, commercial et en qualité de service. Le vélo y sera très certainement plus convivial.

Le tramway constitue la solution la plus efficace, la plus fiable et la plus rapide. De plus, le tramway a une empreinte écologique inférieure et génère moins de pollutions sonores tout en assurant le meilleur confort. Les investissements financiers supplémentaires sont à cet égard tout à fait justifiés. De plus, le tramway représente le meilleur potentiel de développement urbain et de densification et apporte une plus-value importante en matière de patrimoine et de tourisme.

Le tramway forcera la ville à faire les aménagements nécessaires pour le transport en commun. Les systèmes de bus permettront des demi-mesures et de trop grandes concessions à la circulation automobile.

- En faveur du SRB

Possibilité de phasage. Rapport coûts/bénéfices acceptable. Possibilité de bus bi-articulés qui pourraient satisfaire la demande. Moins d'inconnu et expertise d'implantation et de l'exploitation d'un SRB déjà en place à la STO.

L'autobus 100% électrique qui offre confort, flexibilité quant à la grosseur des véhicules à utiliser en dehors des heures de pointe, et qui peut changer de route selon les besoins d'affluence et d'achalandage tout en utilisant tant les rues que les voies réservées et les voies rapides selon le cas et les besoins.

Ce système fonctionne maintenant très bien dans les secteurs où il a été implanté, nul doute que cela fonctionnera également à l'ouest. Le coût vs le système sur rail devrait à lui seul faire réaliser aux dirigeants que c'est la meilleure option.

Buses can use existing road infrastructure. Efficiency, reliability and punctuality will be more a matter of adequate management rather than massive investments.

Car la densité de la population actuelle ne permet pas l'établissement d'un tramway. Il faut que ça soit plus rapide! Le tramway est un système très lent.

Partie 5 – Possibilités d'aménagements

Différents aménagements sont possibles selon l'espace disponible aux différents emplacements. Les aménagements ne seront pas les mêmes sur l'ensemble des tracés, mais pourraient requérir des compromis à certains endroits où l'espace est plus limité.

Nous avons mesuré l'acceptabilité de la réduction du nombre de voies de circulation, des expropriations partielles et totales de propriétés pour aménager des stations plus confortables, une piste cyclable, de la végétation ou des trottoirs plus larges. Les résultats sont présentés aux figures 36, 37 et 38.

De façon générale, les résidents sont davantage prêts à faire des compromis pour avoir des stations mieux aménagées. Ensuite viennent les pistes cyclables, puis la végétation, puis des trottoirs plus larges. Toutefois, les variations sont importantes selon le type de compromis à effectuer.

64 % à 76 % des répondants sont prêts à accepter des **réductions de voies de circulation**. Le niveau d'acceptabilité est significativement plus élevé chez :

- Les résidents du secteur Hull;
- Les usagers du transport collectif en général et pour d'autres motifs que le travail ou les études;
- Les personnes qui utilisent le transport actif pour se rendre au travail ou aux études;
- Les répondants favorables à la mise en place d'un système structurant.

L'acceptabilité des **expropriations partielles de propriétés** varie entre **44 % et 59 %** selon l'objectif de la mesure. Ces pourcentages sont plus élevés parmi :

- Les personnes qui utilisent le transport actif pour se rendre au travail ou aux études;
- Les répondants favorables à la mise en place d'un système structurant.

Une minorité de répondants accepteraient des **expropriations totales de propriétés**, les pourcentages variant entre **24 % et 42 %**. Ceux qui voient la nécessité d'un système structurant y sont plus disposés.

Figure 36 – Acceptabilité de réductions des voies de circulation (n=668)

Q24. Selon vous, des réductions des voies de circulation sont-elles acceptables afin d'aménager …?

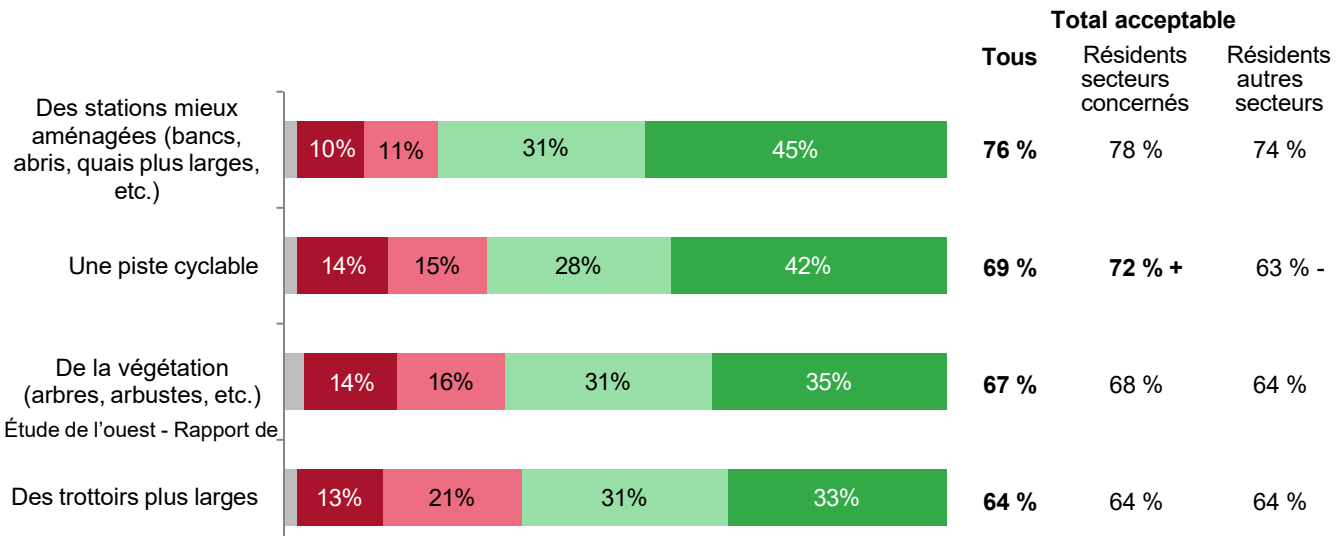


Figure 37 – Acceptabilité d'expropriations partielles de propriétés (n=668)

Q25. Selon vous, des expropriations partielles de propriétés sont-elles acceptables afin d'aménager …?

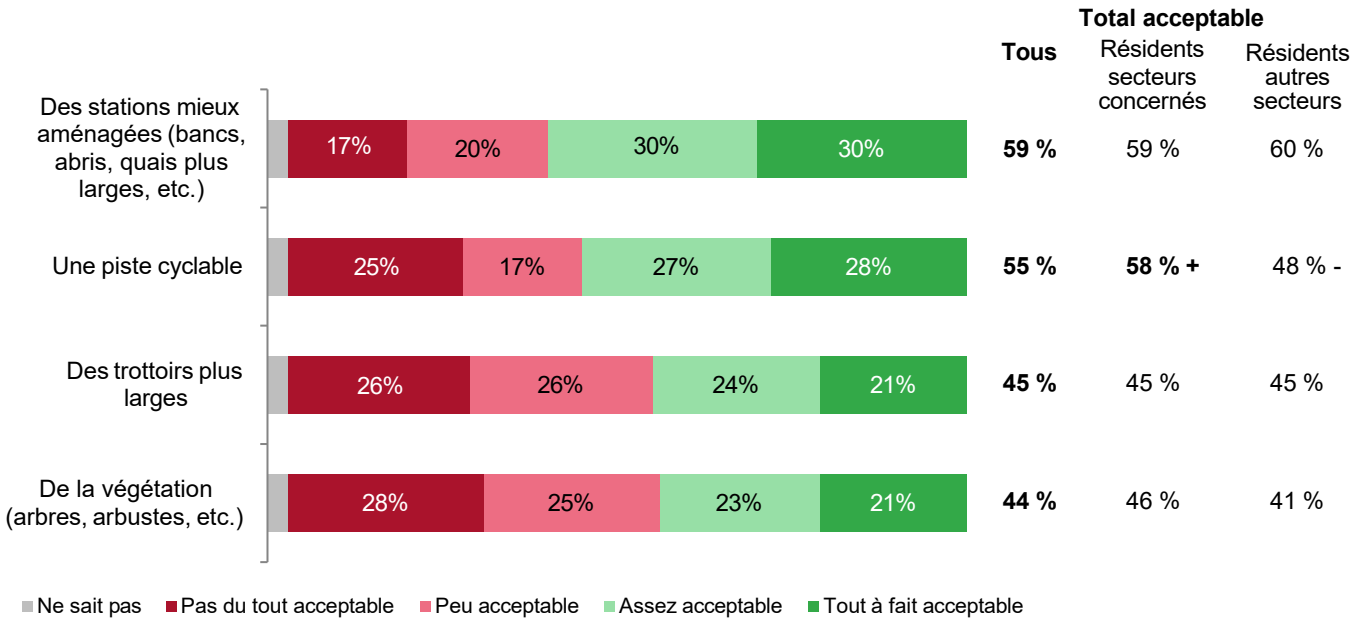
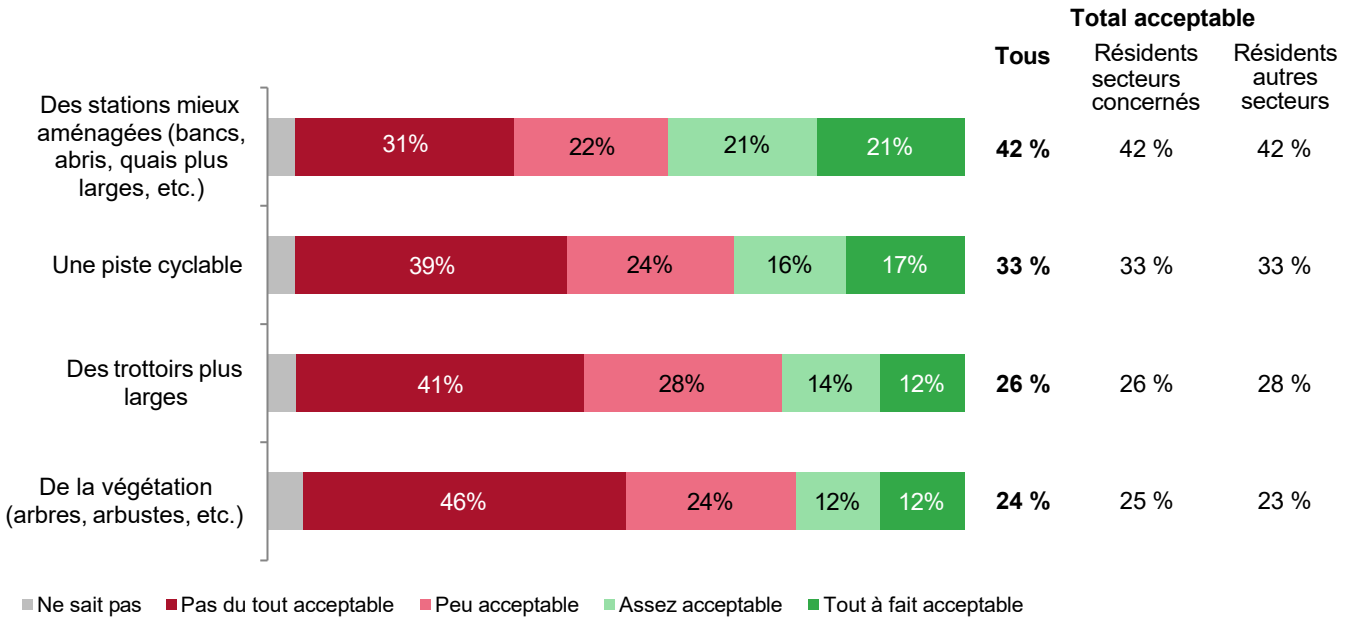


Figure 38 – Acceptabilité d'expropriations totales de propriétés (n=668)

Q26. Selon vous, des expropriations totales de propriétés sont-elles acceptables afin d'aménager …?



Partie 6 - Commentaires généraux

Enfin, les répondants pouvaient faire part de leurs commentaires généraux concernant les scénarios proposés ou tout autre élément en lien avec l'étude. 63 % ont répondu à cette question.

La catégorisation des commentaires est présentée ci-dessous.

Tableau 17 – Autres commentaires en lien avec l'étude (n=668)

Q27. Avez-vous d'autres commentaires concernant les scénarios proposés ou tout autre élément en lien avec l'étude?

Commentaires	Mentions	% répondants
Encouragements / remerciements	53	8 %
Suggestions d'autres options (pont Alexandra, pont Prince-de-Galles, Pré Tunney, utilisation de Lucerne, de Gamelin/St-Joseph, tramway vers le Cégep / sur St-Joseph, monorail, métro)	51	8 %
Il faut réaliser le projet le plus rapidement possible.	48	7 %
Il faut limiter les coûts / les tarifs.	38	6 %
Il faut réduire les temps de déplacement.	35	5 %
Il faut penser long terme / prévoir la croissance de la population.	32	5 %
Il faut que le transport en commun soit fiable.	28	4 %
Commentaires en faveur du tramway	26	4 %
Il faut desservir adéquatement les quartiers / assurer des liens efficaces entre les quartiers et secteurs.	22	3 %
Il faut arrimer le système de transport en commun avec celui d'Ottawa.	22	3 %
Il faut inclure des aménagements pour le transport actif / favoriser la combinaison des modes.	19	3 %
Il faut que le transport en commun soit confortable (places assises, aménagements aux arrêts, etc.)	19	3 %
Il faut arrimer le système avec le Rapibus / développer le service à l'est.	15	2 %
Il faut penser à la qualité de vie et au logement (quartiers TOD).	14	2 %
Il faut réduire la congestion / diminuer le nombre d'automobiles sur les routes / mettre en place une tarification de la congestion.	14	2 %
Il faut éviter les expropriations / être conciliant avec les propriétaires.	12	2 %
Il manquait certaines informations (coûts, services locaux, expropriations).	11	2 %
Il faut que le transport en commun soit isolé de la congestion.	10	1 %
Il faut éviter de réduire le nombre de voies pour les automobiles.	9	1 %
Le tramway est une mauvaise idée / une technologie archaïque.	4	1 %
Autres	8	1 %
Aucun commentaire	248	37 %

Voici quelques-uns de ces commentaires :

Excellent projet absolument nécessaire pour améliorer la qualité de vie de la population tout en diminuant les impacts sur l'environnement (gaz à effet de serre et polluants atmosphériques). Merci de consulter la population sur les différents scénarios envisagés.

Clearly, the West end has been reaching travel capacity for many years, and STO has been trying to keep up with the rapid growth of residential areas. I am glad to see continued discussion and planning to achieve more systemic and long term solutions to the continued growth, and am a strong supporter of the potential for communal transportation. Thanks, and looking forward to a better tomorrow – together

Great work, I really hope that this plan comes to fruition. Thank you for allowing us to voice our opinion even though we are not experts and have spent minimal time studying the issues, its costs, and implications. Keep up the good work.

J'espère que cette consultation mènera enfin à des prises de décisions concrètes. Cela fait des années que la même question se pose, que des études sont faites, sans aucun résultat. Et la réalité des passagers du transport en commun est que chaque année, le temps de transport pour se rendre à Ottawa ne fait qu'augmenter.

The study seems to concentrate on travelling from Aylmer to downtown Ottawa. I would really like to be able to access public transport that allows me to go to West end Ottawa, Hull and Gatineau (particularly the hospitals) in a timely manner and without having to change several times

Je crois que cette étude sous-estime encore une fois les avantages potentiels du pont Champlain et du boulevard de Lucerne.

Tel que mentionné auparavant, il est dommage que l'unique scénario à l'étude consiste à utiliser le Pont Portage. Pour les gens d'Aylmer, nous sommes pratiquement rendus au centre-ville d'Ottawa en prenant ce pont. Il ne semble donc pas y avoir beaucoup d'avantage afin de réduire le temps de transit et de mieux s'arrimer au train d'Ottawa. L'utilisation du pont Prince de Galles devrait être considérée à nouveau, quitte à créer une variante où les gens de l'Ouest voulant se rendre à Hull prendraient un autre tracé.

There are significant gaps in the all-rail scenario proposed by the STO. One is the lack of rail service to the Cégep on Cité-des-Jeunes and to the Mont Bleu neighbourhoods. The all-rail option should provide for a rail link from Aylmer to the Cégep and from the Cégep to a main designated transfer point in Hull. Ideally, the STO should move to have the entire municipality, including all five sectors, covered by light rail.

Clarity will be needed on the extent of grade separation (separation from vehicle traffic) for the tram rail system, and great clarity and attention to real-world traffic patterns and design will be needed to cross Portage Bridge, which has an east-west connection coming in from the Sir John A Macdonald Parkway on the Ottawa side. Mixing trams with vehicle traffic in North America is very challenging. Particular care will need to be taken in order to integrate the tram on the Ottawa side, ensuring that the

passenger experience of changing to Lyon Station is very good, while also ensuring that the tram integrates with Ottawa streets and traffic.

Le système DOIT être FIABLE, fréquent et assez confortable afin de convaincre les automobilistes de délaisser la voiture et d'utiliser le transport en commun.

Un tramway ou un SRB ne régleront rien s'ils restent bloqués dans le trafic comme le fait le Rapibus actuellement sur les ponts et aux lumières. Le nouveau système doit être complètement isolé du trafic automobile.

Regardless of the mode (tram, all bus, hybrid), the most important things for me will be: reliability, shorter commuting time (faster and more frequent service) and a seamless integration with the Ottawa system.

Les citoyens qui n'habitent pas près des stations auront-ils un service efficace? Un système de taxi-bus qui passeraient dans les quartiers moins bien desservis à cause du peu d'achalandage, un genre d'application ou les gens pourraient "appeler" une voiture genre uber-sto. Moins cher qu'un bus... et ce serait sans doute plus efficace qu'un bus qui passe aux heures.

Il faut vraiment valoriser les autres moyens de transport tels que l'autobus, le vélo et même la marche, le moins d'automobiliste possible. Il est aussi extrêmement d'avoir beaucoup de végétation pour l'environnement, d'avoir des belles pistes cyclables et des trottoirs sécuritaires et confortables. Le mieux sera que le transport en commun soit si performant qu'on n'est plus besoin d'autos pour sauver la planète et les générations futures :)

Je considère que le coût d'un train léger pour desservir l'Ouest de Gatineau est totalement injustifiable, compte tenu de la population, et inacceptable quant au coût éventuel, compte tenu de la capacité de payer des citoyens et que l'exemple du Rapibus dans l'Est devrait nous servir de leçon quant au réalisme qui doit nous guider dans nos choix.

Consider creating joined long term planning teams between STO and OC Transpo to plan future infrastructure as one organization. Also include non STO and OC Transpo transportation into your plans, like car sharing, biking, etc. Spread the cost of the new system also to individuals that currently use their personal car, as we all pay for their roads via property taxes. Suggest we get away from a system that effectively subsidizes individual car traffic. Presently, environmentally friendlier transportation by use of an STO bus-pass costs around $100 per month per person, while using streets with one's personal car is free. Suggest inverting the current financial incentives away from individual car traffic and in favor of funding public transit, e.g. by placing a fee on using personal cars on streets/parking while spreading the cost of public transit over all citizens (via property taxes) and thus making public transit less expensive for individual users.

Ne jamais oublier que le réseau de transport en commun ne suffit pas pour faire du développement urbain, il faut aussi une stratégie de développement et un plan d'action de la part de la municipalité. Idéalement, une politique du logement et un bureau qui analyse les projets proposés par les promoteurs. Voir ce que Portland, Oregon a fait avec sa politique de TOD. Très intéressant.

Driving lanes should not be reduced. If anything, they should be increased, along with a rail system. The population has increased exponentially. It's high time something substantive was done.

Appréciation de la consultation

À la fin du questionnaire, une dernière section facultative permettait d'évaluer la satisfaction à l'égard de la consultation. Plus de 500 répondants ont choisi d'y répondre.

Moyens d'information

Tout d'abord, les répondants étaient invités à indiquer par quels moyens ils s'étaient informés sur l'étude et les scénarios. Près des trois quarts ont visité le site de la STO qui contenait les informations essentielles à la compréhension des différents enjeux soulevés par l'étude.

14 % se sont renseignés via les réseaux sociaux, 8 % en se rendant aux soirées portes ouvertes, et 7 % via les médias.

Figure 39 – Moyens d'information sur l'étude et les scénarios (n=503)

Q37. Comment vous êtes-vous informé sur l'étude et les scénarios?

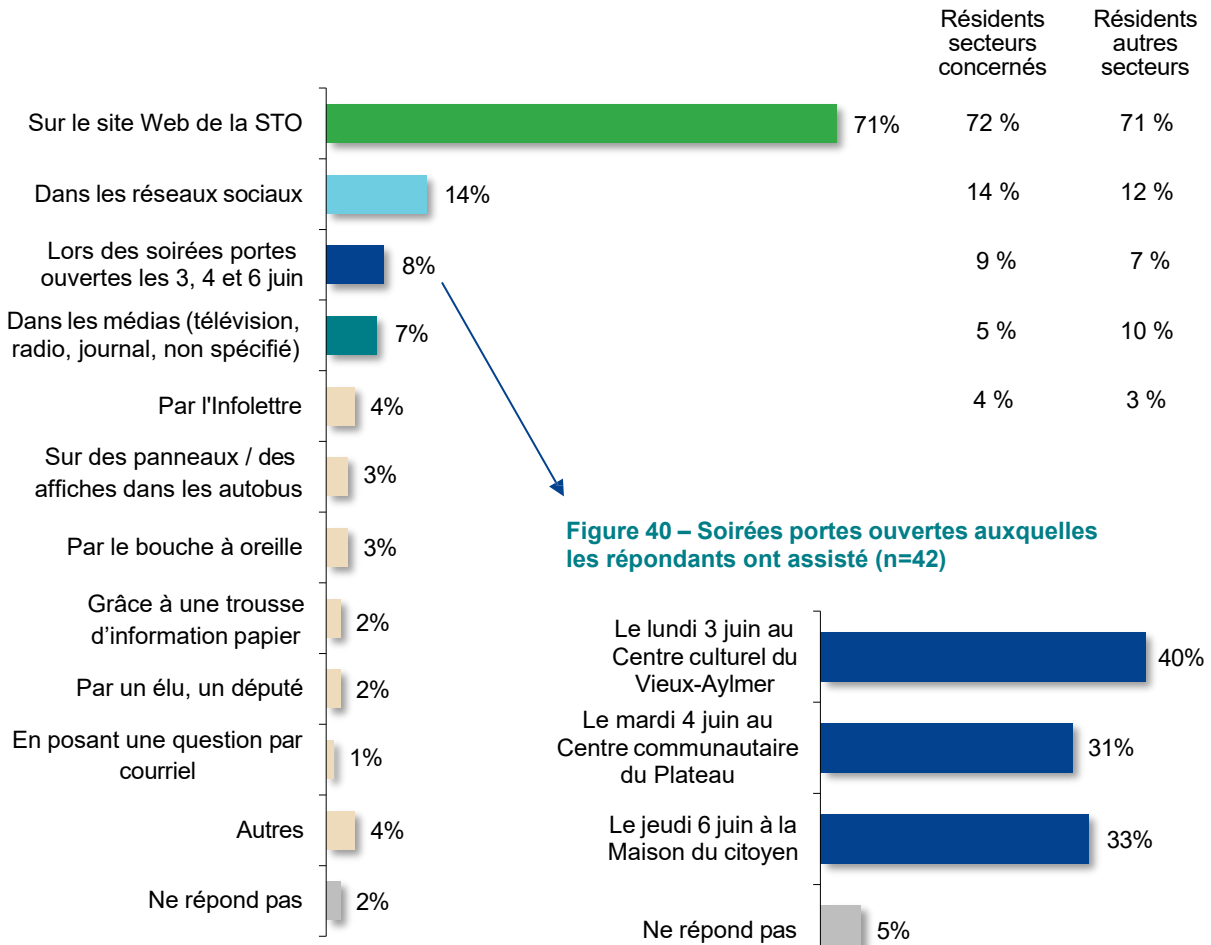


Figure 40 – Soirées portes ouvertes auxquelles les répondants ont assisté (n=42)

Satisfaction à l'égard de la consultation

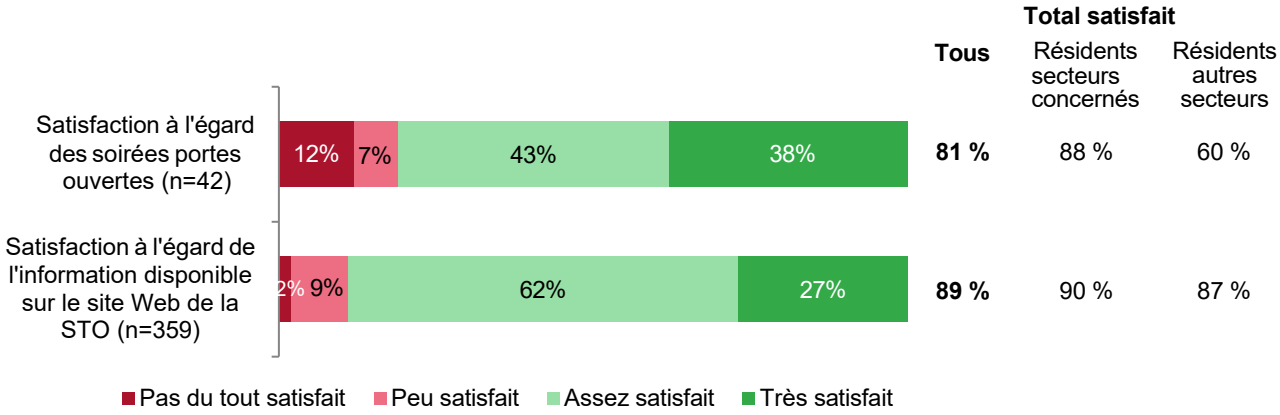
Ensuite, les répondants étaient invités à faire part de leur appréciation à l'égard de différents aspects de la consultation publique.

Les participants aux soirées portes ouvertes ont dit être satisfaits à 81 %, dont 88 % pour les résidents de la partie ouest de Gatineau. Il faut toutefois considérer ces résultats avec réserve étant donné le faible nombre de répondants.

Les personnes qui se sont renseignées sur le site Web de la STO étaient 89 % à se déclarer satisfaites de l'information disponible.

Figure 41 – Satisfaction à l'égard des outils d'information

Q39. Quel est votre niveau de satisfaction à l'égard des soirées portes ouvertes?
Q40. Quel est votre niveau de satisfaction à l'égard de l'information disponible sur le site Web de la STO?

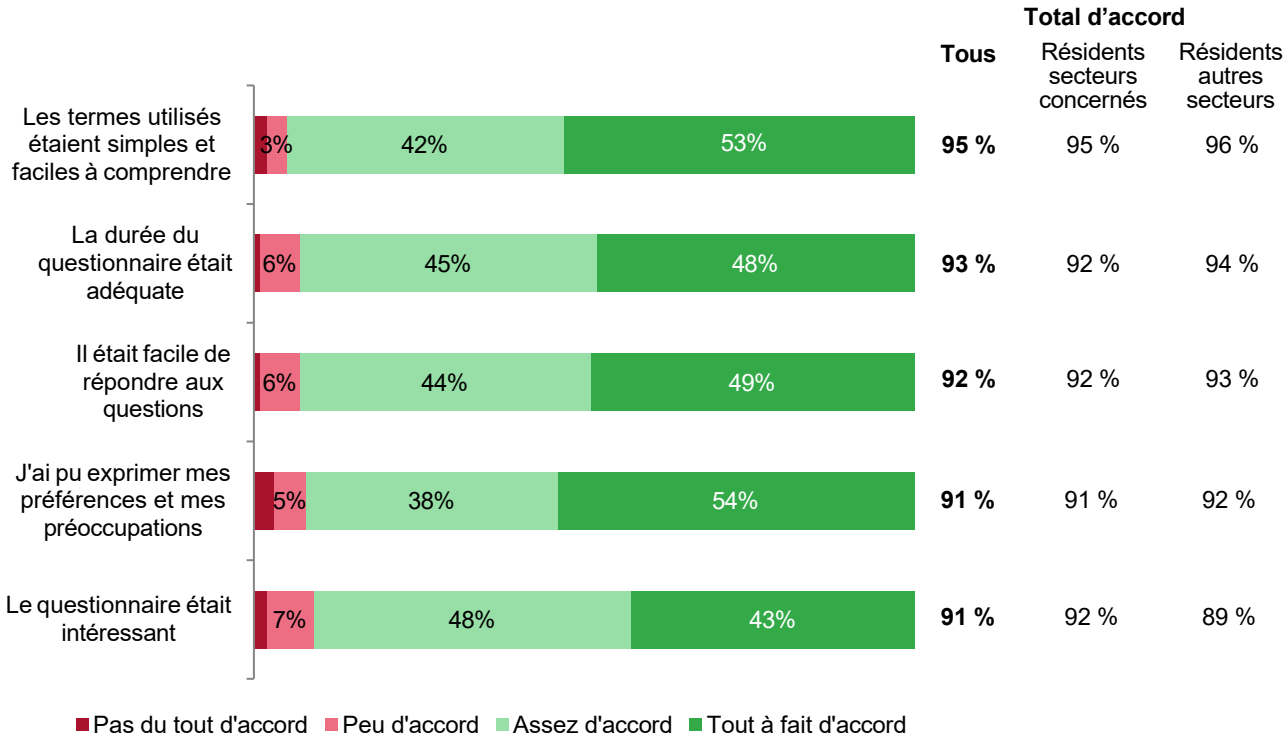


En ce qui concerne le questionnaire, le niveau de satisfaction était relativement élevé :

- 95 % ont trouvé les termes utilisés simples et faciles à comprendre;
- 93 % ont jugé la durée du questionnaire adéquate;
- 92 % ont estimé qu'il était facile de répondre aux questions;
- 91 % ont dit avoir pu exprimer leurs préférences et leurs préoccupations;
- 91 % ont trouvé le questionnaire intéressant.

Figure 42 – Satisfaction à l'égard du questionnaire (n=501)

Q41. Quel est votre degré d'accord avec les énoncés suivants?



Commentaires sur la consultation

Les répondants étaient également invités à faire part de leurs commentaires sur la consultation. Près de 200 répondants ont saisi cette opportunité. Leurs commentaires sont catégorisés ci-dessous.

Tableau 18 – Commentaires sur la consultation (n=501)

Q42. Avez-vous des commentaires sur le processus de consultation?

Commentaires	Mentions	% répondants
Remerciements / félicitations	82	16 %
Il manquait certaines informations (coûts, services locaux, croissance de la population, définitions, rapports complets, etc.).	24	5 %
L'information était complexe / difficilement accessible / manquait de lisibilité.	19	4 %
La consultation est inutile / biaisée / devrait être réalisée par un organisme indépendant.	15	3 %
Il faut prendre l'opinion de la population en compte.	15	3 %
Il faut tenir la population au courant de la suite du projet.	12	2 %
Il est important d'assurer une bonne représentativité de la population.	11	2 %
Il n'y a pas eu assez de publicité pour la consultation / La période de consultation aurait dû être plus longue.	11	2 %
Il aurait fallu plus de consultations en personne.	10	2 %
Il faut aller de l'avant rapidement.	7	1 %

Commentaires	Mentions	% répondants
Participer à la consultation prenait trop de temps.	4	1 %
L'analyse des experts devrait avoir plus de poids que l'avis de la population.	3	1 %
L'information aurait dû être disponible en anglais.	3	1 %
Autres commentaires	5	1 %
Commentaires sur l'étude ou d'autres enjeux	13	3 %
Aucun commentaire	287	57 %

Quelques-uns des commentaires reçus sont reproduits ci-dessous :

Thank you for taking the time to ask the residents and bus users for our opinion. Not all cities would do this, so the fact that you want to hear from the people means a lot to me and means you care about your residents. If is very much appreciated!

I think this is one of the best consultation processes I have been through.

Les dates des consultations en personne n'étaient pas annoncées assez en avance; plus de dates auraient permis plus de gens à y aller. Les vidéos étaient claires. Les questions/choix de réponse étaient parfois trop restreintes.

Vous donnez beaucoup d'information, sinon les discussions avec les chargés de projets c'est bien, on est bien accueilli. On ne sent pas que la STO est déconnecté de ses citoyens. SVP utiliser le terme USAGERS, et non CLIENTS pour parler des utilisateurs de votre service. Vous êtes un service public, pas une entreprise privée.

Félicitations! Très accessible, et permet de nous exposer de manière compréhensive les options et nous faire sentir comme une partie prenante du processus de prise de décision

L'information disponible sur le site internet est une synthèse intéressante mais manque de profondeur pour certain résidents plus aguerri. Les temps de parcours annoncés sont, à mon avis, irréalistes. La congestion fréquente, le non-respect des voies réservés, l'absence de mesures de priorité aux autobus au coin de la promenade du portage et d'Alexandre-taché, le bouchon de circulation perpétuel entre les terrasses chaudière et l'UQO rendre improbable les temps de parcours annoncés. Or, il s'agit du facteur déterminant pour une majorité d'usager. À mon avis, vous avez instauré un biais en faveur de l'autobus dans votre étude ce qui a pour conséquence de biaiser les résultats. Il est impensable qu'un système de tramway en site propre prenne le même temps qu'un trajet en autobus même avec des mesures préférentielles.

Le coût estimé de chaque option ainsi que la logique derrière le choix du pont portage auraient pu contribuer à la crédibilité de la consultation.

La description des scénarios (et plus particulièrement les images décrivant les avantages et inconvénients de chaque scénario) étaient difficiles à consulter sur des tablettes et des téléphones, car les images étaient floues. Il m'a fallu utiliser un ordinateur.

J'aurais aimé avoir plus de détails sur les alternatives qui existeront hors du lien structurant (par exemple pour se rendre à Tunney's Pasture). J'aurais aimé les évaluer.

L'explication des scénarios et des variantes me semblent assez compliquée. Peut-être est-ce la nature et les défis du projet, mais ça demande une bonne dose de réflexion pour saisir le tout. Ce faisant, j'ai des doutes que la consultation soit très accessible pour certaines personnes. Rejoint-on les personnes les plus vulnérables avec ce mode de consultation?

Les secteurs plus affectés devraient être consultés indépendamment (et pas seulement les associations de résidents). Les consultations devraient se faire tout au long du processus - AVANT la prise de décision et les annonces publiques (qui ont un impact différent sur les quartiers "menacés").

La consultation n'a aucun pouvoir de contrainte, donc c'est un peu une formalité. Serait intéressant de faire le bilan, une fois les travaux complétés... voir si les priorités des citoyens ont été respectées en bout de compte... Je suis sceptique.

J'espère vraiment que les avis des citoyens seront pris en compte lors du processus décisionnel. Le questionnaire et la trousse d'information sont très bien structurés. Le fait de demander l'avis des citoyens est très important, mais encore plus important est de les écouter.

Atelier de réflexion

En plus du questionnaire, le processus de consultation public incluait un atelier de réflexion ouvert à tous. Celui-ci s'est tenu le 17 juin de 18 h à 20 h à l'hôtel DoubleTree by Hilton dans le secteur Aylmer.

L'objectif de cet atelier était de favoriser la discussion et l'échange pour aller au-delà des questions posées dans le questionnaire, aborder le sujet sous des angles différents, et utiliser l'intelligence collective pour compléter la démarche de consultation. Plusieurs sujets de discussion étaient proposés sur lesquels les participants ont échangé en groupes.

40 citoyens s'étaient inscrits, cependant, seuls 22 d'entre eux se sont présentés. Afin d'assurer une diversité des lieux de résidence dans chaque groupe, les participants ont été répartis à 3 tables rondes différentes. Des membres de la STO et de WSP étaient également présents.

L'atelier de réflexion s'est déroulé en 3 parties :

1. « Rêvons au succès »
2. « Comprendre l'expérience client »

3. Questions et commentaires

Les deux premières parties ont duré environ 50 minutes chacune et étaient composées toutes les deux de deux exercices, lesquels comprenaient systématiquement un travail par groupe (20 minutes) puis une plénière (5 minutes). Le travail par groupe favorisait les discussions entre les participants à une même table et la plénière permettait de présenter les réponses apportées à chaque table et échanger avec l'ensemble des participants autour des enjeux soulevés. Enfin, la troisième partie a permis aux participants de poser des questions et apporter de nouveaux commentaires qui n'avaient pas été abordés précédemment lors de l'atelier.

Partie 1 – « Rêvons au succès »

L'objectif de cette partie était de changer le niveau de réflexion, de bâtir sur nos histoires et nos valeurs collectives pour imaginer un avenir positif et découvrir les facteurs de succès.

Exercice 1

Pour ce premier exercice, la question était la suivante : *« Partagez un moment où vous vous êtes sentis fier d'être un citoyen de Gatineau. Échangez sur ce qui s'est passé. Qu'est-ce qui était unique? Qu'est-ce qui vous a rendu fier, précisément? »*

Les expériences mentionnées par les participants sont les suivantes :

- Les pistes cyclables et le plan directeur du réseau cyclable de la Ville de Gatineau
- La nature proche de la ville : Parc de la Gatineau, Rivière des Outaouais, Forêt Boucher
- Les activités en plein air, les marchés
- La proximité avec Ottawa, le Parlement, les musées
- Les organismes communautaires
- Une ville à taille humaine et sécuritaire, idéale pour élever des enfants
- Les centres-villes de Hull et Aylmer, la marina d'Aylmer
- La culture : les Mosaïcultures, le Musée canadien de l'histoire
- La solidarité lors des situations difficiles (les inondations, la tornade)
- Le plan de gestion des matières résiduelles

La deuxième question permettait de faire des liens entre les expériences partagées. *« Qu'est-ce que les expériences choisies révèlent sur vos valeurs? Y a-t-il des éléments communs? »*

Les valeurs mentionnées par les participants sont les suivantes :

- Processus consultatif et participatif de la Ville (opinion des citoyens prise en compte)
- Attention portée à l'environnement et au patrimoine culturel
- Volonté de mener des actions qui contribuent au bien-être (qualité de vie)
- Fortes valeurs de solidarité, entraide, résilience

Exercice 2

La question posée aux participants était la suivante : *« Nous nous projetons en 2028. C'est l'ouverture du système structurant et c'est un vif succès. Il donne envie aux automobilistes de prendre le transport en*

commun et l'achalandage est au rendez-vous. Cette réalisation remplit les citoyens de fierté. Qu'est-ce que la STO, la Ville ou les citoyens ont fait? Quelles ont été les clés de cette réussite? »

Les éléments mentionnés par les participants sont les suivants :

- Consultation de la population, financement obtenu, respect de l'échéancier
- Système intéressant financièrement
- Temps de parcours réduits, proximité (pas de correspondances, pas plus de marche)
- Système fréquent et fiable
- Tracé bien planifié, bonne desserte (Aylmer, Cégep, hôpitaux…), stimule le développement
- Considération des modes actifs (à pied, à vélo), des déplacements inter-quartiers
- Attrayant pour les jeunes et les personnes démunies
- Système sécuritaire, silencieux, innovant, confortable, universellement accessible
- Connexion entre les deux villes de Gatineau et Ottawa
- En phase de construction : alternatives proposées, viabilité des commerces

On demandait ensuite aux participants de choisir les 3 actions qu'on devrait faire absolument, parce qu'elles sont facilement réalisables et qu'elles auraient le plus d'impact.

Les éléments mentionnés par les participants sont les suivants :

- Système rapide, assez pour que les automobilistes passent au transport collectif
- Système flexible et fréquent : 24 heures sur 24 et 7 jours sur 7
- Bonne couverture du territoire, réseau d'autobus local efficace

Partie 2 – « Comprendre l'expérience client »

L'objectif de cette partie était de réfléchir ensemble aux implications des scénarios en termes d'expérience client.

Exercice 3

La question était la suivante :

Utiliser un seul mode ou deux modes différents sur les deux axes a plusieurs implications.

Dans les scénarios où le même mode est utilisé sur les deux axes, c'est un même système avec deux branches, une sur le chemin d'Aylmer et l'autre sur Saint-Raymond/Plateau.

Dans les scénarios hybrides, pour éviter que les deux modes se côtoient sur le même axe, le lien sur Plateau se poursuit sur Allumettières vers l'est jusqu'à Maisonneuve.

Quelles seraient les implications possibles pour les déplacements, que ce soit pour les résidents d'Aylmer, du Plateau ou de Hull? Quels sont les avantages des différents scénarios? Quels sont les inconvénients? Comment pourrait-on y remédier?

Les principales implications et recommandations mentionnées par les participants sont les suivantes :

a) Scénarios monomodes :

- Préférables car les usagers prendront l'axe avec le mode le plus performant

- Les clients du Manoir des Trembles seront mieux desservis
- L'efficacité est l'avantage principal du scénario « tout rail »

b) Scénarios hybrides :

- Permettent de franchir la barrière du Parc de la Gatineau ainsi que de desservir les usagers sur Allumettières
- Permettent d'offrir plus de possibilités pour le Plateau vers les centres-villes de Gatineau et Ottawa et les autres secteurs
- Le boulevard du Plateau semble préféré à celui des Allumettières pour les résidents du Plateau mais pas ceux d'Aylmer (détour trop long)

Exercice 4

Pour ce dernier exercice, la question était la suivante :

Dans tous les scénarios, on utilise deux axes pour assurer la desserte : Aylmer / Taché et Plateau / Allumettières. Cependant, on veut aussi assurer le lien entre Aylmer et le Plateau.

Sachant que chaque kilomètre de tramway coûte 50 à 80 millions de dollars, qu'il faut éviter que les deux modes circulent sur le même axe, mais que des services d'autobus peuvent compléter la desserte, comment peut-on assurer des déplacements efficaces entre Aylmer et le Plateau?

Vous pouvez vous appuyer sur deux scénarios différents de votre choix pour développer vos recommandations.

Les principales recommandations mentionnées par les participants sont les suivantes :

- Lignes d'appui et/ou lignes de rabattement
- Boucle Vanier/Allumetières/Wilfrid-Lavigne/chemin d'Aylmer intéressante
- Liens fréquents et rapides entre Aylmer et le Plateau
- Définir d'abord les priorités de développement du territoire et éviter l'étalement urbain : définir les zones à densifier puis choisir les axes préférentiels
- Éviter les correspondances sauf si elles sont bien faites

Partie 3 – Questions et commentaires

Les questions et commentaires abordés par les participants traitaient des sujets suivants :

- Méconnaissance des coûts des scénarios à ce stade de l'étude
- Interconnexion entre les centres-villes de Gatineau et Ottawa
- Préférence pour des autobus électriques plutôt qu'un tramway
- Volonté de la Ville d'Ottawa d'accepter des autobus de la STO en son centre-ville
- Aménagement des stations
- Prochaines étapes de l'étude
- Envoi des informations au panel d'usagers

Mémoires

En marge de la consultation auprès des citoyens, la STO a également reçu 11 mémoires d'organismes ou de particuliers :

- **Antoine L. Normand** a soumis un mémoire le 3 juin 2019 à la Ville de Gatineau et à la STO. Dans celui-ci, il évoque les problématiques de de congestion routière et de pollution, mais il estime que Gatineau n'a pas la quantité suffisante d'usagers, ni la capacité financière de payer un train léger. Au lieu de cela, M. Normand propose que le train léger d'Ottawa ajoute une extension de ses rails jusqu'à Gatineau, ainsi la correspondance avec les autobus de la STO se ferait à Gatineau. Il évoque également une autre alternative, soit utiliser des autobus électriques de faible capacité (20 personnes). Enfin, M. Normand propose d'encourager le covoiturage à deux occupants et de réserver les stationnements en centre-ville aux véhicules électriques.

- **Robert Moreau** a soumis un mémoire le 3 juin 2019 dans lequel il propose d'investir dans un train électrique rapide sur arches. Celui-ci voyagerait dans les airs et les quais seraient en hauteur. Ce train desservirait les centres-villes de Hull et Ottawa, les secteurs Aylmer et Plateau à l'ouest et le boulevard Maloney à l'est, jusqu'à Buckingham voire une même une extension possible jusqu'à Thurso. Les autobus réguliers circuleraient toujours et il pourrait y avoir un service de navettes dans certains quartiers.

- **Frédéric Pouyot** de la société **GPEKS**, fournisseur d'équipements d'énergie solaire à Ottawa, a déposé un mémoire le 17 juin 2019 afin d'évoquer un système différent du bus et du tramway, envisagés par la STO : l'option ferroviaire de type « Tram Surélevé ». Selon GPEKS, l'implantation d'un tramway présente de nombreux inconvénients par rapport à un tel système : coût deux fois plus élevé, augmentation des accidents de voiture, congestion des autres voies, danger pour les vélos et les motos, bruit pour les résidents à proximité.

- **Bill Clennett** a soumis un mémoire le 21 juin 2019 qui appuie le train léger comme choix de système structurant et recommande de relier son trajet au tracé du Rapibus qui devrait être remplacé par un train léger. Un tel système permettrait selon lui d'orienter l'aménagement du territoire afin d'accroître l'utilisation du transport en commun.

- **Stéphane Vigneault** a soumis un mémoire le 21 juin 2019 dans lequel il met l'accent sur le quartier de Val-Tétreau. Il souhaite profiter de la construction du système structurant pour régler le problème d'urbanisme principal de ce quartier, qui stagne commercialement : la configuration du boulevard Alexandre-Taché, dangereux et laid. La solution est donc de réduire la circulation à une seule voie dans les deux sens entre la rue St-Dominique et l'UQO, ce qui donnerait plus d'espace aux trottoirs et pistes cyclables. Aussi, le tracé du tramway emprunterait le boulevard Lucerne (nouvelle voie verte) à partir de la rue St-Dominique et passerait derrière l'UQO. La Ville de Gatineau devrait selon lui compléter cela par d'autres chantiers, par exemple autour de l'école Jean-de-Brébeuf.

- Le comité d'urbanisme de l'**Association des résidents des Jardins Taché (ARJT)** a déposé le Plan de développement durable du quartier Val-Tétreau en tant que mémoire le 23 juin 2019. L'ARJT défend le dossier de la sécurité sur le boulevard Alexandre-Taché et s'oppose fermement au déploiement d'un service rapide par bus. Au cœur de ce plan de développement se trouve un quartier de type TOD (*Transit Oriented Development*) pour Val-Tétreau, qui prône la densification

résidentielle et commerciale du boulevard Alexandre-Taché autour de l'axe de transport du train léger, qui doit emprunter ce boulevard car il sera une solution efficace pour régler la congestion et améliorer la sécurité du quartier.

- L'organisme **Vivre en Ville** a soumis un mémoire le 24 juin 2019. Dans celui-ci, il recommande d'abord un arrimage concret et complet avec l'aménagement du territoire, à savoir relier les milieux de vie entre eux, y planifier des stations en leur cœur, assurer la proximité des activités au réseau structurant et considérer la possibilité de réduire la place allouée à l'automobile. Également, Vivre en Ville demande que le projet soit réalisé selon les deux axes proposés (boulevard du Plateau et chemin d'Aylmer), que l'électrification des transports collectifs soit priorisée et que des connexions efficaces avec le centre-ville d'Ottawa soient renforcées.

- **Louis LePage** a soumis un mémoire le 24 juin 2019 afin de formuler ses commentaires et ceux de sa famille. Il estime que le tramway n'est pas une solution économiquement réaliste pour un système structurant dans l'ouest de Gatineau. Il propose la construction d'un campus de télétravail dans le secteur ouest, et surtout une extension du train léger d'Ottawa jusqu'au centre-ville de Hull et la construction d'une gare centrale située sur les terrains de l'aréna Guertin ou ceux au sud de la Fonderie, ce qui permettrait d'éliminer tous les autobus de la STO au centre-ville d'Ottawa.

- **Mike Clemann**, propriétaire de l'**Hôtel British**, situé sur la rue Principale à Aylmer, a soumis un mémoire le 24 juin 2019 dans lequel il propose que le tramway se rende jusqu'à la marina d'Aylmer via la rue Principale. Il estime que le Vieux Aylmer a besoin d'une meilleure desserte de transport afin de stimuler la croissance économique de ce secteur, de le connecter à tous les secteurs de Gatineau et Ottawa, et de permettre aux citoyens et aux touristes de profiter de l'eau et du soleil.

- L'organisme **Action vélo Outaouais** a soumis un mémoire le 26 juin 2019 dans lequel il soutient la mise en place d'un système structurant dans l'ouest de Gatineau. Action vélo Outaouais insiste particulièrement sur les déplacements vélo : du domicile des cyclistes vers les stations et les corridors proposés ; à même les corridors proposés ; en complémentarité avec les modes de transport proposés soit en transportant son vélo à même les véhicules ou en laissant son vélo à des endroits sécurisés aux stations. La traversée des ponts vers Ottawa devra également être étudiée de près, en maintenant les aménagements cyclables présents et en aménageant des stations à proximité.

- Finalement, **MOBI-O**, le centre de gestion des déplacements de Gatineau et sa région, a soumis un mémoire le 31 juillet 2019, dans lequel il appuie le projet de système structurant dans l'ouest de Gatineau et demande d'assurer la planification de celui-ci de manière intégrée à l'aménagement du territoire. MOBI-O suggère de favoriser l'intégration des modes de transports durables par le développement de milieux de vie de qualité autour des stations. Il met l'accent sur l'optimisation des connexions du réseau avec les centres urbains autour des axes. Enfin, il demande de tenir compte de l'acceptabilité sociale du projet et de préserver l'intégrité des déplacements lors des périodes de travaux.

Les mémoires peuvent être consultés à l'annexe 3.

Conclusion et pistes de réflexion

Avec près de 700 questionnaires complétés, la consultation publique sur le système structurant de transport en commun dans l'ouest a enregistré l'un des taux de participation les plus élevés que Gatineau ait connu ces dernières années. Même si c'est un succès tout relatif par rapport au nombre de citoyens concernés, la fréquentation du site Web atteste de l'intérêt de la population pour les projets de transport en commun. L'appréciation de la consultation semble indiquer que la STO est parvenue à faciliter la compréhension d'enjeux souvent complexes.

La consultation a également attiré une certaine diversité de citoyens : des résidents de l'ouest et de l'est, des usagers du transport en commun et des automobilistes. Même si les résultats ne sont pas représentatifs de la population générale, les écarts entre les différentes catégories de population permettent de comprendre certaines tendances.

Ainsi, on note que quel que soit leur lieu de résidence, la quasi-totalité des répondants considèrent que la mise en place d'un système structurant de transport en commun dans l'ouest est un investissement nécessaire, ce qui est une excellente fondation pour l'acceptabilité sociale du projet.

De fait, le projet est attendu avec impatience dans l'ouest et les attentes sont particulièrement élevées. On constate un engouement pour le tramway qui se fait sentir à travers l'ensemble des réponses au questionnaire. Pour beaucoup des participants, c'est d'ailleurs la seule option acceptable. Certains peuvent en revanche se rallier à un scénario hybride, mais à condition que les rails soient bâtis de leur côté de la ville!

C'est que le tramway est perçu comme étant plus efficace, fiable, écologique et viable à long terme.

Mais l'argument qui revient le plus souvent est celui de la rapidité. Cela peut surprendre. En effet, le tramway est plutôt moins rapide que l'autobus, toutes choses étant égales par ailleurs. Cependant, les citoyens associent l'autobus à la congestion et ne peuvent pas imaginer qu'un système rapide par bus puisse bénéficier d'aménagements de la même qualité qu'un mode sur rail, ni qu'un tramway puisse être pris dans la congestion.

Même si le système bénéficie d'infrastructures de classe mondiale et de priorités absolues aux intersections, ces attentes à l'égard du temps de déplacement pourraient être difficiles à satisfaire étant donné la trame urbaine dans laquelle il devra s'insérer.

Le tramway évoque par ailleurs certaines craintes, telles que l'accès à des services locaux efficaces et fréquents dans les quartiers ou entre les secteurs qui ne seront pas reliés par le système structurant, et la nécessité de faire des correspondances. Normales dans les réseaux dotés de métros ou de tramways, comme le notent à juste titre plusieurs participants, celles-ci sont encore entourées de préjugés très négatifs à Gatineau.

À cet égard, la question de l'arrimage avec Ottawa divise les répondants. Si certains considèrent que l'on devrait voir les deux réseaux comme un système métropolitain unique qui ne devrait pas avoir de redondances, d'autres tiennent à pouvoir faire la totalité de leur déplacement sur le réseau de la STO. L'expérience doit donc être la plus fluide possible d'un côté à l'autre de la rivière des Outaouais.

On note aussi une préoccupation quant aux impacts du système structurant sur les riverains, résidents ou commerçants, ainsi que sur les édifices patrimoniaux et les milieux naturels. Le niveau d'acceptabilité à l'égard des expropriations est relativement faible. Cela explique que les participants aient

systématiquement privilégié les variantes où il y aurait le plus d'espace pour aménager un lien structurant. La seule exception est le boulevard du Plateau, qui est préféré par une large majorité au boulevard des Allumettières, jugé inhospitalier.

La plupart des répondants sont toutefois davantage ouverts à une réduction du nombre de voies de circulation pour donner davantage de place au transport en commun. Certains y voient une solution à la congestion croissante, qui est un enjeu récurrent dans les commentaires des participants. Cependant, d'autres y voient une menace importante pour la fluidité automobile. Il sera donc important pour la STO de démystifier l'impact du système structurant (et d'une potentielle réduction de la capacité routière) sur la congestion.

Cette divergence d'opinions est une des manifestations de profonds clivages qui transparaissent dans les résultats de la consultation.

On observe tout d'abord un clivage entre les résidents de l'ouest, qui demandent un système de transport en commun qui puisse faire face à la croissance de la population et de l'achalandage qu'ils constatent au quotidien, et ceux de l'est, qui ne sont pas convaincus de la nécessité d'investissements aussi importants. En filigrane, il y a un sentiment d'iniquité entre les niveaux de services offerts aux citoyens.

On note aussi un clivage socio-démographique entre des citoyens jeunes, éduqués, fortement préoccupés par les changements climatiques, et des citoyens plus âgés, davantage portés à utiliser l'automobile et inquiets de l'impact de ces choix sur leur compte de taxes.

La STO doit donc continuer à communiquer largement sur le projet, informer la population de ses exigences et contraintes et expliquer le pourquoi des décisions afin d'obtenir le soutien de l'ensemble des citoyens pour la réalisation de ce projet d'envergure.

APPENDIX

B CONSULTATION SUMMARY 2020

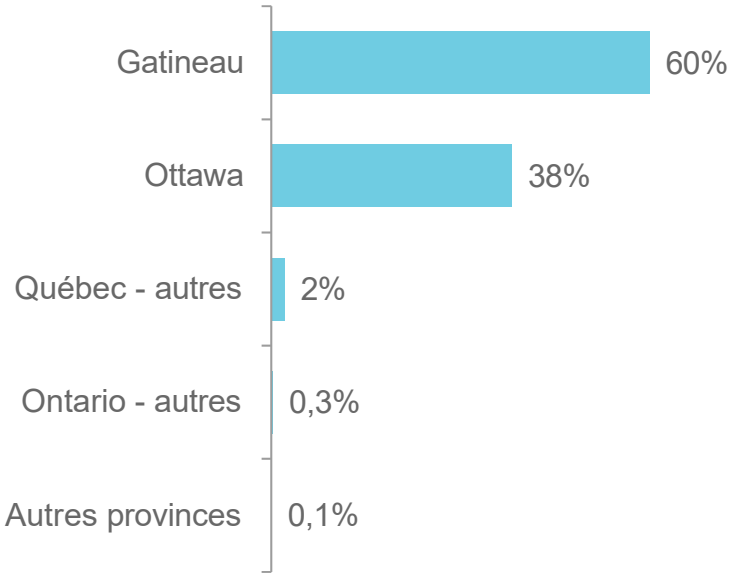
Résultats de consultation

STO Société de transport de l'Outaouais

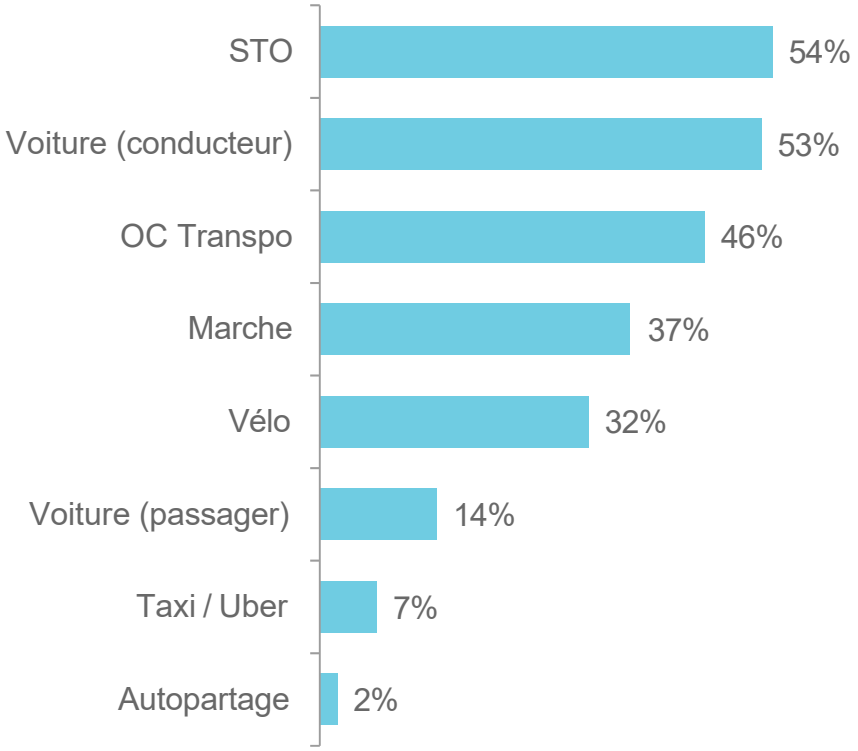
Profil des répondants

1 503 répondants

Lieux de résidence



Principaux modes de transport



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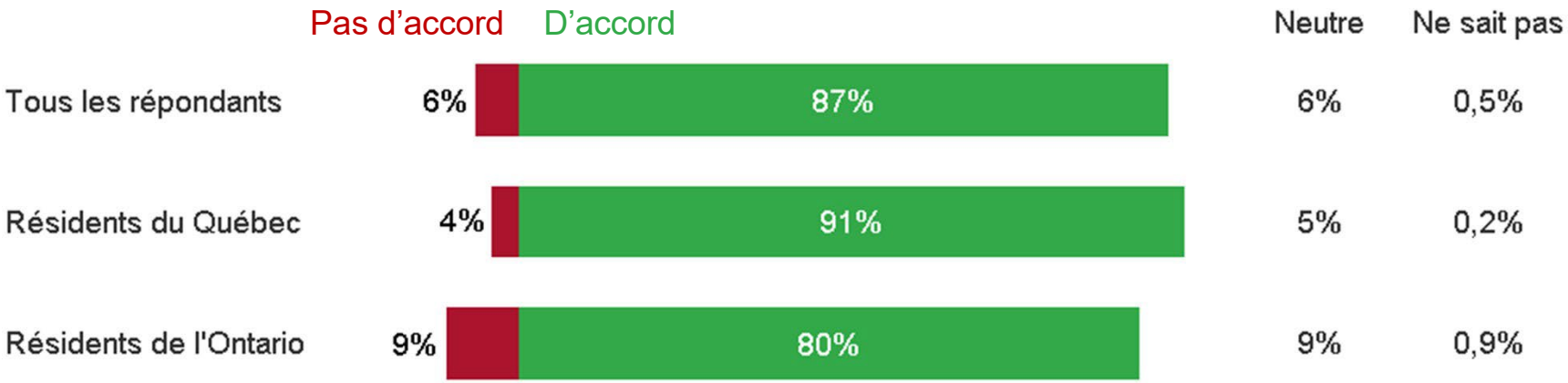
L'avenir en commun

Objectifs du système structurant

Q1. Êtes-vous d'accord avec les énoncés suivants concernant le système de transport en commun qui relierait l'ouest de Gatineau à Ottawa?

Le système de transport en commun doit desservir adéquatement **les destinations au centre-ville d'Ottawa.**



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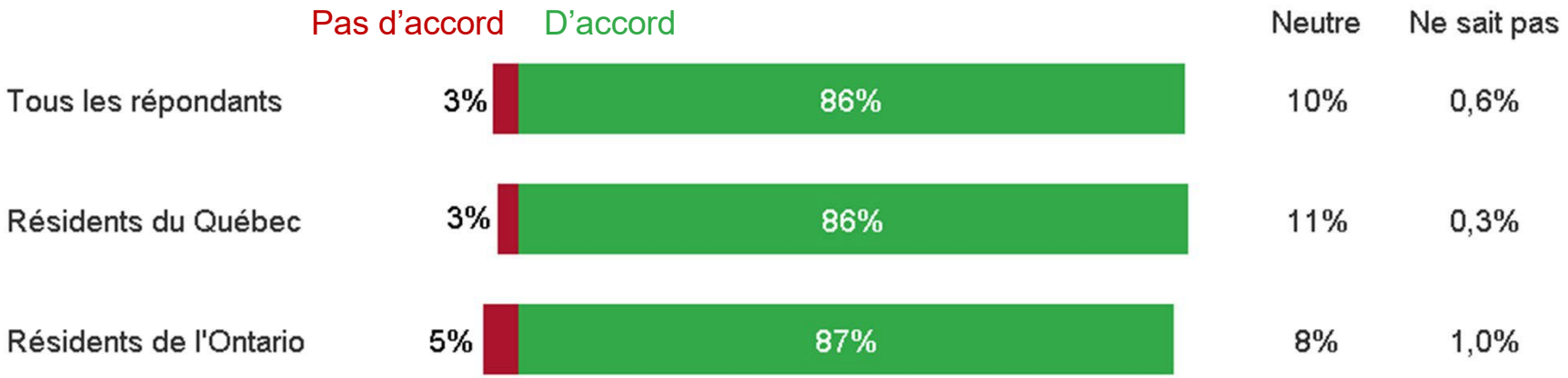
Objectifs du système structurant

Q1. Êtes-vous d'accord avec les énoncés suivants concernant le système de transport en commun qui relierait l'ouest de Gatineau à Ottawa?

Le système de transport en commun doit desservir adéquatement **les destinations au centre-ville de Gatineau.**



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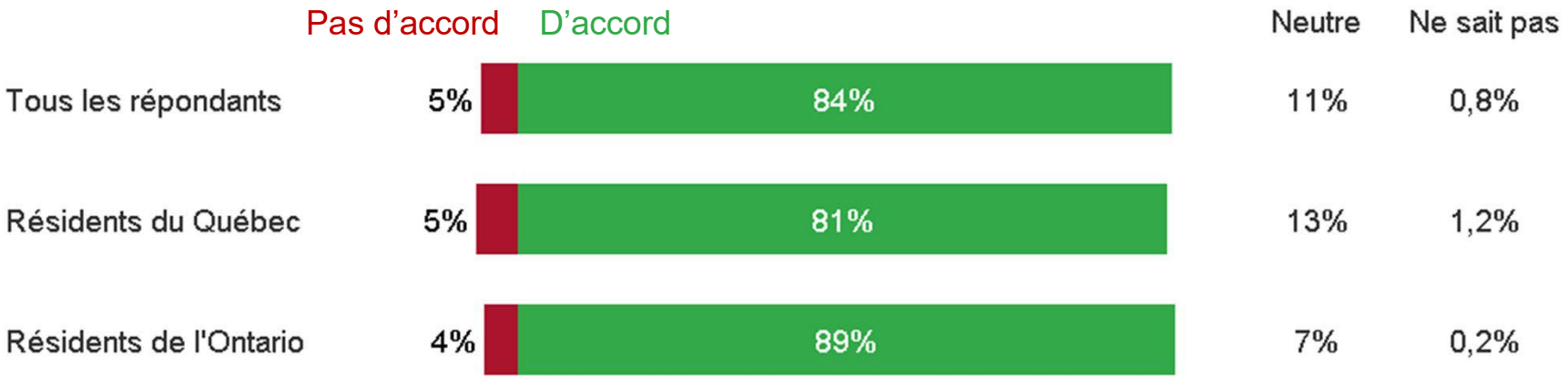
L'avenir en commun

Objectifs du système structurant

Q1. Êtes-vous d'accord avec les énoncés suivants concernant le système de transport en commun qui relierait l'ouest de Gatineau à Ottawa?

Le système de transport en commun doit **s'arrimer avec l'O-Train.**



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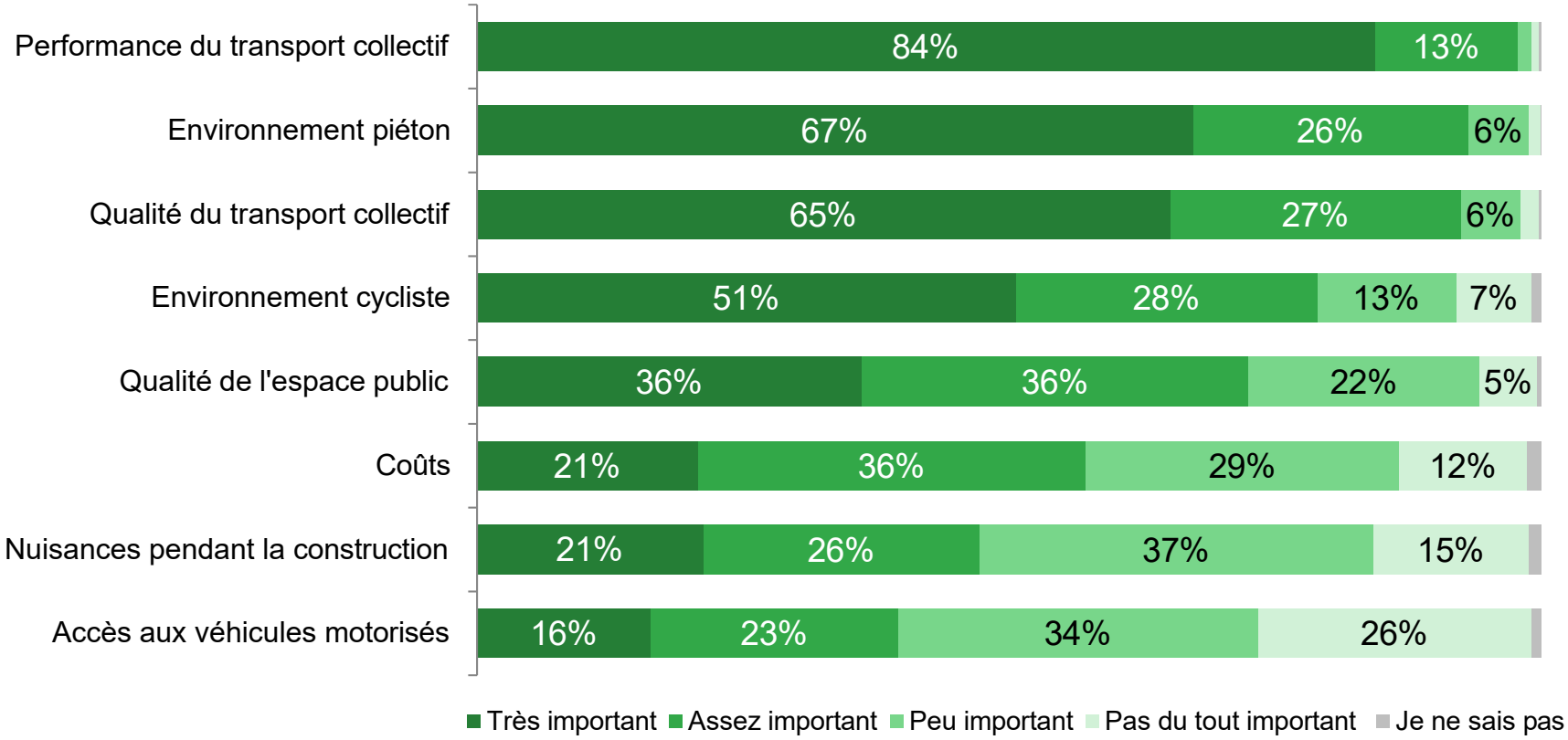
Importance des différents critères

Q2. I y a plusieurs options d'insertion à Ottawa. Selon vous, quel est l'importance des considérations suivantes :



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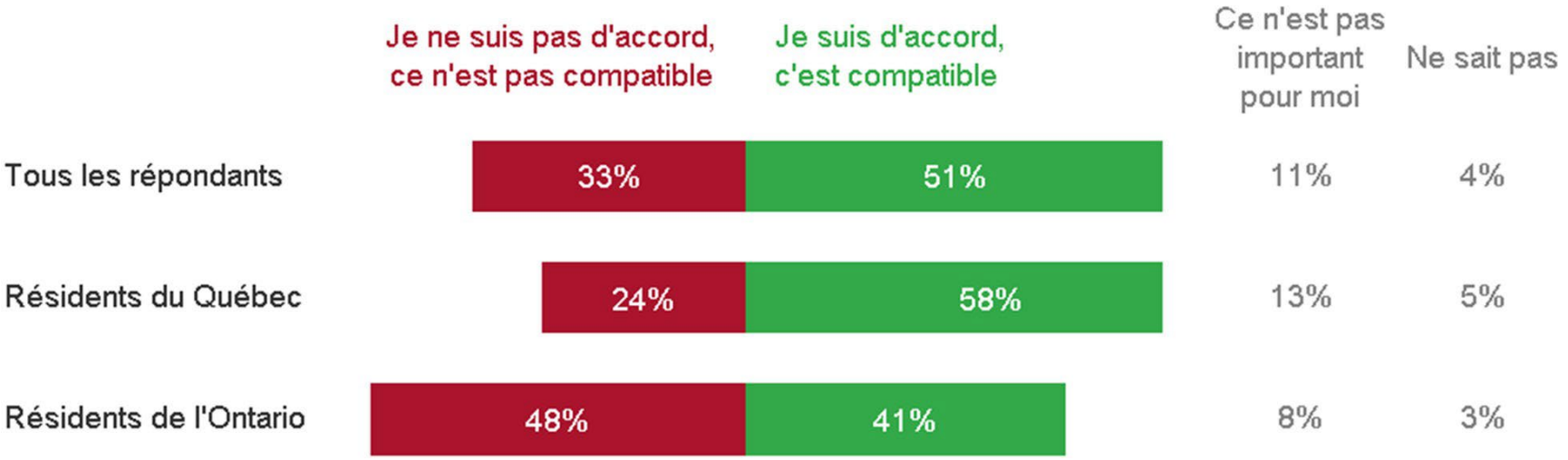
Compatibilité avec le patrimoine

Q3. Êtes-vous d'accord avec l'énoncé suivant?

La présence d'un tramway sur la rue Wellington est compatible avec la préservation de l'image et de la valeur patrimoniale de la Capitale nationale et de la Colline du Parlement.



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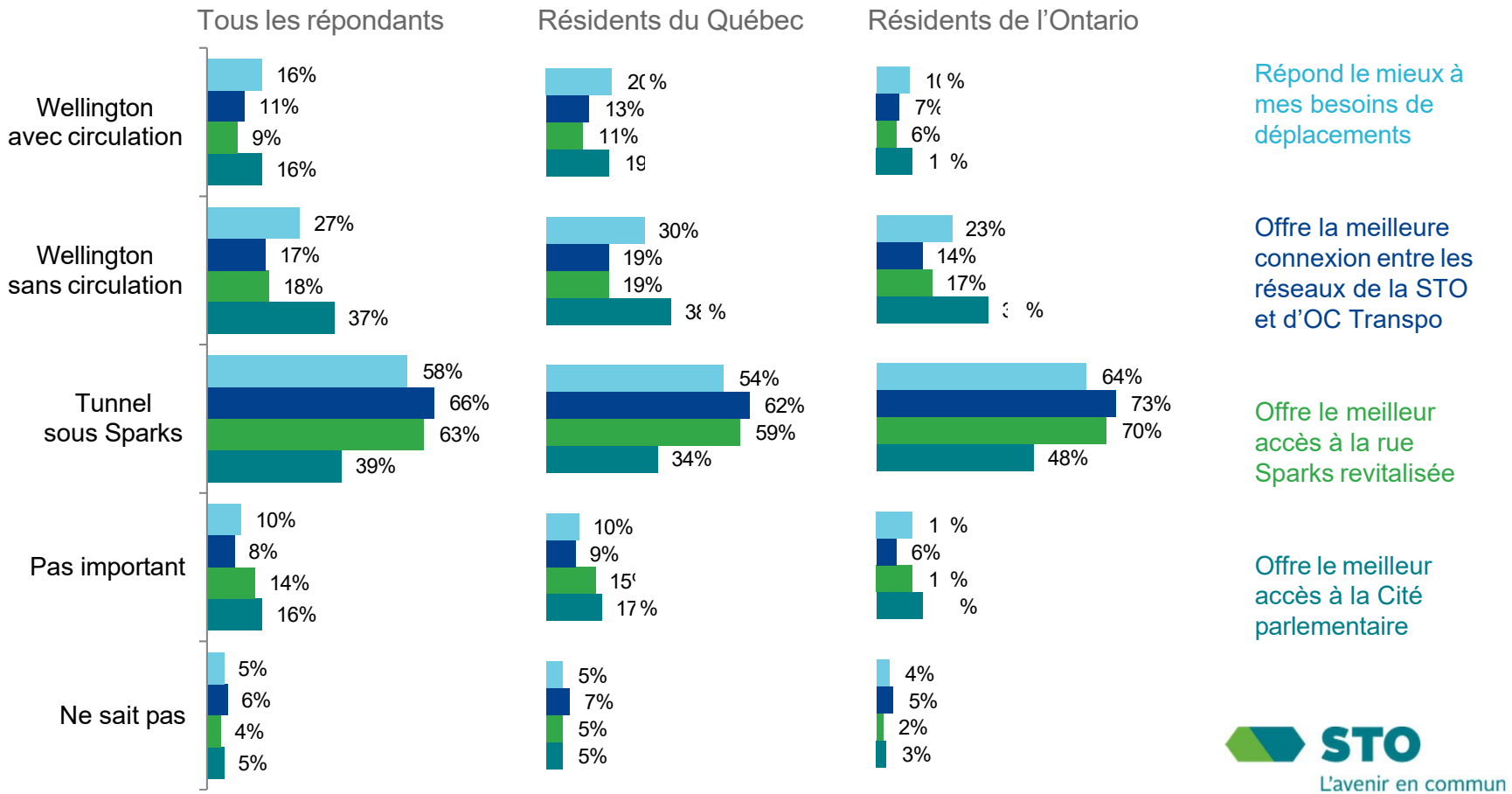
Préférences

Q4. Pour chacun des énoncés ci-dessous, indiquer l'option ou les options qui répondent le mieux à l'objectif. Plusieurs réponses sont possibles.



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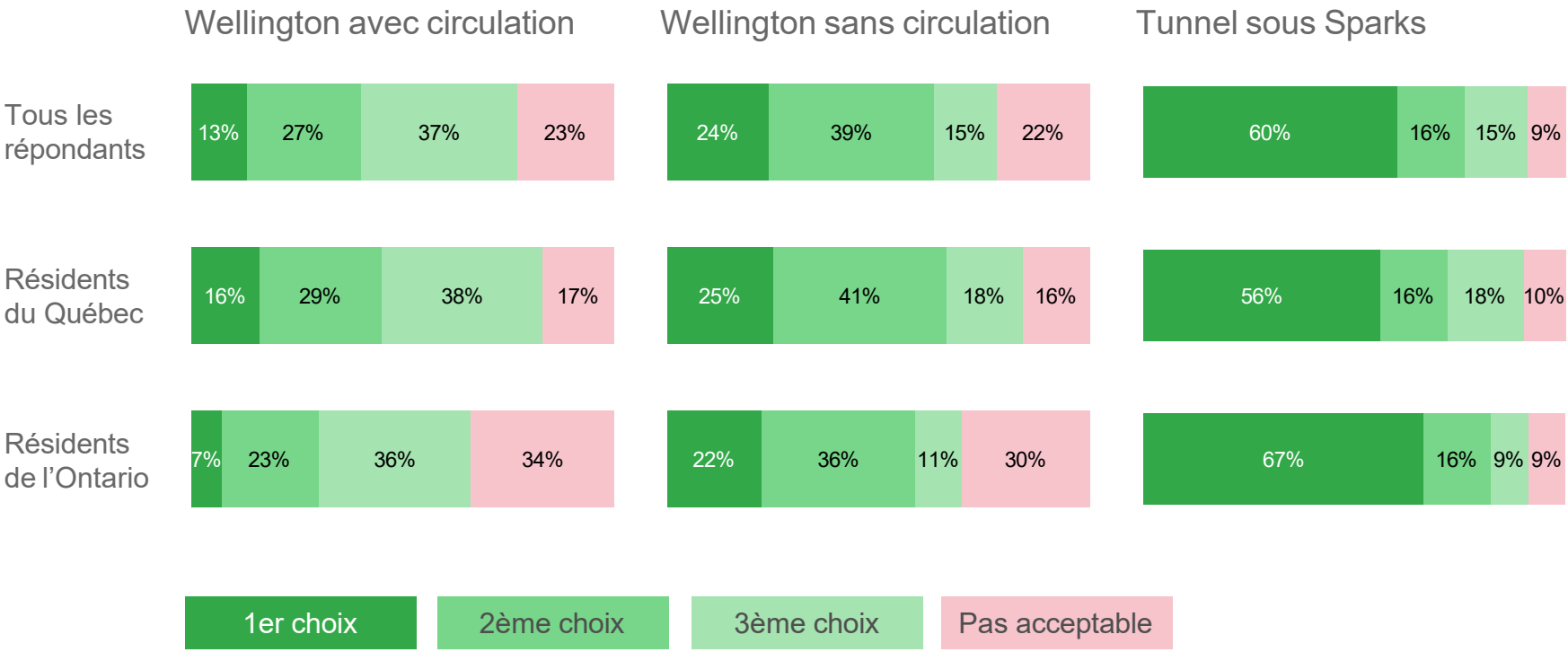
Préférences

Q5. Veuillez indiquer votre ordre de préférence parmi les 3 options proposées.



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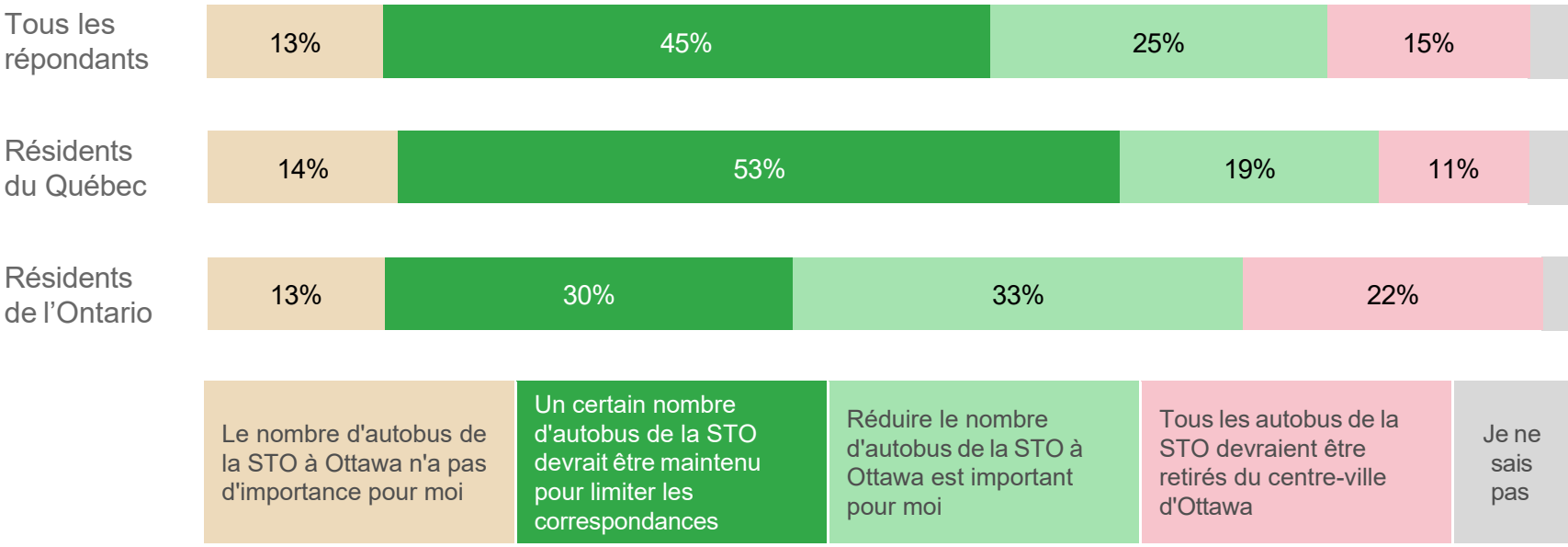
Autobus de la STO à Ottawa

Q6. Il y a trois scénarios à l'étude. Chaque scénario demandera qu'un certain nombre de lignes d'autobus de la STO continuent à se rendre à Ottawa. Le nombre d'autobus sera réduit de 30 à 70 % par rapport aux volumes actuels, dépendamment du scénario retenu.

Parmi les énoncés ci-dessous, lequel correspond le mieux à votre opinion sur ce sujet?



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Conclusions

- La grande majorité des participants à la consultation jugent important de desservir adéquatement les centres-villes et d'arrimer les réseaux de transport en commun de Gatineau et d'Ottawa.
- La performance et la qualité du transport collectif ainsi que la qualité de l'environnement piétonnier sont les trois aspects les plus importants pour les répondants.
- L'accès aux véhicules, les nuisances et les coûts sont jugés moins importants.
- Les participants sont partagés quant à la compatibilité de la préservation du patrimoine avec un tramway en surface. Près du tiers des résidents d'Ottawa considèrent les options sur Wellington inacceptables.
- Le tunnel sous la rue Sparks est privilégiée par la majorité des répondants.
- Une minorité de répondants considère que tous les autobus de la STO devraient être retirés du centre-ville d'Ottawa (11 % des Gatinois et 22 % des Ottaviens).

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Merci!

STO Société de transport de l'Outaouais