McKenzie Avenue RapidBus Corridor Study – Long-Term Vision Report

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Submitted to: BC Transit / District of Saanich
Prepared by: McElhanney Ltd

Contact
Matthew Browning, PEng
Project Manager
236-317-3077
mbrowning@mcelhanney.com

Address
200 – 858 Beatty Street,
Vancouver BC Canada, V6B
1C1

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July 30, 2024

BC Transit
520 Gorge Road East
Victoria, BC, V8W 2P3

Attention:

Simon Button, P.Eng., MEng, PMP, Transit Infrastructure Engineer ,

District of Saanich
770 Vernon Ave
Victoria, BC, V8X 2W7

Troy McKay, P.L.Eng., Senior Manager
Transportation and Development Division

McKenzie RapidBus Corridor Study: Long-Term Vision Report

The purpose of this report is to document the work completed during Activities 1, 2 and 3 of the McKenzie Avenue RapidBus Corridor Study which concludes with the development of the conceptual layout of the long-term vision for the corridor. Building upon this work, the final activities of the project will involve the development of specific priority infrastructure improvements that align with the long-term vision and are implementable in the short-term.

This report is not intended to be public facing, but it is understood that materials from the report may be used for public engagement, online information, and/or internal reporting within BC Transit and the District of Saanich.

Activities completed to-date include:

- Activity 1: Project Initiation
- Activity 2: Base Conditions Assessment
- Activity 3: Long-Term Corridor Vision Development

Prepared by:

Matthew Browning, PEng
Project Manager
mbrowning@mcelhanney.com
250-338-5495

Reviewed by:

Ali Darwiche, PEng, MSc
Senior Planner, Strategic Transportation Planning
adarwiche@mcelhanney.com
604-647-8986

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Executive Summary

The Victoria Regional Transit Commission (VRTC), BC Transit, and the District of Saanich, all share a common goal to reduce greenhouse gas (GHG) emissions and increase transit mode share. To encourage a shift away from single vehicle occupancy use, the VRTC has also set a transit mode share goal of 15% and has approved a RapidBus Implementation Strategy to accelerate ridership growth along key corridors which is expected to have a significant impact on positioning transit in the region as sustainable, convenient, and efficient.

What is RapidBus?

RapidBus consists of bus-based rapid transit service and infrastructure to connect urban centres of high density and mixed-use areas of the region. RapidBus features include branded services, corridor treatments (such as bus-only lanes and queue jumpers), and unique transit stations

McKenzie Avenue runs east-west through the District of Saanich and serves as a major transportation artery, connecting various neighbourhoods and communities across the South Island. It is generally a high trafficked road, particularly during peak hours, and provides a vital route for both area residents and commuters travelling between the University of Victoria campus, suburban neighbourhoods, commercial areas and Highway 17. Although outside of the study area, the corridor's significance is further enhanced by it linking Highways 1 and 17, providing strategic connectivity to downtown Victoria, Swartz Bay, the Saanich Peninsula, and the rest of Vancouver Island.

A next step to expand RapidBus services in the Victoria Region is to develop a corridor plan for McKenzie Avenue to advance conceptual design for transit priority measures, station designs, and active transportation infrastructure to prioritize future investments. McKenzie Avenue is identified in the District's Active Transportation Plan (ATP) as part of the All Ages and Abilities (AAA) Spine Network. Looking at ways to integrate cycling facilities and RapidBus is a key component of this study.

In 2021 BC Transit and the District signed an Infrastructure Exploration Agreement to cost share a Corridor Study. A key objective of the McKenzie Avenue RapidBus Corridor Study is to develop a long-term vision for a complete street design on McKenzie Avenue between Highway 17 and Finnerty Road at the University of Victoria. The design will accommodate RapidBus service, active transportation facilities, green infrastructure, including trees and plantings, and a generous public realm.

Another objective of the study is to develop conceptual designs and cost estimates for future transit priority measures, RapidBus stations, and active transportation facilities that can be completed in the short-term and will build towards the long-term vision.

Process

The process to complete this study occurred between December 2021 and June 2024 and included the following:

1. Developing a base condition assessment to understand the current state of the corridor.
2. Conducting a review of applicable policy documents.
3. Developing cross-section options for the corridor that responded to the issues and opportunities identified in the condition assessment.
4. Creation of scenarios using traffic and transit modelling, and the results of an evaluation using established criteria to identify the best approach to achieve the preferred option for the corridor.
5. Developing a long-term vision for the McKenzie Ave based on the preferred option.

Following the development of the long-term vision for the McKenzie Avenue Corridor, short- and medium-term improvements such as transit priority infrastructure and RapidBus stations were identified for implementation.

A project working group made up of BC Transit and District of Saanich staff was established at the outset of the study. At various points throughout the study, the working group provided input that led to the development of the long-term vision and short-term improvements.

Engagement with key external stakeholders including the Ministry of Transportation and Infrastructure, and the University of Victoria was also undertaken to assess support for the long-term vision.

The redevelopment of McKenzie Avenue into a transit-supportive complete street that provides All Ages and Abilities (AAA) cycling facilities has many existing challenges, namely:

- High traffic demand, especially at peak times.
- Multiple competing priorities for use of the existing right-of-way.
- Sporadic existing infrastructure to support safe and connected active transportation.
- Transit delays at key locations.
- Right-of-way constraints such as existing utilities.
- Existing mature trees.
- A mix of land uses and densities along the corridor – higher-density development in concentrated in the Centres, while long stretches of the corridor, between Centres, remains low density.

Consistent with best practices and in alignment with existing policy, this study addresses these challenges and provides a roadmap for investment in the short-term that will lead to the build out of the long-term vision.

Through discussion with the project partners and technical analysis of potential transportation solutions, the Vision for McKenzie Avenue was developed to align with the goals of making transit and active transportation more attractive travel modes for the growing number of people living, working, and travelling on McKenzie Avenue.

McKenzie Avenue currently carries 2,800 to 3,600 people/hour (depending on the location on the corridor) and the Vision increases the potential people-moving capacity of the corridor by approximately 50% by providing transit priority and AAA cycling infrastructure.

The long-term Vision provides a multi-modal corridor with opportunities for a generous and engaging public realm and tree canopy enhancement, as well as opportunities for seating, bike racks, and wayfinding. It provides separated and comfortable bike lanes for the entire length of the corridor and envisions widened sidewalks and boulevards to support anticipated growth and the tripling of transit trips needed to meet Saanich's climate and transportation safety goals. Most notably the Lochside Regional Trail which is enhanced with an improved plaza gateway area at Borden Street.

Fully protected intersections are provided in the Vision on McKenzie Avenue at Saanich Road, Quadra Street, Borden Street, Blenkinsop Road, Cedar Hill Road, Shelbourne Street, and Gordon Head Road. These provide safe multi-modal connections at major cross-streets, particularly in the neighbourhood centres, and crossing distances are kept to a minimum wherever possible by combining right-turn lanes and bus-only-lanes at intersections.

The Vision provides bus-only lanes at key segments along the corridor to optimize bus speed and reliability, and two-bay bus stops are included for future RapidBus service, ensuring long-term capacity for increased transit service. Traffic analysis indicates that bus travel times along the corridor will be notably shorter in the Vision than a comparable business-as-usual scenario (a reduction of 3 minutes eastbound and 6 minutes westbound during peak periods, or 20-31% faster, respectively) in the future.

The long-term vision for McKenzie Avenue has been developed in the context of other planning efforts in the District and coordination with the Quadra-McKenzie Study (QMS) process was conducted to achieve alignment with the goals and objectives of that study.

The long-term vision concept presents a bold, yet achievable, future for McKenzie Avenue as a Complete Street that provides a balanced and optimized corridor for all users, prioritizing sustainable modes to support mode shift and emission reduction targets and placing a strong emphasis on a safe and accessible environment for all ages and abilities. The full vision concept is provided in *Appendix C*.

1. Introduction

1.1. PURPOSE

This report describes the work completed as part of the McKenzie Avenue RapidBus Corridor Study (the Study) to develop the long-term vision for the corridor. Overall, the study seeks to provide information to allow for future capital planning and business case development for the corridor in alignment with BC Transit's Victoria Regional RapidBus Implementation Strategy, District of Saanich's Official Community Plan and Active Transportation Plan (Moving Saanich Forward), and other strategic transportation planning documents that support a reduced reliance on private automobiles and a greater focus on a safe and sustainable transportation network.

1.2. STUDY OBJECTIVES

The study seeks to meet a series of objectives that support strategic planning and policy goals for the regional transit network and overall mobility in the District, consistent with industry best-practice and the concept of transforming McKenzie Avenue into a complete street. Specifically, the objectives and outcomes of the study are to:

- Develop a long-term vision for the corridor as a complete street that facilitates RapidBus service between Uptown and the University of Victoria (UVic) campus.
- Produce conceptual design of high-quality pedestrian and cycling infrastructure for all ages and abilities.
- Integrate public realm improvements and identification of necessary land use changes to support the development of a complete streets approach to the corridor.
- Develop a safe, connected, sustainable and balanced transportation network that encourages more walking, cycling and transit use.
- Identify RapidBus Station locations and develop concepts.
- Improve and enhance the efficiency of transit operations, including travel time savings and reliability.
- Balance infrastructure and circulation for all users of the corridor.
- Identify priority improvements that can be made in the near-term, working towards – and not precluding – the long-term vision that help to inform ongoing land use and transportation planning efforts by the District.

These objectives make it clear that this is a corridor study that considers all modes equally, and also gives consideration to related public realm elements such as the tree canopy, public space, changing land uses, urban design, and safety. At the time of writing, there was no previous policy to provide guidance on what the corridor could or should look like in the future, nor is there any guidance on the acquisition of land to support corridor improvements. The corridor contains distinct character areas and any recommendations will need to be context-sensitive to reflect the various land uses and travel markets.

The District of Saanich's Active Transportation Plan recommend protected cycling infrastructure and wider sidewalks along the corridor, but it is also noted that this is the main (arguably, only) east-west traffic corridor in the area, and a major transit route particularly for riders accessing the UVic campus, so there are significant competing interests that need to be balanced to deliver an effective complete street.

All analysis within the study is based on data from pre-pandemic traffic conditions, reflecting the anticipation that demand will return to the previous baseline and continue to grow from there.

1.3. STUDY AREA

The project study area is located in the District of Saanich and constitutes the McKenzie Avenue corridor between Highway 17 (Patricia Bay Highway) and Finnerty Road at the University of Victoria. The corridor is approximately 5.7km long and includes 13 signalized intersections and passes through two neighbourhood/commercial centres as well as intersecting with a regional multi-use trail. The study area is identified in *Figure 1* below.

Figure 1: Study area and major cross-streets

1.4. STUDY PROCESS

The McKenzie Avenue Corridor is a major east/west road that connects key commercial, residential, and institutional destinations, and serves high volumes of vehicle traffic daily. It is also a frequent route and provides connections to local transit routes, and it is a transportation route for pedestrians and cyclists.

At peak times, the road is at its capacity for private vehicle use and this condition is expected to worsen as land use changes and population density increases along the corridor, as does the demand for space for single occupancy vehicles.

The transportation priorities that are set now for McKenzie Avenue will determine how the corridor functions over time and whether it will successfully transition to a multi-modal transportation route that effectively serves thousands of people each day as they travel, live, work and recreate on McKenzie Avenue.

This report has been organized to provide an accessible and clear narrative of the study process undertaken to develop the long-term Vision for the corridor. The process to complete this study occurred between December 2021 and June 2024 and included the following steps:

1. A base condition assessment was completed to understand the current state of the corridor. The assessment looked at road design and layout along the corridor and at intersections, land use and redevelopment, active mobility (walking and cycling) and transit. The condition assessment also considered active mobility and traffic volumes, as well as transit travel time variability, ridership, dwell time, buses per hour and stop spacing.

2. Concurrent with the base condition assessment, a review of applicable plans, strategies, and guidelines was completed to ensure alignment between the long-term vision and short-term improvements, and the overarching policy framework for the Province and Saanich.

3. A series of cross sections for the corridor were developed to respond to the issues and opportunities identified in the condition assessment (Step 1). Review of the cross sections allowed the Project Team to identify key features that are critical to the future of the corridor and the vision of it as a complete street. These features were then used to inform scenario development in step 4.

4. Following selection of the preferred cross section, a range of scenarios were developed and tested through traffic and transit modelling to discover the best approach to achieve the preferred cross section option.

5. Developing a long-term vision for the McKenzie Avenue based on the preferred option.

6. Drawing from the preferred cross section option the long-term vision for the McKenzie Ave study corridor was created.

Following development of the long-term vision for the McKenzie Corridor, short- and medium-term improvements such as transit priority infrastructure and RapidBus stations were identified for implementation.

A project working group made up of staff from BC Transit and the District of Saanich was established at the outset of the study. A various points throughout the study, the working group provided input on the cross sections and scenarios that led to the development of the long-term vision and short-term improvements.

Engagement with key external stakeholders including the Ministry of Transportation and Infrastructure, and the University of Victoria was also undertaken to assess support for the long-term vision.

2. Policy Context

The study has been undertaken within the context of many strategic planning documents and initiatives. The most relevant documents are the District of Saanich's Official community Plan (2008), and Active Transportation Plan: *Moving Saanich Forward* (2018), along with BC Transit's Victoria Regional RapidBus Implementation Strategy (2021), the South Island Transportation Strategy (2020), BC Transit's 10 Year Vision, and the Victoria Region Transit Future Plan which all provide important policy context for this study. A summary of the key documents, and their relevance to the study, is provided below.

2.1. PROVINCIAL AND REGIONAL PLANS

2.1.1. Victoria Regional RapidBus Implementation Strategy, BC Transit

The McKenzie Avenue corridor is identified in this plan as part of the Phase Two works within the overall RapidBus Implementation Strategy (with Phase One including implementation of the Westshore to Downtown Victoria RapidBus Line). Along with the Peninsula Line, the McKenzie Line is to undergo conceptual analysis and continued design with the identification of bus stop locations. The strategy identifies the McKenzie Line as connecting Uptown and the UVic campus with "frequent, fast, and reliable RapidBus service" with connectivity to the Westshore and Peninsula Lines at the Uptown Exchange. Attractive walking and cycling connections should be provided within 800m of each station as well as efficient connections to the Frequent Transit Network at Quadra Street and Shelbourne Street.

2.1.2. South Island Transportation Strategy (2020)

The Strategy focuses on improvements to transit and active transportation, and advancing these priorities in partnership with Indigenous, local and regional governments and BC Transit. The Strategy sits within the CleanBC initiative to help transform how people move around in a more sustainable way. McKenzie Avenue is identified as a Regional Serving Road.

2.1.3. Provincial Active Transportation Strategy: Move, Commute, Connect (2019)

This Strategy is part of the Province's CleanBC plan to build a more prosperous and sustainable future for BC. Part of this is doubling the percentage of trips made by active modes and achieving VisionZero (no fatalities or serious injuries resulting from collisions or crashes on the road). Relevant to this study is the key pathway #2: *British Columbia should have an integrated, safe and accessible active transportation system that works for everyone*. The direction that comes from this pathway is that as provincial highways are developed, improved or reconfigured, active transportation infrastructure should be integrated into their design and construction. Given the presence of the Patricia Bay Highway at the west end of the study corridor, the potential to provide contiguous active transportation infrastructure along McKenzie Avenue at this location will be a key determinant of project success.

2.1.4. BC Active Transportation Design Guidelines (2019)

The provincial design guide provides a comprehensive basis for the geometric design and appropriate application of active transportation infrastructure in a variety of contexts. This document provides guidance on minimum requirements (although exceeding minimum requirements will be preferred where possible) for all active mobility facilities.

2.2. DISTRICT OF SAANICH PLANS

2.2.1. District of Saanich Official Community Plan (2008) – Update underway

The updated OCP provides policy direction to integrate land use and transportation planning, prioritize active transportation, reduce GHG emissions by shifting to sustainable transportation modes, eliminating all traffic fatalities and serious injuries, and reducing the total vehicle-kilometres travelled in Saanich.

McKenzie Avenue, Quadra Street, and Shelbourne Street are all identified as Primary Growth Areas. The OCP provides direction to focus growth and development within Primary Growth Areas and support the evolution of urban areas as walkable, mixed-used places that prioritize transit and active transportation.

2.2.2. Active Transportation Plan: Moving Saanich Forward, District of Saanich

The plan identifies McKenzie Avenue as part of the All Ages and Abilities (AAA) spine network in its long-term network plan. The section from Borden Street to the UVic campus is identified as a priority for short-term improvements which are scheduled for completion by 2030.

2.2.3. Shelbourne Valley Action Plan (2017)

Action Plans and Local Area Plans identify actions that will help implement the goals of the OCP, Regional Growth Strategy and other policy documents with specific focus on the needs of the corridor or area in question. Given the status of Shelbourne Street and Quadra Street as Centres on the McKenzie Avenue corridor, it is important that any plans for McKenzie Avenue do not negatively impact the equally-important plans for Shelbourne Street and Quadra Street and their surrounding land uses, but rather support and enhance the actions taken on those corridors.

2.2.4. Quadra McKenzie Study (2023)

The Quadra McKenzie Study (QMS) is an initiative to develop a plan to promote sustainable land use and accommodate new housing and employment growth within designated Centres, Corridors, and Villages. Ultimately the plan will provide guidance ontransit-supportive growth and development within the area. Plan development is currently underway with a target to deliver to Council in December 2024.

2.2.5. Climate Action Plan (2020)

This plan recognizes the current climate emergency and provides strategies and targets for Saanich to respond appropriately. Investment in active transportation and transit are key priorities as part of broader efforts to achieve mode shift objectives and reduce GHG emissions, noting that the transportation sector is the largest source (58%) of greenhouse gas emissions in Saanich, responsible for more than half of the District's total emissions. This highlights the critical need to shift trips onto transit and other non-emitting modes.

2.2.6. Urban Forest Strategy (2010) – Update underway

This strategy supports development of a "no net loss" canopy policy, and urban forest guidelines to inform new or re-development within Saanich. An inventory of the existing tree canopy is underway and will provide valuable data for future design decisions along the corridor. Typically, the goal is to re-provide three trees for every one removed – where removal is unavoidable – and these should be re-provided along the same corridor. The urban forest is a highly valued asset to the community and environment for many reasons and should be incorporated into all corridor planning decisions.

3. McKenzie Avenue Corridor Today: Base Conditions Assessment

McKenzie Avenue runs east-west through the District of Saanich and serves as a major transportation artery connecting residential neighbourhoods, Centres, and Villages. It is a busy road, particularly during peak hours and provides a vital route for both local residents and commuters travelling between the University of Victoria campus, suburban neighbourhoods communities on the west shore, and commercial areas. The road's significance is further enhanced by the connection to Highways 1 and 17, providing strategic connectivity for transit and general traffic to downtown Victoria, Swartz Bay and the Saanich Peninsula, and the rest of Vancouver Island.

Along McKenzie Avenue there is a mix of commercial and institutional uses as well as residential areas, with a range of housing forms from single detached to medium- and high-density residential buildings.

The District of Saanich has been working to improve infrastructure throughout the District and this includes the construction of protected cycling infrastructure on parts of McKenzie Avenue. The following sections provide observations on the key features of the corridor that define its character and set the context for the study.

3.1. LAND USE AND REDEVELOPMENT

Orthographic images of the study area provide the base layer for all mapping in this study. The corridor has been segmented into three areas to display information more easily, and to reflect the different demands and constraints of the various section of the corridor. The corridor segments are:

1. Patricia Bay Highway to Blenkinsop Road
2. Blenkinsop Road to Larchwood Drive
3. Larchwood Drive to Finnerty Road

Illustrated on the base plans are property boundaries, McKenzie Avenue right-of-way (RoW) widths, areas of land dedication due to development, and general land use identification. Base map drawings are provided in *Figure 2*, *Figure 3*, and *Figure 4* below, and collected in higher resolution at *Appendix A*.

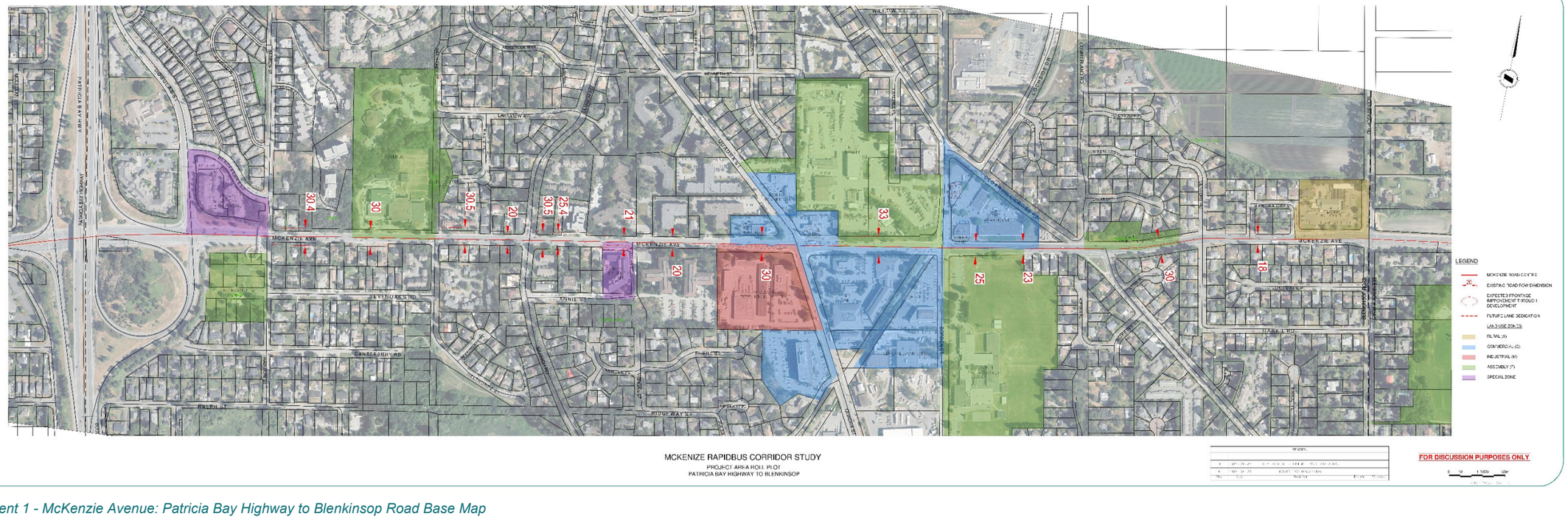


Figure 2: Segment 1 - McKenzie Avenue: Patricia Bay Highway to Blenkinsop Road Base Map

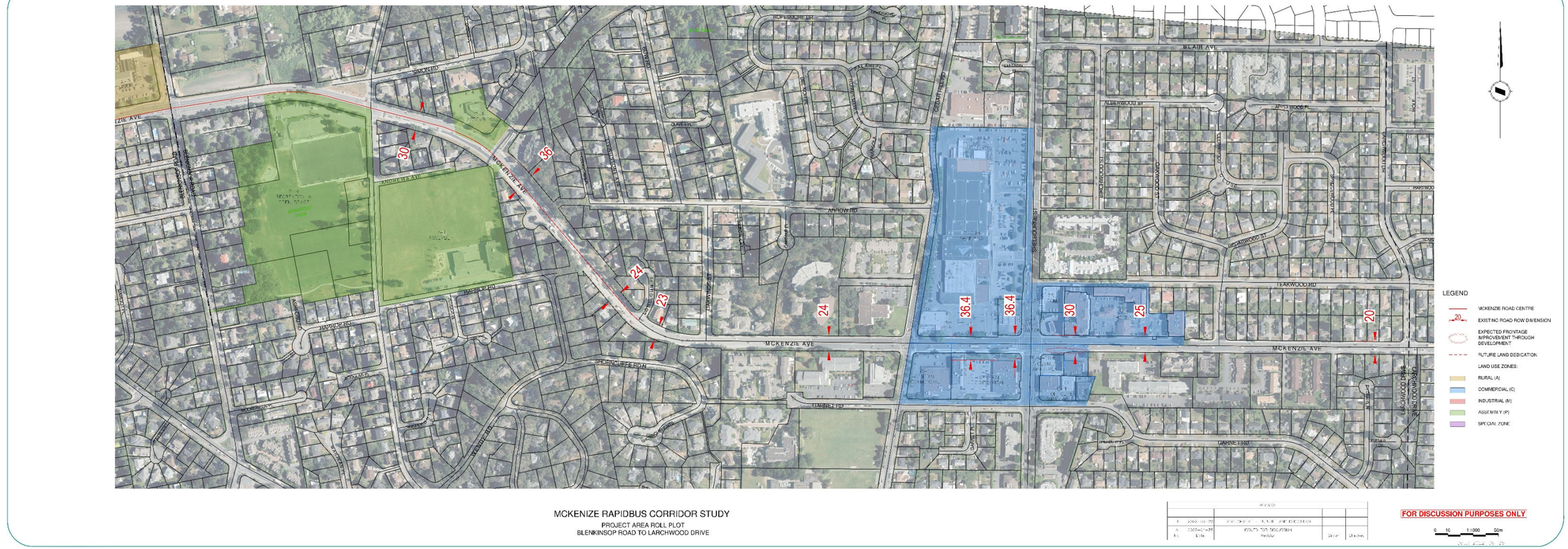


Figure 3: Segment 2 - McKenzie Avenue: Blenkinsop Road to Larchwood Road Base Map

Figure 4: Segment 3 - McKenzie Avenue: Larchwood Road to Finnerty Road Base Map

Development provides a potential opportunity to acquire frontages for future corridor improvements. There is an existing example of this at the redevelopment on the south side of McKenzie Avenue between Saanich Road and Quadra Street where a wide sidewalk and boulevard has been implemented, providing an offset from the curb to building face (see *Figure 5*). Several developments are planned at Rainbow Road (approximately 200 units), Saanich Road (71 units), and between Cedar Hill Road and Shelbourne Street (approximately 1,000 units).

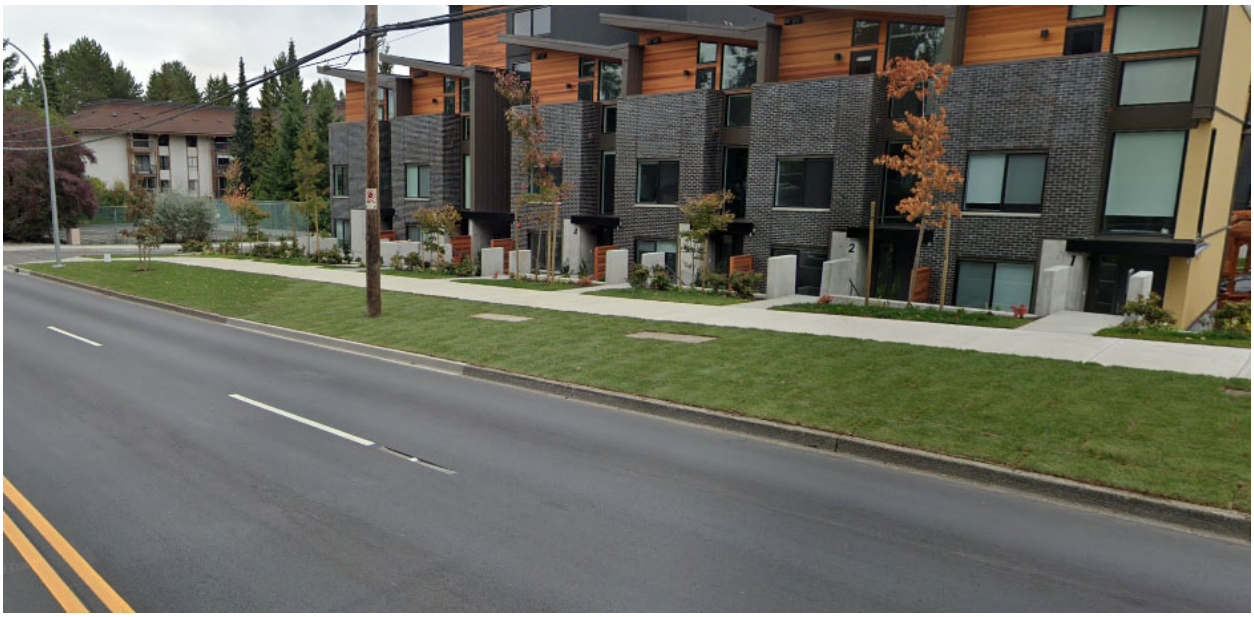


Figure 5: Redevelopment providing space for improved active transportation infrastructure between Saanich Road and Quadra Street, including a generous setback from the roadway

3.2. ACTIVE MOBILITY

3.2.1. Cycling

There are a range of cycling facilities along McKenzie Avenue that offer differing levels of protection and comfort for cyclists. There are painted and buffered lanes in locations along the entire corridor, and there are protected bike lanes west of Borden Street to the University campus. Ultimately, and consistent with the District's Active Transportation Plan, protected (AAA) bike facilities from Highway 17 to the University campus is the goal by 2050 with one-way facility heading east and west being the preferred arrangement.

At the east end of the corridor, within the UVic campus, there are existing multi-use trails that are separated from the roadway and well-used by cyclists and pedestrians. There are existing bike lanes that intersect with McKenzie Avenue, along with the Lochside Regional Trail at Borden Street (*Figure 6*) which is a popular multi-use trail that stretches from Swartz Bay to a connection with the Galloping Goose Trail in the Uptown Core. Where painted bike facilities are present, cyclists mix with transit at on-street stops (*Figure 7*), creating an area of potential conflict.

Figure 6: Bike crossing at McKenzie Avenue and Borden Street, connecting the Lochside Regional Trail

Figure 7: Current condition with buses stopping in bike lanes

3.2.2. Walking

The corridor has consistent sidewalks along its length and most signalized intersections have crosswalks on all sides (although there are exceptions). In some cases, instances between safe crossing points can be quite large (up to 730m between Borden Street and Blenkinsop Road) and some pedestrian crossings are observed to be in poor condition with regards to the visibility of street markings (e.g., Douglas Street). There are two pedestrian overpasses on the corridor, one at Rainbow Street and one at Braefoot Park; both are generally considered to be underutilized.

There are locations along the corridor where pedestrian desire lines indicate that the infrastructure provided is not serving the needs of the community directly, and these provide opportunities to formalize travel patterns to provide safer and more comfortable walking routes (see *Figure 8*).

Figure 8: Opportunity to formalize pedestrian desire-lines (McKenzie Avenue and Douglas Street intersection)

The area around the UVic campus provides pleasant walking environments, with pathways separated from the roadway along well-treed routes, although crossing opportunities are limited between Gordon Head Road and Vikes Way.

The corridor in general boasts a mature tree canopy and good access to green spaces throughout, with established residential communities around Saanich Road, Braefoot Road, and Oakwinds Street all characterized by an abundance of large trees.

Although relatively flat, there are sections of the corridor with steep gradients that may present a barrier to mobility for some, including steep sections on either side of Quadra Street and an overall uphill trend from Quadra Street to the UVic campus with a peak at the intersection with Cedar Hill Cross Road. Overall, a 41m elevation gain occurs, travelling west to east on the corridor.

3.3. TRANSIT

The corridor is served by a series of bus routes (*Table 1*), not all of which cover the entire length of the corridor, along with additional services that intersect the corridor (e.g., Route 6 – Royal Oak Exchange / Downtown along Quadra Street).

Table 1: Current Bus Service Summary on McKenzie Avenue

Route #	Service
12 University Heights / UVic	**Local.** Provides service from the Garnet Road terminus to UVic with only minimal routing along McKenzie Avenue (Cedar Hill Road to Sherbourne Street)
24 Tillicum Centre / Cedar Hill	**Local.** Provides service from the Garnet Road terminus to the Tillicum Centre via downtown Victoria and Esquimalt with only limited routing along McKenzie Avenue (Cedar Hill Road to Shelbourne Street)
25 Maplewood / Tillicum Centre	**Local.** Provides service on McKenzie between Quadra Street and Blenkinsop Road to the Tillicum Centre via downtown Victoria and Esquimalt
26 Dockyard / UVic	**Frequent.** Provides service from HMC Dockyard in Esquimalt to McKenzie Avenue at Saanich Road and then on to the UVic campus.
39 Westhills Exchange / UVic	**Local.** Provides service from Westhills Exchange at Langford Parkway to McKenzie Avenue at Shelbourne Street and then on to the UVic campus
51 Langford / UVic	**Local. Limited Stop.** Provides service from the Langford Exchange to UVic Exchange

Note: the #16 route was discontinued at the onset of the Covid-19 pandemic.

Of these services, #26, #39, and #51 are the most significant in terms of the provision of through-service along McKenzie Avenue. Other routes provide connection to a specific point along the corridor (like the many services that terminate at the UVic Exchange but do not travel along McKenzie Avenue (#4, #14,

#7, etc.). The understanding is that local services along McKenzie Avenue would continue even with a potential RapidBus service on the corridor as local service is extremely important to area residents.

Bus stops along the corridor are generally well-spaced with larger gaps in the lower density areas and more frequent stops in the Centres where the majority of bus-to-bus transfers occur (particularly the #26 to the #39 at Shelbourne Street). Generally, bus stops are located on the far side of intersections, mainly in travel lanes, but with some pull-out bus bays. Some locations on the corridor have undersized stops based on anticipated demand and the confluence of bus routes. Quadra Street and Shelbourne Street are the most prominent examples of where two-bus stops would be necessary to accommodate a future RapidBus route. Note that RapidBus service is anticipated to use double-decker buses, rather than articulated buses.

BC Transit and the District try to avoid locating bus stops in locations where there are difficult or unsafe crossings to access both directions of a route, although there are locations where this still occurs such as Oakwinds Street.

There are currently two layover/terminus locations along the corridor:

1. Between Cedar Hill Road and Shelbourne Street along Garnet Road where BC Transit currently has layover space on the north side of the street for one bus and has indicated the need for space for two
2. At the Tim Hortons on Borden Street where BC Transit has layover space for a single bus but anticipate needing additional space to accommodate future service increases

3.4. STREET AND TRAFFIC NETWORK

McKenzie Avenue is classified as a major road (aside from the section west of Douglas Street which is classified as a highway due to the interchange with Highway 17) and requires a 14m curb-to-curb cross-section (per District of Saanich Engineering Specifications). The long curve east of Blenkinsop Road, along with limited stops, can lead to higher speeds along that stretch of the corridor until Cedar Hill Road.

While the overall peak hours for traffic on the corridor are similar to what would be expected in a busy urban area due to commuter traffic, there are generators of traffic that create additional peaks throughout the day. An example of this is the short, intense congestion around 3-3:15pm caused by the school dismissal at Reynolds Elementary.

Additional observations along the corridor include:

- Development on the north and south sides of the street between Cedar Hill Road and Shelbourne Street are reflective of the intensification of this centre and both intersections with McKenzie Avenue are busy throughout the day.
- McKenzie Avenue has only a single lane westbound from Gordon Head Road to Shelbourne Street, the only location on the corridor that does not have two travel lanes.

- Gordon Head Road intersection contains channelized right-turn lanes that are incongruent with the character of the area (proximity to university campus) and are generally not favoured from an urban design or safety perspective.
- Long queues are observed at Quadra Street between 3-4 pm. Eastbound buses are observed not to make it through the signal during a single cycle.

Figure 9: McKenzie Avenue, looking eastbound at Quadra Street

4. Multi-Modal Corridor Analysis

This section provides a snapshot of current multi-modal travel conditions along the corridor. This includes a high-level overview of daily trips by mode at different sections of McKenzie Avenue, as well as active mobility infrastructure, vehicle traffic, and transit operational performance during the peak periods. This analysis provides key insights for understanding the causes of delay and travel time variability which, in turn, will inform the options generation stage of the study.

4.1. PERSON-TRIPS ALONG THE CORRIDOR

Figure 10 shows the daily number of individual trips made by people using different travel modes (walking, cycling, bus, personal vehicle, or truck) at two locations. This provides a snapshot of the travel characteristics at these two locations.

- Location 1 - East of Quadra Street: Land-use at this location is largely comprised of residential with some commercial activity at the intersection of Quadra Street and McKenzie Avenue, as well as at Borden Street and McKenzie Avenue. Saanich's Public Works and Green Waste site is located on the north side of McKenzie Avenue.
- Location 2 - East of Shelbourne Street: Shelbourne Street is the commercial hub of the corridor; the University Heights Mall and Tuscany Village Shopping Centre are located on the north side of McKenzie Avenue. New retail, office and residential development is underway on the south side of McKenzie Avenue.

The total person trips by mode were derived using the following datasets:

- Auto: Mid-block vehicle counts provided by District of Saanich. A 1.25 occupancy rate was assumed (based on 2017 CRD origin-destination survey results and 2022 results confirmed 1.26 occupancy) to convert vehicle trips to person trips
- Transit: Automated Passenger Count (APC) data provided by BC Transit and which include bus load volumes
- Active: A combination of intersection counts provided by the District of Saanich and cyclist counts

The total vehicles count includes passenger cars, buses and trucks.

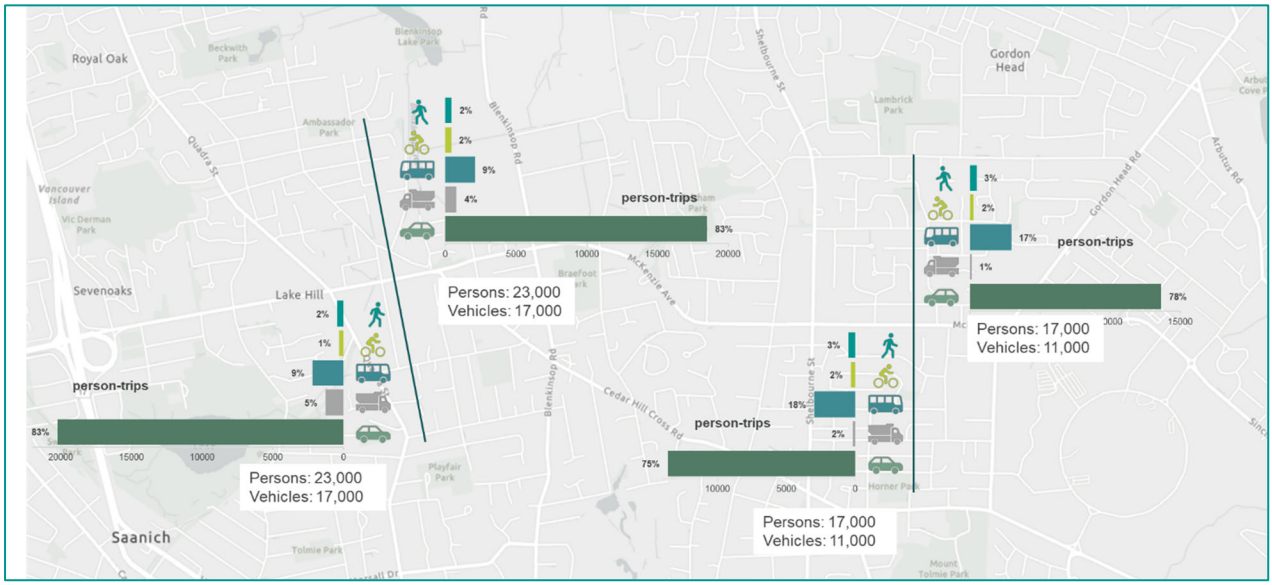


Figure 10: Daily Travel on McKenzie Avenue by Mode

Location 1 is largely dominated by car travel, which is not surprising given its land-use characteristics and proximity to Highway 17. The Quadra Street to Borden Street section experiences the highest vehicle volumes (including personal vehicles, buses, and trucks) along the corridor with an average of 34,000 vehicles per day (weekday). Trucks make up about 7% of the traffic volume at this location, a substantially larger proportion than eastern segments of the corridor.

McKenzie Avenue carries substantially less traffic at Location 2 where a three-lane cross-section limits overall capacity, with approximately 22,000 vehicles per day (weekday). Further, a larger proportion (and number) of trips is made by sustainable modes, specifically transit (approximately 20% mode share). This is mainly due to the location's land-use characteristics and proximity to the University of Victoria campus as many post-secondary trips are typically made by transit and active modes. According to the University

of Victoria's 2021 Transportation Survey[1], more than half the trips generated by the campus were made by sustainable modes in 2018, 26% transit, 17% walk and 9% bike.

During the afternoon peak hour, between 4 PM and 5 PM, the corridor carries approximately 1,300- 1,400 vehicles in each direction at Borden Street as shown in *Figure 11*. Further east, traffic volumes decrease to about 1,000 vehicles per direction at Shelbourne Street. A substantial amount of pedestrian and cycling activity is observed at Shelbourne Street during the afternoon peak, approximately 7-8% of total trips. This is likely related to the commercial activity at Shelbourne Street that usually peaks in the afternoon, and the proximity to University of Victoria, about 2 kilometers east, which makes travel by active modes, such as walking and cycling, more attractive.

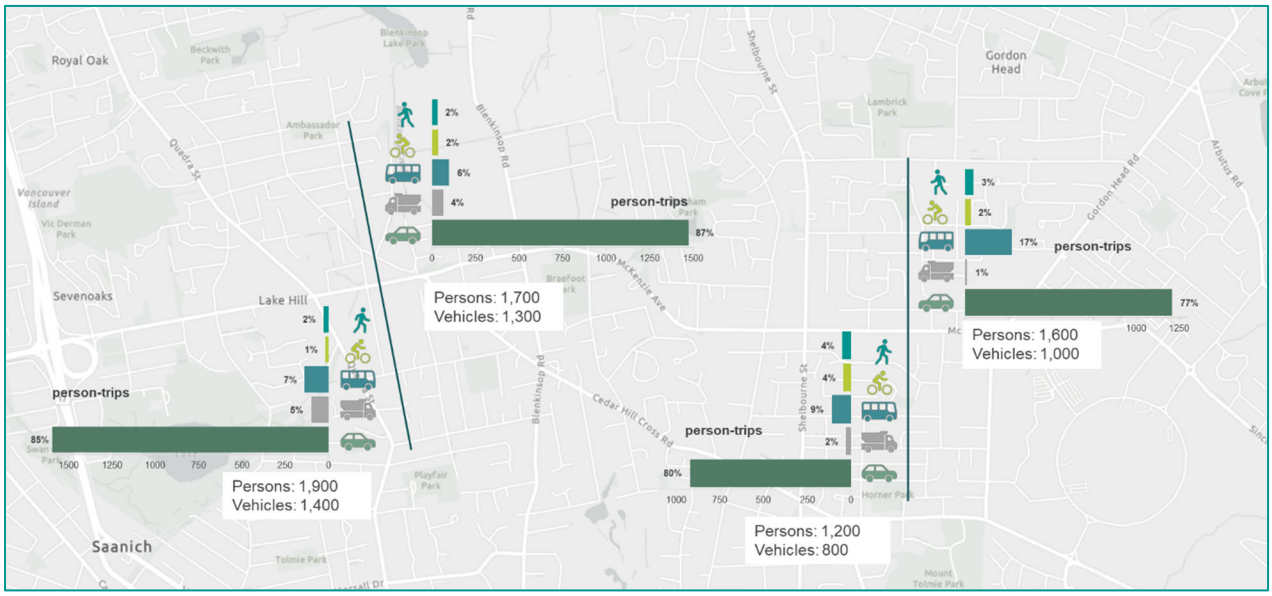


Figure 11: Afternoon Travel (4 to 5 PM) on McKenzie Avenue by Mode

4.2. ACTIVE MODES INVENTORY

McKenzie Avenue has a mix of pedestrian and cycling infrastructure ranging from fully-protected and off-street trails, to painted bike lanes. *Figure 12* and *Figure 13* below highlight the active modes infrastructure within the study area, with key features including:

- McKenzie Avenue contains sidewalks on both sides of the roadway along the entire length of the study area with the pavement generally in good condition and providing adequate width for pedestrians to pass with some exceptions (the north side sidewalk between Rainbow Street and Nelthorpe Street contains utility posts which somewhat restrict throughflow)

1 https://www.uvic.ca/campusplanning/assets/blocks/content/accordions/20220408_uvictrafficsurvey_2021_report_final.pdf

- On-street painted bike lanes are provided on both sides of the roadway between Borden Street and Cedar Hill Road although the only painted crossing is at Borden Street where the connection to the Lochside Regional Trail makes it a busy location for cyclists entering the corridor.
- The Lochside Regional Trail, intersecting the corridor at Borden Street, is a multi-use trail and carries approximately 850 daily riders. It is a trail of regional significance, providing connectivity well beyond the boundaries of the District.
- Protected cycling infrastructure on McKenzie Avenue is only found eastbound between Cedar Hill Road and Shelbourne Street.
- No cycling infrastructure is present at the west end of the corridor at all.
- Traffic signals (and therefore safe opportunities for pedestrians to cross McKenzie Avenue at-grade) are, on average, 500m apart with some up to 750m apart.
- Two grade-separated pedestrian flyovers provide protected crossing at Rainbow Street and the Bow Park Path.
- Off-street pathways are provided in the vicinity of the University of Victoria campus.

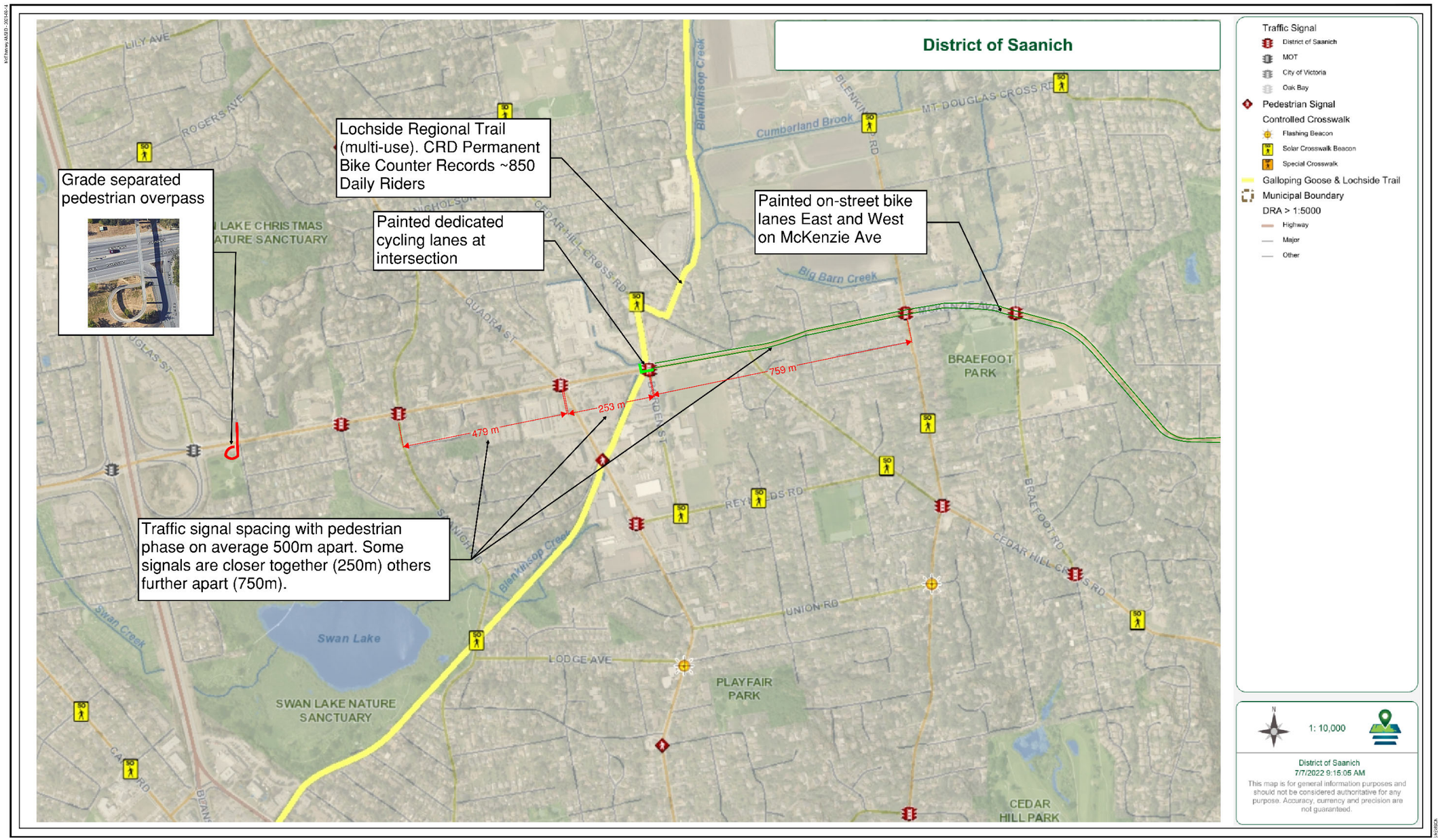


Figure 12: Active Modes Infrastructure (west end of corridor)

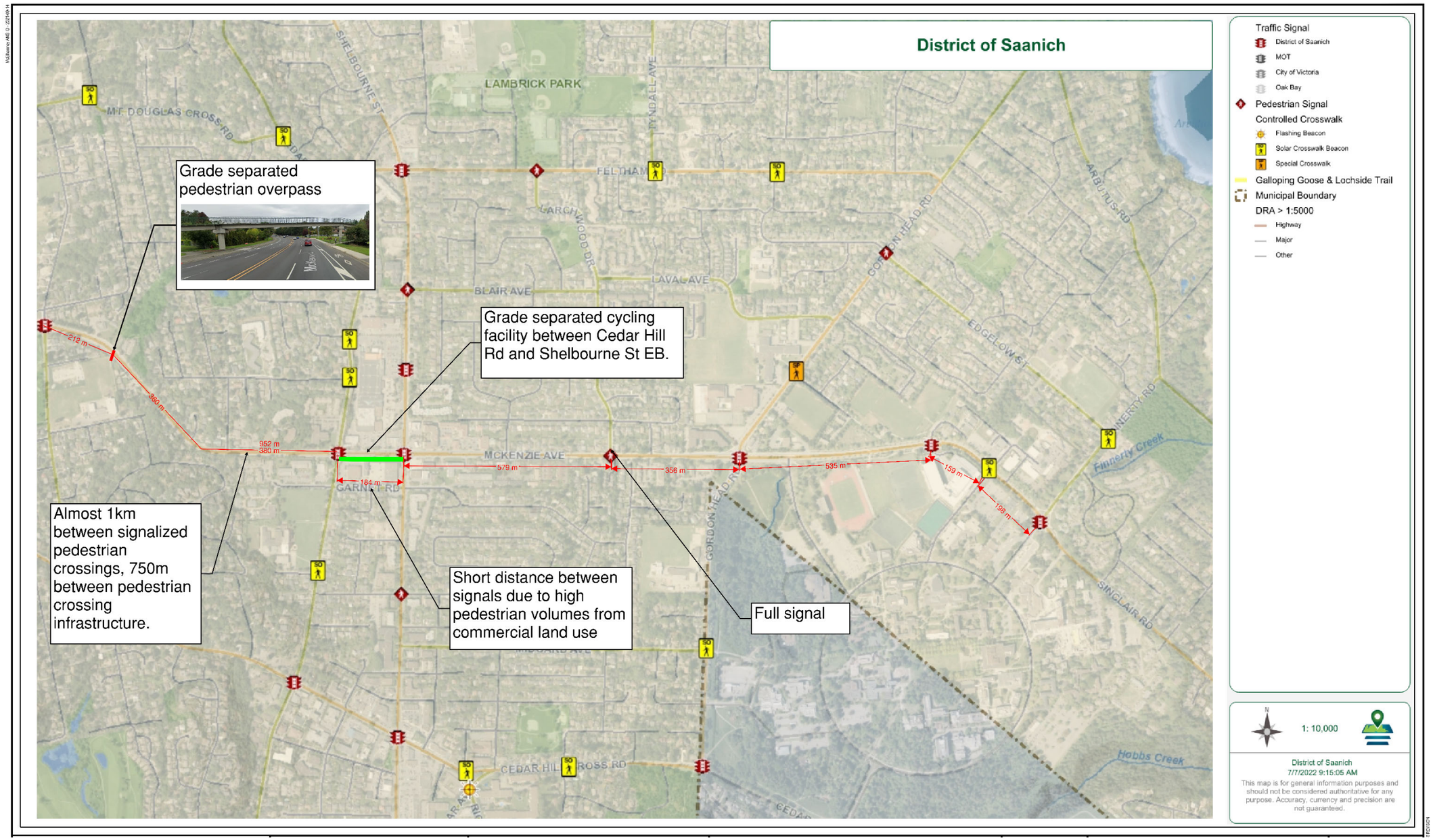


Figure 13: Active Modes Infrastructure (east end of corridor)

4.3. TRANSIT ANALYSIS

The transit analysis of the baseline conditions covered the following areas:

- Transit travel time variability
- Ridership (by stop)
- Dwell time
- Buses per hour and stop spacing

Travel time variability measures the amount of additional time it takes transit to travel between two stops (stop pairs) at the 80th percentile travel time, relative to the 20th percentile travel time (i.e., 80th minus 20th travel time). The 80th percentile is used because it represents a commonly occurring congested traffic condition (approximately once every five days). The 20th percentile represents commonly occurring free-flow conditions. This is an important concept as it directly impacts the reliability and attractiveness of transit to customers. Consistency and predictability are crucial for transit users; when travel times are highly variable, passengers may have to wait longer at stops, leading to missed transfers, longer travel times, and frustration. Reliable travel times make it easier for passengers to plan their trips and trust that they'll reach their destinations on time.

Transit travel time variability is also important for BC Transit as part of its operational planning as managing travel time is central to delivering efficient operations and being able to accurately predict reliable travel times enables better scheduling, resource allocation, and route planning. This can lead to improved service quality, reduced operational costs, and better utilization of transit vehicles.

To account for the greater variability that occurs due to longer stop spacing and busier routes, the analysis is normalized by distance and number of trips. *Figure 14* shows the transit time variability with the yellow/orange/red (greater variability) stop pairs representing approximately half of the stop pairs along the corridor and green (more consistent travel times) representing the other half.

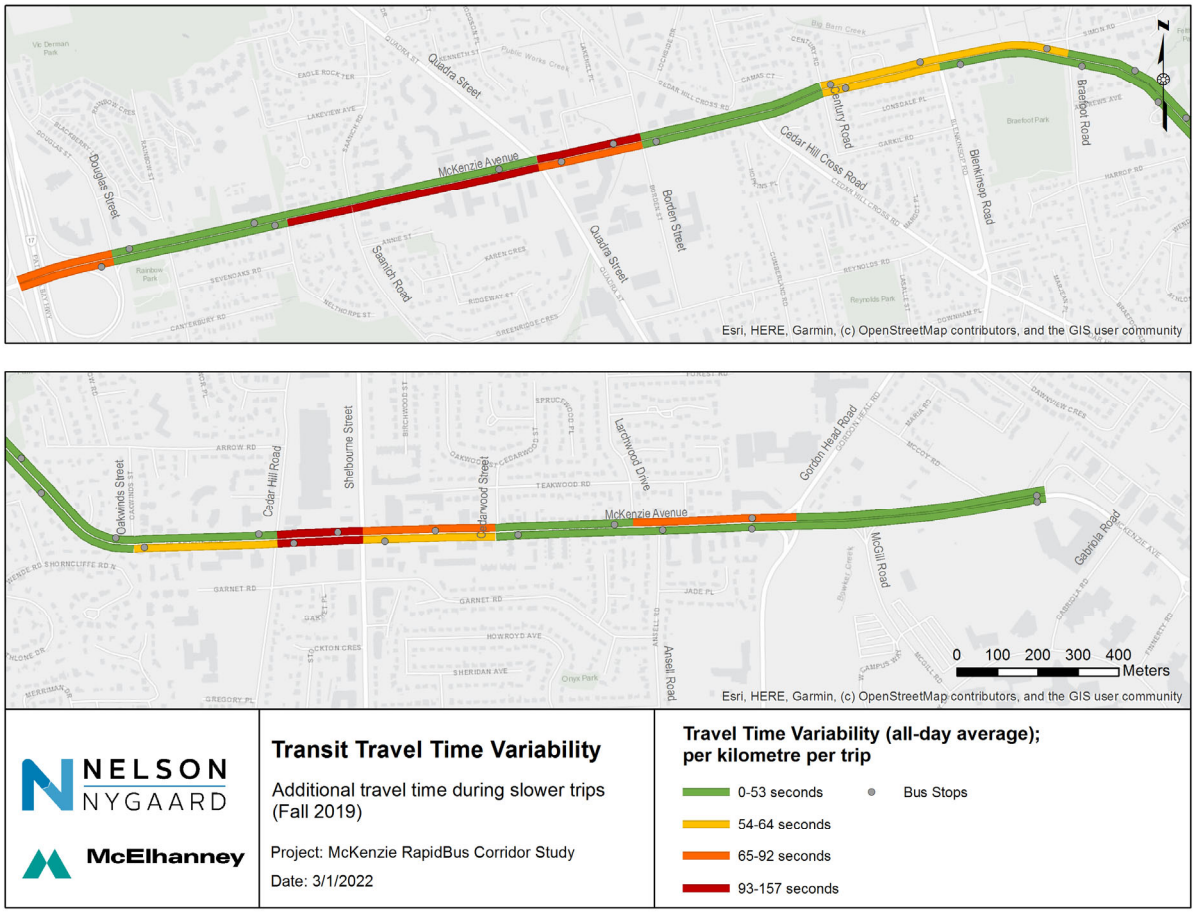


Figure 14: Transit Travel Time Variability

Noted in the analysis is that the approaches to the intersections of Quadra Street, Cedar Hill Road, and Shelbourne Street experience the greatest amount of travel time variability for buses. Lower amounts of delay occur at Borden Street, Blenkinsop Street and westbound from Gordon Head Road to Larchwood Drive, however, these values are still high enough to warrant interventions to reduce transit delay and keep buses on schedule.

Breaking out these all-day averages to view the variability across hours of the day (see *Figure 15* and *Figure 16*) illustrates that the areas of where the greatest variability is found are consistent across the day and that variability tends to increase in the afternoon in both directions.

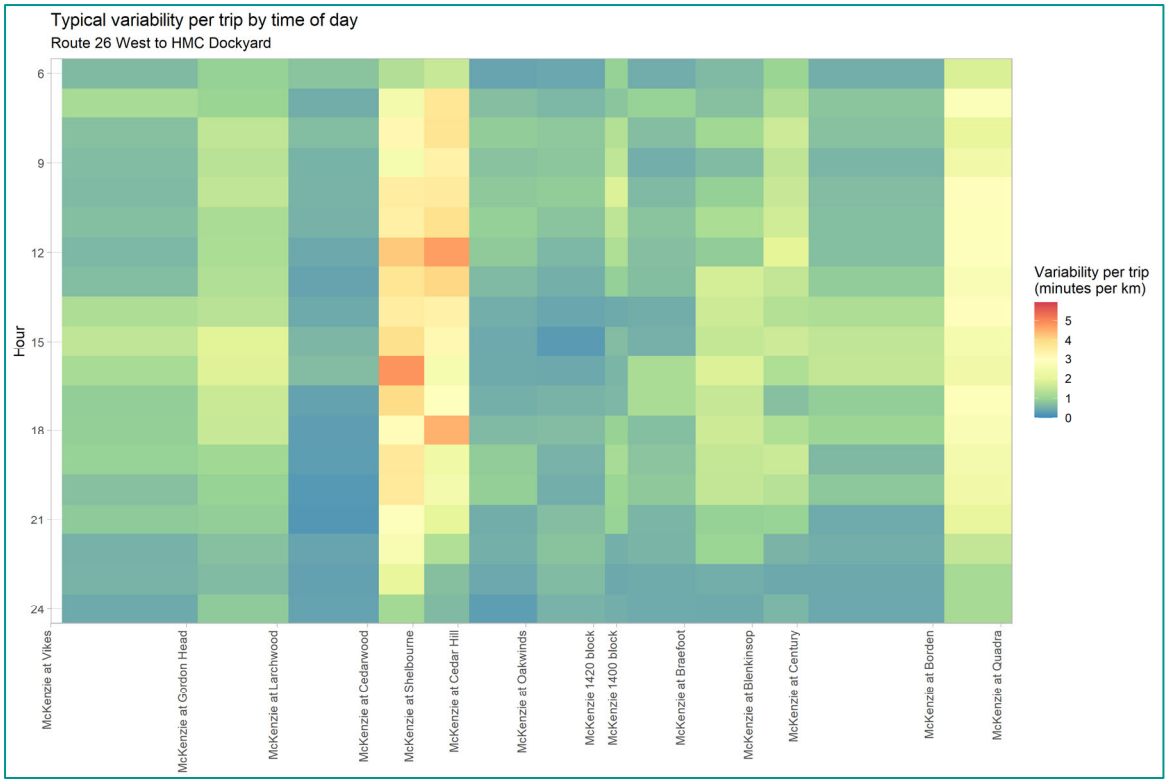


Figure 15: Hourly travel time variability (westbound)

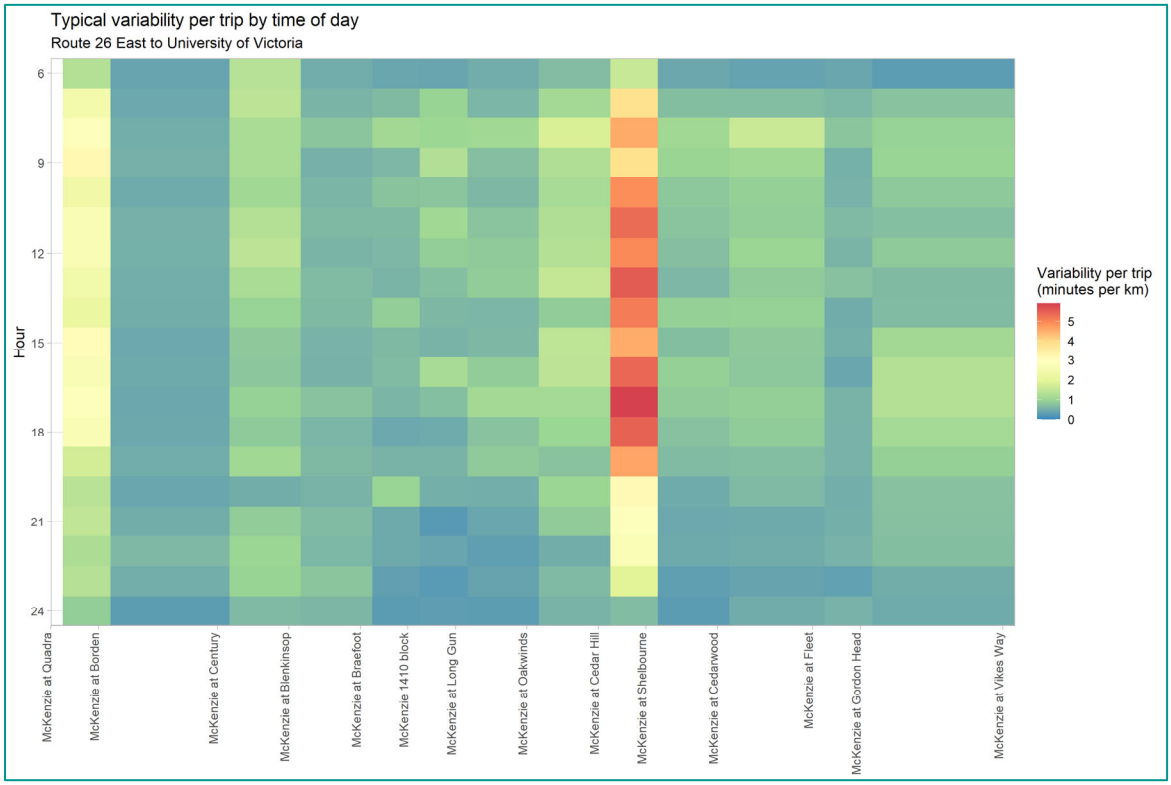


Figure 16: Hourly travel time variability (eastbound)

The above results illustrate the variability in travel time experienced by *buses*, but to understand how this variability affects passengers, the values need to be weighted according to daily average on-board load to represent cumulative variability.

The below figures show where improvements to variability are likely to have the greatest impact for passengers. The highest variability occurs at Cedar Hill Road and Shelbourne Street in both directions, and westbound on the approach to Quadra Street. Moderate variability occurs westbound from Vikes Way to Larchwood Drive, westbound from Braefoot Road to Quadra Street and in both directions between Oakwinds Street and Cedarwood Drive.

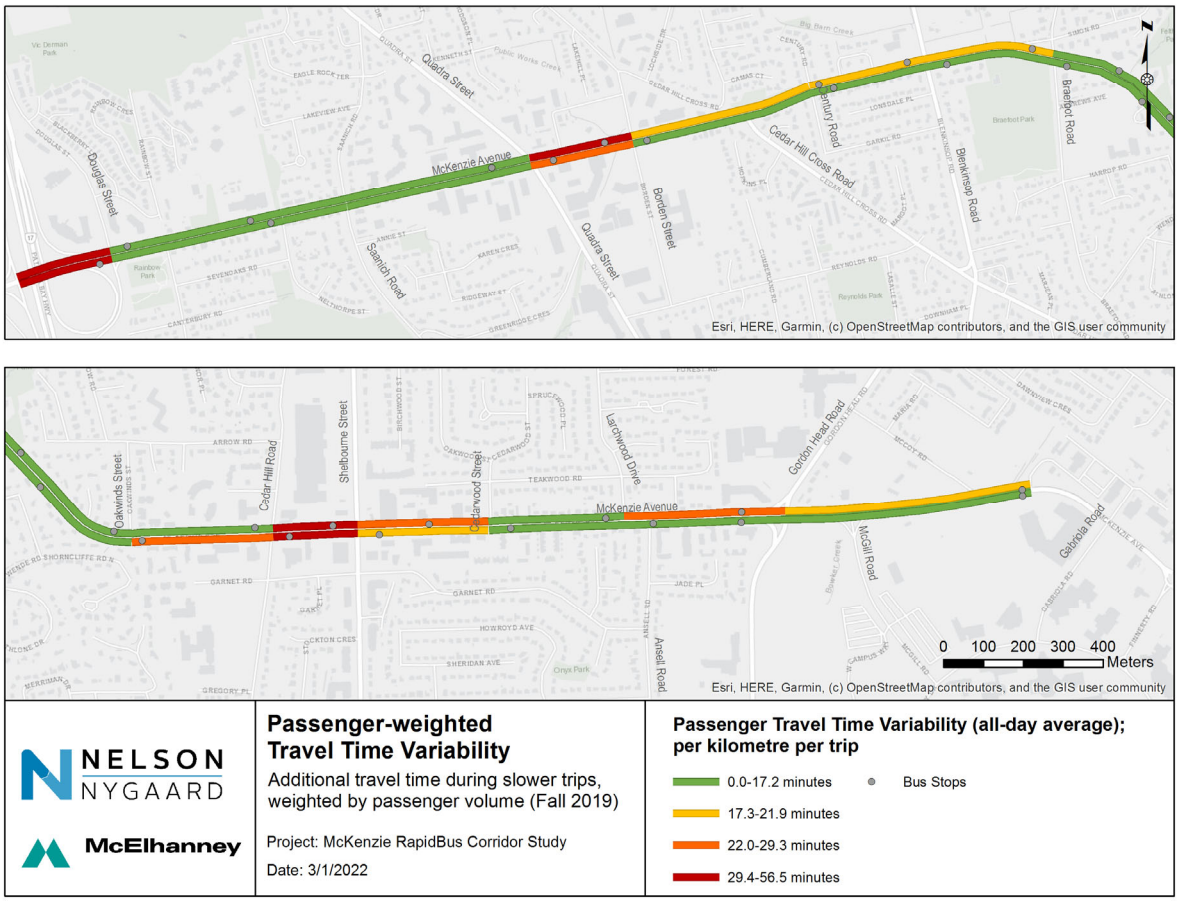


Figure 17: Passenger-weighted travel time variability

The following figure presents the cumulative stop activity for all routes along the corridor (based on Fall 2019 data). Note that routes 16[2] and 51 are limited-stop routes which only serve six stops between Highway 17 and UVic. As anticipated, the busiest stops are at Quadra Street and Shelbourne Street (with

[2] Note that route #16 service was discontinued at the onset of the pandemic.

moderate ridership found at Borden Street, Cedar Hill Road and Cedarwood Road) where the highest concentration of commercial and retail is found.

Figure 18: Ridership by Stop

Like the ridership data, the longest dwell times (i.e., the time a bus spends stationary at a stop) for buses are found at Quadra Street and Shelbourne Street (approaching one minute per stop). Stop time is typically correlated with ridership and the limited number of stops between Braefoot Road and Cedar Hill Road have low dwell times (15 seconds or less).

The number of buses in service along the corridor is less connected to ridership and dwell time and is more a function of the increased overall bus capacity serving the UVic campus where a number of routes converge. A bus every 5-9 minutes is normal during the midday peak for the eastern end of the corridor (east of Shelbourne Street) and as frequently as 3-5 minutes during peak hours. This is as compared to the western end of the corridor where limited individual routes utilize the corridor, and these at a lower frequency, meaning buses can be expected every 20-60mins depending on the time of day.

Figure 19: Dwell time by Stop

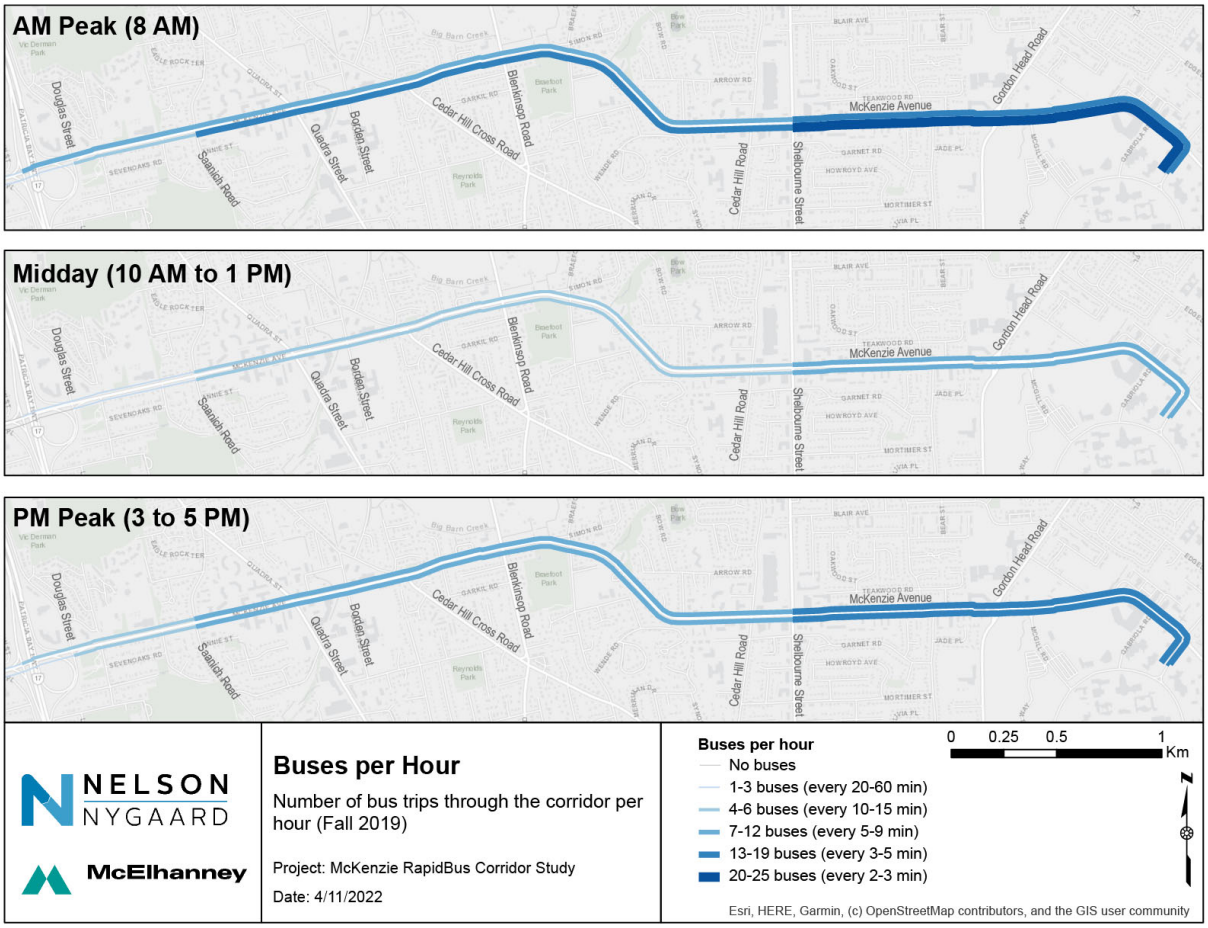


Figure 20: Buses Per Hour

Stop intervals for the local routes (Routes 26 and 39) generally range between 200m and 400m which is in line with the recommended stop interval of 250-300m for local service. There are some stop pairs with intervals greater than 400m and three instances where the interval is less than 200m. Where stops are frequently used, short intervals reduce running speeds and lengthen journey times (due to time spent accelerating and decelerating) and as a general practice, transit agencies typically consolidate these stops together unless there are circumstances (e.g., transfers to intersecting routes) that would dictate otherwise.

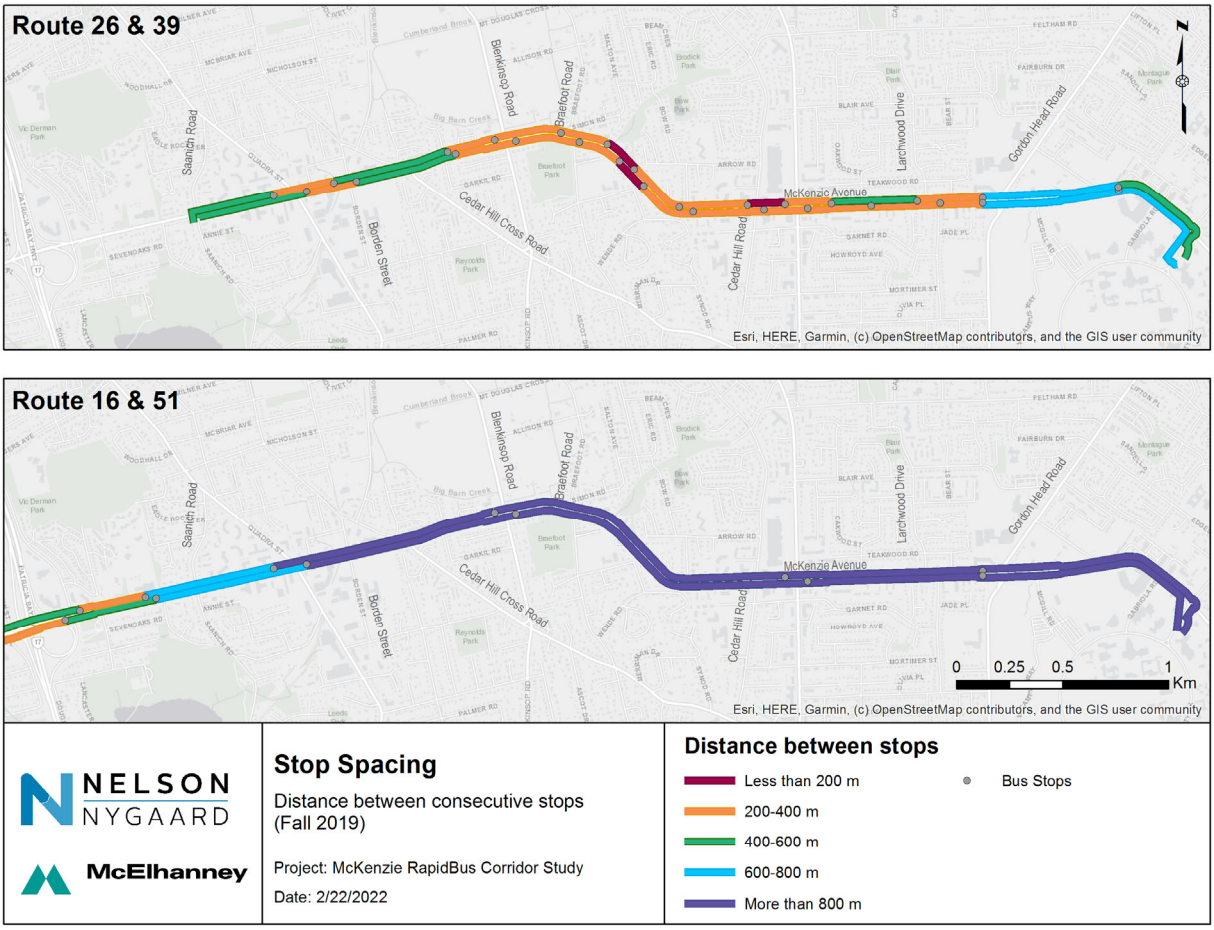


Figure 21: Stop Spacing

4.4. TRAFFIC ANALYSIS

This section summarizes existing traffic operation conditions for vehicles (auto, buses and trucks) along the corridor. The analysis was undertaken using Synchro software. *Table 2* shows the definitions for delay thresholds and corresponding level-of-service (LOS) used for the analysis.

Table 2: Intersection LOS Definitions

Level of Service	Delay Criteria (sec / veh)	Description
	Signalized Intersections[1]	
A	≤ 10	Represents free flow. Individual users are virtually unaffected by others in the traffic stream. Usually no conflicting traffic.
B	> 10 to 20	Stable flow, but the presence of other users in the traffic stream begins to be noticeable. Occasionally some delay due to conflicting traffic.
C	> 20 to 35	Stable flow, but the operation of individual users becomes significantly affected by interactions with others in the traffic stream. Delay is noticeable, but not inconveniencing.
D	> 35 to 55	Represents high-density, but stable flow. Delay is noticeable and irritating; increased likelihood of risk taking.
E	> 55 to 80	Represents operating conditions at or near the capacity level. Delay approaching tolerance levels; risk taking behaviour is likely.
F	> 80	Represents forced or breakdown flow. Delay exceeds tolerance level; high likelihood of risk taking.

Figure 22 summarizes peak morning (8 AM to 9 AM) traffic conditions along the corridor. *Figure 23* and *Figure 24* focus on the two main congestion hot spots, Quadra-Borden and Cedar Hill-Shelbourne-Gordon Head and provide detailed LOS analysis. Below are key observations for the two locations:

- The volume to capacity ratio increases between Gordon Head Road and Shelbourne Street in the westbound direction due to the reduced road capacity in that direction. This however does not impact overall operations substantially as the road expands to two lanes east of Shelbourne Street.
- At Quadra Street, high north-south volumes impact east-west movements as more green time is allocated to Quadra Street.
- The westbound left movement onto Borden Street experiences substantial delay, likely due to the mix of commuting traffic with school drop-off activity.
- At Shelbourne Street high north-south volumes, especially southbound, impact east-west movements as more green time is allocated to Shelbourne Street. Further, green time allocated to the high west-bound-left volumes increase signal delay for the east-bound through movement.

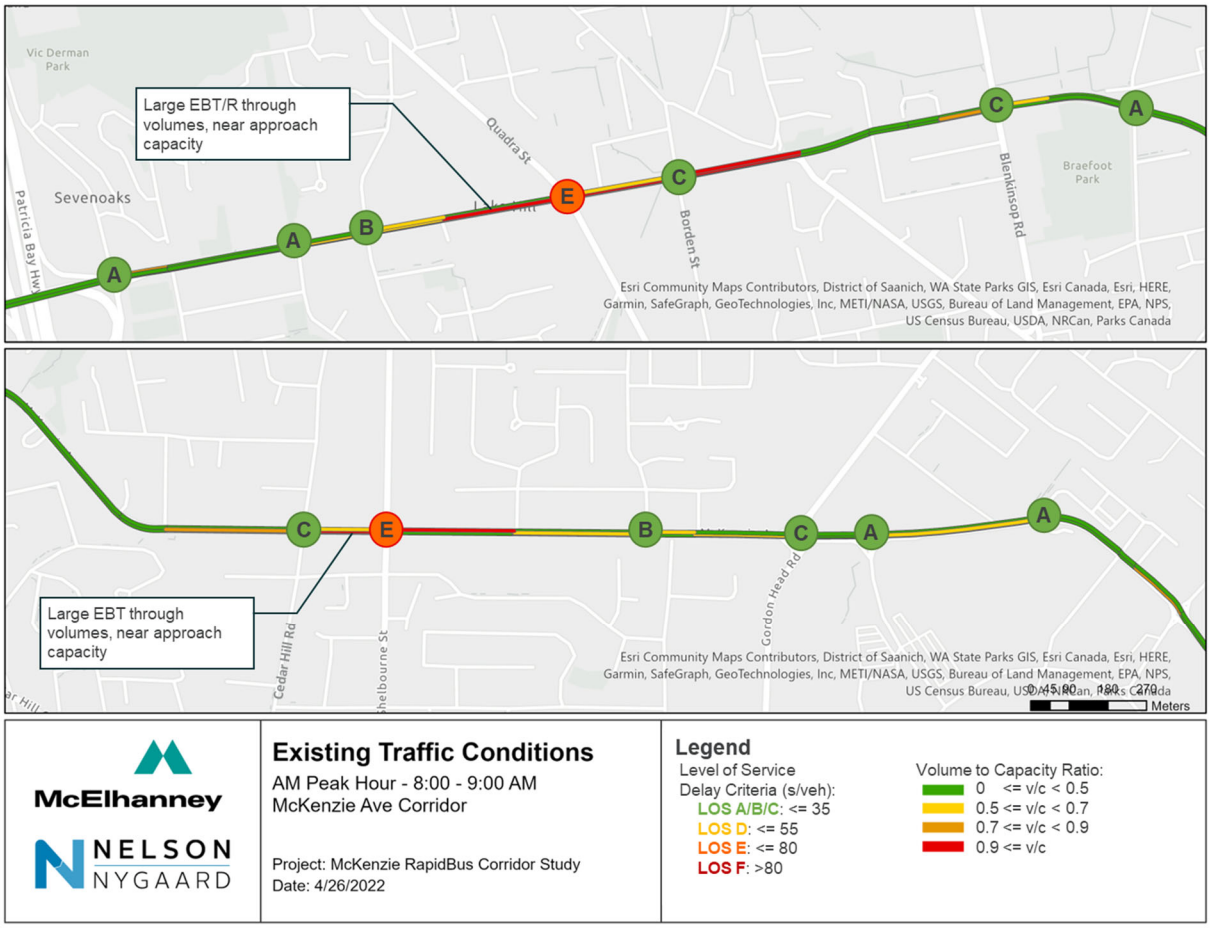


Figure 22: Morning Peak Traffic Conditions

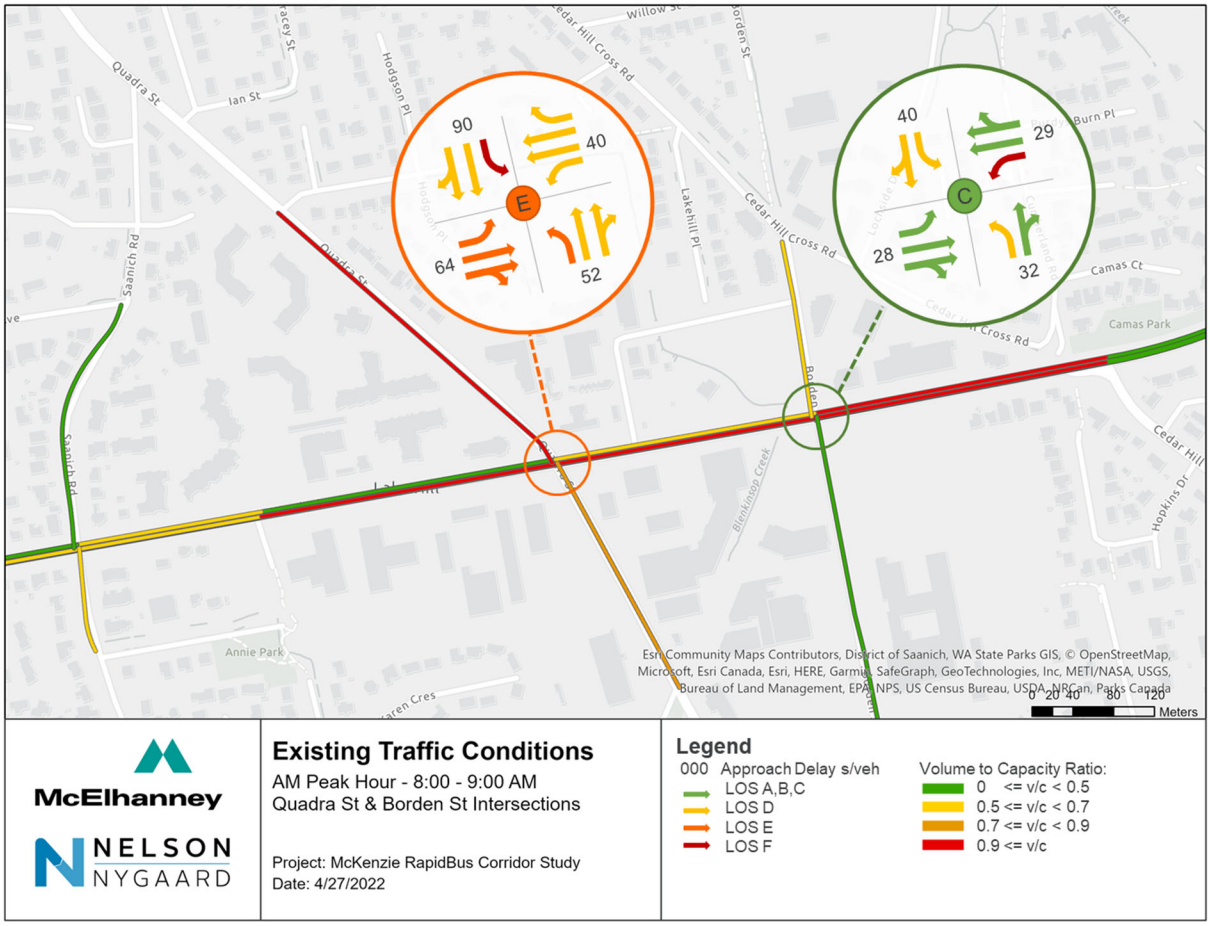


Figure 23; Traffic Operations Hotspot - Quadra/Borden (AM)

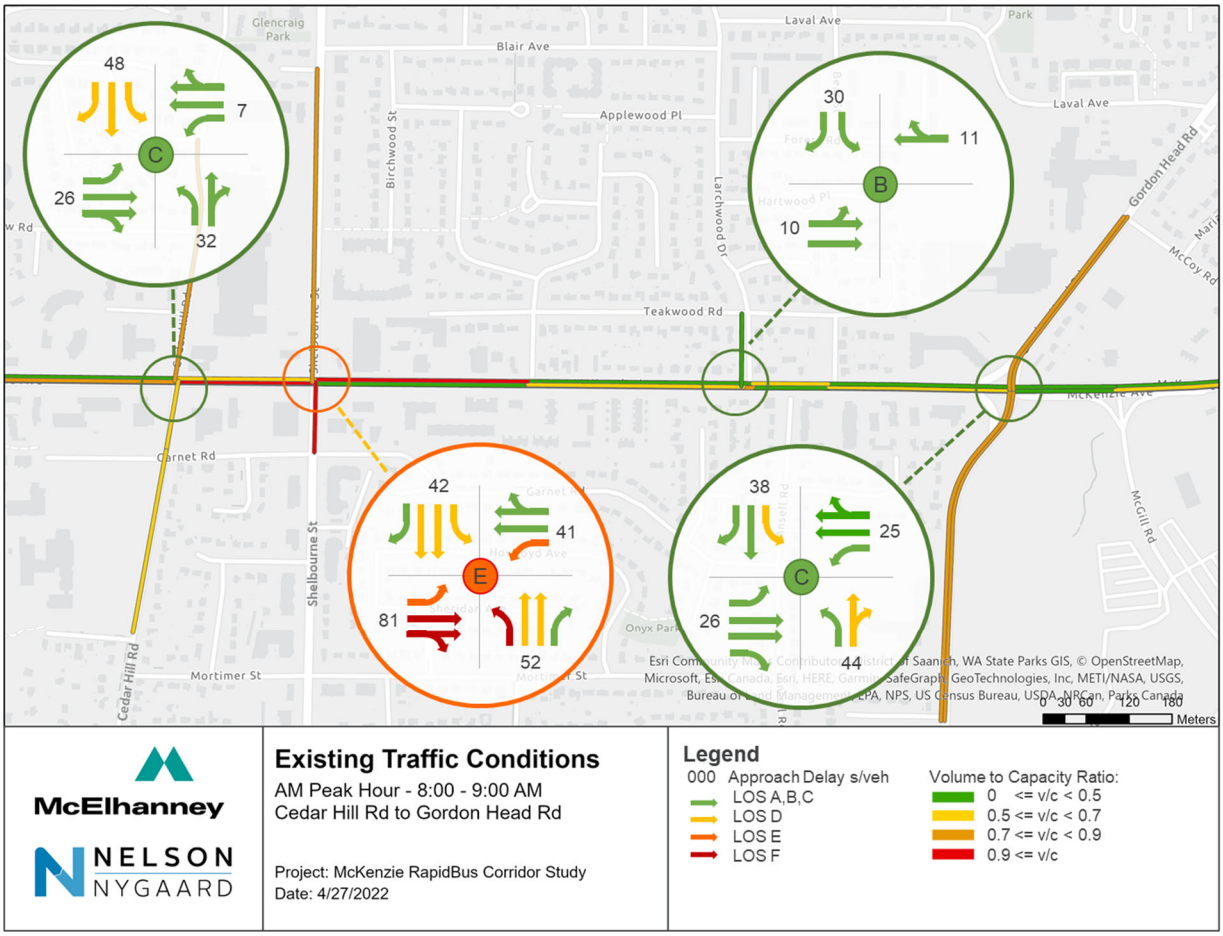


Figure 24: Traffic Operations Hotspot - Cedar Hill / Shelbourne / Gordon Head (AM)

Figure 25 summarizes peak afternoon (4 to 5 PM) traffic conditions along the corridor. *Figure 26* and *Figure 27* focus the two main hot spots, Quadra-Borden and Cedar Hill-Shelbourne-Gordon Head and provide detailed LOS analysis by movement. To simulate school pick-up activity at Borden, the peak-hour factor was adjusted down for the east-bound-right and west-bound-left movements[3]. Below are some key takeaways:

- Generally, the afternoon period is more congested than the morning, as expected. Morning traffic tends to be 'concentrated' as it is mostly comprised of commuters. Afternoon travel is more 'turbulent' due to the substantial discretionary travel that mixes with commuting trips.
- Buses and vehicles experience significant delay at Quadra-Borden due to a combination of factors:

[3] Peak hour factors range from 0 to 1 with the typical factor being 0.9. Traffic volumes during the peak hour are divided by the peak hour factor to reflect 'peak of the peak' 15-minute conditions. At Borden, the peak hour factor for the EBR and WBL movements were adjusted down to 0.5 to reflect the short, yet sharp spike in traffic at 3 PM. This triggers a queue shockwave that takes some time to dissipate, as observed during the team's site visit. This was considered an acceptable calibration adjustment to improve the Synchro model's representation of peak congested conditions.

- High North-South volumes on Quadra Street
- Reduced capacity during the afternoon school pick-up period for the east-bound-through traffic at Borden that shares the curb lane with right-turning traffic. Further, high west-bound-left volumes triggers a green time extension, further reducing the effective eastbound through capacity.
- Queues west of Borden Street can block the Quadra Street intersection.
- Queues from the left-turn lane at Borden Street in the westbound direction can block general-purpose (GP) lanes.
- Substantial north-south pedestrian volumes
- At Shelbourne Street high North-South volumes, especially Northbound, impact east-west movements as more green time gets allocated to the cross-street. Further, green time allocated to the high west-bound-left volumes increase signal delay for the east-bound through movement.
- Gordon Head Road operates at an acceptable level of service D, with the west-bound direction experiencing more delay in the afternoon relative to the morning period as a result of higher volumes.

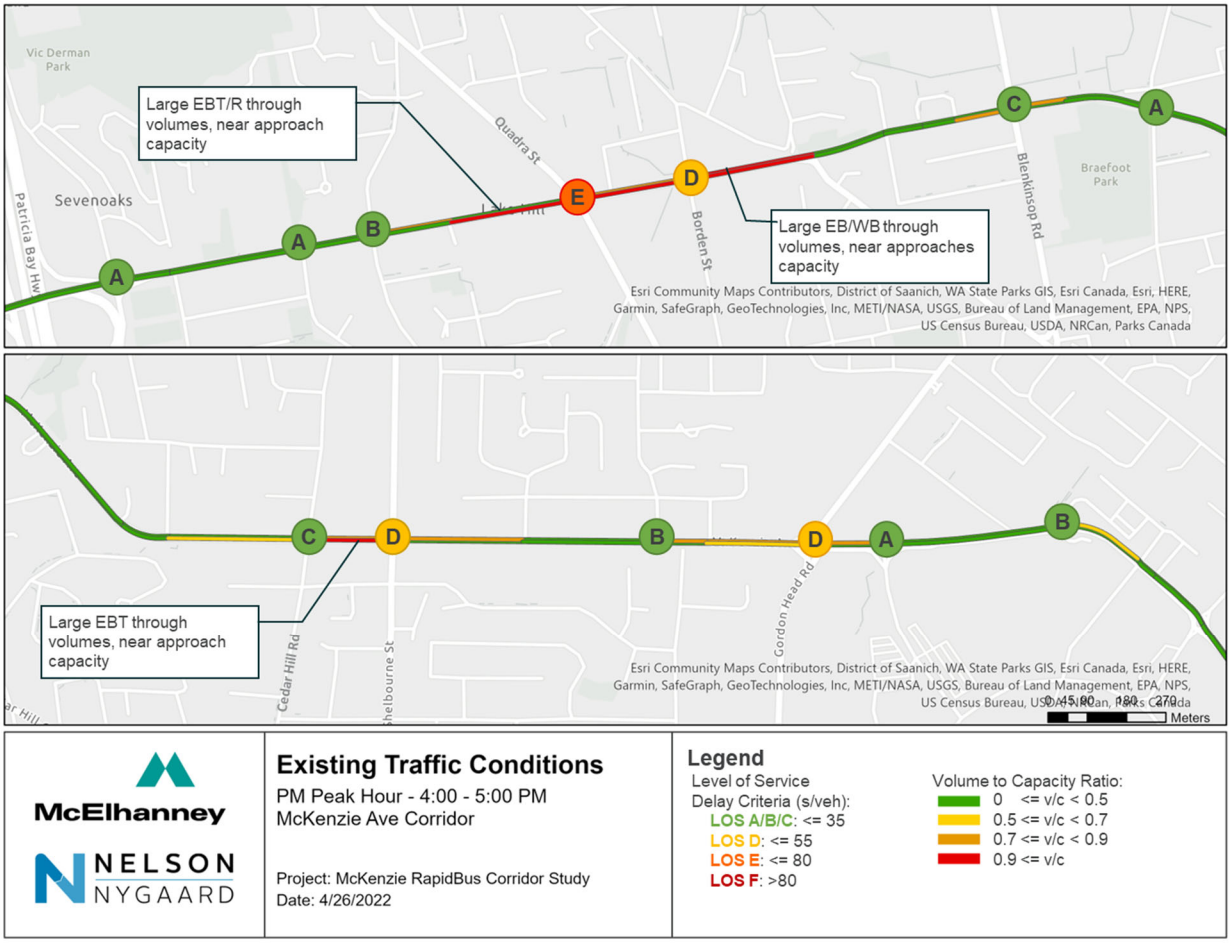


Figure 25: Afternoon Peak Traffic Conditions

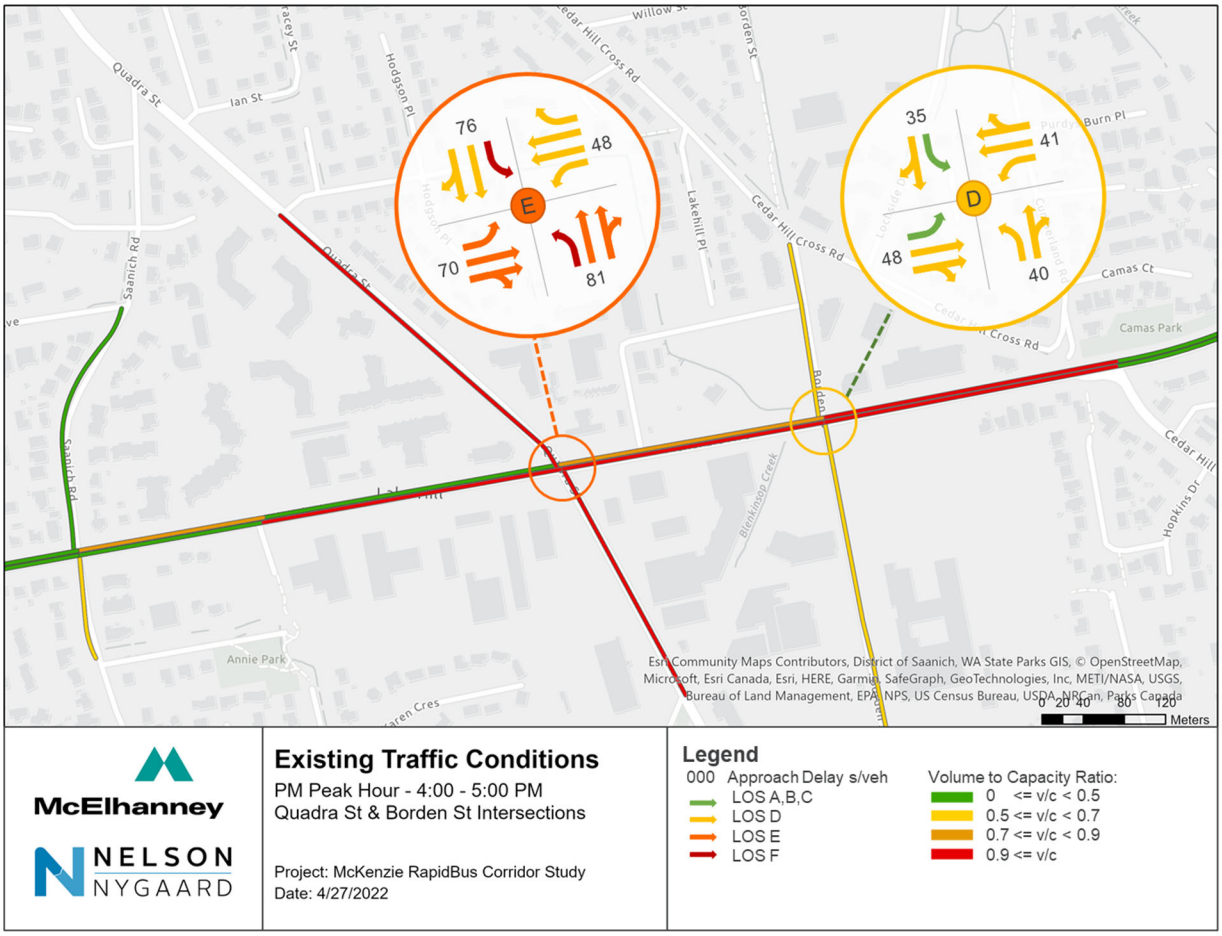


Figure 26: Traffic operations Hotspot - Quadra / Borden (PM)

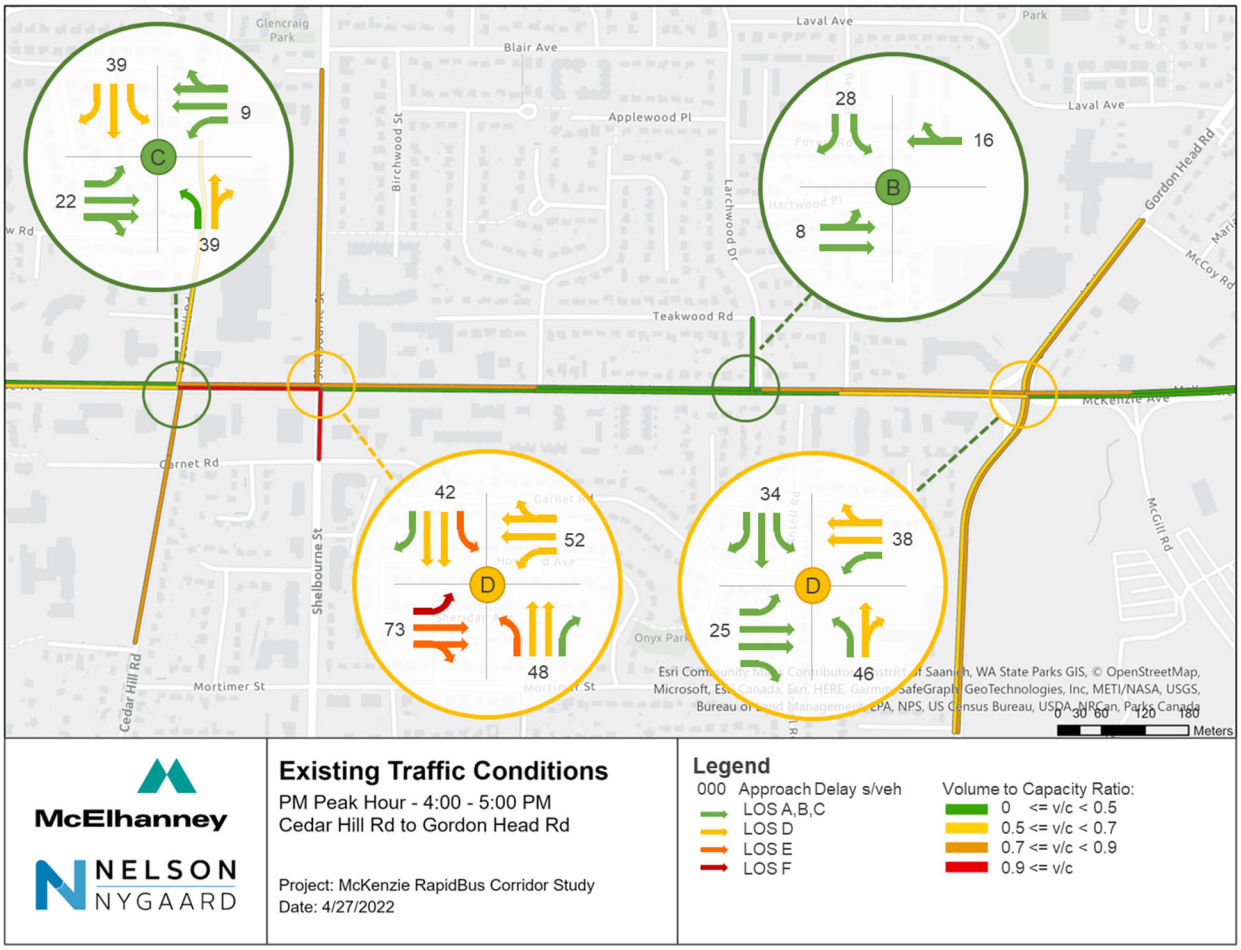


Figure 27: Traffic Operations Hotspot - Cedar Hill / Shelbourne / Gordon Head (PM)

Figure 28 and *Figure 29* show the modelled 95th percentile queue lengths[4] at the corridor's two key hotspots in the afternoon. Some of the observed long queues form due to a combination of large traffic volumes and longer cycle length. These potentially can block access to commercial activity, minor side streets or driveways. It is important to note that the queue at Borden Street would occasionally spill back to Quadra Street, which can result in lost green time in the eastbound direction.

[4] The 95th percentile queue represent extreme queuing conditions which can occur for one or two cycles during the peak hour. Otherwise, queue lengths during the peak are typically shorter, on average.

Figure 28: Afternoon Modelled Queues (95th Percentile) at Quadra / Borden

Figure 29: Afternoon Modelled Queues (95th Percentile) at Cedar Hill / Shelbourne

5. Problem Definition Statement

The base condition assessment provides a view into the current challenges on McKenzie Avenue that will need to be addressed by the District of Saanich and BC Transit as they work to realize the long-term vision for this important corridor. The challenges include:

1. High traffic demand, especially at peak times.
2. Multiple priorities for use of the existing right-of-way.
3. Sporadic infrastructure to support safe and connected active transportation.
4. Transit delays at key locations.
5. Right-of-way constraints such as existing utilities.
6. Existing mature trees.
7. A mix of land uses and densities along the corridor. Higher density development is concentrated in the Centres, while long stretches of the corridor between the Centres remain low density.

McKenzie Avenue is a constrained corridor, with narrow sidewalks, high traffic demand, high bus ridership, on-corridor utility infrastructure, street furniture requirements and treed areas all provided within a limited right-of-way. The growing mobility demands on the corridor, which provides one of the only east-west routes for traffic in the area, due to intensification and population growth will continue to increase. These challenges must be faced in alignment with the strategic goals for enhancing transit service, increasing transit ridership, and providing high-quality active transportation infrastructure on the corridor.

Fundamentally, the challenge is in determining the most effective distribution of roadway allocation for each segment of the corridor, knowing that this will necessarily require trade-offs to be made. The role of development and a well-articulated phasing plan to achieve the required corridor widths cannot be overstated and understanding the path to implementation is key.

With the stated goal in the Victoria Regional RapidBus Implementation Strategy of increasing transit's competitiveness with auto traffic, there is a clear need to identify the causes of transit delay and unreliability and implement solutions to improve travel times and provide a predictable transit service that moves transit ridership in the District towards the ambitious goals of 20% mode share across Saanich.

The District of Saanich's Active Transportation Plan: *Moving Saanich Forward* identifies McKenzie Avenue as a priority in the bicycle network with short-term upgrades identified for the existing facilities to address the top three cycling issues: gaps in the network, lack of bike routes, and intersection safety. It is an essential part of the corridor's vision that an All Ages and Abilities network is incorporated. How this is delivered, and in particular how the relationship between cycling facilities, sidewalks and transit stops are considered, is a key challenge of the study.

A project working group, made up of BC Transit and District of Saanich staff, was established at the outset of the study. At various points throughout the study, the working group provided input that led to the development of the long-term vision and short-term improvements.

5.1. WORKING GROUP SESSION #1: PROJECT INTRODUCTION

The first Working Group session was held on March 4, 2022 (via Microsoft Teams) and was well-attended by both BC Transit and District of Saanich staff.

- The purpose of the meeting was to inform staff of the project and the anticipated role of the working group, to present the findings of the baseline conditions assessment, and to present and discuss the evaluation criteria.
- Following the presentation, the following key discussion points were noted:
  - Ability to implement is a critical issue – analysis on available RoW should be conducted.
  - Long-term plans can't be *too* long-term, and a sensible horizon year should be established.
  - Staff experience of the corridor is that there can often be a wait of 4-5 light cycles at the Quadra intersection and the eastbound right movement must wait for pedestrians a lot.
  - The peak hour tends to extend a little later than normal in the mornings and a little earlier in the afternoons (due to the schools on the corridor).
  - The model results don't seem to show operations as bad as they are in reality [this was addressed through the subsequent recalibration of the Synchro modelling].
  - There can often be 50+ students waiting at the Borden stop from the Reynolds School.
  - There should be something specific done for the Lochside Trail crossing.
  - The #16 bus will come back into operation (it was cancelled during Covid) and the current thinking is that it will be rebranded and redeployed as a RapidBus service.
  - Note the seasonal nature of transit ridership due to University of Victoria semesters.
  - The presentation of screenline by mode was appreciated and provides a good basis to compare future options.
  - There will be opportunities to revisit stop spacings along the corridor, not just for RapidBus.

5.2. SUMMARY OF BASE CONDITIONS ASSESSMENT

The site visit, policy review, traffic analysis and collaborative working session with District and BC Transit staff during the base conditions assessment sets a robust foundation for the development of long-term vision options for the corridor that meet the objectives of the study. The following section describes the process of developing and refining that long-term vision.

5.3. INITIAL OPTIONS EVALUATION CRITERIA

Evaluation framework categories, criteria and measures were developed to assist in developing options that are consistent with the specific project objectives for the study, based on the findings of the base conditions assessment and feedback from the working group.

The framework was organized into categories to group related criteria together. Measures for testing success were also proposed. It is helpful to establish the evaluation criteria at the outset of the study as it guides the development of initial options to ensure that all options can potentially be successful at achieving the overall goals for the corridor.

The framework provided in *Table 3* is the result of a collaborative, multi-disciplinary effort to determine the best mechanism to achieve a preferred long-term vision that meets the objectives of the study in a transparent and technically sound way.

Table 3: Initial Evaluation Framework

Evaluation Framework		
Categories	**Criteria**	**Measures**
Feasibility	Physical feasibility	Delivered within existing RoW
		Availability of sites for bus stops / stations
		Impacts to utilities
Transit	Amenities	Room to accommodate transit amenities
	Walking distance	Maximize population within 400m catchment radius of stops/stations
	Reliability	Travel time variability
	Clarity	Ease of understanding of routes, schedules, connections and stop locations
	Travel time	Relative performance (vs. auto)
Active Transportation	Net improvement	Must not diminish existing facilities and must improve overall walking/cycling infrastructure
	Sidewalks	Minimum vs. ideal pedestrian infrastructure
	Cycling	Minimum vs. ideal cycling infrastructure
	Separation/protection	Level of protection provided (buffer, boulevard, barrier, etc.) from vehicular traffic
Balanced Modes	Overall corridor capacity	Screenline capacity analysis
Government Plans	Alignment	Consistency with and support for local government plans
Community	"Right traffic on the right roads"	Likelihood of neighbourhood traffic infiltration
	Safety	Minimize potential for conflicts between modes/users and minimize crossing distances for pedestrians
	Public realm	Opportunities for public realm improvements
	Driveways and servicing	Impacts to driveways and garbage collection (etc.)
Cost and Implementation	Transit Operating Cost	Improved end-to-end transit travel time
	Street Ops and Maintenance Cost	Ongoing Ops and Maintenance costs
	Capital	Order-of-magnitude costs
	Phasing	Ability to phase improvements over time

6. Vision Development

Given the various objectives and constraints defined at the outset of the project and determined through the base conditions assessment, there are many ways that the vision for the corridor in the future could be structured to achieve the desired goals. The future year for the vision is assumed to be 2050 in alignment with the District's ATP which envisions an increase in sustainable mode share from 18% in 2011 to 50% in 2050 (see *Figure 30*). This includes substantial increases in transit and cycling, requiring ambitious plans to provide improved land use, infrastructure and service for those modes.

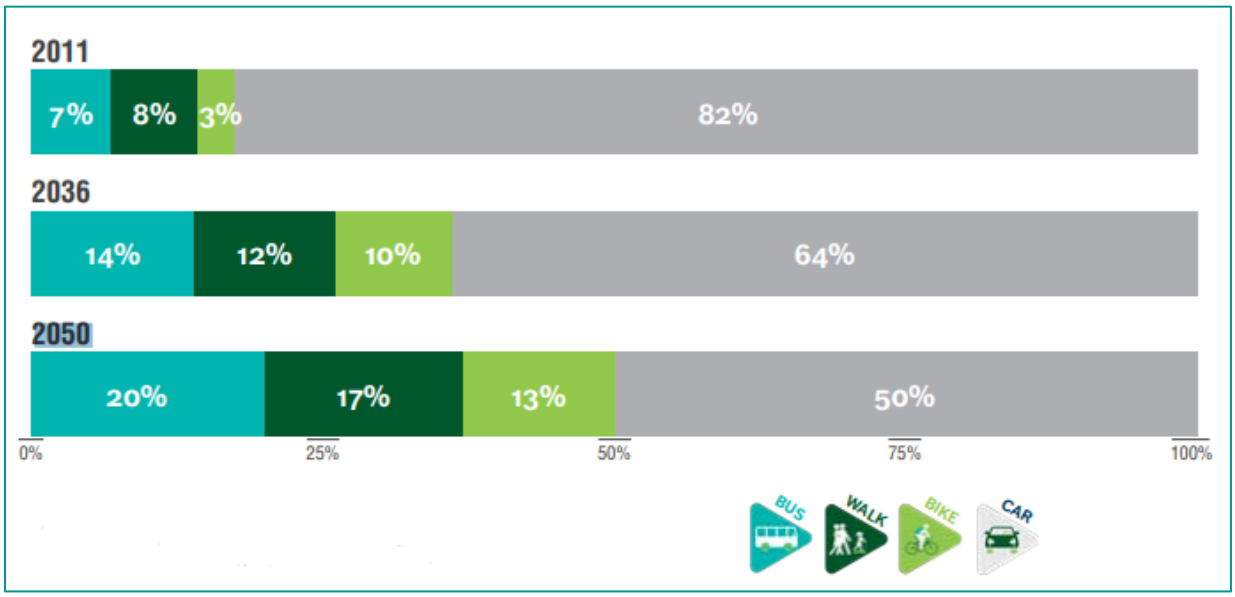


Figure 30: Long-Term Mode Share Target, District of Saanich Active Transportation Plan

To provide structure to the process of determining the most appropriate long-term vision for the corridor, three options were developed to reflect functionally different approaches to reallocating right-of-way. While the intent was to test different options, some common themes were present across all options (such as protected bike lanes). The initial long-term vision options are described below:

6.1. OPTION 1 (CAPACITY)

This option focuses on providing maximum capacity for all modes (private auto, transit, bicycles, and pedestrians) and maintaining vehicular capacity with two general purpose lanes in each direction. Additional features include:

- Widen McKenzie Avenue by 2 lanes
- Curbside bus lanes provided in both directions along the full corridor.
- Protected bike lanes (1.8m) along entire corridor, separated from traffic by a 0.6m buffer.
- Sidewalks at 2.5m midblock and widened to 3.0m at intersections.
- No space for trees at intersections, midblock planting strips of 1.0m is very tight for successful tree planting.
- Overall typical cross-section is 30.8m midblock and 36m at intersections.
- The recent widenings of Douglas Street at Saanich Road and Cloverdale Avenue are examples of what this option looks like when fully built out.

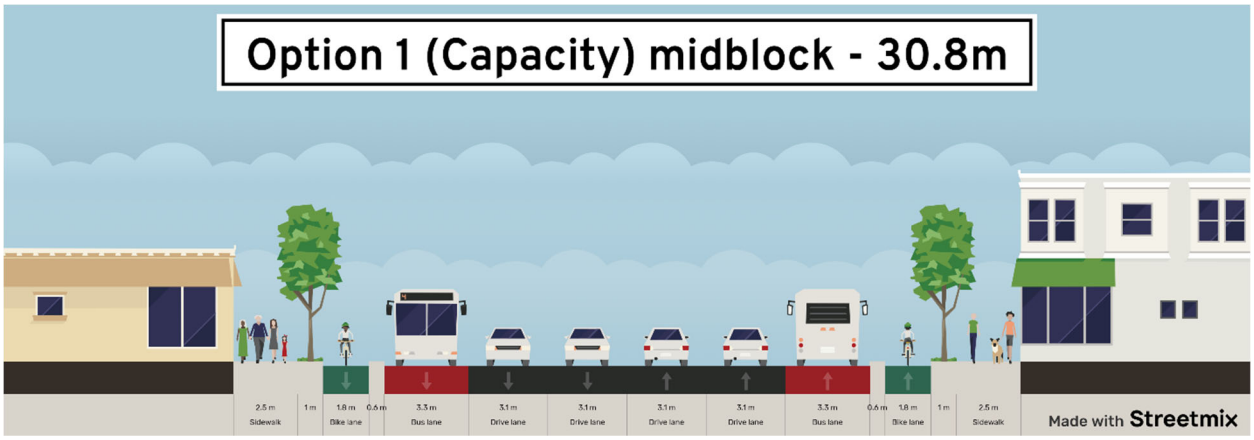


Figure 31: Option 1 Midblock Cross-Section

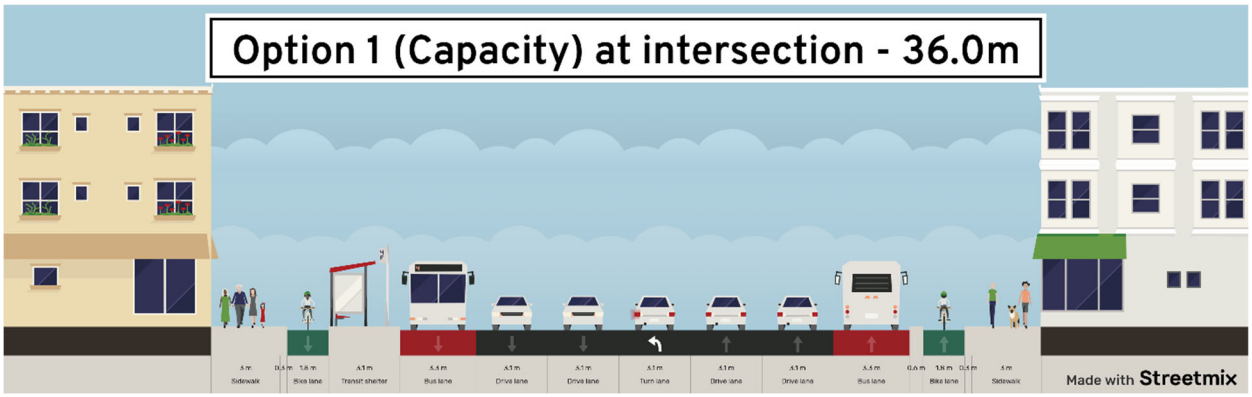


Figure 32: Option 1 Intersection Cross-Section

6.2. OPTION 2 (DEDICATED GUIDEWAY)

This option focuses on providing maximum transit speed and reliability opportunities with exclusive bus-only lanes in the centre of the roadway. Vehicles capacity would be maintained with two lanes in each direction.

- Widening McKenzie Avenue by 2 lanes plus median bus stops
- All left turn movements would need to be protected to prevent bus-turn conflicts.
- Centre-running bus lanes would be provided in both directions, with dedicated bus platforms at stations. The centre-running lanes require protection from general purpose vehicles and the lanes are wider than curbside lanes.
- Protected bike lanes at 1.8m midblock, reducing to 1.5m at intersections with a 0.6m separation.
- Sidewalks at 2.4m at intersections, widening to 2.5m midblock.
- No space for trees at intersections, midblock planting strips of 1.0m is very tight for successful tree planting.
- Overall typical cross-section is 32.4m midblock and 36.4m at intersections.

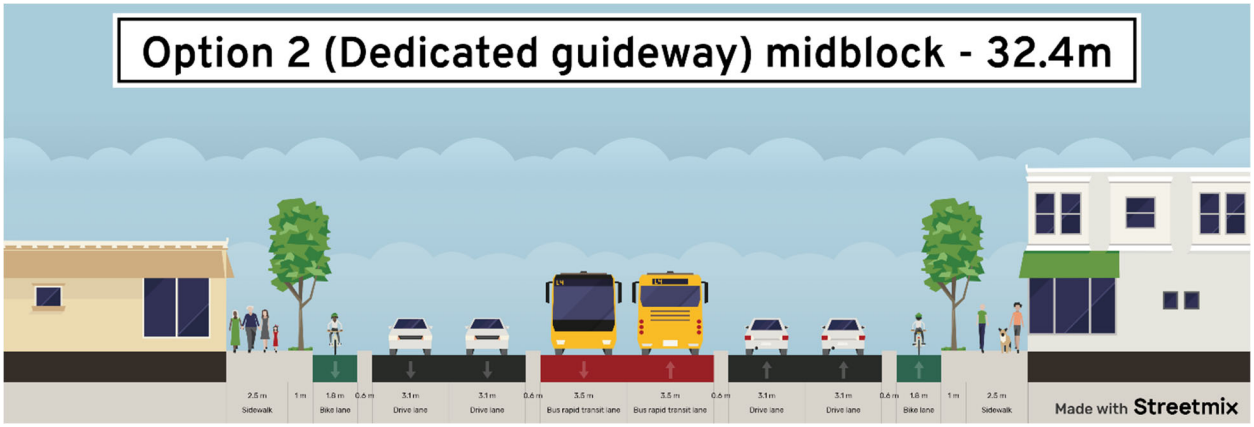


Figure 33: Option 2 Midblock Cross-Section

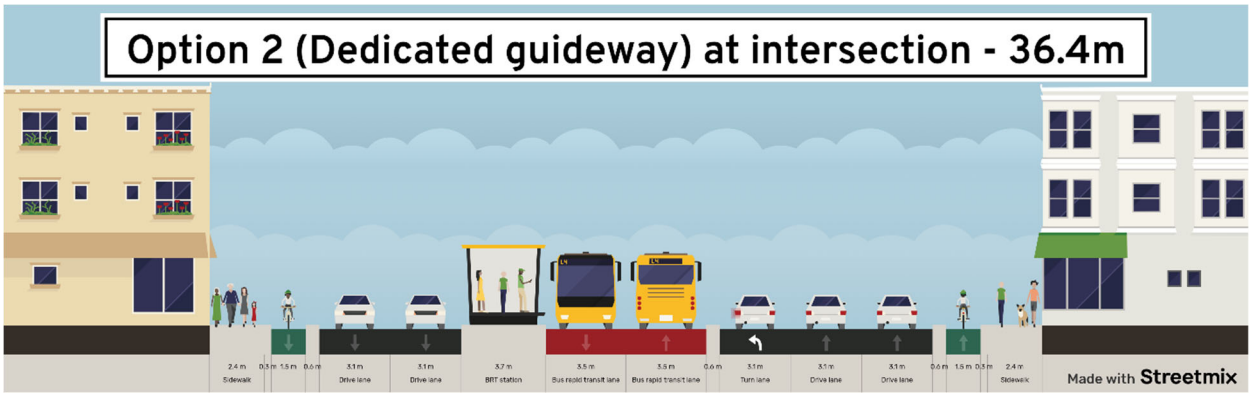


Figure 34: Option 2 Intersection Cross-Section

6.3. OPTION 3 (BALANCED)

This option aims to provide a more balanced cross-section by focusing on transit priority at the intersections where buses are most impacted by traffic congestion. This option also increases space for pedestrians and cyclists.

- Mainain current width, widens on the outisdee to provide priority to pedestrians, cyclists and trees
- Buses would share a space with general purpose traffic between intersections.
- On the approach to intersections, buses would share space with right turning vehicles, but would be able to advance across the intersection to an open lane.
- Protected bike lanes at 1.9m at intersection and 2.0m midblock providing the widest cycling infrastructure out of all options.
- Sidewalks at 3.0m along the entire corridor, again the widest provision of all the options.
- As with the other options, there is limited capacity for trees at intersections. Midblock planting would be within a 1.5m strip, providing a buffer and shading for active modes. Mature tree preservation possible following a detailed tree inventory and adopting policies within QMS study.

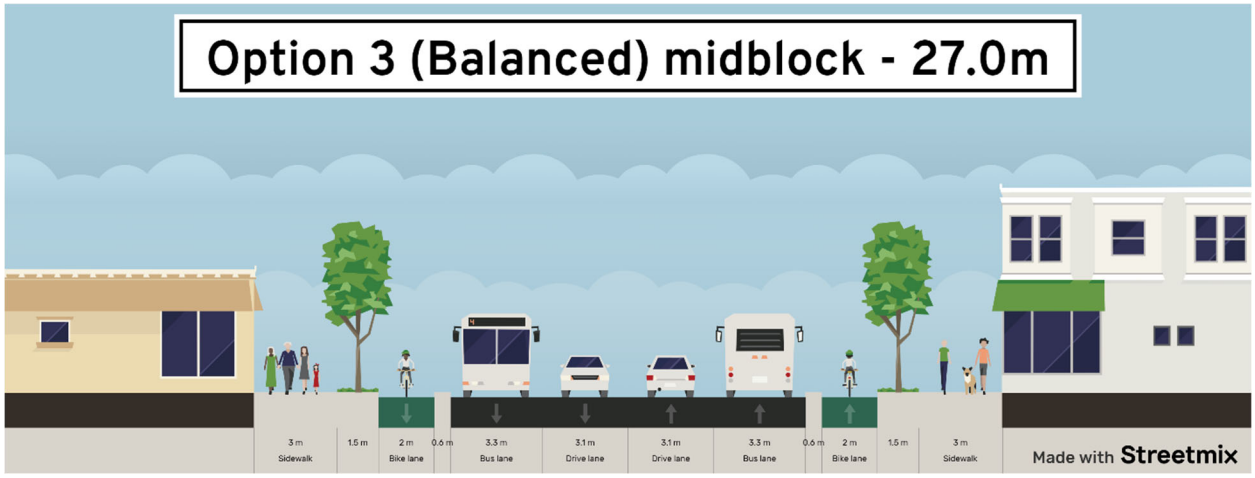


Figure 35: Option 3 Midblock Cross-Section

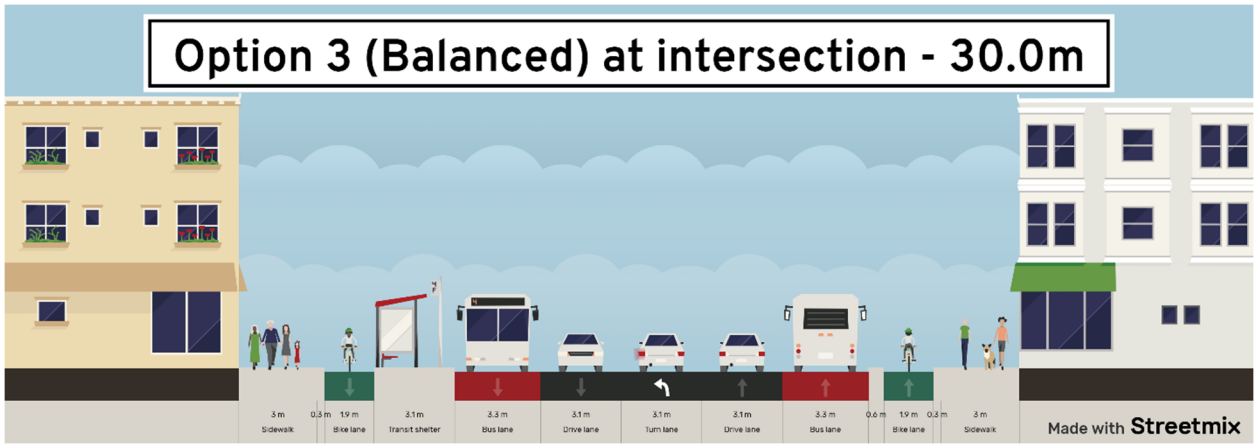


Figure 36: Option 3 Intersection Cross-Section

For ease of comparison, the key details for the three options are summarized in *Table 4*: Summary of options below.

Table 4: Summary of options

	Capacity		Dedicated Guideway		Balanced	
	Intersection	**Midblock**	**Intersection**	**Midblock**	**Intersection**	**Midblock**
ROW width	36.0 m	30.8 m	36.4 m	32.4 m	30.0 m	27.0 m
Curb-to-curb width	29.4 m	23.8 m	31.0 m	25.4 m	23.4 m	18.0 m
Bus lanes	Shared with right turns	Curbside lane	Centre-running bus-only		Shared with right turns	None
General-purpose through lanes	2 lanes	2 lanes	2 lanes	2 lanes	1 lane	2 lanes
Sidewalks	3.0 m	2.5 m	2.4 m	2.5 m	3.0 m	3.0 m
Protected bike lanes	1.8 m	1.8 m	1.5 m	1.8 m	1.9 m	2.0 m
Curbside planting strip	None	1.0 m	None	1.0 m	None	1.5 m

6.4. WORKING GROUP SESSION #2: OPTIONS REVIEW

The second Working Group session of the project was held on May 4, 2022 (via Microsoft Teams) and was well-attended by both BC Transit and District of Saanich staff. The purpose of the meeting was to provide a project update and to present the Long-Term Vision Options as described above. The Working Group then discussed these options and the following key discussion points were noted:

- Opportunities should be sought for widening the pedestrian realm where possible, even where the RoW is constrained.
- More green space, including in the median, would be preferable.
- Consideration for having the green buffer adjacent to the curb lane to protect both pedestrians and cyclists while giving more room to both.
- Dedicated guideway looks unfeasible due to the RoW requirements and restrictions it would place on left turning traffic.
- Reminder that this is a 30-year vision to guide short term solutions, so we should be bold.
- Confirmed that only one vision option will be carried forward, but that multiple scenarios to achieve that vision will be tested.
- Cross-sections at intersections will be key as that will determine not just the throughput along the corridor, but the impact on cross-streets and crossing times for pedestrians and associated safety and comfort considerations.
- Could consider MUPs at some locations, although contra-flow travel can then make the lane dangerous for pedestrians.

- How will local bus routes that service the corridor interface with a dedicated guideway?
- Planting strips should really be a minimum of 1.5m to ensure the success of trees (refer to the Urban Forest Strategy (2010) for more details).

6.5. OVERALL LONG-TERM VISION APPROACH

Based on the evaluation criteria (see Section 5.3) and discussion with the Working Group a qualitative review of the options was undertaken to determine which approach best suited the overall objectives of the study. Many of the challenges of delivering the options are associated with the constrained right-of-way and the need to accommodate multiple modes to achieve a complete street.

- Option 1 would likely provide sufficient overall capacity for all modes, but the number of lanes would result in significant pedestrian crossing distances at intersections and sub-standard active mobility infrastructure on the corridor with these elements only achievable with minimum widths provide, along with excessive property requirements throughout. The intersection lane arrangement would necessitate 7 lanes (9, if the protected bike lanes are included)
- Option 2 would likely improve transit speed and reliability (for RapidBus) the most out of the three options, but there would be locations along the corridor where the RoW would not accommodate the cross-section without substantial property acquisition due to the platform and protected busway requirements. Active mobility provision would also be sub-standard and pedestrian crossing distances and opportunities for mid-block crossing and driveway access would need to be eliminated to remove conflicts with bus operations.
- Option 3 retains much of the existing capacity and provides significant opportunities for active mobility infrastructure and tree planting along the corridor. Intersections provide transit priority to improve speed and reliability but without necessarily extending pedestrian crossing distances. The cross-section can mostly be accommodated within the RoW which would lead to an assumption that this would be the least costly of the options in terms of property acquisition. The reduction in auto capacity will be the most notable challenge with this option, either necessitating mode shift away from private vehicles or else diverting traffic to other routes.

The result of this qualitative assessment is summarized in the table below, with Option 3 – Balanced the only option with no identified ‘poor’ or ‘unworkable’ criteria.

The purpose of this exercise was to determine a general approach to developing the scenarios that will be tested as part of the long-term vision development. By eliminating options that appear to be unfeasible, misaligned with project objectives, or otherwise impractical early on in the process, we avoid unnecessary analysis and can proceed to refining the preferred approach into scenarios that can be implemented.

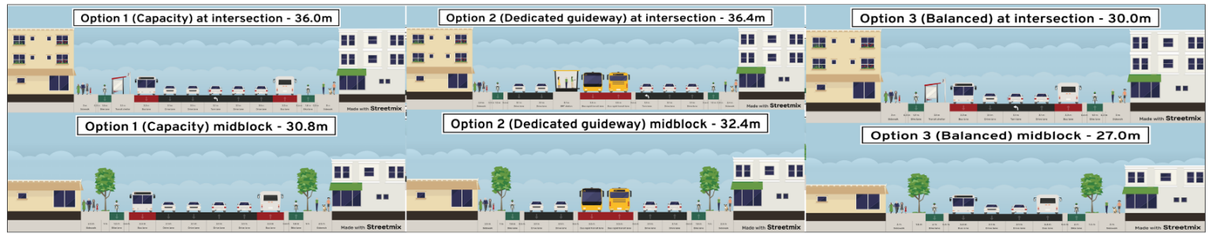
At the close of this initial screening process, Option 3 – Balanced was selected by the working group and project team as the most viable approach within which to develop long-term vision scenarios.

Table 5: Vision Evaluation

Evaluation Framework			Vision					
Categories	**Criteria**	**Measures**	**Option 1: Capacity**		**Option 2: Dedicated Guideway**		**Option 3: Balanced**	
Feasibility	Physical feasibility	Delivered within existing RoW	🟡	30m mid-block RoW would require property acquisition through parts of the corridor	🔴	32m mid-block RoW would require property acquistion throughout almost all of the corridor	○	27m mid-block RoW would require property acquisition through some parts of the corridor
		Availability of sites for bus stops/stations/exchange		Extent of RoW may cause challenges in locating transit stops with adequate space		Stops provided within the roadway so there may be potential limitations		Smaller cross-section at intersection provides ample room for stops
		Impacts to utilities		Impact to all utilities along corridor would be expected		Significant impact to all utilities along corridor would be expected		Lesser impact to all utilities along the corridor would be expected
Transit	Amenities	Room to accommodate transit amenities	○	Extent of RoW may cause challenges in locating transit stops with adequate space	🟢	Stops provided within the roadway	○	Smaller cross-section at intersection provides ample room for stops
	Walking distance	Maximize population within 400m catchment radius of stops/stations		No restriction on maximizing catchment is anticipated		Would likely be a smaller number of stops, given the facilities required and so catchments could be restricted		No restriction on maximizing catchment is anticipated
	Reliability	Travel time variability		Transit operating in a dedicated curb lane		Dedicated guideway		Transit reliability dependent on effectiveness of transit priority improvements at intersections
	Clarity	Ease of understanding of routes, schedules, connections and stop locations		Transit operating in a curb lane		Dedicated centre-running guideway can cause complications for connecting passengers		Transit operating in a curb lane
	Travel time	Relative performance (vs. auto)		Transit operating in a curb lane		Dedicated guideway		Transit operating in a curb lane and in mixed-traffic between intersections
Active transportation	Net improvement	Must not diminish existing facilities and must improve overall walking/cycling infrastructure	🟡	Dedicated bike facilities provided along corridor	🟡	Dedicated bike facility provided along corridor	🟢	Dedicated bike facility provided along corridor
	Sidewalks	Minimum vs. ideal pedestrian infrastructure		3m sidewalk at intersections, 2.5m at mid-block plus tree-planting area.		2.4m sidewalk at intersections, 2.5m midblock plus small planting area		3m sidewalk at intersections and mid-block plus generous tree-planting area
	Cycling	Minimum vs. ideal cycling infrastructure		1.8m bike lane width		1.5-1.8m bike lane		1.9-2m bike lane
	Separation/protection	Level of protection provided (buffer, boulevard, barrier, etc) from vehicular traffic		0.6m raised buffer with dedicated bus lane (lower frequency of vehicles) adjacent		0.6m raised buffer adjacent to auto lane		0.6m raised buffer
Balanced modes	Overall corridor capacity	Screenline capacity analysis	🟢	2 auto lanes, 1 bus lane, 1 bike lane and sidewalk in each direction	🟢	2 auto lanes, 1 bus lane, 1 bike lane and sidewalk in each direction	🟡	1 auto lanes, 1 bus/auto lane, 1 bike lane and sidewalk in each direction
Government Plans	Alignment	Consistency with and support for local government plans	○	Highly supportive of strategic plans	○	Highly supportive of strategic plans	○	Highly supportive of strategic plans
Community	"Right traffic on the right roads"	Likelihood of neighbourhood traffic infiltration	🟡	Low, due to retention of 2 travel lanes for auto	🟡	Low, due to retention of 2 travel lanes for auto, but limited turn options may result in alternate routing	🟡	Higher, due to lack of 2 dedicated auto lanes
	Safety	Minimize potential for conflicts between modes/users and minimize crossing distances for pedestrians		Bike/bus/ped conflict areas would need to be addressed at the option level		Bike/bus/ped conflict areas would need to be addressed at the option level		Bike/bus/ped conflict areas would need to be addressed at the option level. Shortest crosswalk distance
	Public realm	Opportunities for public realm improvements		Improvements challenging at intersections		Improvements challenging at intersections		RoW available for urban realm improvements throughout
	Driveways and servicing	Impacts to driveways and garbage collection (etc)		Curb bus lanes		Transit is centre-running so left-turns will be restricted		Transit at curb
Cost and Implementation	Transit Operating Cost	Improved end-to-end transit travel time	○	Dedicated bus lanes	○	Dedicated bus lanes	🟢	Transit facilities only at intersections
	Street Ops and Maintenance Cost	Ongoing Ops and Maintenance costs		Painted bus lane		Dedicated guideway and island stops		Painted bus lanes only at intersections
	Capital	Order-of-magnitude costs		Property acquisition and build-out of RoW		Property acquisition and build-out of RoW		Property acquisition and build-out of RoW
	Phasing	Ability to phase improvements over time		Heavily dependent on development activity		Heavily dependent on development activity		Less dependent on development activity

Alignment with project objectives:

- Excellent
- Good
- Neutral
- Poor
- Unworkable



7. Scenario Development

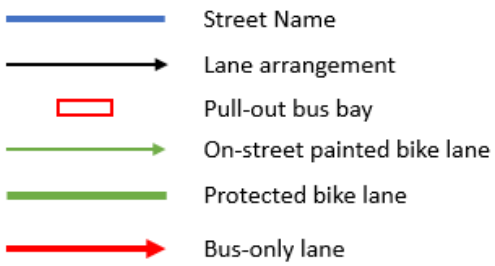
Within the general cross-section from Option 3, selected during the vision development stage, there are several different ways to achieve the priorities and objectives of the study. The following scenarios have been prepared to test the efficacy of different approaches to achieving the vision. Note, all three scenarios were assumed to include dedicated cycling infrastructure along the length of the corridor.

1. Bus-only lanes: dedicating the curb lanes along the corridor to transit.

2. Bus priority: implementation of transit priority measures at intersections while not necessarily removing roadway capacity for general traffic.

3. Intersection improvements: specific transit-related interventions that are targeted towards mitigating identified (and forecast) delay for bus operations.

To prepare the scenarios for both modelling and conceptual design, the corridor was first described in terms of the current lane arrangements for all modes. The line diagram below illustrates the number of general-purpose lanes and where dedicated turn lanes are provided. The extent of dedicated cycling facility is also indicated along with the location of pull-out bus bays.



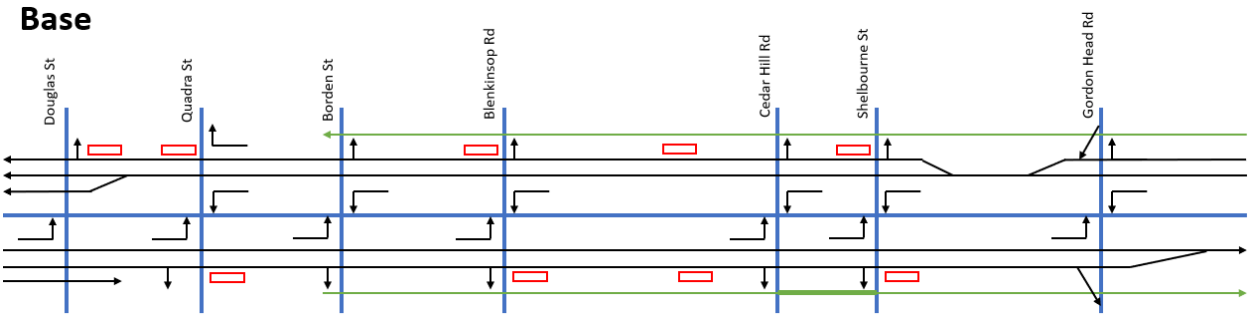


Figure 37: Base Line Diagram

Of note in the base condition is that there is only one block with protected bicycle infrastructure in the base condition (between Cedar Hill Road and Shelbourne Street). Additionally evident is the single lane of travel westbound from Gordon Head Road to Shelbourne Street and channelized right-turn lanes at Gordon Head Road.

The following sections describe the scenarios and highlight key elements that differentiate them.

7.1. SCENARIO 1 – BUS-ONLY LANES

Scenario 1 proposes a four-lane cross-section with dedicated left turn lanes at intersections. By converting a general-purpose curb lane into a dedicated bus lane, the existing pull-out bus bays can be removed, and remaining RoW can be given over to active mode facilities.

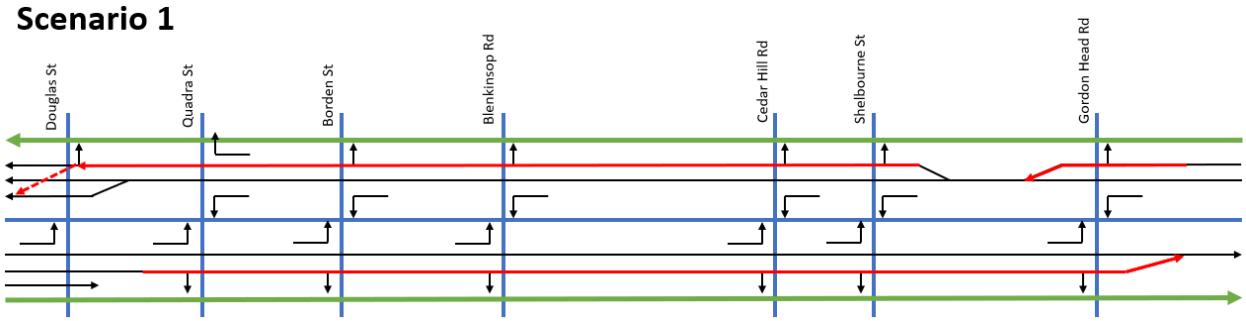


Figure 38: Scenario 1 Line Diagram

Note that in this Scenario the protected bike lanes now extend along the entire corridor and dedicated turn lanes have been retained. The channelized right turn lanes at Gordon Head Road would be removed to provide a more urban intersection arrangement.

7.2. SCENARIO 2 – BUS PRIORITY

Scenario 2 essentially retains the existing roadway arrangement for all lanes, but with the addition of transit queue jump infrastructure to address the intersection-related delays that were identified during the base conditions assessment. Protected bike lanes are provided along the entire corridor, with one instance of the westbound bike lane transitioning to an on-street painted bike lane (included for review purposes, as this is not a favoured method of delivering cycling infrastructure) at Blenkinsop Road.

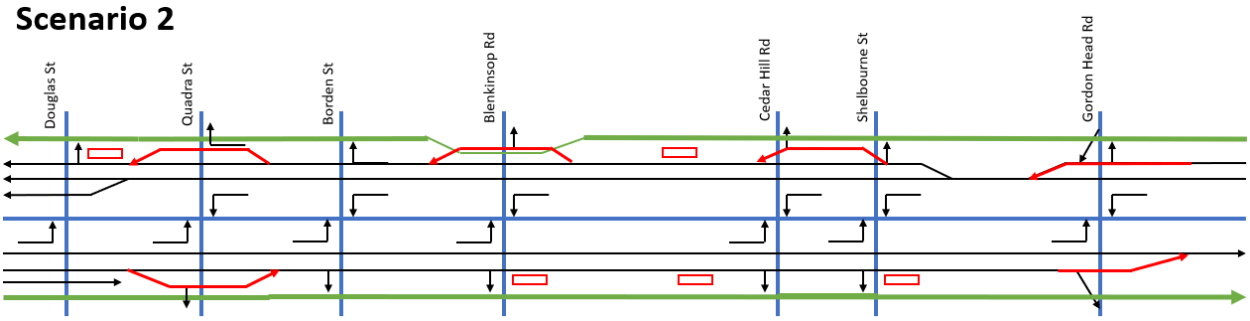


Figure 39: Scenario 2 Line Diagram

Note that this option necessarily increases the cross-section of the roadway through the intersections. Primarily, transit infrastructure has been provided in the westbound direction as that is where the greatest instances of delay and travel time variability were detected.

7.3. SCENARIO 3 – INTERSECTION IMPROVEMENTS

Based on the findings from the first two scenarios, Scenario 3 aims to address specific concerns at intersections and improve overall operation. A roundabout was developed for the Gordon Head Road intersection to try and alleviate the congestion caused by the lane merging that occurs both up and downstream without the use of channelized right-turn lanes. The westbound bus lane at Borden Street was extended through to west of Quadra Street for ease of driver navigation.

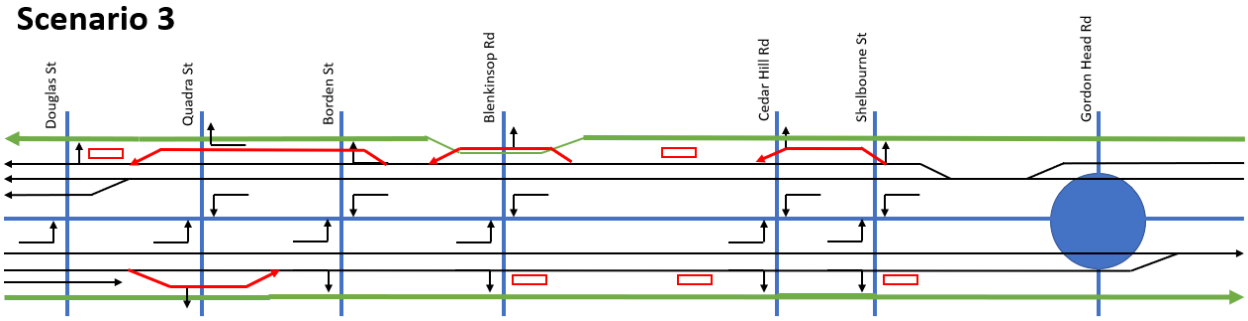


Figure 40: Scenario 3 Line Diagram

As with all scenarios, protected bike lanes are provided throughout.

7.4. WORKING GROUP SESSION #3: SCENARIO ASSESSMENT

The third Working Group session was held on August 19, 2022 (via Microsoft Teams) with the purpose of reviewing the emerging scenarios and concepts for improvement along the corridor. The feedback from this session was used to finalize the scenarios which could then be modelled (using Vissim) and drawn as conceptual plans.

The following key discussion points were noted:

- Ensure that crossing distances / times are included in scenario analysis.
- What will the impact of converting a lane to bus-only, in terms of mode shift, traffic diversion be?
- Additional knock-on effects of the RoW include rainwater run-off and drainage.
- Is a service of 8 buses per hour sufficient to justify an entire lane?
- Note that it would facilitate other routes than RapidBus.
- Be sure to focus on the moving of people, not vehicles.
- Scenario 1 will likely create challenges due to traffic infiltration of neighbourhoods.
- Are there opportunities for a phased approach where a version of Scenario 2 (for example) is implemented in the short term and then built-out to Scenario 1?
- Note that this is an exercise to determine the long-term vision and short-term improvements will be determined in the next phase of work.
- Note that buses may get stuck behind right-turning traffic in the shared queue jump lanes and this will need to be addressed.
- Confirmation that we're using growth projections for future year modelling that incorporate all development build-outs in the region.

- Note that there will be a re-optimization of signals when refining the preferred vision so the scenario testing should just to like-for-like comparisons.

Conceptual plan drawings of all three scenarios were produced to assist in overall evaluation and understanding of the various interventions proposed. These drawings are provided at *Appendix B*.

8. Future Year Modelling (Vissim)

A Vissim traffic micro-simulation model was developed for the McKenzie Avenue corridor between Finnerty Road and Douglas Street to evaluate the three long-term scenarios. Vissim is generally better suited for corridor-level evaluation than other software packages such as Synchro or Vistro, especially if transit priority options and complex intersection configurations are being considered. This section highlights key findings and performance of the three scenarios. For more details on model development and technical traffic analysis see *Appendix D: Technical Memo – Vissim Microsimulation Analysis*.

8.1. BASE YEAR MODEL DEVELOPMENT

A base year 2019 McKenzie Avenue corridor Vissim model was developed using pre-Covid turn movement counts, signal timing plans and transit service information provided by the District of Saanich and BC Transit. Given that higher traffic volumes are observed during the afternoon in both directions, only the PM peak was modelled. The base year model was validated and calibrated to observed traffic conditions in the corridor using traffic counts and travel time information that was sourced from Google Maps Application Programming Interface (API)[5]. A well validated and calibrated Vissim model provides confidence in its ability to generate robust predictions for testing the performance of different scenarios.

As shown in the time space diagrams (*Figure 41* and *Figure 42*), the modelled corridor travel times for general traffic fall within observed ranges from Google, as described by the ‘Best-Case’, ‘Typical’, and ‘Worst-Case’ trend lines.

[5] Google Maps API is a Google Maps-based tool that can be used to extract travel time statistics based on a combination of historic observations and a proprietary travel time prediction developed by Google.

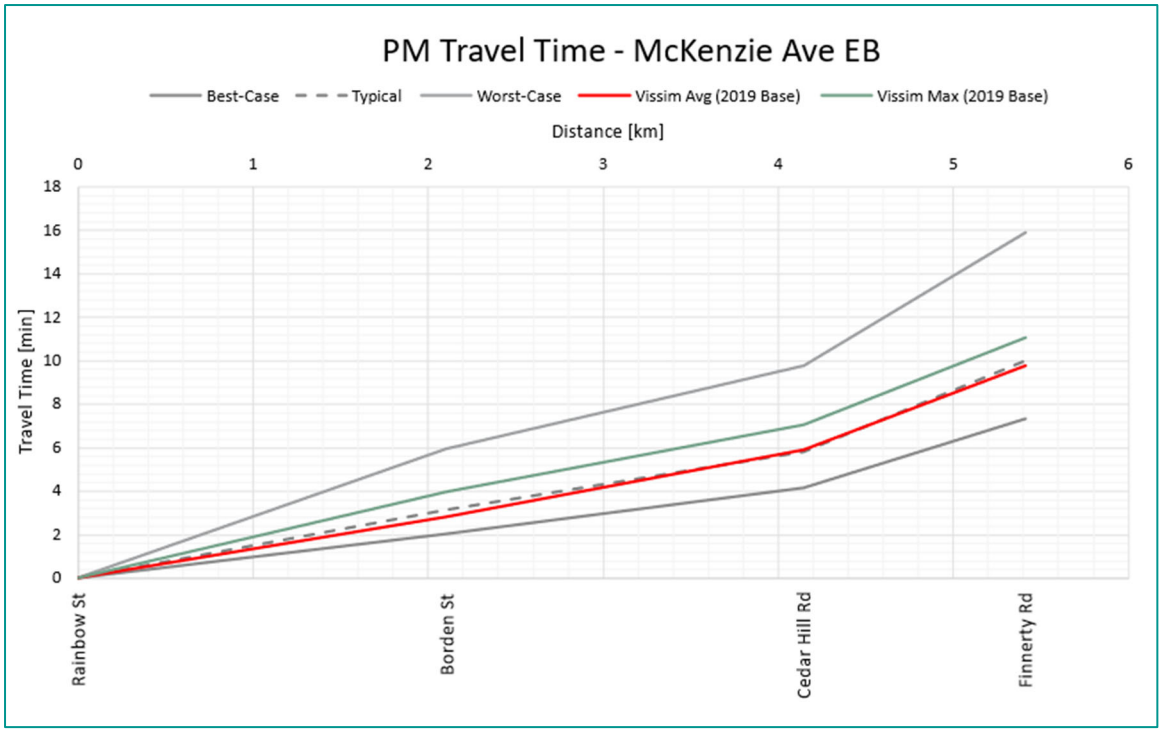


Figure 41: Vissim Model Validation – Eastbound PM Time-Space Diagram

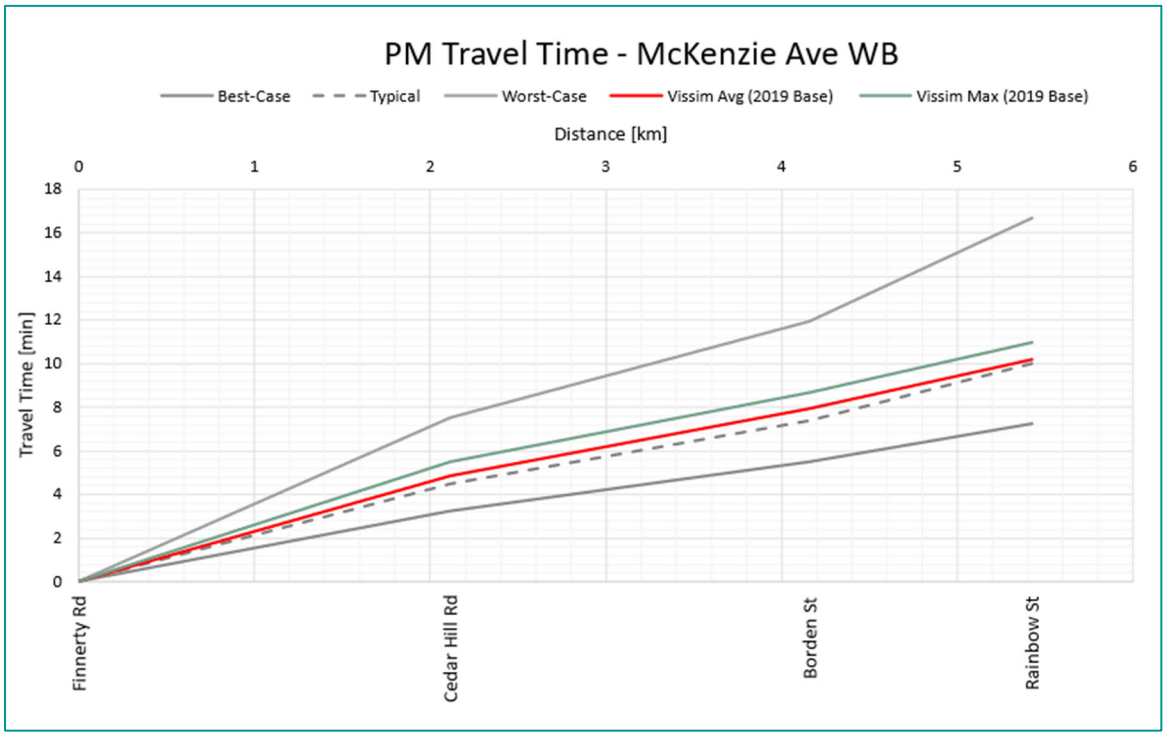


Figure 42: Vissim Model Validation – Westbound PM Time-Space Diagram

Four bus routes that partially or fully run along McKenzie Avenue were included in the base year model as summarized in *Table 6*. An important thing to note is that route #16 was discontinued at the onset of the Covid-19 pandemic but is useful to include to validate the modelled travel times.

Table 6: Afternoon Peak Bus Service on McKenzie (2019)

Route Number	Description	Headway[6] (PM)	Type	McKenzie Section (Study Area)
16	Uptown - UVic	15 min	Limited Stop	Hwy 17 - UVic
26	Dockyard - UVic	15 min	Frequent Stop	Saanich Rd - UVic
39	Westhills - UVic	15 min	Frequent Stop	Shelbourne St - UVic
51	Langford - UVic	60 min	Limited Stop	Hwy 17 - UVic

The model does not explicitly consider the quality of walking or cycling infrastructure, but the model does, however account for pedestrian and cycling intersection crossing volumes and related signal timing parameters.

Modelled transit travel times on McKenzie also validated well with observed estimates provided by BC Transit as shown in *Figure 43* and *Figure 44*.

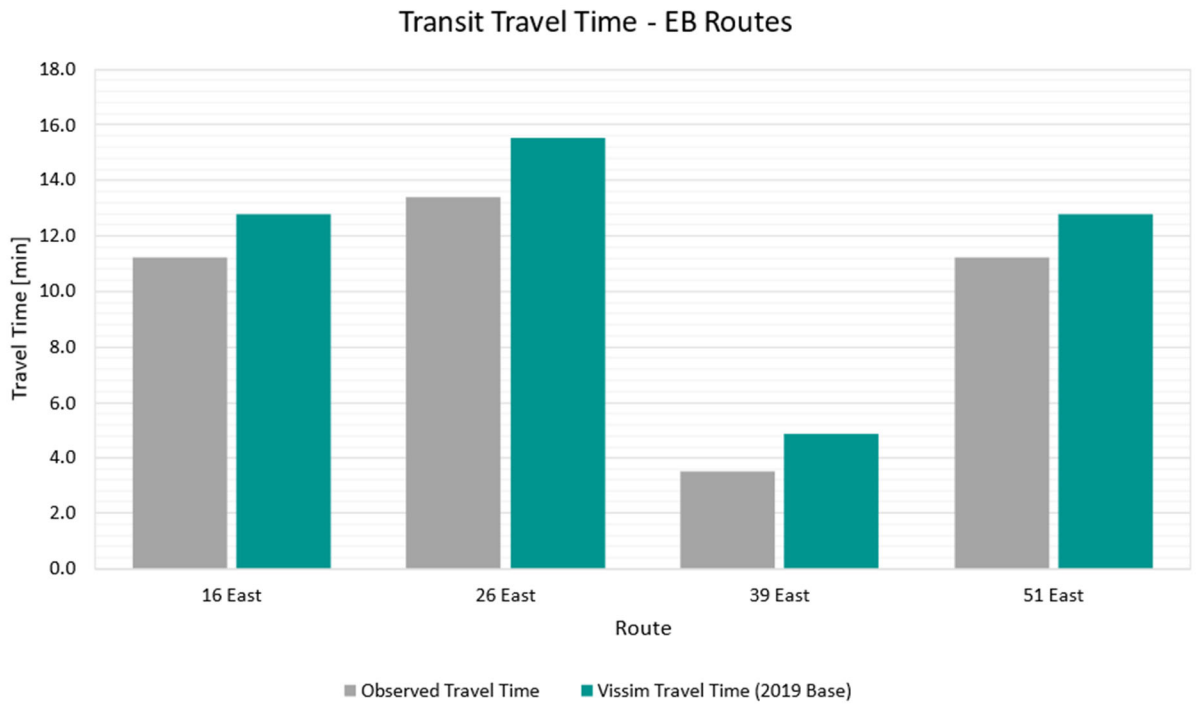


Figure 43: Vissim Model Validation – Modelled vs Observed Eastbound Bus Routes (on McKenzie)

[6] Headway is the amount of time between transit vehicle arrivals at a stop.

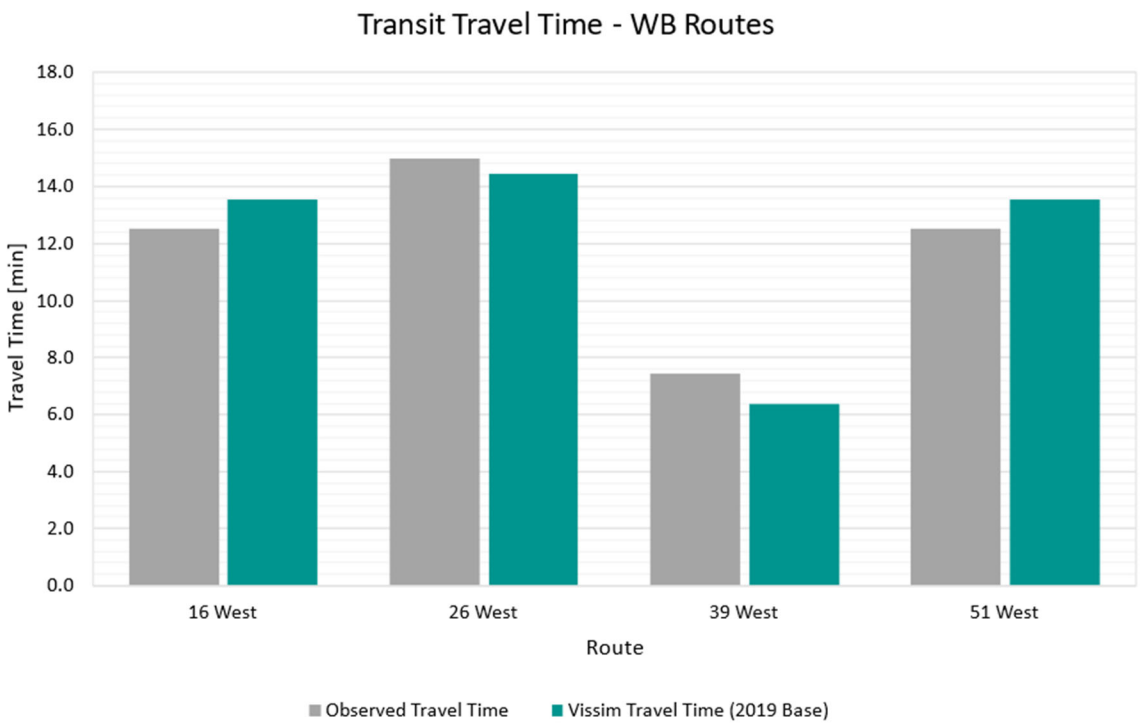


Figure 44: Vissim Model Validation – Modelled vs Observed Westbound Bus Routes (on McKenzie)

8.2. FUTURE BUSINESS AS USUAL (BAU)

A future BAU Vissim model was developed for year 2050, which is consistent with the District of Saanich's current long-term transportation planning horizon. The BAU model serves as the main comparator against which the three long-term scenarios are evaluated.

8.2.1. Future Modelling Assumptions

The following summarizes key assumptions used to develop the 2050 BAU corridor model for the afternoon peak.

1) **Corridor growth factors by mode, auto and transit**: Annual growth factors of 0.5% and 1.5% for auto volumes and transit ridership respectively were developed based on benchmark observed data, forecasts from the CRD travel demand model, BC Stats and District of Saanich's long-term target of increased sustainable travel. Vehicle growth rate at segments that are capacity constrained today was reduced to 0.3% annually. For active modes, walking and cyclists, a 1.5% annual growth was also assumed. The higher growth rate assumed for sustainable modes aligns with the District's long-term vision of a 50% sustainable trip mode share by 2050.

2) **Changes to Signal Timing Plans:** To accommodate future traffic growth, signal timing plans for intersections along the corridor were re-optimized using Synchro.

3) **Future Bus Service:** Future PM peak bus service (2050) assumptions, including RapidBus, were provided by BC Transit and coded in the Vissim model. These are shown below in *Table 7*. Further, dwell times were adjusted to account for increased in future ridership.

Table 7: Future Bus Service Assumption on McKenzie Avenue

Route Number	Description	Frequency (PM)	Headway (PM)	Type	McKenzie Section (Study Area)
26	Dockyard - UVic	4 buses/hr	15 min	Frequent Stop	Saanich Rd - UVic
39	Westhills - UVic	4 buses/hr	15 min	Frequent Stop	Shelbourne St - UVic
51	TBD	2 buses/hr	30 min	Limited Stop	Hwy 17 - UVic
40	Langford - UVic	4 buses/hr	15 min	Limited Stop	Hwy 17 - UVic
RapidBus	Uptown - UVic	8 buses/hr	7.5 min	Limited Stop	Saanich Rd - UVic

Figure 45 shows the forecast daily people movement along McKenzie Avenue across two screenline locations: east of Borden Street and east of Shelbourne Street. These figures are based on the mode-specific growth assumptions stated earlier and represent person movement volumes for the business-as-usual scenario (BAU) scenario. By 2050, about 24% of *all* trips east of Shelbourne Street are forecast to be made by transit, which aligns well with the District's target of increased overall transit use by 2050. For comparison, 2023 UVic data indicates that around 26% of daily trips to/from the campus are taken by transit. This percentage would need to continue to increase to reach the overall District goal of 20%.

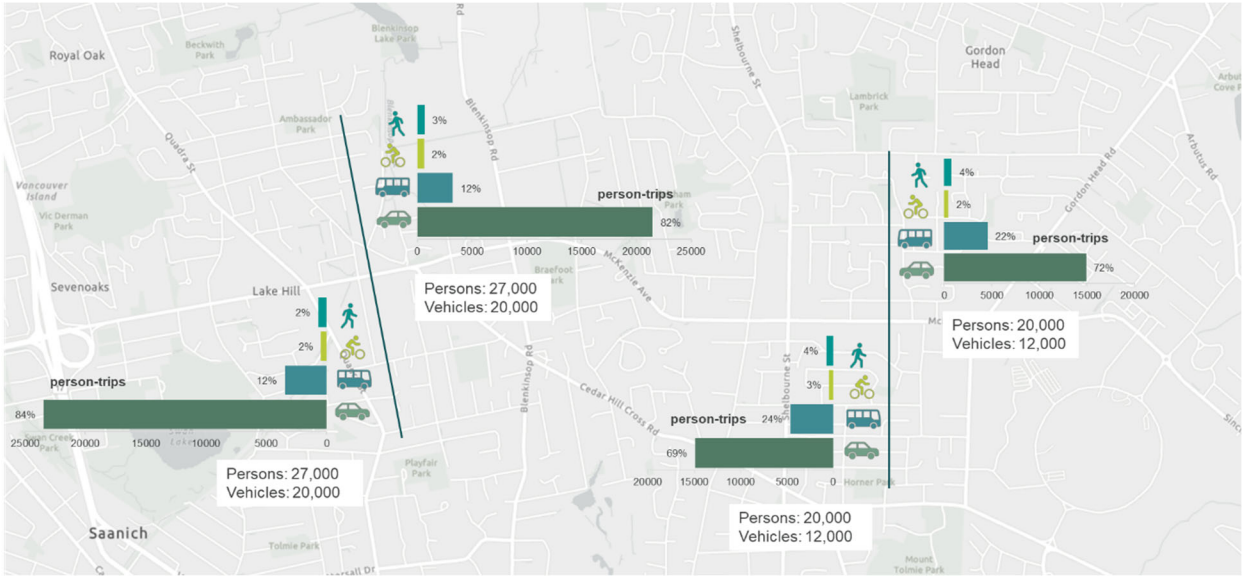


Figure 45: Future Daily Mode Share Screenline

Figure 46 summarizes overall traffic operation and average queues for signalized intersections on McKenzie for the BAU scenario. Below is a summary of hotspots that can impact transit and traffic performance by 2050.

- The westbound through movement at Gordon Head Road becomes a major bottleneck with the queue consistently spilling back to McGill Road and occasionally to Vikes Way. Further this queue blocks the right-turning volume and buses sharing the same lane with through traffic.
- The other major bottleneck is the eastbound approach at Quadra, with the average queue exceeding 200 meters which blocks access to properties and businesses.
- The average queue length for the eastbound left movement at Quadra Street exceeds 200 meters indicating that the existing left-turn storage bay may not be sufficient. This potentially can be mitigated by allowing left turn movement at Saanich Road.
- Major north-south approaches operate at or exceed capacity, specifically, Quadra Street and Shelbourne Street, which are also frequent transit routes.

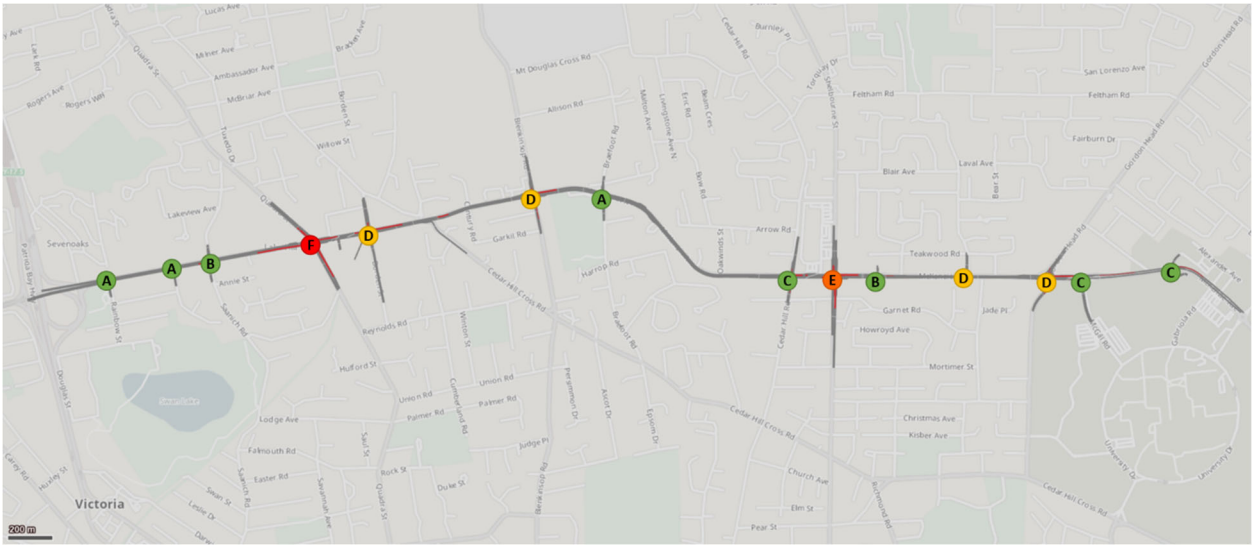


Figure 46: 2050 BAU LOS and Average Queues (red lines)

8.3. SCENARIO EVALUATION

This section presents the evaluation of the three proposed long-term vision scenarios that were previously described in Section 5.1. All three scenarios build off the 2050 BAU scenario. For Scenario 1, a 30% - 45% of traffic reduction was estimated[7] on McKenzie Avenue, largely due to traffic diverting to other roads in the study area, and to a lesser extent, mode and destination shifts. The diversion of traffic allows for large travel time benefits for transit, but at the inconvenience of private auto travel – more detail can be found in ***Appendix D***. In general, the local network will be able to accommodate the additional traffic. Scenario 3 assumes a roundabout at Gordon Head Road and extends the westbound bus queue

[7] These estimates were generated from the Capital Region District (CRD) Travel Demand Model and reflect weekday PM peak hours

jump at Borden Street through to west of Quadra Street for ease of navigation. No traffic diversion was assumed for Scenarios 2 and 3 because these scenarios do not decrease vehicle capacity.

8.3.1. General Traffic Analysis

Figure 47 and *Figure 48* are end-to-end corridor time-space diagrams comparing the three scenarios with the 2050 BAU Scenario for general traffic. In the eastbound direction, all three scenarios operate similarly and reduce travel times by about 1 to 2 minutes relative to the BAU. These savings are largely due to the separation of right turning traffic and buses from through traffic at Quadra Street, and traffic diversion (in the case of Scenario 1).

In the westbound direction, Scenario 1 travel times are approximately 1 to 2 minutes faster between Finnerty Road and Cedar Hill Road. This is largely due to the estimated traffic diversion away from the corridor which improves traffic operations specially at the Gordon Head Road congestion hotspot. In Scenario 2, however, the combination of the McKenzie Avenue/Gordon Head Road configuration and westbound bus queue jump lane results in significant queueing and delay, as indicated in *Figure 48*. This also has the undesired effect of restricting bus access to the queue jump lane. The roundabout option at Gordon Head Road in Scenario 3 improves westbound traffic movement relative to Scenario 2 as shown in *Figure 48* (between Finnerty Road and Cedar Hill Road). This comes at the expense of north-south movements as the intersection is dominated by the larger-east west stream, reducing opportunities for minor north-south traffic to travel along the roundabout. The intersection analysis demonstrated that all north and south movements operate at LOS F with extensive (greater than 2 minutes) delay, and queue lengths exceeding 140m. Westbound movements would also experience queuing in excess of 200m (maximum) and LOS E during peak hours. Thus, a roundabout option is not viable at that location.

Between Cedar Hill Road and Douglas Street, the three scenarios operate similarly in the westbound direction, generating savings of about 1 to 2 minutes relative to the BAU due to the separation of right turning traffic from the traffic stream at busy intersections.

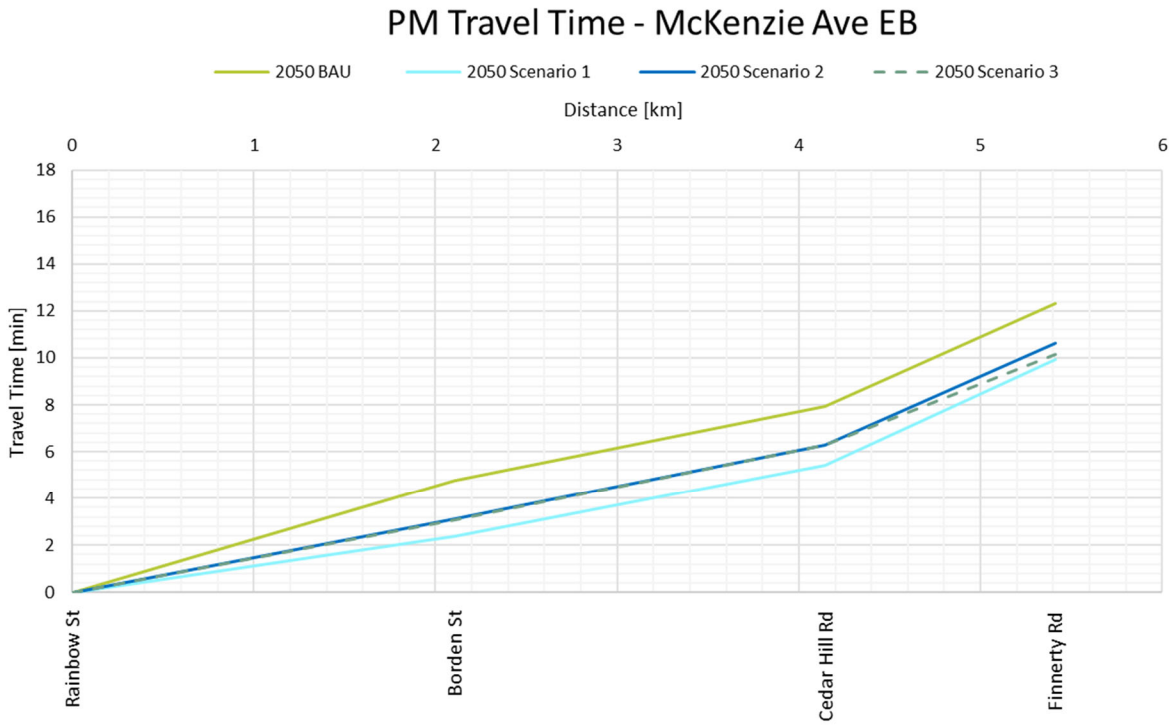


Figure 47: Eastbound Time-Space Diagram, Scenario 1, 2, 3 vs 2050 BAU

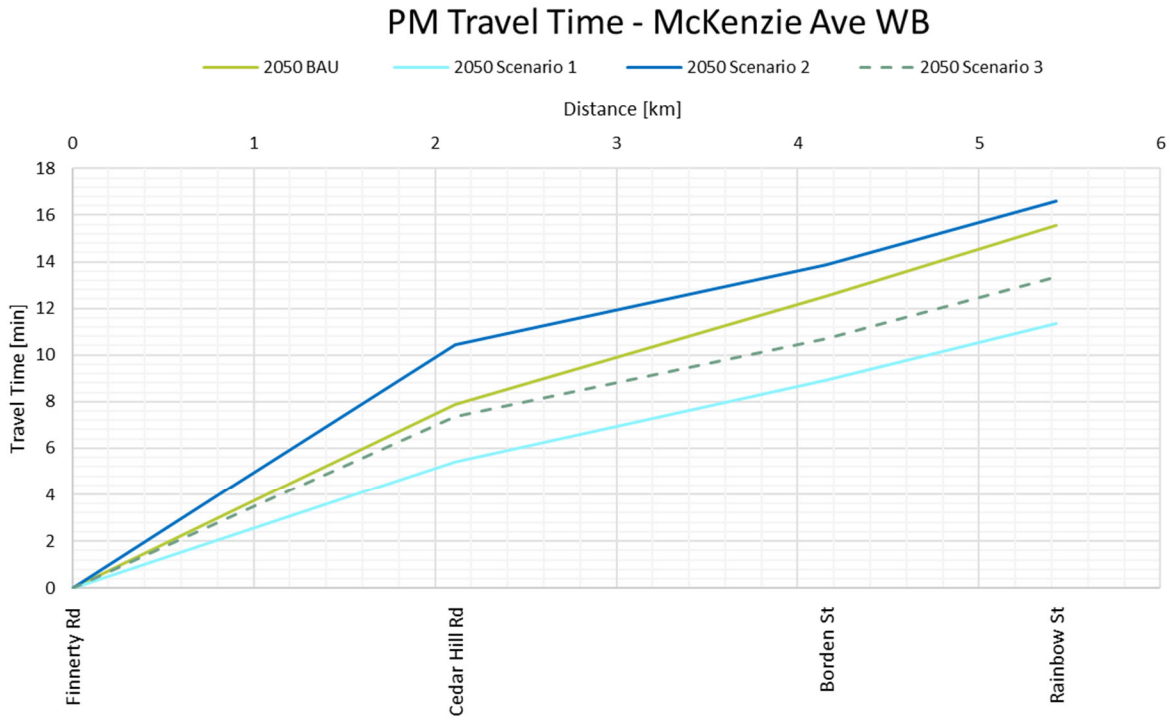


Figure 48: Westbound Time-Space Diagram, Scenario 1, 2, 3 vs 2050 BAU

In general, traffic operations at intersections in all scenarios are similar to the BAU except at Gordon Head Road where traffic performance in the westbound direction deteriorates substantially in Scenario 2. Some north-south movements in Scenario 1 become more congested due to traffic diversion. This, however, can be largely mitigated by re-optimising the signals to provide more north-south green time given lower east-west volumes. *Table 8* summarizes the main differences found in the traffic operations analysis for Scenarios 1 and 2 and highlights locations where queues can potentially impact bus access. Where no significant difference was found, the table is left blank. Westbound queues at Gordon Head Road and McGill Road (Scenario 2) indicate that the bus lane will need to be extended further back upstream possibly to Vikes Way. Other locations that warrant extension of the bus queue jump lane are Quadra Street in the eastbound direction as far back as Saanich Road. Right-of-way constraints at Shelbourne Street restrict the extension of the bus queue jump lane in the westbound direction in Scenario 2 further upstream. These findings all provide valuable insight for developing the preferred vision concept for the corridor.

Scenario 3 is excluded as traffic performance at the intersections is similar to Scenario 2, except at Gordon Head Road where the roundabout option was tested in Scenario 3.

Table 8: Summary outcomes for Scenarios 1 and 2

Intersection	Scenario 1		Scenario 2	
	East - West	North - South	East - West	North - South
Quadra	EB-left movement exceeds capacity	NB approach exceeds capacity	EB-left movement exceeds capacity Avg EB queue (110 m) can block bus access	NB approach exceeds capacity
Borden		NB/SB approaches close to capacity	WB-left movement exceeds capacity	NB/SB approaches close to capacity
Blenkinsop		NB approach exceeds capacity		NB approach close to capacity
Cedar Hill		NB approach close to capacity		NB approach close to capacity
Shelbourne	Avg westbound queue (110 m) can block bus access	NB/SB approaches exceed capacity	EB-left movement exceeds capacity	NB approach exceeds capacity SB approach close to capacity
Gordon Head		NB approach close to capacity	Avg WB queue (150 m) can block bus access	NB approach close to capacity
McGill			WB approach close to capacity Avg WB queue (260 m) can block bus access	

8.3.2. Transit Analysis

Figure 49 and *Figure 50* compare bus travel times for the RapidBus and local route (#26) on McKenzie Avenue for the three scenarios and the BAU. In the eastbound direction, all three scenarios achieve similar travel times savings, approximately 1.5 minutes.

With dedicated bus lanes (Scenario 1), RapidBus achieves significant travel time savings, approximately five minutes in the busier westbound direction[8]. In Scenario 2, however, the RapidBus operates slower than the BAU, travel time gains from queue jump lanes are negated by the major bottleneck at Gordon Head Road. The roundabout option mitigates this, however as previously discussed, this option operates poorly overall due to significant delays at the north-south approaches.

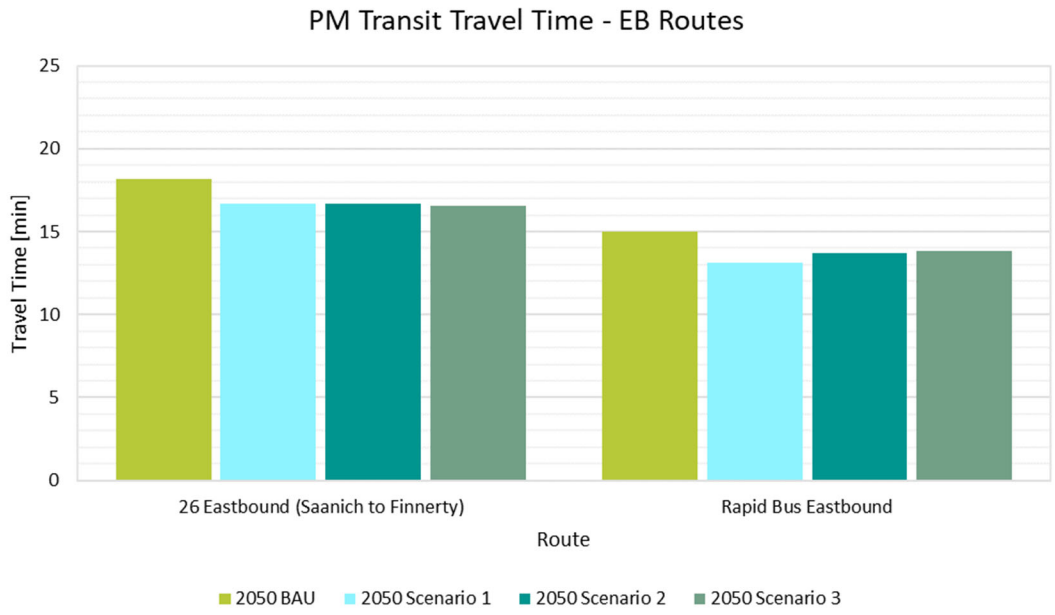


Figure 49: Eastbound Bus Travel Times, Scenario 1, 2,3 vs 2050 BAU

[8] RapidBus appears to operate slightly slower than the No. 26. That is partly because the travel time for the No.26 was extracted for a shorter segment from Vissim, 4.5 km segment between Finnerty Road and Quadra Street. The RapidBus travel time measurement is for the whole corridor (5.5 km). Further, dwell times on the RapidBus are longer given assumed higher ridership levels.

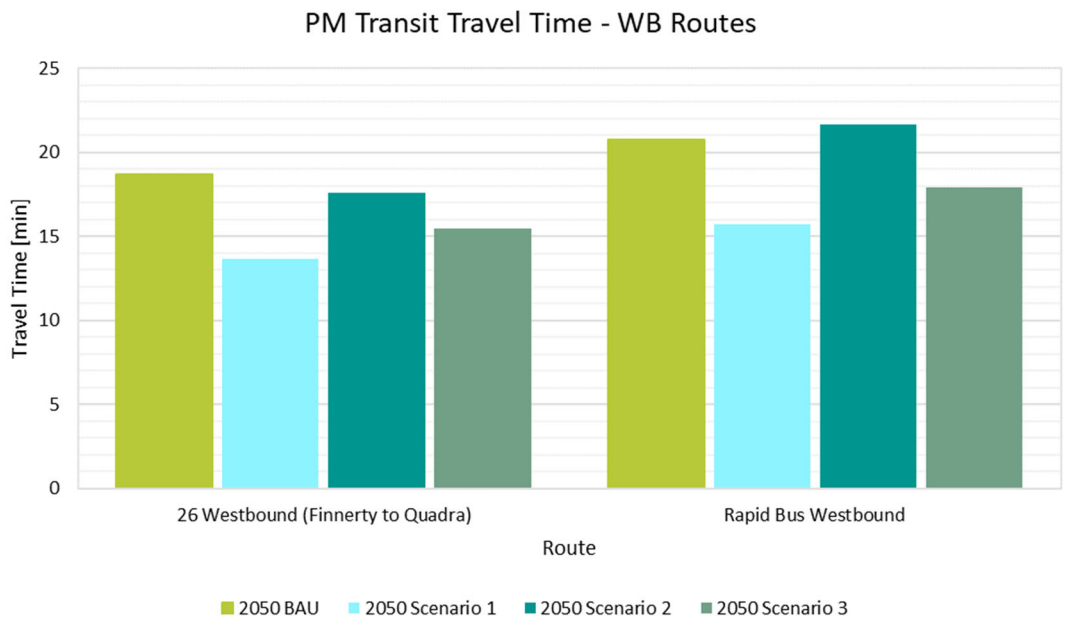


Figure 50: Westbound Bus Travel Times, Scenario 1, 2,3 vs 2050 BAU

Table 9 summarizes changes in average bus delays relative to the BAU scenario at the five busiest intersections in the corridor. In Scenario 3, the extension of the bus queue jump lane in the westbound direction, from upstream Borden Street to downstream Quadra Street, achieves significant travel time savings. A similar intervention at Shelbourne Street, was considered however this would be physically challenging due to property constraints.

Table 9: Bus Delay Compared to 2050 BAU

	Bus Delay at Key Intersections Compared to 2050 BAU [sec]					
	Scenario 1		Scenario 2		Scenario 3	
Intersection	**EB**	**WB**	**EB**	**WB**	**EB**	**WB**
Quadra St	-50	-20	-40	-20	-40	-30
Borden St	0	-50	0	-20	0	-40
Cedar Hill Rd	0	-10	0	-10	0	-10
Shelbourne St	0	-40	-10	0	0	-10
Gordon Head Rd	0	-40	0	0	-30	0
All Five Intersections	**-50**	**-160**	**-50**	**-50**	**-70**	**-90**

Travellers highly value travel time reliability as it enables them to use their time more productively. While travel on McKenzie Avenue will still be faster by car than bus on average, the proposed RapidBus is more reliable, especially in the peak westbound direction as shown in *Figure 51*.This frequent service provides customers with predictable journey times, especially in Scenario 1 where the bus runs in its own dedicated lane.

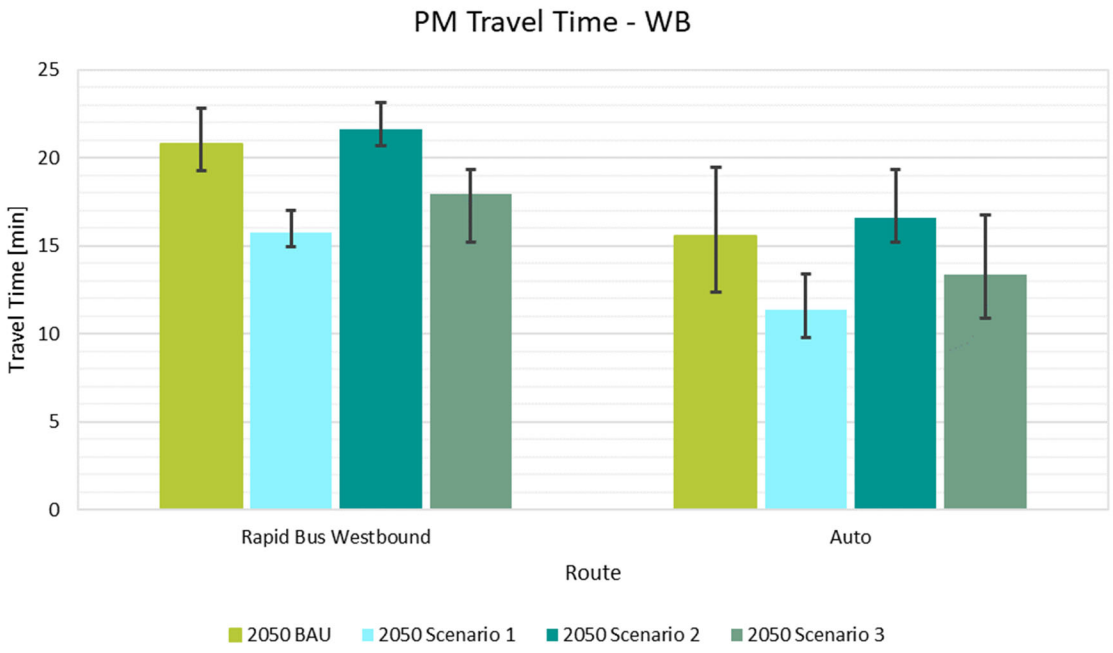


Figure 51: Westbound Auto and RapidBus End-to-End Travel Times

8.3.3. Scenario Evaluation Summary

Based on the traffic and transit analysis above, and discussion with the Working Group, the initial evaluation criteria, developed as part of the option assessment phase of work was revisited to help determine the correct path forward for the preferred vision. Generally, the following key criteria were found to be determinative:

- **Feasibility:** Scenario 1 requires the least additional RoW and could likely be adopted without major property acquisitions. Scenarios 2 and 3 would require localized widening, particularly at intersections.
- **Transit:** All scenarios perform similarly for the eastbound direction, with Scenarios 1 and 3 performing the best for the westbound direction. Scenario 2 performed the worst overall.
- **Active transportation:** All scenarios provide protected pedestrian and cyclist infrastructure, but Scenario 1 provides the shortest crossing distances for north-south travel along with better opportunities for urban realm improvements and greater potential to retain (and expand) the tree canopy.
- **Balanced modes:** The bus-only lanes proposed in Scenario 1 result in traffic diversion away from the corridor due to the reduction in auto capacity. Given the auto demands on the corridor and lower transit ridership on the western end of the corridor, it could be argued that this does not necessarily provide a 'balanced' provision of infrastructure across all modes. Scenarios 2 and 3 retain auto capacity, but at the expense of active modes and transit progression in some instances (intersections).
- **Local government plans:** Scenario 1 is the best aligned with the strategic planning documents identified for the corridor as it prioritizes sustainable modes.

- **Community:** Scenario 1 does present issues with regards to traffic infiltration, and mitigation of traffic growth on adjacent local roads would likely be necessary should the estimated diversions occur. However, the ability to deliver smaller, more urban intersections that are consistent with the Neighbourhood Centre character of the busiest areas of the corridor make this a worthwhile trade-off.
- **Cost and implementation:** The reduced RoW requirements of Scenario 1 at intersections make this the least challenging scenario to implement with Scenario 2 and 3 requiring the acquisition of new property to deliver fully protected intersections at all major intersections.

Ultimately, the District of Saanich wishes to see McKenzie Avenue redeveloped as a complete street that comfortably accommodates all travel modes and supports community activity and social well-being. BC Transit seeks to deploy a RapidBus service that provides a competitive alternative to driving that is fast, safe, and reliable.

Given these objectives, Scenario 1 provides the most appropriate response for a more human-scale corridor and community with a more attractive urban realm and the most competitive version of transit service. However, the traffic infiltration generated by the bus-only lanes of Scenario 1 presents a risk to neighbourhood character that cannot be ignored and the trade-off between this potential traffic diversion and adherence to long-term aspirations is not a simple one.

Emerging from this analysis and discussion came the potential for a hybrid solution utilizing a mix of Scenario 1 and 3 that provides the smaller, more community-focussed intersections that will accommodate the greatest protection for active transportation users, while also accommodating vehicular demand in a reasonable way. Following the working group discussion, the hybrid option for midblock and intersection cross-sections was developed to reflect the preferred outcomes of the study and *Table 10* summarizes the evaluation of these three scenarios.

Table 10: Scenario Evaluation Summary

Categories	Criteria	Measures	Type of analysis	Do nothing (BAU)	Scenario 1	Scenario 2	Scenario 3
Feasibility	Physical feasibility	Delivered within existing RoW Availability of sites for bus stops/stations/exchange Impacts to utilities	Qualitative	N/A	Limited widening	Localized widening primarily at intersections	Localized widening primarily at intersections
Transit	Amenities	Room to accommodate transit amenities	Qualitative	Worst performance WB Similar performance EB	Best performance WB Similar performance EB	Similar performance to BAU WB Similar performance EB	Similar performance to Scenario 1 WB Similar performance EB
	Walking distance	Maximize population within 400m catchment radius of stops/stations	Quantitative				
	Reliability	Travel time variability	Quantitative				
	Clarity	Ease of understanding of routes, connections and stop locations	Qualitative				
	Travel Time	Relative performance (vs. auto)					
Active transportation	Sidewalks	Minimum vs. ideal pedestrian infrastructure	Qualitative	Poor level of service for all active modes	Full separation for cyclists Shortest crossing distances for peds	Full separation for cyclists Additional crossing distance for peds	Full separation for cyclists Additional crossing distance for peds
	Net improvement	Must not diminish existing facilities and must improve overall walking/cycling infrastructure	Qualitative				
	Separation/protection	Level of protection provided from vehicular traffic	Qualitative				
	Cycling	Minimum vs. ideal cycling infrastructure	Qualitative				
Balanced Modes	Overall corridor capacity	Screenline capacity analysis	Quantitative	Baseline	Capacity for auto reduced by ~33% resulting in traffic diversion Improved corridor for active modes	Balanced distribution of RoW for auto/bus Limited RoW for active modes in some locations and greater crossing distances	Balanced distribution of RoW for auto/bus Limited RoW for active modes in some locations and greater crossing distances
Local Government Plans	Alignment	Consistency with and support for active transportation, climate, urban forestry and community livability policies	Qualitative	Not consistent	Well-aligned with all policies	Will present challenges to align with urban forestry goals at intersection locations	Will present challenges to align with urban forestry goals at intersection locations
Community	"Right traffic on the right roads"	Likelihood of neighbourhood traffic infiltration	Qualitative	No response to safety or public realm challenges	Neighbourhood traffic infiltration anticipated. Significant potential for urban realm improvements including safety features	Limited traffic infiltration Minimal opportunity for urban realm improvements at intersection locations and increased crossing distances	Limited traffic infiltration Minimal opportunity for urban realm improvements at intersection locations and increased crossing distances
	Public realm	Opportunities for public realm improvements	Qualitative				
	Safety	Minimize potential for conflicts between modes/users	Qualitative				
	Driveways and servicing	Impacts to driveways, private parking and garbage collection (etc)	Qualitative				
Cost and Implementation	Transit Operating Cost	Improved end-to-end transit travel time	Quantitative	Baseline	Mainly achieved within existing RoW and provides improved end-to-end travel times for transit. Ongoing management of dedicated bus lanes (i.e., enforcement) may be problematic)	Property required at intersection locations resulting in phasing challenges and increased cost	Property required at intersection locations resulting in phasing challenges and increased cost
	Street Ops and Maintenance Cost	Ongoing Ops and Maintenance costs	Quantitative				
	Capital	Order-of-magnitude costs	Qualitative				
	Phasing	Ability to phase improvements over time	Qualitative				

8.3.4. Working Group Session #4: Scenario Analysis and Evaluation

The working group met on October 24, 2022, to discuss the Vissim analysis findings for all three scenarios, along with the plan concept drawings. The following notes capture the key points from the working group discussion.

- Suggestion for all scenarios to consider having the tree buffer between the bike lane and the road – combine the buffers (2m) – rather than having two narrower buffers between the road, bike lane and sidewalk respectively.
- Big trucks/buses can rip off branches if the trees overhang the roadway.
- If we restrict trees that can be planted, we won't get the canopy we want for pedestrians.
- Should consider some variability to be able to plant big trees along the corridor where appropriate, note that this is a major criterion from the District's perspective.
- Can't underestimate the importance of shade for pedestrians and cyclists as well as the urban heat island effect, drainage, and the overall ecosystem.
- Slip lane at Gordon Head should not be there, ideally, as it doesn't represent the urban feel of the corridor that should be the vision.
- Bus lanes should be long enough for two buses to pull up, given the potential future demand.
- Picking a preferred option: large crossing intersection vs. neighbourhood infiltration is one of the major identified trade-offs.
- Preferred scenario: Scenario 3 with no roundabout appears to provide the maximum travel-time benefits without leading to major neighbourhood infiltration.
- Note that at a higher level of detail we will need to factor in the increased signal times to give pedestrians enough time to cross the larger intersections.
- This will be done in Synchro.
- The suggested opportunity to put a half-way island for pedestrians was generally not supported as it doesn't provide a good user experience.
- To achieve the sort of modal shift the District and BC Transit would like to see, there will need to be broader supportive policies and land use, along with external factors (gas prices, micro-mobility, etc.,)
- Suggested notion, based on the relatively minor improvement observed eastbound for Scenario 1, could be to utilize westbound Scenario 1, but eastbound Scenario 3.
- Understanding the multi-faceted nature of the evaluation, agreed to allow time for District/BCT staff to review drawings and provide an informed decision on preference.

8.3.5. Summary of Findings

The Vision for McKenzie Avenue was designed to align with the District of Saanich and BC Transit's goals related to mode shift, environmental sustainability, and road safety. The Vision makes transit and active transportation a more attractive travel mode for the growing number of people living, working, and travelling on McKenzie Avenue. The corridor currently carries 2,800 to 3,600 people/hour depending on the location on the corridor and the Vision increases the people-moving capacity of McKenzie Avenue by approximately 50% by providing transit priority and All Ages and Abilities (AAA) cycling infrastructure.

RapidBus provides fast, frequent, and reliable transit service that is competitive with auto travel in terms of travel time and comfort. Travel times and frequency are two of the most frequently stated opportunities to improve transit by current and potential riders. Dedicated transit infrastructure is required to enable the delivery of RapidBus service since:

- Transit **travel times** are currently significantly impacted during busy periods. Without transit priority infrastructure RapidBus service is forecasted to be 20-30% slower than general traffic during the afternoon peak hour. The Vision is forecasted to reduce transit travel times by 20-30% during the afternoon peak hour, making it more competitive with auto travel.
- When operating high frequency transit service, it is critical to have **reliable** travel times to avoid bus bunching. When high frequency bus service operates in busy shared travel lanes, travel times become inconsistent. Transit travel times can currently vary by up to 5 minutes/kilometre in some sections of the corridor.
- Not only are faster and more reliable transit travel times important factors in attracting new riders, but they also decrease the cost of operating transit service. Infrastructure investments therefore allow BC Transit to **increase transit frequency** as the savings in operating costs can be re-invested into more transit service.

The Vision includes enhanced RapidBus Stations which provide additional amenities to passengers, making transit a more attractive mode of travel. The construction of stations allows for RapidBus branding to be provided, making transit prominent and attractive to potential passengers.

The Vision for McKenzie Avenue enables active transportation by providing a safe and efficient cycling network for cyclists of all ages and abilities, along with safe and comfortable opportunities to walk. Five new crosswalks across McKenzie Avenue are proposed which will improve access to transit and the growing number of amenities on the corridor.

8.4. PREFERRED VISION DEVELOPMENT AND ANALYSIS

The preferred Vision was developed based on consultations with the working group and utilizing the key findings of Scenarios 1, 2 and 3. In general, the preferred Vision scenario is a hybrid of scenarios 1 and 2. The existing four-lane McKenzie Avenue cross-section is generally retained which helps maintains local access to adjacent properties and activity centres, while protecting existing mature trees wherever possible. At intersections, curb lanes are re-purposed for bus and right-turning vehicles but the roadway cross-section is kept as narrow as safety and capacity requirements allow, to provide space for urban realm improvements including new tree planting. Further, a signal is introduced at McGill Road to improve east-west traffic flow and reduce merge conflicts in the westbound direction. In addition, exclusive right turn lanes at Shelbourne Street and right-turn channels at Gordon Head Road were eliminated.

To test the preferred Vision against the scenarios and BAU conditions, an additional Vissim model was developed. *Figure 52* and *Figure 53* are time-space diagrams comparing the Vision scenario with 2050 BAU and Scenario 1 for general traffic. In general, the Vision modelled travel times trend close to Scenario 1, likely because both scenarios assumed the same diversion rates. The removal of exclusive

right-turn lanes at Shelbourne Street and Gordon Head Road, which were not considered in 2050 BAU and Scenario 1, meters traffic volumes onto McKenzie Avenue, resulting in additional travel time savings, especially in the westbound direction.

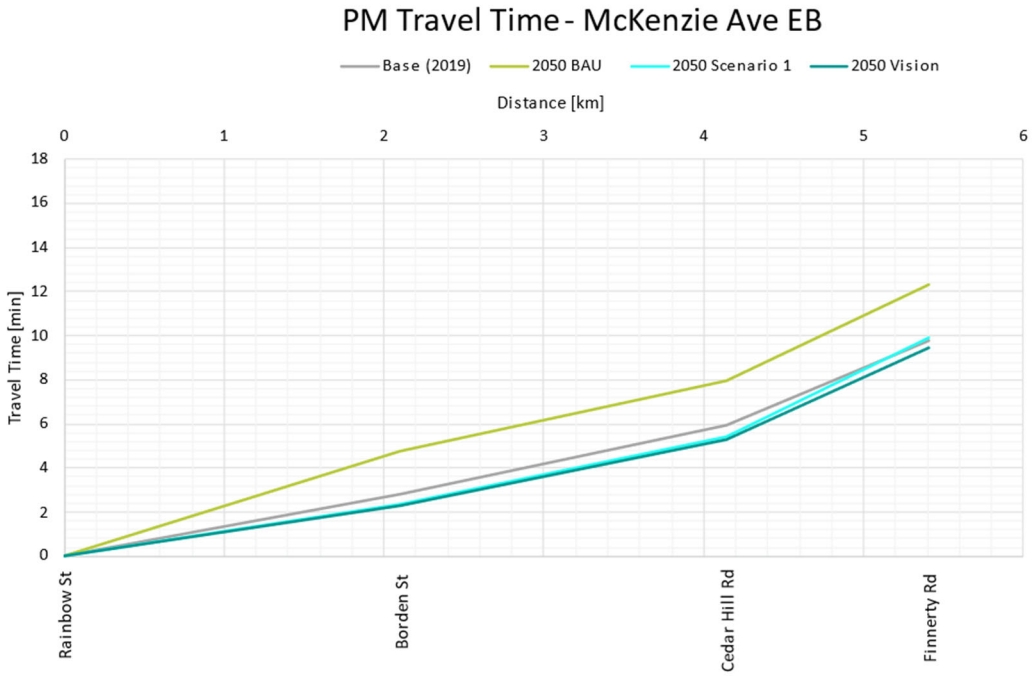


Figure 52: Eastbound Time-Space Diagram, Vision Scenario, Scenario 1 and 2050 BAU

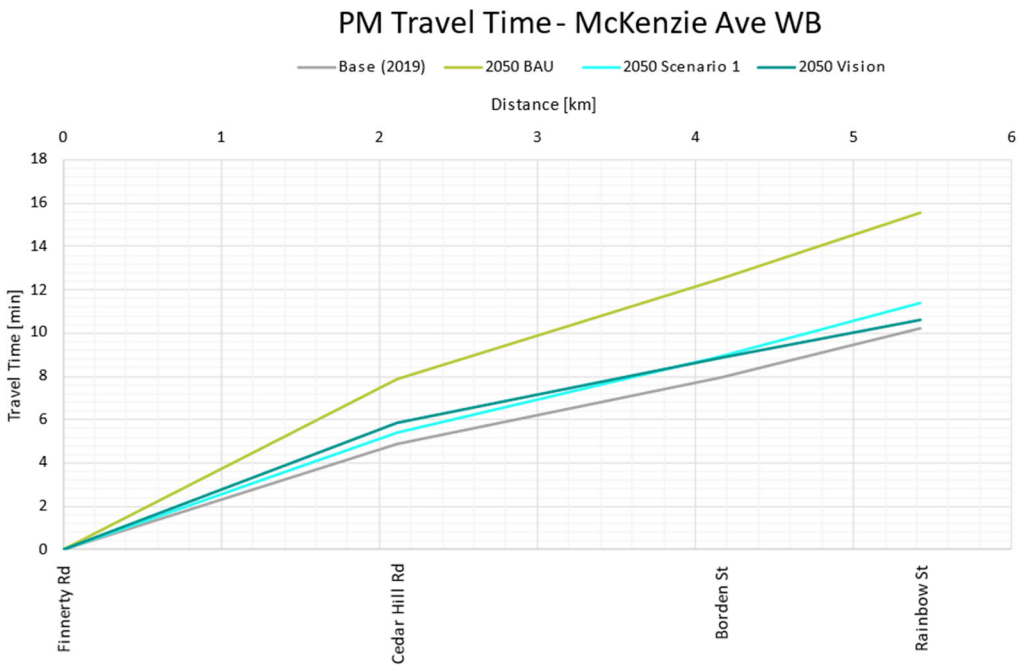


Figure 53: Westbound Time-Space Diagram, Vision Scenario, Scenario 1 and 2050 BAU

Table 11 summarizes the forecast traffic operations at the busiest intersections along the corridor for the Vision Scenario. Similar to Scenario 1, traffic operations at east-west approaches improve due to the large number of cars diverted away from the corridor, right turning vehicles utilizing the bus lane to turn right and the removal channels at Gordon Head Road. Average delay (in seconds) at cross street approaches, however, increases due to the diverted traffic. Eastbound-left queues (in metres) at Quadra Street improve substantially, due to the addition of a left-turn bay at Saanich Road. The longest queues are observed at Shelbourne Street in the westbound direction (110m on average). Bus access to the intersection can get blocked by right-turning vehicles as well as traffic merging into the general traffic lane. Traffic operations at the newly added signal at McGill Road perform well (LOS A to C).

Table 11 Vision Scenario Intersection Analysis

Intersection	2050 Vision	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR	Overall
McKenzie and Saanich Rd	Volume	110	120	80	10	130	30	30	530	100	90	640	40	
	AVG Queue	20	20	5	0	10	10	0	5	10	0	0	0	10
	Max Queue	80	80	40	10	70	70	10	80	90	20	60	60	90
	Average Delay	90	60	40	50	50	40	5	10	5	10	0	0	20
	LOS	F	E	D	D	D	D	A	A	A	B	A	A	B
McKenzie and Quadra St	Volume	160	800	70	210	640	30	50	490	90	50	580	180	
	AVG Queue	360	430	430	20	30	30	10	40	50	5	10	0	120
	Max Queue	460	460	470	110	130	130	40	210	220	30	70	40	470
	Average Delay	160	140	140	60	40	40	70	40	20	50	10	10	70
	LOS	F	F	F	E	D	D	E	D	B	D	B	A	E
McKenzie and Borden St	Volume	80	190	90	160	200	90	80	690	100	70	660	90	
	AVG Queue	20	30	30	10	20	20	0	10	10	0	30	30	10
	Max Queue	130	190	190	70	120	120	20	80	80	30	200	210	250
	Average Delay	100	70	80	40	50	20	20	10	5	40	20	10	30
	LOS	F	E	E	D	D	B	B	A	A	D	B	A	C
McKenzie and Blenkinsop Rd	Volume	100	490	90	80	400	130	150	540	50	110	580	80	
	AVG Queue	20	190	200	10	30	0	5	10	20	5	30	30	50
	Max Queue	220	250	260	40	150	30	50	150	160	40	170	180	260
	Average Delay	100	80	80	60	30	10	30	10	5	30	20	10	40
	LOS	F	F	E	E	C	A	C	B	A	C	B	A	D
McKenzie and Cedar Hill Rd	Volume	90	420	100	30	160	110	150	460	60	120	570	80	
	AVG Queue	10	80	80	0	10	0	5	10	20	5	20	20	20
	Max Queue	90	120	130	20	70	30	50	110	110	30	100	110	140
	Average Delay	70	70	70	50	30	5	30	20	5	20	20	10	30
	LOS	E	E	E	D	C	A	C	B	A	B	B	A	C
McKenzie and Shelbourne St	Volume	120	730	140	150	800	80	130	400	70	200	570	80	
	AVG Queue	180	470	470	470	470	470	10	30	40	20	110	120	230
	Max Queue	330	510	510	510	510	510	60	160	180	130	220	230	510
	Average Delay	210.0	200.0	210.0	180.0	150.0	150.0	70.0	40.0	10.0	70.0	50.0	20.0	120
	LOS	F	F	F	F	F	F	F	D	B	F	D	B	F
McKenzie and Gordon Head Rd	Volume	110	480	60	90	210	110	140	380	100	100	560	150	
	AVG Queue	10	110	120	5	20	0	10	40	10	5	40	40	30
	Max Queue	130	170	180	40	120	20	80	140	70	30	150	160	180
	Average Delay	80	80	80	40	30	30	50	50	20	30	30	10	50
	LOS	F	F	E	D	C	C	D	D	B	C	C	B	D
McKenzie and McGill Rd	Volume	180	-	20	-	-	-	-	380	160	10	630	-	
	AVG Queue	10	-	10	-	-	-	-	10	10	10	10	-	10
	Max Queue	50	-	60	-	-	-	-	100	100	130	130	-	130
	Average Delay	30.0	-	10.0	-	-	-	-	10.0	10.0	10.0	10.0	-	10
	LOS	C	-	A	-	-	-	-	A	A	B	B	-	B
McKenzie and Vikes Way	Volume	100	0	30	10	0	30	5	370	20	10	510	5	
	AVG Queue	5	5	0	0	0	0	0	10	10	0	5	10	5
	Max Queue	30	30	20	10	10	0	0	140	140	10	70	80	150
	Average Delay	20	20	10	20		10	10	10	10	10	10	5	10
	LOS	B	B	A	B		A	B	A	A	A	A	A	A

Figure 54 and *Figure 55* show the substantial travel times savings achieved by both the local bus and RapidBus service in the corridor for the Vision Scenario. In the eastbound direction, the RapidBus is faster by about 3 minutes, a 20% improvement relative to the 2050 BAU. In the westbound direction, the RapidBus is faster by about 6 minutes, a 30% improvement relative to the 2050 BAU. This indicates that the proposed upgrades introduced under the preferred Vision scenario are successful at improving the overall travel experience on the bus making it an attractive and competitive alternative to driving.

Figure 54: Eastbound Bus Travel Times, 'Vision' Scenario vs 2050 BAU

Figure 55: Westbound Bus Travel Times, 'Vision' Scenario vs 2050 BAU

As shown in *Table 12*, long stretches of bus lanes provide substantial travel time savings at intersections, specially at known congestion hot spots at Quadra Street, Borden Street and Shelbourne Street. The results also illustrate the benefit of providing a bus lane at the UVic section of the McKenzie Avenue corridor in the westbound direction, saving about a minute of travel time at McGill Road and Gordon Head Road intersections. Further, substantial savings are achieved at Blenkinsop Road intersection in the westbound direction. In the BAU scenario, average queues of 90m blocked bus access to the intersection. The introduction of a shared bus/right turn lane at the intersection helps the bus move ahead of the queue and reduces overall delay.

Table 12: Bus Delay at Key Intersections: 'Vision Scenario' vs 2050 BAU

Intersection	Bus Delay Compared to 2050 BAU [sec] EB	WB
Saanich Rd	-20	0
Quadra St	-60	0
Borden St	-10	-50
Blenkinsop Rd	-10	-60
Cedar Hill Rd	-10	-20
Shelbourne St	-40	-40
Gordon Head Rd	-20	-30
McGill Rd	5	-30
Total (Eight Intersections)	**- 175 sec**	**- 230 sec**

8.4.1. Preferred Cross-section Examples

Figure 56 and *Figure 57* illustrate preferred cross-sections at the intersections and mid-blocks of the corridor. These are example cross-sections and it should be noted that it will be necessary to accommodate some individual contexts (such as existing mature trees and other constraints). Note that the right turn lanes at Saanich Road and Gordon Head Road also permit through-movements for buses to progress through the intersection with priority.

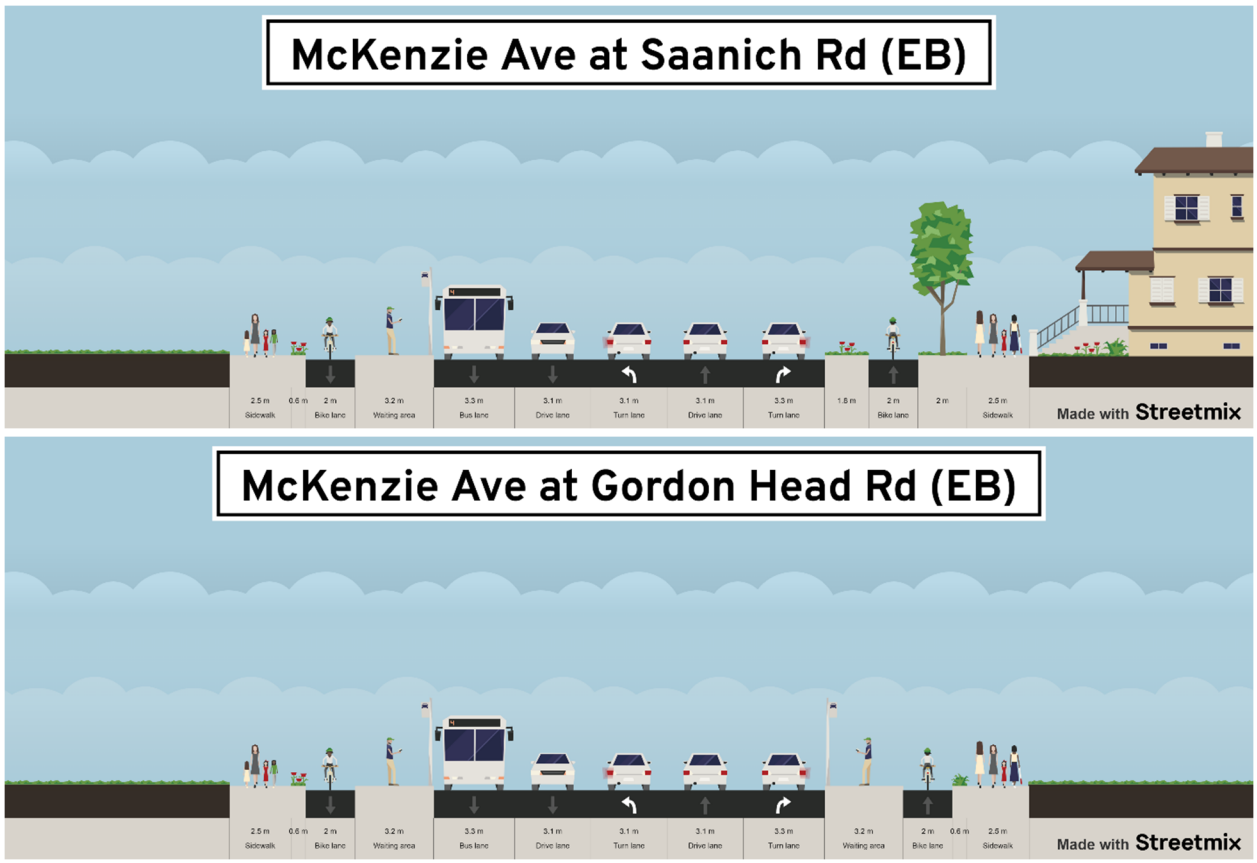


Figure 56: Preferred Typical Intersection Cross-Sections

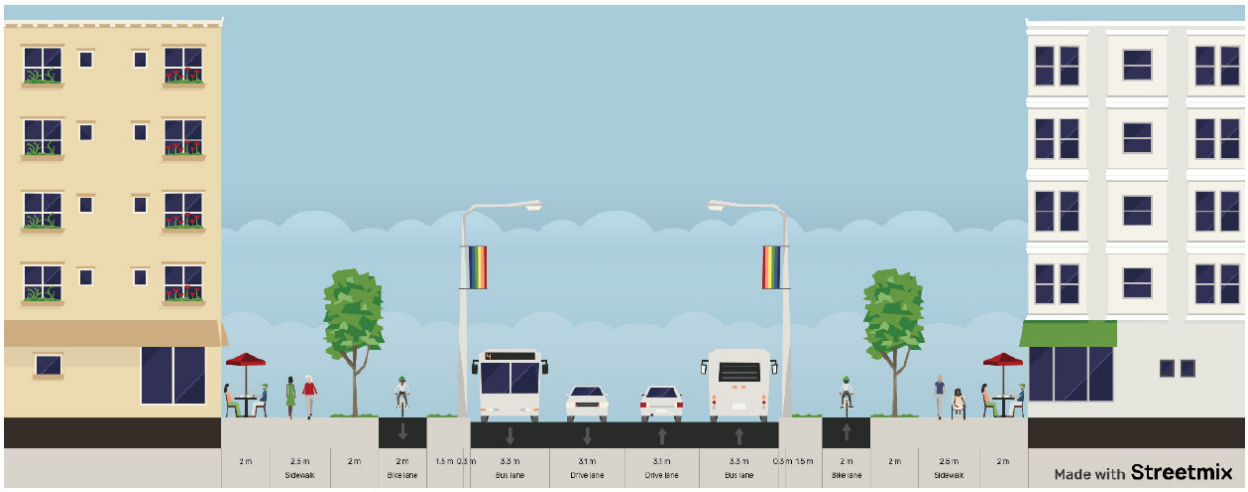


Figure 57: Preferred Typical Mid-Block Cross-Section

Essentially the emerging preferred long-term vision for the corridor should retain a 4-lane cross-section at mid-block locations and include protected bike lanes along the entire corridor. Dedicated bus lanes and left-turn lanes should be added at intersections, where appropriate, based on the traffic analysis, and a wider RoW should be allowed for to accommodate urban realm improvements and the protection of the tree canopy. The expectation is that urban realm improvements will be more substantial at intersections, and especially at major intersections and hubs/centres. At areas such as Quadra and Shelbourne Centres, there should be one dedicated bus lane and one general purpose lane in each direction, and similar laning should be applied east of Cedar Hill Road to the university. This approach provides a reasonable balance of roadway for all modes, as demonstrated in *Figure 58* and *Figure 59* below.

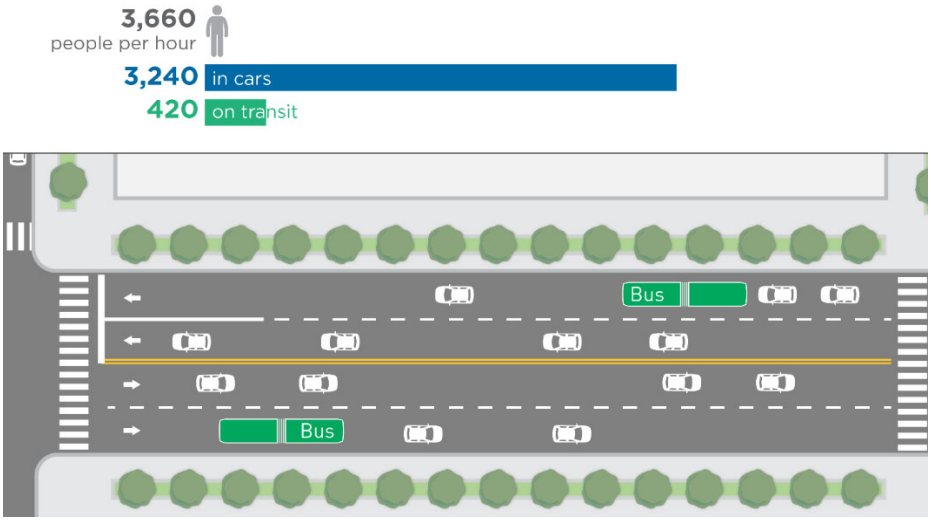


Figure 58: Person Throughput On McKenzie Avenue (2019)

The existing configuration at a typical location on McKenzie Avenue provides for significant capacity for auto travel, consistent with current mode shares and the arterial design of the corridor.

The future plans for RapidBus, roadway and intersection modifications, and protected cycling infrastructure on McKenzie Avenue are intended to affect a mode shift away from auto travel and provide a more balanced cross-section that accommodates all users, and with the capacity to ultimately move more people overall. The provision of improved transit infrastructure provides the potential to continually increase the overall carrying capacity of the roadway with higher-capacity and more-frequent transit service. Included in ***Figure 59*** below is the estimated capacity of a future scenario where double-deckers at ~2minute headways are utilized, moving approximately 4,800 people by transit. This would increase the overall carrying capacity of the corridor to ~7,800, more than double the present capacity.

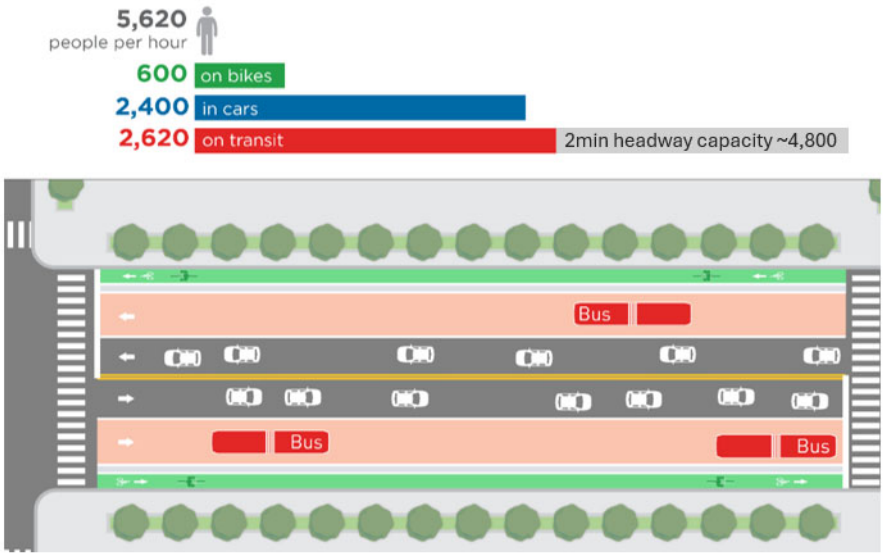


Figure 59: Person Throughput On McKenzie Avenue (Future)

9. Bus Stop Location Review

In advance of selecting a preferred concept for the long-term vision, identifying the appropriate locations for future RapidBus stations enables a more robust examination of the property required and access and connectivity considerations. To this end, a review of the proposed station locations was conducted to provide a recommendation for future station locations.

9.1. STOP SPACING CONSIDERATIONS

There are important considerations when considering the spacing of rapid transit stops:

- Existing ridership and areas of high passenger volume
- Transfer locations
- Land use – high intensity land use may mean stations are needed more frequently than standard
- Availability of safe crossing locations

Generally, the closer the stop spacings, the slower transit travel times will be (see *Figure 60*).

Figure 60: Relationship of stop spacing to transit travel time

The future vision for McKenzie Avenue is that both RapidBus and local service operate in the corridor. There are essentially no parallel east-west routes and therefore maintaining local service is critical. An initial proposal for stop spacing is proposed in ***Figure 61*** below.

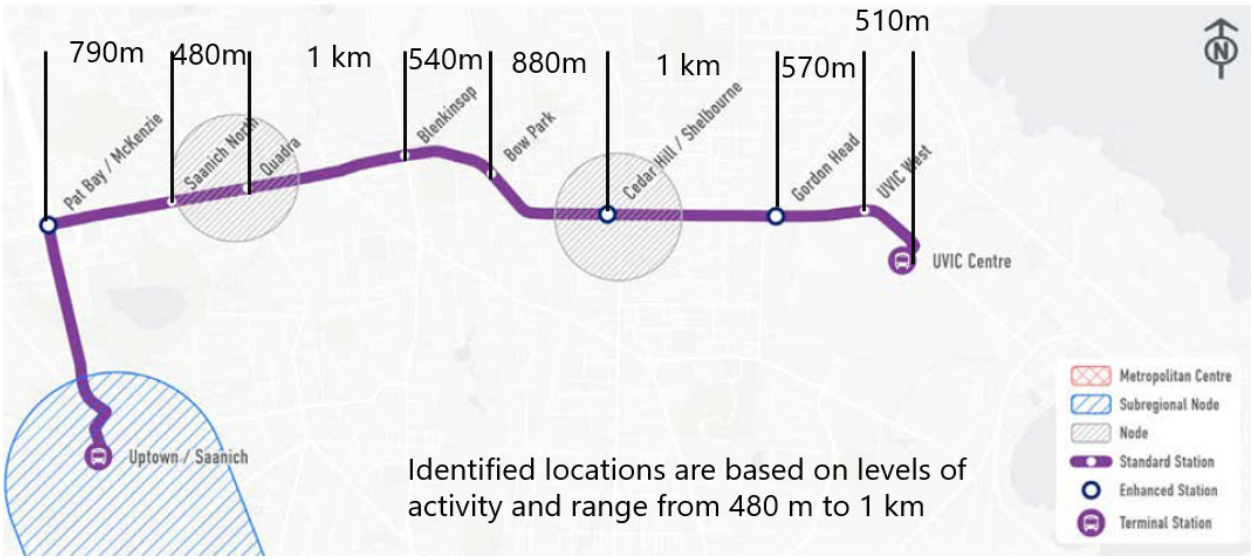


Figure 61: Initial Proposed Station Locations, RapidBus Implementation Strategy

For RapidBus services, the guidance states that spacing should be >400m in urban areas and >1.5km in suburban areas. Local buses may use intermediate stops along the same corridor. In the earlier work conducted as part of the RapidBus Implementation Strategy, initial station location sand spacing were proposed based on the guidance.

Current stop spacing on the corridor differs depending on the route with Routes #26 and #39 being generally closer together, and routes #16 and #51 having more infrequent stops.

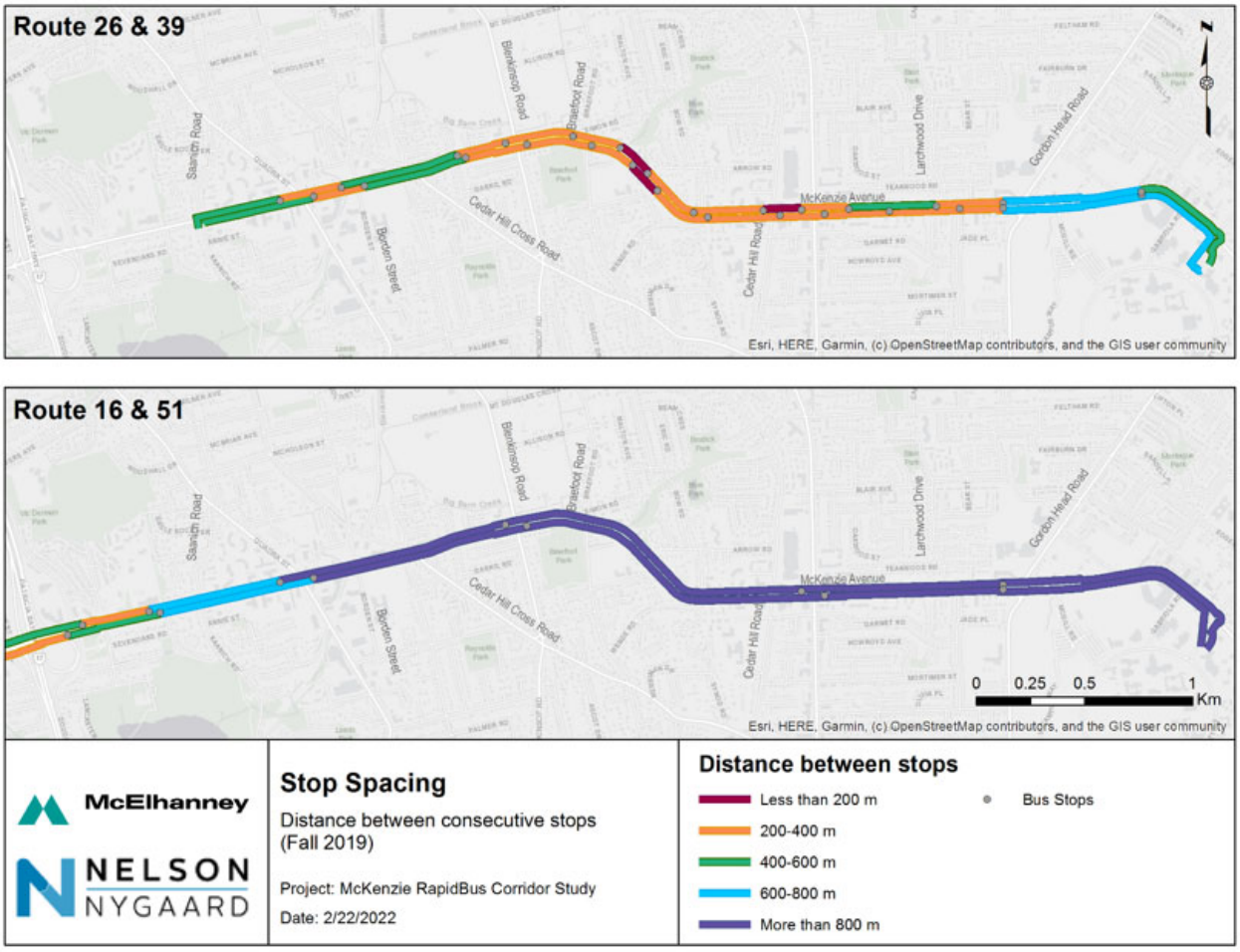


Figure 62: Existing Stop Spacing For Current Routes

Conducting an analysis of the stop spacing relative to the ridership for each stop (total boardings and alightings) reveals that, generally, the stop spacing is closer where there are higher ridership volumes *and* where greater inter-bus transfers are occurring, although this is not entirely consistent along the whole corridor.

Table 13: Current Stop Spacing Compared to Ridership Volumes and Transfers

Stop Pair	Spacing	Ridership	Transfers	
Douglas St		18	70 71 72 75	
Nelthorpe St	380	259		
Saanich Rd	220	*No data*	26	< *Stop located off McKenzie Ave; serves Line 26 only*
Quadra St	475	1,580	6 25	
Borden St	255	772	25	
Century Rd	500	57		
Blenkinsop Rd	260	432	25	
Braefoot Rd	320	199		
1400 Block	215	99		
Long Gun / 1420 Block	165	96		
Oakwinds St	290	86		
Cedar Hill Rd	320	537	12 24	
Shelbourne St	195	2,160	27 28 39	
Cedarwood St	250	435		
Larchwood Dr / Fleet St	375	406		
Gordon Head Rd	245	781		
Vikes Way	640	327		
UVic Exchange	545	*No data*	Multiple lines	

< 200 m
200-399 m
400-599 m
600-799 m
800 m +

RapidBus standard spacing > 400 m

9.2. LONG-TERM STATION AND BUS STOP LOCATIONS

Based on these findings the proposed RapidBus station location shave been updated. A stop at Bow Park could be considered for a RapidBus station in the future, depending on land-use changes surrounding the bus stop.

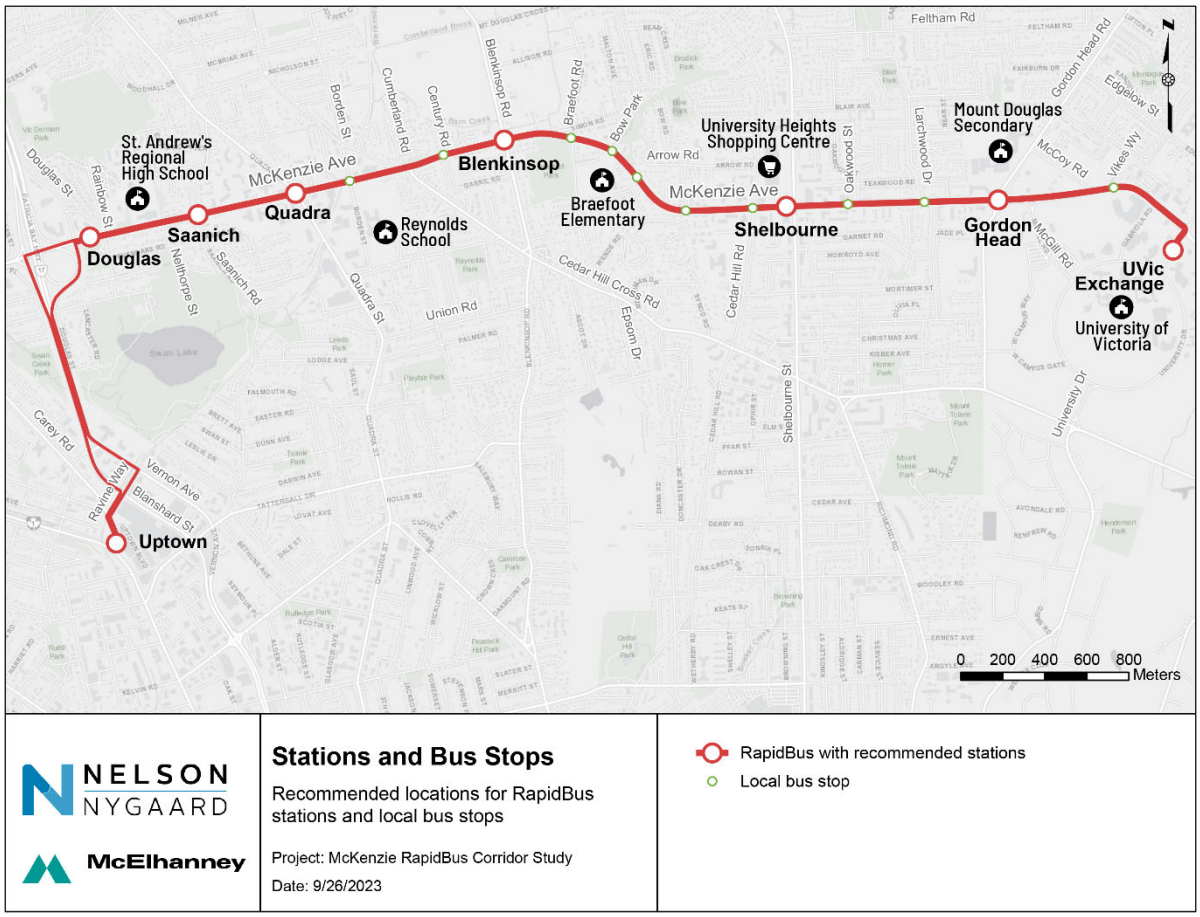


Figure 63: Recommended Station Locations

The location of RapidBus stations is indicated in the figure, based on the observed current demand and transfer activities. Future shifts in land use / density could alter the decision-making on these locations.

10. McKenzie Avenue at Highway 17

The study team met with representatives from the Ministry of Transportation and Infrastructure (MoTI) on February 14, 2023 to discuss the implications of the McKenzie Avenue RapidBus Corridor Study on operations at the interchange between McKenzie Avenue and Highway 17 (Patricia Bay Highway).

The purpose of the meeting was to provide a status update on the project, present and discuss preliminary sketches for the long-term vision at the interchange area and agree – in principle – some design choices at this location.

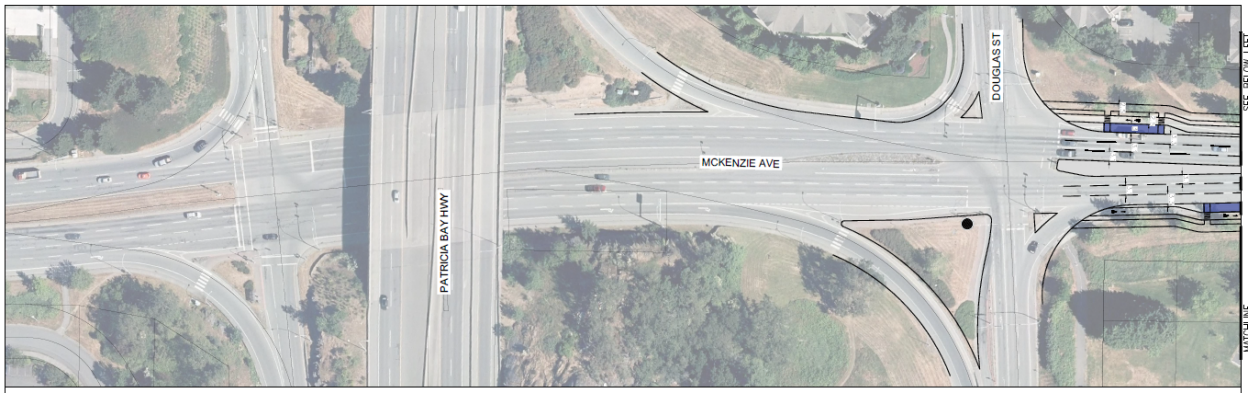


Figure 64: McKenzie Avenue at Patricia Bay Highway

The key points raised during the discussion are summarized below:

- MoTI is interested in maintaining the integrity of the highway and would not want to see anything that may cause back-ups onto highway on/off-ramps.
- The Ministry is supportive of transit objectives (RapidBus will be running on the highway to the Uptown exchange area) and want to ensure a good quality experience for transit users.
- The possibility of removing channelized turn infrastructure was discussed and it was noted that MoTI requires that larger/longer vehicles (WB-20, WB-24) are able to access/egress the highway and that this must be maintained.
- It was noted that no work is underway at this location and the interchange was not included in previous strategic work for the highway so there are no conflicting plans.
- In general, MoTI would be supportive of implementing active mobility infrastructure beneath the highway along McKenzie Avenue, consistent with provincial policy to encourage sustainable transportation options and there are opportunities to utilize existing RoW for this.
- Provided conceptual layouts for the long-term vision provide for the necessary access/egress geometry for larger vehicles and do not present a risk of back-ups onto highway infrastructure, MoTI would be supportive of receiving a long-term vision plan as a baseline for potential future work that they would lead at the interchange.
- MoTI agreed to provide on/off-ramp traffic data to support any project analysis of impacts to highway operations.

11. University of Victoria Campus

The study team met with representatives of the University of Victoria on March 29, 2023 to discuss the implications of the McKenzie Avenue RapidBus Corridor Study on campus operations and understand any in-progress or planned projects that may affect the corridor.

The key points raised in the discussion are summarized below:

- UVic has a development plan in progress around Gordon Head Road.
- There are discussions as to the future of the Fire Hall site (lease expires this year).
- The Campus Plan contains relevant background details as to the future land use and multimodal network for the campus.
- Funding has been received to proceed with a bi-directional bike lane on the west side of McGill Road with construction slated for 2024. The current concept still retains the slip lane from McKenzie and the plan has been shared with the District for further discussion. Discussion on this location between the university and District should be ongoing.
- The McGill Road intersection is problematic from a cycling point of view, as is the westbound movement at Gordon Head Road. Discussions have started with the District, so the timing of the corridor study is good.

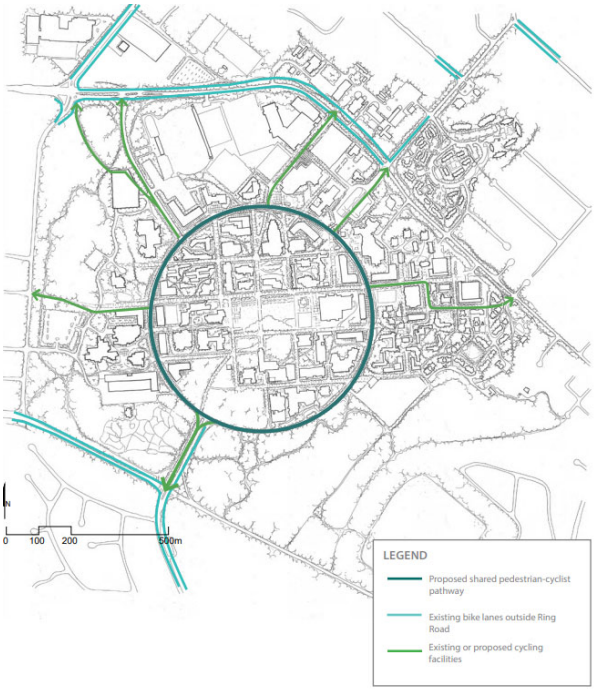


Figure 65: Proposed Future Cycling Network at UVic, Campus Plan (2016)

- There is a potential (500 stall) parking structure at Lot 8 on McGill Road. This may be a mixed-use structure as the campus seeks to diversify revenue streams and create a more complete community.
- A parking study of this proposal has indicated that operational constraints at McGill Road and McKenzie Avenue are expected – specifically the northbound-left turn movement
- The potential for a roundabout at this location has been explored, along with full signalization, both indicating operational improvements
- Generally, the McKenzie Avenue long-term scenarios can all be adjusted to accommodate the necessary traffic control measures at this location, as and when the Lot 8 development occurs, with the District being supportive of either control method
- It is understood that there is a westbound surge of traffic from the campus at 4:30pm that lasts for approximately 15 minutes, however, buses also get caught in this congestion which can be as far back as Vikes Way.
- UVic is proactively addressing TDM measures to bring down parking demand and change mode choice when accessing the campus.

- New traffic data will be gathered in September as part of the bi-annual data collection program.
- UVic has an advanced design to improve Chip Trail at Vikes Way which will be shared with the study team.
- There is a pedestrian desire line between the circle west of Vikes Way to the circle at the end of McCoy Road to the north, for which a mid-block crossing of McKenzie Avenue might be considered.
- Given the housing situation on the South Island, the use of McKenzie to access the campus is expected to increase, however the campus is also increasing residential supply.
- The importance of UVic as a transit-attractor was duly noted

12.Preferred Corridor Vision

12.1. WORKING GROUP SESSION #5: PREFERRED VISION

The Working Group met on March 16, 2023, to discuss the emerging preferred vision for the corridor and provide feedback. The study team presented the evaluation process to this point and the roll-plot for the draft vision and the following discussion points were noted:

- The cross-section needs to show car/bus in the curb lane if it's not a bus-only lane, for clarity.
- Trees should be included (where appropriate and feasible) within the 1.8m boulevard, as well as annotations to indicate that where RoW is constrained, alternative cross-sections will be used.
- Review the stops for the northbound highway locations in terms of transfers to/from McKenzie Avenue services.
- There is a need to find the appropriate level of quantification of impacts to trees along the corridor. The District is undertaking a tree inventory, but the data is not yet available.
- Short-term improvements should reference the need to engage an arborist at an early stage.
- Clarify that some aspects of the concept will need to be addressed in subsequent design stages.
- Where there are missing crosswalks that would improve transit accessibility, these should be included in the vision.
- Borden Street stops should be included as bus bays and enlarged to accommodate two buses.
- There should also be special consideration for the waiting area at this location as large groups of Reynolds Secondary School students congregate here.
- Some discussion of utilizing a 4-lane cross-section between Shelbourne Street and Gordon Head Road needs to be resolved, depending on the District's sense of development potential along this section of the corridor.
- Cedar Hill Road local bus stop requires some adjustment to include a standard bus stop, bike lane and sidewalk.
- Review required for locations where angled crosswalks may be realigned.

12.2. FINAL LONG-TERM VISION

Following the insight received through the scenario analysis and evaluation process, the Working Group discussion, and engagement with key interested parties (MoTI and UVic), the following key points have been incorporated into the final long-term vision for the corridor which is a hybrid of Scenarios 1 and 3:

- McKenzie Avenue is a multi-modal corridor with a generous and engaging public realm. The total width of the public realm is proportional to the width of the road (i.e., if the roadway is being expanded, the public realm areas are expanded at a commensurate rate).
- Vehicle infiltration into neighbourhoods adjacent to McKenzie Avenue is an ongoing concern, possibly made worse by this long-term vision which will prioritize transit and active modes on the corridor over space for more vehicles. To counter this concern, enhanced transit service and improved infrastructure for active modes is anticipated to shift use of the corridor away from private vehicles over time, thus aligning with Saanich and regional goals and targets. The District, as part of ongoing

transportation efforts, will monitor behaviours and determine if traffic calming, new signage or other methods are appropriate for managing any potential impacts due to this infiltration.

- There are opportunities along the corridor to expand the tree canopy by providing a consistent boulevard space. Short-term improvements will need to reflect the existing tree inventory and identify where it is necessary to deviate from the long-term vision to protect mature trees. It is understood that a tree inventory of the corridor is planned, in conjunction with ongoing land use planning initiatives and this will provide an opportunity to reconcile the mobility objectives with urban forestry objectives for an exemplary tree canopy along McKenzie Avenue.
- Boulevards are located between bike lanes and sidewalks wherever possible to support the planting of canopy trees that will remain intact and healthy in the long-term (trees adjacent to the curb will likely be columnar, not canopy, to avoid conflict with larger vehicles and buses on the roadway).
- Bus stops are provided with space for two buses with BC Transit confirming that articulated buses are not anticipated in the short- to medium-term.
- Fully protected intersections are provided at Saanich Road, Quadra Street, Borden Street, Blenkinsop Road, Cedar Hill Road, Shelbourne Street and Gordon Head Road with all applicable safety features and geometry and including protected phasing as individual intersections are redeveloped.

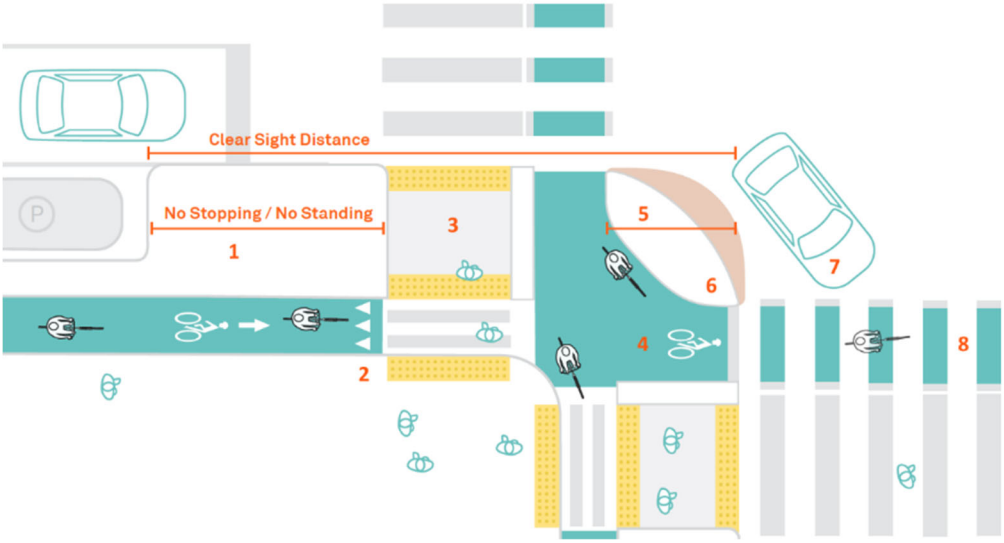


Figure 66: Indicative Protected Intersection Layout - NACTO Guidelines

- Opportunities to create a visually appealing, physically comfortable, safe, and accessible mobility network along the corridor are provided. This includes a specific recommendation to create a new plaza area at the connection to the Lochside Regional Trail at Borden Street, as well as expanded space for pedestrians near Reynolds High School.

The following sub-sections contain excerpts from the full drawing set for the long-term vision that highlight key areas of the corridor where specific interventions are identified. The complete long-term vision is provided at *Appendix C* and *Figure 67* provides a legend for all drawings for reference.

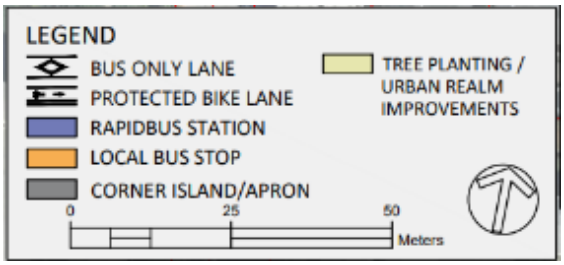


Figure 67: Legend for all Long-Term Vision Concepts

12.2.1. McKenzie Avenue at Highway 17

Figure 68 shows the concept plan for the area of McKenzie Avenue around the Highway 17 interchange. Following the discussion with MoTI representatives, the layout maintains all critical geometry to allow for large vehicles (WB-20 / WB-24) to access/egress the highway and does not restrict queuing or storage lengths for high-demand movements. A single through lane in each direction has been repurposed to provide enhanced active transportation infrastructure on both sides of McKenzie Avenue and the crossing locations and geometry have been selected with safety in mind. The RapidBus stop for north-south routes on the highway has been located on the north side of McKenzie Avenue, between the northbound on-ramp and the intersection with Douglas Street and the move to this location can be facilitated through the existing intersection signal. RapidBus stops for east- and west-bound routes on McKenzie Avenue are provided east of Douglas Street to maximize access for local residents. No private property impacts are identified at this location.

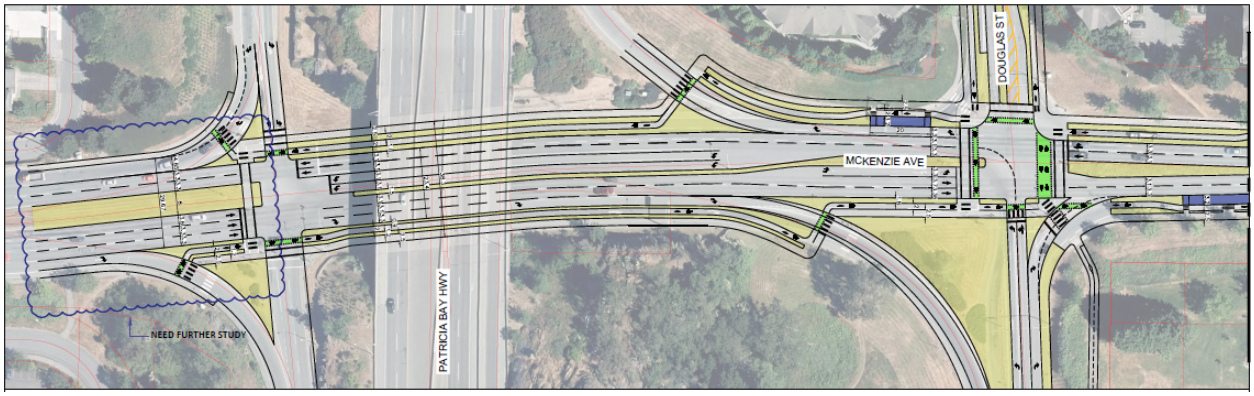


Figure 68: Long-Term Vision at Highway 17

12.2.2. McKenzie Avenue at Saanich Road

Figure 69 shows the long-term vision for the area adjacent to the Saanich Road intersection, where far-side RapidBus stations are proposed for both directions. Saanich Road is shown as a fully protected intersection which ties-in to the long-term plans for protected bike lanes on Saanich Road. While the lane arrangements on the corridor are not substantially different to the current conditions (4-lane cross-section) the expansion of the RoW to incorporate more generous sidewalks and protected bike lanes does result in property impacts along this stretch of the corridor, particularly at intersections where left turn lanes are recommended. The recently completed townhouse development at 991 McKenzie Road

provides a template for how future redevelopments in this area will need to proceed to accommodate the vision, and some parcels (950 and 982 McKenzie Avenue, 3981 Saanich Road, for example) already provide the appropriate setbacks.

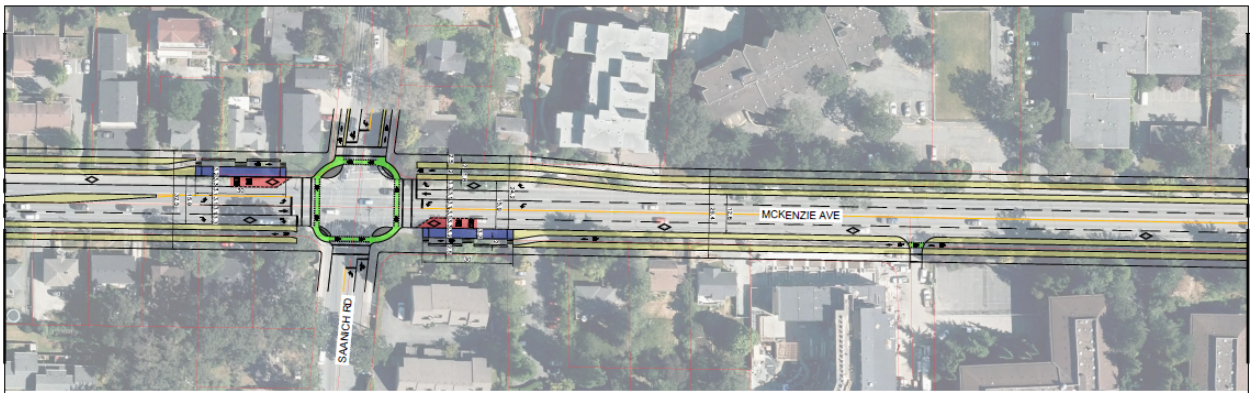


Figure 69: Long-Term Vision at Saanich Road

12.2.3. McKenzie Avenue at Quadra Street

Figure 70 shows the proposed layout for the McKenzie Avenue / Quadra Street intersection. The conversion of the eastbound through-right turn lane to a shared bus/right-turn lane will provide an opportunity for the eastbound RapidBus to progress through the intersection to the far-side station more efficiently and with minimal impact to general traffic. Westbound, the outside through lane is repurposed as a bus-only lane to provide transit priority through the intersection at a location where transit has been shown to experience notable delay. As the change involves repurposing an existing lane, there is no material increase to the roadway cross-section at this location and pedestrian crossing distances are maintained. A fully protected intersection is provided to tie-in to bike lanes on Quadra Street and only the southwest corner of the intersection requires additional property beyond the existing RoW. The Telus building at 3993 Quadra does not currently make use of this space, although there is a single tree within the grassed area that would likely be impacted.

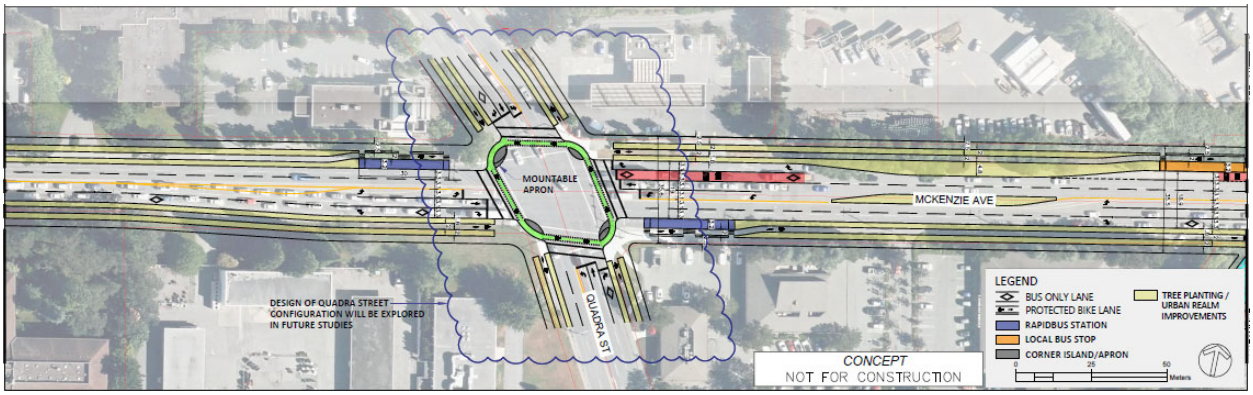


Figure 70: Long-Term Vision at Quadra Street

12.2.4. McKenzie Avenue at Borden Street

Figure 71 shows the proposed layout at the Borden Street intersection. No major laning changes are proposed at this location and the bus stops will serve local routes only. The right-turn lanes in both directions are proposed as being shared with through bus movements to improve transit travel times. The current connection with the Lochside Trail is enhanced with the provision of a generous area for public use, achieved by rerouting the Lochside Trail through the existing parking lot at 250 Borden Street. The space will be re-purposed as a public plaza and will create opportunities for placemaking. With the addition of a public plaza on the corner, the Lochside Trail will be re-routed to intersect McKenzie Avenue at a right angle. It will align with a bidirectional bike lane on the north side of McKenzie Avenue, which will provide a better approach for cyclists. A waiting area for eastbound transit riders is suggested on Reynolds Secondary School property to create a safe area for passengers, including students, to wait for the bus.

Some property impacts are identified to the west of Borden Street on the south side of McKenzie Avenue with some overlap of the greenspace that connects to the Lochside Trail. To the east of Borden Street, the row of single-family homes on the south side, and townhouses on the north side, of McKenzie Avenue would be impacted by the proposed RoW.

In addition, the bend of Cedar Hill Cross Road into Cumberland Road on the north side of the corridor is impacted and this would need specific investigation to resolve.

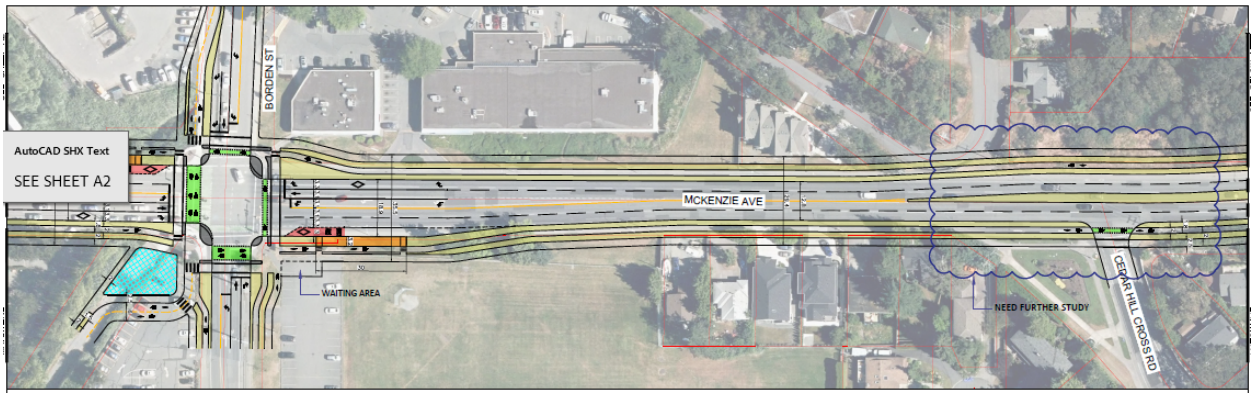


Figure 71: Long-Term Vision at Borden Street

12.2.5. McKenzie at Blenkinsop Road

Figure 72 shows the proposed layout between Century Road and Blenkinsop Road. Like Borden Street, the right-turn lanes in both directions are proposed to be shared with bus movements, providing access to the far-side RapidBus stations on either side of Blenkinsop Road. Both RapidBus Stations are provided as in-line stations, rather than pull-out bays, which maintains a reasonable overall crossing distance on both sides of the intersection. A fully protected intersection is proposed, with connection to bike lanes on Blenkinsop Road in both directions. Property impacts to all residences on the south side of McKenzie Avenue between Century Road and Blenkinsop Road are anticipated.

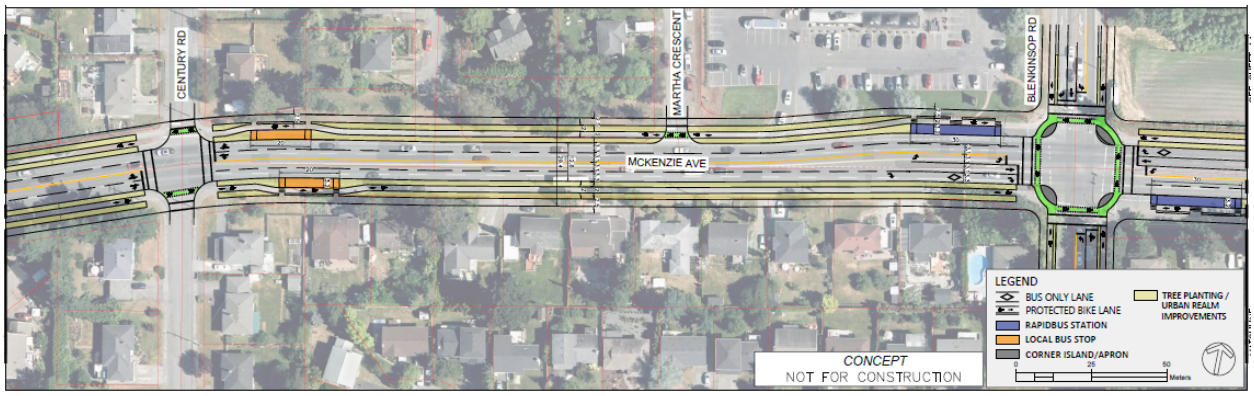


Figure 72: Long-Term Vision at Blenkinsop Road

12.2.6. McKenzie at Cedar Hill Road and Shelbourne Street

Figure 73 shows the proposed layout for the corridor including the intersections of Cedar Hill Road and Shelbourne Street. As one of the busiest intersections on the corridor, where transit often faces the highest levels of delay and key route-to-route transfers take place, it is important to provide enhanced transit priority through this section of the corridor. As such, the curb lane in both directions is designated as bus-only, allowing for efficient transit progression through both intersections. RapidBus stations are provided at Shelbourne (far-side) for eastbound services and mid-block for westbound services. Recognizing the constrained RoW through this section of the corridor, the boulevard provision is minimal and, in some cases, non-existent. However, fully protected intersections are provided at both Cedar Hill Road and Shelbourne Street where high volumes of pedestrians are identified. The Shelbourne Street intersection ties-in to the updated Shelbourne Street cross-section.

The cross-section is mostly contained within the existing RoW although some encroachment is identified on the north side, where land dedication has already been discussed with the developer, and on the southeast corner of the Cedar Hill Road intersection, where a surface parking lot would be impacted to provide wider stop infrastructure for the eastbound local transit service. As this has been recently constructed, it may be possible to tie-in to the existing infrastructure.

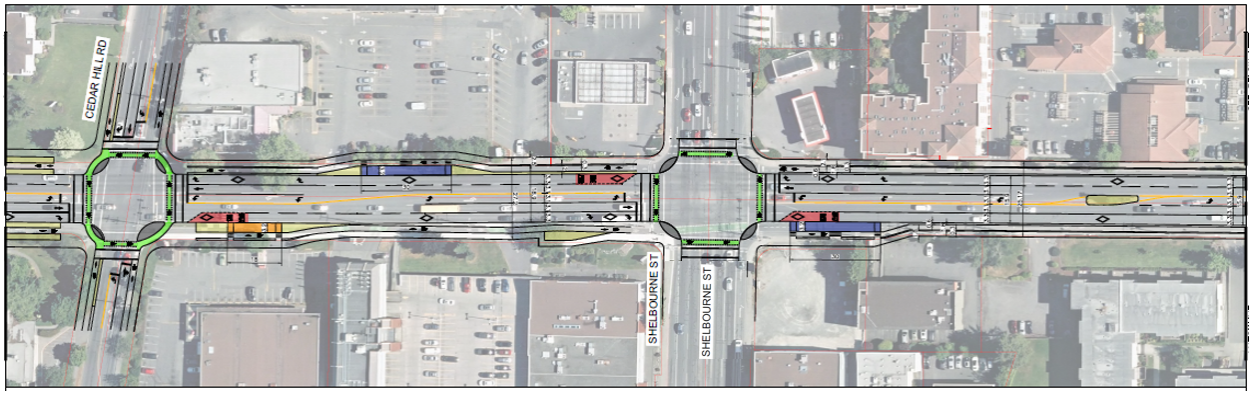


Figure 73: Long-Term Vision at Cedar Hill Road and Shelbourne Street

12.2.7. McKenzie Avenue at Larchwood Drive

Figure 74 shows the proposed layout along the corridor around the Larchwood Drive intersection. This area was identified early in the study process as being highly constrained and the delivery of AAA bike facilities and preferred-width sidewalks will result in property impacts throughout. A conversion of the roadway cross-section to a consistent two lanes of travel in both directions is recommended with a shared-right / transit-only lane for westbound travel at Larchwood Drive and a dedicated left turn for eastbound vehicles at the same intersection. The westbound bus lane is expected to continue through Cedarwood Drive and the neighbourhood centre at Cedar Hill Road / Shelbourne Street.

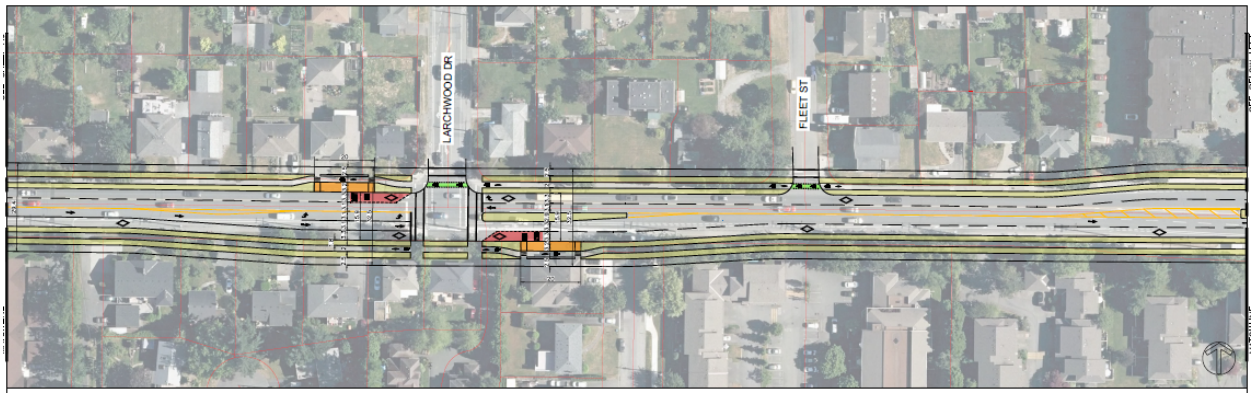


Figure 74: Long-Term Vision at Larchwood Drive

12.2.8. McKenzie Avenue at Gordon Head Road

Figure 75 shows the proposed concept for the Gordon Head Road area. Recognizing the gateway nature of Gordon Head Road as an approach to the UVic Campus, the long-term vision proposes to eliminate the channelized right-turn lanes that are more characteristic of a higher-speed, suburban context. A fully protected intersection is provided, consistent with the high volumes of cyclists and bike lanes on Gordon Head Road, with a much-improved experience for pedestrians and cyclists anticipated. A near-side RapidBus station is proposed for eastbound services, maintaining the current set-up and minimal property impacts are anticipated in this area.

In the westbound direction, a shared-right / bus lane is provided on the approach to Gordon Head Road, which is intended to reduce the delay to transit caused by conflicts at the McGill Road intersection merge, and the bus lane designation continues through the intersection at Gordon Head Road.

It is understood that the University has planned developments that will impact the McGill Road intersection and these should be discussed and incorporated as-appropriate. East of this location, the cross-section broadly ties-in to existing pathways, recognizing that the campus already provides an attractive environment for active transportation.

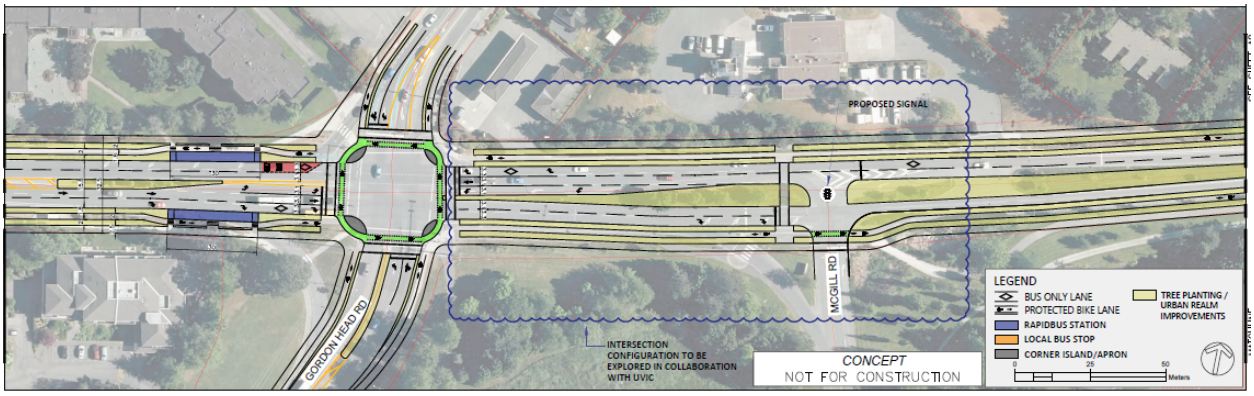


Figure 75: Long-Term Vision at Gordon Head Road

A full version of the conceptual layout is provided in *Appendix C*.

Appendix A – Base Maps

Appendix B – Conceptual Layouts

Appendix C – Long-Term Vision

Appendix D – Vissim Traffic Simulation Analysis