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Calgary-Bow Valley Mass Transit Feasibility Study

(Client Reference: RFP 1-500-5330-5320)

Final Report

Prepared for:
The Town of Banff

Prepared by:
CPCS

In association with sub-contractors:
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Iron Moustache

Solutions for growing economies

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Acknowledgments

The CPCS Team acknowledges and is thankful for input provided by the Town of Banff and other stakeholders consulted in the development of this report.

Confidentiality

This report was prepared for the use of the Town of Banff and may not be relied on by any third-party other than the Town of Banff.

Demand Forecast Disclaimer

The ridership forecasts herein were developed solely for the purposes of assessing the potential feasibility of a mass transit service, based on the information available at the time of submission. Beyond the specific limitations noted in this report, the estimates contained herein are subject to changing external conditions, which may affect the ultimate demand realized.

Cover image source: iStock

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Executive Summary

Key Takeaways

- Road congestion in and around Banff National Park is increasing, leading to longer travel times, more greenhouse gas emissions, increased traffic on wildlife corridors, and a reduced visitor experience. Strategies to accommodate increased visitation while reducing these impacts are required, motivating the study of a mass transit service between the Calgary area and the Bow Valley, including connections to Banff, Canmore and Lake Louise.
- The consultant team developed bus- and rail-based options to provide mass transit along Highway 1 and the CP Laggan Subdivision, respectively.
- All-year bus scenarios are expected to have capital costs ranging from $8.1 million to $19.6 million and operating costs of $4.5 million to $5.8 million per year. Based on ridership estimates ranging from 200,000 to 490,000 boardings per year in 2022, the operating subsidy would be approximately $2.0-$2.3 million per year, with the lower subsidy figure corresponding to the high ridership scenario. A summer-only bus service scenario would reduce the operating subsidy required.
- All-year rail scenarios are expected to have capital costs on the order of $660 million to $680 million, and an operating cost of $13.4 million to $14.3 million per year. Based on ridership estimates of between 220,000 and 620,000 per year in 2022, the estimated operating subsidy would be between $8.1 million to $9.1 million per year, with the lower subsidy number corresponding to the high ridership scenario.
- Regardless of the Calgary-Bow Valley transit option pursued, there are opportunities to further increase ridership (and related benefits) and reduce costs. Further, providing transit from Calgary alone is not a complete solution to addressing congestion in the Bow Valley. Other complementary strategies, such as enhancing transit in the Bow Valley, could also be pursued.

Background and Objectives

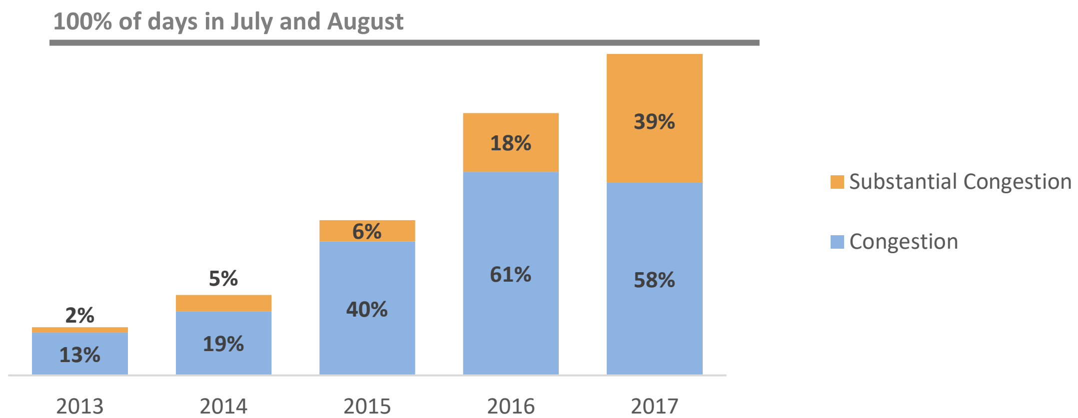
Since 2007, Banff National Park has seen visitation increase by an average of 2.6% per year. As over 93% (3.89 million) of visitors arrive in personal vehicles,[1] this increase in visitation results in road congestion, particularly during the summer months, and associated negative impacts (e.g. longer travel times, more greenhouse gas emissions, increased traffic on wildlife corridors, and reduced visitor experience). In Banff, delays above normal travel times of 10 to 20 minutes or longer are not uncommon when roadway capacity is exceeded.[2] This issue not only impacts the Town of Banff, but also other tourist sites within Banff National Park.

Without any mitigating action, congestion is anticipated to worsen, driven by population increases in nearby Calgary and a growing tourism and hospitality industry in Banff National Park. In the busiest months of July and August, roadway capacity in Banff was exceeded and congestion or substantial

[1] Request for Proposals, p. 3.
[2] Town of Banff. 2016 Traffic Data.

congestion occurred on 97% of days in 2017, up from 15% in 2013 (Figure ES-1).[3] A recent study found that, in 2020, the equivalent of approximately 8,710 vehicles per day would need to be removed to avoid congestion in Banff should traffic continue to grow at the same rate.[4]

Figure ES-1: Percentage of Days in July and August with Congestion and Substantial Congestion



Note: Refer to footnote 3 for the definition of congestion and substantial congestion. Source: CPCS adaptation of Town of Banff chart

To help mitigate this growth in vehicular traffic, the Town of Banff along with its funding partners wished to study the feasibility of introducing a mass transit service between the Calgary area and the Bow Valley, including Canmore, Banff and Lake Louise. To this end, the Town of Banff retained CPCS Transcom Limited (CPCS), in association with Dillon Consulting Limited (Dillon), Dominion Railway Services and Iron Moustache, (collectively the "CPCS Team") to assess the feasibility of introducing a bus- or rail-based mass transit service between Calgary and the Bow Valley. The study team gathered information through consultation, online and in-person surveys (see box), and its own research and analysis.

Survey Summary

An online survey was conducted between July 14 and August 15, 2017, and advertised through community websites and social media profiles in Calgary and the Bow Valley. Overall, 993 responses were received, of which 58% were respondents from the Bow Valley. There was an oversampling of Cochrane and Bow Valley residents. An in-person survey of visitors to the Bow Valley was conducted in Canmore, Banff and Lake Louise on select weekends and weekdays between July 23 and August 17, 2017. In total, 454 visitors were surveyed.

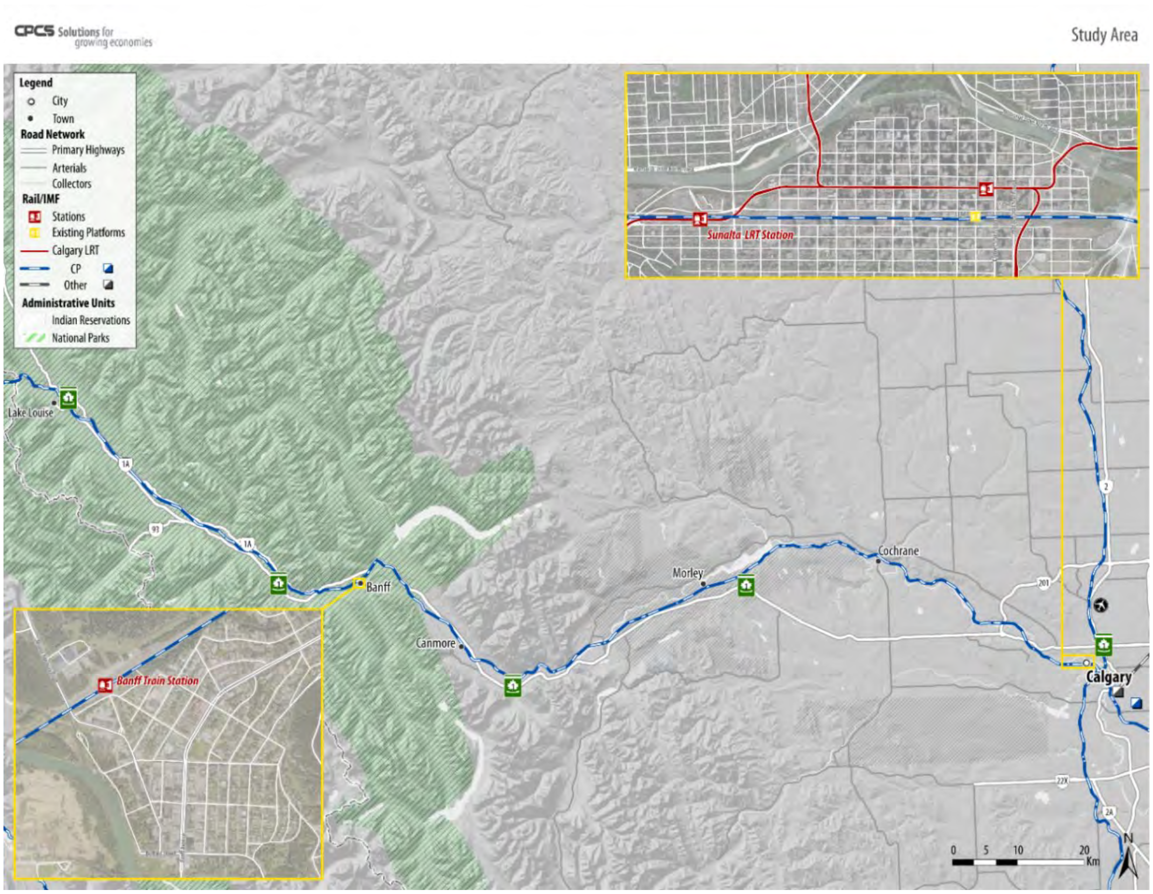
Study Area

Figure ES-2 provides a map of the study area. The proposed mass transit options could provide service for visitors from Calgary to the Bow Valley (including the Stoney Nation, Canmore, the Town of Banff and Lake Louise) as well as for residents of these communities travelling to Calgary. A bus service would travel along the Trans-Canada Highway (Highway 1) connecting Calgary and the Bow Valley, with deviations as required to serve intermediate communities. Subject to reaching an agreement

[3] Based on a study, the Town of Banff defines *congestion* as days when the number of vehicles per day exceeds 24,000, and *substantial congestion* when the number of vehicles per day exceeds 28,000.
[4] Stantec. 2016. Banff Long Term Transportation Study.

with CP, a rail service would utilize a new parallel track along the CP Laggan Subdivision right-of-way. The CP Laggan Subdivision is a busy single-track rail corridor forming part of CP's mainline between Calgary and Vancouver. It almost exclusively serves freight traffic and there are no natural windows in the traffic patterns in which a passenger train could operate without the addition of new track infrastructure.

Figure ES-2: Study Area



Source: CPCS based on various sources

Ridership, Fare and Revenue Scenarios

When forecasting ridership for a new service, a number of assumptions need to be made regarding the potential uptake of the service. We forecasted three ridership and revenue scenarios – low, medium and high. The low and high scenario are based on pessimistic and optimistic assumptions about demand, respectively. They do not necessarily reflect the full range of uncertainty that exists, including the implications of any broader opportunities or risks, such as increasing vehicle automation.

We studied Calgary-Banff fares between $10 and $15 one-way in the three scenarios. The proposed fares for the medium ridership scenario are presented in Figure ES-3, and follow a fare-by-distance structure. Fares are shown between each origin and destination pair. Fares in orange are prices for one-way adult tickets, while fares in green are for return adult tickets (including a 20% discount). Concession discounts for seniors, youth and children are also proposed, as well as a possible commuter pass for residents of the Bow Valley.

Figure ES-3: Proposed Base Fare Structure for Analysis (Medium Ridership Scenarios)

	Calgary	Cochrane	Stoney	Canmore	Banff	Lake Louise
Calgary		$5	$10	$10	$15	$20
Cochrane	$8		$5	$10	$15	$20
Stoney	$16	$8		$5	$10	$15
Canmore	$16	$16	$8		$5	$10
Banff	$24	$24	$16	$8		$5
Lake Louise	$32	$32	$24	$16	$8	

Source: CPCS Team analysis

We estimated revenues by multiplying the proposed adult fares for each origin-destination pair with the estimated demand between the same two locations. Discounts have been applied to the resulting sums in order to account for the effects of the concession fares and passes. Revenues are expected to grow in line with demand by approximately 1.9% per year.

Service Scenarios

We developed bus and rail service scenarios to provide capacity in line with the estimated ridership. All scenarios would provide all-day service, though the frequency would vary depending on the demand. In the bus scenarios a single-deck highway coach would align with the demand under the low and medium ridership forecast scenario (e.g. Figure ES-4), and a double-deck coach (e.g. Figure ES-6) would align with demand in the high ridership scenario. In the rail scenarios, a high-floor diesel-multiple unit (in three-car sets usually [e.g. Figure ES-5]) would align with demand in the low and medium scenarios, whereas locomotive-hauled trains would align with demand in the high scenario (e.g. Figure ES-7).

Figure ES-4: Illustrative Highway Coach

Source: Secondarywaltz / Wikipedia / CC BY-SA 3.0

Figure ES-5: Illustrative High-Floor DMU

Source: Craig James White / Wikipedia / CC BY-SA 4.0

Figure ES-6: Illustrative Double Deck Coach

Source: Youngjin Ko / Wikipedia / CC BY-SA 3.0

Figure ES-7: Illustrative Locomotive-Hauled Train

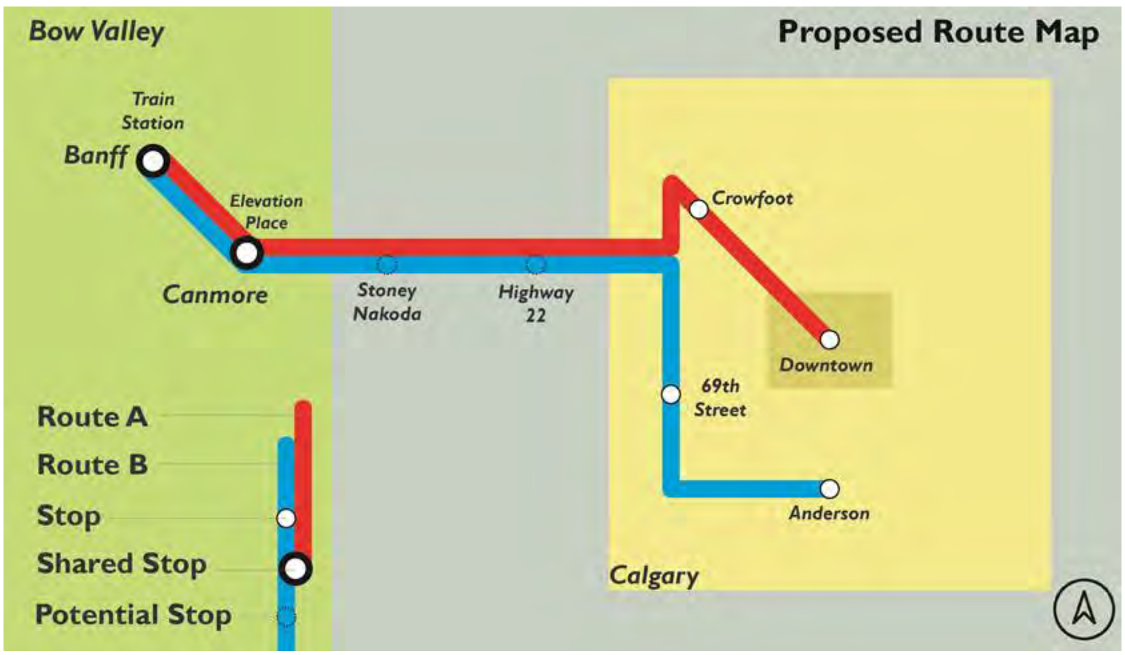
Source: Secondarywaltz / Wikipedia / CC BY-SA 3.0

Stop and Station Locations

We used consultation with stakeholders, along with an evaluation of multiple criteria (including proximity to population and employment), to identify and evaluate possible stop and station sites.

For the bus scenarios, we proposed two routes (Figure ES-8) each with different stop locations. Route A is an express route from Downtown Calgary, with intermediate stops at Crowfoot CTrain station and Canmore. Route B is a local route, starting from Anderson CTrain station ending in Banff, with intermediate stops at the 69 Street SW CTrain station, Highway 1/Highway 22, Stoney Nation and Canmore. Route B is intended to cover Calgary residents and other visitors staying in southwestern Calgary, whereas Route A serves downtown Calgary and the northwest.

Figure ES-8: Route A and Route B Map



Source: Dillon Consulting

Though residents expressed significant interest in a bus service from Cochrane during the market study, the forecasted demand levels did not appear to warrant a stop in Cochrane, particularly as a significant route deviation would be required in the bus scenarios. To serve Cochrane in the bus-only scenarios, a stop at Highway 22 is proposed.

In the rail scenarios, the following station stops were considered:

- Downtown Calgary East, adjacent to the planned Green Line CTrain stop at 9 Avenue SE and 4 Street SW
- Keith Yard, near the overpass of Stoney Trail NW along Bearspaw Dam Road NW
- Downtown Cochrane
- Canmore, near Elevation Place

- Banff Train Station

We understand that CP has plans to convert one of its tracks downtown into an inspection track, which would preclude the use of the proposed Downtown East location. If this occurs, a location on the west end of downtown (e.g. adjacent to Sunalta CTrain) would need to be considered.

Infrastructure Needs

A bus service between Calgary and the Bow Valley would require little new infrastructure, as it would travel along existing publicly funded roadway infrastructure. In addition, to the extent possible, the bus service was designed to utilize existing public-transit facilities, such as CTrain stations in Calgary. While additional discussions with owners of these facilities would be needed to secure their permissions to utilize the sites, doing so in many cases would be mutually beneficial as it could limit capital cost of providing the bus service while drawing additional traffic to these sites.

The rail service scenario under study is proposed to utilize a new parallel track along the CP right-of-way to enable a passenger train to operate reliably and to avoid impacts to CP's existing freight train operations. In addition to the new track infrastructure, the rail scenarios would also require additional station infrastructure, notably station tracks and platforms. However, to the extent possible, rail stations could be integrated into existing or planned facilities (such as adjacent to a proposed Green Line station in Calgary), to limit the new infrastructure required exclusively for rail, such as bus bays, etc.

Findings

Figure ES-9 (on p. vii) presents the findings from the analysis of the bus and rail scenarios. As this study is intended to assess the feasibility of multiple alternatives and because some of the revenues and costs are subject to significant uncertainty (e.g. due to the need for negotiations with other parties), they are correct in their general order of magnitude but should be considered approximate only.

All-year bus scenarios are expected to have capital costs ranging from $8.1 million to $19.6 million and operating costs of $4.5 million to $5.8 million per year. Based on ridership estimates ranging from 200,000 to 490,000 boardings per year in 2022, the operating subsidy would be approximately $2.0-$2.3 million per year, with the lower subsidy figure corresponding to the high ridership scenario. A summer-only bus service scenario would reduce the operating subsidy required.

All-year rail scenarios are expected to have capital costs on the order of $660 million to $680 million, and operating costs of $13.4 million to $14.3 million per year. Based on ridership estimates of between 220,000 and 620,000 per year in 2022, the estimated operating subsidy would be $8.1-$9.1 million per year, with the lower subsidy corresponding to the high ridership scenario.[5]

[5] A rail service option would not be implemented until the mid-to-late 2020s, but the horizon year 2022 has been presented to be consistent with the opening year of the bus service.

Figure ES-9: Summary Table

Mode	Bus				Rail		
Ridership scenario	Low	Medium	High	Medium (Summer, Route A, only) [iii]	Low	Medium	High
Proposed terminus (in Calgary)	*Route A:* Downtown, near 9 Avenue and Centre Street South *Route B:* Anderson CTrain Station				Downtown (near planned Green Line CTrain Station, 4 Street SE)		
Summer frequency, 2022 (round trips per day)	21	24	26	15	8	8	8
Winter frequency, 2022 (round trips per day)	14	16	19	0	6	6	6
Travel times, one-way (h:mm)	Route A: 2:10; Route B: 2:15				1:53[iiii]		
Fare, one-way	$15	$15	$10	$15	$15	$15	$10
Annual ridership, 2022 (in thousands)	200	250	490	100	220	300	620
Annual ridership, 2042 (in thousands)	300	370	710	150	320	440	900
Annual revenue, 2022 (in millions)	$2.2	$2.8	$3.8	$1.1	$3.6 [i]	$4.5 [i]	$6.1 [i]
Capital cost (in millions)	$8.1	$9.5	$19.6	$4.7	$660	$660	$680
Operating cost, 2022 (in millions)	$4.5	$5.1	$5.8	$1.9	$13.7	$14.6	$14.5
Farebox recovery ratio, 2022	49%	55%	66%	58%	27%	31%	43%
Net operating cash requirement, 2022 (in millions)	$2.3	$2.3	$2.0	$0.8	$10.1	$10.1	$8.4
Operating subsidy per rider served, 2022	$12	$9	$4	$8	$46	$34	$14
Annual greenhouse gas emissions reduction, 2022 [ii]	1,100	1,700	2,800	500	-3,900	-3,900	-1,200
Key qualitative pros/opportunities	• Can respond to uncertain ridership in finer increments of capital and operating costs. • Routes can be reconfigured more easily based on changing service needs.				• Possibility for integration with future Edmonton-Calgary high-speed rail line, should one be pursued. • Can accommodate much higher ridership figures, with appropriate flexibility incorporated in design (e.g. ensuring room to extend platforms, etc.).		
Key qualitative cons/risks	• Travel times could be threatened by increased congestion, but this is offset by higher frequencies of service as compared to rail. • Should demand approach the high-ridership scenario, the capacity of the existing CTrain park and rides may not be sufficient, and alternatives would need to be identified.				• Additional regulatory, commercial and construction steps needed, resulting in longer lead time. • Risk that automation reduces need for fixed route mass service, yet fixed costs of rail service remain. • Greater uncertainty of costs, in part due to need to negotiate with CP.		

[i] Includes an additional $1.2 million in revenue possible through a Cochrane commuter service. [ii] Tonnes of carbon dioxide equivalent emissions per year. Negative figure indicates greenhouse gas emissions increase. Calculation assumes an average vehicle occupancy of approximately 2.5 persons per vehicle. Under rail high, the occupancy would need to be approximately 2.1 persons per vehicle for the net impact to be zero. [iii] Assumes no ridership from Route B shifts to Route A. [iiii] Minimum run time without meets. Source: CPCS Team analysis

Sensitivity to Alternative Scenarios

The rail and bus scenarios were created to have similar input assumptions (e.g. fares) for comparability. If $10 fares were implemented in the low and medium bus scenarios, revenues would be expected to decrease by approximately $0.2 million to $0.5 million per year, respectively, in 2022. Correspondingly, ridership would be expected to increase and require additional bus service. As a result, the net operating subsidy would increase by at least $0.2 million per year, due the additional operating costs of buses.

Alternatively, recognizing the higher cost of providing rail service, if a $15 fare were implemented under the rail high scenario, revenues would be expected to increase between $0.6 million to $1.0 million per year in 2022, assuming the same price sensitivity as in the low and medium scenarios. Because, relative to the existing high scenario, ridership would decrease, operating costs would be expected to be the same or slightly lower. As a result, the operating subsidy would be expected to decrease by at least $0.9 million per year. Figure ES-9 summarizes these results.

Figure ES-10: Revenue Sensitivity (2022)

	Bus-Low	Bus-Medium	Rail-High
Fare assumption (original -> new)	$15 -> $10	$15 -> $10	$10 ->$15
Existing scenario annual revenue (in millions)	$2.2	$2.8	$6.1
Change in revenue (in millions)	**-$0.2**	**-$0.5**	**+$0.6-$1.0**
New scenario revenue (in millions)	**$2.0**	**$2.3**	**$6.7-$7.1**
Farebox recovery ratio	**<44%**	**<45%**	**>46%**
New scenario operating subsidy (in millions)	**>$2.5**	**>$2.8**	**<$7.4-$7.8**

Source: CPCS analysis

Conclusion

Regardless of the Calgary to Bow Valley transit option pursued, there are opportunities to further increase ridership (and related benefits) and reduce costs. Further, providing transit from Calgary alone is not a complete solution to addressing congestion in and around Banff National Park. Notably, complementary local transit within and around Banff National Park (or possibly implementing ride-sharing) would be a key factor in maximizing ridership on an intercity transit service. This includes services around the Town of Banff, between Banff and Lake Louise, and between Banff and Canmore. In addition, other strategies to improve the viability of the intercity service, including piloting more market-based fares (e.g. peak/off-peak differentiation), evaluating congestion pricing mechanisms and starting with a summer-only bus service, could be considered. In other words, for an intercity transit service to be financially viable and effective at reducing auto congestion in Banff, it needs to be part of a larger strategy to encourage a mode shift.

Acronyms / Abbreviations

ATR	Above Top of Rail
BAU	Business-As-Usual
BCR	Benefit-Cost Ratio
BRT	Bus Rapid Transit
BVRTSC	The Bow Valley Regional Transit Services Commission
CEAA	Canadian Environmental Assessment Act
CMA	The Calgary Census Metropolitan Area
CMLC	Calgary Municipal Land Corporation
CN	Canadian National
CO_2e	Carbon Dioxide (CO_2) Equivalent
CO	Colorado
CP	Canadian Pacific
CPCS	CPCS Transcom Limited
CROR	Canadian Rail Operating Rules
CRP	Calgary Regional Partnership
CTC	Centralized Traffic Control
CTP	Calgary Transportation Plan
DFO	Fisheries and Oceans Canada
DMU	Diesel-Multiple Unit
EB	Eastbound
ENPV	Economic Net Present Value
FCI	Transport Canada Full Cost Investigation
FL	Flashing Lights
FNPV	Financial net present value
FRA	United States Federal Railroad Administration
FSA	Forward Sortation Area
GDP	Gross Domestic Product
GHG	Greenhouse gas
GTA	Greater Toronto Area
LB	Pounds
LRT	Light Rail transit
LTTS	Long Term Transportation Study
MD	Municipal District
MDP	Municipal Development Plan
MP	Milepost
NW	North West
OAC	Operating Authority Certificate
OEM	Original Equipment Manufacturer
PCU	Passenger Car Equivalent
RDC	Rail Diesel Car
RER	Regional Express Rail
RFP	Request for Proposal
ROW	Right-of-way

RTC	Rail Traffic Controller
RTM	Réseau des transports métropolitains
SARA	Fisheries Act or Species at Risk Act
SDR	Social Discount Rate
SE	South East
SW	South West
TOD	Transit-Oriented Development
UBC	University of British Columbia
US	United States
USD	United States Dollar
VHF	Very high frequency
VKT	Vehicle-KM Travelled
VPD	Vehicles per day
VSL	Value of Statistical Life
WB	Westbound
YUL	Montreal Airport
YVR	Vancouver Airport
YYC	Calgary International Airport
ZBA	Zins Beauchesnes and Associates

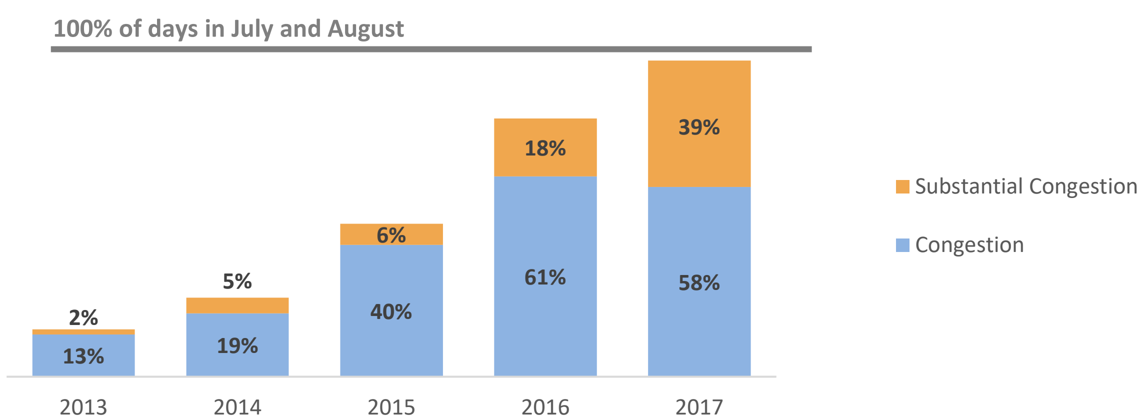
1 Introduction

1.1 Background

Since 2008/09, Banff National Park has seen visitation increase by 2.6% per year, particularly in 2014/15 and 2015/16, likely in part due to the appreciation of the US dollar. As over 93% (3.89 million) of visitors arrive in personal vehicles,[6] this increase in visitation results in vehicle congestion, particularly during the summer months, and associated negative impacts (increased travel times, increased greenhouse gas emissions, increased traffic on wildlife corridors, reduced visitor experience). In Banff, delays above typical travel times of 10 to 20 minutes or longer are not uncommon when roadway capacity is exceeded.[7] This is not only a Banff issue, but an issue impacting Banff National Park, with similar levels of congestion being experienced on the Trans-Canada Highway, Bow Valley Parkway and at Lake Louise during the summer months.

Without any mitigating action, congestion is anticipated to worsen, driven by population increases in nearby Calgary and a growing tourism and hospitality industry in Banff National Park. In the busiest months of July and August, roadway capacity in Banff was exceeded and congestion or substantial congestion occurred on 97% of days in 2017, up from 15% in 2013 (Figure 1-1).[8] A recent study found that, in 2020, the equivalent of approximately 8,710 vehicles per day need to be removed to avoid congestion in Banff.[9]

Figure 1-1: Percentage of Days in July and August with Congestion and Substantial Congestion



Note: Refer to footnote 8 for the definition of congestion and substantial congestion. Source: CPCS adaptation of Town of Banff chart.

[6] Request for Proposals, p. 3.
[7] Town of Banff. 2016 Traffic Data.
[8] Based on a study, the Town of Banff defines *congestion* as days when the number of vehicles per day exceeds 24,000, and *substantial congestion* when the number of vehicles per day exceeds 28,000.
[9] Stantec. 2016. Banff Long Term Transportation Study.

1.2 Project Objectives

Reducing traffic congestion in the Banff National Park requires consideration of the introduction of a mass transit service from Calgary that would provide visitors with a viable option to leave their vehicle at home. To this end, as stated in the Request for Proposals (p. 2), the objective of this study is:

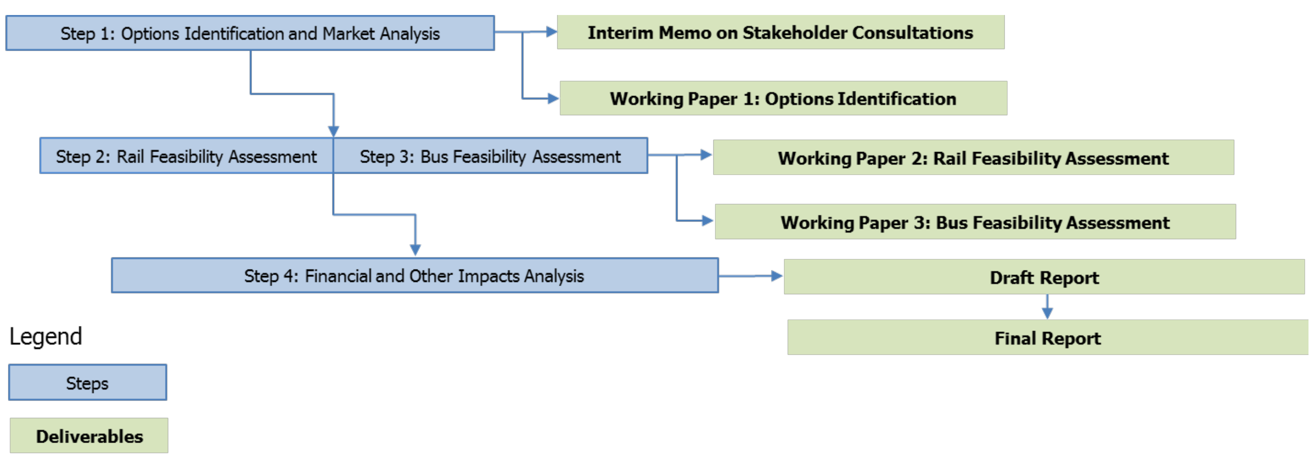
> to determine the feasibility of passenger mass transit through the options of passenger rail and bus/coach between the Town of Banff, Lake Louise (Improvement District 9), Town of Canmore, Town of Cochrane and The City of Calgary. The intent of the service will be to provide a mobility choice for residents and visitors to access the Bow Valley without the need of a personal vehicle.

This study objective was accomplished by studying the feasibility and cost of a range of service options, from bus/coach alternatives to passenger rail service utilizing new and existing infrastructure along the existing CP Laggan Subdivision between Calgary and Banff.

1.3 Project Structure

The project was developed in four steps, as set out in Figure 1-2. This report is the output of all four steps. The purpose of this report is to provide a discussion of feasibility of a mass transit system between Calgary and the Bow Valley, including bus and rail options. CPCS was asked to estimate potential ridership, revenues, capital and operating costs, and select financial and other metrics (e.g. greenhouse gas emissions reduction potential).

Figure 1-2: Project Steps



1.4 Methodology

This report was prepared through an analysis of information and data collected through a stakeholder consultation process, literature review and field data collection.

CPCS consulted with municipalities along the route and other stakeholders, including Parks Canada and the Government of Alberta, to inform the development of this study. A complete list of stakeholders consulted and themes from these consultations is summarized in Appendix A. Stakeholder consultation guides are provided in Appendix B. Over the course of the study, selected stakeholders were consulted for further input, notably regarding station locations in communities along the route.

The data used in this report includes previous market research commissioned by Parks Canada and Banff & Lake Louise Tourism, vehicle counts provided by the Town of Banff and Alberta Transportation, summer 2017 Calgary-Banff pilot bus service demand statistics, along with other sources available to the team. In addition, two surveys were carried out to assist in the identification of the potential demand for a mass transit service. Selected excerpts from these data sources are found in Appendix C and Appendix D. The survey questionnaires and aggregate results are found in Appendix E. The methodology for these surveys is further described in chapter 2. Finally, some high-level site reconnaissance has been conducted to familiarize the team with the area and potential station locations.

Rail infrastructure and operational data used is based upon publicly available timetables and other sources (such as the Transport Canada Grade Crossing Database, Google Earth), infrastructure schematics, traffic data, and estimated and actual siding construction costs provided by CP, as well as team member knowledge of the corridor. CP has been consulted prior to the preparation of this report, though has not provided detailed comments.

1.5 Limitations

This study is, in part, based upon third-party information and opinions provided during a consultation process. While the CPCS Team makes efforts to verify the accuracy of this information, its accuracy cannot be guaranteed.

In addition, this report contains estimates of demand based upon surveys conducted by members of the CPCS Team. There are several specific limitations associated with these surveys, as further discussed in chapter 2, which introduce uncertainties into the forecasted demand. Generally, the forecasts and other information contained herein should be considered nominal, order-of-magnitude, only. Further, while this forecast assumes a certain level of growth, forecasts of the future are inherently subject to changing external conditions.

The capital costs of bus and rail infrastructure were based on aerial imagery, high-level reconnaissance of the sites, and the team members' knowledge of the terrain. The unit costs developed are therefore based on average quantities based on terrain, and may not account for site-specific factors. They are order-of-magnitude only and should be used primarily for comparison of the potential options.

1.6 Outline of this Report

The rest of this report is outlined as follow

- **Chapter 2** describes the methodology used to forecast ridership;
- **Chapter 3** describes the proposed fare levels;
- **Chapter 4** identifies potential bus and rail stop and station locations;
- **Chapters 5 to 10** provide estimated bus ridership and revenues, outline a potential bus service design, provide estimated bus capital and operating costs, and provide implementation steps;
- **Chapters 11 to 18**, with reference to chapters 6 to 10, provide estimated rail ridership and revenues, discuss a potential rail service design, provide estimated rail capital and operating costs, and provide some implementation steps;
- **Chapter 19** provides an assessment of additional financial and other metrics; and
- **Chapter 20** provides an overall conclusion to the study.

2 Demand Analysis Methodology

Key Chapter Takeaways

- This chapter develops the methodology for estimating the potential ridership for mass transit service options, using data collected through online and in-person surveys, as well as other sources researched by the team. Three ridership scenarios are proposed: low, medium and high.
- An online survey was conducted between July 14 and August 15, 2017, and advertised through community websites and social media profiles in Calgary and the Bow Valley. Overall, 993 responses were received, of which 58% were respondents from the Bow Valley. There was an oversampling of Cochrane and Bow Valley residents.
- An in-person survey of visitors to the Bow Valley was conducted in Canmore, Banff and Lake Louise on select weekend and weekdays between July 23 and August 17, 2017. In total, 454 visitors were surveyed.
- In 2016, there would have been an estimated 1.7 to 1.9 million visitors per year considered in-scope, i.e. could potentially be captured by the mass transit service.
- There are approximately 200,000 trips per year by Bow Valley residents to Calgary considered in-scope.
- Various capture rates have been applied to the estimates of in-scope trips to estimate ridership, taking into account the differing preferences for bus and rail.

2.1 Overall Approach

2.1.1 Markets of Interest

Figure 2-1 shows the framework used to assess the potential travel demand for a mass transit service between the Calgary Region and the Bow Valley. Out of the total potential market (those that live in or are visiting the Bow Valley), the sub-markets of interest are:

- visitors to the Bow Valley who are coming from and returning to Calgary, including
    - Calgary Region residents (“Calgary visitors”), and
    - visitors from outside of Calgary who stayed in or travelled through Calgary (“other visitors”); and

- residents of the communities west of Calgary (Cochrane, Canmore, Banff, etc.) who travel or commute to Calgary ("commuters").

Figure 2-1: Breakdown of Potential Sub-Markets

Source: CPCS

Further information on the existing context for these markets is found in Appendix C.

2.1.2 Visitors to the Bow Valley

Visitors to the Bow Valley would be the predominant source of ridership for a mass transit service between Calgary Region and the Bow Valley. The overall approach to estimating the potential ridership for visitors to the Bow Valley involved the following steps:

1. Determine the number of in-scope visitors (i.e. the number of visitors that could potentially use the mass transit service) by:

    a. Estimating the total number of visitors to the Bow Valley (Calgary Region, outside of Calgary but within Alberta, etc.) based on data collected by Parks Canada and Zins Beauchesnes and Associates (ZBA),[10]
    b. Removing visitors who did not come through Calgary on their trip; and
    c. Removing the percentage of visitors to the Bow Valley who continue their trip beyond the Bow Valley.

2. Estimate the percentage of visitors coming from each forward sortation area (FSA)[11] in the Calgary area and assign each FSA to at least one bus and rail station, depending on the mode of access (transit or auto).

[10] These estimates were undertaken by the ultimate origin of the traveller's trip (e.g. United States, etc.)
[11] The first three characters of a postal code.

  a. For Calgary visitors, this estimate was based primarily on data collected by Parks Canada.
  b. For other visitors, the estimate was based on the survey data collected using high-level areas of Calgary, or whether they came through Calgary or directly from the airport.
3. Estimate the distribution of destinations within the Bow Valley, removing trips that are to destinations that are not transit accessible.
4. Estimate the willingness to switch to transit, factoring in the greater preference towards rail rather than bus.
5. Estimate the potential for induced demand.
6. Estimate the distribution of ridership by day.
7. Determine the annual growth rates and apply these to the forecast.

Because of the seasonality of visitation to Banff National Park, the ridership estimates were carried out using two separate demand periods: winter and summer. The winter period is defined as November to April and the summer demand period is defined as May to October. Peaking factors were also developed to account for the peak months within those periods.

2.1.3 Bow Valley Residents

A parallel approach to estimate trips from the Bow Valley (Lake Louise, Banff and Canmore) to Calgary was undertaken as follows:

1. Estimate the number of trips from the Bow Valley to Calgary using the results from the online survey and inflated to account for the sample size.
2. Estimate the approximate number of trips that would be destined to the walking catchment area around Calgary stations (i.e. downtown).
3. Estimate the willingness to switch to transit, factoring in the greater preference towards rail rather than bus.
4. Estimate the distribution of ridership by day.
5. Determine the annual growth rates and apply these to the forecast.

If there is the potential to capture commuters from Cochrane to Calgary within a service scenario, these are separately estimated using existing City of Calgary forecasts.

2.1.4 Scenario-Based Approach

Recognizing that that there is uncertainty with regard to a number of the parameters, low, medium and high scenarios were developed. The low and high scenario are based on pessimistic and optimistic assumptions about demand, respectively. They do not necessarily reflect the full range of uncertainty that exists, including the implications of any broader opportunities or risks, such as increasing vehicle automation.

To develop these forecasts, several parameters are varied, including:

- The size of the in-scope market (i.e. the trips that are candidates to take a mass transit service)
- The potential capture rate (which is a function of the service plan and fare)
- The potential for induced demand

These permutations are discussed in the subsections below.

2.2 Survey Methodologies and Responses

Before further detailing the methodology, this section provides an overview of the two surveys carried out to assist in the assessment of the potential demand.

Online and in-person surveys were conducted in July and August 2017 to understand existing travel patterns between Calgary/Cochrane and the Bow Valley and to assess willingness to use a mass transit service.

2.2.1 General Limitations

While these survey data are useful for assessing the ridership of a mass transit service, some limitations should be considered when interpreting the results:

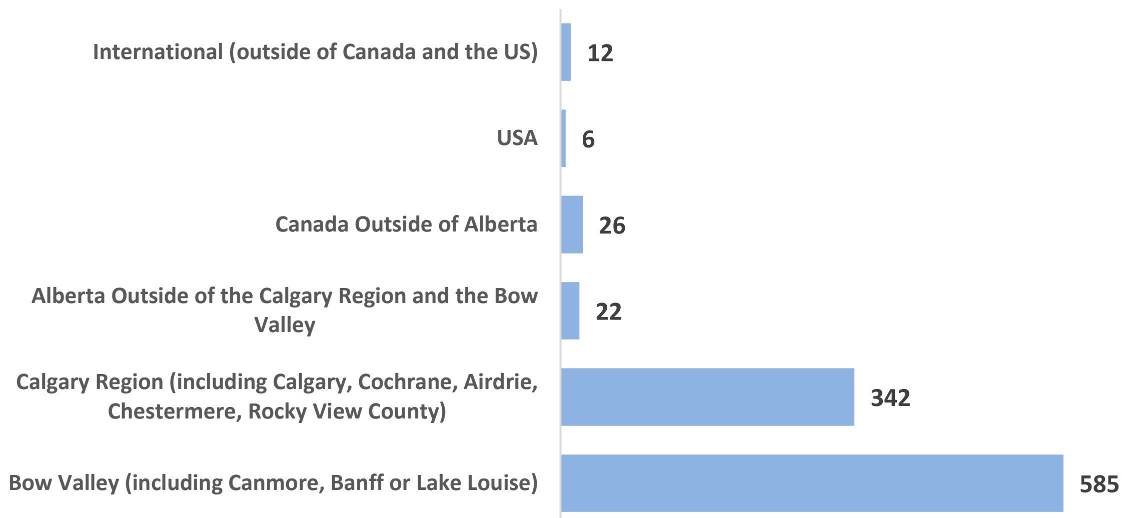
- With sample sizes of approximately 400, the margin of error is at best 5%, with 95% confidence. Subsamples within the survey will have a higher margin of error, as they are drawing from a smaller number of responses.
- The online and in-person samples were based on voluntary responses and convenience, respectively. In particular, with the online survey, there was no direct control who responded to the survey, so some bias may be introduced (such as having more responses from individuals who are keen to have a mass transit service, or vice-versa). With the in-person survey, visitors were approached at random. However, though the survey locations were selected to be central locations where visitors would congregate, it is a less ideal location than a more random sampling approach, such as stopping a sample of visitors entering Banff National Park, which was ruled out because of the potential disruption to visitors, through increased traffic, and cost.
- The responses regarding the willingness to use a new mode are based on stated (rather than revealed) preferences. As a survey asking about a relatively new mode of travel, respondents may have preconceived notions about the service that may impact the results (e.g. a train service may be compared to a CTrain service or a bus service to a Calgary Transit service), which impact the results. In general, it was anticipated that respondents would be overly optimistic in terms of their willingness to use mass transit.

Because of these limitations, the responses were interpreted in conjunction with other sources of data (such as the current observed 2017 pilot bus service)

2.2.2 Online Survey

An online survey was conducted between July 14 and August 15, 2017, and advertised through community websites and social media profiles in Calgary and the Bow Valley. Overall, 993 responses were received. The location of respondents is shown in Figure 2-2. As shown, this survey was primarily responded to by residents of the Bow Valley and of the Calgary area. As such, the results were only used to discuss the preferences of Calgary visitors. However, it should be noted that of the Calgary Region residents, approximately 172 indicated that they resided in Cochrane. The remaining 170 were primarily from Calgary. In other words, there was oversampling of the Cochrane area.

Figure 2-2: Profile of Respondent Residence – Online Survey



Source: CPCS Team based on online survey data

The online survey contained a field for respondents to provide an open-ended response commenting on the opportunities and challenges associated with a potential mass transit service. A sampling of these responses is provided in Appendix F.

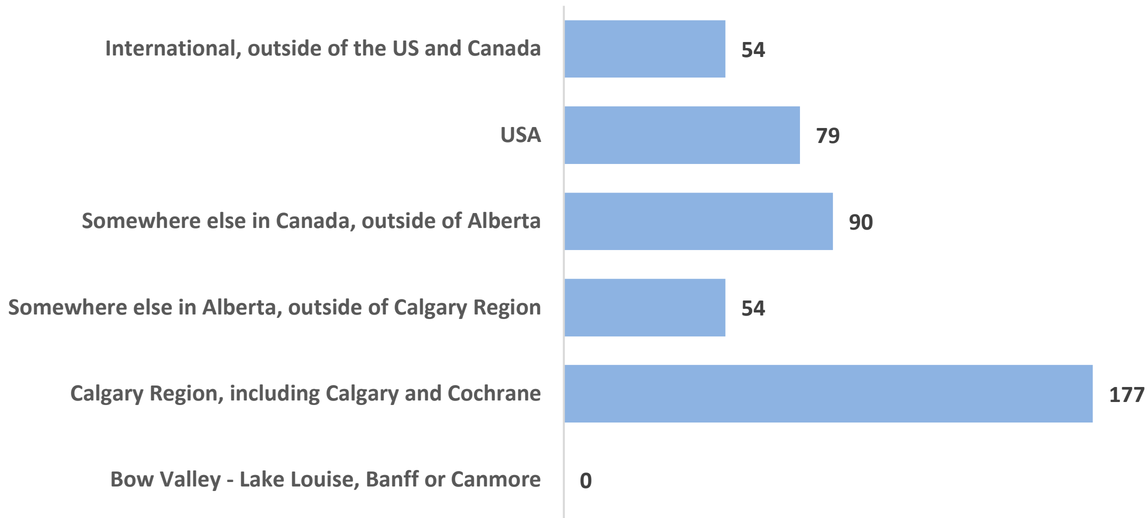
2.2.3 In-Person Survey

An in-person survey of visitors to the Bow Valley was conducted in Canmore, Banff and Lake Louise on select weekends and weekdays between July 23 and August 17, 2017. The specific locations of the surveys included:

- The Canmore Visitor Information Centre;
- Along Banff Avenue in Banff near the Banff Visitor Centre; and
- At Samson Mall and at the Lake Louise Overflow Lot in or near the Village of Lake Louise.

Figure 2-3 summarizes the location of respondents. In total, 454 responses were received from visitors who resided in or passed through Calgary. These results were used to discuss the preferences of both Calgary visitors and visitors from other areas.

Figure 2-3: Profile of Respondent Residence – In-Person Survey



Source: CPCS Team based on in-person survey data

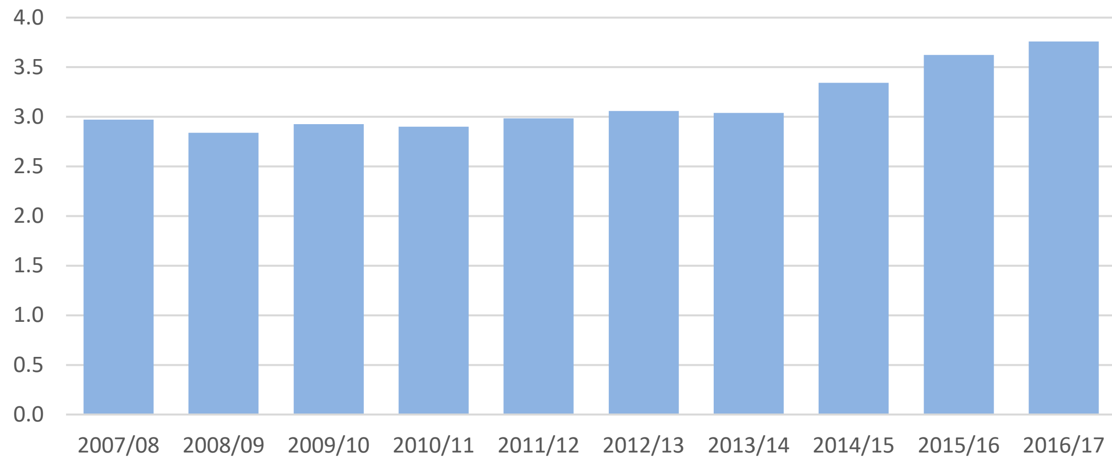
2.3 Estimated In-Scope Visitors

2.3.1 Overall Visitation

As shown in Figure 2-4, in Government of Canada fiscal year 2016/17, 3.8 million independent visitors[12] entered Banff National Park (BNP). Since 2007/2008, there has been growth of 2.6% per year in visitation. This growth is however recent and is essentially occurring since the 2014/2015 fiscal year.

[12] As opposed to Group Tour Visitors. Although the amount of Group Tour Visitors has increased in the past three years, total numbers are down by over 100,000 since 2007/2008.

Figure 2-4: Banff National Park Visitation, 2007/08 to 2016/17 (in Millions)

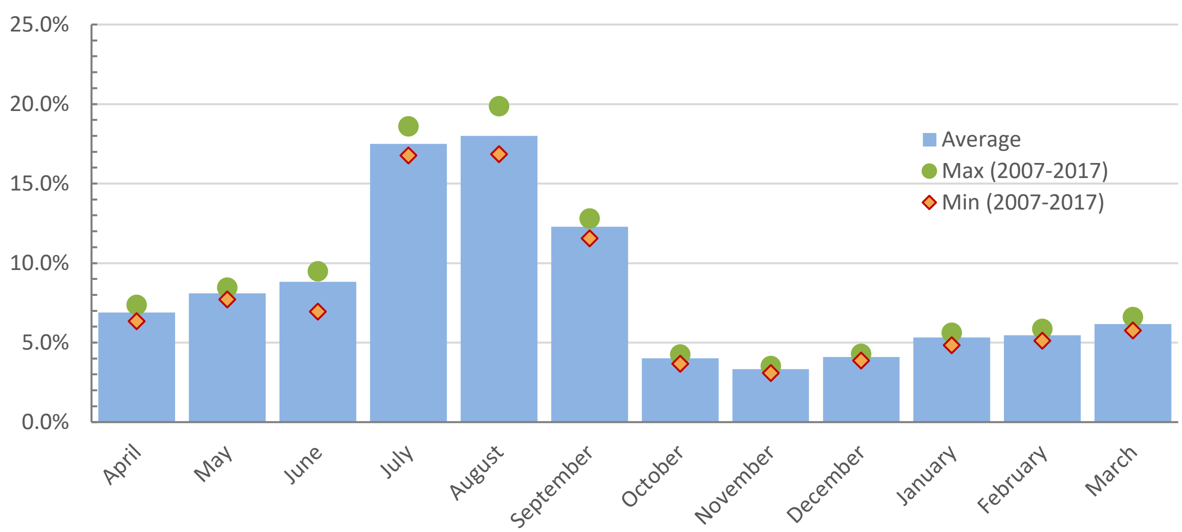


Note: Excludes visitors in organized tour groups. Source: CPCS summary of Parks Canada data

2.3.2 Seasonality

On average, between 2007 and 2017, most visitors to BNP visit during the summer months (76%) (Figure 2-5). For the purposes of this report, the summer is defined from April to October, inclusive, and the winter is defined as November to March, inclusive. In the 2016/17 fiscal year, 1.15 and 2.61 million visitors entered BNP in the winter and summer months, respectively.

Figure 2-5: Banff National Park Independent Visitor Attendance by Month



Source: CPCS summary of Parks Canada data

The peak month for visitation, on average, is August, with 18.0% of visitors arriving in this month.[13] This additional peaking is accounted for later in section 2.9.

[13] In absolute numbers, visitation in August 2016 was 659,540 independent visitors. Visitation in July 2016 was actually slightly higher (680,360 independent visitors).

2.3.3 Visitor Origin

We segmented overall park visitation based on the origin of visitors, using two data sources:

1. In 2015, Zins Beauchesnes and Associates (ZBA) undertook two studies (one in the summer and one in the winter) of the visitor experience in the Banff National Park area.
2. In addition to overall visitation, Parks Canada collected visitor origin data based upon postal codes reported by customers at BNP gates during sales between early April and mid-September 2016.

There are limitations with both surveys. The ZBA surveys were surveys of convenience, so the sample of who responded to the surveys could not be directly controlled. In addition, the survey did not specifically report on the fraction of visitors who live in Calgary (as distinct from all visitors from Alberta). The Parks Canada survey, though it took place at park gates, did not sample all visitors as some may have already purchased an annual pass. This limitation may result in an underestimation of the proportion of visitors from Calgary. The Parks Canada survey also did not continue into winter months.

Figure 2-6 summarizes the estimated number of visitors coming from each origin, by season. The largest fraction of visitors in both seasons is estimated to come from Calgary.[14] In the summer months, the number of other visitors increases, both in absolute numbers and as an overall fraction of total visitation.

Figure 2-6: Banff National Park Visitors from Each Origin

Visitor Origin		Distribution of Visitors		Total Visitors from Each Origin		
		Winter	Summer	Winter	Summer	Total
	Calgary CMA	33%[2]	24%[1]	380,000	630,000	1,010,000
Other Visitors	Other Alberta	25%[3]	18%[4]	290,000	470,000	760,000
	Other Canadian	23%[3]	17%[4]	260,000	440,000	700,000
	USA	8%[3]	13%[4]	90,000	340,000	430,000
	Other International	10%[3]	29%[4]	120,000	760,000	880,000
		~100%	**~100%**	**1,140,000**	**2,640,000**	**3,780,000**

1. Based on Parks Canada point of sale data, expanded based on ration of population within the City of Calgary and the Calgary CMA. The weighted average of the responses for "East Gate" and "Other Gates" was used.
2. Estimated based on product of ZBA Winter 2015 Alberta visitation and fraction of Alberta visitors in Parks Canada data.
3. Estimates based on ZBA data.
4. Estimates based on Parks Canada data.

Source: CPCS

2.3.4 Adjustment for Visitors Not Coming from Calgary

All Calgary visitors are assumed to have travelled from Calgary. However, other visitors may start their trip to BNP elsewhere (e.g. in BC) and not travel through Calgary. These visitors are less likely to use a mass transit service between BNP and Calgary.

[14] Appendix D, Visitor Origin – Additional Data, provides additional details regarding the source of these data.

As part of the in-person survey questionnaire, respondents were asked whether they stayed in or travelled through Calgary before coming to the Bow Valley. Respondents who did *not* travel through Calgary were disqualified from the survey. In total, approximately 80% of people approached to take part in the survey who were *not* (1) Bow Valley residents or (2) on an organized tour came through Calgary before coming to the Bow Valley. In other words, at least 20% of independent visitors are not potential candidates for using a mass transit service as they did not pass through Calgary.

Using this factor, the remaining in-scope visitors are shown in Figure 2-7.

Figure 2-7: Visitors Passing Through Calgary

Visitor Origin		Percent from Calgary	Remaining In-Scope Visitors		
			Winter	Summer	Total
	Calgary CMA	100%	380,000	630,000	1,010,000
Other Visitors	Other Alberta	80%	230,000	380,000	610,000
	Other Canadian	80%	210,000	350,000	570,000
	USA	80%	70,000	270,000	340,000
	Other International	80%	90,000	600,000	700,000
			980,000	**2,230,000**	**3,230,000**

Source: CPCS analysis based on in-person survey

2.3.5 Percent of Visitors Continuing Their Trip Beyond BNP

The number of in-scope visitors was further reduced based on whether they planned to continue their trip beyond BNP, using data from the in-person survey. In-person survey respondents were asked if they planned to continue their trip beyond the Bow Valley. As shown in Figure 2-8, the majority of respondents (86%) from Calgary plan to visit only BNP, whereas few international visitors (19%) plan to stay exclusively in BNP. These factors were used for the low and medium ridership scenarios.

Figure 2-8: Visitors Staying in BNP (Low and Medium Scenarios)

Visitor Origin		Percent Staying in BNP	Remaining In-Scope Visitors		
			Winter	Summer	Total
	Calgary CMA	86%	330,000	540,000	860,000
Other Visitors	Other Alberta	61%	140,000	230,000	370,000
	Other Canadian	41%	90,000	150,000	230,000
	USA	35%	30,000	100,000	120,000
	Other International	19%	20,000	110,000	130,000
	Total		**610,000**	**1,130,000**	**1,710,000**

Source: CPCS analysis based on in-person survey

Some respondents may not be familiar with the specific extents of BNP and some destinations outside of BNP may be accessible using day tours, etc. For example, the Icefields Parkway between Lake Louise and Jasper is partially in Jasper National Park, but could still be accessible to BNP visitors within a day. In the high scenario, we have assumed the in-scope visitation is 15% higher (Figure 2-9).

Figure 2-9: Visitors Staying in BNP (High Scenarios)

Visitor Origin		Percent Staying in BNP	Remaining In-Scope Visitors		
			Winter	Summer	Total
	Calgary CMA	99%	380,000	620,000	990,000
Other Visitors	Other Alberta	70%	160,000	260,000	430,000
Other Visitors	Other Canadian	47%	100,000	170,000	270,000
Other Visitors	USA	41%	30,000	110,000	140,000
Other Visitors	Other International	21%	20,000	130,000	150,000
	Total		**690,000**	**1,290,000**	**1,980,000**

Source: CPCS analysis based on in-person survey. Results.

2.4 Visitors – Distribution of Origins and Destinations

2.4.1 Calgary Region Residents

Origins

The total number of visitors estimated in Figure 2-8 and Figure 2-9 were distributed across each forward sortation area (FSA) in the Calgary CMA. The distribution was based on the postal codes reported in the Parks Canada point-of-sale survey introduced in section 2.3.3.[15] All (100%) visitors were assigned. Visitors who are residents of each FSA were assigned to at least one Calgary CMA area mass transit station, based on the proximity to the station.[16] Potential station locations are introduced in chapter 4.

Destinations

Appendix D summarizes the destinations that Calgary residents visit in the Bow Valley based on the survey responses. As most visitors visit multiple locations on their trips, some assumptions are required to forecast the where visitors would board and alight from a mass transit service between Calgary and the Bow Valley. Otherwise, there would be double-counting of potential trips.

To estimate the potential first stop of mass transit users travelling from Calgary, the following approach was used:

- If a visitor visited *only* Canmore, the destination was assigned to Canmore.
- If a visitor visited Banff, without visiting Lake Louise, the destination was assigned to Banff.
- If a visitor visited both Banff and Lake Louise, the destination was assigned to Banff. While this likely underestimates the potential traffic directly to Lake Louise, given the higher

[15] The distribution of visitor origins for locations outside of the City of Calgary but inside the Calgary CMA (i.e. Airdrie and Cochrane) were based on the relative population of these areas.
[16] If there was no transit access to a given FSA, then only an auto access station was identified.

proportion of accommodations in Banff, it was anticipated that most visitors would stop in Banff first (to drop off luggage, etc.).

- If a visitor visited Lake Louise without visiting Banff, they were assigned to Lake Louise.

This approach likely underestimates some of the demand for individuals travelling directly to areas outside of Banff. However, its findings are consistent with the ridership patterns of the summer 2017 Calgary-Banff pilot bus service, where the majority of alightings (greater than 90%) occurred in Banff.

The estimated distribution based on these assumptions is summarized in Figure 2-10. Note that the total distribution of visitors does not equal to 100%, as visitors who visited an area that was not transit accessible were excluded. Though few of the respondents to the survey noted that they stop at the Stoney Nakoda Resort and Casino, there may still be demand for a stop that was not captured as both surveys were primarily targeting visitors to Banff, Canmore and Lake Louise.

Figure 2-10: Calgary Visitors - Distribution of Likely First Stop of a Mass Transit Service to Bow Valley

Location	Percentage of First Stop	Number of Visitors per Period (Low and Medium)		Number of Visitors per Period (High)	
		Winter	Summer	Winter	Summer
Stoney Nakoda Resort and Casino	0%	0	0	0	0
Town of Canmore	7%	24,000	39,000	27,000	45,000
Town of Banff	52%	220,000	370,000	260,000	430,000
Lake Louise/Village of Lake Louise	10%	37,000	62,000	42,000	71,000
Subtotal	**87%**	**280,000**	**470,000**	**330,000**	**540,000**
Total		**750,000**		**870,000**	

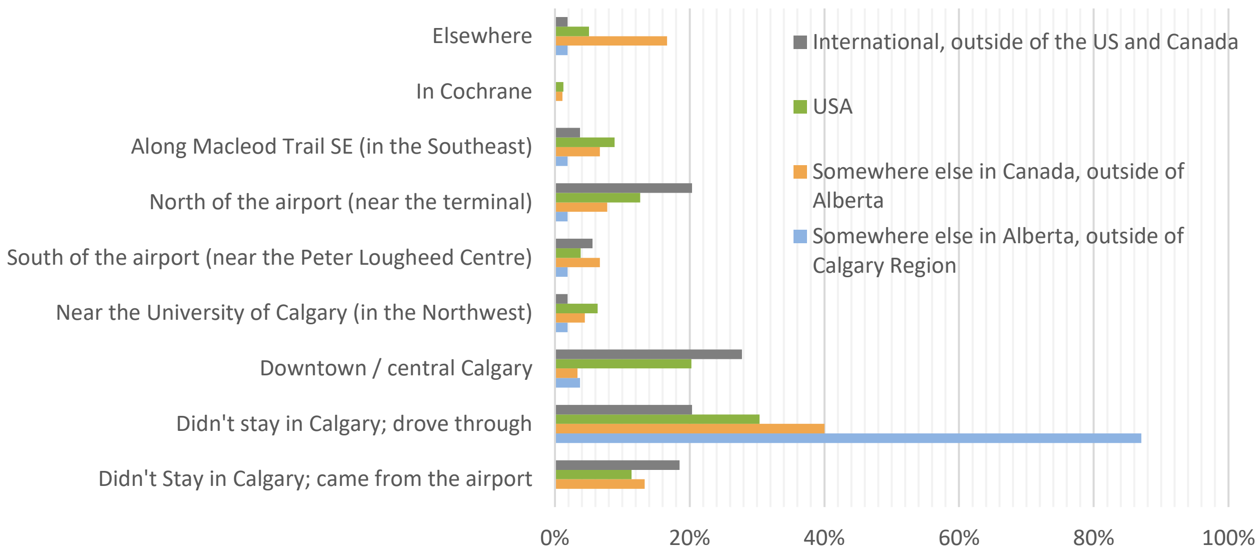
Source: CPCS analysis of in-person survey responses

2.4.2 Other Visitors

Origins

Figure 2-11 summarizes the location where non-Calgary residents stayed in Calgary (or whether they came directly through or from the airport [YYC]). The vast majority (87%) of Alberta residents from outside of Calgary did not stay over in Calgary on their way to the Bow Valley. A fairly large percentage of other Canadian visitors (40%) and USA visitors (30%) also did not stay in Calgary, but drove through. For international visitors, most (28%) stayed downtown, followed by north of the airport (20%).

Figure 2-11: Non-Calgary Residents – Local Calgary Origin



Source: CPCS analysis of in-person survey data

As with Calgary visitors, visitors coming from/staying in each location above were assigned to at least one transit stop within Calgary, including those passing through or coming directly from the airport. This assignment was based on proximity and minimizing circuity, and the likely mode of access. For example, those driving through Calgary were assigned to a park-and-ride station, whereas those individuals coming from the airport were assigned to a transit accessible station.

Destinations

Appendix D summarizes the destinations that other visitors visit in the Bow Valley based on the survey responses. Similar to the approach taken for Calgary visitors described in section 2.4.1, the likely destination of a visitor using a mass transit service from Calgary was determined (Figure 2-12). None of the in-person survey respondents visited Stoney Nakoda Resort and Casino, though the in-person survey was not as well designed to capture this potential destination.

Figure 2-12: Other Visitors – Distribution of Destinations

Location	Percentage of First Stop	Number of Visitors per Period (Low and Medium)		Number of Visitors per Period (High)	
		Winter	Summer	Winter	Summer
Stoney Nakoda Resort and Casino	0%	0	0	0	0
Town of Canmore	7%	20,000	40,000	20,000	50,000
Town of Banff	83%	230,000	480,000	260,000	560,000
Lake Louise/Village of Lake Louise	10%	30,000	60,000	30,000	70,000
Subtotal	**100%**	**270,000**	**580,000**	**310,000**	**670,000**
Total		**850,000**		**980,000**	

Source: CPCS analysis of in-person survey results

2.5 Bow Valley Residents

2.5.1 Estimated In-Scope Trips

In order to estimate the annual trips from the Bow Valley to Calgary, expansion factors were used to inflate the survey responses to actual annual trips. Two different methodologies were used to develop the expansion factors. The first approach involved comparing the number of survey responses to dwelling units[17] in each town (Banff, Canmore and Lake Louise). Using this methodology, the number of trips indicated in the survey should be expanded by 13 to 17 times.

Figure 2-13: Possible Expansion Factors Based on Dwelling Units

Origin	Responses	Dwelling Units Occupied by Usual Residents	Population Over 15	Expansion Factor
Lake Louise (T0L)	165	2,543	6,690	15
Banff (T1L)	328	5,738	10,025	17
Canmore (T1W)	69	31	876	13

Source: CPCS analysis of online survey results and Statistics Canada data

Because the survey responses were voluntary, the survey likely captured individuals who took more trips to Calgary and are thus more interested in the introduction of a mass transit service. As an alternative approach, survey responses were compared to data from the 2014 Town of Canmore census. In 2014, the census found that 555 Canmore residents commute to work in Calgary. The online survey found that 71% of Canmore residents who travelled to work to Calgary did so “multiple times per week”, which was assumed to be 2.5 days per week on average (Figure 2-14). Using the distribution of work trip frequency from the online survey and the number of Canmore residents who work in Calgary, we estimate that about 80,000 roundtrips are made from Canmore to Calgary for work every year. This estimate is about 10 times higher than the number of work trips indicated in the survey responses, suggesting an expansion factor of about 10.

Figure 2-14: Work Trip Distribution

	Once per day	Multiple times per week	Once per week	Once every two weeks / bi-weekly	Once per month	Once every two months / bi-monthly
Days per year	261	130	52	26	12	6
Work trip frequency	17%	71%	5%	4%	2%	1%

Source: CPCS analysis of online survey data

More conservatively, we have assumed an expansion factor of 10. On this basis, we estimate that there are approximately 183,000 roundtrips per year by Bow Valley Residents to Calgary every year (Figure 2-15).

[17] In the case of Lake Louise, we used the population over 18 years of age, as dwelling units is likely not a reasonable indicator of the total “size” of Lake Louise considering temporary residents, etc.

Figure 2-15: Estimated Number of Trips by Bow Valley Residents to Calgary

Origin	Estimated Round Trips per Year (in Sample)	Expansion Factor Used	Estimated Round Trips per Year (Expanded)	Estimated Average Trips per Day (Expanded)
Banff	3,642	10	36,000	100
Canmore	13,446	10	134,000	368
Lake Louise	1,202	10	12,000	33

Source: CPCS analysis of online survey data and Town of Canmore Census

2.5.2 Destinations

As most of the trips are related to commuting, it was assumed that only approximately 21%[18] of the trips by Bow Valley residents would be captured by a mass transit service, corresponding to the fraction of employment in downtown Calgary to the broader CMA. This estimate results in a total of 40,000 in-scope trips.

2.6 Willingness to Use Transit

This subsection discusses the selection of the capture rate by the mass transit service. In other words, how many trips out of the in-scope demand are likely to use the mass transit service. Ridership from the summer 2017 pilot bus service was the starting point for the estimated capture rate, as these data demonstrate the preferences of the potential market.

In addition, online and in-person survey respondents were asked about their preferences towards a mass transit option, the results of which are summarized in Appendix D. This information was primarily used to assess the relative preference between bus and rail options (in section 2.6.4).

2.6.1 Observations from the Summer 2017 Calgary-Banff Pilot Bus Service

The baseline capture rate for transit was estimated by comparing the in-scope market against the observed demand from the summer 2017 pilot bus service (Figure 2-16). As the pilot service only operated on summer weekends, its demand was annualized assuming that it had operated during all of 2017, using the same factors used for the demand model.[19] The annualized demand was estimated to be approximately 100,000 one-way trips. The model assumed that for each in-scope visitor or Bow Valley resident reporting a trip, there were two one-way trips.

[18] This is an approximate assumption based on experience in the Greater Toronto Area. Based on analysis of survey data, approximately 80% of travellers alight a commuter rail service at Union Station (the main destination station) and walk to their final destination. As a result, it is expected that the majority of trips on the mass transit service would be to downtown Calgary, as this is also a major employment location. Given that the number of trips from the Bow Valley are relatively small as compared to total trips (i.e. visitor trips), this estimate reasonably captures most relevant trips. However, promoting a seamless transfer between modes (e.g. connectivity to a Green Line station) could help encourage additional trips that would utilize local transit.

[19] The average daily pilot bus demand in July and August (462 one-way trips) was divided by (1) 1.50 (the peaking factor for summer months) and (2) 1.13 (the ratio of vehicle entries on weekend days to weekdays in 2017), then multiplied by 365.

Figure 2-16: Estimated Base Capture Rate

Market	Percentage of Pilot Bus Customers	Number of Pilot Bus Trips (One-Way)	In-Scope Trips (One-Way)	Estimated Base Capture Rate
Calgary Visitors	55%	55,000	1,510,000	3.6%
Other Visitors	35%	35,000	1,690,000	2.1%
Bow Valley Residents	10%	10,000	80,000	13.0%

Source: 2017 Calgary-Banff Pilot Bus Service customer database and CPCS analysis

For the purposes of the demand model, the other visitors market was further divided into three submarkets based on the origins expressed in section 2.4.2: persons going to the Bow Valley from the airport directly, persons just travelling through Calgary without staying overnight, and persons staying in Calgary. Figure 2-17 summarizes the capture rates that were assumed for each. These capture rates were estimated such that the total number of other visitors who used transit in the model was approximately equal to that of the summer 2017 pilot bus service. Through a survey of pilot bus users, it was possible to establish that 0.3% could have driven (i.e. their main reason for using the service is that they did not have automobile access). To this end, the capture rate for other visitors (passing through), all of whom would likely have automobile access, was selected to be less than 0.3%.

Figure 2-17: Estimated Base Capture Rate (with Additional Breakdown)

Market	Estimated Base Capture Rate
Calgary Visitors	3.6%
Other Visitors (airport direct)	2.1%
Other Visitors (passing through)	0.2%
Other Visitors (staying in Calgary)	5.4%
Bow Valley Residents	10.0%

Source: CPCS estimates

2.6.2 Ramp Up

The summer 2017 pilot bus service was in its first year of operation. New transit services typically require about three years to reach their full demand potential. Industry sources suggest that the long-term demand potential is typically somewhere between about 1.5 to 3.0 times higher than the initial first-year demand. Figure 2-18 shows some examples.

Figure 2-18: Ramp-Up Periods – Percentage of Long-Term Demand

Year of Operation	Transport for London	UP Express Estimates
One	35%	65%
Two	75%	80%
Three	90%	90%
Four	100%	100%

Source: CPCS summary of Transport for London's Business Case Development Manual, 2013 and Steer Davies Gleave, Toronto Union Pearson Express, Ridership Forecast Update, May 2013.

In order to estimate demand, the following ramp-up factors were assumed (Figure 2-19). As the summer 2017 pilot bus service was advertised locally, lower ramp-up factors were used for Calgary and Bow Valley residents, and typically higher ramp-up factors were used for other visitors.

Figure 2-19: Ramp-Up Factors

	Low	Medium	High
Calgary Visitors	2.0	2.3	3.0
Other Visitors (airport direct)	3.0	3.0	3.0
Other Visitors (passing through)	2.0	2.0	2.0
Other Visitors (staying in Calgary)	3.0	3.0	3.0
Bow Valley Residents	2.0	2.0	2.0

Source: CPCS

2.6.3 Fare Adjustment

Finally, the capture rates were adjusted to account for the proposed fares used for analysis. The summer 2017 pilot bus service had a fare of $10 per one-way trip. The fares proposed for analysis (in chapter 3) were $15 one-way between Calgary and Banff in the low and medium scenarios, and $10 in the high scenarios. As a result, the capture rate in the low and medium scenarios were reduced by 25% and 20% in the low and medium scenarios, respectively, to account for the price sensitivity to fares.[20] The final capture rates assumed are shown in Figure 2-20.

Figure 2-20: Capture Rates

	Low	Medium	High
Calgary Visitors	5.4%	6.5%	10.8%
Other Visitors (airport direct)	7.7%	8.2%	10.2%
Other Visitors (passing through)	0.3%	0.3%	0.6%
Other Visitors (staying in Calgary)	12.2%	13.1%	16.3%
Bow Valley Residents	19.5%	20.8%	26.0%

Source: CPCS estimates

2.6.4 Rail Versus Bus

In the surveys, separate groups of respondents were asked about their preferences to take bus or rail, the results of which are summarized in Appendix D. More respondents, proportionally, would elect to take a train rather than bus. In some cases, the preference towards rail was twice that of bus, but was typically approximately 25% to 50% higher.

However, it is also known that respondents might bring their own preconceived view of what a train and bus service might look like. For example, respondents might mentally compare a high-frequency reliable train service (e.g. the CTrain) to an infrequent bus. When asked about the most important

[20] In the surveys, respondents were asked about their willingness to take a bus or rail service at varying price points. Most people were generally willing to pay up to $15 to $30 one-way fares (91% and 72% for Calgary residents, respectively), above which demand would start to drop precipitously. To that end, we assumed the elasticity of demand to price would be relatively insensitive within a relatively small change from $10, specifically 0.5 for the low scenario and 0.4 for a medium. As an example with the medium scenario, if the fare were to increase from $10 to $15 (a change of 50%), the demand would decrease by approximately 20% (50% x 0.4).

factors in selecting a mode of travel, only 9% of respondents to the online survey indicated that "mode" was a top consideration in their selection of transit options (as compared to frequency, affordability, etc.). Therefore, while rail would have a higher ridership than an otherwise comparable bus service, the difference is likely to be somewhat less than the values directly given in the survey responses.

In the ridership model, rail ridership is assumed to be 10%, 20% or 30% higher than for bus in the low, medium and high scenarios, respectively.

2.7 Potential for Induced Trips

Induced trips are trips that otherwise would not have been taken had it not been for the implementation of a transit service. There are two sources of induced demand in the context of the study:

1. Visitors from Calgary and residents who do not own a car, and now would have access to a relatively low-cost transportation alternative;
2. Visitors from Calgary and elsewhere who would now come to Bow Valley just because a mass transit service exists.

Source (1) may occur for both bus and rail options. In a survey of summer 2017 pilot bus service users, 47% of Calgary residents and 56% of Bow Valley residents surveyed indicated that they "Don't Own a Vehicle" or are a "Visitor to the Area Without a Vehicle." Though these respondents might have travelled to the Bow Valley regardless through other means (e.g. carpooling, other bus services, etc.), it is suggestive that up to 50% of demand might have been induced.

Source (2) would likely only occur should a rail option be implemented, given that it is perceived more as an experience. Certainly there is a portion of the population who would travel just to take rail as an experience, though there is no empirical data to specifically estimate volumes. Estimates of 2.5% to 10% have been assumed for all markets. **These figures are speculative and should be considered as "what-if" scenarios.**

Based on sources (1) and (2), the following estimates of induced demand have been assumed (Figure 2-21 and Figure 2-22).

Figure 2-21: Assumed Induced Demand – Bus

	Low	Medium	High
Calgary Visitors	5%	25%	50%
Other Visitors (airport direct)	0%	0%	0%
Other Visitors (passing through)	0%	0%	0%
Other Visitors (staying in Calgary)	0%	0%	0%
Bow Valley Residents	10%	25%	50%

Source: CPCS, based in part on summer 2017 pilot bus data

Figure 2-22: Assumed Induced Demand – Rail

	Low	Medium	High
Calgary Visitors	7.5%	30%	60%
Other Visitors (airport direct)	2.5%	5%	10%
Other Visitors (passing through)	2.5%	5%	10%
Other Visitors (staying in Calgary)	2.5%	5%	10%
Bow Valley Residents	12.5%	30%	60%

Source: CPCS

2.8 Intra-Bow Valley Transit Trips

Parks Canada retained a private contractor to provide a free bus shuttle between Banff and Lake Louise during the summer of 2017. On average, it received approximately 150 to 160 one-way trips day per direction, with peaks of around 200 per day per direction on the August long weekend. As the bus and rail service designs proposed terminating in Banff, this ridership was not further factored into any of the subsequent analysis.

2.9 Peaking Factors and Daily Distributions

2.9.1 Peaking Factors

The demand for a mass transit service between Calgary and the Bow Valley would be highly seasonal, primarily due to the seasonality of visitation. For the purposes of the service design, to ensure there is adequate service during peak visitation months during the winter and summer periods – in particular during July and August – the following peaking factors were estimated based on Parks Canada attendance data (Figure 2-23). These peaking factors account for demand in the peak month during each period, but not necessarily for the demand on the absolute highest demand day (such as a long weekend).

Figure 2-23: Peaking Factors

Time Period	Factor
Summer Peak Month Factor (Ratio of August Visitation to Average Summer Visitation)	1.50
Winter Peak Month Factor (Ratio of April Visitation to Average Winter Visitation)	1.27

Source: CPCS analysis of Parks Canada attendance data

2.9.2 Time of Day Distribution

Using the daily distribution of loads observed on the summer 2017 Calgary-Banff pilot bus service, we estimated the following distribution of daily demand, using the ridership observed on buses at different times of day (Figure 2-24).[21] There are clear directional peaks westbound in the morning (driven by visitors to the Bow Valley coming from Calgary) and eastbound in the evening. It is noted

[21] Specifically, the observed load on buses departing in the given time period were summed and divided by the total daily demand in the same direction.

that there is a much smaller peak of counter-flow traffic eastbound in the early morning and again in evening, likely representing Bow Valley residents travelling to Calgary for the day.

Figure 2-24: Time of Day Distributions

	Westbound		Eastbound	
	One-Way Trips	Percentage	One-Way Trips	Percentage
Before Morning Peak (7:00-10:00)	1557	35%	352	8%
Morning Peak (10:00-13:00)	2140	47%	269	6%
Mid-Day (13:00-17:00)	368	8%	682	15%
Evening Peak (17:00-20:00)	94	2%	2399	52%
After Evening Peak (20:00-23:00)	354	8%	938	20%
Total	**4513**	**100%**	**4640**	**100%**

Source: CPCS analysis of summer 2017 Calgary-Banff pilot bus service ridership data compiled by the Town of Banff, for trip dates between June 17 and August 20 inclusive.

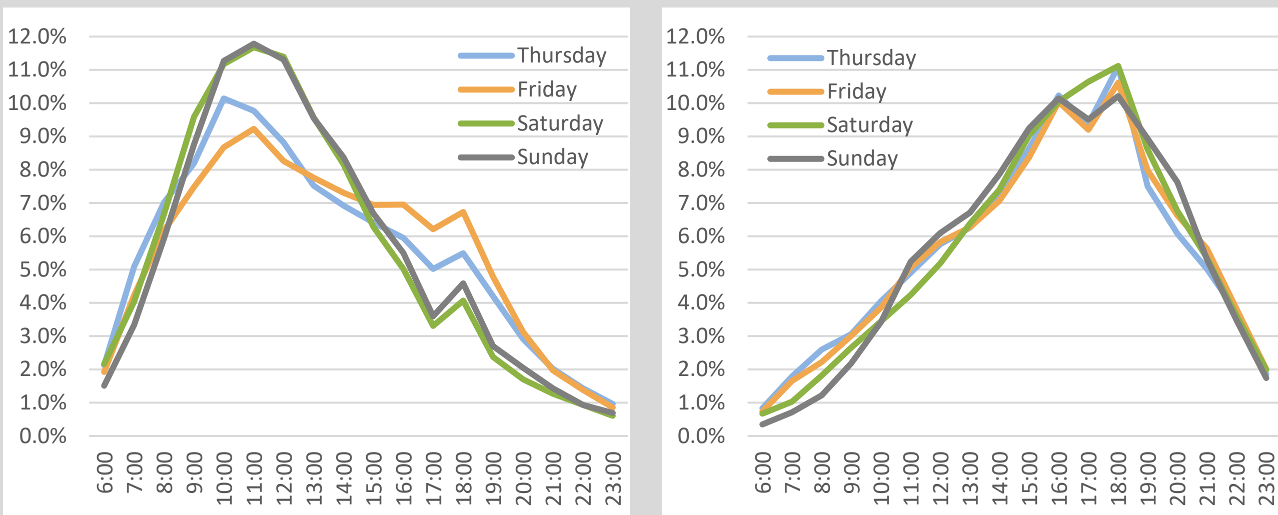
While the following breakdown was used for analysis, it should be noted that based on Alberta Transportation data summarized below (see box), the peak travel time westbound to Banff in the winter is concentrated earlier (i.e. “Before the Morning Peak”) likely due to ski hill traffic. The summer 2017 pilot bus service distribution provides an approximation sufficient for estimating the bus service hours during the winter months, though some schedule adjustments may be appropriate to better target the winter ski crowd.

Seasonal Variation in Peaks

Though summer 2017 Calgary-Banff pilot bus service data were used to estimate the peaking factors, these data were only available for summer months. Based on Alberta Transportation highway traffic counts, the peaks are likely to occur at different times of day in the summer and winter months.

Figure 2-25 summarizes the daily distribution of traffic for Thursday, Friday, Saturday, Sunday between Banff and the East Banff National Park Gates, which would include vehicles travelling from Calgary to Banff.[22] On an average Saturday in August, most (34.2%) westbound vehicles pass this point between 10:00am and 1:00pm, suggesting a departure time from Calgary of approximately 8:30am-11:30am. By contrast, most eastbound vehicles (31.8%) pass this point between 4:00pm and 7:00pm, suggesting that many people depart Banff shortly before dinner time.

Figure 2-25: Daily Distribution of Traffic Westbound (left) and Eastbound (right) West of Banff National Parks Gates East Entrance, August 2016

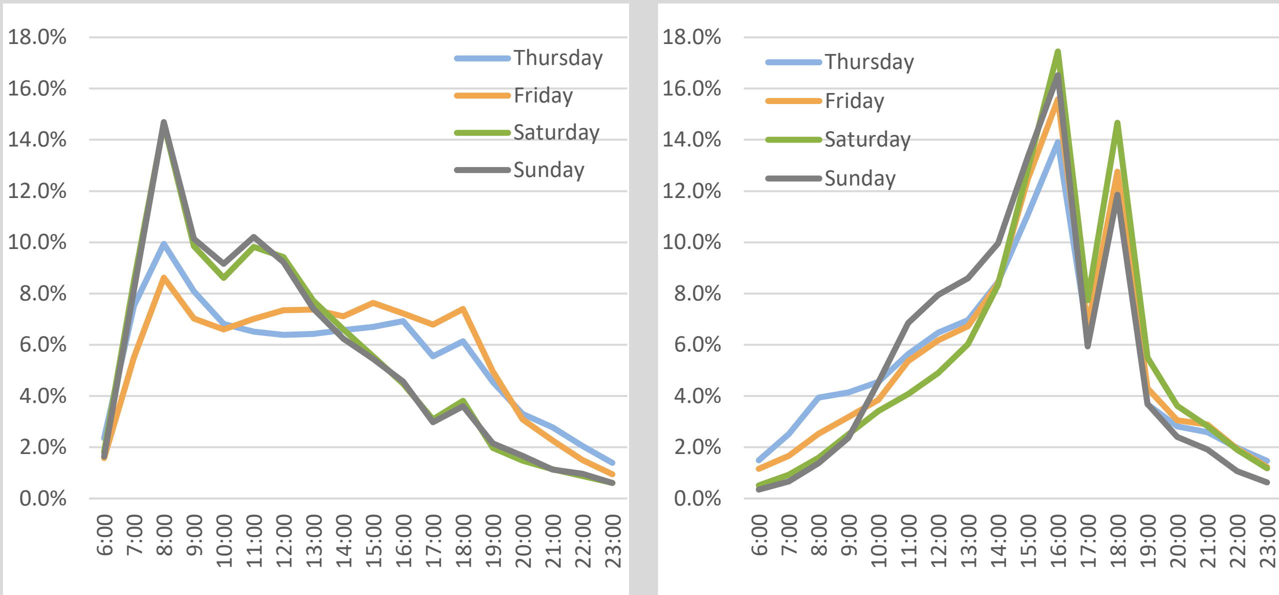


Source: CPCS analysis of Alberta Transportation Data

In the winter (Figure 2-26), weekend westbound and eastbound traffic peaks earlier and more dramatically than in the summer, likely corresponding to travel to ski hill opening times and the generally shorter days. On an average Saturday in January, most westbound traffic (14.6%) occurs between 8:00 and 9:00am. Most eastbound traffic (17.5%) occurs between 4:00 and 5:00pm, with a second peak occurring between 6:00 and 7:00pm. This second peak might reflect individuals staying in Banff for dinner as well as those travelling further from Lake Louise after the end of the ski day.

[22] However, not all of these vehicles are necessarily stopping in Banff National Park.

Figure 2-26: Daily Distribution of Traffic Westbound (left) and Eastbound (right) West of Banff National Parks Gates East Entrance, January 2016



Source: CPCS analysis of Alberta Transportation data

2.10 Growth Rates

For growth rates, an annual rate of 1.9% was assumed. The Banff Long Term Transportation Study notes that vehicle traffic growth in the Town was about 1.8% per year since 2008 and this figure is used to forecast traffic through 2045. In the case of visitation numbers, growth figures have been around 2.5%, while population growth in the Calgary CMA was also at 2.5%. The high visitation growth of past years is believed to be partially due to the appreciation of the US dollar. In the longer-term, we anticipate that the growth rate to be more similar to the long-term population growth rate of the Calgary Region, i.e. approximately 1.9% per year.

2.11 Estimated Ridership

Based on the above methodology, along with the assumptions for fares discussed in chapter 3, the estimated ridership for bus and rail scenarios are provided in chapter 5 and chapter 11, respectively. As noted, each of the bus and rail options is provided with low, medium and high ridership levels.

3 Potential Fares

Key Chapter Takeaways

- Fares are generally based on the principles of fare-by-distance, with longer trips being more expensive than shorter trips.
- The fare-by-distance cost of this service is approximately 10 to 13 cents per kilometre for the low- and medium-demand scenarios and 7 to 9 cents per kilometre for the high-demand scenario. This is less expensive fare compared to the other inter-regional visitor-oriented mass transit services noted above (which range from 15 to 60 cents per kilometre). However, a lower fare in this market was deemed appropriate to better compete with other existing travel mode costs (other transit service and personal vehicle travel). In addition, some of the higher-fare services are private sector services that provide direct point-to-point service (i.e. directly from the airport to a hotel), which is more convenient from a traveller perspective than a terminal-to-terminal service, and do not receive government operating support.
- Concession discounts are offered for round-trip tickets, seniors, youth and children.
- Fare integration with BVRTSC services is recommended to improve mobility in the Bow Valley and improve passenger convenience

3.1 Potential Fare Levels

The fares for a mass transit service between Calgary and the Bow Valley would have a significant effect on its success. Setting appropriate fares requires striking a balance between various considerations. If fares are set too high, passengers will seek alternative means of transportation and ridership is likely to suffer. If fares are set too low, there is the possibility that ridership will be high but the cost recovery of the service will be low, resulting in need for significant operating investment from its funding partners.

The preliminary fare structure has been developed based on a review of the following considerations:

- Stakeholder consultation;
- Existing fares on other intercity passenger services between Calgary and the Bow Valley (summer 2017 pilot bus service, existing Greyhound fares, existing Roam Transit regional fares and existing airport shuttle (Brewster and Banff Airporter) fares);
- Costs for comparable transportation alternatives (e.g. car rental) between Calgary and the Bow Valley; and

- Costs for comparable transit services in other communities focused on the tourism industry.

3.1.1 Stakeholder Consultation

During the stakeholder consultation, it was frequently noted that transit fares must be competitive with other transportation options to be viable. Other options include both bus services currently operating between Calgary and the Bow Valley, as well as the private automobile. A specific example noted by multiple stakeholders was a rental vehicle: if the cost of taking transit is not lower than a rental vehicle, few would be likely to take transit.

Stakeholders also expressed a desire to see various fares, discounting costs for families, frequent users and seniors, and for passengers not travelling the entire length of the route.

In addition to a preference for affordable fares, an important consideration for stakeholders is that the service is financially sustainable at a reasonable level of cost recovery.

3.1.2 Existing Services

There are several existing transportation services that provide connection opportunities between Calgary and the Bow Valley. These were explored to determine the cost of service and the types of fare options available to passengers, including:

- The summer 2017 Calgary-Banff pilot bus service;
- Greyhound;
- Brewster;
- Banff Airporter; and
- Roam Transit.

The fares for service between Calgary and the Banff range from $10 for the summer 2017 pilot bus service to $64 for the Banff Airporter service. These are detailed in Appendix C. Due to the nature of the proposed rapid transit link between Calgary and the Bow Valley, it is recommended that fares for this service are set in an attempt to compete for the market currently held by the summer 2017 pilot bus and Greyhound. Because the transit link would not directly service the Calgary International Airport and individual hotels in the Bow Valley, fares for this service should be set lower than the equivalent Brewster and Banff Airporter fares.

3.1.3 Car Rental Costs

An average representative cost for a two-day car rental, including all ancillary fees, is outlined below:

- Two-day car rental: $75 - $150[23]

[23] Based on Kayak.com prices aggregated for a trip on July 28-30, June 16, 2017. The prices can vary significantly by season, day of week, and the location of pick-up. The higher cost represents an airport pick-up.

- Gas price: ~$35

Using the above assumptions, the average transportation cost for a group of four people travelling to the Bow Valley from Calgary for two days is approximately $110 to $185, a benchmark for group travel to the Bow Valley.

3.1.4 Driving

Visitors taking their own vehicle would incur both direct costs such as fuel and indirect costs such as wear and tear. Most drivers typically view their direct costs (e.g. fuel and parking) when deciding on travel modes. Estimated fuel costs between Calgary and Banff is ~$25-35, depending on the fuel efficiency of the vehicle.

3.1.5 Comparable Services in Other Jurisdictions

The network distance between Calgary and the Bow Valley ranges between approximately 115 kilometres to Canmore and 190 kilometres to Lake Louise. Comparable transportation services, linking a large metropolitan city with a recreational and tourist area, exist in North America. To gauge the fares being charged on these links, a peer review was completed. In each case, the transportation links service a combination of tourists, regional travellers and commuters. Below is a brief summary of the fares on the following services:

- **Vancouver-Whistler** (approximately 120 kilometres): A number of private shuttle services, along with Greyhound, serve the Vancouver to Whistler route. Some routes serve Vancouver International Airport while others serve Downtown Vancouver and some suburban SkyTrain stations. One-way adult fares for bus services range from $18 to $79. The fare-by-distance costs range from approximately to 15 to 60 cents per kilometre.

- **Toronto-Niagara Falls** (approximately 130 kilometres): A number of bus and train routes serve the Toronto to Niagara Falls route. Both long distance inter-city operators, public agencies (GO Transit and VIA Rail), and private operators service the corridor. One-way adult fares for bus services range from $5 to $30, although most tickets fall into the $15 to $20 range. One-way adult fares for train services range from $17 (GO Transit) to $25 (VIA Rail). The fare-by-distance costs average approximately 15 cents per kilometre.

- **Montreal-Mont Tremblant** (approximately 145 kilometres): One regularly scheduled inter-city bus service and one seasonal express airport shuttle serve the Montreal to Mont Tremblant route. One-way adult fares for bus services range from $32 to $100. The fare-by-distance cost for the regularly scheduled inter-city bus service is approximately 22 cents per kilometre.

- **Denver-Winter Park** (approximately 110 kilometres): Amtrak runs a seasonal ski train on weekends between Denver and the Winter Park Ski Resort. One-way adult fares for train services start at $39 (USD). The fare-by-distance costs average approximately 32 cents per kilometre.

A more detailed summary of these services is available in Appendix H.

3.2 Proposed Fares

The proposed fares (low and medium-ridership scenarios) for a public transit service between Calgary and the Bow Valley are presented in Figure 3-1. Fares are shown between each origin and destination pair. Fares in orange are prices for one-way adult tickets, while fares in green are for return adult tickets (including a 20% discount). The proposed fares do not include the cost to acquire a daily or annual National Park Entry Pass, which would need to be acquired by all visitors to Banff National Park.

Figure 3-1: Proposed Base Fare Structure for Analysis (Low and Medium Ridership Scenarios)

	Calgary	Cochrane	Stoney	Canmore	Banff	Lake Louise
Calgary		$5	$10	$10	$15	$20
Cochrane	$8		$5	$10	$15	$20
Stoney	$16	$8		$5	$10	$15
Canmore	$16	$16	$8		$5	$10
Banff	$24	$24	$16	$8		$5
Lake Louise	$32	$32	$24	$16	$8	

Source: CPCS Team analysis

The high-ridership scenario includes lower fares, with a base one-way fare between Calgary and Banff of $10. Figure 3-2 shows the proposed fare levels in the high-ridership scenario. At these low fare levels, offering a simple flat fare with no discount for return trips, similar to the existing summer 2017 pilot bus service, could also be considered.

Figure 3-2: Proposed High-Ridership Scenario Fare Structure

	Calgary	Cochrane	Stoney	Canmore	Banff	Lake Louise
Calgary		$5	$10	$10	$10	$15
Cochrane	$8		$5	$10	$10	$15
Stoney	$16	$8		$5	$10	$15
Canmore	$16	$16	$8		$5	$10
Banff	$16	$16	$16	$8		$5
Lake Louise	$24	$24	$24	$16	$8	

Source: CPCS Team analysis

The fare-by-distance cost of this service is approximately 10 to 13 cents per kilometre for the low and medium-demand scenarios and 7 to 9 cents per kilometre for the high-demand scenario. This is less expensive fare compared to the other inter-regional visitor-oriented mass transit services noted above (which range from 15 to 60 cents per kilometre). However, a lower fare in this market was deemed appropriate to better compete with other existing travel mode costs (other transit service and personal vehicle travel). In addition, some of the higher-fare services are private sector services that provide direct point-to-point service (i.e. directly from the airport to a hotel), which is more convenient from a traveller perspective than a terminal-to-terminal service, and do not receive government operating support. A comparison of fares for the one-way and two-way fares for the various transportation options in the Calgary-Bow Valley corridor is shown in Figure 3-3.

Figure 3-3: Comparison of Proposed Fares (Low and Medium Ridership Scenario)

	Greyhound	Brewster	Banff Airporter	Southland	Summer 2017 Pilot	Roam Transit	Proposed Fares
Calgary-Cochrane	-	-	-	$15/$30*	-	-	$5/$8
Calgary-Canmore	$17/$33	$65/$110	$62/$123	-	$10/$20	-	$10/$16
Calgary-Banff	$18/$35	$65/$110	$63/$126	-	$10/$20	-	$15/$24
Calgary-Lake Louise	$23/$45	$90/$153	-	-	-	-	$20/$32
Canmore-Banff	$8/$15	$20/$34	-	-	-	$6/$12*	$5/$8
Banff-Lake Louise	$12/$23	$30/$51	-	-	-	$12/$20	$5/$8

*Monthly commuter passes are available on these services, significantly lowering the cost per trip. Source: CPCS team analysis

Once the service is in place, the financial performance and ridership uptake of the service should be monitored. Tweaking initial fares may be appropriate to adjust the demand for and utilization of the service.

It is recommended that all tickets would include fare integration with local Roam Transit routes. It is assumed that passengers purchasing tickets to Lake Louise would be accommodated on the BVRTSC's planned Banff to Lake Louise route.

3.3 Concession Fares and Implications on Average Fares

To entice families, groups and various passenger demographics to use the proposed transit service to travel between Calgary and the Bow Valley, concession fares should be offered at lower costs. Concession fares are traditionally offered to children, seniors, frequent riders and groups travelling together.

The following concession fares are recommended (and summarized in Figure 3-4). Concession fares by age category are proposed to be aligned with the age categories defined by Parks Canada for the purchase of a National Park Entry Pass. This may allow for a more streamlined process for passengers purchasing both a transit fare and a Park Entry Pass.[24]

Figure 3-4: Proposed Ticket Discounts

Demographic	Age	Ticket Discount
Senior	65+	25%
Student	6-17	25%
Child	0-5	50%

Source: CPCS Team

[24] Revenue analysis presented in section 5.2 was completed based on slightly different age categories, which have since been adjusted to align with the age categories identified by Parks Canada for the purchase of a National Park Entry Pass. This change may result in a small change in estimated revenues but does not impact the overall conclusions of the study.

3.3.1 Senior (65+)

Seniors tickets, both one-way and return, are recommended to be sold at a 25% discount relative to the full adult ticket price. Seniors are often on fixed incomes and will benefit from a reduction in the ticket price.

3.3.2 Youth (6-17)

Student tickets, both one way and return, are recommended to be sold at a 25% discount relative to the full adult ticket price. Students often have a lower income and will benefit from a reduction in the ticket price.

3.3.3 Child (0-5)

Child tickets, both one way and return, are recommended to be sold at a 50% discount relative to the full adult ticket price. Children will always be travelling with their guardian(s), and the discount offered will help reduce the total cost of purchasing tickets for the party.

3.3.4 Commuter Passes

Commuters from the Bow Valley to Calgary represent an important potential passenger market for this transit service. Discounted fares for frequent users would likely help increase ridership. A monthly commuter pass should be considered for implementation, as it would help fill unused capacity in the non-peak direction.

3.3.1 Off-peak Fares

Consideration should also be made to lowering fares during off-peak periods to help even out the demand and reduce the need to purchase and operate additional peak period vehicles. Using a reservation-based system to purchase tickets (both online and over the phone) would easily allow different pricing strategies to manage demand and utilize spare capacity. Offering up to a 25% fare reduction for off-peak periods would help to manage demand.

3.4 Roam Transit Integration

It is recommended that all fare products include integration with existing Roam Transit services. The integration between inter-city transit provided by the new service and local/regional transit provided by the Bow Valley Regional Transit Services Commission (BVRTSC) would be key to the success of this venture. Passengers would appreciate the convenience of their ticket providing them continued mobility at their destination in the Bow Valley, without having to rely on additional private shuttles, taxis or having to pay extra for local transit. As a result, it is proposed that all tickets and passes also be valid for free local transit on the local Roam Transit network.

For passengers who stop in Canmore and want to explore the rest of the Bow Valley, fare integration should also be considered for the Roam Transit Route 3 Regional Canmore service (providing a link between Canmore and Banff). Passengers bound to/from Lake Louise would require a transfer to/from a Roam Transit bus service at the Banff Train Station. As part of Roam Transit's strategic plan, this route is planned to be launched in the near future, though not yet confirmed. Although the operator may be different from the Calgary-Banff service (depending on the service delivery model selected), passengers who have purchased a round-trip or one-way ticket to/from Lake Louise would have the Banff-Lake Louise leg of their journey already included in the fare.

For fare integration to take place, a portion of the revenue collected from the Calgary to Banff mass transit service would need to be shared with the BVRTSC, should the intercity service be operated by another entity. This would decrease the gross revenues collected from fares on the Calgary to Banff mass transit service (as some of it would be used to fund the local service). Further study would need to be done on how the fare integration model would work and how revenues would be shared between services. This is recommended to be completed once a service delivery model (discussed in section 6.6) is selected, as it would have an impact on revenue sharing.

4 Candidate Rail Station and Bus Stop Locations

Key Chapter Takeaways

- Should a rail service be provided, we recommended the service terminate in Banff, with complementary local transit provided to other destinations from there. As most visitors to Lake Louise are going to destinations away from the rail line, a dedicated rail transfer point would need to be provided near the Lake Louise Train Station. This would increase the capital cost as compared to bus service (which would go directly to Lake Louise), but not offer any significant gain in service attractiveness, as a transfer would still be required, either in Banff or Lake Louise.
- Stop and station locations were first evaluated using a multi-criteria analysis. Subsequently, these locations were refined through consultations with some of the municipalities along the proposed routes.
- For the proposed bus service, four stops in Calgary are recommended: Downtown (on-street, on 9 Avenue SE, to the east of Centre Street South); Crowfoot CTrain; Anderson CTrain; and 69 Street SW CTrain.
- For the proposed rail service, two stations in Calgary are recommended: Downtown East (near 9 Avenue SE and 4 Street SE); and Keith Yard (near Stoney Trail).
- CP's plans in the downtown core may limit the possibility of the proposed downtown location, in which case a station to the west of downtown (e.g. at Sunalta) would need to be considered.

A key component of the route design for both the bus and the rail option is the identification of potential stations. For the rail option, station locations are constrained to the CP Laggan Subdivision[25] and the assessment evaluates the optimal locations and the number of stations required to achieve ridership targets and minimize costs. For the bus option, there is more flexibility in the location of stations as well as the number of stations located in each population centre.

This section of the report identifies possible rail and bus stations, and considers the possible opportunities and constraints associated with each when designing a mass transit service. The initial list of potential station locations was developed through an on-site review as well as discussions with key stakeholders along the corridor between Calgary and the Bow Valley.

To narrow the long list of stations to a more suitable number for both bus and rail service, an evaluation matrix (summarized in Figure 4-1) has been developed. It summarizes the various

[25] The scope of this study was limited to rail options along the existing CP corridor.

considerations and evaluates potential locations relative to other station locations in each municipality (where there is more than one possible location). High priority stations in each municipality were then looked at from a corridor perspective to identify which stations would help meet the goals of providing a mass transit service between Calgary and the Bow Valley.

The evaluation criteria are associated with four goals, which were selected to (1) lower the cost of developing stations, (2) increase potential ridership, and (3) ensure alignment with other stakeholders (or minimize the potential impacts, such as on CP).

For each criterion, the measures have been evaluated using the following conventions:

x Not Present and/or Poor

✓ Present and/or Good

✓✓ Present and/or Excellent

The evaluation will be used to assess each station option in the formation of a route. This includes a decision of whether it is feasible to stop a train or a bus in each municipality measured against the travel time and ridership impacts of upstream passengers. The recommended station locations were then confirmed through an analysis of the ridership potential of each station, discussed further in chapter 5 (for bus) and chapter 11 (for rail).

Figure 4-1: Station Location Evaluation Criteria

Goals	Criteria	Measure
Leverage existing station infrastructure with passenger amenities or easier to develop site	Presence of rail infrastructure	Platforms, station tracks (only applicable for potential rail stations)
	Presence of existing bus terminal infrastructure	Bus bays, laybys
	Availability of passenger amenities	Shelters, benches, indoor waiting areas
	Land available for station	Only applicable if facility does not currently exist
Accessible by all modes of transportation to improve connectivity	Access to parking	Number and availability of on-site and off-site parking stalls
	Connectivity to transit	Connections to bus and rail services
	Connectivity to active transportation	Presence of sidewalks, cycling infrastructure, and trails in station vicinity
	Walkability	Walk Score rating – measures proximity of amenities and other locations of interest (www.walkscore.com) X: 0-49; ✓:50-79; ✓✓:80-100
	Proximity to highways/arterials	Only applicable if facility is a park and ride-oriented location
	Deviation from Hwy 1 between downtown Calgary and Lake Louise (travel time impact)	One-way deviation from Trans-Canada Highway, in minutes (only applicable for potential bus stations) X: >10 min; ✓:5-10 min; ✓✓: <5min

Goals	Criteria	Measure
Close to trip origins and destinations, as appropriate	Proximity to population	Population within 800 metres of station based on network distance* (scoring compared to other potential locations)
	Proximity to employment	Employment within 800 metres of station based on network distance* (scoring compared to other potential locations)
	Commuter-shed population	Population within 15-minute drive of station (scoring compared to other potential locations)
	Proximity to tourist attractions	Presence of nearby tourist attractions (scoring compared to other potential locations)
	Proximity to accommodations	Number of hotels within 1 kilometre (scoring compared to other potential locations)
Good alignment / avoidance of impact on other stakeholders	Opportunity for intensification / alignment with municipal plans	Compliance with zoning bylaws and opportunities for additional development
	Avoids impacts on CP's operations	Interference with freight rail traffic (only applicable for potential rail stations)

*As opposed to straightline distance. Source: The CPCS/Dillon Team

In a complementary fashion to this evaluation, stop and station locations were further refined in consultations with some municipalities along the route.

4.1 Calgary

In Calgary, the CP Laggan Subdivision runs from downtown Calgary south of 9 Avenue SW/SE, approximately a three-minute walk from the CTrain line along 7 Avenue SW/SW. It then briefly parallels the West CTrain line at Sunalta, before heading along the Bow River northwest towards Cochrane.

Calgary could be both an origin for visitors to the Bow Valley and a destination station for commuters and visitors coming from Cochrane and the Bow Valley. For visitors to the Bow Valley, a station's proximity to population and accommodations, and connectivity to modes of access, would be particularly important criteria. For commuters from Cochrane and the Bow Valley, proximity to employment, walkability and connectivity to frequent local transit would be particularly important criteria.

For rail service, it will be important to consider the implications on CP's operations in downtown Calgary in particular, as this area is in close proximity to its Alyth Yard, and there is no room within the existing corridor for any relatively low-cost capacity expansion (e.g. an additional at-grade track), except towards the east and west ends of downtown.

For bus service, proximity to the highway network is also important to reduce travel time between Calgary and the Bow Valley.

We considered eight potential station areas for a mass transit service. Four locations could serve bus and rail, whereas four locations could only be served by bus.

1. **Downtown East (Potential Future High-Speed Rail Station):** Alberta Transportation has acquired land southeast of 9 Avenue SE and 4 Street SE as a potential location for an intercity (Edmonton-Calgary) rail service in the future; however, no decision by the Province has been made to move forward with planning for this project.[26] There is currently no station infrastructure, but the adjacent 4 Street overpass appears to have sufficient room for a fifth main track to the south to allow for a potential station track. This site is also directly adjacent to the proposed Green Line CTrain station.

2. **Downtown Central (e.g. CP Pavilion):** The CP Pavilion is a trainshed located to the southeast of 1 Street SW and 9 Avenue SW, adjacent to the Fairmount Palliser Hotel. There are two tracks each capable of accommodating five 26 m cars; however, several limitations exist. In particular, the ventilation of the trainshed is an issue – CP currently positions locomotives outside of the shed to push and pull trains in and out. No off-street facilities exist for buses. There is also a large privately owned parking lot approximately 500 metres to the east between 4 Street and 8 Street SW that could be considered (approximately 475 metres long); however, discussions would need to be held with the parking lot owner regarding how a train station could be integrated into its development plans safely.

3. **Downtown West (Sunalta CTrain Station):** Approximately two kilometres west of downtown Calgary, the CTrain's Blue Line Sunalta station is located immediately adjacent to the CP Laggan Subdivision. Immediately to the north of railway, there is an 11,000 square metre parking lot. Calgary's primary inter-city (Greyhound) bus station is located across Bow Trail. A pedestrian connection to Sunalta CTrain station is provided via an elevated walkway. This area is identified as a Regional/Inter City Gateway Hub in Calgary's Primary Transit Network. The City of Calgary has a redevelopment plan for the area to the north (West Village Area Redevelopment Plan) which would bring additional residents to the area in a mixed-use development.

4. **Keith Yard (Nose Hill and Stoney Trail):** The land adjacent to CP Keith Yard, near Stoney Trail, Nose Hill Drive and 87 Street NW could potentially be developed as a suburban park and ride-oriented station. It can be easily accessed from Stoney Trail,[27] which is envisioned to encompass Calgary, though there is no higher-order transit to this location. Like the

[26] To elaborate, should the Province elect to move forward with planning for high-speed rail in the future, this location would be evaluated along with other potential locations in the Calgary Region. No decision by the Province has been made to use this location. The Province has also not identified an alignment for a potential high-speed line to enter Calgary, if built.

[27] Visitors to Banff who come from Calgary along the NW portion of Stoney Trail would directly pass by this location. According to Google Earth, the NW Stoney Trail is the shortest route for a large fraction of NW Calgary. For those visitors who would travel to Banff along Highway 1 or who would use the SW/W Stoney Trail once built, Keith is an approximately three-minute drive north of Highway 1. As a result, for those drivers who would use this new route, the additional travel time to access this point would be limited.

Sunalta CTrain site, it is also identified as a Regional/Inter City Gateway Hub in Calgary's Primary Transit Network.

5. **Somerset-Bridlewood CTrain Station:** Somerset-Bridlewood is the southern terminus of the CTrain's Red Line. This station was selected as a stop for the summer 2017 pilot bus service to Banff, primarily because buses serving the station are stored and serviced in southern Calgary. The station does not have any dedicated bus loops, instead being served by bus layby lanes at four separate locations around the station. In addition, Somerset-Bridlewood station has a large park and ride with 913 parking stalls, half of which are unreserved. Somerset-Bridlewood has a large catchment area that covers a significant portion of southern Calgary.
6. **Anderson Station:** Anderson station is located on the southern end of CTrain's Red Line. It has a large bus loop with platforms accommodating 11 buses, as well as the largest park and ride facility in the Calgary Transit network, with 1,750 stalls. Anderson station is currently the subject of redevelopment plans that, if realized, will see the transformation of the site into a Transit-Oriented Development (TOD). Any potential development would incorporate a bus terminal and a parking facility. Anderson station is a major transportation node in southern Calgary and has a direct pedestrian connection to Southcentre Mall, a major retail centre. Anderson station has a large catchment area that covers a significant portion of south-central and southern Calgary.
7. **69 Street SW Station:** 69 Street SW Station is located on the western end of Calgary's CTrain Blue line. It has a large bus loop with platforms accommodating five buses, as well as a number of on-street bus bays. Additionally, it has a large multi-level park and ride with 736 parking stalls. 69 Street SW station has a large catchment area that covers a significant portion of western Calgary.
8. **Crowfoot CTrain Station:** Crowfoot is a station in northwest Calgary on the CTrain's Red Line. This station was selected as the main Calgary stop for the summer 2017 pilot bus service to Banff, due to its quick highway access, ample parking, rapid transit connectivity and large catchment area. The station has 12 dedicated bus bays and provides connections to eight Calgary Transit bus routes. In addition, Crowfoot station has a large park and ride with 1,345 parking stalls, half of which are unreserved. Crowfoot station has a large catchment area that covers a significant portion of northwest Calgary.

The eight identified stations, including their applicability for bus and rail are listed in Figure 4-2, and shown in Figure 4-3. A number of other locations were also considered as potential stops for a bus service, but were not fully evaluated due to factors ruling them out. Specifically, Chinook and Sirocco CTrain stations were also discussed as potential bus stop locations, although they were discounted because input from the City of Calgary indicated that there is no capacity available at these locations.

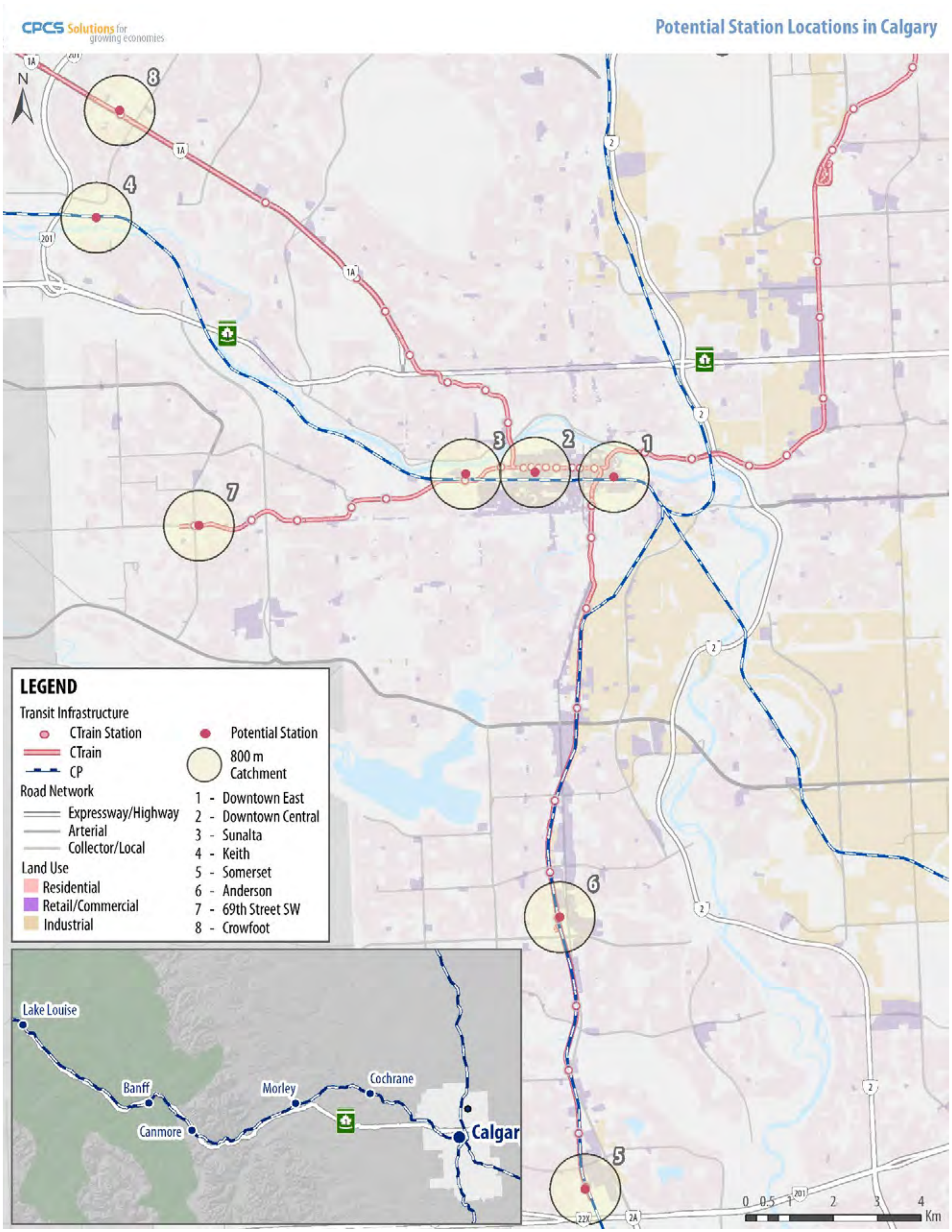
Figure 4-2: Potential Station Locations in Calgary

Location	Bus	Rail
Downtown East – Potential Future High-Speed Rail Station	✓	✓
Downtown Central – CP Pavilion	✓	✓

Location	Bus	Rail
Downtown West – Sunalta CTrain Station	✓	✓
Keith Yard	✓	✓
Somerset-Bridlewood CTrain Station	✓	
Anderson CTrain Station	✓	
69 Street CTrain Station	✓	
Crowfoot CTrain Station	✓	

Source: CPCS Team

Figure 4-3: Potential Station Locations in Calgary Map



Source: CPCS Team analysis

Figure 4-4 summarizes the characteristics of each of the station location options. From a market perspective, having access to a station downtown would be desirable (relative to having only a suburban station or a stop at Sunalta) as there are a number of hotels in the area, a larger employment base (relevant for commuter service from Cochrane and the Bow Valley) and arguably better CTrain connections. There is greater potential for interference with CP freight traffic downtown, though strategies exist to avoid or mitigate these impacts.

Figure 4-4: Calgary Rail and Bus Station Location Evaluation Summary

Criteria	Downtown East	Central Downtown	Downtown West (Sunalta)	Keith
Presence of station rail infrastructure (e.g. platforms)	X Potential future high speed rail station	X The Pavilion platform length is constrained, and ventilation is likely an issue	X No platforms or infrastructure exist	X No platforms or infrastructure exist
Availability of passenger amenities	X No station currently exists	✓✓ Indoor waiting area; washrooms	X No station currently exists	X No station currently exists
Land available for station	✓ Sufficient land for train platform and bus platform	✓ • Existing rail station (Pavilion) or sufficient length for a rail platform (parking lot) ** • Sufficient room for an on-street bus layover only	✓ Sufficient land for a platform and bus bay***	✓✓ Sufficient land for station and parking
Access to parking	✓ Existing off-site parkades / Surface Lots (paid)	✓ Existing off-site parkades / Surface Lots (paid)	✓ Existing parkades / Surface Lots (paid)	X No existing parking but sufficient land to provide parking
Connectivity to transit	✓✓ • 8-minute walk to **two** CTrain Lines • Adjacent to Green Line Station • Numerous bus connections within 5-minute walk	✓✓ • 3-minute walk to **two** CTrain Lines • Close to proposed Green Line • Numerous bus connections within 5-minute walk	✓ • Connection to Blue Line CTrain • 4 bus connections	X • 1 bus connection
Connectivity to active transportation	✓✓ • Sidewalks on all adjacent streets • Bike lanes on 9th Avenue	✓✓ • Sidewalks on all adjacent streets • Cycle tracks nearby	✓ • Sidewalks on some adjacent streets • Close to Bow River Pathway	X • No sidewalks on all adjacent streets
Walkability	✓✓ Walkscore: 87	✓✓ Walkscore: 98	✓ Walkscore: 61	X Walkscore: 10
Proximity to highways/arterials (for park and ride-oriented locations)	**N/A** • Not a park-and-ride location	**N/A** • Not a park-and-ride location	**N/A** • Not a park-and-ride location	✓✓ • Close to Stoney Trail • Close to Trans-Canada Highway • Close to Crowfoot Trail
Deviation from Hwy 1 between downtown Calgary and Lake Louise (minutes)	**N/A** Route starts in downtown Calgary	**N/A** Route starts in downtown Calgary	**N/A** Route starts in downtown Calgary	✓✓ 4-5-minute one-way deviation from Trans-Canada Highway
Proximity to population (within 800m of station)	✓ 1,763 population	✓✓ 12,243 population	X 0 population****	X 0 population
Proximity to employment (within 800m of station)	✓✓ 11,000 employment	✓✓ 80,164 employment	✓ 1,277 employment	X 0 employment

Criteria	Downtown East	Central Downtown	Downtown West (Sunalta)	Keith
Commuter-shed population (within 15-minute drive of station)	✓✓ 872,084 population	✓✓ 848,174 population	✓✓ 866,898 population	✓✓ 564,909 population
Proximity to tourist attractions (relative to other potential locations)	✓✓ • Stampede Grounds • National Music Centre • Downtown Calgary • Fort Calgary	✓✓ • Downtown Calgary • Calgary Tower • Prince's Island Park	X • No tourist attractions nearby	✓ • Canada Olympic Park • Canada's Sports Hall of Fame
Proximity to accommodations	✓✓ 8 hotels within 1km	✓✓ 7 hotels within 1km	✓ 2 hotels within 1km	X 0 hotels within 1km
Opportunity for intensification / alignment with municipal plans	✓✓ • "Rail Town Regional Transportation Hub" • Aligns with MDP and CTP • Opportunity for intensification and redevelopment of surface parking lots	✓ • Aligns with MDP and CTP • Limited redevelopment potential except on the east side	✓✓ • Identified as a regional/inter-city gateway hub • Significant residential intensification potential • Aligns with MDP and CTP	✓ • Intensification potential limited (e.g. park on the south side, nearby water treatment plant) • Identified as a regional hub • Aligns with MDP and CTP
Avoids impacts on CP's operations	✓ Enters downtown, but land available for a siding track off the south track	X Would require a new cross-over to allow for north track to be kept clear	✓✓ • Avoids downtown tracks • Land available for a siding	✓✓ • Avoids downtown tracks • Land available for a siding

**There is sufficient length for a rail platform at the parking lot, though further analysis would be required as to how the station could be safely integrated into any development. Buses would still have to layby on street. There is not sufficient room for any additional bus infrastructure. ***Based on the current arrangement. ****When measured by straightline distance, there are approximately 5,200 people in the catchment. However, currently access by the population to the south is largely only provided by the connection through the CTrain station. Source: CPCS Team analysis

Figure 4-5: Calgary Bus-Stop Only Location Evaluation Summary

Criteria	Somerset-Bridlewood	Anderson	69 Street SW	Crowfoot
Presence of station rail infrastructure (e.g. platforms)	**N/A** This site is not under consideration for a rail station	**N/A** This site is not under consideration for a rail station	**N/A** This site is not under consideration for a rail station	**N/A** This site is not under consideration for a rail station
Presence of existing bus terminal infrastructure (e.g. bus bays)	✓ 4 existing on-street bus lay-by areas	✓✓ 11 existing bus bays	✓✓ 11 existing bus bays (6 off-street)	✓✓ 12 existing bus bays (11 off-street)
Availability of passenger amenities	✓ Benches, indoor waiting area	✓ Benches, indoor waiting area	✓ Benches, indoor waiting area	✓ Benches, indoor waiting area
Land available for station	**N/A** Existing bus station	**N/A** Existing bus station Future TOD redevelopment site	**N/A** Existing bus station	**N/A** Existing bus station
Access to parking	✓✓ 913 parking stalls*	✓✓ 1,750 parking stalls*	✓✓ 736 parking stalls*	✓✓ 1,345 parking stalls*
Connectivity to transit	✓ • Red Line CTrain southern terminal station • 11 bus connections • Backtracking likely involved for most passengers	✓✓ • Red Line CTrain southern leg station • 9 bus connections	✓✓ • Blue Line CTrain western terminal station • 8 bus connections	✓✓ • Red Line CTrain northern leg station • 7 bus connections
Connectivity to active transportation	✓✓ • Sidewalks on all adjacent streets • Multi-use trails in station vicinity	✓ • No sidewalks on Macleod Trail or Anderson Road • Direct pedestrian connection to Southcentre Mall • Station connected to multi-use trails	✓✓ • Sidewalks on all adjacent streets • Station connected to multi-use trails	✓✓ • Sidewalks on all adjacent streets • Station connected to multi-use trails
Walkability	✓ Walkscore: 74	X Walkscore: 43	✓ Walkscore: 53	✓ Walkscore: 75
Proximity to highways/arterials (for park and ride-oriented locations)	✓✓ • Close to Stoney Trail • Close to Macleod Trail	✓✓ • Close to Macleod Trail • Close to Glenmore Trail • Close to Deerfoot Trail	✓✓ • Close to Sarcee and proposed Stoney Trail	✓✓ • Close to Stoney Trail • Close to Crowfoot Trail
Deviation from Hwy 1 between downtown Calgary and Lake Louise (minutes)	**N/A** • Station located south of downtown Calgary • Does not add to travel time between downtown and Lake Louise	**N/A** • Station located south of downtown Calgary • Does not add to travel time between downtown and Lake Louise	✓ • 12-13-minute one-way deviation from Trans-Canada Highway • Less deviation if stop is on route that does not serve downtown Calgary	✓ • 8-10-minute one-way deviation from Trans-Canada Highway
Proximity to population (within 800m of station)	✓ 2,687 population	✓ 0 population**	✓ 2,687 population	✓ 846 population
Proximity to employment (within 800m of station)	✓ 604 employment	✓ 1,815 employment	✓ 422 population	X 33 employment

Criteria	Somerset-Bridlewood	Anderson	69 Street SW	Crowfoot
Commuter-shed population (within 15-minute drive of station)	✓ 351,816 population	✓✓ 620,268 population	✓ 490,903 population	✓✓ 668,044 population
Proximity to tourist attractions (relative to other potential locations)	X • No tourist attractions nearby	X • No tourist attractions nearby	X • No tourist attractions nearby	X • No tourist attractions nearby
Proximity to accommodations	✓ 2 hotels within 1km	✓ 2 hotels within 1km	X 0 hotels within 1km	X 0 hotels within 1km
Opportunity for intensification / alignment with municipal plans	✓✓ • Identified as a primary transit hub • Major activity centre and Transit Oriented Development area • Opportunity for redevelopment of parking lots • Aligns with MDP and CTP	✓✓ • Currently subject of the Anderson Station Area Redevelopment Plan • Major activity centre and Transit Oriented Development area • Opportunity for redevelopment of parking lots • Aligns with MDP and CTP	✓ • Identified as a primary transit hub • Unlikely to be further developed, as facility is recently constructed • Additional residential development expected to the west of station site	✓✓ • Identified as a regional/inter-city gateway hub • Opportunity for redevelopment of parking lots • Aligns with MDP and CTP
Avoids impacts on CP's operations	**N/A** This site is not under consideration for a rail station	**N/A** This site is not under consideration for a rail station	**N/A** This site is not under consideration for a rail station	**N/A** This site is not under consideration for a rail station

*These stalls are intended for the use of Calgary Transit customers, and are likely to be well-utilized on weekdays. Approximately half of the stalls at each location are reserved for specific customers during the week. **When measured by straightline distance, there are approximately 3,100 people in the catchment. Source: CPCS Team analysis

4.2 Cochrane

Cochrane is northwest of Calgary with a population of approximately 26,000 residents. It is located approximately 35 kilometres northwest of Calgary on Highway 1A. It is located approximately 12 kilometres north of the Trans-Canada Highway and, as a result, is not on the most direct highway route connecting Calgary and the Bow Valley.

In Cochrane, the railway runs to the south of the existing downtown between Railway Street and 1 Street. Likely the most desirable location for a station would be in central Cochrane, as east of downtown the CP Laggan Subdivision diverges from Highway 1A and arterial roadways in general, limiting connectivity to the station.

Cochrane would be primarily an “origin” station for visitors to Banff as well as for commuters into Calgary. As a result, proximity to population and good connectivity to other modes of transportation to provide a feeder to this station is particularly important.

We considered two potential station/stop locations:

9. **Future Downtown Cochrane Transit Hub (Railway Street West):** The Town of Cochrane owns an approximately 6,500 square metre site adjacent to the CP right-of-way on Railway Street West, approximately midway between Centre Avenue and Fifth Avenue. The site is envisioned as the hub of Cochrane’s future transit network. The site is just south of Downtown Cochrane, and within walking distance of a large multi-use area (The Quarry) that is currently being developed.
10. **Highway 1/22 Interchange (42148 Highway 1):** A Petro-Canada Gas Station and Truck Stop is located on the northwest corner of the interchange. This location is often used as an informal park-and-ride facility, with a significant numbers of cars parking along the shoulders of Township Road 245A. This location is on the way to the Bow Valley from Cochrane, but likely would not be effective as a park and ride for commuters to Calgary from Cochrane, due to the route circuity.

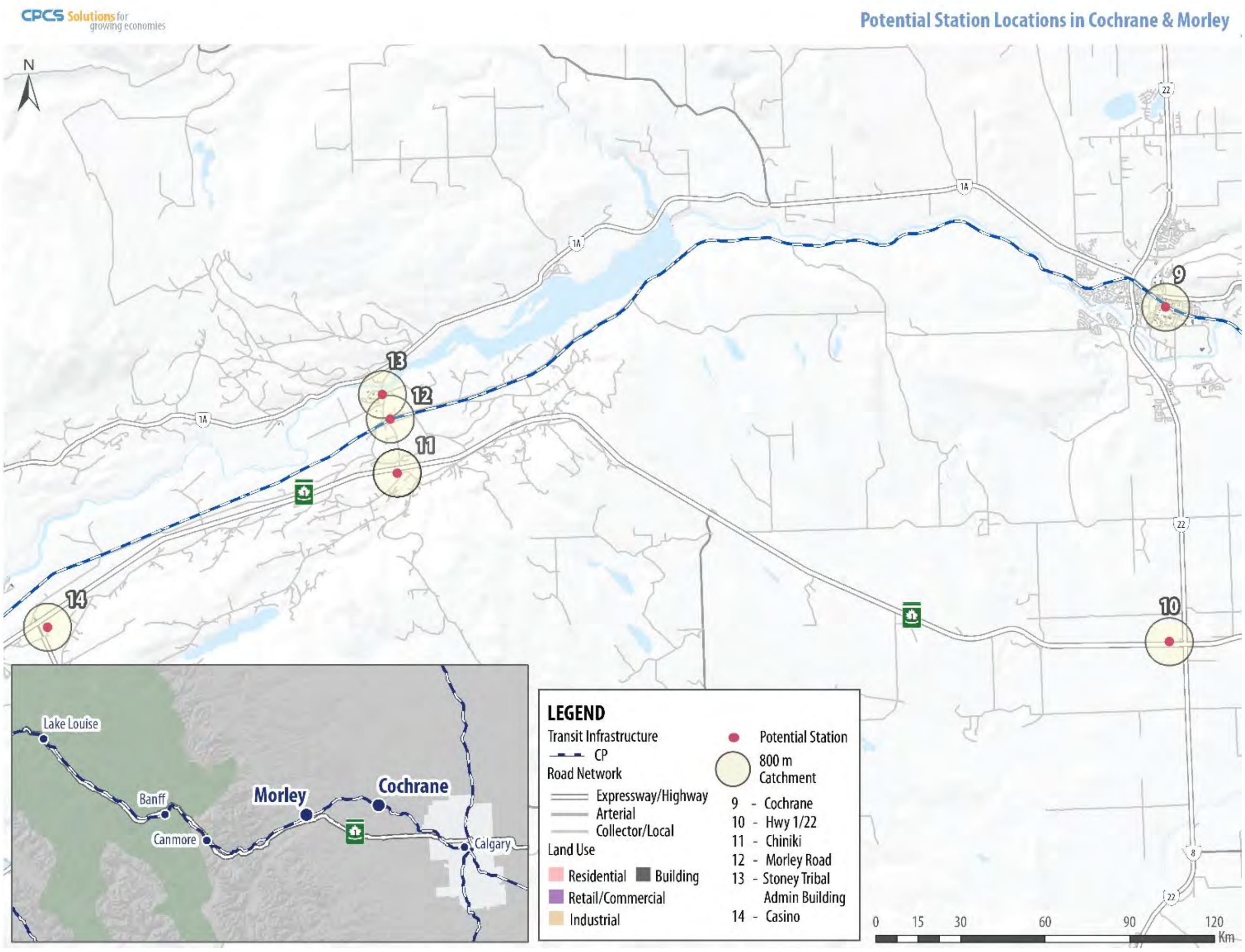
Two possible station locations servicing Cochrane are shown in Figure 4-6, along with their applicability to bus and rail. These are also shown in Figure 4-7 (along with potential station locations on Stoney Nation lands discussed in the next section).

Figure 4-6: Potential Cochrane Station Locations

Location	Bus	Rail
Future Downtown Cochrane Transit Hub	✓	✓
Highway 1/22 Intersection	✓	

Source: CPCS Team

Figure 4-7: Potential Station Locations in Cochrane and Morley Map



Source: CPCS Team analysis

Figure 4-8 summarizes the evaluation of the two Cochrane stations.

Figure 4-8: Cochrane Station Location Evaluation Summary

Criteria	Downtown Cochrane	Highway 1/22
Presence of station rail infrastructure (e.g. platforms)	X No platforms or infrastructure exist	N/A This site is not under consideration for a rail station
Presence of existing bus terminal infrastructure (e.g. bus bays)	X Bus bays (future)	X No bus bays or infrastructure exist
Availability of passenger amenities	X Shelters (future) Benches (future)	✓ Heated waiting area (in truck stop) Washrooms (in truck stop)
Land available for station	✓ Planned as a bus hub Insufficient land for parking on-site	✓✓ Open land Sufficient land to accommodate station and parking
Access to parking	X No parking on-site	X No formal parking on-site. While Township Road 245A shoulders are used as informal parking, this is not a preferred practice and there is a desire to prohibit this.
Connectivity to transit	✓✓ Planned future transit hub	X None
Connectivity to active transportation	✓ Sidewalks on all adjacent streets	X No sidewalks on adjacent streets
Walkability	✓ Walkscore: 68	X Walkscore: 9
Proximity to highways/arterials (for park and ride-oriented locations)	✓ Close to Highway 1A	✓ • Close to Trans-Canada Highway • Impractical for Cochrane commuters for Calgary • Useful for Cochrane tourists to Bow Valley
Deviation from Hwy 1 between downtown Calgary and Lake Louise (minutes)	X 15-minute one-way deviation from most direct route between Calgary and Lake Louise	✓✓ 1-2-minute one-way deviation from Trans-Canada Highway
Proximity to population (within 800m of station)	✓ 2,148 population	X Minimal population
Proximity to employment (within 800m of station)	✓ 2,233 employment	X Minimal employment**
Commuter-shed population (within 15-minute drive of station)	✓ 29,267 population	✓✓ 106,653 population (spillover into Calgary catchment area)
Proximity to tourist attractions (relative to other potential locations)	✓ Downtown Cochrane	X No tourist attractions nearby
Proximity to accommodations (relative to other potential locations)	✓ 1 hotel within 1 km	X 0 hotels within 1 km
Opportunity for intensification / alignment with municipal plans	✓✓ • Future transit terminal site* • Significant intensification potential to the south • Aligns with MDP/Downtown Plan	✓ • Aligns with County Plan that encourages infrastructure-based growth at this location. • Formal study would need to take place on park-and-ride needs in this area before a stop is recommended.
Impacts on CP operations	✓ Impact from the station stop could be mitigated through an additional station track	N/A • This site is not under consideration for a rail station

*The Town Council retained consultants to undertake a Transit Feasibility Study. **Would include the Petro-Canada station and truck stop. Source: CPCS Team analysis of various sources

4.3 Stoney Nation

Stoney Nation is a First Nations reserve with a population of approximately 4,000, located approximately 60 kilometres west of Calgary. Its population is dispersed over a large area, but the administrative centre is the community of Morley.

With the exception of the Stoney Nakoda Resort & Casino, Stoney Nation is primarily an "origin" station for commuters destined to employment in Calgary, Cochrane, Canmore and Banff. As a result, the primary consideration would be parking availability and proximity to population.

We considered four potential bus or rail stop locations:

11. **Chiniki Cultural Centre:** This centre, with a restaurant, exhibit and other facilities is located at the southwest corner of the interchange of the Trans-Canada Highway and Alberta 133X, approximately 3 km south of the community of Morley. The site has a large parking lot that could accommodate a bus stop.

12. **Morley Road (Alberta 133X):** Morley Road crosses the CP Laggan Subdivision approximately 1 km south of the centre of the community of Morley. The Stoney Tribal Chiniki Gas bar is located adjacent to the railway and could be used as a station site, or a new location in the vicinity could be used instead.

13. **Stoney Tribal Administration Building (40 Morley Road):** The Stoney Tribal Administration Building is located in the centre of the community of Morley. Although residential density is extremely low, it is located in close proximity to a school, a youth centre, a hockey arena and a small retail area. It is located approximately five minutes from the Trans-Canada Highway.

14. **Stoney Nakoda Resort & Casino (888 Nakoda Way):** The Stoney Nakoda Resort & Casino is an entertainment complex consisting of a 110-room hotel, a casino, a waterpark and two restaurants. It is located immediately adjacent to the Trans-Canada Highway and has a passenger drop-off/pick-up loop.

Four possible station locations servicing Stoney Nation are illustrated in Figure 4-7, and listed in Figure 4-9

Figure 4-9: Potential Station Locations on Stoney Nation Lands

Location	Bus	Rail
Chiniki Cultural Centre	✓	
Morley Road	✓	✓
Stoney Tribal Administration Building	✓	
Stoney Nakoda Resort & Casino	✓	

Source: CPCS Team

Figure 4-10 summarizes our evaluation of possible station locations serving the Stoney Nation. Due to the relatively small population catchment areas, a bus servicing either of the four potential station locations is not guaranteed, and would be subject to evaluation.

Figure 4-10: Stoney Nation Station Locations Evaluation Summary

Criteria	Chiniki Cultural Centre	Morley (Alberta 133X)	Stoney Tribal Administration Building	Stoney Nakoda Resort & Casino
Presence of station rail infrastructure (e.g. platforms)	N/A This site is not under consideration for a rail station	X No platforms or infrastructure exist	N/A This site is not under consideration for a rail station	N/A This site is not under consideration for a rail station
Presence of existing bus terminal infrastructure (e.g. bus bays)	X No bus bays or infrastructure exist	X No bus bays or infrastructure exist	X No bus bays or infrastructure exist	✓ Existing pick-up/drop-off loop
Availability of passenger amenities	✓✓ • Heated waiting area • Benches • Washrooms	X No station currently exists	✓ • Benches • Washroom	✓✓ • Heated waiting area • Benches • Washrooms
Land available for station (approximate)	N/A Existing facility	✓✓ Open land	N/A Existing facility	N/A Existing facility
Access to parking	✓ Existing parking	X No existing parking, but sufficient land to accommodate such	✓ Over 100 parking stalls (free)	✓✓ Over 400 parking stalls (free)
Connectivity to transit	X No transit connections	X No transit connections	X No transit connections	✓ Friday and Saturday night casino shuttle service to Banff and Canmore
Connectivity to active transportation	X No sidewalks on adjacent streets	X No sidewalks on adjacent streets	X No sidewalks on adjacent streets	X No sidewalks on adjacent streets
Walkability	X Walkscore: 7	X Walkscore: 7	X Walkscore: 20	X Walkscore: 0
Proximity to highways/arterials (for park and ride-oriented locations)	✓✓ Close to Trans-Canada Highway and AB-133X	✓ Close to AB-133X	✓ Close to AB-133X	✓✓ Close to Trans-Canada Highway and AB-40
Deviation from Hwy 1 between downtown Calgary and Lake Louise	✓✓ 1-minute one-way deviation from Trans-Canada Highway	✓ 5-minute one-way deviation from Trans-Canada Highway	✓ 5-minute one-way deviation from Trans-Canada Highway	✓✓ 1-minute one-way deviation from Trans-Canada Highway
Proximity to population (within 800m of station)	X Minimal population	X Minimal population	X Minimal population	X Minimal population
Proximity to employment (within 800m of station)	X Minimal employment	X Minimal employment	X Minimal employment	✓ Resort and casino employment
Commuter-shed population (within 15-minute drive of station)	X 3,186 population	X 3,186 population	X 3,186 population	X 3,147 population
Proximity to tourist attractions (relative to other potential locations)	✓ Cultural Centre	X No tourist attractions nearby	X No tourist attractions nearby	✓ Resort and casino
Proximity to accommodations (relative to other potential locations)	X 0 hotels within 1km	X 0 hotels within 1km	X 0 hotels within 1km	✓ 1 hotel within 1km

Criteria	Chiniki Cultural Centre	Morley (Alberta 133X)	Stoney Tribal Administration Building	Stoney Nakoda Resort & Casino
Opportunity for intensification / alignment with municipal plans	✓ Not in official plans but site could easily accommodate transit	✓ Not in official plans but Stoney Nation prefers a central location for transit in Morley	✓✓ Not in official plans but Stoney Nation prefers a central location for transit in Morley	✓ Not in official plans but site could easily accommodate transit
Avoids impacts on CP's operations	N/A This site is not under consideration for a rail station	✓ Impact from the station stop would need to be mitigated through an additional station track	N/A This site is not under consideration for a rail station	N/A This site is not under consideration for a rail station

Source: CPCS Team analysis of various sources

4.4 Canmore

Of the municipal areas along the route, the Town of Canmore presents the least obvious station location out of the communities considered. The CP Laggan Subdivision is parallel to the Bow Valley Trail (Highway 1A).

A number of potential bus and train stations have been identified in the Town of Canmore. The commercial core of Canmore is located to the west of the Trans-Canada Highway. A downtown stop was also considered but was not assessed in full detail because the one-way deviation from the Trans-Canada Highway would be over five minutes (which could impact ridership between Calgary and Banff National Park), most accommodations are located along Bow Valley Trail, and the existing Roam Transit service provides bus service downtown. Therefore, preference was given to a bus station east of Spring Creek.

Canmore could be both an "origin" station for commuters bound to Calgary and Banff, as well as a "destination" station for visitors coming to the area and staying in hotels. As a result, having adequate parking at the station for commuters who wish to park and ride, as well as close proximity to hotels and attractions will be important considerations.

We considered five potential station areas in Canmore:

15. **The Moustache Lands (Trans-Canada Westbound on/off-ramps at Palliser Trail):** This site is located at the ramps connecting the eastbound Trans-Canada Highway to/from Palliser Trail. The site is currently undeveloped. It provides convenient access/egress for eastbound buses, but westbound buses require a 3-5-minute one-way trip to reach the site. This site is on the opposite site of the Trans-Canada Highway from downtown Canmore, and the number of destinations within walking distance is limited. The west side of the ramps is commercial and mixed use, according to the Canmore Municipal Development Plan approved on September 13, 2016.

16. **Elevation Place (700 Railway Avenue):** Elevation Place is a newly opened multi-purpose facility that contains an aquatic centre, library and other community spaces. It is located on Railway Avenue, just west of the CP right-of-way and just east of downtown Canmore's main street, 8th Street. It has a drop-off loop, benches, a parking lot, and is owned by the Town of Canmore.

17. **Railway Avenue at 10th Street (1100 Railway Avenue):** The Town of Canmore owns a strip of land approximately 18 metres adjacent to the CP right-of-way extending from its Elevation Place recreation facility. It extends approximately 200 metres (650 feet) from the existing parking lot to behind the existing Save-on-Foods, and adjacent to its overflow parking lot.[28] There is a paved trail that runs between the site and the existing CP right-of-way, and an at-grade rail pedestrian crossing just west of the site.

18. **Railway Avenue at 17th Street (1 Industrial Place):** There is currently a privately owned undeveloped parcel west of 17th Street and Railway Avenue of approximately 8,200 square metres adjacent to the CP right-of-way. The owner of this site has indicated a willingness to consider using this site for a rail and/or bus station.

19. **Bow Valley Trail (East End of Highway 1A in Canmore):** There is a forested area, approximately 88,756 square metres,[29] at the east end of Canmore between the Bow Valley Trail, Spring Creek Gate and the Laggan Subdivision. Most of the area is currently zoned for industrial use, according to the Canmore Municipal Development Plan approved on September 13, 2016.

These potential locations are summarized and shown in Figure 4-11 and Figure 4-12, respectively.

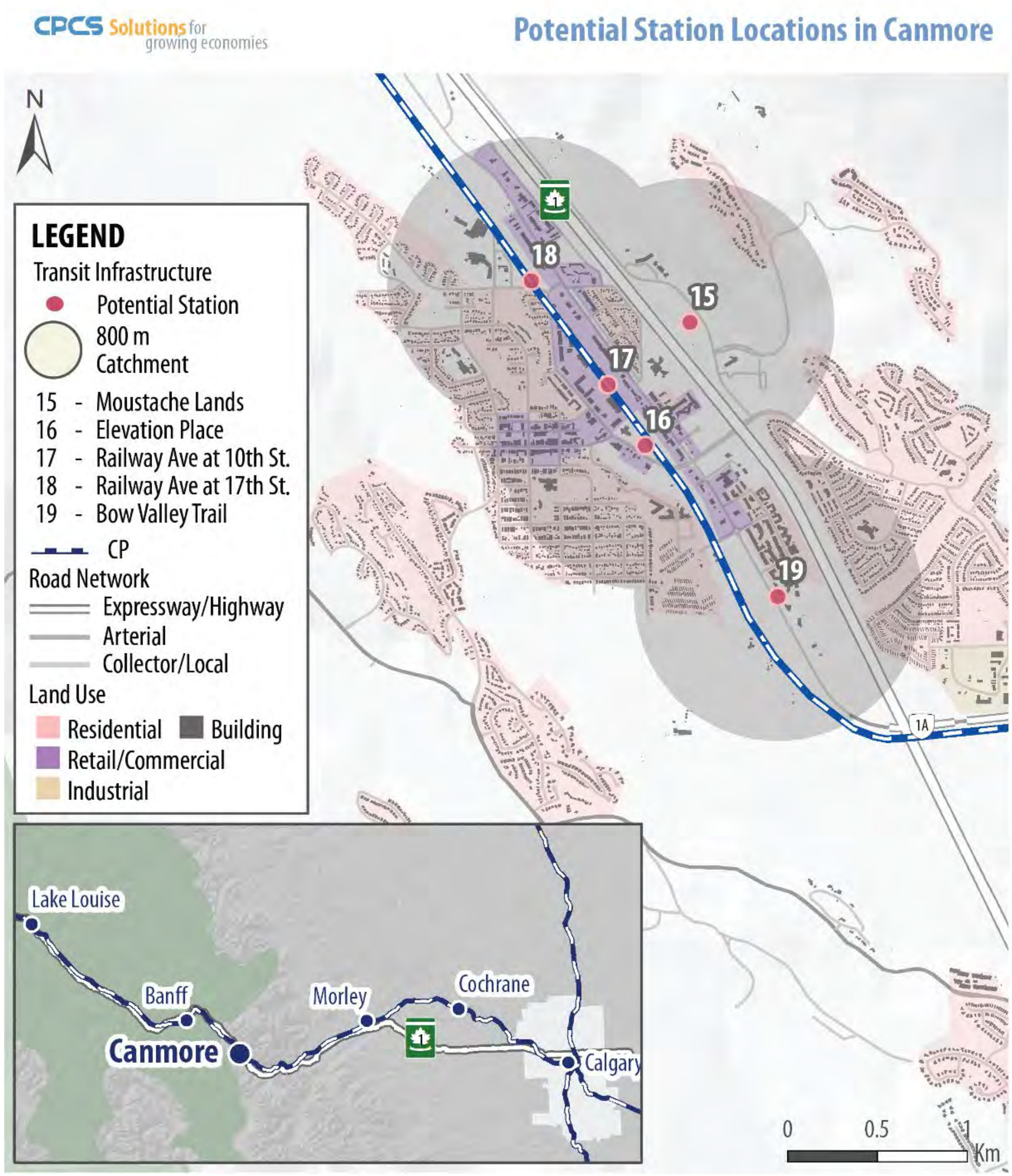
Figure 4-11: Potential Canmore Station Locations

Location	Bus	Rail
The Moustache Lands	✓	✓
Elevation Place	✓	✓
Railway Avenue at 10th Street	✓	✓
Railway Avenue at 17th Street	✓	✓
Bow Valley Trail	✓	

Source: CPCS Team

[28] Based on distances and areas computed using Canmore Property Information Viewer.
[29] As noted in footnote above.

Figure 4-12: Potential Canmore Station Locations Map



Source: CPCS Team analysis

Figure 4-13 summarizes our evaluation of the possible station locations in Canmore.

Figure 4-13: Canmore Station Location Evaluation Summary

Criteria	Bow Valley Trail	Elevation Place	Railway Avenue at 10th Street	Railway Avenue at 17th Street	Moustache Lands
Presence of station rail infrastructure (e.g. platforms)	X No platforms or infrastructure exist	X No platforms or infrastructure exist	X No platforms or infrastructure exist	X No platforms or infrastructure exist	N/A This site is not under consideration for a rail station
Presence of existing bus terminal infrastructure (e.g. bus bays)	X No bus bays or infrastructure exist	✓ Existing drop-off loop	X No bus bays or infrastructure exist	X No bus bays or infrastructure exist	X No bus bays or infrastructure exist
Availability of passenger amenities	X No station currently exists	✓ • Benches • Lighting • Heated indoor waiting area (6am-10pm)	X No station currently exists	X No station currently exists	X No station currently exists
Land available for station (approximate)	✓✓ Sufficient land available for station and small parking lot	✓ Constrained land due to existing buildings	✓ Constrained land due to existing buildings	✓ 8,200 square metres available	✓✓ Sufficient land available for station and parking
Access to parking	X • None existing • Sufficient land to accommodate some parking on site	✓ • 100 on-site spots • Would need to negotiate with property owners	✓ • 75 on-site spots • Would need to negotiate with property owners	X • None existing • Sufficient land to accommodate some parking on site	X • None existing • Sufficient land to accommodate parking on site
Connectivity to transit	✓ • Local Canmore Roam Route 5 serves site directly (weekends only)	✓✓ • Local Canmore Roam Route 5 and Banff-Canmore Roam Route 3 serve site directly	✓✓ • Local Canmore Roam Route 5 and Banff-Canmore Roam Route 3 serves site directly	✓✓ • Local Canmore Roam Route 5 and Banff-Canmore Roam Route 3 serves site directly	✓ • Banff-Canmore Roam Route 3 serves site directly (though stop would need to be added)
Connectivity to active transportation	✓ • Multi-use path on Bow Valley Trail	✓✓ • Sidewalks on all adjacent streets • Multi-use path parallel to CP tracks • Close to Policeman's Creek Boardwalk • Close to pedestrian bridge to Spring Creek	✓✓ • Sidewalks on all adjacent streets • Pedestrian crossing of CP tracks • Multi-use path parallel to CP tracks	✓✓ • Sidewalks on all adjacent streets • Multi-use path parallel to CP tracks	✓ • Multi-use path on Palliser Trail
Walkability	X Walkscore: 28	✓ Walkscore: 70	✓ Walkscore: 78	✓ Walkscore: 53	X Walkscore: 27

Criteria	Bow Valley Trail	Elevation Place	Railway Avenue at 10th Street	Railway Avenue at 17th Street	Moustache Lands
Proximity to highways/arterials (for park and ride-oriented locations)	✓✓ • Close to Trans-Canada Highway • Close to Highway 1A	✓✓ • Close to Trans-Canada Highway • Close to Highway 1A	✓ • Close to Highway 1A	✓ • Close to Highway 1A	✓ • Close to Trans-Canada Highway
Deviation from Hwy 1 between downtown Calgary and Lake Louise (minutes)	✓✓ 1-2-minute one-way deviation from Trans-Canada Highway	✓ 2-4-minute one-way deviation from Trans-Canada Highway	X 4-5-minute one-way deviation from Trans-Canada Highway	X 4-5-minute one-way deviation from Trans-Canada Highway	✓✓ 1-3-minute one-way deviation from Trans-Canada Highway
Proximity to population (within 800m of station)	X 0 population*	X 0 population*	X 808 population	X 874 population	X 0 population*
Proximity to employment (within 800m of station)	X Minimal employment	✓ Downtown, commercial and hotel employment	✓ Downtown, commercial and hotel employment	✓ Commercial and hotel employment	X Minimal employment
Commuter-shed population (within 15-minute drive of station)	✓ 12,538 population	✓ 16,990 population	✓ 14,283 population	✓ 17,283 population	✓ 16,990 population
Proximity to tourist attractions (relative to other potential locations)	X No tourist attractions nearby	✓ Downtown Canmore	✓ Downtown Canmore	X No tourist attractions nearby	X No tourist attractions nearby
Proximity to accommodations (relative to other potential locations)	✓✓ 15 hotels within 1km	✓✓ 17 hotels within 1km	✓✓ 15 hotels within 1km	✓ 11 hotels within 1km	X 1 hotel within 1km
Opportunity for intensification / alignment with municipal plans	✓✓ • Aligns with MDP Commercial mixed use/industrial area • Tourist service area • Within the growth boundary	✓ • Aligns with MDP • Commercial mixed-use area	✓ • Aligns with MDP • Commercial mixed-use area (already built-up)	✓✓ • Aligns with MDP • Zoned for tourist service	✓✓ • Aligns with MDP • Open land available for development
Impact on CP operations	✓ • Additional station track required	✓ • Additional station track required • Proximity of multi-use trail requires further investigation	✓ • Additional station track required • Proximity of multi-use trail requires further investigation	✓ • Additional station track required	**N/A** This site is not under consideration for a rail station

*Based on straight-line distance, there is up to about 2,300 persons living within 800 metres. Source: CPCS Team analysis

4.5 Banff

Banff is the urban heart of the Bow Valley, and represents a significant tourist draw. Banff can be accessed by rail using the CP Laggan Subdivision which runs to the northwest of downtown. The Town also has good access to the Trans-Canada Highway, which is provided by interchanges at Mount Norquay Road and Banff Avenue.

Banff is primarily a "destination" station for visitors coming to the area. However, there is a potential for a smaller flow of travellers destined to employment, retail or tourist sites in Lake Louise, Canmore and Calgary. As a result, the primary consideration will be proximity to attractions and integration with the local transportation network.

We considered two potential station/stop locations:

20. **Banff Train Station (327 Railway Avenue):** The historic Banff Train Station is an approximately eight-minute walk from the Banff Visitor Centre. It currently serves as Banff's intercity bus station.[30] Additionally, the Rocky Mountaineer tourist train uses the facility and its 2,000-foot platform on the south side of the CP mainline. The existing station has passenger amenities, including a heated waiting room and washroom facilities. It is located approximately two minutes from the Trans-Canada Highway. The lessee of the train station, Liricon Capital, has plans to develop the area, including the provision of 500 park and ride spaces, as shown in Figure 4-14.

21. **Banff Community High School (Banff Avenue at Wolf Street):** This location is an on-street bus stop on the west side of Banff Avenue and north side of Wolf Street, in the heart of downtown Banff. The curb lane is currently used for parking but could be converted into a bus layover area. A small washroom facility is located at the intersection, but no other passenger amenities other than outdoor benches exist. It is located approximately four minutes from the Trans-Canada Highway.

[30] Greyhound, providing up to 10 services per day, has indicated that it plans to discontinue Western Canadian service.

Figure 4-14: Banff Train Station Development Plans

Source: Liricon Capital

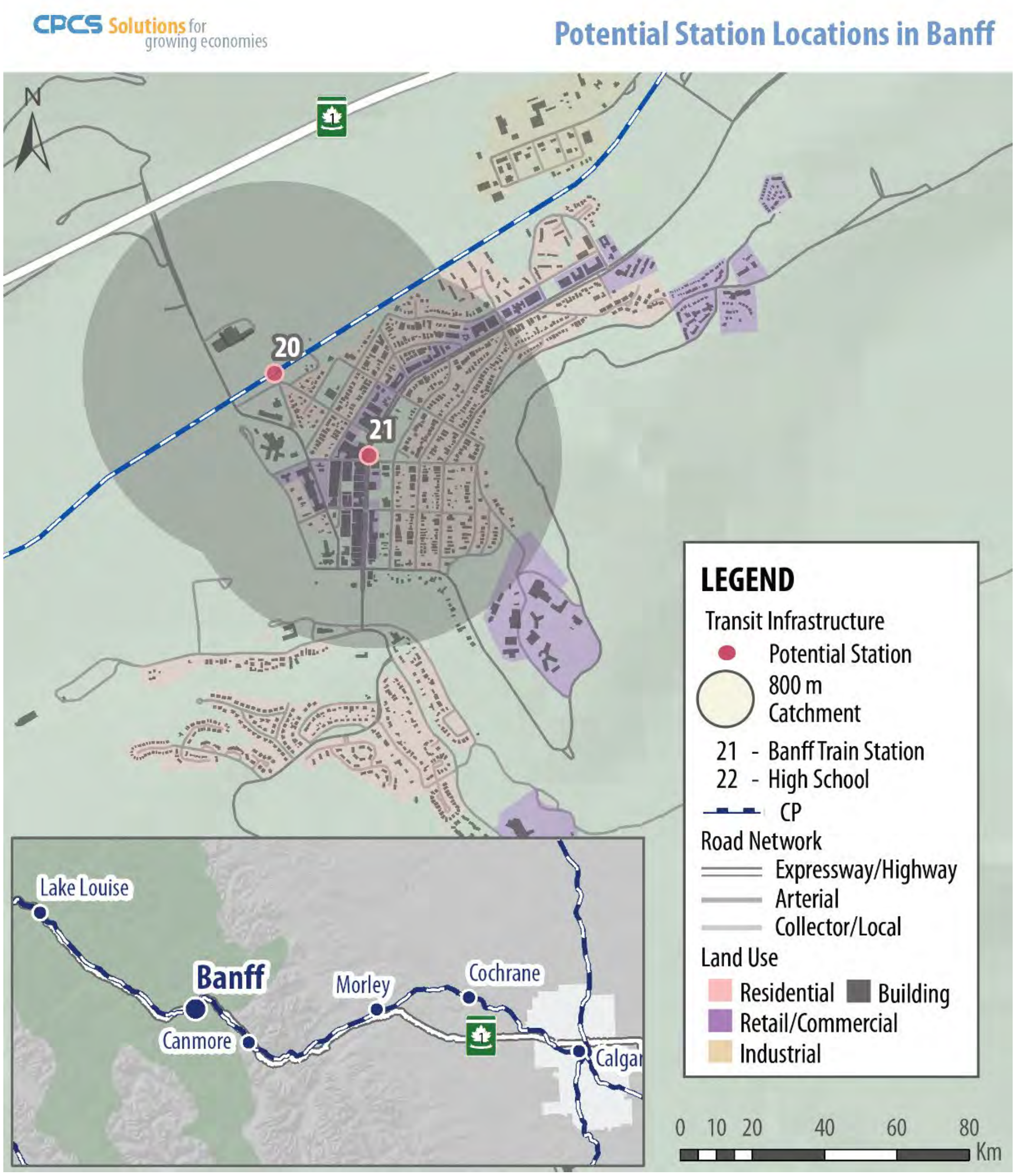
There are two potential station areas that could potentially be considered for a bus or rail service in Banff, as shown in Figure 4-15 and Figure 4-16

Figure 4-15: Potential Banff Station Locations

Location	Bus	Rail
Banff Train Station	✓	✓
Banff Avenue / Wolfe Street	✓	

Source: CPCS Team analysis

Figure 4-16: Potential Banff Station Locations Map



Source: CPCS Team

Figure 4-17 summarizes the evaluation of the possible Banff Station Locations.

Figure 4-17: Banff Station Locations Evaluation Summary

Banff Railway Station	Banff Train Station	Banff High School
Presence of rail infrastructure (e.g. platforms)	✓✓ • Platforms • Heated waiting area	N/A This site is not under consideration for a rail station
Presence of existing bus terminal infrastructure (e.g. bus bays)	✓✓ • 3 existing bus bays • Layover space • A future integrated transit facility (including bus bays) is planned	✓✓ • A bus facility is under construction.
Availability of passenger amenities	✓✓ • Heated waiting area • Benches • Washrooms	✓ • Benches • Washroom
Available land available for station (approximate)	N/A Existing facility	X Insufficient land for any off-street passenger facilities, bus infrastructure or on-site parking
Access to parking	✓✓ • 24 on-site spots • 206 off-street spots within 5-minute walk • Plan to build 500 parking spots on-site	✓ • 0 on-site spots • 493 off-street spots within 5-minute walk • No long-term parking available
Connectivity to transit	✓ • Primary inter-city transit station • Direct connections to Roam Transit Route 3 (Canmore) and Roam Route 4 (seasonal) • 500-metre walk to Roam Route 1 and Route 2	✓✓ • Directly served by all 3 local Roam routes • Directly served by Roam Route 3 (Canmore) • 500-metre walk to inter-city transit station
Connectivity to active transportation	✓ • Sidewalks on two of three access streets • No cycling facilities	✓ • Sidewalks on all access streets • No cycling facilities
Walkability	✓ Walkscore: 75	✓✓ Walkscore: 88
Proximity to highways/arterials (for park and ride-oriented locations)	N/A This site is not primarily a park-and-ride location	N/A This site is not primarily a park-and-ride location
Deviation from straight-line path between downtown Calgary and Lake Louise	✓✓ 2-minute one-way deviation from Trans-Canada Highway	✓ 4-5-minute one-way deviation from Trans-Canada Highway
Proximity to population (within 1km of station)	✓ 1,071 population	✓✓ 3,872 population
Proximity to employment (within 1km of station)	✓ Some downtown, commercial and hotel employment	✓✓ Most downtown, commercial and hotel employment
Commuter-shed population (within 15-minute drive of station)	✓ 8,379 population	✓ 8,867 population
Proximity to tourist attractions (relative to other potential locations)	✓ Close to downtown Banff	✓✓ Centre of downtown Banff
Proximity to accommodations (relative to other potential locations)	✓✓ 15 hotels within 1km	✓✓ 17 hotels within 1km
Opportunity for intensification / alignment with municipal plans	✓✓ Site envisioned as local and regional transit hub	✓✓ Site envisioned as local and regional transit hub

Banff Railway Station	Banff Train Station	Banff High School
Impact on CP operations	✓ If terminal station, would likely require a pocket track	N/A This site is not under consideration for a rail station

Source: CPCS Team analysis

4.6 Lake Louise

Lake Louise and the adjoining area is a significant tourist draw. In Lake Louise, the CP Laggan Subdivision runs to the southwest of the Village of Lake Louise. On the west side of Lake Louise, the subdivision separates into two main tracks. Access to the Trans-Canada Highway is provided by an interchange at Lake Louise Drive.

Lake Louise is almost exclusively a "destination" station for visitors coming to the area. As a result, the primary consideration for selecting a suitable bus stop would be proximity to attractions and accommodations. As it would represent the western end of a potential inter-city bus route, it is possible to include more than one stop in Lake Louise due to lessened downstream scheduling effects. As many of the sights and activities around Lake Louise are not within typical walking distance of the CP Laggan Subdivision (e.g. Lake Louise is an approximately 60-minute walk from the visitor centre), effective local transit linking to the rail or intercity bus station would also need to be provided throughout the area.

We considered four potential station/stop locations:

22. **Fairmont Chateau Lake Louise (111 Lake Louise Drive):** The historic Fairmont Chateau Lake Louise is located adjacent to Lake Louise's namesake body of water, the primary tourist attraction in the area. The hotel itself is a luxury property containing approximately 550 guest rooms. It is located approximately eight minutes from the Trans-Canada Highway and has a passenger drop-off/pick-up loop. The travel time to this destination can be significantly longer during the peak tourist seasons due to roadway congestion.

23. **Lake Louise Railway Station (200 Sentinel Road):** The historic Lake Louise Railway Station is located at the end of Sentinel Road, adjacent to the CP tracks. A restaurant and gift shop currently occupy the building. Despite its close proximity to accommodations, it is mostly outside of walking range to hotels due to the lack of a connection across the railway tracks to Village Road. No passenger platform currently exists at the station. It is located approximately three minutes from the Trans-Canada Highway.

24. **Samson Mall (101 Village Road):** The Samson Mall is the commercial and retail hub of Lake Louise and is located at the centre of the hamlet, at the intersection of Lake Louise Drive and Village Road. It contains a number of shops as well as the Lake Louise Visitors Centre. The parking lot contains approximately 100 vehicle parking spaces as well as a layover area for approximately 10 buses. Being adjacent to the CP rail tracks, it could also be the site of a train station, though the length of train would be constrained by the proximity of adjacent bridges. It is located approximately one minute from the Trans-Canada Highway.

25. **Lake Louise Overflow Parking Lot (Eastbound Trans-Canada Highway):** This location is approximately five kilometres east of the Lake Louise townsite, along the eastbound lanes of the Trans-Canada Highway. It is an overflow parking lot, from which Parks Canada runs shuttles to Lake Louise. No facilities apart from ample parking exist at this site.

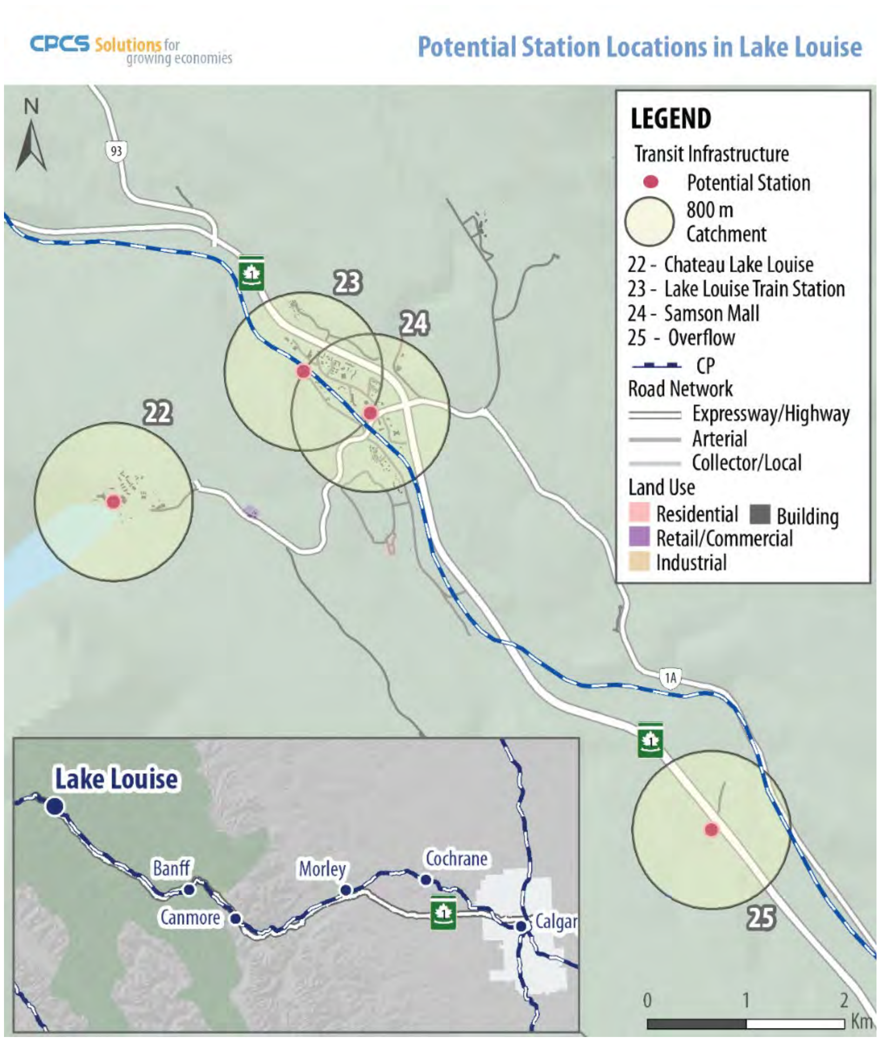
The potential station locations around Lake Louise are listed and shown in Figure 4-18 and Figure 4-19.

Figure 4-18: Potential Station Locations Around Lake Louise

Location	Bus	Rail
Chateau Lake Louise	✓	
Lake Louise Railway Station	✓	✓
Samson Mall	✓	✓
Lake Louise Overflow Parking Lot	✓	

Source: CPCS Team

Figure 4-19: Potential Station Locations in Lake Louise Map



Source: CPCS Team

Figure 4-20 summarizes our evaluation of possible station locations in Lake Louise.

Figure 4-20: Lake Louise Station Locations Evaluation Summary

Criteria	Chateau Lake Louise	Lake Louise Railway Station	Samson Mall	Lake Louise Overflow Lot
Presence of rail infrastructure (e.g. platforms)	N/A This site is not under consideration for a rail station	✓ Platform	X No platforms or infrastructure exist	N/A This site is not under consideration for a rail station
Presence of existing bus terminal infrastructure (e.g. bus bays)	✓✓ • 6 existing bus bays • Existing pick-up/ drop-off loop • Existing bus layover spaces	✓ • Existing pick-up/ drop-off loop	✓ • Existing bus layover spaces	✓ • Existing bus layover spaces
Availability of passenger amenities	✓✓ • Benches • Lighting • Heated indoor waiting area • Washrooms	✓✓ • Benches • Lighting • Heated indoor waiting area • Washrooms	✓✓ • Benches • Lighting • Heated indoor waiting area (limited hours)	X • No bus bays or infrastructure exist
Land available for station (approximate)	N/A Existing facility	N/A Existing facility Sufficient land for platform	X Train length constrained by bridges	✓ Sufficient for bus station and parking
Access to parking	✓✓ Over 400 on-site spots	✓ 50 on-site spots	✓ 100 on-site spots	✓✓ 200 on-site spots
Connectivity to transit	✓ Served by Parks Canada shuttle (summer), Lake Louise Ski Resort shuttle (year-round), and Brewster bus (year-round)	X No transit connection	✓ Served by Parks Canada shuttle (summer) and Lake Louise Ski Resort shuttle (year-round)	✓ Served by Parks Canada shuttle (summer)
Connectivity to active transportation	✓ • Connections to numerous walking trails • No sidewalks on adjacent streets	✓ • Connection Tramline trail • No sidewalks on adjacent streets	✓ • No sidewalks on adjacent streets • Paved shoulders on Village Road	X • No sidewalks on Trans-Canada Highway
Walkability	X Walkscore: 21	X Walkscore: 12	X Walkscore: 20	X Walkscore: 0
Proximity to highways/arterials	N/A This site is not primarily a park-and-ride location	N/A This site is not primarily a park-and-ride location	N/A This site is not primarily a park-and-ride location	N/A This site is not primarily a park-and-ride location
Deviation from straight-line path between downtown Calgary and Lake Louise	N/A Not a deviation as Lake Louise is the end of the route	N/A Not a deviation as Lake Louise is the end of the route	N/A Not a deviation as Lake Louise is the end of the route	X Route must backtrack on the TransCanada to access final destination (adds travel time)
Proximity to population (within 1 km of station)	X 0 population	X 0 population	✓ 417 population	X 0 population
Proximity to employment (within 1 km of station)	✓ Resort employment	X Minimal employment	✓ Hotel and commercial employment	X No employment

Criteria	Chateau Lake Louise	Lake Louise Railway Station	Samson Mall	Lake Louise Overflow Lot
Commuter-shed population (within 15-minute drive of station)	X 417 population	X 417 population	X 417 population	X 417 population
Proximity to tourist attractions (relative to other potential locations)	✓✓ • Lake Louise • Nature trails	X • No tourist attractions nearby	✓ • Lake Louise Visitor Centre	X • No tourist attractions nearby
Proximity to accommodations (relative to other potential locations)	✓ 2 hotels within 1km	X 0 hotels within 1km	✓ 4 hotels within 1km	X 0 hotels within 1km
Opportunity for intensification / alignment with municipal plans	**N/A** Under Parks Canada jurisdiction, which does not have town plans or development guides	**N/A** Under Parks Canada jurisdiction, which does not have town plans or development guides	**N/A** Under Parks Canada jurisdiction, which does not have town plans or development guides	**N/A** Under Parks Canada jurisdiction, which does not have town plans or development guides
Impact on CP operations	**N/A** This site is not under consideration for a rail station	✓ In double track territory; could consider using a relocated Chalet Spur in the area	X Would require mainline stop or short station track, but adding infrastructure constrained by bridges and grades	**N/A** This site is not under consideration for a rail station

Source: CPCS Team analysis

As Lake Louise is almost exclusively a "destination" station for visitors coming to the area, the primary considerations for selecting a suitable bus station are proximity to attractions and accommodations. Due to the community being located at the end of the route, it is possible for the bus to make multiple stops in the community without inconveniencing passengers, because no additional travel time is being added.

4.7 Proposed Bus Routes and Stops

4.7.1 Stop Locations

Based on the assessment of potential locations in this chapter and further consultations with stakeholders, we identify the stops we selected to form part of the mass transit bus service between Calgary and the Bow Valley.

Calgary

We propose four stops in Calgary to promote access to the mass transit bus service. We selected these stops to be close to major roadways and highways, have good rapid and local transit connections, provide passenger amenities, contain park-and-ride facilities and be near to population and employment centres:

- **Downtown Calgary:** The Downtown Calgary station is proposed to be located on-street, on 9 Avenue SE, to the east of Centre Street South. The station would be located adjacent to the Calgary Tower within walking distance of various hotels, shopping centres, employment hubs, entertainment facilities and the current stop location for the Red Arrow bus service to Edmonton. This location is within two blocks of the Centre Street (eastbound [EB]) and 1 Street SW (westbound [WB]) stations on the Red and Blue CTrain Lines. It is also within close proximity to the future 7 Avenue SW stop on the future Green Line CTrain. Finally, it is also within close proximity of Calgary Transit's 300 Airport bus rapid transit route, which currently operates at a 20-minute headway and provides the opportunity to connect air travellers to this service.

- **Crowfoot:** A stop is proposed at the existing Crowfoot CTrain station, on the CTrain's northwest Red Line. Its catchment area would include drivers from the northern half of the City of Calgary, as well as transit users in the northwest. In addition to being located directly on a rapid transit route, the stop is easily accessible from Stoney Trail and Crowchild Trail. For the bus service itself, it does not represent a significant deviation from the straight-line route between Downtown Calgary and the Bow Valley. As a result, the catchment area of this stop also extends to suburban communities such as Airdrie and Chestermere. An existing Calgary Transit park-and-ride facility would help accommodate passengers who choose to drive to access the stop.

- **Anderson:** A stop is proposed at the existing Anderson CTrain station, on the CTrain's south Red Line. Its catchment area would include drivers from the southern half of the City of Calgary, as well as transit users in the southeast and southwest. In addition to being located directly on a rapid transit route, the stop is easily accessible from Macleod Trail, Anderson Road and Deerfoot Trail. As a result, the catchment area of this station also extends to suburban communities such as Okotoks and High River. Its location in close proximity to Southcentre Mall (one of the largest malls in the Calgary area) also has the potential to attract Bow Valley residents looking to conveniently shop in Calgary. The Anderson CTrain site is currently the subject of a transit-oriented redevelopment proposal. The intensification of the site would result in the addition of new residents, workplaces and community amenities. A redeveloped Calgary Transit park-and-ride facility would help accommodate passengers who choose to drive to access the stop.

- **69 Street SW:** A stop in Calgary is proposed to be located at the existing 69 St SW CTrain station, on the CTrain's west Blue Line. Its catchment area would include drivers south of the Bow River and west of Crowchild Trail, as well as transit users in the same area. In addition to being located directly on a rapid transit route, it is easily accessible from Sarcee Trail. An existing Calgary Transit park-and-ride facility would help accommodate passengers who choose to drive to access the stop.

Optional Stop - Highway 22

We propose an optional stop at the existing Petro Canada Gas Station and Truck Stop, at the interchange of the Trans-Canada Highway and Highway 22. The stop requires minimal deviation from Highway 1, with the potential to accommodate drivers from the Town of Cochrane (located approximately 12 kilometres to the north along Highway 22) and Calgary choosing to bypass the proposed stop locations in the City. The challenge with this site is that demand is low, and the informal park-and-ride facility used by drivers is not ideal (drivers currently park on the service road). It is recommended that a stop be considered at this location only as part of a larger initiative by Rocky View County and Alberta Transportation to construct a formal park-and-ride facility.

Optional Stop – Stoney Nation

We propose an optional stop serving Stoney Nation at either the Chiniki Cultural Centre or the Stoney Nakoda Resort and Casino. The former is located closer to the community of Morley and has a gallery, shop and restaurant, whereas that latter has somewhat greater potential of attracting visitors due to its on-site hotel, casino and restaurants. For either location, the catchment area of this stop would include the Stoney Indian Reserves Nos. 142, 143 and 144, including the community of Morley. Due to the lower projected passenger demand to and from Stoney Nation, further consultation on the need, cost and location of the stop should take place with Stoney Nation. If a stop is implemented, it would receive only limited service, with not every bus stopping at this location.

Canmore

Of the numerous potential bus station locations evaluated in Canmore, the location at Elevation Place is preferred. Elevation Place is centrally located, with easy access to both downtown Canmore and local hotels, and accessing it does not require a significant a detour off the Trans-Canada Highway. It is connected to local transit and has existing passenger amenities.

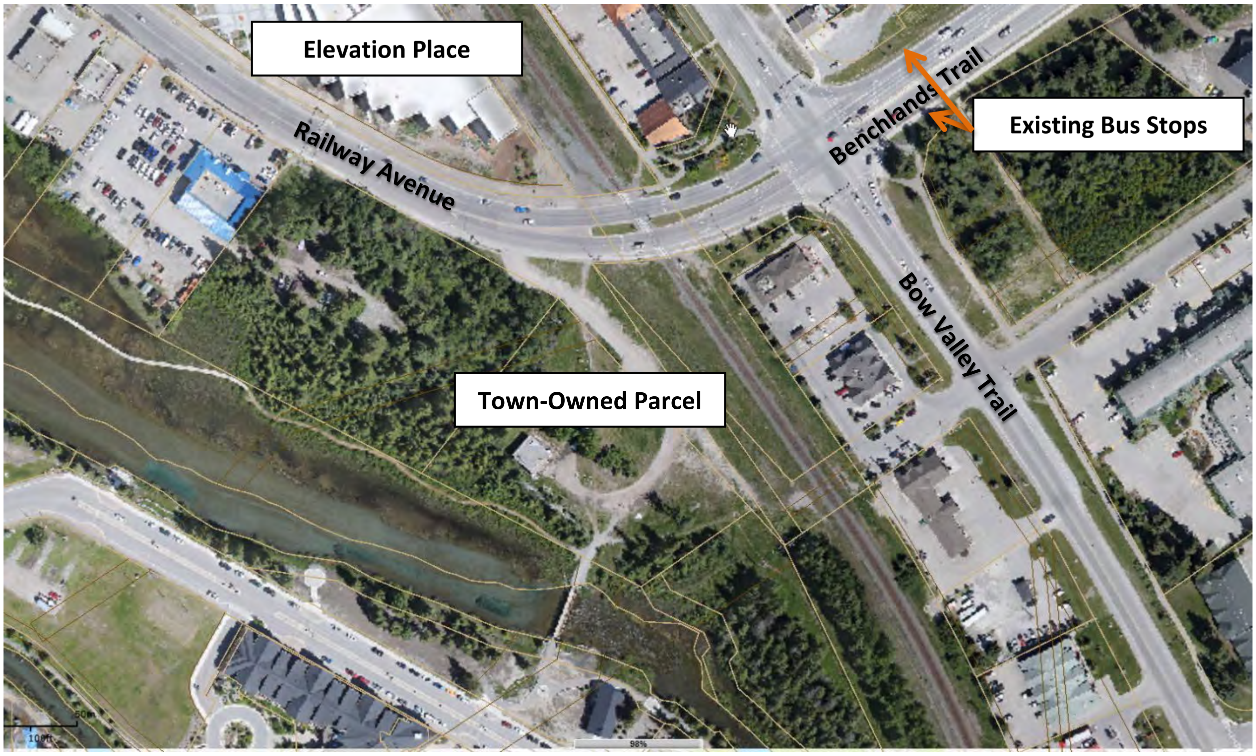
However, after further discussions with stakeholders from the Town of Canmore, the congestion at the existing location and limited parking spaces was identified as an operational concern that would preclude the site's usage as an intercity bus stop. Upon further review of the evaluation, a location near Elevation Place would remain the preferred alternative, due to its central location, convenient access to active transportation infrastructure, proximity to the Trans-Canada Highway, and its feasible integration with a potential rail service. As an alternative to the Elevation Place site, the Town of Canmore identified two nearby sites for additional consideration and analysis (see Figure 4-21):

- A parcel of municipally owned land, immediately across Railway Avenue from Elevation Place and adjacent to the Canadian Pacific right-of-way. The Town is already exploring the option of developing this site into an integrated park and ride and transit facility, which would limit any additional capital costs required for the Calgary-Bow Valley Mass Transit service.

- The intersection of Benchlands Trail and Bow Valley Trail (Highway 1A). Existing buses already serve this location.

Both of these sites are located in close proximity to Elevation Place and maintain its location advantages while avoiding the operational challenges associated with the site itself.

Figure 4-21: Canmore Bus Stop Locations



Source: Google Maps

The recommended station location is at the Town-owned parcel on the south side of Railway Avenue, to the west of the CP tracks. The site is large enough to accommodate multiple bus bays, a park-and-ride lot, and a rail platform, if required. It also has good pedestrian access to the downtown.

In the interim, before the integrated transportation facility is constructed on the Town-owned parcel, the existing bus stops on Benchlands Trail east of Bow Valley Trail can be used as the Canmore stop for the Calgary to Bow Valley bus service. Buses would serve the site by operating on Bow Valley Trail between Benchlands Trail and Exit 86 on the Trans-Canada Highway. Consideration may be given to providing an additional stop in the vicinity of Bow Valley Trail and 17 Street. These stops would no longer be served once the integrated transportation facility is constructed on Railway Avenue, across from Elevation Place.

Banff

Based on the evaluation, we recommend both stops in Banff for the bus service: one at the Banff Train Station and the second at the downtown transit terminal on Banff Avenue and Wolf Street. The Banff Train Station would provide connections to various intercity services and the transit service to Lake Louise (see discussion below) as well as the planned park-and-ride lot. The stop is located near the centre of town (approximately a six-minute walk) and is relatively close to the Trans-Canada Highway.

The downtown transit terminal provides improved connectivity to a number of hotels and retailers on Banff Avenue. Terminating the route at this location would also improve connectivity to a number of local Roam Transit routes, allowing visitors to use transit to access a number of local attractions.

With the implementation of the service, consideration would need to be given to where the mass transit bus would lay over at the end of each run. This could be incorporated into the design of the downtown terminal. The alternative would be to incorporate a space at the Banff Train Station.

4.7.2 Locations Not Directly Served

Lake Louise

The majority of travellers destined to the Bow Valley travel to Banff. While Lake Louise is a popular visitor destination, and demand between Banff and Lake Louise is high, we have estimated that through trips directly between Calgary and Lake Louise are expected to be on the order of 45 passengers per day in the 2022 horizon year, depending on the scenario.

The round-trip distance between Banff and Lake Louise can be covered in approximately two hours, including a short layover in Lake Louise. This represents an increase of about 40% from the total Calgary to Banff round trip time. The significant increase in revenue vehicle hours, and related operating costs, is not justified by the relatively small direct ridership between Calgary and Lake Louise.

To accommodate these passengers, it is proposed that service be integrated with a planned Roam Transit route between Banff and Lake Louise. The Bow Valley Regional Transit Services Commission is proposing to operate a transit service between Banff and Lake Louise at some point in the near future. Service would run at hourly frequencies or better throughout the majority of the day and stop at the Banff Train Station. A second service would operate along the Bow Valley connecting to a number of trail heads. Schedules between the two services should be coordinated where possible to ensure hassle-free transfers with minimal waiting times between the two bus routes at the Banff Train Station.

Implementing this option to service Lake Louise would prevent duplication of service, increase the cost recovery of the service, and permit a more efficient utilization of resources for the core section of the corridor between Calgary and Banff. It also allows the Calgary to Banff bus to stop in downtown Banff, providing improved access to a number of accommodations and attractions.

Cochrane

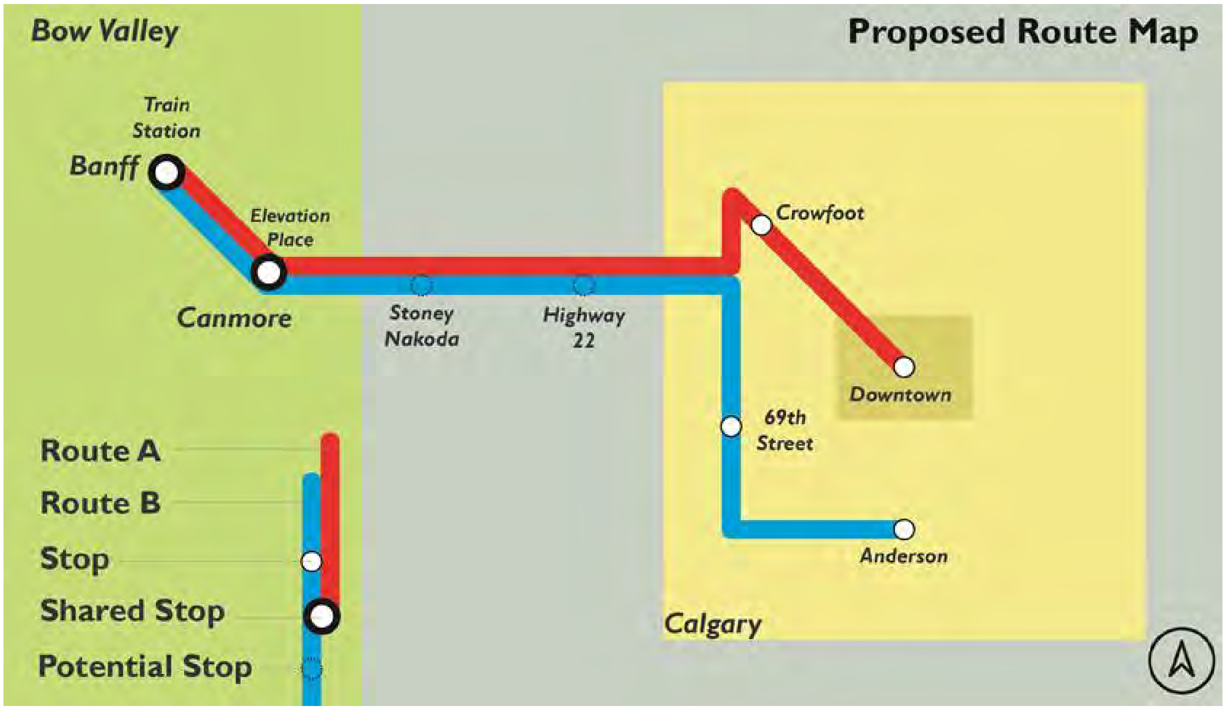
Analysis of travel demand between Cochrane and the Bow Valley shows a limited potential for ridership generated by a stop in Cochrane. In total, it is estimated that approximately five daily boardings could reasonably be expected at a stop in Cochrane by 2022. This estimate does not include commuters to and from Calgary.

Serving Cochrane directly would add approximately 10 kilometres and 20 minutes of run time to a route between Calgary and the Bow Valley. The route deviation and subsequent additional travel time required to serve Cochrane is not justified by the potential ridership generated at that stop.

4.7.3 Route Design

Two mass transit bus routes were designed to connect each stop and provide service between Calgary and the Bow Valley. A description of each route is described below and illustrated in Figure 4-22.

Figure 4-22: Route A and Route B Map



Source: Dillon Consulting.

Route A

Route A would be the primary route between Calgary and Banff, serving the stations with the highest expected ridership volumes. The route would service downtown Calgary and northwest Calgary before heading to the Bow Valley. The following stations are proposed to be connected to Route A:

- Downtown Calgary;
- Crowfoot;
- Canmore; and
- Banff.

Route B

Route B would be the secondary route between Calgary and Banff, serving the stations with the lower expected ridership volumes. The route would service southeast and southwest Calgary before heading to the Bow Valley. The following stations are proposed to be connected to Route B:

- Anderson;
- 69 Street SW;
- Highway 22 (optional future stop);

- Stoney Nation (optional future stop);
- Canmore; and
- Banff.

4.8 Proposed Rail Stations

4.8.1 Calgary

Downtown

If a rail service is the preferred option, we recommend that two stations be located in Calgary: one downtown (serving residents and visitors staying downtown as well as those who could arrive by CTrain or by an airport BRT service) and one at Keith (serving residents and visitors arriving by vehicle).

Based on the evaluation of downtown stations, we are proposing to study the Downtown East location most closely, due to its relatively high proximity to population, employment and attractions. It would also have nearly direct connectivity to the planned Green Line CTrain station (Figure 4-23), which may eventually connect to the Calgary Airport.

Figure 4-23: Artist Rendition of Green Line Station Along 9 Avenue and 4 Street SE

Source: City of Calgary. 2017. Green Line LRT Long Term Vision: 160 Avenue N to Seton

While the CP Pavilion is centrally located and has some existing infrastructure, we do not believe it would be suitable for a regular intercity service (though may be appropriate for a less frequent service) due primarily to the ventilation concerns that exist.

One potential constraint on the feasibility of the Downtown East location is that CP is considering converting its south-most track into an inspection track, thereby limiting access to a potential station track. Should a rail option be selected for development, further negotiations would need to be held with CP regarding this site. If this site is not feasible, the Downtown West (Sunalta) location could be considered.

If the Downtown East location is selected, the following are considerations for integration with the surrounding area:

- Sufficient room needs to be maintained for the width of the station track and platform: The proposed station track should be located at least 20 feet (6.1 metres) from the existing CP track, and, in consultation with CP, fencing would be suggested between tracks to reduce trespassing risk. In addition, the platform width should be at least four metres wide, though wider is preferred if feasible.

- If a 5 Street SE underpass is constructed, it should maintain the capability to allow the station track and platform to be extended eastward.

- The Green Line station should be constructed with allowances to allow for as seamless transition as possible from the intercity rail platform to the CTrain platform (e.g. locations for future ramps and stairs), though it is recognized that some delineation for proof-of-payment reasons may be required. In addition, it is recommended that the station be planned with a higher-capacity elevator and/or another means to move between Green Line platforms and between the platforms and street-level if not already planned, as many users of the intercity rail service will be carrying luggage.

Keith

The potential Keith station location would be located just to the west of the Stoney Trail overpass over the CP right-of-way. It is a desirable location as residents and vehicles from nearly any location in Calgary could pass to this point, so there is limited travel time deviation from a direct route from Calgary to Banff.

Station locations on the north and south side of the CP right-of-way could be considered. The approximate locations for both are shown in Figure 4-24.

A platform location on the south side would require less rail infrastructure for the station itself, though road access is more limited. It is also more difficult to provide transit service as Scenic Bow Road is a dead end. A platform on the north side would have better vehicle access off Bearspaw Dam Road and could be better served by transit, but would require more extensive rail infrastructure changes and higher capital costs.[31] Notably, as all proposed stations are located on the south side of the CP Laggan subdivision, if a station were preferred on the north side of Keith yard, to completely avoid conflicts

[31] In discussions with the City of Calgary, it prefers to have a station on the north side of Keith Yard as (1) Scenic Bow Road (on the south side) is a cul-de-sac, so would add circuity to any transit route and (2) access off of 85 Street would need to be reviewed. Depending on the demand, additional upgrades would be required to the access road and adjacent intersections, as well.

with freight trains, a fly-over or fly-under of the dedicated track would be required on both ends of the yard, or another appropriate location.

As a result, we have further studied a location on the south side. Once a preferred alignment for a dedicated track is identified in preliminary engineering, further discussion could be held with project stakeholders to determine whether a station on the north side is preferred or, alternatively, if a hybrid option could be pursued (i.e. a platform on the south side, with a pedestrian underpass to a park and ride and bus bays on the north side).

Figure 4-24: Potential Keith Station Location

Source: Google

4.8.1 Cochrane

The Downtown Cochrane Transit Terminal is the only potential station location on the CP corridor. Unlike with a bus service, there is no issue of having to deviate from the quickest route. However, the low ridership forecast from Cochrane to the Bow Valley does not justify the capital costs of station infrastructure for rail service that is oriented exclusively at serving visitors to the Bow Valley. If the rail service also serves as a commuter service from Cochrane to Calgary, the corresponding ridership would then justify the expense of station infrastructure.

Figure 4-25: Potential Cochrane Station Site

Source: Google

4.8.1 Canmore

A location at Elevation Place was identified as the preferred location for a rail station within the Town of Canmore due to its relatively large commuter shed population and proximity to accommodations, among other factors. However, after further discussions with stakeholders, Elevation Place itself is too congested to accommodate additional traffic generated by a rail station. As a result, we have studied a location to the south of Elevation Place across Railway Avenue. The approximate location is shown in Figure 4-26.

Figure 4-26: Potential Canmore Rail Station Site

Source: Google, DigitalGlobe.

4.8.2 Banff

The existing train station would be the proposed site for a potential train service. To allow trains to clear the CP mainline, we anticipate that a station track would need to be provided on the east side of the existing station, approximately shown in Figure 4-27.

Figure 4-27: Potential Banff Rail Station Site

Source: Google, Town of Banff

4.8.3 Locations Not Directly Served

Stoney Nation

If a rail option is selected, the Morley Road location is the only station on the CP corridor. Given the limited population and employment around the site, it is expected that this station will not generate enough ridership to warrant the cost of building a station and to offset the anticipated loss in ridership upstream of the station as a result of the increased travel time that comes with the addition of each station on the corridor.

Lake Louise

For rail service, a station near Lake Louise Rail station is the only viable option available to service the community; a location closer to Samson Mall is problematic due to the proximity to two adjacent bridges (limiting station length) and the signal block for the turnout moving from single to double track (which increases operational impediments).

However, there are several challenges with this location. Improved local bus and pedestrian connections would need to be in place to service this station, including a potential pedestrian crossing of the CP tracks to Village Road. As noted, this station is less preferred from a bus perspective, so there would be no synergies with a bus service from Calgary or Banff to Lake Louise. Essentially, complementary bus station infrastructure at Lake Louise would need to be created solely to service the train station, increasing the capital cost of installing the service.

From a market perspective, as discussed in chapter 2, though there is significant demand for trips to Lake Louise, most travellers also visit or stay in Banff and Canmore. In addition, even if there is a rail station in Lake Louise near the existing train station, visitors from Calgary would need to transfer to a bus service to reach their final destination (e.g. Lake Louise). Visitors going to Lake Louise from Banff would have an additional transfer in Lake Louise when taking the train. As there is no significant time advantage of rail over bus (both approximately take on the order of 45 minutes between Banff and Lake Louise), providing rail service to Lake Louise does not create a more attractive service offering for more visitors.

In sum, we anticipate it would be more suitable to use the existing train station in Banff as the rail terminal, and use it as a transfer point for onward bus service to Lake Louise.

5 Bus Ridership and Revenues

Key Chapter Takeaways

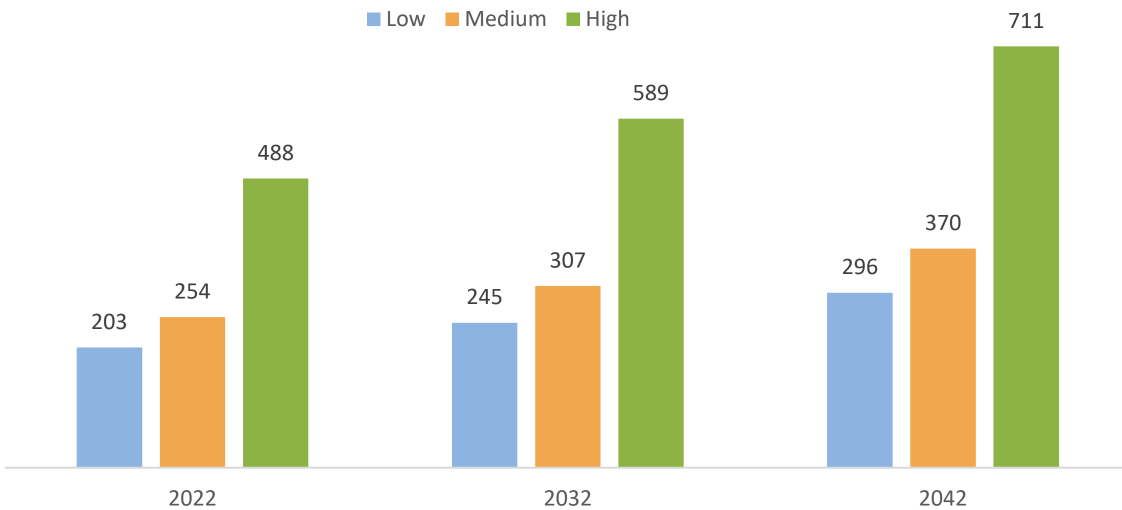
- In 2022, bus ridership is expected to vary between 200,000 boardings in the low ridership scenario to 490,000 boardings in the high scenario.
- Bus ridership is expected to grow from approximately 250,000 passengers in 2022 to 370,000 passengers in 2042, under the medium-ridership scenario. Approximately two-thirds of the ridership would be during the summer period.
- In 2022, bus revenues are expected to vary between $2.2 million in the low scenario and $3.8 million in the high scenario.
- Bus revenues are expected to grow from $2.8 million in 2022 to $4.0 million in 2042, under the medium ridership scenario.

5.1 Estimated Ridership

5.1.1 Total Annual

Based on the methodology discussed in chapter 2, Figure 5-1 summarizes the total annual bus boardings across the three scenarios. The annual boardings include all travel between the Calgary area and the Bow Valley.

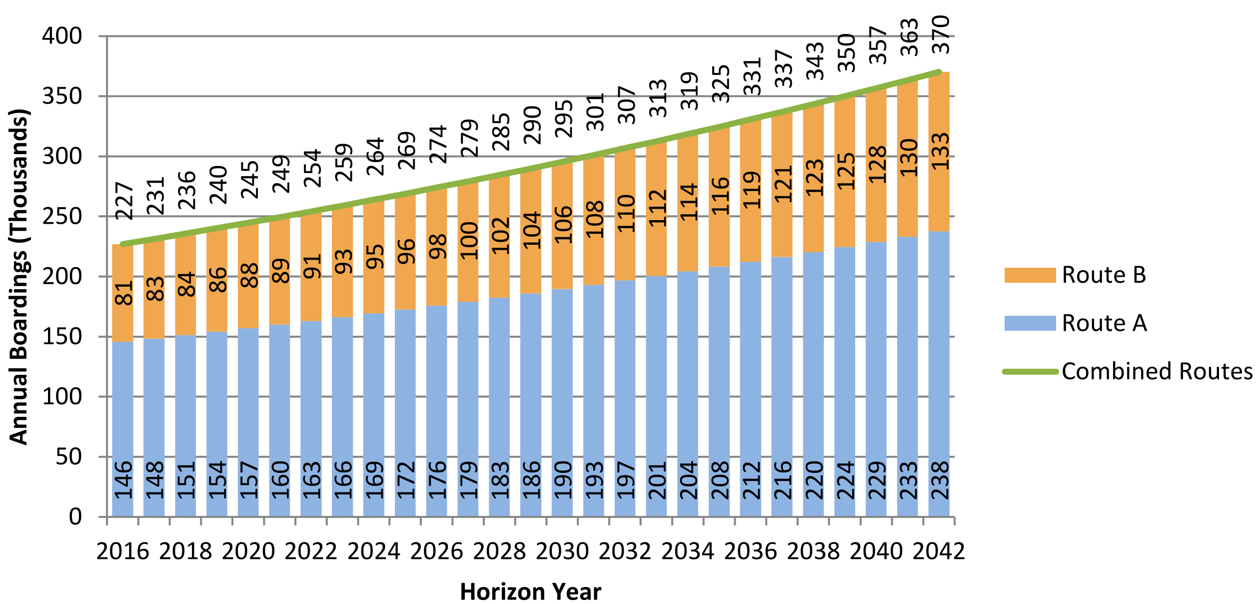
Figure 5-1: Annual Bus Boardings by Scenario (in Thousands)



Source: CPCS Team analysis

Figure 5-2 shows the estimated annual boardings for the proposed bus services in the medium ridership scenario, by route. Route A is expected to carry approximately three times more passengers than Route B, due to its proximity to major population and employment centres in Calgary. The combined projected ridership on both routes would be expected to grow from approximately 224,000 trips per year (in 2022) to 326,000 per year (in 2042).

Figure 5-2: Annual Bus Boardings (Medium-Ridership Scenario)



Source: CPCS Team analysis

Figure 5-3 shows the estimated ridership, by scenario and horizon year.

Figure 5-3: Estimated Annual Bus Ridership, by Scenario, in Thousands

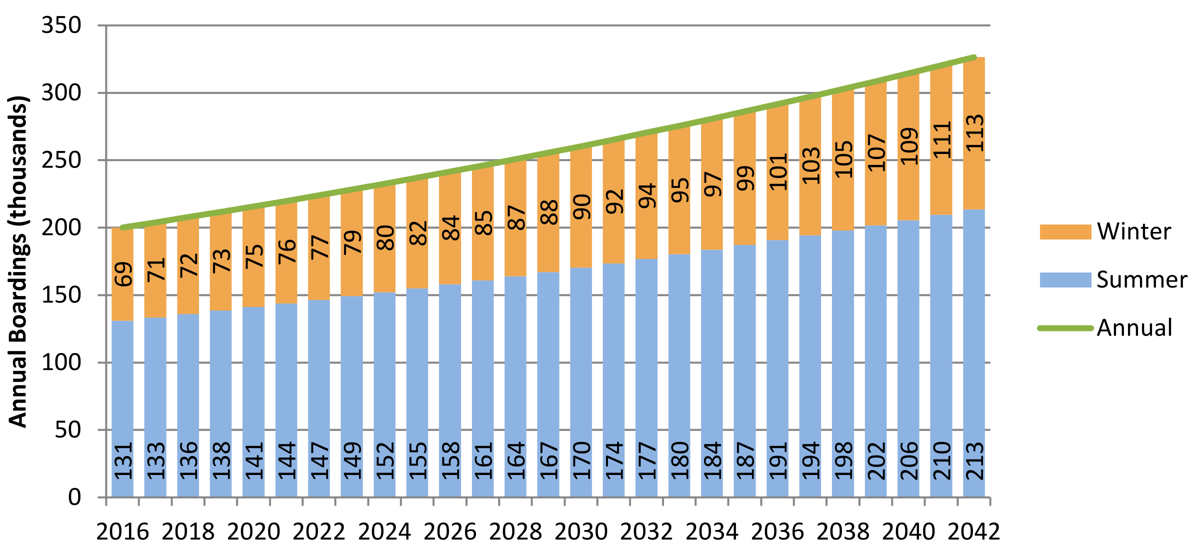
Year	Low			Medium			High		
	Route A	Route B	**Total**	Route A	Route B	**Total**	Route A	Route B	**Total**
2022	135	67	**203**	163	91	**254**	294	194	**488**
2032	163	81	**244**	197	110	**307**	355	234	**589**
2042	197	98	**295**	238	133	**370**	428	283	**711**

Source: CPCS Team analysis

Seasonally, ridership during the May to October summer visitor season is expected to exceed that during the November to April winter season by a factor of approximately 1.8. Peaking of demand during the summer season is expected, in particular, between late May and mid-September.

Figure 5-4 shows the estimated breakdown of summer and winter bus ridership, by year, in the medium-ridership scenario. Seasonally, ridership during the May to October summer visitor season is expected to exceed that during the November to April winter season by a factor of approximately 1.8. Peaking of demand during the summer season is expected, in particular, between late May and mid-September.

Figure 5-4: Seasonal Bus Boardings (Medium Scenario)



Source: CPCS Team analysis

5.1.2 Boardings/Alightings by Station

Figure 5-5 and Figure 5-6 illustrate the estimated daily boardings by bus stop on Route A in the medium ridership scenario during the summer and winter periods, respectively.

It can be noted that both Calgary stops (Downtown and Crowfoot) would generate significant amounts of ridership for the bus service. Passengers destined to/originating from Lake Louise are accounted for in the Banff ridership statistics, as they would transfer at this location.

Figure 5-7 and Figure 5-8 illustrate the estimated daily boardings by bus stop on Route B in the medium ridership scenario during the summer and winter periods, respectively.

Though there was noted interest by individuals in Cochrane in the market survey, the relative demand is very low. The Cochrane demand has been assigned to the Highway 22 station. It is possible that this stop would experience additional ridership from Calgary residents choosing to use this location rather than one of the four locations in the city. There was also limited estimated demand to Stoney Nation, though we reiterate the survey was not necessarily targeting this demand.

Figure 5-5: Boardings per Day by Station, Route A (Summer) – Medium Ridership Scenario

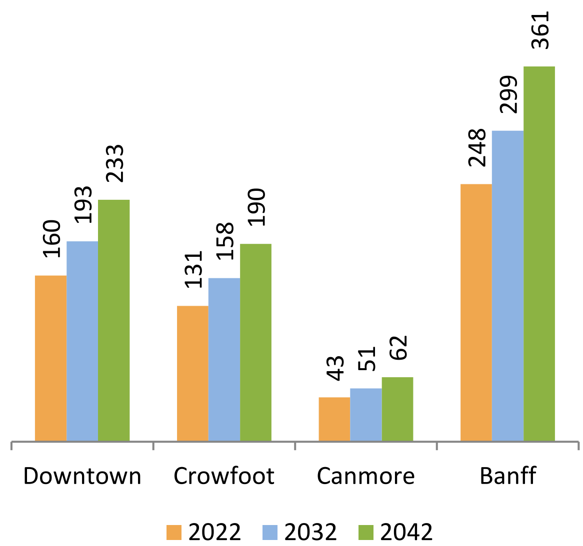


Figure 5-6: Boardings per Day by Station, Route A (Winter) – Medium Ridership Scenario

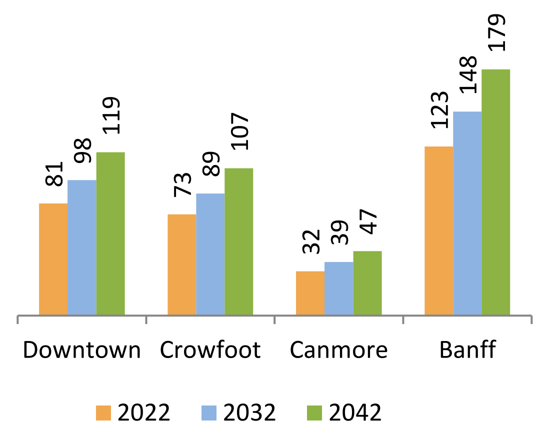


Figure 5-7: Boardings per Day by Station, Route B (Summer) – Medium Ridership Scenario

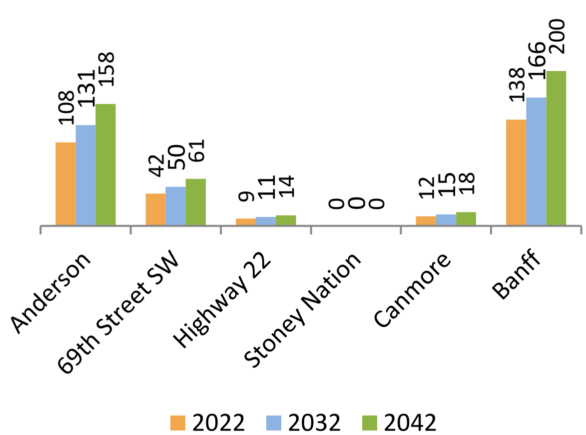
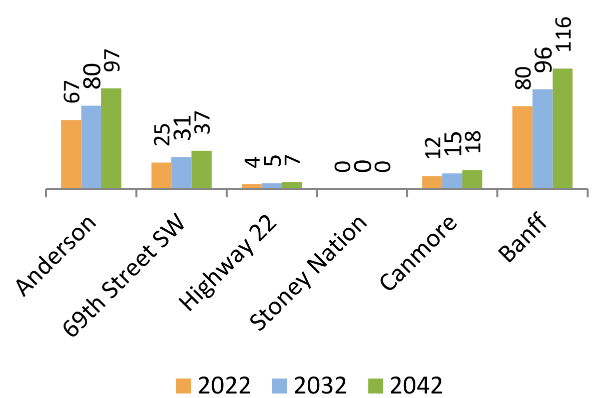


Figure 5-8: Boardings per Day by Station, Route B (Winter) – Medium Ridership Scenario

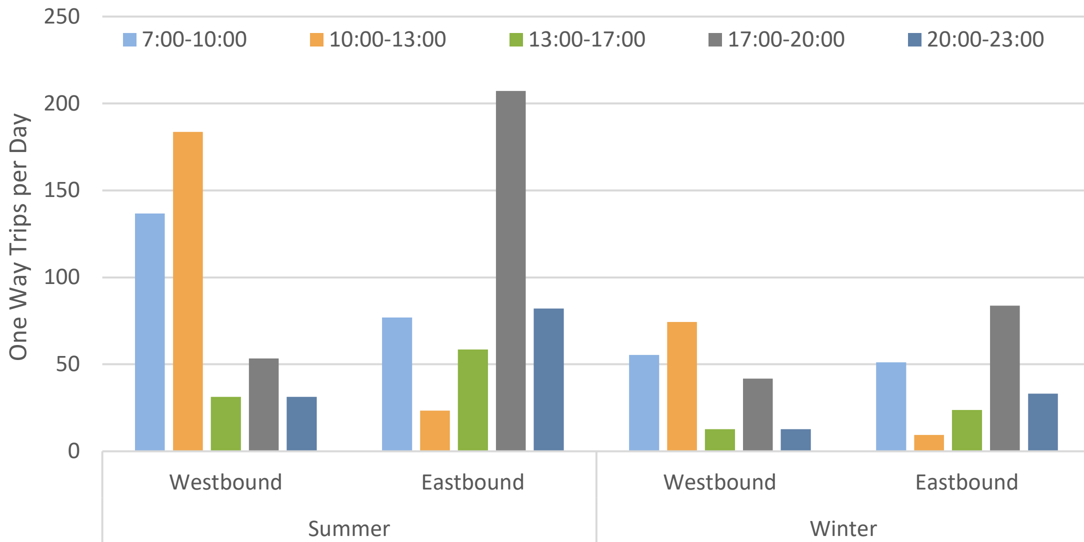


Source: CPCS Team analysis

5.1.3 Trips by Time of Day

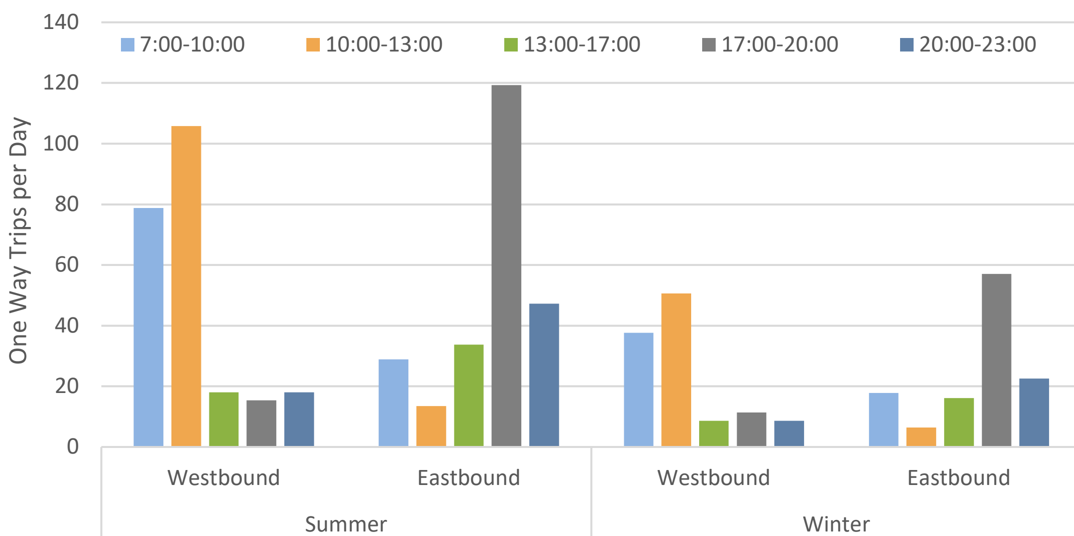
Understanding the variation of demand throughout the day helps inform an appropriate service design that can accommodate ridership demands. We estimated the peak loads per period as the product of number of one-way trips per day, the peak month demand factor discussed in section 2.9.1, and the time of day distribution discussed in section 2.9.2. Peak link loads, in this context, refers to the segment of the route with the highest number of passengers (i.e. accounting for the boardings and alightings along the route). Figure 5-9 and Figure 5-10 show the estimated 2,022 peak loads by time of day on Route A and Route B, respectively.[32] The times specified are the arrival (westbound) and departure (eastbound) times from Banff.

Figure 5-9: Peak Link Loads by Time of Day, Route A (2022 Medium Ridership Scenario)



Source: CPCS Team analysis

Figure 5-10: Peak Loads by Time of Day, Route B (2022 Medium Ridership Scenario)



Source: CPCS Team analysis

[32] The year 2022 was shown for comparison, but in practice the entire forecast horizon was used for analysis.

5.2 Bus Annual Revenue

5.2.1 Methodology

The calculation of annual revenue is based on the proposed fare levels, ridership demographics and the service's estimated ridership.

Several assumptions have been made to permit the estimation of annual fare revenue. These assumptions are detailed below:

1. It is assumed that 90% of travellers purchasing tickets would opt for a round-trip ticket (and the remaining 10% would opt for a one-way ticket). Because the service caters more to the vacation market, travellers will generally have fixed arrival and departure times, and will prefer to benefit from the discount offered when purchasing a return ticket.
2. From the results of the Bow Valley Regional Transit Services Commission Passenger Survey, conducted in September 2017, the visitor demographics, by age group, are approximately as follows:
   - 70% adults between ages 19 and 65;
   - 15% seniors over age 65;
   - 10% youth between ages 12 and 18; and
   - 5% children under age 12.

We assumed round-trip and one-way concession tickets would be purchased in the same proportion as described above.

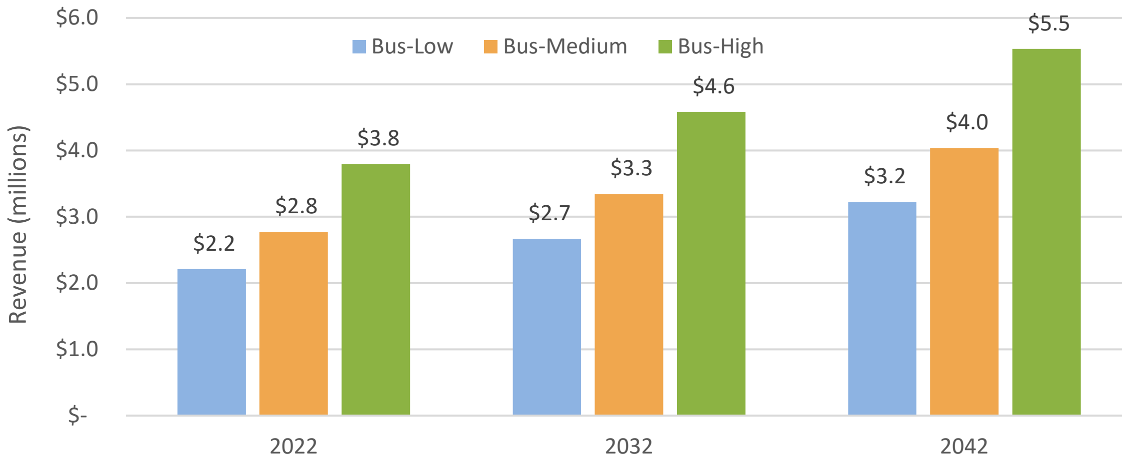
5.2.2 Estimated Revenues

Total estimated revenues have been calculated multiplying the proposed adult fares for each origin-destination pair with the estimated demand between the same two locations. Discounts have been applied to the resulting sums in order to account for the effects of the concession fares and passes.

Figure 5-11 shows a projection of annual revenue in the future horizon years. The low, medium and high correspond to the estimated ridership scenarios.[33]

[33] The fares have not been adjusted for inflation over the future horizon years, and the revenues are expressed in constant dollars. Furthermore, none of the assumptions were modified in the projection of future revenues. As a result, the growth in annual revenues is directly proportional to the growth in annual boardings.

Figure 5-11: Estimated Annual Fare Revenue (millions)



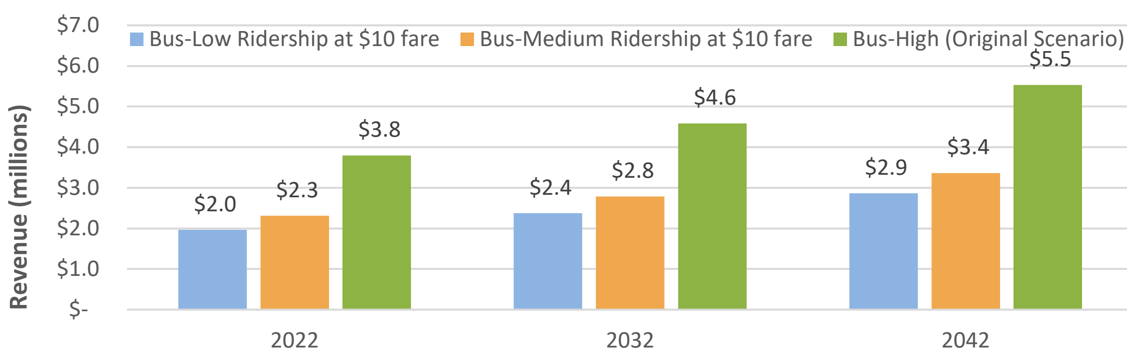
Source: CPCS Team analysis

To obtain the average fare per boarding in the Calgary to Bow Valley corridor (all origin-destination pairs), the total estimated annual fare revenues have been divided by the total estimated annual boardings. The result is an expected average one-way fare of approximately $11 in the medium-ridership scenario.

5.2.3 Sensitivity

Figure 5-12 shows estimated revenues assuming that all fares are set at $10 per one-way trip (as opposed to $15 for the low and medium scenarios). The high scenario remains at $10 per one-way trip. As in line with the assumptions in section 2.6.3, because of the reduced fare the estimated ridership would increase in the low and medium scenarios, by 1.33[34] and 1.25 respectively. In 2022, using a $10 fare, the estimated revenues would be $0.2 and $0.5 million lower than the original low and medium scenarios, respectively. Correspondingly, additional operating costs would need to be assumed to account for the higher ridership than would materialize at a $15 fare.

Figure 5-12: Alternative Scenarios $10 Fares – Estimated Annual Revenue (millions)



Source: CPCS Team analysis

[34] This is equivalent to dividing the estimated ridership in the low or medium scenarios by 0.75 and 0.80 respectively, the same assumptions used in the previous scenario.

6 Bus Service Design and Operational Requirements

Key Chapter Takeaways

- Two separate routes are proposed to link Calgary to the Bow Valley.
- One-way travel times between Calgary and Banff would be slightly over two hours.
- Summer frequencies are estimated to be 21, 24 and 26 round trips per day in 2022, including Route A and Route B trips. Winter frequencies are estimated to be 14, 16 and 19 round trips per day in 2022.
- Standard highway coach buses are recommended for the opening day of service for the low and medium scenarios. Double decker coaches are recommended should the high ridership scenario be expected to materialize.
- Consideration to switch the fleet to double-decker buses should be made when the first generation of buses needs to be replaced.
- Alberta regulations require operators to obtain an Operating Authority Certificate (OAC).
- Operating regulations govern licensing standards, minimum rest times and other practical considerations.

6.1 Service Design

A preliminary service design has been developed for both bus routes. The design of the service is based on matching service levels with demand levels, while keeping in mind the importance of convenience and flexibility required to attract customers to the proposed service. It should be noted that the service design was developed at a high level for costing purposes and should be revisited in more detail if there is a desire to move forward with the service.

6.1.1 Trip Times

Travel Time

Bus travel times are generally slower than comparable times for personal vehicles, due to the need to make deviations from the straight-line route for stops, and the time spent loading and unloading passengers. Conservative trip times for the two proposed routes have been estimated using assumptions about average speeds, based on road type and typical traffic flows. They have also been referenced to the summer 2017 pilot bus service schedules.

The expected scheduled travel time on Route A is presented in Figure 6-1.

Figure 6-1: Route A Travel Time

Stop	Arrive	Layover	Depart	Travel Time	Average Speed
Downtown Calgary	-	-	0:00	25 minutes	40 km/h
Crowfoot	0:25	10 minutes	0:35	70 minutes	83 km/h
Canmore	1:45	3 minutes	1:48	22 minutes	68 km/h
Banff	2:10	-	-	-	-

Source: Dillon Consulting analysis

The expected scheduled travel time on Route B is presented in Figure 6-2.

Figure 6-2: Route B Travel Time

Stop	Arrive	Layover	Depart	Travel Time	Average Speed
Anderson	-	-	0:00	28 minutes	36 km/h
69 Street SW	0:28	2 minutes	0:30	26 minutes	60 km/h
Highway 22*	0:56	1 minute	0:57	30 minutes	88 km/h
Stoney Nation*	1:27	1 minute	1:28	22 minutes	84 km/h
Canmore	1:50	3 minutes	1:53	22 minutes	68 km/h
Banff	2:15	-	-	-	-

*Note: Optional stops at Highway 22 and Stoney Nation were included in the preliminary schedule to the layover time should both be implemented. Removing these stops would not significantly reduce the travel time and therefore operating cost of the service.
Source: Dillon Consulting analysis

Layover

Layovers at the end of the two routes, in Banff and Calgary, would be a minimum of 15 minutes in length. This provides sufficient time for schedule padding should traffic delays or other incidents result in a delayed arrival at the terminal point. Furthermore, this exceeds the 10-minute minimum mandated break time, as prescribed in the *Drivers' Hours of Service Regulation* (AR317/2002). Should the service be implemented, a more detailed scheduling of the service by the operator may result in reduced layovers, slightly improving the efficiency of the service.

Cycle Time

The minimum cycle time for one bus, on both Route A and Route B, is scheduled at five hours. A return trip for a particular vehicle will not be scheduled less than 2.5 hours after its departure from the origin point. This means that a round-trip between Calgary and Banff would take five hours to complete, including a break for the driver midway through the cycle at the terminal point.

6.1.2 Frequency

Service frequencies are determined based on two primary factors: projected ridership and passenger convenience/perception. A number of guiding principles were adhered to in developing the level of service (frequency) of both routes:

- Projected ridership during the peak periods must be accommodated within the capacity of the vehicle provided;
- Passengers should have the perception of a convenient service, with flexible departure options throughout the day to accommodate their travel needs;
- Timetables should minimize the overall number of vehicles required; and
- Timetables should avoid long layovers at terminal points, if possible.

Following the principles listed above, the proposed headways for the summer service on Route A and Route B are outlined in Figure 6-3 and Figure 6-4, respectively, while the proposed schedule for the winter service on Route A and Route B is outlined in Figure 6-5 and Figure 6-6, respectively. It should be noted that the headways presented below represent a high-level schedule. If the service is adopted, a more detailed schedule should be developed which balances a customer-focused service with scheduling efficiencies that would reduce operating costs and bus requirements.

Figure 6-3: Proposed Route A Summer Bus Service Headways by Horizon and Ridership Scenario

	Low		Medium		High	
	2022	2042	2022	2042	2022	2042
Early Morning	60	60	60	45	45	45
AM Peak	45	45	45	30	30	30
Mid-day	120	90	120	90	120	90
PM Peak	45	30	30	30	30	30
Evening	90	90	90	90	90	60

Note: Year 2042 for all ridership scenarios and High Ridership Scenario for all horizon years based on use of double-decker buses
Source: Dillon Consulting analysis

Figure 6-4: Proposed Route B Summer Bus Service Headways by Horizon and Ridership Scenario

	Low		Medium		High	
	2022	2042	2022	2042	2022	2042
Early Morning	90	90	90	90	60	60
AM Peak	90	90	60	60	60	45
Mid-day						90
PM Peak	90	60	60	60	60	45
Evening	120	120	120	120	90	120

Note: Year 2042 for all ridership scenarios and High Ridership Scenario for all horizon years based on use of double-decker buses
Source: Dillon Consulting analysis

Figure 6-5: Proposed Route A Winter Bus Service Headways by Horizon and Ridership Scenario

	Low		Medium		High	
	2022	2042	2022	2042	2022	2042
Early Morning	120	90	90	90	90	90
AM Peak	90	90	90	90	90	60
Mid-day						
PM Peak	90	90	90	60	60	60
Evening	120	120	120	120	120	120

Note: Year 2042 for all ridership scenarios and High Ridership Scenario for all horizon years based on use of double-decker buses
Source: Dillon Consulting analysis

Figure 6-6: Proposed Route B Winter Bus Service Headways by Horizon and Ridership Scenario

	Low		Medium		High	
	2022	2042	2022	2042	2022	2042
Early Morning	150	150	150	150	90	90
AM Peak	150	150	90	90	90	90
Mid-day						
PM Peak	150	150	90	90	90	90
Evening	150	150	150	150	150	150

Note: Year 2042 for all ridership scenarios and High Ridership Scenario for all horizon years based on use of double-decker buses
Source: Dillon Consulting analysis

The frequencies proposed would be in effect as of the service's opening day. Some modifications improvements are expected by 2042 to accommodate increased demand. The major increase in capacity is recommended in the 15- to 20-year horizon, with the introduction of double-decker buses replacing the standard highway coach buses. This would add capacity without a significant increase in operating costs.

The high-ridership scenario requires an increased level of service to accommodate the projected ridership. In the high-ridership scenario, it is recommended that double-decker buses be introduced immediately upon the launch of the service in order to more efficiently transport the increased demand.

6.1.3 Bus Requirements

As described above, an important consideration in developing the service concept for Route A and Route B is maximizing the use of expensive capital resources by minimizing the bus requirements. The proposed schedules result in the bus requirements listed in

Figure 6-7, Figure 6-8 and Figure 6-9. In order to maintain a reliable service, it is recommended that a spare vehicle ratio of approximately 25% be in place.

Figure 6-7: Bus Requirements (Low-Ridership Scenarios)

	2022		2042	
	Summer	Winter	Summer	Winter
Route A Vehicles	6	3	7	3
Route B Vehicles	3	2	4	2
Spare Vehicles (25%)	3	2	3	2
Total Vehicle Requirement	12	7	14	7

Source: Dillon Consulting analysis. 2022 vehicles are single-decker standard highway coaches, while 2042 vehicles are double-decker buses.

Figure 6-8: Bus Requirements (Medium-Ridership Scenario)

	2022		2042	
	Summer	Winter	Summer	Winter
Route A Vehicles	6	3	8	4
Route B Vehicles	5	3	6	3
Spare Vehicles (25%)	3	2	4	2
Total Vehicle Requirement	14	8	18	9

Source: Dillon Consulting analysis. 2022 and 2032 vehicles are single-decker standard highway coaches, while 2042 vehicles are double-decker buses.

Figure 6-9: Bus Requirements (High-Ridership Scenario)

	2022		2042	
	Summer	Winter	Summer	Winter
Route A Vehicles	8	5	10	5
Route B Vehicles	5	4	8	5
Spare Vehicles (25%)	4	3	5	3
Total Vehicle Requirement	17	12	23	13

Source: Dillon Consulting analysis. All vehicles are double-decker buses.

6.2 Vehicle Selection

6.2.1 Alternatives

A key question that was assessed is the vehicle type best suited to operate the service. Three primary choices were considered: standard diesel-powered highway coach buses, diesel-powered double-decker buses and electric buses (highway coach and double-decker). Inter-city bus operators in North America use both bus types on various routes. Both offer comfortable passenger seating with storage space available for luggage. The considerations explored, as well as the recommendation made, are based on the ridership projections and the vehicle type's appropriateness for use in the service design. Furthermore, both capital and operating cost considerations are explored.

Standard Diesel-Powered Highway Coach Bus

Standard highway coaches are generally 40 to 45 feet in length and have a seated capacity of between 50 and 55 passengers. The majority of inter-city coaches on the road in North America fall within this category. Greyhound Canada, the largest inter-city bus carrier in Canada, relies on a fleet composed of standard highway coach buses produced by Motor Coach Industries and Prevost. Most standard highway coach bus models include an accessible lift and dedicated seating for passengers with mobility aids. Additionally, buses can be equipped with bike racks to facilitate the transport of up to two bicycles. Customized solutions are also available to place bike racks in the interior of the bus, however, this would reduce the seated capacity of the vehicle.

On a per-unit basis, standard highway coach buses provide a capital cost savings compared to double-decker buses. Similarly, standard highway coach buses are slightly cheaper to operate on a per-hour basis, due to their marginally lower fuel consumption.

Standard coach buses are not expected to present any logistical problems at any of the proposed stops. They are of similar dimensions to the majority of local 40-foot transit buses and can load and unload at the same facilities without requiring the modification of infrastructure.

Diesel-Powered Double-Decker Bus

Double-decker buses are generally 40 to 45 feet in length and have a seated capacity of between 80 and 100 passengers on two floors. Double-decker buses are used on a mix of regional and long-distance services in Canada. Megabus is the only inter-city operator of double-decker buses in Canada, while OC Transpo in Ottawa, Strathcona County Transit in Alberta and GO Transit in the Greater Toronto Area are three examples of regional operators. Two primary models of double-decker buses, the Enviro500 produced by Alexander Dennis and the TD925 Astromega produced by Van Hool, are operated in the Canadian market. Foldable wheelchair ramps with two tie-down positions in the lower deck ensure accessibility for all passenger segments. Bike racks can also be provided on the exterior and interior of the bus similar to highway coaches.

Higher capacity vehicles such as double-decker buses can address crowding issues by providing more capacity on the vehicle. This allows the operator to increase capacity without increasing frequency of service. This reduces the overall operating and capital costs on well-utilized buses. As an example, a full double-decker bus would require two standard highway coach buses to carry the same passenger load. This reduces labour and fuel costs, and also has the potential to reduce capital cost (albeit only slightly due to the higher costs of higher capacity vehicles noted in Figure 6-10). This is, therefore, an effective model during busy operating periods, but may not be as effective when ridership is not as high (e.g. in the off-peak direction or during the winter schedule).

Double-decker buses are typically used on high demand corridors where customers travel longer distances; a description that fits the proposed Calgary to Bow Valley service. Additionally, double-decker buses have the potential to be attractive to tourists, who may place additional value on panoramic scenic views from the upper level.

Double-decker buses will reduce the need to add frequency to address crowding. However, in the case of the Calgary to Bow Valley service, a corridor with a high visitor market, many of which are oriented to car travel, lowering frequencies also decreases the convenience and attractiveness of the service and therefore can have a negative impact on ridership and transit mode share.

Double-decker buses are not expected to present any logistical problems at any of the proposed stops. Length and width-wise, they are of similar dimensions to the majority of local 40-foot transit buses and can load and unload at the same facilities without requiring the modification of infrastructure. There may be height restrictions for double-decker buses in downtown Calgary owing to the +15 elevated pedestrian walkway system and the low clearances of the CP underpasses. The use of double-decker buses would need to be carefully reviewed prior to procurement to ensure that safe operations can be maintained at all times.

Electric Buses

The use of electric buses is relatively new in the North American market and several transit systems are testing the use of these vehicles. Edmonton will receive its first shipment of electric buses in late 2019 for testing before additional vehicles are ordered in 2020. The Canadian Urban Transit Research and Innovation Consortium (CUTRIC) is also working with federal, provincial and municipal governments to trial electric bus technology in Vancouver BC, York Region ON and Brampton ON to get a better understanding of their cost and benefit. The Bow Valley Regional Transit Services Commission (BVRTSC) is also exploring the potential to implement electric buses to reduce GHG emissions and noise as well as vehicle maintenance and fuel costs. This is at least two years away and would be dependent on lessons learned from other systems such as Edmonton.

There are a number of benefits to moving to an electric bus fleet. These include:

- Reduced greenhouse gas emissions (GHG);
- Less ambient noise, vibration and exhaust smell;
- Reduce fuel and maintenance costs (due to lack of engine, transmission, etc.); and
- Viewed favourably by residents and visitors as a sustainable mode of mobility.

While there are numerous benefits to electric buses, there are some still concerns, particularly for systems that become early adopters of this new technology, as since the long-term benefits and costs are still not fully understood. These include:

- Increased capital cost of the vehicle, typically 40-70% higher than diesel buses (see Figure 6-10);
- Expensive investment in charging infrastructure (charging systems and transit facility upgrades);
- The range of an electric charge between charging is between 150 to 300 km (depending on the number of stops, use of air conditioning, grade, etc.). The approximate distance between Calgary and Banff is 150 km, which would require the bus to charge at both trip ends;
- Potential challenges finding a private contractor that is willing to invest in this vehicle technology and required charging infrastructure (particularly for a seasonal service). To generate interest from the private sector, the municipality would need to purchase the vehicles for the private contractor to operate. If the private contractor were required to

purchase vehicles, a long-term contract (7-10 years) along with a year-round service plan (summer and winter) would likely be required;

- Long layover times required to charge buses (4 to 8 hours for a complete charge); which may result in an increase in peak vehicle requirements; and
- Electricity requirements that may be required during peak times (particularly for long-distance routes where buses may need to be charged mid-day).

Figure 6-10: Bus Options and Costs

Bus Type	# Seats*	Capital Cost
Diesel-Powered Standard Accessible Highway Coach Bus	50-55	$650,000 - $700,000
Diesel-Powered Double-Decker Low-Floor Accessible Bus	80-100	$1,100,000 - $1,200,000
Electric Accessible Highway Coach Bus	50-55	$1,000,000 - $1,200,000
Electric Double-Decker Low-Floor Accessible Bus	80-100	$1,400,000 - $1,600,000

*Exact number of seats varies depending on configuration of the vehicle. Source: Dillon Consulting analysis

6.2.2 Analysis and Recommendation

The service design has been compared for two scenarios, one assuming standard highway coach buses and the other assuming double-decker buses. During peak periods, slightly lowered frequencies could be achieved on Route A through the use of higher capacity vehicles to accommodate the estimated demand. However, throughout the remainder of the day, the additional capacity provided by double-decker buses is not required. Regardless of the capacity of the vehicle, customers will be drawn to a service that can offer predictable and convenient headways throughout the day. As a result, although the number of daily departures based on the estimated ridership could theoretically be reduced using double-decker buses, it would not be desirable to do so from a customer convenience standpoint. Furthermore, the extra capacity provided by double-decker buses would not be required on Route A during the winter period or on Route B at any time of the year. For ease of vehicle maintenance, driver training and passenger expectations, it is desirable to maintain a standard fleet, and not mix different bus types.

With respect to fleet composition, it is recommended that:

1. For the opening day of service, standard highway coach buses be used for the low and medium ridership scenario. If higher ridership is expected (in line with the high ridership scenario), double-decker highway coach buses should be used for the opening day of service.
2. When planning for the renewal of the fleet after the functional 15-20 year vehicle lifetime, consideration should be given to purchasing double-decker highway coach buses. Doing so would provide an immediate capacity boost that could accommodate the estimated growth in passenger volumes. The switch in buses would add capacity without significantly adding to operating costs. Given the ridership forecasts, this strategy would help accommodate a growing passenger demand without reducing the frequency of the service.

3. Standard diesel-powered buses be used in the short-term (2022) due to the increased capital costs of electric buses and the uncertainty of long-term operational savings. Electric bus technology is rapidly progressing and as more systems begin to introduce electric buses, the opportunity should be revisited as the short-term (2022) fleet is replaced or if growing ridership results in the need to expand the fleet size.

6.3 Regulatory Requirements for Bus Operations

In October 2011, the Alberta government began the process of deregulating the inter-city bus market in the province. This decision has minimized barriers to entry for new service providers through a loosening of route restrictions, a reduction in start-up costs, and the elimination of price subsidies on unprofitable routes.

As a passenger transportation service provider, the operator of an inter-city bus service must obtain an Operating Authority Certificate (OAC). The certificate is granted by Alberta Transportation, provided a number of supporting documents are successfully submitted and approved. There are a number of applications types available for different transportation providers, including Operating Authority Certificates for scheduled, charter, industrial, private and multiple services. In the case of this proposed service, the Regional Operating Authority Certificate application is applicable because this service would be operated and funded through a partnership of municipalities with a private carrier. Other transportation providers that have obtained a Regional OAC include Brewster Inc., Greyhound Canada and White Mountain Tours Ltd.

The successful granting of the OAC does not allow the operator to provide services province wide; instead, the application must identify the precise geographic boundaries in which the service plans to operate, along with specifying the vehicle type and seating capacity utilized.

As part of the application for an OAC, a number of supporting requirements must be successfully completed and approved before the certificate can be granted. These include:

- Completed Operating Authority Certificate Application;
- Logistics Plan;
- Passenger Risk Mitigation Strategy;
- Commercial Vehicle Inspection Certificates for all vehicles;
- Copy of written safety and maintenance programs for vehicles;
- Regional Agreement Letter of all municipalities; and
- A copy of the contract or letter of understanding/agreement with the company to which the service is being provided.

If the service is being provided by a private sector operator, the funding partners must ensure that the contract selected meets the above requirements for operation.

Logistics Plan

The Logistics Plan helps confirm the sustainability of a scheduled bus service. The Plan requires that the transportation provider outline in detail what type of service is proposed (e.g. customers, schedules and timelines). The Plan also requires that in case of an emergency or vehicle breakdown what the listed emergency equipment is, how the operators are instructed to react, whether they are trained in first aid and other information. Other aspects include operator scheduling – which includes number of operators, hours of service requirement and procedure for sick operators. The Plan requires the organization to identify the infrastructure required including the number of buses, maintenance schedule and boarding / alighting locations.

Passenger Risk Mitigation Strategy

The Passenger Risk Mitigation Strategy is a requirement for all regional public transit service providers when "allowing, controlling, or limiting standees on a transit bus".[35] This strategy must be shared in electronic format on the organization's website and distributed to all operators on all routes. The Strategy includes the identification of passenger safety risks, strategies to mitigate risks and establishment of corporate policies, procedures and management plans to ensure passenger safety. A variety of different issues may arise, all of which the Strategy may address, including standees, objects brought onto the bus, accessibility, driver training, passenger security, high speed operation, mechanical issues and vehicle choice.

Commercial Vehicle Inspection Certificates and Safety and Maintenance Programs

Buses with a designated seating capacity of more than nine passengers must be inspected semi-annually in order to maintain the CVI certificate, as per regulation AR 211/2006. Proof of valid certification and up-to-date safety and maintenance programs must be submitted as part of an application for a Regional OAC.

Regional Agreement Letter and Contract/Letter of Understanding

A Regional Agreement Letter is required from all the municipalities where the service will operate. Additionally, a copy of the contract or letter of understanding / agreement that the private operator of the service is provided is obligatory as part of the submission for an OAC.

Fees associated with obtaining an Operating Authority Certificate are minimal, including a small filing fee, in addition to other costs associated with obtaining inspection certificates for all vehicles to be used to provide the service.

35 http://www.transportation.alberta.ca/Content/docType276/Production/Passenger_Risk_Mitigation_Strategy_Guidelines.pdf

6.4 Operating Requirements

6.4.1 Staff Licensing

All coach bus operators in the province of Alberta require a Class 2 driver's licence, pursuant to the *Operator Licensing and Vehicle Control Regulation* (AR 320/2002).

6.4.2 Vehicle Licensing

All coach buses operating inter-city routes in the province of Alberta require a Class 1 licence plate, pursuant to the *Operator Licensing and Vehicle Control Regulation* (AR 320/2002).

6.4.3 Hours of Work Restrictions

There are a number of operating restrictions pertaining to the operation of commercial vehicles, including inter-city coach buses. The *Drivers' Hours of Service Regulation* (AR317/2002) controls the time maximum on-duty and driving times, minimum off-duty times, cycle times, break periods and other important operating requirements.

- Minimum rest time between shifts: not to be less than eight consecutive hours off-duty
- Maximum driving time per shift: not to exceed 13 hours
- Maximum shift time: not to exceed 15 consecutive hours on duty
- Minimum break frequency/length: not to be less than 10 minutes after a four-hour driving period, or not to be less than 30 minutes after a six-hour driving period

A number of exceptions to the limits described above exist and may be applicable in certain circumstances. Specific limitations, exemptions and other circumstances are detailed in the *Drivers' Hours of Service Regulation* (AR317/2002).

6.4.4 Insurance

Two types of insurance coverage are required for passenger transportation services: Public Liability and Property Damage Insurance, and Passenger Hazard Insurance.

Public Liability and Property Damage Insurance

Section 627 of the *Insurance Act* stipulates that any vehicle providing passenger transportation services have at least $200,000 of insurance coverage under this category. However, insurance companies do not typically offer such a low level of coverage. The industry standard for inter-city coach buses carrying more than 10 passengers is to have at least $2 million of Public Liability and Property Damage coverage.

Passenger Hazard Insurance

Section 26 of the *Alberta Commercial Vehicle Certificate and Insurance Regulation* (AR314/2002) stipulates that any vehicle providing passenger transportation services with a seating capacity of 11 persons or more have at least $2 million of insurance coverage for bodily injury or death.

6.5 Bus Maintenance and Storage Facility

Inter-city coach buses generally have a functional life span lasting between 15 and 20 years. To keep these vehicles on the road for this period, the buses must be well-maintained. This includes regular fueling, cleaning, mechanical service and other routine preventative maintenance. These tasks would be performed by the service's operator at its own facilities.

Since the majority of early morning bus departures would occur from Calgary, it is recommended that the bus storage and maintenance facility be located in Calgary. The facility would be used for storage of vehicles, fueling and maintenance.

A second facility is recommended to be located in the Town of Banff to reduce vehicle deadheading time for buses that depart from Banff in the early morning (based on the schedule). This facility is recommended to be used for storage, fueling and cleaning only. Depending on the operator of the service, a partnership with an existing bus operator in Banff (e.g. the Bow Valley Regional Transit Services Commission) may be established to store 1-2 vehicles overnight. All major repairs and maintenance would be conducted in the Calgary facility.

It is recommended that an existing facility used by an existing private bus contractor be used to store and maintain vehicles. The cost of the facility would be included in the average hourly rate of the service contract as noted in chapter 8.

6.6 Service Delivery Options

There are three basic operating models for a bus-based mass transit service between Calgary and the Bow Valley that should be considered. These are:

Option 1: Municipally owned and operated system;

Option 2: Senior government-owned and operated system;

Option 3: Privately contracted system.

The sections below describe each service delivery model. This is followed by an evaluation and a recommendation for the Town of Banff moving forward.

6.6.1 Option 1 – Municipally Owned and Operated System

In this scenario, a municipal government or municipally owned government organization such as the Bow Valley Regional Transit Services Commission would both own the transit fleet and employ staff to manage, operate and maintain the service. In this model, the BVRTSC would have direct responsibility for the planning, finance, personnel, transportation operation and maintenance, complaint investigation, reporting to the Commission/Council, budget preparation and marketing activities.

The transit service between Calgary and the Bow Valley would operate in both directions during most time periods. However, there would be peak periods and directions of travel that include Calgary to Bow Valley during the morning and Bow Valley to Calgary during the late afternoon and evening. To accommodate this, it makes the most sense to store and maintain the vehicles at a facility in Calgary in order to minimize out-of-service travel time. One or two of the vehicles should be stored in Banff for maximum service flexibility.

There are several advantages to setting up a municipally owned and operated system:

- Permits comprehensive planning of all aspects of the transportation and transit system.
- Fosters a high level of political responsiveness to the development and implementation of transit policy and standards.
- Increases the accountability of the municipality to achieve its overall social, environmental and economic goals and objectives (because of the direct control over the staff and personnel that manage and operate the system).
- Improved ability to integrate service with local and regional Roam Transit services.
- Provides greater control over the use, condition and maintenance of transit vehicles.
- Ability to use expanded maintenance and storage facility in Banff for one to two vehicles.

The disadvantages of this model for the Town of Banff are that:

- Since the service would be reduced by approximately half in the winter season, finding seasonal employees to operate and maintain the service in the summer will be difficult, particularly since the majority of BVRTSC employees are already seasonal.
- There is an added capital requirement to purchase and build or lease an existing facility in the City of Calgary to store and maintain vehicles. This will add to the upfront capital cost.
- There is an added capital requirement to purchase vehicles and parts to operate the service. This will add to the upfront capital cost.
- Supervision will also be required in Calgary at the new facility, adding to the transit administration costs.

The above describes a scenario where the Town of Banff and the BVRTSC own and operate the transit service. There is variation of this model where two or more municipal or regional organizations come together in some form of partnership with one of the organizations providing day-to-day management and administration with the financial and/or in-kind support of the other organizations, and some form of oversight by a committee of the partners. The Town of Banff, the BVRTSC, City of Calgary, Calgary Transit, Parks Canada, and some of the municipalities between Banff and Calgary may all have some interest in a potential partnership. All of the advantages and disadvantages that are described above would still apply to a partnership arrangement, and there would be additional points to consider:

- One of the partners may be able to provide facilities (such as a Calgary area storage and maintenance space for vehicles) or resources (such as greater access to a pool of potential seasonal staff) to enhance the service.
- A partnership may make it easier to access sufficient financial resources for start-up and for operations, and enhance the stability of those financial resources.
- A partnership could add to administrative time and cost and slow down decision making because of the necessity to consult with and gain approval from the partners.

6.6.2 Option 2 – Senior Government-Owned and Operated System

While transit services in Canada are most commonly owned, operated and/or managed by municipal or regional organizations in the communities that they serve, there are some examples of services being organized by provincial governments. These include:

- Metrolinx – An agency of the Province of Ontario that plans transportation infrastructure around the Greater Toronto and Hamilton Area, and operates the regional transit service GO Transit. A number of municipal transit services also operate in the region under different oversight and management than that of GO Transit.
- BC Transit – An agency of the Province of British Columbia that organizes transit service for all communities in the province outside of the greater Vancouver area. In most communities, BC Transit plans and schedules the transit service in consultation with the local community, arranges a private contractor to operate the service, and owns the vehicles. BC Transit and the municipality cost share the operation of the service.

The advantages of this approach include:

- Potential for lower costs to the municipality as some of the costs are shared with the larger provincial tax base.
- Potential for more knowledgeable or up to date staff from a larger provincial organization who are planning or working with multiple transit services in multiple communities.
- Potential for better access to project and infrastructure funding through provincial and federal programs.

There are also some disadvantages:

- Potential for slower decision making due to involvement of multiple levels of government.
- Potential for higher overall costs due to the possible duplication of administrative activities and oversight.
- Potential for less decision-making control for the municipality.

The most significant challenge for this option for a Calgary/Bow Valley transit service is that Alberta does not currently have any sort of transit planning or operating agency the way Ontario or British

Columbia do. The time and resources necessary to establish such an agency and make it viable would be a significant challenge for this project, assuming, of course, that the Province is interested in the approach.

6.6.3 Option 3 – Privately Contracted System

A number of municipal jurisdictions contract out transit services to a private bus operator, with a municipal employee designated as Transit Coordinator and tasked with the responsibility of managing the contract. In this model, the municipality is in control of what service is to be provided and how it is to be financed. The service contract sets out rules, regulations and policies that the private operator must comply with, including standards for equipment, operation and maintenance, level of service, qualifications of the driver, fares, etc. The level of detail provided in the contract can vary from municipality to municipality, and is dependent on how much responsibility the municipality wants to take on and the desire for a private contractor to agree to the terms and conditions of the contract. Based on the service contract parameters agreed to, the private sector is in control of how the service is delivered.

Capital costs (purchase of storage and maintenance facility and vehicles) can either be borne by the contractor or by the municipality. If owned by the contractor, the cost of the facility/fleet is amortized and included as part of the hourly operating rate. If owned by the municipality, an agreement is made with the contractor to maintain the condition of the assets during the contract. This typically lowers the hourly operating rate. For the purposes of this assessment, it was assumed that the contractor owns/leases the storage and maintenance facility and the contracting entity owns the vehicles.

In most cases, the contract is awarded through a tendering process to the private sector. If the private sector option is selected, once the transit operating strategy is agreed upon, a Request for Proposal (RFP) would be prepared. Several key decisions would have to be made. These include:

- **Revenue (in service) hours or kilometres**: This would establish the basis on which the contractor is paid.
- **Vehicle type**: This would include vehicle characteristics such as type, age, on-board equipment and seating capacity. In this case, it is recommended that the Town purchase vehicles, taking advantage of potential funding opportunities such as Phase 2 of Infrastructure Canada's Public Transit Infrastructure Funding.
- **Maintenance/storage**: Requirements for maintenance of vehicles and storage would need to be identified, as well as who supplies the facility. In the case of Banff, it is recommended that the contractor identify and supply a facility.
- **Duration of the contract**: This will depend on who owns the vehicles. If the contracting entity owns the vehicles, then a three-year fixed contract with a one- or two-year extension option is normal. If the contractor is to supply the vehicles, then a five-year fixed contract with two- or three-year extension options is normal. This may vary with the type of vehicle specified. Extension periods are governed by several performance targets spelled out in the RFP.

- **Revenue sharing and performance standards**: Normally all revenue collected is to be provided to the municipality. However, some innovative contracts have the municipality setting fares but the contractor retaining revenues as an incentive to maximize customer service and ridership growth. Performance standards need to be set and monitored with provisions for corrective actions as required.

- **Escalation terms:** Frequency and triggers for payment increases, perhaps due to fuel price adjustments.

- **Key performance indicators:** In many contracts, key performance indicators are included which set out financial incentives and penalties based on operator performance (e.g. level of customer service, maintenance of vehicles, reliability, etc.).

There are several advantages of entering into a private sector contract:

- Lower costs can be achieved with private sector operation through the process of competition for the contract, particularly in a competitive market such as Calgary. This includes both variable costs (i.e. driver costs, vehicle maintenance, etc.) and fixed plant costs (i.e. maintenance and operations of the garage).

- Generally, many private transit operators have use of existing storage and maintenance facilities from other operations they are responsible for (e.g. school bus), which can reduce overall costs. There are several such businesses in the Calgary region.

- Increased innovation can be achieved in operating practices in an effort to meet the targets set in performance-based contracts. This allows the private sector to maximize its own profitability while maintaining minimum service levels or maximizing ridership as stated in their performance contracts.

- Provides more flexibility for the municipality to cancel the contract or scale back level of service after the contract period is up if ridership forecasts are not being realized, though in the interim flexibility may be more limited depending on the contract terms.

- May be easier to find labour to operate a seasonal service as many contracted staff can be more easily shifted to other services operated by the contractor during the winter season.

There are several disadvantages to this service delivery model:

- Requires a large number of potential bidders to realize the benefits of competition.

- Potential for higher costs when contracting service to a “for-profit” organization depending on the competitiveness of the market.

- May be more difficult to integrate with local and regional Roam Transit services.

- Time required by municipal staff for contract negotiations.

- Contractor would need to find two facilities (primary facility in Calgary and smaller secondary facility to store one to two vehicles in Banff). There may be challenges in using the existing Town of Banff facility used to store and maintain BVRTSC vehicles.

6.6.4 Assessment of Service Operating Structure

The option of having a senior government organize and operate this transit service is not realistic in the short-term. Based on the assessment of the remaining two options, it is recommended that the service be contracted out, with the BVRTSC taking on a large role in administering the contract to improve integration with Roam Transit services. Establishing a private sector contract would allow for implementation of a transit service that the public sector could maintain control over, while minimizing costs and the need to hire additional seasonal staff to operate and maintain the service. The strategy also should reduce costs of facility storage and maintenance, as a number of contractors in the Calgary market may already have access to a facility they could utilize to accommodate 10 to 12 additional buses. If not, there are a number of suitable industrial spaces available that could be leased by the contractor.

The decision for the municipality to own the transit vehicles or have the contractor purchase them and amortize the cost as part of the hourly operating rate will need to be made. There are various inputs that go into making this decision.

1. **Capital and Operating Cost**

While municipally owned transit vehicles introduce a higher capital cost, it would reduce the operating cost paid to the contractor by 10 to 20%. If a private contractor is required to purchase vehicles, the capital costs are recouped by amortizing the vehicle purchase price over the life of the contract. Some of the larger potential contractors may have access to good vehicle purchase prices, or already have appropriate and reasonably new vehicles available from other communities where they provide service. This could lower overall costs.

2. **Contract Duration**

Contracts with municipally owned vehicles are typically shorter in duration (approximately three years plus a provision to extend the contract by two years). For contracts with privately owned vehicles, the minimum contract duration is typically five years. This is due to the need to amortize the capital investment made by the contractor to the operating cost. While a five-year contract is not abnormal, there may be a desire for flexibility to terminate the contract early if it deems the service is not meeting its desired objectives or the contractor is not meeting performance standards set through the contract.

3. **Funding Sources**

Another advantage of the municipality purchasing vehicles is the ability to recoup some of the costs through provincial and federal funding sources such as GreenTrip funding or the Public Transit Infrastructure Fund. This is not possible if the contractor purchases its own vehicles as the rules for many of these programs require the municipality to own the vehicles/infrastructure.

4. **Competition**

   Contracts with municipally owned fleets tend to increase the number of qualified vendors that are able to bid on the contract. This may have the impact of lowering the overall operating cost of the service.

For the purposes of this feasibility study, it is assumed that a public-sector entity would purchase the vehicles and lease them to the successful private contractor.

7 Bus Stop Requirements

Key Chapter Takeaways

- Generally, all stations require bus platforms, sheltered passenger waiting areas, park-and-ride facilities, and passenger pick-up and drop-off facilities.
- Where possible, existing infrastructure has been leveraged to reduce capital costs.
- Major construction would occur at the Banff Train Station; as part of its redevelopment, a 12-bay bus terminal has been conceptually designed.
- Minor construction would be required to accommodate a bus stop at the Canmore and Highway 22 stop locations.
- Improvements to local transit in the Bow Valley would help support the introduction of the new bus service and ensure a seamless and convenient journey for passengers.

7.1 Conceptual Station Requirements

The success of the mass transit bus service is dependent on the ability of passengers to access the service, and the convenience and functionality of the stop where passengers are required to wait for and board/alight the service. The location of bus stops along the corridor was selected based on the ability to promote multi-modal connections and accommodate increased passenger activity on site. The following section provides a summary of the requirements that were considered for each bus stop, along with an assessment of each station to determine any capital or operating requirements needed to meet the above noted objectives.

7.1.1 Bus Platforms

Bus platforms, or dedicated layby areas, are required to provide a safe location for buses to pull out of traffic while embarking and disembarking passengers. Due to the need to also load and unload luggage, the bus platform should be able to accommodate a minimum three-minute dwell time. Bus stops have generally been selected at existing transit stations in locations that already provide bus platforms, where feasible.

7.1.2 Passenger Waiting Areas

Passenger waiting areas should consist of a concrete pad, a shelter, benches and lighting. Where possible, an indoor waiting area or heated shelter should be available within the vicinity of the bus platform to increase passenger comfort while waiting for the bus, particularly during inclement weather conditions. The provision of washrooms is not necessary for lower-ridership stops, but this amenity is appreciated by passengers. Bus stops have been generally selected in locations that already provide indoor passenger waiting areas, where feasible.

7.1.3 Park-and-Ride Lots

In two of the three large passenger markets for the bus service, Calgary residents and Bow Valley residents, customers are expected to primarily rely on their personal vehicles to access stations. As a result, park-and-ride facilities are recommended at stations to accommodate passengers arriving by car. Park-and-ride facilities should be located in well-lit areas in close proximity to the highway network and allow for overnight parking of vehicles.

Several assumptions have been made to estimate the demand for park-and-ride spaces. These assumptions are detailed below:

1. It is assumed that 91% of passengers would access non-downtown Calgary bus stops by car in the short-term (2022). This would decrease to 80% in the long-term (2042).
2. It is assumed that nearly 100% of passengers would access the downtown Calgary station by transit, active transportation or passenger drop-off (with very few parking spaces near this station). Those passengers who decide to drive would park in private garages.
3. Based on the survey results of Calgary residents, peak summer weekends are assumed to have 1.5 times the average summer daily demand.
4. Average vehicle occupancy for passengers driving to bus stations was assumed to be 2.2 passengers per vehicle. This number is slightly lower than the observed vehicle occupancy of visitors to the Bow Valley. This is because passengers who make short trips to a bus stop in Calgary are slightly less likely to carpool than if they were to drive all the way to the Bow Valley.
5. It is assumed that 25% of Calgary residents would stay overnight in the Bow Valley, thus occupying a parking spot for more than one day.
6. It is assumed that 10% of Bow Valley residents would stay overnight in Calgary, thus occupying a parking spot for more than one day.
7. It is assumed that an additional 10% of park-and-ride spaces would be used by other visitors.
8. It is assumed that 10% of morning visitors using the space may not stay the whole day and the space may become available for another visitor arriving in the late afternoon.

The assumptions detailed were used to estimate required park-and-ride spaces at each of the proposed bus stations from both the short- and long-term during the peak summer period. The summary is provided in Figure 7-1.

Figure 7-1: Park-and-ride Space Requirements (Medium-Ridership Scenario)

Station	Route	Short-Term (2022)		Long-Term (2042)	
		Weekday	Weekend	Weekday	Weekend
Downtown Calgary	A	minimal	minimal	minimal	minimal
Crowfoot	A	80	120	110	170
Anderson	B	60	100	90	140
69 Street SW	B	30	50	50	70
Highway 22	B	minimal	minimal	minimal	minimal
Stoney Nation	B	minimal	minimal	minimal	minimal
Canmore	A & B	20	20	30	25
Banff	A & B	minimal	minimal	minimal	minimal

Source: Dillon Consulting analysis

Stations have generally been selected in locations that already provide parking facilities, where feasible. The Calgary Transit stations (Crowfoot, Anderson and 69 Street SW) do not have additional capacity to accommodate parking for Calgary to Bow Valley bus passengers on weekdays, although there is significant spare capacity during the peak demand period on weekends. It is generally not intended that new park-and-ride facilities be constructed to accommodate demand associated with the mass transit bus service.

The park-and-ride space requirements in the high ridership scenarios would be more than what is reported in the figure above. Should demand approach the high-ridership scenario, the capacity of the existing CTrain park-and-ride lots may not be sufficient, and alternatives would need to be identified.

7.1.4 Passenger Drop-Offs and Pick-Ups

A dedicated passenger drop-off and pick-up area is desirable to provide a safe location for embarking and disembarking passengers. Ensuring this is provided would help reduce the instance of passengers choosing to park and ride, which reduces the capital cost requirement of building parking spaces. Bus stops have generally been selected in locations that already provide drop-off and pick-up loops, or an alternate location that permits loading and unloading of passengers into personal vehicles for short periods of time. In the case of some bus stops, existing drop-off and pick-up loops would be fully or partially repurposed to accommodate buses. In this case, an alternative location for drop-offs and pick-ups would be required.

7.1.5 Enhanced Station Connectivity and Complementary Transit Needs

To increase the mode share of alternative transportation modes accessing stations, it is important to ensure that the locations chosen are well connected to transit and active transportation networks. This is particularly important for the last mile of a trip where passengers require good pedestrian, transit or taxi connections to complete their trip from the bus station to the final destination. Where feasible, consideration has been given to selecting locations at existing transit hubs. Additionally, suggestions have been made to improve active transportation connections to increase pedestrian and cycling access to and from each bus stop.

7.2 Bus Stations

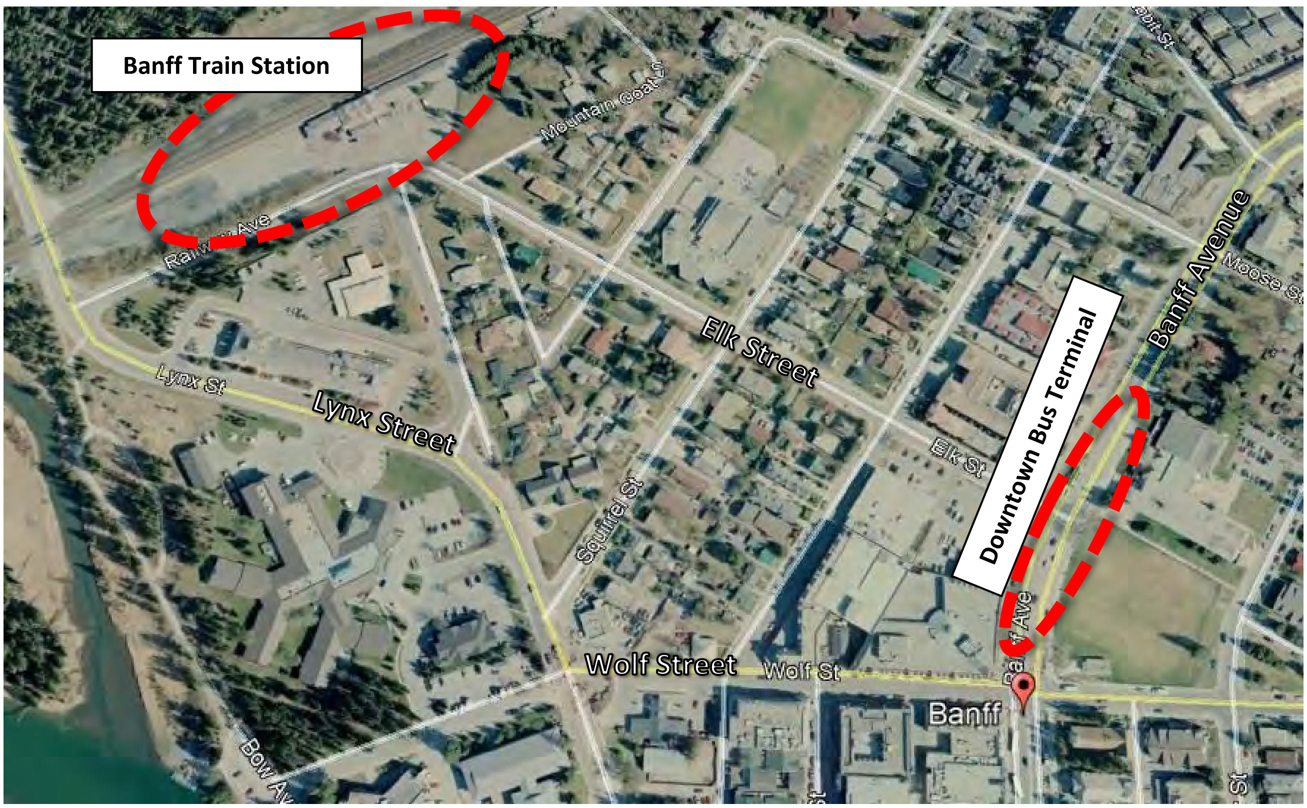
The following section provides an inventory of the recommended requirements at each bus station, based on the routes recommended in chapter 4.

7.2.1 Common Stops (Route A and B)

Banff – Train Station

Two stops are proposed in Banff: One at the Banff Train Station and a second in downtown Banff at the intersection of Banff Avenue and Elk Street. Figure 7-2 shows the location of both bus stations proposed in Banff.

Figure 7-2: Proposed Bus Stops in Banff



Source: Google Maps

The primary bus stop in Banff is proposed to be at the Banff Train Station (Figure 7-3). The lessee of the train station (Liricon Capital) is currently undergoing an environmental assessment to build a 500-space parking lot east of the station. Concept plans have also been developed to build a heritage railway site to the west of the train station building; however, these proposals are not part of the environmental assessment.

Figure 7-3: Existing Banff Train Station Bus Terminal

Source: Dillon Consulting

Figure 7-4 summarizes proposed improvements to the Banff Train Station. Because the bus could also stop at the planned transit terminal in downtown Banff, these proposed upgrades are not strictly necessary for the implementation of a bus service between Calgary and Banff. Further, most of the proposed improvements are related to serving many of the bus services operating in and around Banff, except for one or two bus bays. As a result, the capital cost of these improvements has not been assumed to be allocated to this service.

Figure 7-4: Banff Train Station – Proposed Improvements for Inter-city Buses

Element	Proposed Improvement
Bus Platforms and Passenger Infrastructure	• New platform with between 7 to 11 dedicated bus bays (see concept). The existing train station can be used as a passenger waiting area, however, additional shelters may be considered based on the platform design. This upgrade will take place with or without the proposed Calgary to Bow Valley Mass Transit bus service (with only one to two of these bays required for the inter-municipal service).
Park-and-Ride Lots	• The proposed 500 stalls would be sufficient to accommodate the minimal park-and-ride demand expected; no upgrades are proposed.
Passenger Drop-Offs and Pick-Ups	• A passenger drop-off and pick-up area should be identified in front of the Banff Train Station as part of its redevelopment, e.g. number of designated, time-limited parking spaces close to the facility's main entrance, or a small loop.
Complementary Local Transit	• Several new services, in line with previous studies, are recommended to ensure travellers can reach their final destination: o A train station shuttle to downtown Banff during the summer period. o Two demand-responsive hotel shuttles during the summer. o Frequency improvements to Roam Routes 1 and 2 (accessing a number of hotels and major visitor sites). o Improvements to Route 4, including access to the Banff Centre. o Implementation of connecting service to Lake Louise, and local service within Lake Louise.
Active Transportation	• Consideration toward an improved pedestrian and cycling connection to the Bow Valley Trail, including implementing better signage and minimizing vehicular conflict points through the definition of a clear connecting path.

Element	Proposed Improvement
	• Consideration toward an improved pedestrian and cycling connection to Banff Avenue (though urban design and way-finding enhancements) along Lynx Street/Wolf Street and/or Elk Street.

Source: Dillon Consulting analysis

A potential concept with these improvements is shown in the box below. **This concept was developed to assess general feasibility and land requirements only.** We understand that refinements would be needed to avoid heritage features at the station.

Potential Concept for Train Station Bus Terminal

Figure 7-5 lists the existing and anticipated bus routes that would access the Train Station terminal and the number of bus bays that should be planned for in the terminal design. Between seven and 11 bus bays are anticipated to be designed at the terminal along with a layover area to accommodate additional buses for the shuttle services (e.g. when the Rocky Mountaineer train pulls into the station, more than one bus may be required to accommodate the large passenger demand).

Figure 7-5:Bus Bay Requirements at Banff Train Station

Service	Peak Hourly Pull-Ins 2022	Peak Hourly Pull-Ins 2042	Dedicated Bus Bays	Comments
Calgary to Bow Valley Proposed Mass Transit	2	2	1-2	May be 1 bay if schedule for Route A and B are offset
Roam Transit Train Station Shuttle	6	6	1	Proposed shuttle between train station and downtown Banff
Roam Transit Hotel Shuttles (2)	-	4	2	Proposed on-demand shuttles between train station and Banff hotels
Roam Transit Route 4B	2	2	0	Proposed Roam Transit route (uses Train Station Shuttle bus bay)
Roam Transit Route 3 - Canmore	2	2	1 - 2	1-2 bus bays can be shared between Canmore service, Lake Minnewanka service and proposed Lake Louise service
Roam Transit Route 6 – Lake Minnewanka	2	2		
Roam Transit Lake Louise Regional	2	2		
Rocky Mountaineer Shuttles	1	1	1 - 2	Space to layover up to 4 buses required near terminal
Greyhound	1	1	1	1 bus bay can be shared between Rocky Mountaineer service and Greyhound service.
Brewster Shuttles	1	1	0-1	Can share bus bay with Greyhound bus bay if Greyhound continues service discontinuance
Total	**19**	**23**	**7-11**	

Source: Dillon Consulting based on various sources

The bus terminal concept could be located immediately to the west of the train station building, with a second transit hub located immediately north of Railway Avenue. The hub is based on a central platform design with saw-tooth bus bays accommodating six vehicles. The bays are designed to accommodate in-and-out movement without the need for buses to back up when departing the bay. This second platform is recommended for use of Roam Transit services and shuttles as well as the Calgary to Banff mass transit service. The conceptual design of the platform is estimated at 673 square metres. Based on a Level of Service of A as defined by the *Transit Capacity and Quality of Service Manual*, the platform is large enough to accommodate up to 500 passengers transferring between vehicles.

Potential Concept for Train Station Bus Terminal (continued)

The space provided on the new platform exceeds the space required to accommodate the maximum projected passenger volumes. The worst-case loading scenario is expected to consist of 80 passengers alighting each double-decker bus from Calgary (160 total), plus 100 other passengers transferring from the park and ride or between the local service and one of the regional services. The platform should also include a large shelter and passenger amenities (benches, garbage receptacles, transit information, etc.).

To facilitate movement within the transit station site, a second bus-only access is recommended just west of the existing train station entrance. The intersection of Railway Avenue and Lynx Street should also be reviewed for signalization to minimize the potential for bus delays.

The overall land requirement of the entire transit hub with such a layout at the train station is approximately 3,500 square metres (based on the conceptual design identified in Figure 7-6). This includes bus bays, platforms and travel lanes.

Figure 7-6: Conceptual Design of Banff Bus Terminal

Source: Dillon Consulting concept

Banff – Downtown

For the downtown terminal, a dedicated space would be required on the east side of Banff Avenue to accommodate a bus pull-over and passenger boarding and alighting. The Town of Banff is currently developing a design for a downtown on-street terminal that will include connections to local Roam Transit services.

Figure 7-7 identifies the station area requirements for the downtown site.

Figure 7-7: Banff Downtown – Proposed Improvements for Buses

Element	Proposed Improvement
Bus Platforms and Passenger Infrastructure	• If ridership continues to grow, consideration should be made to creating a small passenger waiting area adjacent to the sidewalk, if not already part of the proposed station development in this area. This would help reduce the potential of passengers with luggage blocking pedestrian traffic on the sidewalk. If service is provided in the winter season, a shelter should also be considered on-site.
Park-and-Ride Lots	• Not required; park-and-ride activities should be encouraged at the Banff Train Station.
Passenger Drop-Offs and Pick-Ups	• Not required; passenger drop-off and pick-up should be encouraged at the Banff Train Station
Complementary Local Transit	• The 2017 Banff Local Transit Review recommended a number of local transit improvements to reduce automobile congestion, including frequency improvements on Roam Route 1 and 2, and the modification of Route 4 to access the Banff Centre.
Active Transportation	• None.

Source: Dillon Consulting analysis

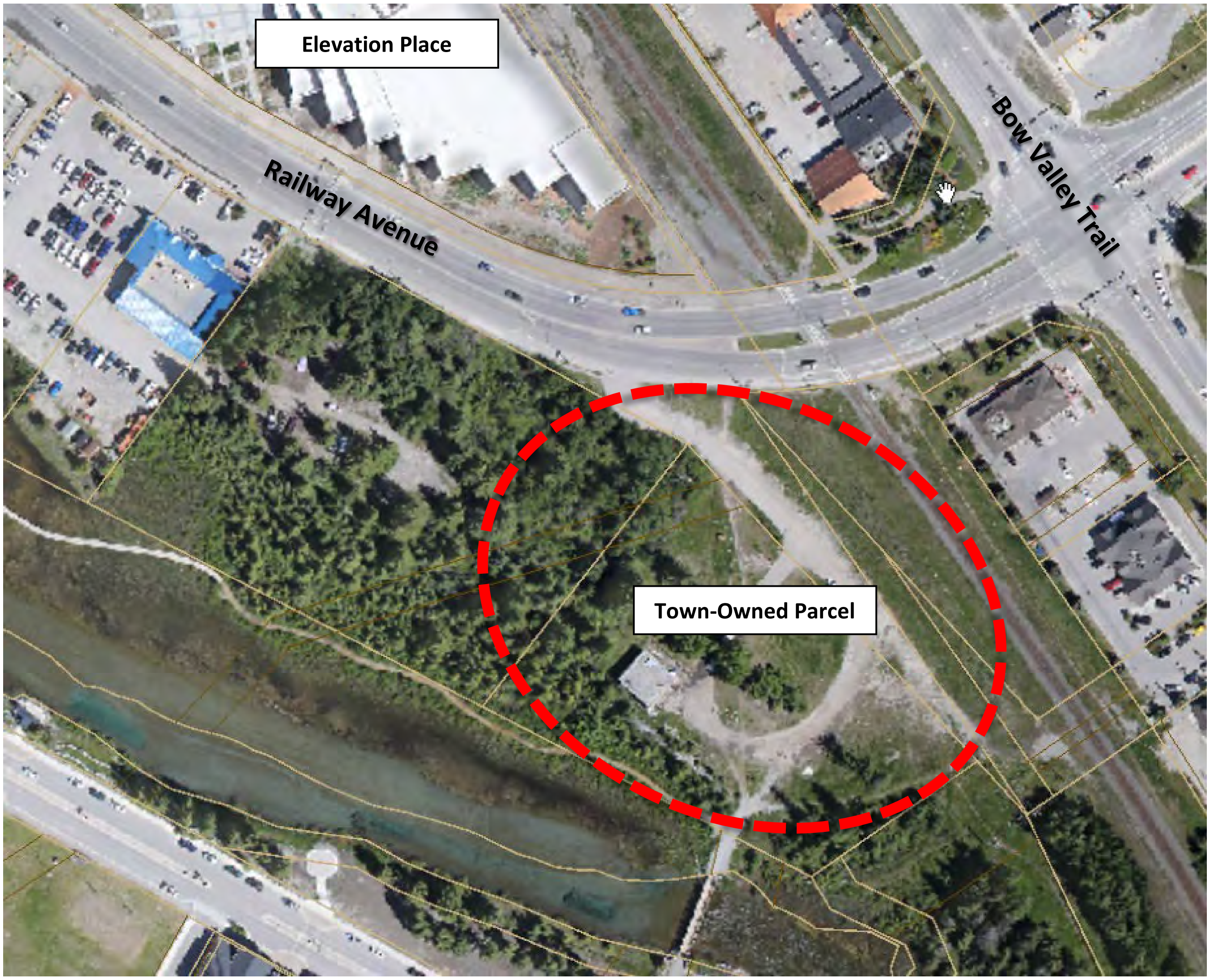
Canmore

The bus stop in Canmore is proposed to be on a Town-owned plot of land across Railway Avenue from Elevation Place, just west of the CP railway. The Town of Canmore has plans to develop this property to accommodate an integrated park and ride and transit terminal. The location of the proposed facility is illustrated in Figure 7-8.

If a Calgary to Bow Valley bus service is implemented before construction of the Canmore integrated park and ride and transit facility, it is proposed that buses temporarily stop at the Benchlands Trail and Bow Valley Trail intersection. Existing transit stops (serving both eastbound and westbound directions) are located on Benchlands Trail, to the east of Bow Valley Trail. Owing to its temporary nature, the interim stop location would not have additional passenger amenities, on-site parking, or any passenger drop-off and pick-up facilities.

Figure 7-9 identifies the station area requirements for both the temporary bus stop and the Canmore integrated park-and-ride facility in Canmore.

Figure 7-8: Proposed Canmore Integrated Park and Ride and Transit Terminal Location



Source: Google Maps

Figure 7-9: Canmore – Proposed Improvements for Buses

Element	Proposed Improvement
Bus Platforms and Passenger Infrastructure	Short-term Temporary Stop • Continue to stop at existing Benchland Trail location • No investment required Canmore Integrated Park-and-Ride Facility • 2 or 3 bus platforms could be constructed at this site, depending on the additional usage of the site by Roam Transit (local and regional services), • Basic passenger amenities, including shelters, benches, lighting and bicycle parking, should be provided at this location.

Element	Proposed Improvement
Park-and-Ride Lots	*Short-term Temporary Stop* • None required *Canmore Integrated Park-and-Ride Facility* • Up to 50 stalls at the proposed new location
Passenger Drop-Offs and Pick-Ups	*Short-term Temporary Stop* • None required *Canmore Integrated Park-and-Ride Facility* • A combined bus loop and passenger pick-up/drop-off area toward the south end of the site, separated (although connected to) from the bus/rail platform.
Complementary Local Transit	*Short-term Temporary Stop and Canmore Integrated Park-and-Ride Facility* • Increase Sunday service on Roam Route 5 to match Saturday service and coordinate schedules to the extent possible. • Increase Saturday and Sunday service on Route 3 to every 30 minutes, matching current weekday peak period service. *Canmore Integrated Park-and-Ride Facility* • Consider moving the existing Roam bus stop onto the integrated park and ride and transit facility site to promote integration between local and the mass transit service. • Given the challenge of integrating schedules between the mass transit service and the local bus route, consider implementing a future demand responsive service that would allow customers coming off or going to the mass transit service to schedule a shared ride.
Active Transportation	*Short-term Temporary Stop* • None required *Canmore Integrated Park-and-Ride Facility* • Ensure connectivity to adjacent trails and consider in any future complete streets initiatives.

Source: Dillon Consulting analysis

7.2.2 Route A Stops

Crowfoot

The Crowfoot stop in Calgary is proposed to be at the Crowfoot CTrain station, on the CTrain's northwest Red Line. Figure 7-10 illustrates the station location and Figure 7-11 identifies the station area requirements for this bus stop.

Figure 7-10: Crowfoot Bus Stop Location

Note: Buses would utilize the existing bus terminal facility, located to the north of Crowchild Trail, at the top of the image.
Source: Google Earth

Figure 7-11: Crowfoot – Proposed Improvements for Buses

Element	Proposed Improvement
Bus Platforms and Passenger Infrastructure	• The existing bus loop accommodates 10 buses simultaneously, with room for 1 additional bus in a layby off Crowfoot Parade. • Additional passenger amenities are not required at this location. Passenger shelters, benches and lighting are already in place.
Park-and-Ride Lots	• None; peak weekend parking demand can likely be accommodated within the existing parking capacity at the Crowfoot CTrain station. However, weekday inter-city bus passengers wanting to use the park-and-ride facilities may have difficulty finding available parking spaces, particularly if there has been any growth in utilization of the park-and-ride lot since 2011 (when the previous parking occupancy study was completed). • Longer-term, to better manage parking capacity issues and ensure parking availability, the City of Calgary may consider a number of options:

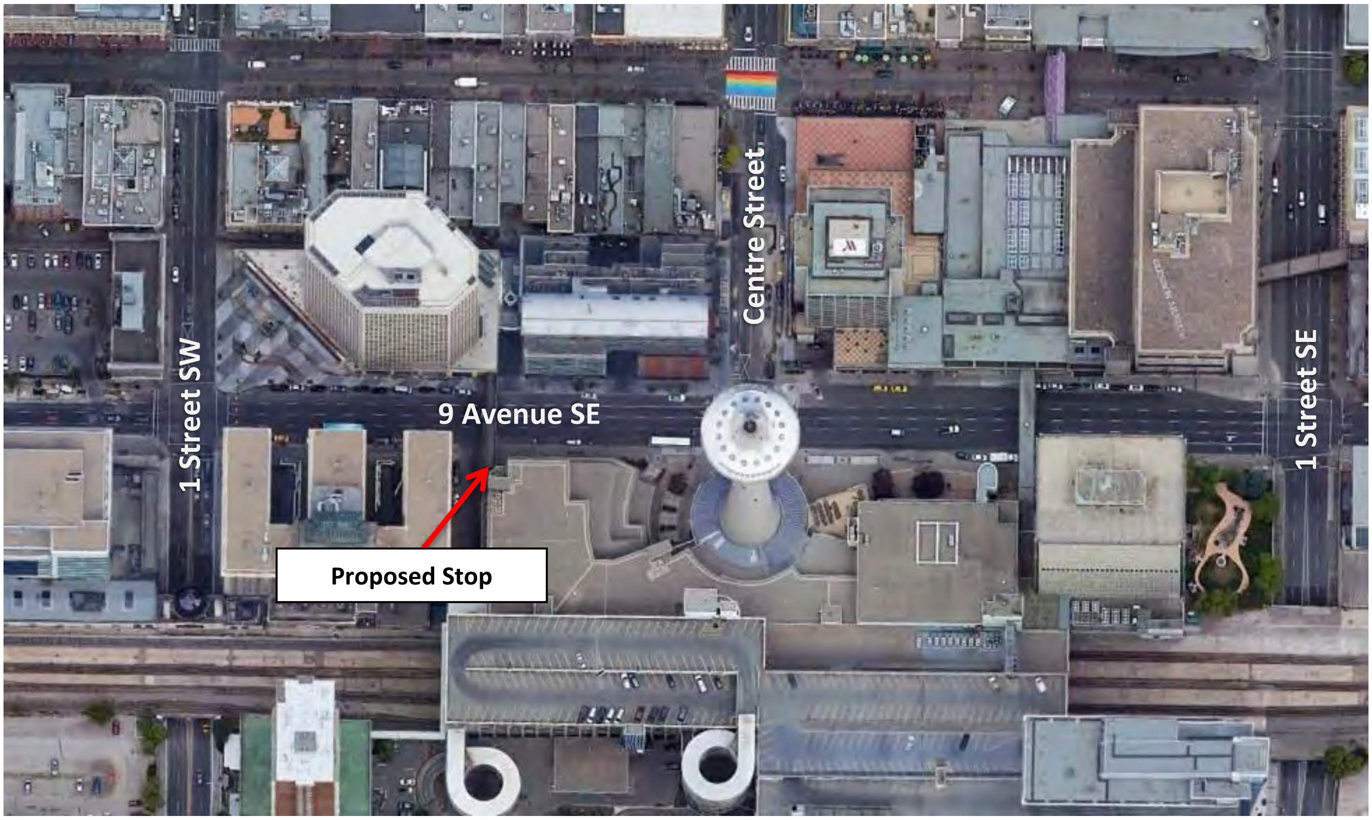
Element	Proposed Improvement
	o Build a multi-level parking structure on site or begin charging for parking (these strategies should only be considered if commuter parking demand is exceeding the existing supply and not solely based on the nominal increase in demand due to the Calgary to Bow Valley mass transit bus service). o Enter into exploratory discussions with adjacent commercial landowners to the north of the station to permit a limited number of overflow parking spots for commuters and/or users of the Calgary to Bow Valley mass transit bus service. o Increase local transit connections to the Crowfoot Station to reduce demand for parking.
Passenger Drop-Offs and Pick-Ups	• Request that Calgary Transit designate up to 10 time-limited parking spaces for pick-up/drop-off, located adjacent to the bus loop on the north side of Crowchild Trail in close proximity to the bus stop. • If Calgary Transit does not agree to this option, the existing drop-off and pick-up loop on the south side of Crowchild Trail can also be used for the proposed Calgary to Bow Valley bus service.
Complementary Local Transit	• None. The terminal is well serviced by local transit and the CTrain.
Active Transportation	• None. Existing multi-use pathways connect the Crowfoot CTrain station to the east (Nose Hill Drive NW), the north (Crowfoot Way NW), the west (Scurfield Drive NW), and the south (Scenic Acres Boulevard NW).

Source: Dillon Consulting analysis

Downtown Calgary

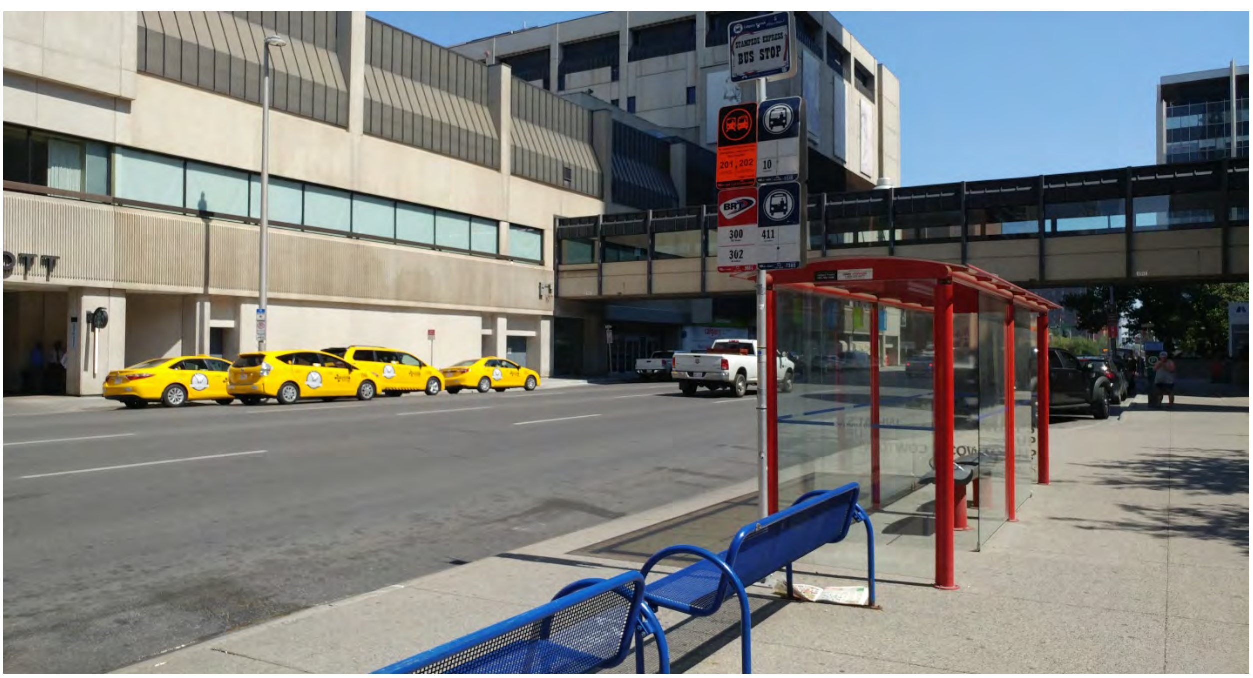
The Downtown Calgary bus stop is proposed to be on 9 Avenue SE, between Centre Street South and 1 Street SW. Buses for the Calgary to Bow Valley service are recommended to stop in the existing layby lane, under the overhead pedestrian bridge. By eliminating parking on the south side of 9 Avenue SE, the construction of bus bays is not required or recommended. Passenger amenities, including several benches and bus shelters already exist at this location to serve Calgary Transit passengers. The location of the proposed bus stop is illustrated in Figure 7-12 and Figure 7-13. Buses would utilize the existing layby lane, located under the pedestrian bridge, at the right of the image.

Figure 7-12: Downtown Calgary Bus Stop Location



Source: Google Earth.

Figure 7-13: Downtown Calgary Bus Stop



Source: Dillon Consulting

Figure 7-14 identifies the station area requirements for this bus stop.

Figure 7-14: Downtown Calgary – Proposed Improvements for Buses

Element	Proposed Improvement
Bus Platforms and Passenger Infrastructure	• Due to the projected ridership volumes of the service, install additional benches and shelters, particularly in the long-term. Bus stop sign required to indicate the location of the station.
Park-and-Ride Lots	• None; a number of publicly and privately owned parking garages are located in the vicinity.
Passenger Drop-Offs and Pick-Ups	• None; use adjacent loading zones or taxi stands on Centre Street South just north of 9 Avenue SE.
Complementary Local Transit	• Bus station is well serviced by transit (within two blocks of the Centre Street (eastbound) and 1st Street SW (westbound) stations on the Red and Blue CTrain lines). • Continued airport connectivity through the BRT 300 route should be considered. • No additional improvements requirements.
Active Transportation	• Consider continuing to expand the separated cycling network in Downtown Calgary, including a connection to 9 Avenue SE.

Source: Dillon Consulting analysis

7.2.3 Route B Stops

Stoney Nation – Optional Stop

Stoney Nation is proposed to be served from one of two potential bus stop locations: the Stoney Nakoda Resort & Casino or the Chiniki Cultural Centre. Geometric analysis of bus turning radius has confirmed that both sites can accommodate full-size highway coach buses without any physical modifications. Figure 7-15 shows the location of both sites along the Trans-Canada Highway (Highway 1) between Kananaskis Trail (Nakoda Resort & Casino) and Morley Road (Chiniki Cultural Centre).

Figure 7-15: Stoney Nakoda Resort & Casino Bus Stop Location

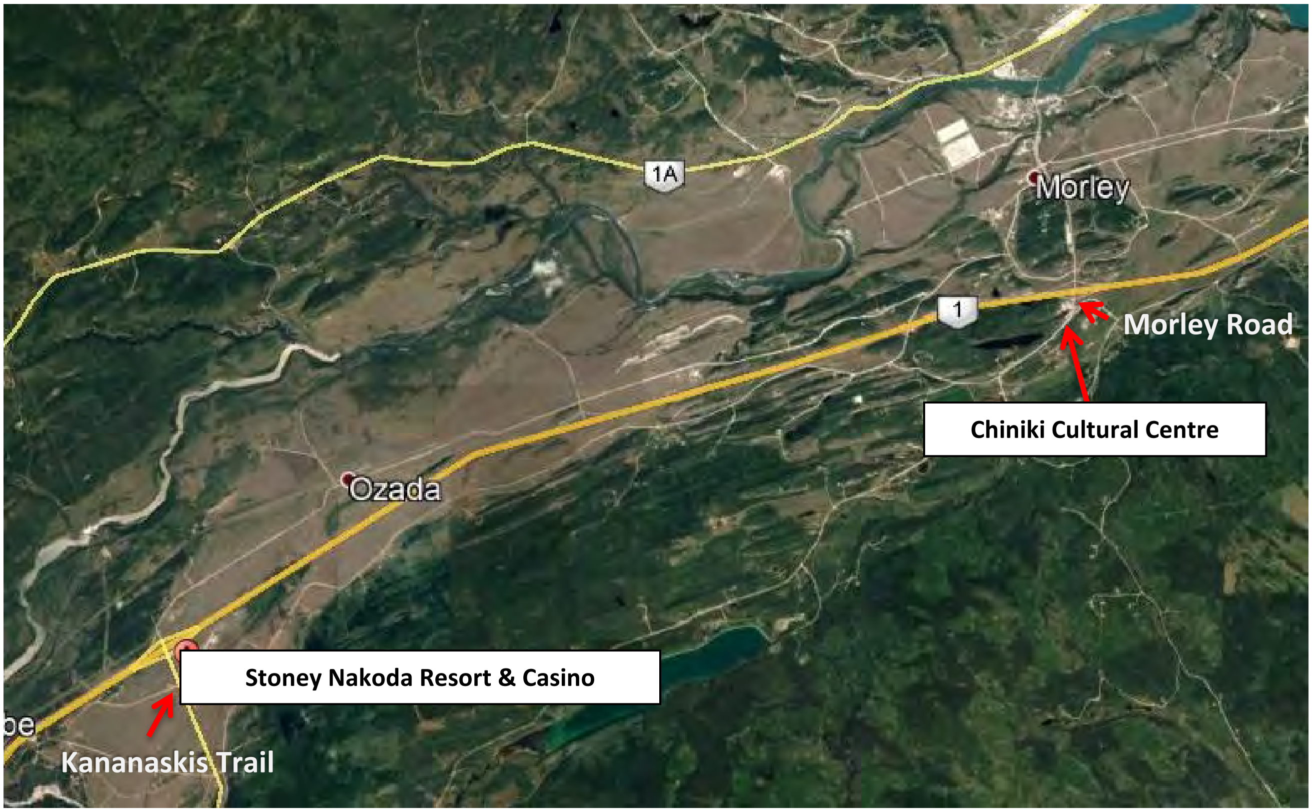


Figure 7-16 identifies the station area requirements for this bus stop.

Figure 7-16: Stoney Nation – Proposed Improvements for Buses

Element	Proposed Improvement
Bus Platforms and Passenger Infrastructure	• Minor signage changes prohibiting parking or standing is required to prevent the stop location from being blocked. • Because the facilities operate until late (around the clock, in the case of the Stoney Nakoda Resort & Casino), passengers will have indoor access to restrooms, heating and shelter at most times.
Park-and-Ride Lots	• None; park-and-ride demand at both locations is expected to be very low and it is anticipated that vehicles can be accommodated within the available parking supply (100+ parking spaces at each site).
Passenger Drop-Offs and Pick-Ups	• None; use adjacent loading zones, and taxi stands exist at both sites.
Complementary Local Transit	• None; the Stoney Nakoda Resort & Casino operates a shuttle service connecting the site to Lake Louise, Banff and Canmore. The service runs Friday and Saturday evenings only and provides three trips in each direction. • No transit service is provided to the Chiniki Cultural Centre, but due to the remote rural nature of these locations, no additional connecting transit services are proposed.
Active Transportation	• None; due to the remote rural nature of these locations, no active transportation facilities are proposed.

Source: Dillon Consulting analysis

Highway 22 – Optional Stop

The Highway 22 bus stop on the Route B bus service is an optional stop that needs to be further explored based on conversations with Rocky View County and Alberta Transportation (Figure 7-17). The implementation of the stop should coincide with plans to build a more formal park-and-ride facility at this location. Should a decision be made to move forward with this stop, the stop could be located at the Petro Canada Gas Station and Truck Stop. This would require a bus pad with shelter, potentially located at the southeast corner of the site, adjacent to the large "Petro Pass" sign (see Figure 7-18). Due to its capital cost, the shelter should only be installed after monitoring passenger volumes at the stop for one year and confirming its continued usage.

Westbound buses would enter the site from the direct ramp off the Trans-Canada Highway, and cross Township Road 245A before pulling up to the bus stop immediately thereafter. Leaving the site, buses would loop counter-clockwise through the bus parking area and emerge at the west end of the site, where they would proceed straight onto the ramp to rejoin the Trans-Canada Highway. Eastbound buses would exit the Trans-Canada Highway at the Highway 22 North ramp, turn left onto Township Road 245A, and turn right into the bus stop. They would proceed through the site in the manner described above and turn left onto Township Road 245A to return to Highway 22 and the Trans-Canada Highway eastbound.

Geometric analysis of bus turning radius has confirmed that the loop can accommodate full-size highway coach buses without any physical modifications. Figure 7-19Figure 7-18 identifies the station area requirements for this bus stop.

Figure 7-17: Highway 22 Bus Stop Location

Source: Google Maps

Figure 7-18: Highway 22 Bus Stop

Source: Google Maps

Figure 7-19: Highway 22 – Proposed Improvements for Buses

Element	Proposed Improvement
Bus Platforms and Passenger Infrastructure	• New bus pad with shelter 12 metres long by 3 metres wide, in order to accommodate a shelter and meet accessibility requirements and clear signage prohibiting parking or standing is required in order to prevent the stop location from being blocked.
Park-and-Ride Lots	• If Alberta Transportation constructs a formal park-and-ride facility at this location (to accommodate the large number of vehicles informally parking on the shoulders of Township Road 245A), consideration should be made to accommodate the potential demand from the Calgary to Bow Valley mass transit bus service. It should be noted that no formal park-and-ride facility is required solely as a result of the proposed mass transit bus service, as ridership demands from this stop are expected to be low.
Passenger Drop-Offs and Pick-Ups	• None.
Complementary Local Transit	• None; due to the remote rural nature of this location, no connecting transit is proposed.
Active Transportation	• None; due to the remote rural nature of these locations, no active transportation facilities are proposed.

Source: Dillon Consulting analysis

69 Street SW

The 69 Street SW stop in Calgary is proposed to be at the 69 Street SW CTrain station, on the CTrain's west Blue Line. As this site already functions as a bus terminal, this location requires minimal infrastructure improvements to support the bus service. The existing bus loop accommodates six buses simultaneously, with room for four additional buses in a layby off 69 Street SW. Figure 7-20 illustrates the location of this site. Figure 7-21 identifies the station area requirements for this bus stop.

Figure 7-20: 69 Street SW Bus Stop Location

Note: Buses would utilize the existing bus terminal facility (located to the right of the image) or on-street bus bays on 69 Street SW (located in the centre of the image).
Source: Google Earth

Figure 7-21: 69 Street – Proposed Improvements for Buses

Element	Proposed Improvement
Bus Platforms and Passenger Infrastructure	• None. Can use existing infrastructure at the bus terminal.
Park-and-Ride Lots	• None; 69 Street SW Train station has parking for approximately 827 vehicles in both a large three-storey parking garage and a smaller surface parking lot (no information on parking utilization available) • To better manage parking capacity issues and ensure parking availability, the City of Calgary may consider charging for parking or increasing the service levels on connecting Calgary Transit services. It should be noted, however, that the additional parking demand brought about by the users of the mass transit bus service to the Bow Valley is not the impetus to increase capacity or Calgary Transit service levels; rather, commuter parking demand forms the overwhelming majority of parking demand at the 69 Street SW CTrain station.
Passenger Drop-Offs and Pick-Ups	• None; use existing lane.
Complementary Local Transit	• None. Calgary Transit provides extensive transit service to 69 Street SW station (including CTrain and local bus services).
Active Transportation	• Consider extending the active transportation network to the west and the north of the station site.

Source: Dillon Consulting analysis

Anderson

The Anderson stop in Calgary is proposed to be at the Anderson CTrain station, on the CTrain's south Red Line. It is close to the Southcentre Mall, one of the largest malls in the Calgary area. Anderson CTrain station is currently the subject of a transit-oriented redevelopment proposal. The redeveloped station would include provisions for a Calgary Transit bus terminal that could accommodate the Calgary to Bow Valley service. As a result, this location would not require any infrastructure improvements to support the bus service. The location of the station is illustrated in Figure 7-22.

Figure 7-22: Anderson Bus Stop Location

Note: Buses would utilize the existing bus terminal facility (located to centre-left of the image).
Source: Google Earth

Figure 7-23 identifies the station area requirements for this bus stop.

Figure 7-23: Anderson – Proposed Improvements for Buses

Element	Proposed Improvement
Bus Platforms and Passenger Infrastructure	• None.
Park-and-Ride Lots	• None; the station has parking for approximately 1,665 vehicles on site, of which half the spaces are reserved for monthly customers. A Calgary Transit parking occupancy report from 2011 suggests that parking occupancy on weekdays at this station is only 44%. Anecdotally, parking occupancy at this station has increased significantly. • To better manage parking capacity issues and ensure parking availability, two options could be considered:

Element	Proposed Improvement
	o Enter into exploratory discussions with Oxford Properties (owners of Southcentre Mall) to permit a limited number of overflow parking spots (over and above the 165 spaces allocated for Calgary Transit users) for users of the Calgary to Bow Valley mass transit bus service. o Increase local transit connections to the Anderson Station to reduce demand for parking.
Passenger Drop-Offs and Pick-Ups	• None. Existing facility located in the parking lot to the east of the main entrance. • Transit-oriented redevelopment of the site would include enhanced pedestrian passenger pick-up and drop-off location.
Complementary Local Transit	• None. Calgary Transit provides extensive transit service to 69 Street SW station (including CTrain and local bus services).
Active Transportation	• None. Transit-oriented redevelopment of the site would include enhanced pedestrian and cycling connections.

8 Bus Operating Costs

Key Chapter Takeaways

- Operating costs paid to the service's contractor (including labour, fuel, maintenance, storage and administration) are estimated at $130 per vehicle hour for standard highway coaches and $135 per hour for double-decker buses. This is similar to the hourly cost of services provided by Roam Transit, Calgary Transit and Edmonton Transit (i.e. approximately $130 to $137 per hour).
- Annual operating costs in the low ridership scenario are expected to increase from $4.6 million upon the launch of the service to $5.4 million when double-decker buses would be introduced in 2042 (2017 dollars).
- Annual operating costs in the medium ridership scenarios are expected to increase from $5.2 million upon the launch of the service to $5.8 million when double-decker buses would be introduced in 2042 (2017 dollars).
- Annual operating costs in the high ridership scenario are expected to increase from $5.9 million upon the launch of the service to $7.4 million in 2042 (2017 dollars).
- The direct revenue-to-cost ratio of the proposed Calgary to Bow Valley bus service is expected to range from 49-66% upon the launch of the service in 2022.
- The expected net operating cash requirement for an all-year service is expected to be between $2.0 and $2.3 million per year in 2022, with the lower figure representing the high scenario.
- Boardings per revenue vehicle hour for both routes would range between 6 and 11 in the medium ridership scenario (2022). This is due to the long travel time, peak-direction nature of the service.

8.1 Bus Operations

As identified in section 6.6, the operation of the Calgary to Bow Valley bus service is recommended to be contracted to a private company. Under this arrangement, the operator generally charges the funding partners an agreed-upon hourly operating rate. This rate covers the cost of driver wages, fuel, cleaning, storage, maintenance, insurance and includes the contractor's profit.

8.1.1 Hourly Operating Cost

For the purposes of calculating estimates of annual operating costs, an hourly operating cost of $130 for standard highway coach vehicles and $135 for double-decker vehicles was assumed (noted in 2017 dollars).[36] For the high-ridership scenario (all horizon years) and the 2042 horizon (all ridership scenarios), the purchase of double-decker buses would lead to slightly increased fuel costs. Fuel costs

[36] The exact cost would need to be determined through an RFP process from prospective private operators.

generally account for approximately 10-15% of the overall operating cost of a vehicle. As a result, it is conservatively assumed that the hourly operating cost of a double-decker bus is $135 in 2017 dollars.

This assumption was arrived at by benchmarking existing transit systems in the Alberta market. The results are shown in Figure 8-1.

Figure 8-1: Bus Hourly Operating Cost Comparison

Location	Operator	Hourly Operating Cost (2015)
Calgary	Calgary Transit	$137
Bow Valley (Consolidated)	BVRTSC	$120*
Bow Valley (Route 3 Canmore)	BVRTSC	$130*
Calgary-Banff (Summer 2017 Pilot Bus Service)	Southland Transportation	$144**
Edmonton	Edmonton Transit	$130
Strathcona County	Strathcona County Transit	$118
Lethbridge	Lethbridge Transit	$105

Source: Systems derived from 2015 CUTA Canadian Transit Fact Book and increased by 2% annually to account for inflation
*Values reported by BVRTSC for 2017.
**Value reported by Calgary Regional Partnership.

Hourly rates include the cost of:

- Transit operator (drivers);
- Fuel;
- Vehicle maintenance;
- Storage facility maintenance; and
- Administration (e.g. management, customer service staff, etc.).

For the purpose of this calculation of costs (see section 6.5), it was also assumed that the contractor would use its own or lease an existing facility to maintain and store vehicles. This would increase the cost of the hourly rate slightly. For vehicles, it is assumed that the funding partners for this service would purchase vehicles and the contractor would be required to store and maintain them. Therefore, the capital cost of vehicles is reflected in the capital plan.

The rate charged by Southland Transportation, a private contractor, to operate the summer 2017 pilot bus service between Calgary and Banff is the highest in the benchmarking group at $144. This rate is higher than average because it includes the cost of the storage and maintenance facility, and the capital cost of vehicles, amortized over the life of the contract.

The purchase of vehicles by the Calgary to Bow Valley bus service's funding partners would lower the hourly operating cost, as the private contractor would not need to amortize the capital costs of the vehicles. A long-term contract (e.g. 5+ years) could also lower the hourly rate. As a result, an hourly cost similar to the Bow Valley Regional Transit Services Commission was used.

8.1.2 Annual Service Hours

Annual operating costs were calculated based on the annual total service hours (schedules, hours of service and frequencies proposed for Route A and Route B). With different service levels being offered during the summer and the winter periods, it is necessary to calculate the service hours separately before annualizing them. It was assumed that in addition to the hours required to operate revenue service, buses would require an additional 10% auxiliary hours to account for layovers, travel time to and from the transit facility before the start of service and at the end of service. The summary of annual service hours for each horizon period and ridership scenario is illustrated in Figure 8-2 to Figure 8-7.

Figure 8-2: Annual Bus Service Hours (2022 Low-Ridership Scenario)

Route	Summer			Winter			Total
	Daily Revenue Service Hours	Daily Non-Revenue Service Hours	Seasonal Service Hours	Daily Revenue Service Hours	Daily Non-Revenue Service Hours	Seasonal Service Hours	Annual Service Hours
A	68	7	13,800	39	4	7,753	21,553
B	34	4	7,007	30	4	6,214	13,222
Total	102	11	20,807	69	8	13,967	**34,775**

Source: Dillon Consulting analysis

Figure 8-3: Annual Bus Service Hours (2042 Low-Ridership Scenario)

Route	Summer			Winter			Total
	Daily Revenue Service Hours	Daily Non-Revenue Service Hours	Seasonal Service Hours	Daily Revenue Service Hours	Daily Non-Revenue Service Hours	Seasonal Service Hours	Annual Service Hours
A	82	9	16,775	43	5	8,688	25,463
B	39	4	7,943	30	4	6,214	14,157
Total	121	13	24,717	73	9	14,902	**39,620**

Source: Dillon Consulting analysis

Figure 8-4: Annual Bus Service Hours (2022 Medium-Ridership Scenario)

Route	Summer			Winter			Total
	Daily Revenue Service Hours	Daily Non-Revenue Service Hours	Seasonal Service Hours	Daily Revenue Service Hours	Daily Non-Revenue Service Hours	Seasonal Service Hours	Annual Service Hours
A	72	8	14,720	40	5	8,205	22,925
B	38	4	7,789	34	4	6,908	14,698
Total	110	13	24,650	74	8	14,850	**37,623**

Source: Dillon Consulting analysis

Figure 8-5: Annual Bus Service Hours (2042 Medium-Ridership Scenario)

Route	Summer			Winter			Total
	Daily Revenue Service Hours	Daily Non-Revenue Service Hours	Seasonal Service Hours	Daily Revenue Service Hours	Daily Non-Revenue Service Hours	Seasonal Service Hours	Annual Service Hours
A	86	9	17,434	47	5	9,472	26,906
B	43	5	8,755	34	4	6,908	15,664
Total	128	14	26,189	82	9	16,381	**42,570**

Source: Dillon Consulting analysis

Figure 8-6: Annual Bus Service Hours (2022 – High-Ridership Scenarios)

Route	Summer			Winter			Total
	Daily Revenue Service Hours	Daily Non-Revenue Service Hours	Seasonal Service Hours	Daily Revenue Service Hours	Daily Non-Revenue Service Hours	Seasonal Service Hours	Annual Service Hours
A	76	8	15,502	54	6	10,770	26,272
B	44	5	9,016	39	4	7,723	16,739
Total	120	13	24,518	92	10	18,492	**43,010**

Source: Dillon Consulting analysis

Figure 8-7: Annual Bus Service Hours (2042 – High-Ridership Scenarios)

Route	Summer			Winter			Total
	Daily Revenue Service Hours	Daily Non-Revenue Service Hours	Seasonal Service Hours	Daily Revenue Service Hours	Daily Non-Revenue Service Hours	Seasonal Service Hours	Annual Service Hours
A	95	10	19,259	58	6	11,584	30,843
B	68	7	13,831	49	5	9,714	23,544
Total	163	17	33,089	107	11	21,298	**54,387**

Source: Dillon Consulting analysis

8.1.3 Annual Operating Costs

Multiplying the estimated $130 to $135 hourly operating cost with the estimated annual service hours in each ridership scenario results in an annual operating cost for the service.

Based on the above assumptions, annual operating costs for 2022 are projected to range between approximately $4.5 million and $5.8 million for the low- and high-demand ridership scenarios respectively. This figure is expressed in 2017 dollars. This grows to between $5.3 million and $7.3 million by 2042 for the low- and high-demand ridership scenarios respectively.

Figure 8-8: Annual Bus Operating Costs (in Millions)

Horizon	Summer			Winter			Total		
	Low	Medium	High	Low	Medium	High	Low	Medium	High
2022	$2.7	$3.2	$3.3	$1.8	$1.9	$2.5	$4.5	$5.1	$5.8
2042	$3.3	$3.5	$4.5	$2.0	$2.2	$2.9	$5.3	$5.7	$7.3

Source: Dillon Consulting analysis

8.2 Ancillary, Supervisory, Management and Other Fixed Costs

A number of other costs would be incurred to successfully manage and coordinate the agreement with the private contractor and support the provision of the service. The ancillary operating costs that would be incurred to support the service include the following:

Contract Administration

A contract administrator would need to be designated by the lead funding agency to ensure that the bus operator is complying with the required terms of the service contract. The duties of this position would also include contract negotiation, dispute resolution and service planning. This position may be outsourced to an organization that has expertise in this field, such as the Bow Valley Regional Transit Services Commission. Existing staff may be able to accommodate this role. If an additional staff member is required, an annual salary of $80,000 to $100,000 was assumed.

Website Services

The bus service's website would be the primary interface for prospective passengers. As a result, it would need to be well-designed, easy to navigate, provide all the necessary travel and schedule information, and have a robust, online fare-purchasing functionality. The annual costs would consist of the ongoing hosting the website on a platform capable of supporting significant web traffic, periodic modifications to the website's design and content, and the transactional costs charged by credit cards and online payment systems. The estimated annual costs amount to approximately $10,000 to $25,000 (depending on the complexity of the website).

Customer Service Agents

It is recommended that two customer agents be hired to provide passenger support. Their duties would include facilitating phone reservations, providing customer support and replying to passenger inquiries. If this service (estimated to cost approximately $120,000 to $140,000 annually) is provided by the private contractor, it would be included as part of the hourly operating cost.

8.3 Bus Stop Operations

The Calgary to Bow Valley mass transit bus service is proposed to use stops located on property owned by various landowners. They include Petro Canada, Chiniki Cultural Centre or the Stoney Nakoda Resort & Casino, the Town of Canmore and Liricon Capital. The provision of an inter-city bus service at these sites would provide benefits to the landowners through increased passenger traffic. Minimal additional maintenance would be required since all proposed bus stops use existing facilities. As such, no maintenance payments are foreseen to these property owners. As is currently the case, landowners would continue to be responsible for general site maintenance, snow removal and garbage collection.

Since the proposed bus stops in Calgary use existing Calgary Transit stations, it is assumed that the cost to maintain stations (e.g. general site maintenance, snow removal and garbage collection) would not see any noticeable increases. The extent of cost increases would depend on the need to expand park-and-ride lots (as discussed in chapter 7) if the additional demand brought on by the Calgary to Bow Valley mass transit service limits that ability for Calgary Transit customers to find a suitable space.

Discussions should take place with the City of Calgary to develop agreements to use existing stations, including any associated annual operating or maintenance fees.

8.4 Summary

A summary of operating costs is shown in Figure 8-9.

Figure 8-9: Operating Costs Summary (millions)

Operating Cost Component	2022			2042		
	Low	Medium	High	Low	Medium	High
Operations Contract	$4.5	$5.1	$5.8	$5.3	$5.7	$7.3
Ancillary Costs	$0.1	$0.1	$0.1	$0.1	$0.1	$0.1
Total Costs	$4.6	$5.2	$5.9	$5.4	$5.8	$7.4

All values are expressed in 2017 dollars. Source: Dillon Consulting analysis
*Actual net revenues would be lower than the reported values due to cost-sharing arrangements with BVRTSC for fare integration.

Based on the estimated operating costs, Figure 8-10 summarizes the farebox recovery ratio (revenues to costs), net operating cash requirements and operating subsidy per rider served. These are provided for the horizon year 2022.

Figure 8-10: Summary Metrics

	Low	Medium	High	Medium (Summer, Route A only)
Annual ridership, 2022 (in thousands)	200	250	490	100
Annual revenue, 2022 (in millions)	$2.2	$2.8	$3.8	$1.1
Boardings per revenue vehicle hour, 2022	5.83	6.75	11.35	7.3
Farebox recovery ratio, 2022	49%	55%	66%	58%
Net operating cash requirement, 2022 (in millions)	$2.3	$2.3	$2.0	$0.8
Operating subsidy per rider served, 2022	$12	$9	$4	$8

Source: CPCS Team analysis

It is difficult to compare the farebox recovery ratio of the Bow Valley service with other transit services in Canada. Large Alberta-based transit systems such as Calgary and Edmonton recover 40 to 50% of their operating costs from the farebox, while smaller systems typically recover between 25 and 45%. Roam Transit is unique amongst Alberta systems, recovering 74% of its operating cost from the farebox. This is partially due to a significant visitor population and a smaller geographic area, increasing the density of potential passengers.

Other inter-municipal systems with long-distance travel in Canada include Translink (Vancouver), GO Transit (Toronto), and the AMT (Montreal), which operate a commuter-based, inter-regional service using a combination of bus and rail. The farebox recovery for these systems ranges between 40% and 78%.

For the Bow Valley service, a farebox recovery between 49% and 66% does fall within a parameter that is acceptable by most municipalities, particularly when weighed against the other goals of congestion and environmental footprint reduction and economic and visitor attraction.

Another important metric to review is the productivity of the service. While the vehicle occupancy is expected to be high in the peak direction of service, the overall productivity is anticipated to be low (ranging from six to 11 boardings per revenue vehicle hour depending on the ridership demand scenario). This is due to the long-distance nature of the trip (5+ hours) with minimal demand for stops at intermediate stations. As such, the seated capacity is typically filled near the origin station (i.e. Calgary), with few drop-offs until the final destination (i.e. Banff). Assuming a single-level coach has a maximum capacity of 50 passengers and the service takes 2.5 hours for a one-way trip (including layover), the maximum boardings per revenue vehicle hour would be 20 in the peak direction. Since ridership demand also has a strong peak orientation, ridership in the reverse flow is anticipated to be lower, further reducing the productivity of the service.

9 Bus Capital Costs

Key Chapter Takeaways

- Bus capital costs are expected to range between $7.8 and $20.4 million to launch the service, depending on the ridership demand scenario.
- Vehicle replacement costs after 15 to 20 years are expected to range between $15.4 and $27.6 million, depending on the ridership demand scenario.
- We have not assumed any capital costs at any of the stations, as upgrades would either be relatively modest or the proposed bus service would be an incremental user to a planned facility. Discussions would need to be held with each facility owner to confirm the apportionment of capital cost for the planned Calgary-Banff bus service, if any.

9.1 Vehicle

The capital cost for buses for all three ridership scenarios is illustrated in Figure 9-1, Figure 9-2 and Figure 9-3, which make up nearly all of the capital cost of providing the service. All scenarios include two spare buses. The capital cost per each vehicle used was:

- Highway coach vehicle (single level): $650,000 to $700,000
- Double-decker highway coach vehicle: $1,100,000 to $1,200,000

Both the standard highway coaches and the double-decker buses are available with accessibility ramps to accommodate all passenger requirements and should include bike racks. Highway coach vehicles have a life span of 15 to 20 years if properly maintained. The capital cost assumes all existing vehicles purchased in 2022 would be replaced around 2042.

For the purposes of this analysis, it was assumed that for the low and medium-ridership scenarios, the single-level highway coach buses would be replaced by double-decker highway coach vehicles before 2042 to increase capacity on the system. The high-ridership scenario would utilize double-decker buses from the inauguration of service.

Figure 9-1: Bus Capital Costs – Low-Ridership Scenario

Bus Type	2022 Units	2042 Units	Unit Cost (millions)	2022 (millions)	2042 (millions)
Standard Accessible Highway Coach Bus	12	-	$0.65 – 0.70	$7.8 - $8.4	-
Double-Decker Accessible Bus	-	14	$1.10 – 1.20	-	$15.4 - $16.8
TOTAL	12	14		$7.8 - $8.4	$15.4 - $16.8

Source: MCI, Prevost, VanHool

Figure 9-2: Bus Capital Costs – Medium-Ridership Scenario

Bus Type	2022 Units	2042 Units	Unit Cost (millions)	2022 (millions)	2042 (millions)
Standard Accessible Highway Coach Bus	14	-	$0.65 – 0.70	$9.1 - $9.8	-
Double-Decker Accessible Bus	-	18	$1.10 – 1.20	-	$19.8 - $21.6
TOTAL	14	18		$9.1 - $9.8	$18.7 - $20.4

Source: MCI, Prevost, VanHool

Figure 9-3: Bus Capital Costs – High-Ridership Scenario

Bus Type	2022 Units	2042 Units	Unit Cost (millions)	2022 (millions)	2042 (millions)
Standard Accessible Highway Coach Bus	-	-	$0.65 – 0.70		-
Double-Decker Accessible Bus	17	23	$1.10 – 1.20	$18.7 - $20.4	$25.3 - $27.6
TOTAL	-	23		$18.7 - $20.4	$25.3 - $27.6

Source: MCI, Prevost, VanHool

9.2 Stops

We have not assumed any capital costs at any of the stations, as upgrades would either be relatively modest or the proposed bus service would be an incremental user to a planned facility. Discussions would need to be held with each facility owner to confirm the apportionment of capital cost for the planned Calgary-Banff bus service, if any.

All stops would need to be equipped with a bus stop sign, which typically cost approximately $100 each. Stops where there are no planned infrastructure upgrades should be equipped with a shelter (i.e. Calgary-Downtown and Highway 22 should it be included). BC Transit's *Transit Shelter Program* estimates the full cost of a shelter to be approximately $25,000, but can be higher ($125,000) if real-time display signs are installed or there are other architectural features. Costs of shelters can be significantly reduced with advertising contracts.

9.3 Maintenance Depot

Capital costs for the storage and maintenance facility are anticipated to be included as part of the hourly operating cost (as noted in section 6.5).

10 Bus Implementation Plan

Key Chapter Takeaways

- Next steps would include issuing a request for proposals for service delivery and procuring buses.
- Decisions would need to be made on how the service is funded, including supporting transit services and allocation of fares due to fare integration.
- Marketing and communications would be key to attract new riders to the service.

10.1 Bus Implementation Steps and Timelines

If a mass transit bus service between Calgary and the Bow Valley is considered feasible, a number of next steps would be required to implement the service by 2022. These are noted below.

1. **Enter into Discussions to Determine Funding Allocation Between the Potential Partners**

   Discussions should be initiated early to determine how the service would be funded. Potential funding partners for the service could include Parks Canada, the Town of Banff, the Town of Canmore, ID9, the City of Calgary and the private sector.[37] Both routes would provide benefits to these stakeholders and a funding arrangement should be in place before the service is committed to.

2. **Continue Summer Bus Pilot to Monitor Ridership**

   A decision would need to be made about whether to purchase single-level or double-decker highway coaches for the 2022 service start. If single-level highway coaches are purchased and the ridership level exceeds the medium forecast, additional peak period buses may need to be acquired and operating costs increased to pay for additional service hours. If double-decker buses are purchased for 2022 anticipating a high ridership forecast, there is the risk that the buses are not fully utilized if the forecast is not realized. To help mitigate this risk, it is recommended that the contractor purchase the vehicles for the first few years of the service (similar to the summer 2017 pilot bus service contract). This would allow the funding partners to monitor ridership against the forecasts and make decisions about other strategies that may influence ridership (e.g. whether to introduce congesting pricing mechanisms in Banff). It also provides some time to assess the potential of introducing electric buses into the fleet. When there is some greater certainly about

[37] For clarity, any of the potential parties listed here may or may not become funding partners.

the forecast and the capital needs required to accommodate demand, the service contract can be changed to have municipal-owned vehicles used by the private contractor.

3. Purchase New Vehicles

Orders for 12 to 17 new buses (depending on the ridership demand scenario) to operate the service would take some time (up to one year from order to delivery). The funding partners may wish to issue an RFP for the order to ensure a competitive price and quality of vehicle. Buses should be received with sufficient time to install any standard ITS system or potential smartcard readers. The order should also include bike racks on the exterior and potentially inside of the buses. Bus wrapping with either the Roam Transit brand or a new brand for the service should occur upon delivery. Federal and provincial funding opportunities should also be sought to purchase capital requirements.

4. Issue an RFP for the Service Contract

The operation of the mass transit bus service is recommended to be contracted out. The funding partner should issue an RFP to contract out this service at least one year before the service is expected to begin operations. The RFP should identify the expected revenue service hours, bus storage and maintenance requirements, a plan for growth (in case higher ridership forecasts are achieved) and key performance indicators.

5. Maintenance and Storage

The Town of Banff is currently exploring the expansion of its existing bus storage facility on Hawk Avenue. As part of this, the potential to store, fuel and clean one or two Calgary to Bow Valley mass transit buses at this facility should be explored. If feasible and favourable, the option should be identified in the RFP to the private contractor.

6. Bus Stop Installation and Terminal Requirements

New bus stop signs, shelters and concrete pads (where applicable) would need to be installed along the new routes. Should the Banff Train Station be selected as the primary stop in Banff, discussions should take place with Liricon Capital to include one to two bus bays for the mass transit bus service into the design of the Banff Train Station terminal. Any cost-sharing requirements should also be discussed at this time.

7. Fare Strategy and Integration

The fare strategy identified in this report should be confirmed with the proposed funding partners, including a strategy to integrate fares with Roam Transit services. Allocation of fare revenues with the BVRTSC would need to be finalized.

8. Create Website

A website would need to be created for the proposed service, including information on local transit connections and park-and-ride opportunities at each of the bus stops. The website should allow for online ticket purchases, allowing passengers to schedule their arrival and departure at their selected bus stop.

9. Communications and Marketing

A communications and marketing strategy should be developed promoting the introduction of the new service. This should be targeted to the City of Calgary where possible, informing visitors about the ease of getting to and travel within the Bow Valley without a vehicle. Marketing to visitors would be important, as it may impact their mode choice for both arriving to the BNP and how they travel within the park. We would suggest that the funding partners approach Parks Canada in particular to support marketing activities.

10. Explore Additional Funding Opportunities

The Federation of Canadian Municipalities has recently issued a grant program that provides up to $1M in funding for capital projects that reduce GHG emissions. The purchase of two new transit buses would be an ideal submission for this grant and would help reduce capital costs. If there is a desire to explore electric buses, funding can be used to test the technology on this corridor. Funding is also available for 80% of up to $175,000 to conduct a study that informs solutions to reduce GHG emissions. This could be used towards one of the studies identified in this section.

11. Explore Development of Transit App

The funding partners should explore the opportunity to develop a transit app for the Calgary to Bow Valley mass transit service, integrated with Roam Transit services. The app should focus on wayfinding within the Bow Valley and identify transit opportunities to arrive at these locations. This would be linked to real-time bus schedules and allow visitors to plan their trip while in the Bow Valley. Funding from Parks Canada and other key visitor attractions in Banff National Park should be sought.

11 Rail Ridership and Revenue Estimates

Key Chapter Takeaways

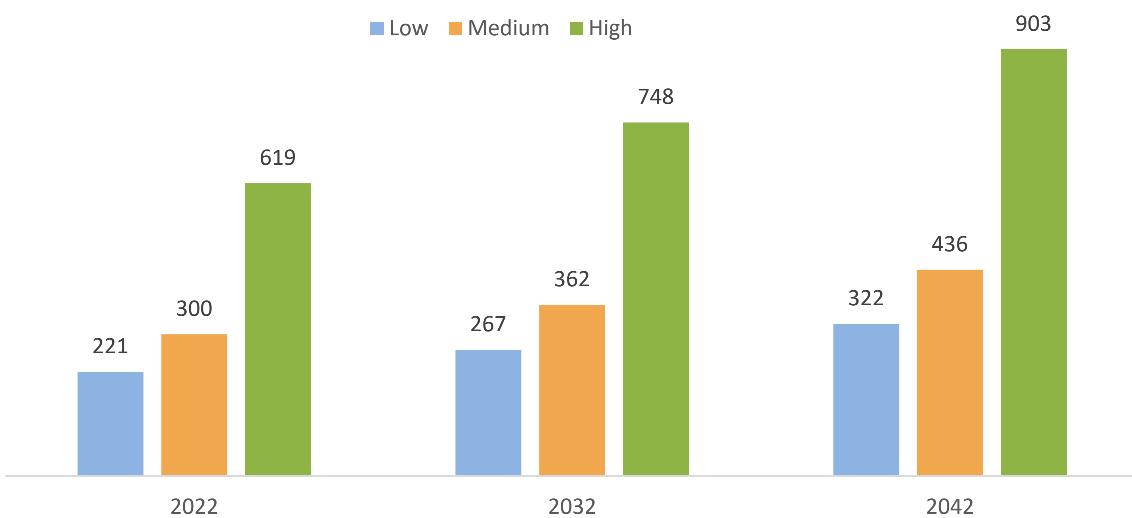
- In 2022, ridership on a potential rail service would be estimated to vary between 220,000 in the low ridership scenario and 620,000 boardings per year in the high ridership scenario. Though a rail service would not be implemented until the mid-to-late 2020s, to allow for comparisons with the bus scenarios, the 2022 horizon year has also been presented.
- Under the medium scenario, demand for a potential rail service would be expected to grow from approximately 300,000 boardings per year (in 2022) to 440,000 per year (in 2042). The annual boardings include all travel from the Calgary area and the Bow Valley (and vice-versa), but do not include trips from Cochrane to Calgary.
- In 2022, revenues are expected to vary between $2.4 million per year in the low scenario and $4.9 million per year in the high scenario.
- Under the medium scenario, revenues are expected to grow from $3.3 million in 2022 to $4.8 million in 2042.
- The provision of a weekday commuter service from Cochrane to downtown Calgary could add about $1.0 to $1.8 million in additional revenue.

11.1 Estimated Ridership

11.1.1 Total Annual

Based on the methodology discussed in chapter 2, Figure 11-1 shows the annual estimated rail boardings by scenario. Though a rail service would not be implemented until the mid-to-late 2020s, to allow for comparisons with the bus scenarios the 2022 horizon year has also been presented.

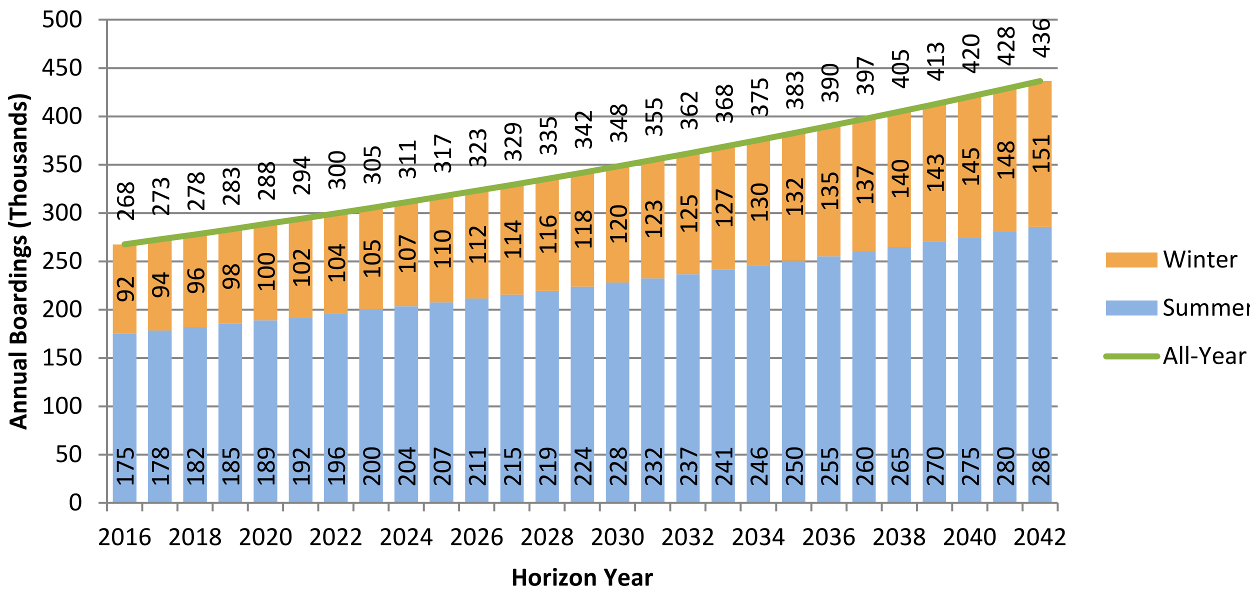
Figure 11-1: Annual Rail Boardings by Scenario (in Thousands)



Source: CPCS Team analysis

Figure 11-2 shows the estimated annual boardings for the proposed rail services. The annual boardings include all travel from the Calgary area and the Bow Valley (and vice-versa), but do not include trips from Cochrane to Calgary. Demand would be expected to grow from approximately 200,000 per year (in 2016) to 300,000 per year (in 2042). Again, this figure does not account for the actual implementation date of the rail service (i.e. these boardings would not occur until trains enter service, as discussed in chapter 18).

Figure 11-2: Annual Boardings

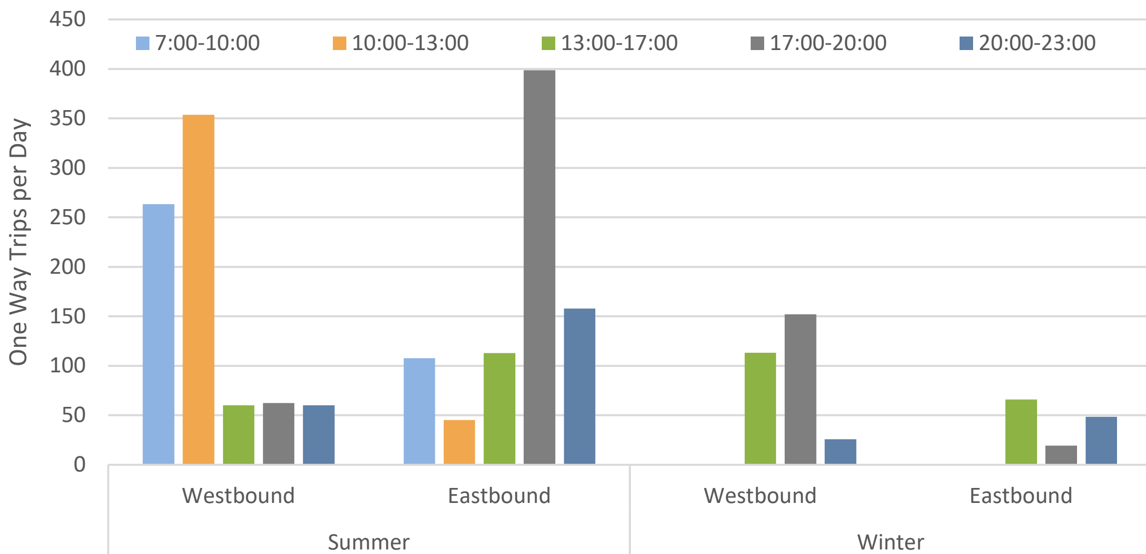


Source: CPCS Team analysis

11.1.2 Highest Link Loads by Time of Day

Understanding the variation of demand throughout the day helps inform an appropriate service design that can accommodate ridership demands. We estimated the peak loads per period using the product of number of one-way trips per day, the peak month demand factor discussed in section 2.9.1, and the time of day distribution discussed in section 2.9.2. Peak link loads, in this context, refers to the segment of the route with the highest number of passengers (i.e. accounting for the boardings and alightings along the route). Using 2022 as an illustrative year, Figure 11-3 shows the estimated maximum link load by time period. Time periods listed are based on arrival and departure times in or from Banff.

Figure 11-3: Highest Link Loads by Time of Day (2022)



Time periods listed are based on arrival and departure times from Banff. Source: CPCS Team analysis

11.1.3 Boardings/Alightings by Station

Figure 11-4 and Figure 11-5 show the estimated boardings per day by station in the summer and winter, respectively. These figures do not include estimates for commuters travelling from Cochrane to Calgary, which would increase use at a station located in Cochrane, provided commuter-oriented service could be provided. In addition, boardings in Lake Louise are summed with those in Banff (though are considered separately by the revenue analysis).

Figure 11-4: Boardings per Day by Station, Medium Scenario, Summer (2022)

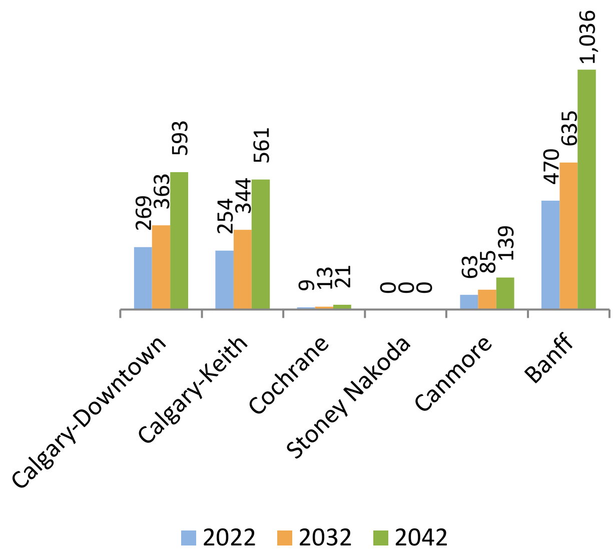
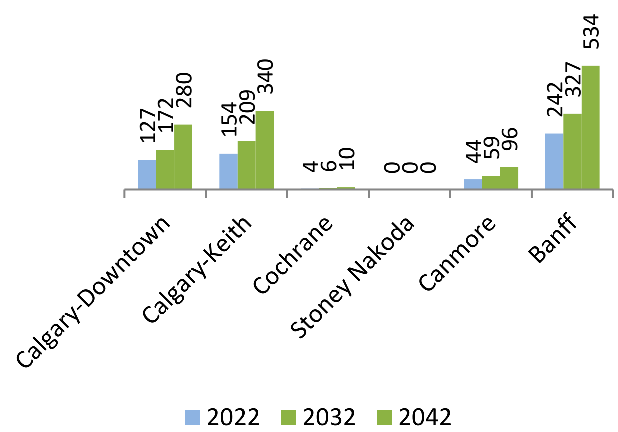


Figure 11-5: Boardings per Day by Station, Medium Scenario, Winter (2022)



Source: CPCS Team analysis

11.2 Estimated Revenue

11.2.1 Fare Levels

The fare levels analyzed for rail were the same as those analyzed for bus, as discussed in chapter 3. These include similar concessionary discounts and integration with Roam Transit routes.

11.2.2 Revenues

The calculation of annual revenue is based on the proposed fare levels, ridership demographics and the service's estimated ridership. Several assumptions have been made to permit the estimation of annual fare revenue. These assumptions are detailed in chapter 3.

Total estimated revenues have been calculated by multiplying the proposed adult fares for each origin-destination pair with the estimated demand between the same two locations. This excludes commuter demand between Cochrane and Calgary. Discounts have been applied to the resulting sums to account for the effects of the concession fares and passes.

Figure 11-6 shows a projection of annual revenue in the horizon years.[38]

[38] The fares have not been adjusted for inflation over the future horizon years, and the revenues are expressed in constant dollars. Furthermore, none of the assumptions were modified in the projection of future revenues. As a result, the growth in annual revenues is directly proportional to the growth in annual boardings.

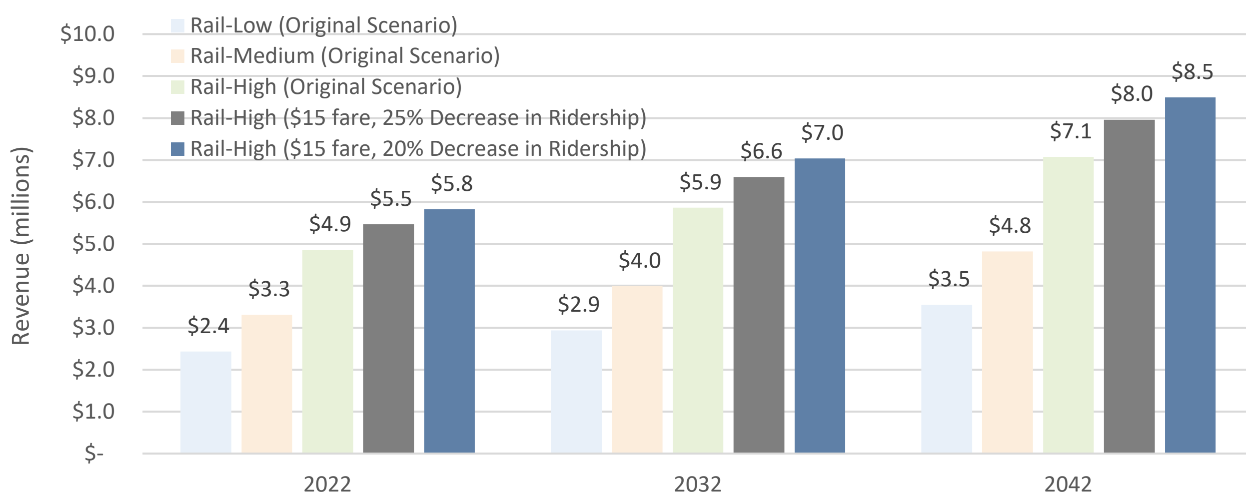
Figure 11-6: Estimated Annual Fare Revenue

Source: CPCS Team analysis

11.2.3 Sensitivity

Figure 11-7 shows the estimated annual revenue potential possible with a $15 one-way fare between Calgary and Banff in the high scenario. The estimated annual revenue could be $0.7 to 1.2 million higher than the original rail scenario, using the same sensitivities of ridership to changes fare as assumed in the low and medium scenarios. That is, as fares are increased, ridership would decrease to a certain extent. However, all else equal, operating costs would stay the same or slightly decrease, as ridership would also decrease as compared to the original rail scenario.

Figure 11-7: Alternative High Scenario with $15 Fare – Estimated Annual Revenue (millions)



Source: CPCS Team analysis

There are individuals willing to pay more for a rail service than bus for a variety of reasons (including the greater comfort and prestige offered by a train, the view by some that it is an experience, etc.), thereby warranting offering the service at a higher fare. However, further increases in fares beyond $15 would decrease ridership more substantially. In the online survey of Calgary residents, affordability of fares was the top-ranked concern by most residents (Appendix D, Figure D-19). Further increases in fares beyond $15 one-way would also result in rail losing its competitiveness against the cost of driving on a round-trip basis, even for a single traveller, while not offering a shorter travel time. In short, while further increases in fares might result in increased revenue, it cannot be directly extrapolated from this sensitivity assessment.

11.3 Additional Cochrane Commuter Demand

The focus of this study was on the potential for a rail (and bus) service between Calgary and the Bow Valley. However, because the rail line passes through Cochrane, there would not be any route deviation to serve this community (as compared to bus). As a result, this section provides a discussion on the nominal potential for the service to accommodate Cochrane commuter rail demand, and the related revenue potential.

Generally, the peak demand for commuter trips from Cochrane to Calgary is in the contra-flow direction demand for peak trips from Calgary to the Bow Valley. For example, the existing commuter bus from Cochrane to Calgary arrives in Calgary shortly after 7:00am, whereas peak demand to the Bow Valley does not ramp up until later in the morning (after 10:00am arrival time in Banff). Similarly, in the evening peak, the existing bus service from Calgary to Cochrane departs after 4:00pm, but the peak demand period from the Bow Valley to Calgary continues until 8:00pm. While there is some overlap in the evening peak, a train service could be considered to accommodate both peaks, particularly in the summer months. To this end, our rail scenarios consider this possibility.

In Calgary's Transportation Forecasting Model, in 2015, there are 195 and 192 commuters from Cochrane to the Calgary downtown who "walk access" existing transit services in the AM and PM peak period, respectively. In the model, three buses during the peak periods are assumed, comparable to the current privately operated bus service on this route. These trips were annualized using 254 working days per year and the potential revenue was estimated using a $10 one-way fare, excluding the fare of local transit connections in Cochrane.[39]

Demand growth was assumed to be 3.0% per year, in line with Cochrane's forecasted transportation growth; however, annual demand was capped at the available seat capacity post-2035.[40] In practice, depending on the demand for visitors to the Bow Valley and other factors, new trainsets would be purchased, fares would be increased to manage demand, or standing would be allowed in the trainsets (given that the trip is shorter than from Calgary to Banff).

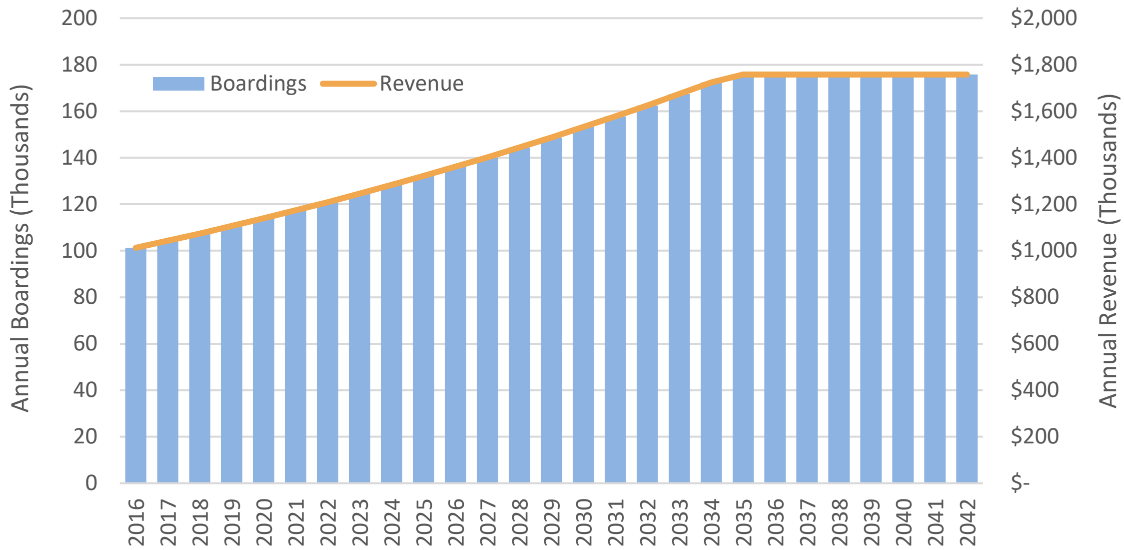
[39] Though the proposed fare by distance for Cochrane to Calgary is $5 or $6 one-way, the currently observed demand is based on the current private-sector service, which has a one-way fare of $15. The difference between $15 and $10 would provide an allowance for a contribution to a local-connecting transit service.

[40] The population of Cochrane is expected to grow more quickly than the population of Calgary. According to City of Calgary forecasts, the population of Cochrane is expected to grow 4.7% per year (2015-2028) and 2.0% per year (2028-2039), or on average 3.0% per year.

We emphasize the above discussion is not our own forecast for the potential for commuter rail service from Cochrane but rather an attempt to quantify, nominally, the additional revenue potential from serving Cochrane based on existing data.

On the basis of the above assumptions, the provision of a weekday commuter service from Cochrane to downtown Calgary could add about $1.0 to $1.8 million in additional revenue (Figure 11-8). Though this revenue is accounted for separately, it is incorporated in the financial analysis in chapter 19.

Figure 11-8: Incremental Passenger and Revenue Potential from Cochrane Commuters



Source: CPCS Team analysis

12 Existing Rail Infrastructure and Operations

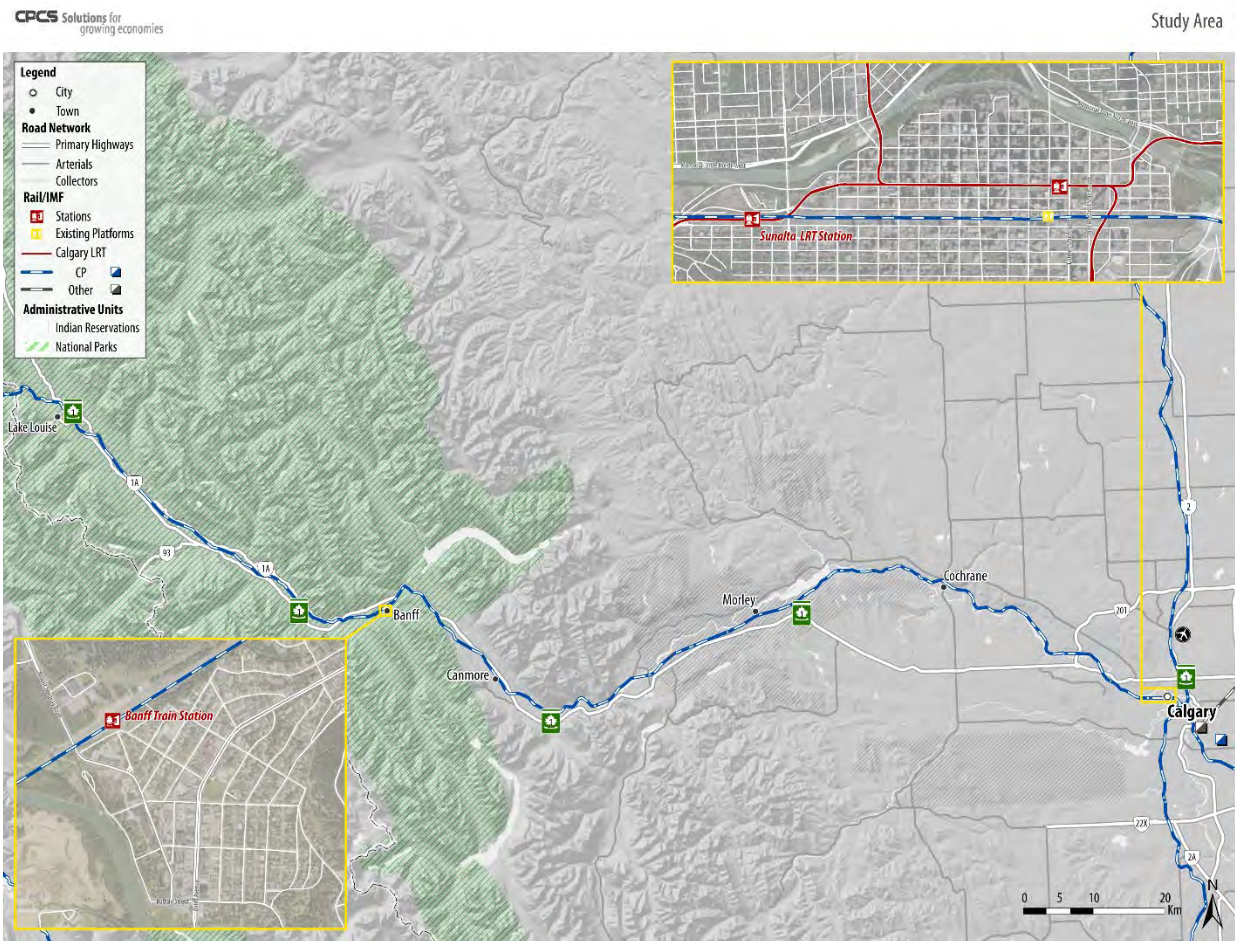
Key Chapter Takeaways

- The CP Laggan Subdivision between Calgary and Banff and Lake Louise is a single-track line on a primarily 200-foot-wide right of way. As CP's mainline between Calgary and the Port of Vancouver, it sees on the order of 24 trains per day, of which approximately 50% are "unscheduled" bulk trains. As such, there are no "natural windows" for passenger train service.
- Additional capacity would need to be provided (1) to enable passenger trains to operate reliably; (2) to ensure net impacts on existing freight train operations are at least neutral; and (3) to maintain CP's ability to add freight train service to the extent the existing infrastructure permits (i.e. the passenger train cannot use up any "spare" capacity that exists).
- CP noted that a dedicated passenger rail line that does not allow for freight operations would potentially constrain or make it more costly for CP to expand its corridor in the future, though potentially the capacity of this line could be used by CP overnight to mitigate this concern.

12.1 Study Area

A potential rail service between Calgary and Banff or Lake Louise would operate along the Canadian Pacific Railway's (CP's) Laggan Subdivision. The Laggan Subdivision of Canadian Pacific extends westward from Calgary to Field, BC, extending 136.6 track miles comprised primarily of single track. For the most part, east of Lake Louise, the track follows the original grade and alignment from the construction of the Canadian Pacific Railway through this region in 1883-1884. A map of the study area is shown in Figure 12-1, on the next page.

Figure 12-1: Study Area

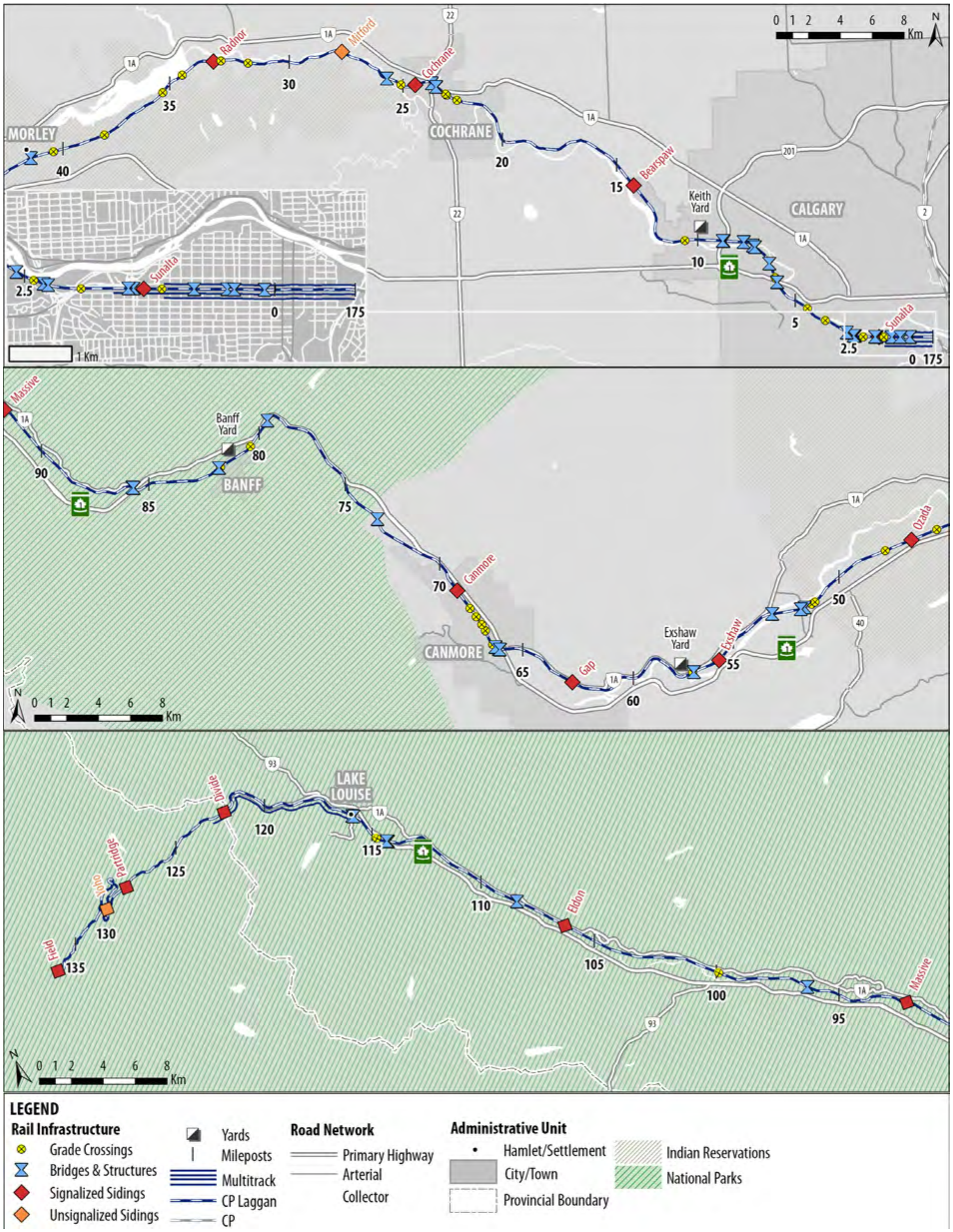


Source: CPCS based on various sources

12.2 Existing Linear Rail Infrastructure

Figure 12-2 summarizes the approximate location of infrastructure along the CP Laggan Subdivision, for visual reference.

Figure 12-2: CP Laggan Subdivision Infrastructure Summary



Note: Locations shown are approximate. Source: CPCS summary of data from CP, Transport Canada's Grade Crossing Database, and other sources

12.2.1 Overall Track Configuration

The overall track configuration has implications on the capacity available to accommodate additional passenger trains on the Laggan Subdivision.

Passing Sidings and Mainline Turnouts

The Laggan Subdivision commences west of the main terminal of Calgary and comprises four depot tracks from mile 0.0 to mile 1.1, two main tracks from mile 1.1 to mile 1.6, single main track from mile 1.6 to 116.2, two main tracks from mile 116.2 to 123.0 (near Lake Louise) and single track from mile 123.0 to 136.6.

Figure 12-3 summarizes the location of existing sidings on the Laggan Subdivision, and the associated milepost (MP). Maximum track speed on sidings is 25 miles per hour, except 30 mph at the signalled sidings at Radnor, Ozada, Gap and Massive. Canadian Rail Operating Rules (CROR) rule 105 applies on non-signalled siding use and requires a speed that will permit stopping within half the range of vision.

All sidings on the Laggan Subdivision are of sufficient length to handle any passenger consist (set of cars) envisioned. The longer, signalled sidings (**bolded** and shaded) are those that receive the most use due to freight train length.

Figure 12-3: CP Laggan Subdivision Sidings May 2017

Milepost (MP)	Station	East MP	West MP	Siding Length (feet)	Control System
9.6	Keith	8.7	10.4	13,140	Signalized
14.0	Bearspaw	13.3	14.8	7,277	CROR Rule 105
24.5	Cochrane	23.7	25.2	7,172	CROR Rule 105
33.4	Radnor	31.7	34.2	11,476	Signalized
46.9	Ozada	45.7	47.8	10,295	Signalized
56.1	Exshaw	55.5	56.9	7,191	CROR Rule 105
62.4	Gap	61.7	63.8	10,659	Signalized
68.7	Canmore	67.9	69.6	7,655	CROR Rule 105
81.9	Banff	80.5	82.1	7,312	CROR Rule 105
92.7	Massive	91.1	93.4	11,987	Signalized
106.3	Eldon	105.7	107.2	7,096	CROR Rule 105
128.0	Partridge	126.7	128.8	9,083	Signalized

Source: CPCS Team based CP timetables

All sidings have dual-control switches at each end that are normally controlled by the Rail Traffic Controller (RTC) in Calgary and may also be operated by hand at each location with authority from the RTC.

Yards and Facilities

There are several small rail yards on the Laggan Subdivision primarily for CP use, located at Keith, Exshaw and Banff.

There is virtually no industry along the Laggan Subdivision except for Exshaw, Alberta, mile 57.0, which has a small yard separate from the siding. This yard has its own switching assignment and handles cement, lime and other products produced or used at several nearby manufacturing facilities, the most prominent of which is the Lafarge cement plant.

12.2.2 Right-of-Way, Track and Bridges

Right-of-Way

The right-of-way on the Laggan Subdivision starts at the west end of the Canadian Prairies. It follows the Bow River westward, hugging its banks in many locations. It continues westward into the foothills at Gap and enters the Rocky Mountains at Canmore. The right-of-way continues following the Bow River Valley to Lake Louise where it begins the final climb to Stephen and the Great Divide at mile 122.2.

The right-of-way width is generally 200 feet, though is narrower in many locations (e.g. through some communities along the route) or otherwise bordered by the Bow River. Current real estate plans would have to be consulted for each location under consideration.

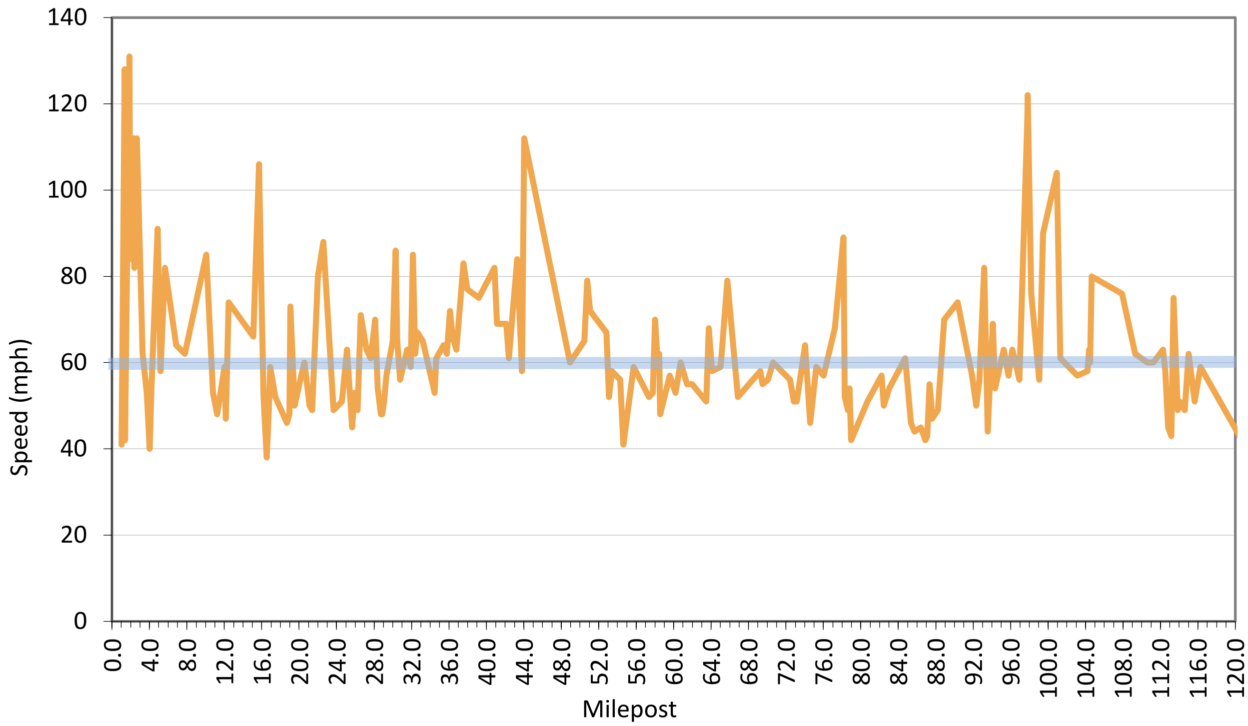
Track

The rail on the Laggan Subdivision main track is 136 LB RE[41] and is all continuous welded rail. Sidings are comprised of continuously welded rail or long lengths of rail in either 132 LB RE or 136 LB RE sections.

The Laggan Subdivision is maintained to Class 3 and Class 4 track standards, which permits speeds of up to 60 mph or 80 mph for freight and passenger equipment, respectively, subject to other constraints such as curvature, crossing warning systems, and passage through urban areas.[42] For example, as shown in Figure 12-4, there are a number of curves on the Laggan Subdivision that would limit the allowable speed to below 60 mph (i.e. where the orange line drops below the blue line in the figure). (For further clarity, this figure does *not* show the allowable speed limits. Even if a curve allows for a speed greater than 60 or 80 mph, the allowable speed by track class would govern. Further, other factors, such as the presence of warning systems, may govern the maximum speed.)

[41] This designation refers to the cross section of the rail. The 136 refers to the weight of the rail in lbs. per yard.
[42] Transport Canada. Rules Respecting Track Safety.

Figure 12-4: Allowable Speed at Curves



Notes: Assumes three inches of unbalanced super-elevation. Source: CPCS Team analysis

The main track is constructed with a subgrade mainly of local material with sub-ballast, and a ballast section of grade 4 and 4.5 crushed rock providing good drainage. Rail weight is 136 lb per yard on hardwood ties with tieplates, cut spikes and rail anchors.

12.2.3 Bridges, Structures and Utility Crossings

Locations of bridges (both rail and road) pose restrictions on the cost-effective addition of passing sidings or second main tracks, except in locations where an existing road over rail structure has sufficient room between the abutments to allow for a second track without reconstruction, or a rail bridge has sufficient room and load capacity for additional track. As such, the placement of these tracks would need to consider the location of bridges.

The Laggan Subdivision has:

- 14 road over rail structures
- 10 rail over road structures
- 13 rail over water structures

A summary of these structures is found in Appendix G.

12.2.4 At-Grade Road Crossings

There are 31 public and private at-grade crossings between Calgary and Lake Louise, which are summarized in Appendix G. Like bridges, the introduction of passing sidings or second main tracks at crossings adds additional expense due to the installation or relocation of crossing infrastructure and systems. More importantly, under the Canadian Rail Operating Rules, Rule 103, trains are prohibited from stopping for periods greater than five minutes over an at-grade crossing where traffic requires passage, which would be an unacceptable operating constraint at a siding location.[43] However, the Rocky Mountaineer passenger train stops on the main track at Banff without any crossing issues. In addition, adding trains travelling at higher speeds than freights would require the crossing warning advance circuits to be changed.

12.2.5 Train Control, Signals and Communications

The Laggan Subdivision main track and signalled sidings use Centralized Traffic Control (CTC) which permits the movement of trains based on signal indication.

The Laggan Subdivision "other than main track and signalled sidings" uses Canadian Rail Operating Rules Rule 105: trains must operate at a speed that permits stopping within half the range of vision of equipment and track units, and short of red and blue flags (used to protect workers and equipment).

There are five wayside inspection stations (hot box detectors [HBDs]) between Calgary and Field that measure overheated wheels, overheated axles and dragging equipment:

- Mile 19.6 east of Cochrane
- Mile 42.0 east of Ozada
- Mile 65.6 east of Canmore
- Mile 88.0 east of Massive
- Mile 111.0 east of Lake Louise

For radio communications, a VHF (very high frequency) system is used between RTC Calgary, trains and engineering personnel.

12.3 Maintenance Facilities

12.3.1 Stations

There are three existing facilities along the route that could be considered as potential station locations.

- **Calgary:** The existing Pavilion located to the west of the Fairmount Palliser in downtown Calgary holds a train shed that was formerly used by the Royal Canadian Pacific. It is owned

[43] Transportation Canada may allow for exceptions to this requirement on a crossing by crossing basis, if there is a potential alternative route.

by CP, but it is understood that it is for sale/lease. Currently, the switch into the facility is not in service, but it could be a possible downtown terminal off CP's mainline subject to receiving further information from CP regarding its suitability. The former CP/VIA station located in the basement of Palliser Square is no longer considered a viable station location by CP due to the interference that location would have with freight train operations through downtown Calgary.

- **Banff:** The existing Banff Train Station is owned by CP and leased to Liricon Capital. There is an existing platform and the station is currently used by Rocky Mountaineer.
- **Lake Louise:** The existing Lake Louise train station, currently a restaurant, does not currently have any rail station facilities (e.g. platforms), but the leaseholder from CP noted it has an obligation to support passenger trains, should a service be implemented.

12.3.2 Maintenance Facilities and Operations

CP indicated it would not be interested in providing any maintenance or operations services, though it would consider leasing land for a maintenance facility should a suitable site be developed. Rocky Mountaineer services its trains in Calgary; however, heavy maintenance of its trains is performed in Kamloops.

12.4 Existing Rail Operations

12.4.1 Available Capacity / Considerations in Developing Service Plan

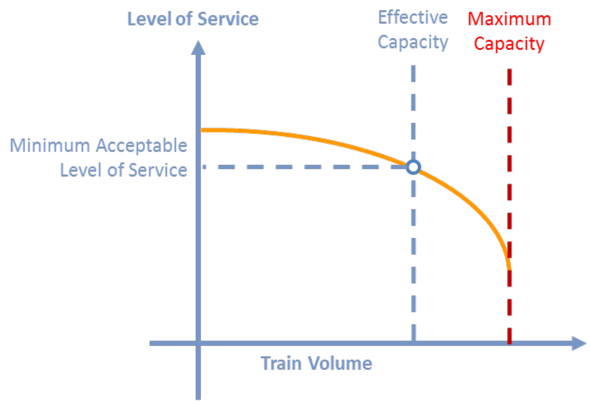
Rail line capacity – that is, the capacity between rail yards – can be defined as

> a measure of the ability to move a specific amount of traffic over a defined rail line with a given set of resources under a specific service plan. [44]

Capacity is not only a function of the layout and other characteristics of the infrastructure (i.e. the "defined rail line"), but also the desired level of service (i.e. the "service plan"). While a given rail line may theoretically be able to accommodate a certain number of trains, as the number of trains in the service plan increases, the level of service (e.g. travel times, on-time performance, etc.) will decrease below a minimum acceptable level of service threshold, as shown in Figure 12-5.

[44] Krueger, H. 1999. Parametric Modeling in Rail Capacity Planning. Proceedings of the 1999 Winter Simulation Conference.

Figure 12-5: Level of Service and Capacity



Source: CPCS

"Sustainable capacity" is a term often used to describe a rail line's capacity after making allowances for track outages such as for maintenance activities. It is the capacity that can be expected to be achieved over an extended period, while still meeting desired service parameters.

Passenger rail service has service characteristics that typically result in it using more capacity than a typical freight train when operating in mixed service with freight trains, including higher speeds/lower travel times, set frequencies, and schedule reliability measured in minutes. These characteristics are required to make the service attractive to potential customers by effectively lowering the travel time. However, they also require stricter operating requirements to meet these market characteristics, which if met would have impacts on freight operations.

To this end, sufficient additional capacity must be provided

(1) to enable passenger trains to operate reliably;

(2) so that net impacts on freight train operations are at least neutral; and

(3) to maintain CP's current ability to increase the number of freight trains operated, but without negatively impacting a potential passenger train service (i.e. the passenger train cannot use up "spare" capacity that exists).

Based on a preliminary assessment of the likely infrastructure improvements and discussions with client representatives, options that primarily utilized existing CP track have been removed from further consideration. The remainder of the report focuses entirely on analyzing a dedicated (separate) track for passenger rail, except in locations where track may be space constrained (e.g. downtown Calgary), east of Sunalta.

12.4.2 Existing Train Volumes

The CP Laggan Subdivision is a part of CP's main line between Vancouver and Calgary and, as such, accommodates traffic between the Port of Vancouver, Calgary and beyond, including intermodal, general merchandise, and bulk commodities (e.g. grain, potash, sulphur, etc.).

As of 2016, there are about 24 trains per day operated on the Laggan Subdivision between Calgary and Banff and Lake Louise, as reported in the Transport Canada Grade Crossing Database. Consultations with CP confirmed that these are the current order of magnitude volumes on a typical day, though noted that they can be significantly higher on days following recovery from a track outage, such as an avalanche in the mountains. Likewise, track is taken out of service for several hours on a regular basis for heavy maintenance work, which results in heavier volumes subsequently to recover.

12.4.3 Yard Operations Within Calgary

There are four tracks through the Calgary downtown, all of which may be used to stage freight trains at various times. Avoiding and/or mitigating operational impacts on these tracks is a key consideration. Immediately east of the downtown tracks are the junctions to lines extending north (Edmonton) and south (Lethbridge), and Alyth yard, the main CP yard in Calgary for marshalling freight trains.

12.4.4 Potential Future Growth

In the short-term, it is anticipated that freight traffic levels, on average, would not increase significantly beyond the 24 trains per day noted in section 12.4.2. However, given the length of time required for rail service implementation, there is the possibility of rail traffic to increase.

For example, CPCS previously conducted, as part of the 2014 *Canada Transportation Act* review, a scenario-based approach to assessing the growth of bulk rail traffic in Canada. In one scenario, CPCS estimated that train traffic would increase from approximately six to 10 bulk trains per days in 2013 to possibly between 16 to 20 bulk trains per day by 2045 (Figure 12-6). This could result in scenarios with 30 or more trains per day, if other traffic levels were to hold constant. Of course, some scenarios predicted limited growth, and some scenarios predicted higher traffic growth.

Because of the potential traffic increase, and the fact that bulk trains travel much slower than passenger trains, it highlights the potential challenges in operating a passenger train on the existing CP Laggan subdivision. In addition, the potential traffic growth highlights CP's interest in protecting its right-of-way for future traffic increases. To this end, CP noted that a dedicated passenger rail line that does not allow for freight operations would potentially constrain or make it more costly for CP to expand its corridor in the future. However, it could be explored how CP could utilize some of the capacity of the dedicated line overnight to mitigate this concern, and potentially have the option of repurchasing the line after a defined period for CP's primary use (e.g. 25 years).

Figure 12-6: Railway Demand for Top Six Bulk Commodities, Baseline Forecast, 2045

Source: CPCS analysis based on various sources. The original source of the maps is found in the CPCS report, "Impact of Future Bulk Commodity Flows on the Canadian Transportation System: Final Report".

13 Rolling Stock Alternatives

Key Chapter Takeaways

- In this chapter we identify and assess possible rolling stock alternatives, from locomotive-hauled trains to diesel-multiple units. Diesel multiple units (DMUs) are coaches with integrated diesel engines and control cabs.
- Assuming new rolling stock is procured, a set of DMUs would likely be most cost-effective in carrying demand in the low and medium scenarios. Based on recent procurements, a three-DMU set carrying 173 passengers is approximately $14 million. The main risk with assuming the use a DMU at this stage is that there are relatively few DMUs in operation in North America (as compared to locomotive-hauled trains) and only one procurement of a new, Transport Canada-compliant vehicle in recent years. As a result, sourcing the required vehicles would be possible but challenging.
- A locomotive-hauled train in push-pull configuration would likely be most cost-effective in carrying demand in the high scenario. Based on recent procurements, a three-car set (with locomotive) carrying up to 420 passengers is approximately $18 million. In practice, some seating would need to be removed to accommodate luggage racks, as most are configured for commuter operations.
- Given that many passengers would be carrying luggage, we anticipate that providing platforms that permit level boarding would be desirable from a passenger comfort and accessibility perspective. The existing station in Banff does not permit level boarding.
- The rolling stock options proposed represent the most cost-effective options for each scenario but, in practice, one would need to be selected and a design platform height selected.

13.1 Alternatives Identified

The chapter considers the potential range rolling stock options for a potential train service between Calgary and the Bow Valley. For any service between Calgary and the Bow Valley, the trainset would need to be configured to operate in push-pull operations, to avoid having to turn the train at each end of the route.[45]

Broadly, the alternatives can be classified along the following three dimensions:

- **Type of Locomotion:** These can include consists (sets of cars) pushed and pulled by a diesel-locomotive as well as diesel-multiple unit alternatives. Diesel-hauled locomotive consists would either require a cab car or an unpowered locomotive at the tail end to enable push-pull

[45] For example, having to turn the train at either end would involve extending the wye in Banff, and would also require operating into Alyth Yard in Calgary. Doing so would therefore be undesirable from a capital cost and operating perspective.

operations. Diesel multiple units (DMUs) are coaches with integrated diesel engines and control cabs.

- **New and Rebuilt Equipment:** New and refurbished/rebuilt equipment is considered, though the latter would be subject to availability at the time the service is introduced.
- **DMU floor height:** We considered alternatives that are compliant with traditional United States Federal Railroad Administration (FRA) and Transport Canada regulations, as well as European-designed alternatives. European-designed DMUs have the potential advantage of lower floor heights, which allow for level boarding with a lower platform height. The potential disadvantage is that until recently they have been allowed to operate only on dedicated lines or with temporal separation from freight (i.e. passenger trains during the day and freight overnight), which may be possible to achieve with a dedicated track. However, in recent years, at least in the US, one DMU manufacturer (Stadler) has been able to demonstrate that it meets FRA requirements through "alternative compliance" regulations.

Based on this review, we have identified the following five typical alternatives for consideration (Figure 13-1 through Figure 13-6)

Figure 13-1: Summary of Options Considered

Option	New or Rebuilt	Configuration	Floor Height (above top of rail)	Possible Configuration and Seating Capacity
1. Push-Pull Locomotive-Hauled Consist (New)	New; e.g. a Motive Power MP36/40-series locomotive (or similar) and Bombardier Bi-Level cars	Push-Pull	Low (0.64 metres)*	Single Car: up to 160 passengers Three-Car Set: 480 passengers Some reduction of seating capacity likely required to accommodate luggage loads[46]
2. Push-Pull Locomotive-Hauled Consist (Rebuilt)	Rebuilt	Push-Pull	High (1.22 metres)[47]	Uncertain
3. FRA-compliant High-Floor DMU (New or Used)	New or used; e.g. Nippon Sharyo DMUs	DMU	High (1.22 metres)	Three-car set: 173 passengers, luggage, onboard washroom.[48] Two, or higher car set configurations possible[49]
4. Budd Rail Diesel Car (RDC) DMU (Rebuilt)	Rebuilt	DMU	High (1.22 metres)	One car: 70 passengers, with a 5m-long luggage compartment One to six car set configuration possible.[50]

[46] GO Transit. Fact Sheet.
[47] A high floor refers to a floor 48 inches above the top of rail (ATR)
[48] Nippon Sharyo. Fact Sheet.
[49] Cascadia Center of Discovery Institute. 2011. Seattle, Washington-Vancouver, British Columbia Diesel Multiple Unit Feasibility Study. May 31.
[50] Stakeholders have indicated that RDCs as single-car sets have been known to not shunt signals. This issue would need to be studied more should single-car operations be proposed

Option	New or Rebuilt	Configuration	Floor Height (above top of rail)	Possible Configuration and Seating Capacity
5. Alternative Compliant Low-Floor DMU	New	DMU	Low (0.57 metres)	Three- Car Set: 200 passengers Two to six car set configuration possible

*Some bi-level vehicles are designed to allow boarding at a height closer to 1.21 metres above top-of-rail. Source: CPCS summary of multiple sources, including Trahan et al. (2016), Level Boarding in Mixed Fleets.

Figure 13-2: Example of Alternative 1

Figure 13-3: Example of Alternative 2

Figure 13-4: Example of Alternative 3

Source: Metrolinx

Figure 13-5: Example of Alternative 4

Source: Wikipedia

Figure 13-6: Example of Alternative 5

Source: Railway Gazette

13.2 Electrification and Alternative Fuels

Our analysis did not consider electrification of the system in-depth, as the frequency of service demanded is likely not sufficient to justify the additional capital costs. Costs and estimates of electrification are in the range of $1 million per track-km (UK context)[51] to approximately $3 million per track kilometre ($4.8 million per track-mile, US context) to install overhead catenary (Figure 13-7).[52] In addition, given that over 90% of the installed electricity capacity in Alberta uses coal and natural gas[53] – though that figure is expected to decrease in the future – there are likely to be limited benefits from an emissions perspective over the forecast range. Finally, and likely most significantly, the overhead catenary are visually disruptive, which would be a significant concern in Banff National Park.

Figure 13-7: Overhead Catenary Wires

Source: Freefoto.com

As an alternative to overhead catenary, Metrolinx is currently conducting a feasibility study regarding the possibility of using hydrogen fuel cells to power its future "Regional Express Rail" (RER) trainsets.[54] In 2010, Metrolinx had previously determined that it would not be feasible, but there have been advances in the technology since then. The backgrounder elaborates on why the use of hydrogen fuel cells are a form of electrification:

> **Why is hydrogen considered a form of electrification**? Electricity is used to split water into hydrogen fuel which is then pumped into the vehicle's tank. The hydrogen is then used to generate electricity on the vehicles using fuel cells. Finally, that electricity is used to drive electric traction motors to move the vehicle. There is no combustion in this process. Hydrogen acts an 'energy carrier' between electricity generated using renewable technologies and electricity driving electric motors.

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[51] Railway Technology. Northern Hub and North-West Electrification Programme, United Kingdom.
[52] Cambridge Systematics. 2012. Analysis of Freight Rail Electrification in the SCAG Region.
[53] Alberta Energy. 2015. Alberta's Electricity Generation.
[54] Metrolinx. Hydrogen Feasibility Study.

In the context of a rail service between Calgary and Banff, it would be premature to assume such technology would be feasible for such a service and outside the scope of this study to conduct a further assessment. However, should a rail service be pursued, it would be worth monitoring for the results of the Metrolinx study to understand the feasibility of this option in the Canadian context.

13.3 Analysis of Alternatives

Figure 13-8 summarizes the qualitative advantages and disadvantages of the five alternatives, which are discussed further below.

Figure 13-8: Summary of Advantages and Disadvantages

Option	Capital Cost (millions)	Availability and Current Use	Other Advantages	Disadvantages
1. Push-Pull Locomotive-Hauled Consist (New)	$18 per three-car set[55]	High, commonly used by commuter railways in Canada	- Meets US EPA Tier 4 emission requirements[56] - Platform compatible with freight service - Some areas accessible through deployment of wheelchair ramp at elevated platform area	- Though seat dense, would require some reconfigurations to deal with luggage, lowering capacity
2. Push-Pull Locomotive-Hauled Consist (Rebuilt)	Uncertain	Uncertain; for example, some may be potentially available when VIA renews its rolling stock in the medium term	- Lower cost, should some be available	- Aging equipment - Uncertain availability and cost - Accessibility depends on configuration and platform height
3. FRA-compliant High-Floor DMU (New or Used)	$14 per three-car set[57]	Medium. Only one procurement in North America. Used by Metrolinx in Toronto for the UP Express Service and SMART in California	- US EPA Tier 4 emission requirements - FRA Compliant - Provides redundancy in case of a failure over the road - Fully accessible	- DMUs have higher maintenance costs per unit than passenger cars should demand grow - Limited availability

[55] Metrolinx procured a large order of 146 cars for approximately $3.4 million per car. It procured 16 locomotives for approximately $97 million (USD), or approximately $7.5 million (CAD) per locomotive. Metrolinx. GO RER Initial Business Case. Wabtec. 2016. Wabtec Delivers First Tier 4 Commuter Locomotive.

[56] Canadian Locomotive Emissions Regulations require locomotives to meet US EPA standards, the latest, effective 2015, is Tier 4, though there are some exceptions for remanufactured locomotives.

[57] In 2011, the cost of a 12-DMU order was reported to be $53 million (CAD), or $13.25 million per three-car trainset. Bowen. 2011. Metrolinx Orders 12 DMUs for Toronto Airport Line. *Railway Age*.

Option	Capital Cost (millions)	Availability and Current Use	Other Advantages	Disadvantages
4. Budd Rail Diesel Car (RDC) DMU (Rebuilt)	$1.3-2.0 per car (Acquisition and repair)[58]	Low, many scrapped. Those existing are in disrepair, but could potentially be rebuilt	- Lower cost, should some be available - Can be made accessible with lift, or with high platform	- Low availability - Uncertainty over whether rebuild could meet latest regulatory requirements for air emissions, etc.
5. Alternative Compliant Low-Floor DMU	$12.5 per set[59]	Commonly used in Europe, and some commuter rail operations in North America. The manufacturer Stadler has designed a low-floor DMU, the "FLIRT," in compliance with FRA "alternative compliance" regulations	- US EPA Tier 4 emission requirements	- Further regulatory analysis and consultations with CP and Transport Canada would be required to determine whether these would be acceptable for use in Canada. Temporal separation would be likely needed, which would only be feasible with a dedicated track.

Source: CPCS analysis using multiple sources

Assuming hourly service during the peak periods, a three-car DMU set (alternative 3) would be sufficient to accommodate demand for the low and medium ridership scenarios into the late 2030s. DMUs also provide some redundancy in case of mechanical breakdowns en route. However, relative to other rolling stock options, few have been manufactured in the North American context, so they would be more difficult to source.[60]

Based on capital costs, DMUs are usually cost-effective up to approximately three-to-four-car sets, above which a locomotive-hauled consist usually would have a lower capital cost. Because each DMU has an onboard engine, they are more costly to maintain than an unpowered coach, so running long consists of DMUs is undesirable from an operating cost perspective as well. With hourly service in the peak period, DMUs would not provide sufficient capacity to accommodate ridership in the high scenario, even in a six-car consist.

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[58] CB Hall Vermont Business Magazine. AllEarth pays $4 million for commuter rail cars.
[59] Railway Gazette. 2015. TEX Rail orders Stadler Flirt DMUs.
[60] As of this final report, Nippon Sharyo has closed its plant in Rochelle, IL that manufactured these DMUs. It could be investigated whether used DMUs from Metrolinx's UP Express could be sold in the future. Metrolinx has plans to electrify portions of the Kitchener Line along which the UP Express service operates by 2022-2023, including the spur to the airport. If these timelines were to hold, and if a bus service to Banff were initially implemented, these cars could potentially be procured for a future Bow Valley to Calgary service. Metrolinx currently owns 18 DMUs, enough for six three-car trains. However, it may also wish to repurpose these cars for use on other lines (e.g. Niagara Falls service) in the future. Alternatively, procuring rebuilt Budd RDCs could be investigated, though they would need to be extensively reconfigured for a rail service to the Bow Valley. Given that many have been recently scrapped, we do not consider this to be a viable option for further analysis at this stage.

To accommodate the high-demand scenario, a locomotive-hauled consist along the lines of alternative 1 would need to be considered.

Alternative 3[61] would require a high platform at 1.22 metres above top of rail (48 inches), e.g. Figure 13-9. Use of a high platform would require a dedicated track to avoid interference with the clearance envelope of a freight train. Given that CP would require stations platforms to be located by tracks not used by freight trains, building a high platform does not require any new track configuration that would not already be required, however. It would also improve accessibility for individuals with luggage and individuals with a disability, and reduce boarding times.[62]

Figure 13-9: Example High Platform with Low Platform in the Foreground

Source: CPCS

The floor heights of bi-level cars vary by manufacturer platform (or elevated platform area). Many, including the Bombardier Bi-Level, are 0.64 metres above top of rail. Low platforms are approximately 0.20 metres above top of rail, and can be used to board these vehicles with a step. Figure 13-10 shows an example of a low platform with an elevated level boarding area for wheelchair accessibility, which requires a ramp to be deployed to bridge the gap.

[61] A Budd RDC can board at a lower level but a step would be required.

[62] Otherwise, wheelchair lifts would need to be installed to allow for boarding of persons with a disability.

Figure 13-10: Example Low Platform with Elevated Waiting Area

Source: CPCS

For the purposes of this study, we have used a DMU set (alternative 3) for the low and medium scenarios, and a locomotive-hauled consist with bi-level cars (alternative 1) for the high scenario (Figure 13-11). These options represent the most cost-effective options for each scenario but, in practice, one would need to be selected and a design platform height selected. In order to maintain flexibility, several interim strategies could be pursued:

- Though rail demand would likely be higher than bus riderships, continue to run and increase bus service in order to better understand the ridership demand.
- Undertake a detailed review of potential through consultations with rolling stock manufacturers and Transport Canada, after initial agreements with key stakeholders have been put into place, but before design of stations commences. In practice, some of the options considered may no longer be available. Alternatively, some of the newer options (e.g. alternative 5), may be possible.

Ultimately, if a high platform were constructed at 1.22 metres above top-of-rail, there exist both single- and bi-level coaches that could also accommodate this height.

Figure 13-11: Assumed Consist Parameters

Element	Low and Medium Scenarios (DMU)	High Scenario (Locomotive-Hauled Consist)
Length per car	25.9 metres (85 feet)	25.9 metres (85 feet)
Fuel economy	1.2 litres per km per unit	3.5 litres per km per three car train
Seating capacity	53 to 60 passenger per car	Up to 160 passengers per car
Platform height	1.22 metres above top of rail	Varies, usually at least 0.64 metres for level boarding

Source: CPCS based on sources including Nippon Sharyo and NCRRP Report 3: Comparison of Passenger Rail Energy Consumption with Competing Modes.

14 Rail Service Scenarios and Fixed Infrastructure Requirements

Key Chapter Takeaways

- A Calgary-Banff train would be expected to have a travel time of about two hours, subject to the final infrastructure configuration.
- In the summer period, eight round trips per day are proposed, with two of the trainsets laying over in Banff, rather than returning to Calgary in the mid-day when demand is lower. For the winter period, six round trips are proposed (i.e. the two trips undertaken by the trainsets laying over in Banff would not be undertaken).
- All of the proposed service concepts are based on the provision of a dedicated track along CP's right-of-way, except in downtown Calgary, where the passenger train would need to operate on one of CP's existing tracks. Compensation in the form of additional capacity elsewhere (e.g. extending yard tracks at Keith Yard) would need to be provided.

14.1 Rail Service Design

14.1.1 Trip Times

Minimum Run Times

For development of the service plans, historical timetables with speed zones were consulted to estimate the potential run time between Calgary and Banff. Based on our analysis, the minimum run time between Calgary downtown and Banff is 1:43 (hour:minutes, excluding station stops and any freight train interference).[63] The minimum run time between Keith and Banff is approximately 1:29. Estimated minimum run times between possible stations are summarized in Figure 14-1.

[63] Permission would need to be granted by Transport Canada to operate with an allowable unbalanced superelevation of four inches, which is used elsewhere in Canada for passenger trains.

Figure 14-1: Minimum Run Time between Stations

Segment	Travel Time (minutes)	Travel Time Between Possible Stations (minutes)	Travel Time (minutes)
Calgary-Brickburn	9	Downtown-Keith	14
Brickburn-Keith*	5		
Keith-Bearspaw	6	Keith-Cochrane	20
Bearspaw-Cochrane	14		
Cochrane-Radnor	12	Cochrane-Canmore	52
Radnor-Ozada	14		
Ozada-Exshaw	11		
Exshaw -Gap	8		
Gap-Canmore	7		
Canmore-Banff	17	Canmore-Banff	17

Source: CPCS Team analysis

Station Stop Time

Commuter trains can come to a stop for as little as about 30 seconds at a station stop. More conservatively, because some individuals may have skis, bikes and luggage, we have assumed a one-minute station stop time at most stops, except at Keith, where a large fraction of the demand would be expected (Figure 14-2). In addition to the stop time, we have included a one-minute acceleration/deceleration penalty.

Figure 14-2: Station Stop Times

Station	Stop Time (minutes)	Acceleration Penalty (minutes)	Total Time Penalty (minutes)
Keith	4	1	5
Cochrane, Canmore	1	1	2

Source: CPCS Team analysis

Travel Time Summary

Figure 14-3 summarizes the estimated travel time between Calgary and Banff, without any allowance for meets of passenger trains along the route. The route between Calgary-Keith[64] and Banff could be completed in as little as approximately 1:33, slightly faster than the express bus of the summer 2017 pilot bus service, which was scheduled for 1:45 between Crowfoot Station and Banff.

[64] Keith Station was selected for comparison as it is closer to the western edge of Calgary, like Crowfoot.

Figure 14-3: Travel Time Summary

Cycle Time Components	Calgary-Downtown to Banff	Calgary-Keith to Banff
Minimum Run Time	103	89
Station stops each direction	9	4
Total Time (one-way, without train meets)	112 (1:52)	93 (1:33)

Source: CPCS Team analysis

For comparison, historically, in the 1980s, VIA operated between Calgary and Banff in 2:10 (h:mm), with another 50 minutes to travel to Lake Louise (in addition to the stop time in Banff).[65] However, this travel time assumes shared operations with freight. It was noted in the consultations that Rocky Mountaineer can operate a deadhead non-revenue service between Calgary and Banff in 1:30, though a 33% buffer is planned for to account for interaction with other traffic, equivalent to a travel time of 2:00. Additional station stops would increase the potential travel time.

The above travel times do not provide any allowance for meets. If a dedicated track were provided with five sidings, a passenger train may still be delayed for up to about 15 to 20 minutes if schedules became delayed and train meets could not be located in their optimal location. This additional buffer has been incorporated into the minimum cycle time.

With a dedicated track, other strategies to increase speeds and reduce travel times could be considered. Firstly, the superelevation in selected sharper curves can be increased to 5½ inches. Secondly, if the passenger track is a dedicated railway track within the existing right-of-way, it could be constructed to a higher level of geometry standards – a well-constructed formation with good clean ballast.[66] This would invite the opportunity to set the track to a higher track class, which would allow increased speeds. This would only be undertaken in selected locations, as in many locations speeds would be restricted by the track curvature dictated by the existing alignment (i.e. urban areas). Finally, in selected areas curves could be softened through additional property acquisition. These increases may be able to reduce travel times about 10% cumulatively.

Layover Time

We have assumed a minimum layover time of 10 minutes in Banff and 15 minutes in Calgary.

Cycle Times

We estimate that a minimum cycle time of approximately 4.5 hours is possible, based on the estimates in Figure 14-4.

Figure 14-4: Cycle Time

Cycle Time Components	Time (minutes)
Calgary to Banff minimum run time	103
Banff to Calgary minimum run time	103
Station stops (both directions)	18
Buffer time (both directions, for meets)	20

[65] VIA Rail Canada. 1988. National Timetable.
[66] Crossing warning circuits would need to be reprogrammed for increased speeds.

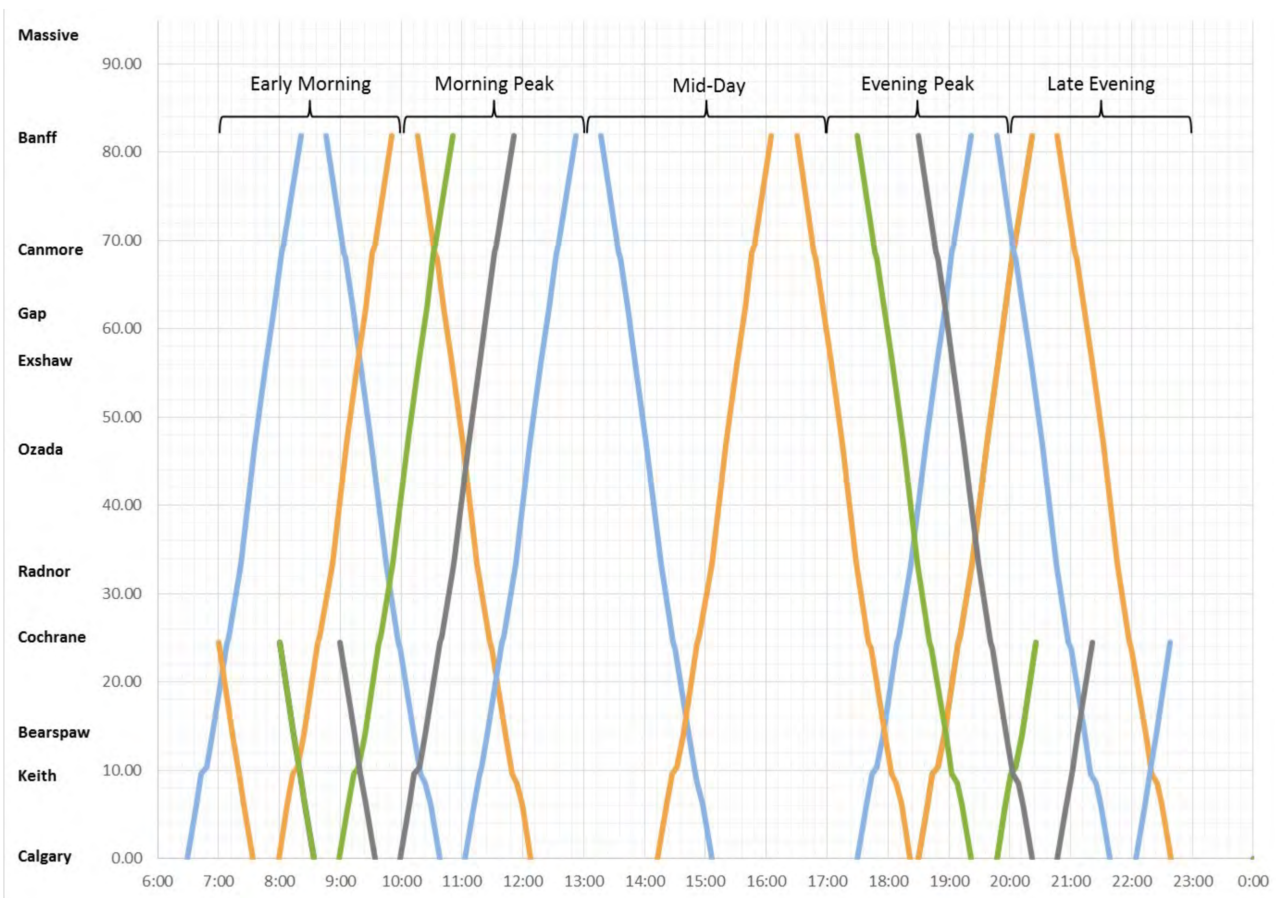
Cycle Time Components	Time (minutes)
Banff layover time	10
Calgary layover time	15
Total	269 (4.5 hours)

Source: CPCS Team analysis

14.1.2 Frequencies

To be comparable with an all-day bus option, an all-day rail service is proposed. Figure 14-5 shows an illustrative time-distance diagram for summer service, with each line used to represent a different trainset. In the summer period, eight round trips per day are proposed, with two of the trainsets laying over in Banff, rather than returning to Calgary in the mid-day when demand is lower. For the winter period, six round trips are proposed (i.e. the two trips undertaken by the trainsets laying over in Banff would not be undertaken).

Figure 14-5: Illustrative Time-Distance Diagram – Summer Period



Note: Each coloured line represents a trainset. Source: CPCS Team analysis

14.2 Rail Infrastructure Capacity Requirements

Should a complete, all-day rail service be under consideration, a completely dedicated track with multiple short sidings would likely be required. At least five short sidings of approximately 1,000 feet each would be required. In downtown Calgary, from approximately Sunalta station east, because of available-land constraints in downtown Calgary, a passenger rail train would need to use existing CP track.

Provided CP were able to utilize the available track capacity overnight of the new dedicated track, we believe there is sufficient capacity for freight use for the foreseeable future.[67] One exception is the exclusive use of one of the four tracks through the downtown. Because additional tracks could not be built through this area, the passenger train would need to utilize one of the four tracks exclusively throughout the day when the service operates. To compensate CP for the use of this track, the extension of two tracks at Keith Yard to at least 11,000 feet long is proposed.

14.3 Operating Requirements

14.3.1 Trainsets

Figure 14-6 summarizes the estimated trainset requirements for the scenarios under consideration. In all three scenarios during the summer months, the length of the trainset would be 78 metres, excluding the length of the locomotives. In the winter months, some trainsets could be stored, and in some cases the trainset length reduced.

Figure 14-6: Trainset Requirements

Scenario	Number of Train-sets – Summer (Winter)	Type	Number of DMUs/Cars per Trainset – Summer (Winter)	Maximum Length of Trainset (excluding locomotive) (m)	Spare Cars/DMUs	Total Cars (including spares)	Number of Loco-motives (including one spare)
Low	4 (2)	DMU	3 (2)	78	3	15	0
Medium	4 (2)	DMU	3 (3)	78	3	15	0
High	4 (2)	Loco-hauled	3 (3)	78	3	15	4

*All trainsets, except spare, would operate during the summer period. During the winter period, only two trainsets would operate. Source: CPCS analysis

14.3.2 Operating Crews

In Canada, though trains are typically staffed with two (or more) crew members in the locomotive, there is no general prohibition on operating trains on a federally regulated railway with a single person

[67] CP may nonetheless wish that the agreement specify that CP has the right to purchase back the dedicated track at the end of the agreement period.

(except for trains carrying dangerous goods).[68] We anticipate that trains would be staffed by a locomotive engineer and an on-board staff member.[69] The locomotive engineer would drive, call signals, operate switches and undertake routine equipment inspections. The on-board personnel would primarily monitor passenger embarking and disembarking, check tickets and supervise on-board activities. The above arrangement would be subject to conducting a risk assessment to identify possible hazards and mitigation strategies, as well as agreement by CP.

Crew members would need to be qualified in accordance with the Railway Employee Qualification Standards Regulations, which sets the minimum qualification standards for locomotive engineers, transfer hostlers, conductors and yard foremen. The regulations require the railway to provide employee training and to certify employees. Companies exist to provide the necessary training, and CP could administer the required certifying test. (However, as discussed further in chapter 18, CP is not interested in contracting to provide operating staff.) Extensive programs of recruitment/selection and training would need to be implemented for both locomotive engineers and on-board personnel.

Transport Canada Work/Rest Rules for Railway Rules for Railway Operating Employees (TC O 0-140) govern work/rest requirements for operating employees. Operating employees are allowed to be on duty up to 12 hours (Section 5.1.1 (a)). The on-duty time can be in two distinct periods to allow for split shifts. A minimum of eight hours is required between on-duty periods. In principle, these rules allow a crew member to work a split shift to cover both the morning and evening peak-period train runs.

Crew shifts have been estimated on a minimum eight-hour shift basis (i.e. at least one eight-hour crew shift is required per trainset). Subject to the agreement between the operator and its staff members, shifts can be up to 12 hours according to regulations. Figure 14-7 summarizes the number of eight-hour shift equivalents per day.

Figure 14-7: Crew Requirements

	Summer			Winter		
Scenario	Operating Trainsets per Day	Crew Shifts per Trainset (8-hour equivalent)*	Crew Shifts per Day	Operating Trainsets per Day	Crew Shifts per Trainset (8-hour equivalent)	Crew Shifts per Day
Low	4	1.5	6	2	2	4
Medium	4	1.5	6	2	2	4
High	4	1.5	6	2	2	4

*Two of the trainsets would layover in Banff, so crews of this train would work a split shift; that is, two trainsets would require one crew-shift to cover the entire day, whereas two trainsets would require two crews. Source: CPCS analysis

[68] Canadian Rail Operating Rules, General Rule M.

[69] We understand that the three-person crew is standard on most GO Transit lines. However, on the GO Transit Milton Line, there are typically no onboard service personnel.

14.4 Rolling Stock Maintenance, Servicing and Stabling Requirements

14.4.1 Maintenance Requirements

Rolling stock would need to be rebuilt, maintained and inspected in accordance with the following regulations:

- Railway Safety Appliance Standards Regulations;
- Railway Passenger Car Inspection & Safety Rules; and
- Railway Locomotive Inspection and Safety Rules.

The scheduled maintenance (e.g. replacing fluids and filters, addressing original equipment manufacturer requirements, etc.), as well as cleaning and stabling of rolling stock, would be undertaken at the depot. With a spare trainset, maintenance work on the spare locomotive could be completed at any time; otherwise, it would need to be in the overnight hours. Job classes required would include electrician, mechanics, carmen/women and general cleaners. At all operating times, employees would need to be engaged in work or available on call to respond to service failures. Fuelling would be direct from truck.[70]

14.4.2 Maintenance Depot

A maintenance depot would need to be constructed in or near Calgary to service rolling stock. The depot would need to be equipped to undertake running maintenance and scheduled maintenance (fluids, filters, OEM requirements, etc.), as well as store rolling stock when not in use. Required equipment includes:

- A fuelling site complete with drip trays and oil-water separators
- Drop tables for component change-outs
- A concrete pit (or elevated track) for undercarriage service
- An overhead steel building complete with compressed air and pneumatic tools and lunch room, office and washroom facilities
- Cleaning and washing equipment

To show a typical arrangement of such a facility, Figure 14-8 shows the Rocky Mountaineer storage and maintenance facility in Kamloops. Maintenance and administration buildings are shown on the left-hand side of the photo and storage tracks on the right, with access roads at either end of the yard. Given that the potential Bow Valley-Calgary service would have relatively short rolling stock sets, there would be fewer and shorter storage tracks.

[70] Fuelling would either need to take place at the maintenance depot or while a train is stationed in Banff, as the Calgary station location would have limited vehicle access.

Figure 14-8: Typical Arrangement of Facility (e.g. Rocky Mountaineer)

Source: Google

Because this service would also be intended to provide commuter service to Cochrane, a depot located at the east end of Cochrane, alongside the CP right-of-way in the commercial/light-industrial area, would be preferred, to minimize the length of the non-revenue movement from the depot to the station stop in Cochrane. If a suitable location were not identified, then a location near Keith would likely be the second preference.

15 Rail Station Requirements

Key Chapter Takeaways

- Rail stations have been proposed for Downtown Calgary, Keith, Cochrane, Canmore and Banff.
- All stations are proposed to have a 130-metre-long high platform at 1.22 metres above top of rail to permit level boarding, including in Banff, as the existing low platform does not permit level boarding.
- Besides track and platform infrastructure, stations would typically require some pick-up and drop-off facilities, park and rides, bus bays and other intermodal facilities. In most cases, the rail service is proposed to be integrated with planned facilities. However, at Keith station, a new purpose-built park-and-ride facility would be needed.

15.1 Station Requirements

Figure 15-1 summarizes the rail station track and platform infrastructure requirements. Because many customers would bring luggage and equipment, as well as to allow for accessibility, it would be highly desirable for station platforms to allow for level boarding. For a high-floor DMU, the platform height would need to be 1.22 metres (48 inches) above top-of-rail. Some bi-level cars are also compatible with this height. In addition, the track lengths cited are the minimum required. The platforms should be designed to accommodate at least one additional car in cases of higher than expected demand.

In Banff, because two of the trainsets would layover during the day, an additional layover track would be required to accommodate these trainsets and keep the main platform free. Otherwise, it is assumed that the passenger trains would stop on the proposed dedicated track.

Figure 15-1: Station Linear Infrastructure Requirements

Station Track and Platform Requirements	
Downtown Calgary East*	• Single 130-metre (up to four cars and locomotive) station stub-ended track • Single high platform • Switch-off of CP’s south downtown track
Keith	• Single 130-metre (up to four cars and locomotive) station track siding on south side of right-of-way • Single side high platform on south side
Cochrane	• Single 130-metre (up to four cars and locomotive) station area along dedicated track • Single-side high platform on south side

Station Track and Platform Requirements	
Canmore	• Single 130-metre (up to four cars and locomotive) station area along dedicated track • Single-side high platform on south side
Banff	• Single 130-metre (up to four cars and locomotive) station track area at stub end of dedicated track • Single-side high platform • 260 metres of layover track with switch-off of dedicated track

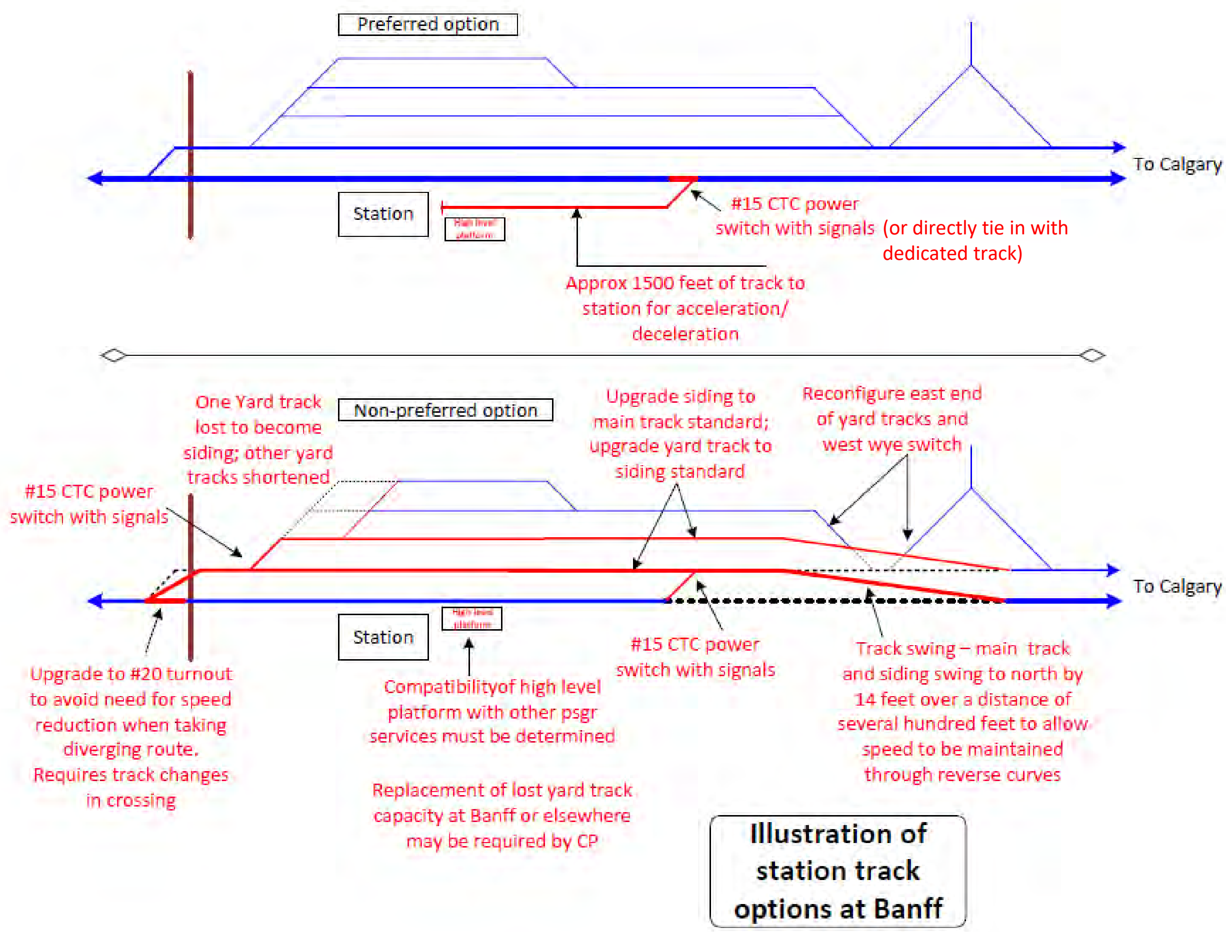
*A station near Sunalta could also be considered, though for further analysis we assumed it would be on the east end of downtown. Source: CPCS Team analysis

In Banff, we propose that the station track be located on the east side of the existing station building. The top of Figure 15-2 shows the general location. While there is a potential alternative that could utilize the existing mainline, there would be additional costs involved in relocating and reconfiguring the existing yard tracks in Banff to convert the mainline into a station track. This option, also shown in Figure 15-2, would result in higher capital costs, and has not been further studied. Should it be pursued, compatibility with the existing service by Rocky Mountaineer would need to be confirmed with respect to:

- Scheduling, to ensure that the proposed Calgary-Banff service does not impact Rocky Mountaineer ability to arrive and depart at the station; and
- Clearance, to ensure that the higher platform does not enter the clearance envelope of the Rocky Mountaineer rolling stock.

In addition to the station track Figure 15-2, a second layover track would be required to keep the station tracks free for other Calgary-Banff passenger trains.

Figure 15-2: Approximate Station Configurations, Banff



Source: CPCS Team analysis

15.1.1 Park-and-Ride Facilities

In two of the three large passenger markets for the rail service, Calgary residents and Bow Valley residents, customers are expected to primarily rely on their personal vehicles to access stations. As a result, park-and-ride facilities are recommended at stations to accommodate passengers arriving by car (Figure 15-3). Park-and-ride facilities should be located in well-lit areas within close proximity to the highway network and allow for overnight parking of vehicles. Similar to the bus scenarios, a number of assumptions including the percentage auto mode split, etc. have been made to determine these figures.

Figure 15-3: Park-and-Ride Space Requirements (Medium Scenario)

Station	Short-Term (2022)		Long-Term (2042)		Notes
	Weekday	Weekend	Weekday	Weekend	
Downtown Calgary	minimal	minimal	minimal	minimal	
Keith	80	125	125	185	New facility required (Figure 14-3 and Figure 14-4).
Cochrane (Bow Valley Demand)	5	5	10	10	Not required.
Cochrane (Calgary Demand)	160	55	265	90	Providing parking for Cochrane to Calgary commuters is outside of the scope of this study, but should be further investigated.
Canmore	25	20	35	30	Provide new park and ride on land adjacent to station.
Banff	minimal	minimal	minimal	minimal	Accommodate within existing supply (500 stalls)

Source: Dillon Consulting analysis

The primary park-and-ride facility to be constructed for the Calgary to Bow Valley rail service would be located at Keith station. To confirm space availability, Figure 15-4 and Figure 15-5 show high-level concepts for this facility.[71]

[71] The purpose of these conceptual designs is to quantify the land requirements for these stations, to confirm that adequate space is available at potential locations, and to estimate the capital cost. Other locations in the vicinity of these locations could also be considered and no detailed consultations with landowners have been undertaken. Discussions with landowners would need to be undertaken in the next steps of the project, should the Town of Banff and its partners move forward with further planning.

Figure 15-4: Keith Station (East Side)

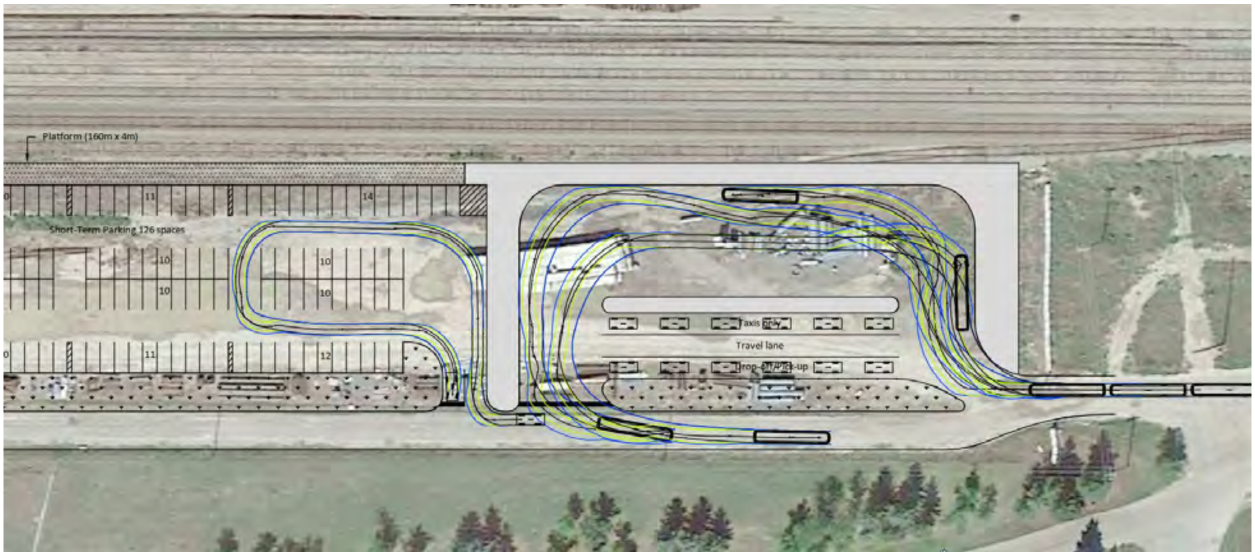


Figure 15-5: Keith Station (West Side)

Source: Dillon Consulting

15.1.2 Passenger Pick-Up and Drop-Off Facilities

Pick-up and drop-off facilities are recommended for each auto-oriented station in the network. Pick-up/drop-off spots encourage more sustainable methods of transportation and decrease the requirement for park-and-ride facilities. They serve personal vehicles, taxis and ridesharing services. Pick-up/drop-off facility guidelines were based on a review of other existing commuter rail stations in Canada.

A review was conducted of existing suburban GO Transit park-and-ride lots to determine the ratio of pick-up/drop-off spaces to park-and-ride spaces. Typically, there are four pick-up/drop-off spaces for each 100 park-and-ride spaces. Park-and-ride lots with fewer than 250 spaces typically did not have passenger pick-up/drop-off facilities in the GO Transit rail network. Regardless, it is recommended that all stations with significant estimated passenger volumes be equipped with pick-up/drop-off facilities. Figure 15-6 summarizes the potential needs.

Figure 15-6: Passenger Pick-Up and Drop-Off Needs

Location	Proposed Improvement
Calgary Downtown	Hold further discussions with the City of Calgary as to whether some of the parking spaces adjacent to the Green Line station could be used as a drop-off point (see Figure 15-7).
Calgary Keith	Conceptual design includes a pick-up and drop-off area located close to the station's platform, with a dedicated lane for taxis and ridesharing vehicles.
Cochrane	Incorporate pick-up and drop-off area into park-and-ride facility.
Canmore	A passenger pick-up/drop-off area should be implemented by designating up to five time-limited parking spaces near station platform.
Banff	A passenger pick-up/drop-off area should be implemented in front of the Banff Train Station as part of its redevelopment, e.g. designated time-limited parking spaces close to the facility's main entrance, or a small loop.

Source: Dillon Consulting

Based on discussions with the City of Calgary, a number of changes in the vicinity of the Downtown location are expected due to the construction of the Green Line station and the associated CTrain tunnel portal on the west side of 4 Street SE. In particular, the City of Calgary is exploring using the 10 Avenue SE cul-de-sac as a bus drop-off point (in the case of CTrain disruptions), which will be connected by overpass from the Green Line station (Figure 15-7). Further discussions should be held with the City of Calgary as to whether some of the adjacent parking spaces could be used as a drop-off point.

Figure 15-7: Downtown Calgary Station – Proposed Bus Loop

Source: Google, with markups by CPCS

15.1.3 Connecting Transit Improvements and Bus Bay Requirements

An important attribute of a rail station is its interface with other modes of transportation. More specifically, connecting transit is crucial to providing an integrated transportation system. As a result, it is desirable to facilitate bus connections at the proposed rail stations. Where feasible, bus connections have been designed to occur on-site, as summarized in Figure 15-8.

Figure 15-8: Connecting Transit Requirements

Station	Existing Transit	Current State	Future Transit	New Requirements
Downtown Calgary	On-street routes	On-street stop	Green Line 4 Street SE station Potential routes 1, 75, 302, 305, 411	Based on discussions with the City of Calgary, would leverage a planned bus loop at 10 Avenue SE.
Keith*	None	None	Potential route 40 or 1	Dedicated bus platform with 2-3 bus bays.
Cochrane	None	None	Cochrane Transit Routes	New transit hub planned adjacent to station; incorporate plans for rail service into design.
Canmore	On-street routes	On-street stop	Potential Roam Transit Route 3, 5 stops directly on-site **	Incorporate into proposed terminal southeast of Elevation Place.**

Station	Existing Transit	Current State	Future Transit	New Requirements
Banff	Roam Transit Route 4, 6 Greyhound Brewster	Bus terminal accommodating approximately 6 buses	Roam Transit Route 4b, 6 Hotel Shuttles Downtown shuttle Roam Transit Banff to Lake Louise bus Roam Transit Banff to Lake Louise bus Brewster**	New bus terminal design to accommodate up to 12 buses.

*The City of Calgary indicated a preference that the proposed station be located on the north side of Keith. A change to local Calgary Transit service is recommended to provide transit access to Keith Station. The City of Calgary indicated it would conduct a service plan review shortly before the planned opening of a rail service to determine necessary changes.

** Described in detail in chapter 7.

Source: Dillon Consulting analysis

16 Rail Operating Costs

Key Chapter Takeaways

- Annual operating costs are expected to be approximately between $13.4-$14.2 million per year during the forecast period. The largest fraction of these costs is for maintaining and operating the dedicated track.
- In 2022, the net operating cost requirement is expected to be between $8.1-$9.8 million per year and farebox recovery ratio is expected to be between 27-43%. The estimated net operating cash requirement is expected to be between $6.9-$9.1 million, with the lower figure representing that high scenario. Again, though the rail service would not be implemented until the mid-to-late 2020s, 2022 has been selected to be a consistent horizon year for comparison with bus service.

16.1 Rolling Stock Operating and Maintenance

16.1.1 Fuel and Other

Figure 16-1 summarizes the fuel costs assumed in the operating costs. Fuel costs can be volatile, though they are a relatively small component of the overall costs of operating.

Figure 16-1: Fuel and Oil Costs

Item	Value	Unit
Diesel fuel cost	1.00	$ / litre
Oil & Other (% of diesel)	5%	

Source: CPCS analysis of various sources

Figure 16-2 shows the estimated annual fuel costs, by scenario. All costs shown are for the entire forecast period except if noted.

Figure 16-2: Annual Fuel Consumption

Scenario	Low	Medium	High
Estimated Fuel Consumed (million litres)	2.3	2.7	2.8
Fuel, Oil and Other (millions)	$2.4	$2.8	$2.8

Source: CPCS analysis

16.1.2 Maintenance Charges

To estimate the cost of rolling stock maintenance, we reviewed relevant studies. Because the fleet of rolling would be relatively small, we also consulted with industry experts to ensure that the estimated maintenance cost in the lowest scenario would likely be adequate.

A business case for increases to GO Transit service estimates the cost of its maintenance at approximately $1.39 per locomotive-km and $1.06 per car-km for its unpowered bilevel cars. These costs are based on GO Transit actuals in 2013-2014, and are noted as being inclusive of cleaning but exclusive of periodic refurbishment (which is treated as a capital cost).[72] Because each DMU has an onboard engine, its maintenance requirements more closely resemble that of a locomotive than an unpowered car, so a cost of $1.39 per locomotive-km was assumed. All costs have been converted to per miles and inflated to 2017 dollars.

Figure 16-3 summarizes the estimated annual maintenance charges, by scenario. We understand from another source that typical maintenance requirements for a DMU for a small fleet, can be about $200,000 to $250,000 per year. In the low scenario, the annual maintenance cost works out to $188,000 just under this range. Some of the DMUs or cars would not need to be used for the entire year due the lower demand in the winter, so the fact that the estimate is slightly lower is reasonable.

Figure 16-3: Estimated Annual Maintenance Costs

Vehicle type	Cost per vehicle mile	Low		Medium		High	
		Annual Miles (million)	Cost (millions)	Annual Miles (million)	Cost (millions)	Annual Miles (million)	Cost (millions)
DMUs	$2.32	1.2	$2.8	1.4	$3.3	0.0	0.0
Locomotives	$2.32	0.0	0.0	0.0	0.0	0.5	1.1
Cars	$1.76	0.0	0.0	0.0	0.0	1.2	2.1
Total			**$2.8**		**$3.3**		**$3.2**

Source: CPCS analysis of sources noted

16.2 Operating Labour

In order to estimate the potential operating labour cost for the crew members described in section 14.3.2, we have used figures in the GO Transit business case noted above, in conjunction with Metrolinx's 2014-2015 Annual Report.[73] In the business case, it notes that the annual crew costs are $44 million in 2014 and, in the annual report, there are 52 trainsets per weekday operating.[74] Assuming two daily shifts (16 hours) per weekday per trainset, the estimated hourly crew cost is approximately $210 per hour per three-person crew. Factoring this estimate by two-thirds results in a two-person crew cost of approximately $140 per crew per hour. We have used this figure, noting

[72] Metrolinx. GO RER Initial Business Case.
[73] Metrolinx. GO RER Initial Business Case.
[74] In 2014, there was weekend service operating on one line.

that the minimum daily shift is eight hours per crew (i.e. approximately $1,120 per eight-hour shift). For all scenarios, the crewing costs are expected to be similar (Figure 16-4)

Figure 16-4: Annual Crew Costs

Vehicle type	Low		Medium		High	
	Annual shifts	Cost (millions)	Annual shifts	Cost (millions)	Annual shifts	Cost (millions)
DMUs	1,800	$2.0	1,800	$2.0	1,800	$2.0

Source: CPCS analysis

16.3 Track Maintenance and Operations Costs

Unlike for a bus service, which only indirectly pays for the cost of the infrastructure it uses through licensing fees, fuel taxes, etc., a train service would be required to pay directly for the infrastructure utilized, including the track maintenance and operations costs for new track primarily used by the passenger service, as well as track access charges for use of shared infrastructure by CP.

Track access charges are used to compensate the host railway for the rail capacity utilized by the passenger rail service, and for the operations and maintenance activities undertaken by the host railway (e.g. coordination, dispatching, infrastructure maintenance, etc.). Some of these costs are specific to the passenger rail service (i.e. are incremental costs), whereas other costs are shared with freight services.

In Canada, track access fees are negotiated and agreed in confidential contracts between passenger rail operators and the private freight railways, which own most of the track. As a result, there is limited public benchmarking of these charges. While there can be some technical analysis of the costs associated with track access (e.g. incremental maintenance costs associated with the passenger operations), the final track access costs would be developed through negotiations with CP.

16.3.1 Review of Existing Agreements

CPCS has reviewed one track-access agreement between CP and BC Rapid Transit Company related to the West Coast Express commuter rail service. In this agreement there are two primary fee components, a charge for shared infrastructure use, pertaining to the use of existing infrastructure capacity, and a charge for operating, which pertains to costs related to operations and maintenance of infrastructure. The charge for operating includes both incremental costs related to the commuter rail service itself (e.g. an additional CP manager to liaise between the operator and CP), as well as shared costs (e.g. crossing warning system maintenance, etc.).

If a dedicated track were to be constructed, the cost for shared infrastructure use would not be applicable, except in downtown Calgary. However, rather than pay CP an ongoing charge, we assume CP would be compensated for this capacity usage through the construction of additional infrastructure capacity elsewhere on its network.

The charge for operating for West Coast Express is approximately $18.70 per train-mile.[75] Based on an estimated 473,000 train-miles per year for the proposed Calgary-Bow Valley service, the estimated annual operating charge would be approximately $8.8 million per year.

16.3.2 Bottom-up Estimate

We also undertook a bottom up estimate of the potential cost of operating and maintaining the dedicated track, focusing particularly on maintenance costs.

We have estimated track maintenance charges on the basis of the paper "Estimating Maintenance Costs for Mixed Higher Speed Passenger and Freight Train Corridors", updated to 2017 dollars and converted to Canadian dollars.[76] This resource provides an estimated maintenance charge for track per mile, based on parameters including class of track, curvature and traffic mix between freight and passenger. For approximately 80 miles of new track at $64,000 per mile per year, the estimated annual maintenance costs are $5.1 million per year.

Benchmarking this figure, Metrolinx GO Regional Express Rail Initial Business Case estimates that the annual fixed cost of track infrastructure would be approximately 1% of the track capital cost plus a variable charge per train-mile. For a three-car, diesel locomotive-hauled consist, the variable charge would be approximately $1.90 per track mile. Applying these figures to this corridor using the medium scenario, the estimated maintenance costs would be approximately $4.9 million per year (Figure 16-5), comparable to the estimate above.

Figure 16-5: Estimated Total Maintenance Charges Using Metrolinx Figures

Cost Component	Unit Cost	Actual Units (in millions)	Estimated Cost (millions)
Fixed Cost (percentage of capital cost)	1%	$380	$3.8
Variable Cost (train-miles)	$1.90	0.5	$1.0
Total			**$4.9**

Source: CPCS analysis of Express Rail Initial Business Case

Though it is not specifically noted in the case of the Metrolinx study, these figures represent the long-term, steady-state maintenance needs of the line. In the case of a dedicated track, though regular inspection and maintenance would be required as soon as the line opens, renewal costs would be lower (e.g. rail and tie replacements) and ramp up over a period of about 20 years.[77] Capital renewal costs are not specifically isolated in the figures cited above, so it is not possible to directly isolate these for calculations.

CP would also need to be compensated for providing other services, including notably dispatching, overall right-of-way maintenance, policing/security services, etc. One study indicated that that the cost for dispatching and other out-of-pocket costs experienced by a freight railway was approximately $0.57 per train-mile (converted to Canadian dollars and inflated to 2017 dollars).[78] The study notes

[75] Purchase of Services Agreement Between CP Rail System and BC Transit, inflated from 2007 dollars in the agreement to 2017 dollars.
[76] Zarembski and Patel. Proceedings of the 2010 Joint Rail Conference (JRC2010). April 27-29, 2010, Urbana, IL, USA.
[77] TEMS and Quandrel Consulting. 2008. High Speed Rail Feasibility Study Methodology Technical Report.
[78] TEMS and Quandrel Consulting. 2008. High Speed Rail Feasibility Study Methodology Technical Report.

that this is only the *incremental* cost of any passenger rail operation, so does not include any allowance for the host railway's fixed costs related to providing these services. CP would likely require a contribution towards the fixed cost of providing these services, particularly as the new service would be a significant user of the overall right-of-way.

To summarize, we have added $0.3 million (473,000 train-miles x $0.57) to the overall cost of the first maintenance cost estimate. We have also added the cost of a dedicated CP manager to oversee the contract ($125,000). Figure 16-6 summarizes the estimate using this methodology.

Figure 16-6: Estimate of Track Operations and Maintenance Charges (Steady State)

Cost Component	Annual Maintenance Cost (millions)
Track maintenance and renewal	$5.1
Track operations	$0.3
CP Manager	$0.1
Subtotal	**$5.5**
CP profit (assumed 15%)	$0.8
Total	**$6.3**

Source: CPCS analysis

16.3.3 Summary

Both approaches to estimating the operating and maintenance costs pursued have advantages and limitations. The first approach (applying an existing agreement) is more accurate in the sense that it includes shared costs for operations, but the underlying basis for how shared costs are distributed is less clear. The second approach using a bottom-up estimate excludes shared costs (so is likely too low), but the estimate of maintenance costs is based on the specific context.

As a starting point, we have taken an average of the two costs, which is $7.6 million per year. As mentioned, however, both are based on long-term, steady-state costs. Because the dedicated line would be new, some renewal costs would be lower in the first years of operations (i.e. starting at nearly zero then ramping up to 100% by year 20). However, many of the costs, including regular maintenance, dispatching, etc. would be required from the start. On average over the forecast period of the new rail, we have assumed costs at 75% of the long-term, steady-state costs, or $5.6 million per year.

Ultimately, these costs represent a significant fraction of the overall operating costs and they are subject to significant uncertainty, as they would be determined through negotiations with CP. On one hand, CP may seek additional charges related to land leasing required for the dedicated track and stations. On the other, it could also be explored if there is any benefit to CP utilizing the line when passenger service does not operate (e.g. overnight). Ultimately, these

Ultimately, these costs represent a significant fraction of the overall operating costs and they are subject to significant uncertainty, as they would be determined through negotiations with CP.

estimates are correct in their general order of magnitude, but further analysis of costs and allocation between the passenger operator would need to be undertaken.

16.4 Insurance

A rail service operator would be required to maintain several insurance policies. Most significantly, it would be required to maintain coverage for third-party liability. An Alberta-regulated railway must maintain $25 million in third-party liability insurance for each occurrence.[79] However, in Canada, a host railway may set its own liability insurance limits as part of a track access agreement. In consultations with CP, it has indicated that at minimum $100 million third-party liability insurance coverage would be required to operate over its track. This limit is subject to negotiation with CP, which may request a higher limit based on the expected number of train frequencies, ridership, etc.

Based on $100 million in liability coverage, annual premiums would be approximately $200,000.[80] An additional $100 million in coverage ($200 million total) would increase the premium by an additional $100,000 per year ($300,000 total). These estimates are based on a number of assumptions by potential underwriters and have been rounded to the nearest $100,000. For the purposes of this analysis, we have assumed $200,000 per year in insurance premiums.

To reduce these costs, the operating authority could explore having the Province of Alberta indemnify the operating authority for a portion of claims between $25 million and $100 million. Effectively, this would be a non-cash operating subsidy by the Province of Alberta.

16.5 Station and Depot Operating Costs

We have assumed that stations would not be staffed regularly, but would require cleaning and trash removal, security, etc. As a component of the overall costs, these costs are relatively low, assuming that stations are generally unstaffed, but have electronic ticket vending machines, etc.

To some degree these elements could be contracted to station owners and operators that serve the facility, but at minimum some level of security would need to be provided by the transit system itself, to survey for trespassing, etc. through a closed-circuit television (CCTV) system, and dispatch appropriate personnel in case of an incident, liaise with CP, etc. One study cited a cost of about $100,000 (CAD) in 2017 dollars, though this also includes cleaning, etc. [81] We have assumed about $300,000 total, based on the need to have at least one staff member monitoring CCTV continuously during system operations.[82]

Other station operating costs would be driven by the need for snow removal, notably for park-and-ride facilities. As Keith station would be dedicated to rail and have a large park and ride, some

[79] Section 37, Alberta Railway Regulation (177/2002).

[80] We acknowledge the Alberta Urban Municipalities Association for the efforts undertaken to develop this estimate.

[81] TEMS and Quandrel Consulting. 2008. High Speed Rail Feasibility Study Methodology Technical Report.

[82] At least two staff members per day would be required to cover the full hours of operation, plus an additional employee required for days off, vacation, etc.

maintenance costs would need to be budgeted. A 2011 Calgary Transit report estimated the cost of maintaining park-and-ride facilities at approximately $200 per space. Adjusted for inflation, the cost is approximately equivalent to $250 per space in 2017 dollars. This amount covers costs relating to snow removal, lighting, security, and light maintenance of parking areas.

Stations without large dedicated park and ride and passenger pick-up and drop-off facilities (Cochrane, Canmore, and Banff) may incur some costs for platform maintenance and snow removal. We have budgeted for a platform shelter (in the capital cost) to minimize snow and ensure passenger comfort; however, further analysis would be needed to assess whether this could minimize snow ingress while being outside of the clearance envelope of trains. Alternatively, heating of the platform slab while the train is in service could be explored.

Figure 16-7: Keith Park-and-Ride Costs

	Low	Medium	High
Number of stalls (short-term)	150	225	575
Number of stalls (long-term)	240	370	890
Annual maintenance costs	$60,000	$90,000	$220,000

Source: CPCS Team analysis

For the rail maintenance depot, we have allowed for a budget of $25,000 per year for snow clearing for all scenarios.

16.6 Supervisory, Management and Other Fixed Costs

In order to manage the rail operations, some supervisory resources would be required. We have included within the operating cost estimate an estimate of $150,000 per year for a general manager, and $125,000 per year for an operations supervisor. Maintenance supervisors would also be required, but these are assumed to be included in the vehicle and track maintenance costs estimate.

We have not included any market expenditures within these estimates, for comparison with the bus estimates. Section 8.2 outlines recommended website and call centre staff.

16.7 Summary

The estimated annual OPEX for the three scenarios is shown in Figure 16-8.

Figure 16-8: Annual OPEX Summary in Millions, Typical During Forecast Period

	Low	Medium	High
Fuel	$2.4	$2.8	$2.8
Rolling Stock Maintenance	$2.8	$3.3	$3.2
Operating Labour	$2.0	$2.0	$2.0
Track Operations and Maintenance	$5.6	$5.6	$5.6
Fixed Supervisory Labour	$0.3	$0.3	$0.3

	Low	Medium	High
Station and Depot Costs	$0.4	$0.4	$0.4
Insurance Charges	$0.2	$0.2	$0.2
Total Rail Operating Costs	**$13.7**	**$14.6**	**$14.5**

Includes potential service to/from Cochrane. Source: CPCS Team analysis

Figure 16-9 summarizes metrics relating the costs to ridership and revenues, including the operating subsidy and farebox recovery ratio. Though in 2022 the rail service would not be operational, it was selected to compare with bus in its opening year.

Figure 16-9: Metrics

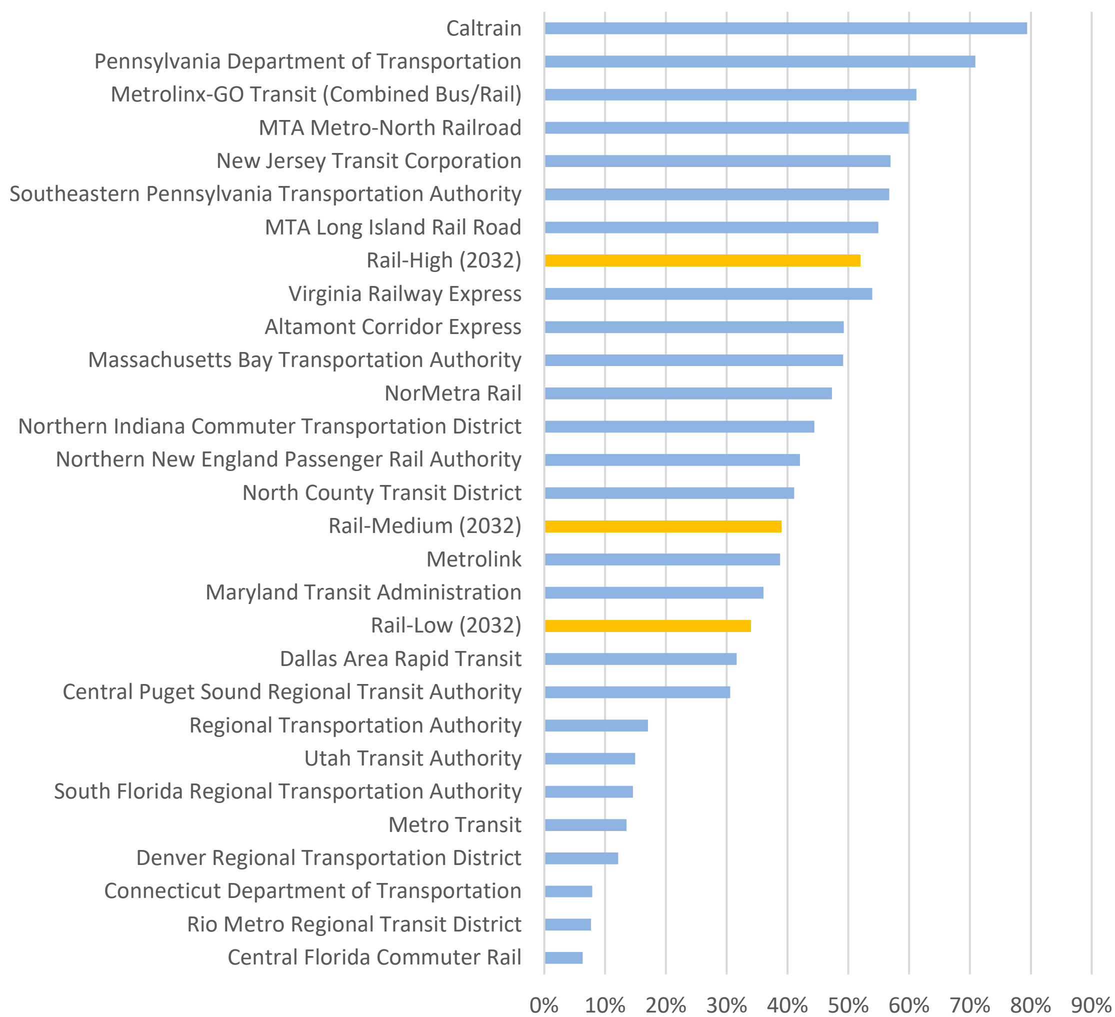
	Metric	Low	Medium	High
2022	Annual ridership, 2022 (in thousands)	220	300	620
	Annual revenues (in millions)	$3.6	$4.5	$6.1
	Farebox recovery ratio (revenues / operating costs)	27%	31%	42%
	Net operating cash requirement (in millions)	$10.1	$10.1	$8.4
	Operating subsidy per rider served	$46	$34	$14
2032	Annual ridership (in thousands)	270	360	750
	Annual revenues (in millions)	$4.6	$5.7	$7.6
	Farebox recovery ratio (revenues / operating costs)	34%	49%	52%
	Net operating cash requirement (in millions)	$9.1	$8.9	$6.9
	Operating subsidy per rider served	$34	$25	$9

Note: Annual revenues include additional revenue from Cochrane-to-Calgary service. Source: CPCS Team analysis

Figure 16-10 compares the farebox recovery rail of the proposed services with selected[83] commuter rail systems in the US and Canada. At 54%, the Rail-High scenario would fall in the top third of systems in 2032, whereas the other rail scenarios would fall in the lower half to third. For comparison, VIA Rail's revenues to operating expenses (excluding contributions for employee benefits) is approximately 62% in 2017, across its network.[84]

[83] The data do not include information for commuter rail services in Vancouver and Montreal.
[84] VIA Rail Canada. 2017 Annual Report.

Figure 16-10: Comparison of Farebox Recovery Ratio



Source: CPCS analysis of US Federal Transit Administration National Transit Database

17 Rail Capital Costs

Key Chapter Takeaways

- The capital cost for a proposed rail service is expected to be approximately $660-680 million, including track, stations, maintenance deport and rolling stock.
- The track component (excluding station tracks) is expected to be approximately $380 million, excluding engineering and contingency.
- Each station is expected to have a capital cost of approximately $4 to $6 million, excluding park-and-ride facilities.
- Five sets of rolling stock are estimated to be needed. The total cost for rolling stock is expected to be $70 to $90 million.

The subsections below present the estimated capital costs for each of the elements required (track, stations, maintenance depot, rolling stock, bus and local transit improvements). These costs are exclusive of engineering and contingency. Given the conceptual nature of the scenarios and the designs, they should be considered order of magnitude only.

17.1 Track

Figure 17-1 provides our estimates of the capital construction costs of new track infrastructure for all scenarios, excluding track infrastructure required specifically for the new train stations. The methodology for developing the unit costs is described in Appendix F, and are based on the existing track standards used on the Laggan Subdivision (i.e. Class 4 track). The number of units were identified using data provided by CP regarding the existing infrastructure, team's knowledge of the corridor, and reviews using Google Earth.

Track components, such as rail, ties and turnouts can have maximum lifespans up to 100, 36 and 30 years respectively.[85] However, these components are subject to wear, and may need to be replaced before this lifespan. Chapter 16 discusses the ongoing maintenance costs associated with the track infrastructure.

[85] Zarembski and Patel. Proceedings of the 2010 Joint Rail Conference (JRC2010). April 27-29, 2010, Urbana, IL, USA.

Figure 17-1: Linear Infrastructure Cost

Item	Unit	Unit cost ('000)	Number of Units	Extended Cost ('000)
New track construction adjacent to main track, prairie grassland, no S&C*	mile	$2,950	42	$123,067
New track construction adjacent to main track, forested, no S&C	mile	$3,500	13	$46,585
New track construction adjacent to main track, over wet area	mile	$4,800	7	$32,160
New track construction adjacent to main track, urban area	mile	$9,200	6	$51,428
New track construction adjacent to main track, cutting into earth slope	mile	$8,800	4	$39,512
New track construction adjacent to main track, cutting into rock	mile	$12,500	1	$7,625
New track construction on existing track bed	mile	$2,800	10	$28,838
Add new track to CTC**	mile	$182	83	$15,054
New #15 switch (dual control)	switch	$240	10	$2,400
New #20 switch (dual control)	switch	$331	1	$331
Level crossing surface for second track (crossings usually 40 ft.)	foot	$1	775	$550
Change crossing protection to add additional track	crossing	$115	19	$2,185
Change crossing protection for increase in train speeds	crossing	$16.00	19	$304
CMP*** culvert	foot	$1.15	1440	$1,656
Bridge support bents	bent	$49	25	$1,225
Single track concrete bridge span	foot	$8	2076	$16,442
New control point	each	$469	11	$5,159
Subtotal				**$375,000**
Extend two tracks at Keith to 11,000 feet to offset capacity lost downtown	each	$6,126	1	$6,200
Total				**$381,200**

*Signals and Communications **Centralized Traffic Control ***Corrugated Metal Pipe. Source: CPCS Team analysis

17.2 Station

17.2.1 Track and Platforms

Figure 17-2 summarizes the station capital costs for the track and platform infrastructure.

Figure 17-2: Track and Platform - Station Capital Costs ($'000)

Item	Unit	Unit cost ($'000)	Down-town Calgary	Keith	Cochrane	Can-more	Banff
New track construction adjacent to main track, urban area	mile	9,200	0.14				
New track construction on existing track bed	mile	2,800					0.22
Add new track to CTC	mile	182					0.22
New #15 switch (dual control)	switch	240	1				1
High platform (48 inches above TOR) 12-foot width – one side of tracks	sq. foot	0.226	5,200	5,200	5,200	5,200	5,200
Station canopy (12-foot width)	sq. foot	0.56	5,200	5,200	5,200	5,200	5,200
Lighting, benches, phone, bike rack, maps	platform	60.5	1	1	1	1	1
Display signs on platform	platform	10.1	1	1	1	1	1
Change crossing protection for increase in train speeds	crossing	16				1	
New control point	each	469	1	0	0	0	1
Total per Station			**$6,139**	**$4,158**	**$4,158**	**$4,174**	**$5,523**

Source: CPCS Team analysis

17.2.2 Park and Ride, Bus Terminal and Other Costs

Figure 17-3 summarizes the capital cost of the park and ride, bus terminal and other elements to connect the rail platform to the bus platform at Keith Station. We have included no cost for the Downtown Calgary station as it could likely tie into the existing infrastructure proposed for the Green Line station. In practice, some nominal cost sharing would be required to construct an additional bus bay on 10 Avenue SE and possibly some additional drop-off spots. We have also not included any additional costs for Cochrane, Canmore or Banff, as developments in these locations would be expected to occur regardless of the development of a rail service.

Figure 17-3: Park and Ride, Bus Terminal and Other Element Capital Cost ($'000)

	Low	Medium	High
Keith Station	$3,300	$3,800	$5,900

Source: Dillon Consulting analysis
Note: Costs noted above follow a Class 4 Conceptual Design estimate. The estimate was prepared based off the aerial conceptual drawings and do not include detailed geotechnical & municipal infrastructure data. As a result, the variance of the cost estimate is expected to be -40% to +75%. Costs also do not include land acquisition or permitting. As these costs are a relatively small component of the overall costs, the capital costs have been factored depending on the total number of stalls required in each scenario.

17.3 Maintenance Depot

Based on an approximate bottom-up analysis of the various components required, and consultations with industry, we anticipate that the capital cost of a maintenance depot would be about $3 million. At a high level, Figure 17-4 summarizes the elements that would be required.

Figure 17-4: Items of Work for Maintenance Depot

Item of Works	Cost
Site development (earthwork, drainage, services and paving)	$250,000
Maintenance shed	$400,000
Concrete pit (or elevated track)	$100,000
Drop table	$100,000
Lightings and power outlets	$125,000
Fuelling site complete with drip trays and oil-water separator	$275,000
Firefighting system	$25,000
Cleaning and washing equipment	$25,000
Compressed air system and pneumatic tools	$150,000
Track work	$360,000
Miscellaneous tools and equipment	$50,000
Road vehicle	$90,000
New dual-control switch	$240,000
Land acquisition (one hectare)	$500,000
Total	**$2,690,000**

Source: CPCS analysis

17.4 Rolling Stock

Figure 17-5 shows the total estimated capital cost by scenario. The capital costs are in line with the information presented in chapter 13. In all scenarios, one spare set of rolling stock was assumed.

Figure 17-5: Rolling Stock Capital Cost

Vehicle Type (including Spares)	Low	Medium	High
Number of DMUs in service ($4.67 million/DMU)	15	15	0
Number of locomotives ($7.5 million/locomotive)	0	0	5
Number of cars ($3.4 million/car)	0	0	15
Total cost (in millions)	**$70.1**	**$70.1**	**$88.5**

Source: CPCS analysis

Rolling stock can have lifespans of 30-40 years or more. For example, some of VIA Rail's rolling stock is over 50 years old. However, the commercial life of rolling stock, driven by factors including maintainability, availability, customer acceptance, etc. is usually lower than that. Amtrak, for example, estimates a useful commercial life of approximately 20 years for diesel locomotives and 30 years for coaches.[86]

17.5 Summary

The estimated capital cost for the three scenarios is approximately $660 to $680 million (Figure 17-6). The slightly higher capital cost in the high scenario is due to the different rolling stock selected in the high scenario to account for the higher demand.[87]

Figure 17-6: Estimated Capital Cost (Millions)

	Component	Low	Medium	High
Infrastructure	Track (excluding stations)	$381	$381	$381
	Stations (trackside)	$24	$24	$24
	Station (park and ride, bus terminal)	$2	$3	$9
	Maintenance depot	$3	$3	$3
	Infrastructure subtotal	$410	$411	$413
	Contingency (30%)	$123	$123	$124
	Subtotal with contingency	$533	$534	$537
	Engineering (10%)	$53	$53	$54
	Infrastructure total	$587	$587	$591
Vehicles	Rolling stock	$70	$70	$89
	Total	**$660**	**$660**	**$680**

Source: CPCS Team analysis

[86] Amtrak. 2010. Amtrak Fleet Strategy.
[87] If DMUs were used to accommodate the demand in the high scenario rather than locomotive hauled trainsets, the cost would be higher than the current estimate; that is, the higher cost in the high scenario does not imply a non-optimal solution.

18 Rail Implementation Options and Timelines

Key Chapter Takeaways

- If a decision were made to move forward with the steps outlined above in 2018, a complete service likely would not be implemented until the mid-to-late 2020s
- Should Calgary pursue a bid for the 2026 Winter Olympics, it could serve as a potential target for service implementation, though would be somewhat aggressive.

18.1 Operating Structure

This section discusses the operating structure for a train service between Calgary and the Bow Valley. Though it would not primarily be a "commuter" service, the structure of commuter rail services has been reviewed, given that most commuter services enter multiple municipal jurisdictions, similar to this potential service.

18.1.1 Corporate Structure

For a potential rail service, we anticipate that a regional agency would either need to be created, or the mandate of the Bow Valley Regional Transit Services Commission expanded, to operate a passenger train service between Calgary and the Bow Valley. Such an approach is consistent with most commuter rail operations in Canada. All commuter rail services in Canada operating across multiple municipalities are configured in such a fashion:

- In Vancouver, the West Coast Express Limited, an operating company of the BC Rapid Transit Company Ltd., a subsidiary of TransLink, operates a commuter rail service to Vancouver along the Fraser Valley.
- In the Greater Toronto Area, GO Transit, a division of Metrolinx, operates regional bus and rail services across the region.
- In Montreal, the Réseau des transports métropolitains (RTM), operates commuter train and bus services across the region.

However, various aspects of the service could be contracted, as discussed below.

18.1.2 Operating Structure

In Canada, commuter rail operations are primarily contracted to third parties by a regional transportation agency. At GO Transit in the Greater Toronto Area, the RTM in Montreal, and West Coast Express in Metro Vancouver, Bombardier is contracted for most train operations. The exception in Canada is the Ottawa O-Train Trillium Line, which is operated by OC Transpo staff, the urban transit division of the City of Ottawa.

For the provision of train operations, potential options could include:

1. Contracting to CP
2. Contracting to another entity with expertise in rail operations
3. Operating the commuter rail service in-house

We have asked about CP's interest to operate the train service (i.e. providing crews, maintaining vehicles, etc.), but it has indicated it's not interested in operating a passenger rail service. As a result, only options 2 and 3 are plausible.

We would recommend consideration be given to contracting to an existing entity with expertise in railway operations in the area. To this end, we have also inquired as to the interest of Rocky Mountaineer to operate the service, given that it is the only passenger rail service provider operating in the area. Should the Town of Banff and its partners decide to move forward with further planning of a rail service, Rocky Mountaineer indicated an openness to potential discussions. Other operators could be identified through an expression of interest process.

18.1.3 Agreements with CP

To operate a train service, a passenger rail service would need to access CP's track and land. To operate a potential train service, the rail operating authority would need to enter into one or more agreements with CP to determine the terms for track access, to construct, operate and lease a dedicated track, as well as to lease land along its right-of-way for station and depot infrastructure. Agreements with CP would also be required regarding overall right-of-way maintenance, shared facilities (e.g. grade crossing warning devices, etc.). This agreement would need to be negotiated on commercial terms, subject potentially to limited regulatory recourse, further discussed in section 18.2.

For any purely dedicated infrastructure, such as the maintenance depot, a third-party maintenance company would need to be contracted to provide maintenance services. Two companies that provide these services include PNR Railworks and A&B Rail.

18.2 Regulatory and Related Considerations

18.2.1 Track Access and Construction

This section examines from a legal perspective how an Alberta-regulated[88] public passenger service provider, whether currently existing or to be established, would go about providing rail passenger services from Calgary to Banff and back. Ultimately, should a commercially negotiated agreement be reached with CP, which is the first, preferred course of action, then the need to consider the regulatory recourses below is not required. Any passenger rail operator would, of course, need to meet the safety and other requirements of the applicable federal and provincial legislation.[89]

We will focus on the following scenarios: the first one is that the Alberta-regulated public passenger service provider would run passenger trains from Calgary to Banff and back on the existing CP railway line; the second one is that a rail line would be built on CP's right-of-way. We assume that any new railway line, if built on CP right-of-way, would be owned or leased by CP (although paid in full or in part by the Alberta-regulated public passenger service provider or its funding partners), operated by CP[90] but used by the Alberta-regulated public passenger service provider to run passenger trains. Because of land constraints in certain areas (e.g. downtown Calgary), the Alberta-regulated public passenger service would need to access existing CP track, so both scenarios would occur in practice.

---

[88] The regulatory jurisdiction under which a railway operates is ultimately derived from the division of federal and provincial powers in the Constitution. In general, a railway that does not cross provincial or national borders would likely be provincially regulated, even if it has running rights over a corridor owned by a federally regulated railway. There are exceptions, namely if a passenger service provider were to be owned, controlled, leased or operated by a person who operates a railway within the legislative authority of Parliament (e.g. CP, VIA Rail, Rocky Mountaineer). However, the existence of a running rights agreement with a federally regulated railway in it of itself would not be sufficient for a railway to be deemed federally regulated. The Canadian Transportation Agency may be asked to determine the regulatory jurisdiction of a railway, but must follow its existing enabling legislation, which in turn is derived from the division of powers in the Constitution. The matter of jurisdiction would not be determined by the desirability (from the perspective of a regulator or operator) of having the passenger rail service provider and host infrastructure regulated by the same order of government.

[89] An Alberta-regulated passenger rail service provider would also be subject to federal rail safety legislation enforced by Transport Canada. Specifically, it would fall under the definition of a local railway company for the purposes of the *Railway Safety Act*, i.e. a person, other than a railway company or an agent or mandatary of a railway company, that operates railway equipment on a railway within the legislative authority of Parliament, of which CP Laggan Subdivision is certainly one. The *Railway Safety Act* and the regulations made under it are administered and enforced by Transport Canada. Other rail operators under provincial jurisdiction (e.g. Metrolinx GO Transit) fall under a similar definition when operating over federally regulated railways.

[90] I.e. the railway line would be operated and maintained by CP, while the passenger trains (and the passenger services) would be operated by the Alberta-regulated public passenger service provider. Section 87 of the *Canada Transportation Act* defines "operate" to include, with respect to a railway, any act necessary for the maintenance of the railway or the operation of a train. Canadian Transportation Agency's Decision No. 273-R-2001, dated May 24, 2001, in re *Application, as amended, filed jointly by the Agence métropolitaine de transport and Metropolitan Railways Inc., pursuant to section 91 of the Canada Transportation Act, for a certificate of fitness to operate a commuter train service on the right-of-ways owned by the Canadian National Railway Company and the St. Lawrence & Hudson Railway Company Limited in the metropolitan region of Montréal, in the province of Quebec)* provides a fairly good description of the role of the host railway company and that of the passenger train service operator when the host railway company grants running rights to the passenger train service operator.

CP is a federally regulated railway company[91] and its Laggan Subdivision also falls within federal jurisdiction. Relevant federal legislation concerning the matters discussed below includes the *Canada Transportation Act* and the *Railway Safety Act*.

First Variant – Running Rights Agreement

Preliminary matters – The first variant requires the Alberta-regulated public passenger service provider to enter into a running rights agreement with CP. These types of agreements are commercial agreements falling outside the scope of the *Canada Transportation Act* and are not always named "running rights agreements"; sometimes they are referred to as "Joint Facility Agreements", "Train Service Agreements", etc.[92])

If CP were to refuse to enter into such a running rights agreement, there is little that the Alberta-regulated public passenger service provider could do to oblige CP to grant it running rights over its Laggan Subdivision, as can be seen from our review of section 138 and section 152.1(1) of the *Canada Transportation Act.*

Section 138 of the *Canada Transportation Act*. This section provides that a railway company may apply to the Canadian Transportation Agency for a running rights order against another railway company.

Section 138 reads in part as follows:

> (1) A railway company may apply to the Agency for the right to (….) (c) run and operate its trains over and on any portion of the railway of any other railway company.
>
> (2) The Agency may grant the right and may make any order and impose any conditions on either railway company respecting the exercise or restriction of the rights as appear just or desirable to the Agency, having regard to the public interest.

There are two major drawbacks to any application under section 138:

- The Alberta-regulated public passenger service provider would need to become a federally regulated railway before making an application under section 138. For the purposes of the *Canada Transportation Act*, a "railway company" means a person who holds a certificate of fitness under section 92.[93] This is not only time consuming but may not even be possible in the case at hand (see below under the heading "No federal certificate of fitness is needed").
- There had been no decisions on section 138 of the *Canada Transportation Act*, or its equivalent in earlier legislation, before a set of three decisions were issued by the Canadian Transportation Agency, two in 2001 and one in 2002.[94] Writing in 2003, Evans J.A. of the

[91] See here the list of federal railway companies found on the Canadian Transportation Agency's website.

[92] See Canadian Transportation Agency's Decision No. 195-R-2013, dated May 17, 2013, in re: *Application by VIA Rail Canada Inc. pursuant to section 152.1 of the Canada Transportation Act*, at paragraphs 5 and 6.

[93] See section 87 of the *Canada Transportation Act*.

[94] Canadian Transportation Agency's Decision No. 213-R-2001, dated May 3, 2001, in re: *Application by Ferroequus Railway Company, pursuant to section 138 of the Canada Transportation Act, etc.*; Canadian Transportation Agency's Decision No. 212-R-2001, dated May 3, 2001, in re: *Application by the Hudson Bay Railway Company, etc.*; and Canadian Transportation

Federal Court of Appeal explained that: "Although a statutory power to grant running rights has existed for over 80 years, it has never been exercised."[95] Since 2002 there has been no new decision on section 138 by the Canadian Transportation Agency. In those three 2001-2002 decisions the Canadian Transportation Agency construed narrowly section 138 calling it an "exceptional remedy". This said, while the above decisions may not be especially relevant in the case at hand inasmuch as the applicants wanted to run freight trains over CN's lines in direct competition with CN, it is noteworthy, we believe, that in 95 years no railway company wanting to run passenger trains over the lines of another railway company has made use of section 138.

Section 152.1(1) of the *Canada Transportation Act*. Section 152.1(1) provides as follows:

> Whenever a public passenger service provider and a railway company are unable to agree in respect of any matter raised in the context of the negotiation of any agreement concerning the use of the railway company's railway, land, equipment, facilities or services by the public passenger service provider or concerning the conditions, or the amount to be paid, for that use, the public passenger service provider may, after reasonable efforts to resolve the matter have been made, apply to the Agency to decide the matter.

Unlike the railway company referred to in section 138, the public passenger service provider referred to in section 152.1(1) need not be a federally regulated railway company. However, given the definition of "public passenger service provider" in the *Canada Transportation Act*,[96] for a non-federal entity to qualify as such it would have to fall within the definition of "urban transit authority", the latter being "an entity owned or controlled by the federal government or a provincial, municipal or district government that provides commuter services."[97]

The Canadian Transportation Agency recognizes Calgary Transit as an urban transit authority.[98] Should the Bow Valley Regional Transit Services Commission, or a similar entity, be provided the mandate to operate a Calgary-Bow Valley train service, its status as an "urban transit authority" ("an entity …. that provides commuter services") is less obvious in view of the BVRTSC's larger mandate "to provide passenger transportation services,"[99] and not solely commuter services.

In addition to having to qualify as an urban transit authority, there is another hurdle the Alberta-regulated public passenger service provider would need to overcome before being able to have recourse to section 152.1 of the *Canada Transportation Act*. Negotiations need to begin with CP.

Agency's Decision No. 505-R-2002, dated September 10, 2002, in re: *Application filed by Ferroequus Railway Company Limited, pursuant to subsections 138(1) and (2) of the Canada Transportation Act seeking the right to run and operate its trains on and over specified lines of the Canadian National Railway Company between Lloydminster, Saskatchewan and Prince Rupert, British Columbia and between Camrose, Alberta and Prince Rupert, British Columbia*.

[95] *Ferroequus Railway Co.* v. *Canadian National Railway Co., 2003 FCA 454 (FCA).*

[96] See section 87: "*public passenger service provider* means VIA Rail Canada Inc., a passenger rail service provider designated by the [Federal] Minister [of Transport] or an urban transit authority."

[97] See once again section 87.

[98] See here.

[99] Section 4 of the *Bow Valley Regional Transit Services Commission Regulation*.

Section 152.1(1) of the *Canada Transportation Act* is not available if CP were simply to refuse to entertain the possibility of any running rights agreement with the Alberta-regulated public passenger service provider, as there is a requirement under 152.1(1) that "reasonable efforts" at negotiation be made before recourse to it may be had.[100]

This said, we will assume for the purposes of what follows that the Alberta-regulated public passenger service provider is able to enter into a running rights agreement with CP with respect to the Laggan Subdivision.

Operation –

No federal certificate of fitness is needed. The Alberta-regulated public passenger service provider can remain under provincial jurisdiction even though the railway line upon which it runs its passenger trains is a federal one. No certificate of fitness under the *Canada Transportation Act* is therefore required, nor will one be issued even if a request is made to the Canadian Transportation Agency for such a certificate.[101]

Safety of railway operations. Since January 1, 2015, new railway companies and local railway companies must obtain a Railway Operating Certificate from Transport Canada before commencing operations. The relevant provisions are found at section 17.1 (1) and 17.2 of the *Railway Safety Act*:

> No person shall operate or maintain a railway, or operate railway equipment on a railway, without a railway operating certificate.

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[100] See Canadian Transportation Agency's Decision No. 195-R-2013, dated May 17, 2013, in re: *Application by VIA Rail Canada Inc. pursuant to section 152.1 of the Canada Transportation Act*, at paragraphs 46 and 47: "The Agency's interpretation of section 152.1 of the CTA is that a public passenger service provider does not need to exhaust all possible negotiation attempts for the remedy to be available. The wording of the section only requires that "reasonable efforts" be made. The Agency will consider that a reasonable effort has been made when, given the circumstances of a case, it is satisfied that serious discussions or attempts to discuss have been made about the matter to be agreed on. In assessing this, the Agency will consider whether agreement proposals have been offered, considered and refused. Reasonable attempts to resolve the matter will not require a party to make a counterproposal that would include considerations that a party finds to be untenable. Insofar as one party's essential consideration for an agreement is a consideration untenable to the other party, parties may quickly come to an impasse in negotiations and there may be no other efforts to be pursued between them to resolve the matter. The Agency notes that CP and VIA staff up to the executive level have exchanged significant correspondence, attended a number of meetings and even attempted to mediate a resolution of their matters."

[101] See Canadian Transportation Agency's Decision No. 273-R-2001, dated May 24, 2001, in re *Application, as amended, filed jointly by the Agence métropolitaine de transport and Metropolitan Railways Inc., pursuant to section 91 of the* Canada Transportation Act*, for a certificate of fitness to operate a commuter train service on the right-of-ways owned by the Canadian National Railway Company and the St. Lawrence & Hudson Railway Company Limited in the metropolitan region of Montréal, in the province of Quebec*: "In its submission to the Agency, WCE argued that AMT/MRI has acceded to federal jurisdiction as it has applied for a certificate of fitness. Consistent with the above findings of the Agency, the *Constitution Act, 1867* and the CTA provide the parameters under which a railway work or undertaking may be found to be within the legislative authority of Parliament. The mere fact that a provincial railway company like AMT/MRI applies for a certificate of fitness cannot change the local nature of the provincial railway. Section 87 of the CTA only permits the Agency to issue a certificate of fitness for the proposed construction or operation of a railway within the legislative authority of Parliament."

No railway company shall operate or maintain a railway, including any railway work or railway equipment, and no local railway company shall operate railway equipment on a railway, otherwise than in accordance with a railway operating certificate.

In this respect we must note that although the Alberta-regulated public passenger service would probably not be considered a federal railway company for the purposes of the *Canada Transportation Act* (see above), it does fall squarely within the definition of local railway company for the purposes of the *Railway Safety Act*, i.e. a person, other than a railway company or an agent or mandatary of a railway company, that operates railway equipment on a railway within the legislative authority of Parliament,[102] of which CP Laggan Subdivision is certainly one.

In addition to having to obtain a Railway Operating Certificate the Alberta-regulated public passenger service provider, as a local railway company, will need to abide by a number of other provisions found in the *Railway Safety Act*, including those pertaining to the development of a safety management system, as supplemented by the Railway Safety Management System Regulations, 2015, as well as other regulations, rules, and standards listed in Appendix H.[103] These requirements represent the minimum standards that any safely operating railway must follow, so are not barriers to the implementation. Several notable requirements have already been discussed.

The *Railway Safety Act* and the regulations made under it are administered and enforced by Transport Canada.

Second Variant – A New Rail Line Will Be Built on CP's Right-of-Way

General – The second variant of making use of CP Laggan Subdivision contemplates that a new railway line would be built on the existing right-of-way, that the new line would be operated by CP who would own or lease it (but not pay for its construction), and that it would be used by the Alberta-regulated public passenger service provider to run passenger trains.

For the most part what we discussed in relation to the first variant is equally applicable here, including the need for a negotiated agreement with CP since the same caveats, which make the recourse to section 138(1)[104] and section 152.1(1) the *Canada Transportation Act* difficult in relation to running rights, also apply in relation to the use of CP's land/right-of-way.

The only substantial difference from the first variant concerns the statutory approvals needed to construct the new railway line.

Construction – Section 90(1)(a) of the *Canada Transportation Act* provides that:

[102] See section 4(1) of the *Railway Safety Act*.

[103] Part 1 sets out the requirements for railway companies and Part 2 sets out the requirements for local railway companies.

[104] Section 138(1) also provides that: "A railway company may apply to the Agency for the right to (a) take possession of, use or occupy any land belonging to any other railway company; (b) use the whole or any portion of the right-of-way…"

> No person shall construct a railway without being the holder of a certificate of fitness that is issued under paragraph 92(1)(a).

Given that the new railway line would be built on CP right-of-way and that it would be operated by CP, it makes sense that CP's existing certificate of fitness be varied to include this new line within its scope.[105]

With respect to the actual construction of a railway line, section 98 of the *Canada Transportation Act* provides that a railway company shall not construct a railway line without the approval of the Canadian Transportation Agency and that the Agency may grant the approval if it considers that the location of the railway line is reasonable, taking into consideration requirements for railway operations and services and the interests of the localities that would be affected by the line.

However, section 98 (3) of the *Canada Transportation Act* provides that no approval is needed from the Canadian Transportation Agency for the construction of a railway line within the right-of-way of an existing railway line.

There is no doubt that if the exception found in section 98 (3) can be used by CP, matters would be greatly simplified thereby since the granting of an approval by the Canadian Transportation Agency can be quite a cumbersome process.[106]

18.2.2 Environmental Reviews

Environmental reviews of proposed rail options are expected but the level of formality of these reviews is uncertain. Under the variants of a running rights agreement or a new rail line constructed on CP right-of-way, federal environmental legislation would apply. Theoretically, if all necessary construction work required for a new commuter rail link could be completed within the CP-owned right-of-way, including right-of-way sections within Banff National Park (i.e., federal lands), the project would not be considered a *designated project* under the *Canadian Environmental Assessment Act*, 2012 (CEAA 2012) and would therefore not require the completion of a formal environmental assessment or require federal approval under CEAA 2012.

While Section 6 of CEAA 2012 may not apply (i.e., not a designated project under the *Act),* it is expected that a federal agency (e.g., Transport Canada, Parks Canada, Fisheries and Oceans Canada, Canadian Transportation Agency) responsible for the issuance of a permit or approval under some other piece of federal legislation could require an environmental review of the project. Under Section 67 of *CEAA* 2012, federal agencies are obligated to determine whether a project is likely to cause significant adverse environmental effects before deciding (e.g., issuing a permit or approval) that would allow a project to be constructed. The *Act* provides some discretion regarding how to conduct an analysis to determine whether or not a project is likely to cause significant adverse environmental

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[105] For a decision on a variance of a certificate of fitness, see Canadian Transportation Agency's Decision No. 396-R-2007, dated August 9, 2007, in re *Application by the Canadian Pacific Railway Company pursuant to paragraph 93(1)(c) of the* Canada Transportation Act*, for a variance to its certificate of fitness to reflect recent changes in railway operations or circumstances relating to those operations by removing reference to the Esquimalt and Nanaimo Railway Company from the list of subsidiaries, associated or affiliated railway companies listed in Appendix A of Certificate of fitness No. 96001-2*.

[106] See Canadian Transportation Agency's Decision No. 341-R-2015, dated October 30, 2015, in re Application by the Canadian Pacific Railway Company pursuant to subsection 98(2) of the *Canada Transportation Act.*

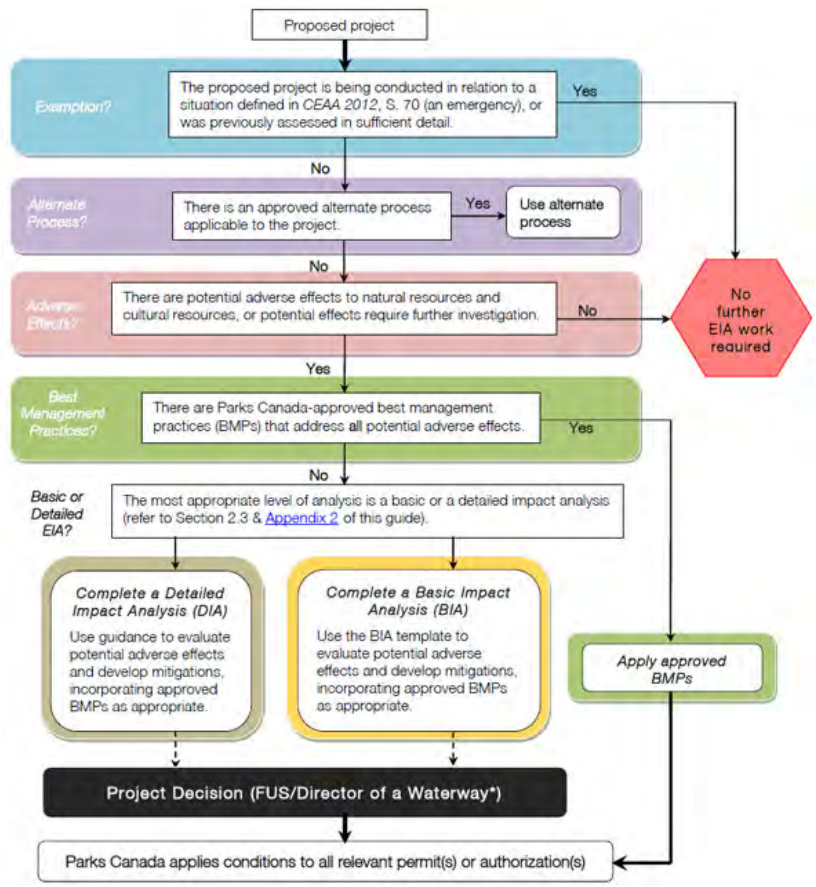
effects. A summary of environmental review processes of federal agencies that may be involved in the commuter rail project is provided below.

Parks Canada

Parks Canada has developed its own environmental impact analysis (EIA) process to fulfill its requirements as a federal land manager under *CEAA 2012* (S.C. 2012, c. 19, s. 52) as well as its legal and mandated obligations to protect Canada's natural and cultural heritage. Its EIA process allows Parks Canada to: meet its obligation under *CEAA 2012* of determining whether a project is likely to cause significant adverse environmental effects; evaluate projects within protected heritage places to avoid or reduce adverse effects; and achieve the Agency's mandate to protect nationally significant examples of Canada's natural and cultural heritage, which includes potential adverse effects on environmental characteristics important to key visitor experience and to the health and socio-economic conditions of Indigenous and non-Indigenous peoples.

The EIA process developed by Parks Canada focuses on projects having the greatest potential for adverse environmental effects through the selection of one of four *EIA pathways* (Figure 18-1). The level of analysis varies with each pathway, enabling alignment with the risk and likelihood of the project causing significant adverse environmental effects. Timing requirements and cost also vary with each pathway with the detailed impact analysis process requiring the highest level of resources. It is anticipated that a project review for a complex project could take Parks Canada staff between six and 12 months. Parks Canada bases the need for an EIA and selection of the appropriate pathway on its review of the Project Description.

Figure 18-1: Parks Canada EIA Decision Framework



Source: Parks Canada

Fisheries and Oceans Canada

Fisheries and Oceans Canada (DFO) has developed a risk-based approach for the assessment and reporting of potential environmental effects of projects proposed on federal lands that are subject to section 67 of CEAA 2012. Project Effects Determination Reports are prepared for medium- to high-risk projects on federal lands and provide the means to record proposed mitigation measures and predicted environmental effects of a project.

Other project environmental reviews by DFO may be required under the *Fisheries Act* or *Species at Risk Act* (SARA) when project elements have the potential to: cause serious harm to fish that are part of or support a commercial, recreational or Aboriginal fishery; or have the potential to harm individuals or damage the critical habitats of aquatic species that are listed as extirpated, endangered or threatened, respectively. DFO is responsible for the protection of aquatic species at risk wherever they are found with the exception of areas administered by Parks Canada (i.e., Banff National Park).

If serious harm to fish is expected to result from a project (e.g., culvert extension, channel relocation), proponents are required to apply for authorization that includes detailed information about their project and potential impacts on fish and fish habitat. The preparation and review of applications can take up to 18 months or more depending on potential effects and efforts to minimize these effects.

For projects where *Fisheries Act* or *Species at Risk Act* regulatory decisions have the potential to adversely affect Aboriginal or Treaty rights, DFO will consult with potentially affected Indigenous peoples and apply measures to minimize adverse impacts on Aboriginal or Treaty Rights, as appropriate.

Transport Canada

The regulation of rail safety is the responsibility of Transport Canada. Administered under the *Canadian Railway Safety Act*, its regulations, standards and programs work to make Canada's railway system safe, secure, accessible, and more environmentally responsible. Transport Canada meets its CEAA 2012 obligations through the implementation and review of its Federal Lands Framework which includes Environmental Effect Determinations (EEDs) for projects subject to section 67. The EEDs are used to identify potential environmental effects of a proposed project and include measures to mitigate those effects, where necessary. Transport Canada regularly collaborates with other federal departments to ensure that the assessment of significant adverse environmental effects is identified so that the appropriate mitigation measures can be implemented in support of sustainable project development.

Canadian Transportation Agency

As discussed in section 18.2.1 above, approval to construct the project may or may not be required by the Canadian Transportation Agency (the Agency) under Section 98 of the *Canada Transportation Act*. As a federal agency they are, however, obligated under Section 67 of *CEAA 2012* to consider the potential for the project to cause significant environmental effects. This includes the interests of the localities potentially affected by the project. The Agency does not have a formal approach to the assessment and determination of environmental effects; however, it is anticipated that the Agency would require the proponent of a rail project to complete sufficient investigations to understand potential environmental effects associated with construction and operation stages particularly as they relate to the interests of the localities along the railway line. If applicable, this information would be incorporated into a Section 98 application to construct railway infrastructure in the corridor.

Environment and Climate Change Canada

Environment and Climate Change Canada's (ECCC) mandate is to protect the environment, conserve the country's natural heritage, and provide weather and meteorological information to keep Canadians informed and safe. This diverse department includes the Canadian Environmental Assessment Agency, Parks Canada Agency and the Canadian Wildlife Service, among others. The department fulfills its obligations under sections 67-69 of CEAA 2012 through the determination of environmental impacts of projects on federal lands on a case-by-case basis following a standardized risk-based approach and considering the potential for significant adverse environmental effects. The department has developed guidance documents and tools to support the implementation of environmental reviews.

18.2.3 Engagement of Indigenous Peoples

An expected component of any environmental review is engagement with and accommodation of those parties who may be affected by proposed construction and/or operations of the commuter rail line. In addition to the general public and project-specific stakeholders, Indigenous peoples are regularly engaged. The traditional territories of several First Nations occur between the Bow Valley and Calgary who will have an interest in the project, particularly in the case of infrastructure expansion and land purchase, if applicable.

The duty to consult is the responsibility of the Crown and is usually triggered by the need for a government agency decision on a project (e.g., issuance of approval). It is, however, common for the Crown to delegate at least some of this obligation to project proponents through regulatory processes. The level of engagement and accommodation by the proponent is determined by, and proportionate to, the strength of Indigenous interest (e.g., lands, resources) and the anticipated project impacts on that interest. It is important that meaningful involvement of Indigenous Peoples occurs, where appropriate.

Depending on the level of engagement, steps to be taken may include:

- Pre-engagement assessment of interests and anticipated impacts on those interests;
- Written notice of proposed project and activities;
- Follow-up engagement in the form of letters, telephone/email communications and/or face-to-face meeting(s).

In discussions with representatives of the Stoney Nation, it was specifically recommended that a letter introducing the project be forwarded to the Consultation Manager at the Stoney Tribal Administration, describing the proposed project and outlining the potential benefits to their community. It was also noted that because of the greater potential impact from rail (construction and operations), that rail would likely need to go through a formal process, though a bus service may not.

18.3 Implementation Timelines

The following sections describe some of the implementation steps – particularly those steps on the critical path -- and possible timelines:

1. **Agreements with CP**: As a first step, agreements would need to be reached with CP to allow for track access and discuss the terms for the construction of a new dedicated line. As part of this process, CP may request a detailed capacity study (using railway simulation software), particularly for higher orders of desired service. Such studies can take upwards of six months or more. In addition, a key element of the agreement would be addressing concerns over CP's liability, which may require discussions with the Province of Alberta over possible strategies to provide CP the indemnification it would require.[107] In addition, CP would require a business case outlining the funding commitments of proposed partners. Because of the iterative nature of this process, approximately two years may be required to confirm detailed infrastructure needs and funding commitments.

[107] Refer to discussion in section 16.3.

2. **Other property acquisition:** In order to implement a potential rail service, the proposed operator would need to acquire and/or lease land to construct station infrastructure and maintenance depot infrastructure, as well as to provide easements to access the station infrastructure. Besides entering into agreements with CP, negotiations would need to be undertaken with potential property owners/lessors including Alberta Transportation (for the current location of the proposed Calgary station), Liricon Capital (for the Banff Station), as well as the Towns of Cochrane and Canmore. These steps would need to be undertaken in parallel to discussions with CP to finalize a preliminary design for the service and related infrastructure.

3. **Environmental reviews and engagement with Indigenous and non-Indigenous peoples:** While a very formal environmental review may not be required should all infrastructure be constructed on CP's right-of-way, various permitting processes would nonetheless require environmental reviews. The timelines of these reviews can take upwards of 18 months.

4. **Creating operating authority (or expanding the mandate of the BVRTSC) and identifying a suitable operator:** As part of implementation, a suitable operator of the service would need to be identified. Ultimately, we anticipate that a multi-stage tendering process would need to be undertaken to identify an operator. Acquisition of suitable rolling stock could be incorporated as part of this contract.

5. **Detailed design and construction:** In the team's experience individual new sidings can be taken from design to execution within approximately two years. However, a more comprehensive project would be more likely require four to five years for design and implementation.

6. **Acquisition of rolling stock:** Once there is agreement to move forward with the project, a search for possible rolling stock would need to be undertaken. As discussed, while a diesel-multiple unit would likely be most cost-effective in meeting demand, there are few in operation in North America, and only one in recent production. There is the possibility that diesel-multiple units used by Metrolinx on its airport service may become surplus by Metrolinx in the mid-2020s, provided they do not reallocate the vehicles to other services. Generally speaking, in the FRA's experience, the procurement of new rolling stock can take on the order of five to eight years.[108]

If a decision were made to move forward with the steps outlined above in 2018, a complete service likely would not be implemented until the late 2020s (Figure 18-2). Should the City of Calgary pursue an Olympic bid for 2026, having the service in place beforehand would be an aggressive target.

[108] FRA Rail Program Delivery. 2017. Rolling Stock Procurement webinar.

Figure 18-2: Approximate Timing of Activities

	Years							
Step	1	2	3	4	5	6	7	8
1. Agreements with CP	■	■						
2. Other property acquisition	■	■						
3. Environmental reviews and engagement			■	■				
4. Operator identification			■	■				
5. Detailed design and construction					■	■	■	■
6. Acquisition of rolling stock					■	■	■	■

Source: CPCS

19 Financial and Other Metrics

Key Chapter Takeaways

- The financial net present value (FNPV) is a metric used to compare the different cash flow profiles in terms of a single value. The FNPV of the bus services are expected to be between -\$33 to -\$13 million. The FNPV of the rail services are expected to be -\$397 to -\$355 million.
- In 2022, bus scenarios are expected to result in greenhouse gas (GHG) emission reductions between 1,100 to 2,800 tonnes per year.
- In 2022, rail scenarios are expected to result in increases in GHG emissions between 1,200 and 3,900 tonnes per year. However, by 2032, the rail-high scenario would result in slightly positive greenhouse gas emissions reductions.
- A number of factors, within and outside of the control of the potential operator, can affect these estimates. Notably, should the average occupancy of vehicles diverted be lower than approximately 2.1 persons per vehicle (i.e. more vehicles are diverted than expected), then the rail-high scenario would likely result in GHG emissions reductions in all horizon years.

19.1 Financial Net Present Value

In order to compare the different cash flows of the bus and rail projects, we have estimated the financial net present value (FNPV) for all of the scenarios. The FNPV provides the discounted[109] value of the revenues minus the capital and operating costs.

19.1.1 Key Concepts

Time Horizon

For the purposes of this analysis, the project was forecasted over a period of 25 years. The construction costs are assumed to be distributed evenly over the construction period shown in Figure 19-1. Any operational revenues and costs are assumed to be incurred after the start of service.

[109] Discounting is an approach used in financial and economic analysis to address the time value of money (often measured by the interest or discount rate). In practice, discounting means revenues and costs further into the future have less of an impact than revenues and costs incurred closer to the present.

Figure 19-1: Construction Time Period

Scenario	Construction Period	Start of Service
Bus scenarios	1 year (2021)	2022
Rail scenarios	5 year (2022-2026)	2027

Source: CPCS analysis

All buses would need to be replaced at the end of the forecast period. To account for the fact that the rail infrastructure has a lifespan beyond 25 years, particularly if maintained on an ongoing basis, we assumed a residual value of the track in the year 2042 equivalent to the construction cost of the track.[110] Similarly, as rolling stock would have only operated for 15 out of its 20-year lifespan, we have assumed 25% residual value for rolling stock.

Cost of Capital

In order to discount future cash flows to estimate a financial net present value (FNPV) for the project, an appropriate discount rate is required. The financial discount rate can be viewed as the cost to the project financier of cash used in the project.

For the purposes of this analysis, we have assumed that the Town of Banff is the project financier. The Town of Banff raises cash through debt and taxes. The cost of debt is relatively straightforward and is generally calculated as the interest paid divided by the market value of debt. The cost of taxes is much more complex and relates to the cost to the economy of the distortions generated by the various taxes levied by the Town of Banff and the senior governments that may provide funding to the Town of Banff. Given the conceptual nature of this study, we have chosen to use only the cost of debt as the financial discount rate for the project. In 2016, the Town of Banff was borrowing at a nominal rate of 3.67%,[111] which is equivalent to a real rate of 2.25% assuming annual inflation of 1.5%.

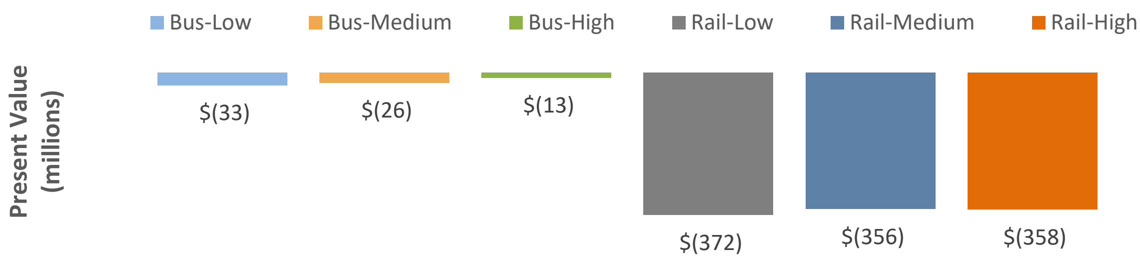
19.1.2 Summary

Figure 19-2 shows the FNPV of the projects, which is the sum of the discounted cash flows over the forecast period. As expected, all of the FNPVs are negative.

[110] In practice, this residual value may or may not occur. For example, in one hypothetical scenario, CP might be willing to purchase the track in 2042 to accommodate future freight service growth. Alternatively, there may be a scenario in which the track would be sold for scrap, because there is no further use for the asset. As the rail scenarios are by far the most costly, we have included the residual value for analysis purposes.

[111] Town of Banff. 2016 Consolidated Financial Statements.

Figure 19-2: Financial Net Present Value (in Millions)



Source: CPCS analysis

19.2 Other Impacts

This section computes other impacts of the project, including greenhouse gas emissions reductions and avoided highway maintenance costs.

19.2.1 Analytical Scenarios and Business as Usual Scenario

In order to compute selected other impacts, the bus and rail scenarios must be compared against a reasonable counterfactual of what might occur if mass transit were not implemented. In other words, a business as usual (BAU) must be established.

A driver of many of the benefits quantified in this analysis is the relative change in vehicle-km (VKT) travelled between modes, particularly the reduction in VKT by auto due to the diverted demand. Given that the modal split observed in the surveys is over 95% for auto, and this modal split *included* the summer 2017 pilot bus, we have assumed that most of the ridership for the bus would be diverted from auto modes. Some of the ridership would in practice come from existing bus services.

As a result, an estimate of the diverted (or "avoided") automobile VKT is required. The avoided auto VKT is estimated based on the forecasted mass transit ridership (netting out any induced demand), the average auto occupancy of the vehicle trips that would no longer be taken, and the distance between cities and towns served by the mass transit service. The ridership estimates are discussed in earlier chapters, and the distances between cities/towns was estimated using Google Maps. We used an estimated occupancy factor of 2.5 passenger per vehicle, based on Parks Canada estimates. Figure 19-3 summarizes the VKT avoided by auto, as well as the VKT under each of the other scenarios.

Figure 19-3: Annual Vehicle-Km Travelled, 2022 (in Millions)

	Bus			Rail		
	Low	Medium	High	Low	Medium	High
*Auto (avoided)**	*9.9*	*13.2*	*18.7*	*10.7*	*13.1*	*23.7*
Bus	1.7	1.9	2.1	0.0	0.0	0.0
DMU	0.0	0.0	0.0	1.9	2.2	0.0
Loco-hauled**	0.0	0.0	0.0	0.0	0.0	0.8

*The actual calculation was based on the sum product of the origin-destination trip matrix (i.e. accounts for specific origin and destination station) and the distance in kilometres. The annual demand and the highway distance between Calgary and Banff (129 km) can be used as an approximate estimate. In the rail-medium scenario, the calculation would be as follows: 300,000 annual one-way trips x 86% (percentage of demand not induced) x 129 km/trip x 1/2.5 persons/vehicle = 13.3 million vehicle-km.
**Calculations are based on trainset miles not vehicle-miles.
Source: CPCS analysis

19.2.2 Greenhouse Gas (GHG) Emissions Reduction

Mass transit would be expected to result in some environmental benefits as passengers are diverted from other modes of transportation that are less fuel efficient than bus and train; however, achieving these benefits depends on the bus and train achieving a sufficient load factor.

To calculate these benefits, it is necessary to:

- Estimate the VKT increase or decrease by mode of transportation in each scenario (see above)
- Estimate the fuel consumption for each mode in the forecast period
- Apply the appropriate emissions factors for each fuel type

Fuel Efficiency and Consumption

Figure 19-4 summarizes the fuel efficiency factors used in the analysis.

Figure 19-4: Fuel Efficiency Factors

Vehicle	Litres per vehicle-km	Source
Auto	0.107	US Bureau of Transportation Statistics
DMU	1.175[1]	Nippon Sharyo
Locomotive-hauled trainset	3.522[2]	Average of comparable rolling stock in NCRRP Report 3
Bus	0.322[3]	US Bureau of Transportation Statistics

[1]Per DMU. [2]Per trainset. [3]Increased by 5% in the bus-high scenario to account for the lower fuel efficiency of double-decker buses.
Source: CPCS analysis

Figure 19-5 summarizes the estimated fuel consumption by mode in 2022. As noted, the auto estimate represents the amount of fuel consumption that is avoided.

Figure 19-5: Annual Fuel Consumption by Mode, 2022 (in Millions of Litres)

	Bus			Rail		
	Low	Medium	High	Low	Medium	High
Auto (avoided)	*1.1*	*1.4*	*2.0*	*1.1*	*1.4*	*2.5*
Bus	0.5	0.6	0.7	0.0	0.0	0.0
DMU	0.0	0.0	0.0	2.3	2.7	0.0
Loco-hauled	0.0	0.0	0.0	0.0	0.0	2.7

Source: CPCS

Emissions Factors

The following CO_2 equivalent (CO_2e) emissions factors were applied to the fuel consumption estimates for each of the modes over the forecast period (Figure 19-6). Auto is assumed to be entirely gasoline, whereas the other mass transit vehicles would use diesel. We did not include any estimates of criteria pollutants, as these impacts, if any, are more localized.

Figure 19-6: Greenhouse Gas Emissions Factors

Fuel	CO_2e Emissions (kg/litre)	Source
Road gasoline	2.349	US EIA (converted from imperial units)
Diesel fuel	2.684	US EIA (converted from imperial units)

Source: CPCS, based on the sources noted

Figure 19-7 summarizes the estimated greenhouse gas emissions (CO_2e) by mode in 2022. As noted, the auto estimate represents the amount of fuel consumption that is avoided.

Figure 19-7: Greenhouse Gas Emission (in Millions of kg)

	Bus			Rail		
	Low	Medium	High	Low	Medium	High
*Auto (avoided)**	*2.5*	*3.3*	*4.7*	*2.7*	*3.3*	*6.0*
Bus	1.5	1.6	1.8	0.0	0.0	0.0
DMU	0.0	0.0	0.0	6.2	7.2	0.0
Loco-hauled**	0.0	0.0	0.0	0.0	0.0	7.2

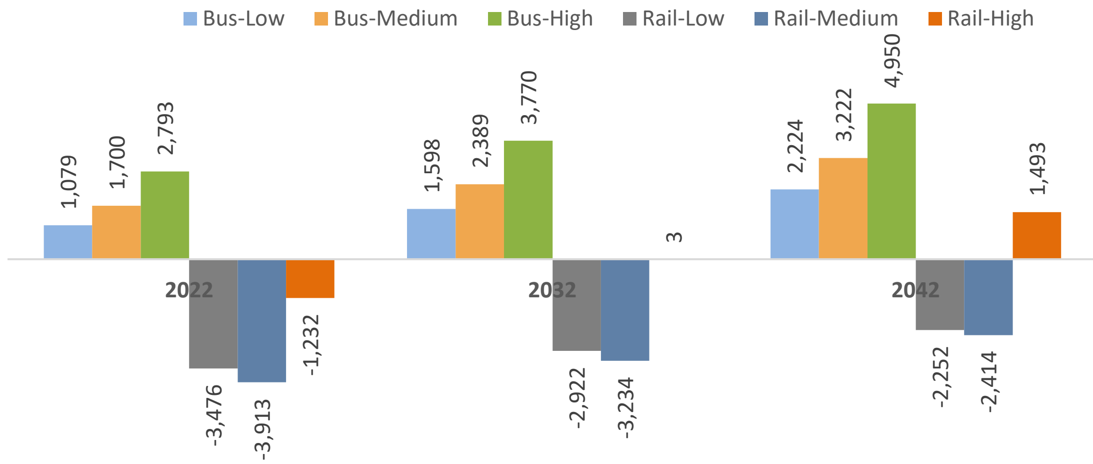
Note: may not match final calculation due to rounding. Source: CPCS

Summary of Greenhouse Gas Emissions Reduction Potential

Figure 19-8 summarizes the estimated reduction in GHG emissions.[112] The bus scenarios always result in reduced GHG emissions and are always higher than rail in any given horizon year. Only the rail-high scenario after 2032 results in a GHG emissions reduction.

[112] A negative number indicates a GHG emissions increase

Figure 19-8: GHG Reduction (in Tonnes)



Negative number indicates GHG emissions increase. Source: CPCS analysis

A number of factors can affect these estimates, including the average vehicle occupancy of automobiles diverted because of transit, the specific automobile vehicle mix used in the corridor and resulting average fuel efficiency, the potential for vehicle electrification in the future, the actual buses and rolling stock selected, the service design (e.g. frequency[113] and number of stops) etc. Some of these factors are within the control of the mass transit operator, though many are not. Notably, the average vehicle occupancy of autos diverted would need to be approximately 2.1 persons per vehicle or lower for rail-high to have GHG reductions in all horizon years.

However, these results are broadly in line with the outcomes of a study undertaken by the Union of Concerned Scientists. The study recommended the most environmentally friendly mode of travel (as measured by greenhouse gas emissions) based on the party size and distance travelled (Figure 19-9). Motor coach (bus) is always the best option, having the lowest GHG emissions, regardless of distance or party size. For trips of approximately 100 miles (160 km), train only has lower emissions than driving a typical car if the party size is two travellers or smaller. The study does not provide an estimate for three travellers. For groups of four travellers, driving a car or SUV usually results in fewer emissions than taking a typical train.

[113] Removing bus or rail trips with low ridership will help enhance greenhouse gas emissions reduction potential.

Figure 19-9: Relative Greenhouse Gas Emissions for Different Modes per Travel, by Group Size

Best Travel Options: Solo Traveler

	100 miles	500 miles	1,000+ miles
Best	Take motor coach	Take motor coach	Take motor coach
	Take train	Take train	Fly economy
	Fly economy	Fly economy	Take train
	Drive typical car	Drive typical car	Fly first class
	Drive typical SUV	Fly first class	Drive typical car
Worst	Fly first class	Drive typical SUV	Drive typical SUV

Best Travel Options: Two Travelers

	100 miles	500 miles	1,000+ miles
Best	Take motor coach	Take motor coach	Take motor coach
	Take train	Take train	Fly economy
	Drive typical car	Drive typical car	Take train
	Drive typical SUV	Fly economy	Drive typical car
	Fly economy	Drive typical SUV	Drive typical SUV
Worst	Fly first class	Fly first class	Fly first class

Best Travel Options: Family of Four

	100 miles	500 miles	1,000+ miles
Best	Take motor coach	Take motor coach	Take motor coach
	Drive typical car	Drive typical car	Drive typical car
	Drive typical SUV	Drive typical SUV	Drive typical SUV
	Take train	Take train	Fly economy
	Fly economy	Fly economy	Take train
Worst	Fly first class	Fly first class	Fly first class

Notes: The red designation is a subjective assessment based on the distribution of total CO_2 emissions across modes. The analysis assumes typical car and typical SUV fuel economies of 23 mpg and 18 mpg, respectively. Train emissions reflect an average of electric and diesel operations. The analysis assumes turboprop use for 100-mile flights, regional jet use for 500-mile flights, and narrow-body jets for 1,000-mile flights, based on information from the Federal Aviation Administration. We assume that all flights are nonstop. For more on the emissions factors we used, and the magnitude emitted by each mode, see the full *Getting There Greener* report at *www.ucsusa.org/gettingtheregreener*.

Source: Union of Concerned Scientists, Getting There Greener: The Guide to Your Lower-Carbon Vacation

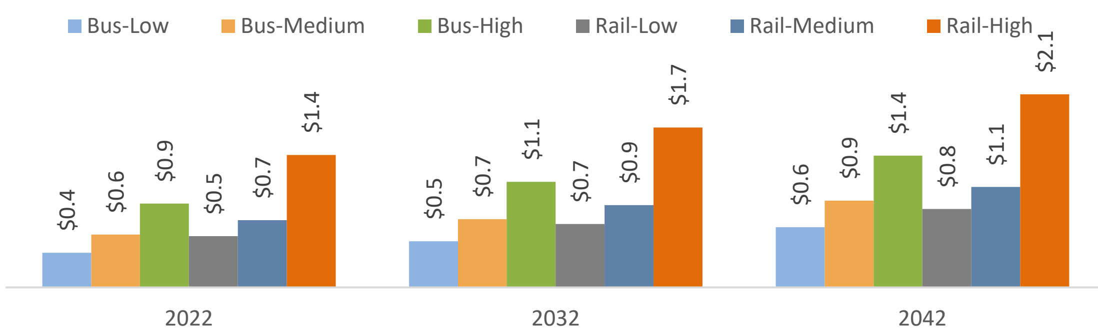
19.2.3 Highway Maintenance Costs

By reducing auto VKT there is a benefit in the form of reduced highway maintenance costs. A Transport Canada Full Cost of Infrastructure (FCI) study estimated intercity light vehicle infrastructure plus vehicle costs to be $0.148 per passenger-km travelled (2000 $). Because this value includes vehicle costs, we estimated the portion of this amount that is due solely to infrastructure costs ($0.04),[114] inflated this value to 2017 dollars and applied an auto occupancy assumption of 1.13 occupants per vehicle.[115] This methodology results in a value per VKT of $0.06.

In the bus scenarios, the potential benefit is offset by the increase in bus VKT. Buses use more road capacity than automobiles due to their size and slower acceleration/deceleration. To factor this impact in, we assumed the passenger car equivalent (PCU) value for buses to be 2.0 (one bus uses twice as much road capacity as one car). Therefore, for bus, we assume that the vehicle infrastructure cost per VKT is twice that of an auto.

To estimate savings in highway maintenance costs, the above values are multiplied by the respective auto and bus VKT in each of the forecast years. Figure 19-10 summarizes the results. In 2022, the benefit is expected to be between $0.4 and $0.9 million per year for the bus scenarios, and $0.5 to $1.4 million per year for the rail scenarios.

Figure 19-10: Highway Maintenance Cost Reduction (in Millions)



Source: CPCS analysis

19.3 Opportunities and Risks

The following sections provide a non-exhaustive list of some of the opportunities and risks that were not specifically addressed by the scenarios.

19.3.1 Congestion Pricing Mechanisms

Congestion-charging mechanisms (such as parking charges) in Banff National Park could provide a revenue stream to close the gap between revenues and costs. Such mechanisms, along with strategies such as transit-only lanes, high-occupancy lanes and pedestrianizing the downtown core, could help to increase ridership on a mass transit service.

[114] This ratio was estimated by taking the sum of road infrastructure costs from Table 3-20 of the FCI report ($35.01 billion) and dividing that by the total road mode costs ($146.50 billion) from the same table.
Transport Canada. 2008. Estimates of the Full Cost of Transportation in Canada.
[115] This vehicle occupancy factor is intended to represent an average across Canada for the purposes of converting the value in the FCI report from passenger-km travelled to vehicle-km travelled.

These strategies would encourage additional ridership on the mass transit service. One of the challenges with providing a transit service between Calgary and the Bow Valley is that the travel times by bus or rail would be longer than driving, particularly once all the station access time and transfers are accounted for. Congestion charging and related strategies would help level the playing field between a mass transit service and the perceived cost of driving, and thus encourage higher ridership.

It is important to note that, as an alternative to implementing a transit service, any strategy to accommodate additional vehicles in the Town of Banff comes at both a financial and economic cost. Financially, the cost of a new parking facility to accommodate the demand taken up by a transit service could range from the order of $1 million to $10 million or more, with the higher figures representing the cost if a parking structure were required. There is also the possible financial opportunity cost for Banff because some visitors may balk at coming due to congestion in the downtown core. Economically, shifting visitors from autos to transit may have benefits including reducing greenhouse gas emissions (in certain scenarios) and reducing highway expansion and maintenance. Thus, a rationale for implementing is not necessarily about making a transit service successful, but also to account for the full cost of providing parking.

19.3.2 Market Pricing Fares

The proposed fare structure is a flat fare, with various concessionary discounts, typical of most transit systems. To increase revenues and close the gap between revenues and costs, the Town of Banff could alternatively consider introducing a more market-based fare structure, including peak and off-peak fares.

In the case of the proposed service, there would be significant daily peaks for the service, notably from Calgary to Banff in the morning and vice-versa in the evening. Yet, during the mid-day, there would be lower demand. Consideration could be given to introducing a slightly higher fare during the peak periods (when riders are likely to be less price sensitive) and a lower discounted fare during the off-peak periods (when riders are likely to be more price sensitive). Such strategies can increase both revenues and ridership by 10% to 20%.[116]

The other advantage to such a strategy is that it can help spread demand from the peaks (when adding another bus or train comes at an additional capital and operating cost) into the off-peaks (which have unused capacity). Thus, it not only helps increase revenues but can also help constrain costs.

Depending on the ticketing system employed by the potential operator, further price differentiation could also be introduced for specific departure times, by time of booking relative to trip, etc. if trips must be reserved prior to travel.

Ultimately, the revenue potential of this strategy is dependent on understanding the price sensitivity of travellers, including at different times of the day. As a result, some testing of different pricing levels at different times of day, either through a peak/off-peak system, or through a reservation system, would be required to judge the effectiveness.

[116] CPCS et al. 2015. NCRRP Report 1: Alternative Funding and Financing Mechanisms for Passenger and Freight Rail Projects.

19.3.3 Provide a Summer-Only Service

Providing a summer-only bus service would reduce operating subsidy required. If only one route is provided, it would also likely reduce the capital cost as well. If a summer service were provided on Route A only, the annual net cash requirement (operating subsidy) would decrease from $2.3 to $0.8 million, assuming none of the demand from Route B shifts to Route A. The number of buses that would need to be purchased would also decrease, reducing the capital cost.

19.3.4 Long-Term Automation and Electrification

A risk to providing a mass transit service between Calgary and Banff is the potential for vehicle automation and electrification to obviate the need for a mass transit service.

While it cannot be predicted with any precision when automated vehicles will come into mass use,[117] either in fleets or owned by individuals, they will significantly lower the cost of using automobiles. For example, General Motors, as cited in *The Economist*, predicts that the cost of ridesharing services will fall from $2.50 per mile to $1.00 per mile when the driver is eliminated,[118] and possibly further with electrification.[119]

This reduction in cost will improve the cost competitiveness of providing a ridesharing service directly from a home or hotel in Calgary to Banff. For example, using the per-mile figure above, the cost of a ridesharing trip from Calgary to Banff could be reduced from about $200 (with driver) to $80 (without driver). If there were four people on an average trip, the cost would be approximately $20 per one-way trip, only slightly above the proposed transit fare. Yet, a ridesharing service offers the convenience of a point-to-point service (rather than operating on a fixed route).

This risk is much more significant for a rail scenario than bus. With a bus option, the capital cost of the buses (the most-costly item) is largely depreciated in 15 years. Further, there is certainly potential for autonomous electric buses to operate between higher-density origins and destinations. Yet, with a rail service, there is the potential that the track infrastructure and vehicles would no longer serve a purpose after the forecast period. Even if the engineer and conductor were no longer required, track and vehicle maintenance remain a significant cost, and rail offers less flexibility than a road-based mode.

Of course, though this study is focused on mass transit options, it is important to emphasize that from a transportation perspective, vehicle automation and electrification overall represent a promising trend to transport visitors from Calgary to Banff.

Without automation, further study could also explore how a ridesharing solution in partnership with companies like Tapp Car, Uber or Lyft could help reduce the number of individual vehicles going to

[117] Issues related to winter driving conditions are increasingly being addressed through research, for example. Paley, R.T. 2017. Autonomous cars still on thin ice for winter driving. *The Globe and Mail.*

[118] *The Economist.* 2018. GM takes an unexpected lead in the race to develop autonomous vehicles.

[119] Arbib, J. and Seba, T. 2017. Rethinking Transportation 2020-2030: The Disruption of Transportation and the Collapse of the Internal-Combustion Vehicle and Oil Industries.

Banff. Such an option might be attractive to individuals who appreciate the convenience of door-to-door service but would prefer not to drive, including persons who are disabled or visually impaired.

Such partnerships have a precedent in Canada. The Town of Innisfil, north of Toronto, has partnered with Uber as part of a pilot to provide alternatives to driving. For certain trips, such as to community centres from selected areas, the Town of Innisfil will subsidize the trip on a variable basis so that the fare is "fixed" from the resident's perspective. On other trips to/from other areas, the Town of Innisfil will subsidize the trip by $5. The overall budget for the six-month pilot for the community of 36,000 was $175,000. The pilot is seen as a more cost-effective substitute to the $1 million cost of purchasing and operating buses, which also would be able to serve only certain parts of Innisfil and only at certain times, whereas Uber covers the entire town 24 hours a day, seven days per week.[120]

19.3.5 Accuracy of Underlying Visitation Counts

The ridership estimates for this study are based in part on the underlying Banff National Park attendance figures published by Parks Canada. We understand through discussions with the Town of Banff that these figures published by Parks Canada are not direct visitor counts, but rather estimates based on a number of data sources and estimated through an empirical study that has not been recently updated. As a result, the actual ridership may differ from the predicted ridership due to any inaccuracies in the underlying visitor counts, which may be possible due to changes in visitation patterns in and around the Banff National Park area.

19.3.6 Airport Connectivity

As many visitors to Banff National Park arrive via air, providing a direct connection to the Calgary Airport creates the possibility of increasing demand for a mass transit service, and reducing the number of visitors who use a rental car to access the park. This option was not explored in detail due to the larger number of existing private bus operators that provide scheduled service between the airport and the Bow Valley. While adding this stop would increase demand on the mass transit bus service, much of this would shift from existing operators. In addition, while the cost to revise bus routings would be modest, the cost to provide a direct airport connection by rail would be substantial, in part driven by the need to cross over the Bow River and Deerfoot Trail.

Some airports in Canada (namely Pearson International Airport in Toronto) are promoting turning airports into a "mega" transit hub, recognizing that airports, besides facilitating tourism, are also major employment hubs. In such a concept, a number of rail-based transit and surface intercity services (e.g. high-speed rail) would operate to/from the airport. In Calgary, there are concepts for eventual CTrain connections to the airport, as well as the potential for high-speed rail between Edmonton and Calgary in the future, which, depending on alignment, could pass near Calgary International Airport. In this context, it is suggested that these plans consider the need to provide connectivity to and from the Bow Valley, as the incremental cost to provide connectivity between the airport and the Bow Valley would likely be more modest, yet be an important source of demand. This is already taken into account in this study to the extent possible, by proposing a rail station along a proposed Green Line CTrain station.

[120] Pelley, L. 2017. Innisfil, Ont., partners with Uber to create substitute for public transit.

20 Conclusion

The number of visitors arriving by personal vehicle in Banff National Park and Bow Valley is increasing every year, leading to increased congestion in the area. To help mitigate this congestion, in this study the CPCS Team analyzed a number of bus- and rail-based mass transit options to provide a viable option to allow visitors to travel to the area from Calgary without a vehicle. These intercity mass transit options are intended to complement and/or replace other strategies considered by the Town of Banff and its funding partners, such as intercept parking lots.

Regardless of the Calgary-Banff transit option pursued, there are opportunities to further increase ridership (and related benefits) and reduce costs. Further, providing transit from Calgary alone is not a complete solution to addressing congestion in Banff National Park. Notably, complementary local transit within and around Banff National Park (or possibly implementing ridesharing) would be a key factor in maximizing ridership on an intercity transit service. This includes services around the Town of Banff, between Banff and Lake Louise, and between Banff and Canmore. In addition, other strategies to improve the viability of the intercity service, including piloting more market-based fares (e.g. peak/off-peak differentiation), evaluating congestion pricing mechanisms and starting with a summer-only bus service, could be considered. In other words, for an intercity transit service to be financially viable and effective at reducing auto congestion in Banff, it needs to be part of a larger strategy to encourage a mode shift.

Appendix A. Stakeholder Consultation Results

Summary of Stakeholder Consultations

Consultation with key stakeholders formed a key component of this study and was conducted early in the process to understand their needs and preferences, as well as to gather insight based on their individual areas of expertise. The consultation strategy was designed to obtain stakeholder input early in the process to inform future stages of the feasibility study and preliminary service design.

Reducing congestion and demand on parking, improving park visitor experience, environmental benefits through reduced greenhouse gas emissions, and improving mobility for those without access to private automobiles were some of the more frequently stated benefits.

Stakeholders raised a number of potential opportunities associated with mass transit between Calgary and the Bow Valley. The most commonly described opportunity was the ability to make the trip into the Park a memorable experience in its own right. While typically associated with rail, some also stated that a bus-based system could achieve this opportunity as well. Another frequently identified opportunity was the ability to increase the number of visitors to the Park during off-peak seasons (e.g., winter).

The most commonly shared challenge associated with a rail-based system was working with CP to ensure minimal or no impact to its freight operations should a passenger system use the same track and, alternately, the cost of creating a second and separate track for use by passenger rail, whether within the CP right-of-way or elsewhere in the corridor. High capital and operational costs were raised as a challenge by most stakeholders.

In summary, nearly all stakeholders saw benefits from mass transit for residents, visitors or the sectors their organization represents, although stakeholders associated with the tourism industry saw more opportunities associated with mass transit than those communities more reliant on natural resources, where the local economy relies heavily on freight rail. Specific characteristics of a mass transit service envisioned by stakeholders varied. Preference was generally for rail, although bus was seen as either:

1. an interim solution to rail;
2. a part of the rail solution (e.g., supplement rail service); or
3. a less desirable, but more feasible option.

Stakeholder Consultation Purpose and Methods

CPCS and Dillon Consulting Limited were retained by the Town of Banff to assess the feasibility of passenger mass transit through the options of passenger rail and bus/coach between the City of Calgary and the Bow Valley. The intent of the service would be to provide a mobility choice for residents and visitors to access the Bow Valley without the need of a personal vehicle.

Consultation with key stakeholders formed a key component of this study and was conducted early in the process to understand their needs and preferences, as well as to gather insight based on their individual areas of expertise. The consultation strategy was designed to obtain stakeholder input early in the process to inform future stages of the feasibility study and preliminary service design.

Consultation meetings were conducted as one-on-one, semi-structured interviews. Participants were provided with a list of broad questions exploring the benefits, opportunities, challenges and system attributes of a potential mass transit service between Calgary and the Bow Valley. As the list of organizational stakeholders was broad and diverse (including municipalities, federal and provincial agencies, private businesses and not-for-profit organizations), specific questions were customized to each stakeholder to generate input and discussion that was relevant to them. The list of stakeholders was obtained from an initial list provided in the project Request for Proposals and includes municipalities, government agencies, First Nations, associations, CP and members of the private sector that may be impacted by a mass transit solution to the Bow Valley. The initial list was reviewed with some additional stakeholders added based on discussions with the project steering committee and other stakeholders.

Stakeholders that were interviewed and provided input into the question of mass passenger transit between Calgary and the Bow Valley include:

1. Banff & Lake Louise Hospitality Association
2. Banff & Lake Louise Tourism
3. Bow Valley Regional Transit Services Commission
4. Calgary Regional Partnership
5. Canadian Pacific (CP) Rail
6. City of Calgary

7. Government of Alberta Ministry of Transportation
8. Improvement District #9
9. Lake Louise Train Station leaseholder
10. Liricon Capital (Banff Railway Station leaseholder)
11. Municipal District (MD) of Bighorn No. 8
12. Parks Canada (Banff and Lake Louise)
13. Stoney Tribal Administration (Morley)
14. Sustainable Alberta
15. Town of Banff
16. Town of Canmore
17. Town of Cochrane

Feedback gathered through each of these interviews was recorded and organized by broad, recurring themes as they emerged through the analysis.

Stakeholder Feedback Detailed Summary

The following is a summary of common themes that have emerged from preliminary review of stakeholder interviews to date.

Figure A-1: Stakeholder Themes

Theme	Supporting Feedback
1. Opportunities and Benefits	
1.1. Reducing Congestion and Demand for Parking	Nearly all municipal stakeholders, as well as some non-municipal stakeholders noted reduction in congestion and demand for parking as the primary benefit of a mass transit service, although the severity and characteristics of congestion varied by municipality. • Congestion is increasing, particularly in Banff and Lake Louise, but also in Canmore and Cochrane. This is seen as a threat to visitor and resident experience. Banff and Lake Louise in particular were not designed to accommodate the current numbers of vehicles. Changing infrastructure to accommodate additional vehicles would threaten the Parks experience. (Also see 1.6: Visitor Experience) • Multiple stakeholders felt it was important to distinguish visitors from vehicles. The number of vehicles in destinations like Lake Louise and Banff was seen as an issue; however, there is still room for additional visitors. To paraphrase a common theme, "The Park has an issue with too many cars, not too many people." • Two particular points of concern for increased congestion were the Banff Ave. Bridge across the Bow River in the Town of Banff, and Lake Louise Drive in Lake Louise, leading to the Chateau Lake Louise. • Congestion in summer months is also leading to delays for existing transit services. • Reduced traffic along the Alberta Provincial highway system was also noted as a benefit, as well as deferring the need to expand infrastructure.
1.2. Environmental Benefits	Potential environmental benefits were mentioned by nearly all of the interview participants, although generally not discussed in depth. • Environmental benefits were more prominent in discussions with federal (Parks Canada) and provincial (Alberta Transportation) representatives. • Benefits included reducing car traffic and emissions and fitting into key environmental stewardship policies. • Some mentioned the importance of both the *perception* of public transit as an environmentally friendly option in addition to actual greenhouse gas (GHG) emission reductions.
1.3. Supporting the Tourism Industry/Local Business	Many mentioned the potential benefits to the tourism industry, particularly those stakeholders within the Park, by increasing the number of visitors with the access provided by a mass transit service between Calgary and the Bow Valley. • Those stakeholders within the Park generally saw a mass transit service as a benefit primarily to tourists, although they acknowledged benefits to residents as well.

Theme	Supporting Feedback
	• Those located outside of the Park saw more benefit to commuters between Calgary and Bow Valley communities. • Many described potential benefits to businesses within the Park specifically, although the Town of Cochrane also saw potential benefits to local business should a stop be included there. Most frequently, these benefits were seen as resulting from increased numbers of visitors to the Park. One stakeholder saw new entrepreneurial opportunities for people arriving by transit. For example, this might increase demand for guided activities. • Some described an increased interest among Albertans and Canadians to 'stay close to home' when vacationing, which has contributed to increased visitors to Banff.
1.4. Workforce Mobility and Connecting Communities	A potential mass transit service was seen as a way to move commuters between destinations in the Bow Valley corridor, supporting greater workforce mobility and connecting communities. • A major opportunity associated with a mass transit service described by many was the increased workforce mobility. Such a service would support commuters travelling from Calgary to other Bow Valley destinations, as well as those commuting into Calgary. This was viewed as an opportunity in Canmore and Cochrane in particular. • A mass transit service could also reduce isolation, allowing workers without personal vehicles greater access to Calgary and other Bow Valley destinations, thereby improving their quality of life. This is particularly the case for seasonal workers in Lake Louise and Banff who do not have access to a private automobile. • Very limited availability of housing presents a challenge throughout the Bow Valley region. This challenge is felt more acutely in Banff, due to the need to reside near jobs, as well as in Lake Louise. Canmore is also experiencing limited housing availability to a lesser extent. A mass transit service has the potential to alleviate some of this housing pressure by improving mobility between communities, bringing people to where there are jobs. • Increased mobility in the region also presents the potential for Canmore to become a 'bedroom community'. • The On-It regional service has demonstrated an interest from smaller communities in regional transit, both for the sense of connection it can create and the improved mobility. • Adoption of the service by commuters would depend largely on whether the schedule responds to commuter needs.
1.5. Accessibility and Equitability	A number of stakeholders also noted the social benefits of a mass transit service in the region. This service could improve access for those unable to drive and those without access to personal vehicles. • A mass transit service could allow access into Banff National Park for those who were not previously able to get to the Park easily, such as those who are unable or cannot afford to drive there. • Fare affordability was brought up by a number of stakeholders. This was seen as important both in making it competitive in comparison to other modes of transportation, as well as allowing more people to use the system.

Theme	Supporting Feedback
1.6. Visitor Experience	The importance of visitor experience within the Park was raised frequently by stakeholders. This theme was strongly linked with the negative impact of congestion on experience (Theme 1.1). • While Net Promoter Score (a measure of a visitor or customer's willingness to recommend an experience or service to others) has increased in Banff, according to Banff Lake Louise Tourism, the perception of congestion has also increased. Ultimately, the perceived experience of congestion would be a detriment to overall visitor experience, and most stakeholders, particularly within the Park, noted that this is an urgent matter. If the issue is not addressed, there is a risk visitors would go elsewhere. • There is a fear that expanding infrastructure to accommodate additional vehicles would negatively impact the character of tourism destinations. A mass transit service was seen as an alternative that could allow increased numbers of visitors without fundamentally changing the character of locations like Banff or Lake Louise.
1.7. Travel Experience	Many viewed the travel experience of a potential mass transit service as an attraction in itself. The trip could provide an opportunity for education, tourism promotion and an iconic Canadian experience. • The opportunity to create a travel experience was more frequently raised in reference to rail. There is a historic, romantic, nostalgic appeal to rail – the Park was built around a rail connection. • Generally, rail was perceived to be preferable to bus, in terms of popular appeal. Rail is more marketable from a tourism perspective. As one stakeholder described it, travellers would be more likely to share their rail trip on social media than a bus trip. It was anticipated that visitors would not go out of their way to take a regional bus to Banff, but they would to take a train. • Mass transport by bus or rail provides a committed audience, and many saw this as an opportunity for Park education and promotion of local attractions. • Some stakeholders also described the important distinction between regional and local transit. A regional service should be more comfortable, regardless of whether it is intended for tourists or commuters.
1.8. Increase in Winter/Shoulder Season Visitors	A number of stakeholders identified a desire to increase visitation during off-peak periods outside the busy summer period (June to September). • While the number of visitors to the Park has historically been much higher in summer months, the number of winter visitors has been rising at a much higher rate than summer. The off-season or shoulder season is quickly disappearing. A mass transit service could help in spreading visitor numbers throughout the year. • A mass transit service would also provide an option for those visitors less experienced with driving in Canadian winters with a more attractive travel option.
1.9. Evidence of Market for Public Transit	Many stakeholders saw evidence of existing demand for a mass transit service in the region. • There is strong demand from ski hills for alternative means of bringing in visitors. • There has been significant media and public interest in the Calgary Regional Partnership's On-It pilot bus shuttle.

Theme	Supporting Feedback
	• Existing demand for a mass transit service would need to be supplemented by thorough promotions and a change in attitudes and culture (see Theme 2.7).
2. Challenges of Mass Transit	
2.1. Impact on Freight Operations (Rail)	For the passenger rail option, most stakeholders emphasized the key importance of working with CP in developing any passenger rail service. Perspectives varied on the feasibility of including passenger rail on the CP ROW, whether through creating new dedicated track or negotiating access to the existing track. • CP's priority is maintaining its freight business through the Laggan Subdivision, which provides its only access to the West Coast. It is currently nearing capacity, and CP has stated that it needs the ability to respond to surges and other changes in freight patterns. Passenger rail sharing the same track would limit this flexibility. • Access to freight is also important economically for some stakeholders in the Bow Valley region; passenger rail was seen by some as a threat to this. • Reliability would be a key challenge for passenger rail. As freight would take priority if existing track was shared, it would be very difficult to avoid delays for passenger trains. • Most stakeholders interviewed felt that a separate track for passenger rail was more feasible from an operations standpoint, although capital cost would certainly be higher. Dedicated track would still require CP approval, and some felt this option would be feasible if it could be demonstrated to create very minimal disruption to CP activities. • Some also noted that infrastructure and any other improvements associated with passenger rail should also benefit CP; for example, extending sidings. This could create mutually beneficial opportunities. • One suggestion was to build passenger rail along the Trans-Canada Highway corridor, thereby avoiding potential challenges associated with mixing passenger and freight on the same corridor.
2.2. Funding – Capital Costs and Operational Costs	Not surprisingly, nearly all stakeholders described cost as a key challenge in implementing any mass transit solution. • There were concerns that, while funding is available for capital costs for a project like this, there is less federal or provincial funding, if any, currently available for operations. • It was commonly believed that a mass transit service would require subsidy, although few could say to what extent it should be subsidized. Ultimately, most felt it should be financially sustainable and be viewed by the public as a good use of public funds. • Some also noted that not implementing mass transit also costs money, and that this should be factored into any decision making. Developing and maintaining roads and parking for private vehicles also has a cost.
2.3. Parks Canada Regulatory Requirements	A number of stakeholders emphasized the importance of working closely with Parks Canada on any proposed mass transit service. Proposed infrastructure or activities in the Park would need to meet Parks Canada regulatory requirements. • Exact regulatory requirements would depend on the proposed system routing and design, but any project with a potentially significant environmental impact would require assessment under the Canadian Environmental Assessment Act. Parks Canada would not endorse or allow a project that could have significant environmental impacts.

Theme	Supporting Feedback
	• The potential impact on wildlife of a mass transit service would also be determined by frequency of vehicles, particularly trains. Any increase in traffic would increase the risk of interactions with wildlife. Any mitigation would need to address this. • CP land is the only privately owned property in the Park, so Parks Canada would need to work with CP on issues related to any passenger rail through the Park. • Bus stops within the Park, if outside of the Banff town site, would require a licence of occupation, or to be under Parks Canada authority. • The system would need to be consistent with the Parks Management Plan.
2.4. Limited Land Availability	• Many stakeholders within the Park noted the strict limitations on development within the Park as a potential challenge, should additional land be required for infrastructure associated with a mass transit service. • Stakeholders also noted limited availability of land in Canmore, but this was primarily related to the high cost of acquiring land there. • Although limited land availability was noted as a challenge by many, a number of municipalities had also identified suitable lands for mass transit hubs and potential rail stations.
2.5. Increased Visitors	The increasing number of visitors to the Park and area was framed by stakeholders as both an opportunity and a challenge. • Many described the increase in visitors to the Park as inevitable. Interest is primarily in mitigating this increase, but not introducing a limit on visitors. As noted in Theme 1.1, most felt that the Park is facing 'a car problem, not a people problem'. • If the number of visitors using private vehicles continues to increase, the character of the Park and visitor experience could be threatened.
2.6. Future Technologies	While not discussed in detail, a number of participants did note uncertainty around the future of mobility more broadly as a potential challenge. For example, technological advances in autonomous vehicles will certainly have an influence on the design of any future mass transit service.
2.7. Culture Change	Many participants noted that municipalities in the region are typically auto-oriented in design, and this is often reflected culturally. The success of a mass transit service will rely in part on a cultural shift towards more use of transit. • While the cultural dominance of the private automobile is a commonly held assumption, some noted that getting people out of their cars is not as difficult as commonly thought. • While getting visitors to travel via mass transit to the Park would require changes in habits and culture for many Albertans, for many visitors to the Park from outside North America, travel via mass transit to tourist destinations is not unusual. • Raising awareness of the mass transit option was also highlighted as a potential challenge. The On-It pilot to the Park was seen as one way of raising public awareness of the potential.
3. System Attributes	
3.1. System Integration	The integration of the regional and local transportation systems was frequently described as a key element of a successful mass transit service – passengers on regional transit need easy and well-timed connections to their ultimate destination.

<table>
<tr><th>Theme</th><th>Supporting Feedback</th></tr>
<tr><td></td><td>Stakeholders presented a wide variety of solutions for the last leg of the journey, among them were Roam Transit, private shuttles run by hotels and other destinations, carpooling options, shared economy solutions like car and bike sharing.
Most felt that the success of a mass transit service in achieving reduced congestion would rely on the ability of that system to get people to their ultimate destination with their equipment (such as mountain bikes, skis or camping equipment). Some felt that the last leg needed to be an integral part of the planning of any system, while others were optimistic the local market would quickly ‘fill in the gaps’ once the regional mass transit service was established.</td></tr>
<tr><td>3.2. Stop Locations</td><td>In general, for bus and rail service, most stakeholders envisioned transit hubs in each destination or municipality, with connections to other local services. Below are the locations suggested in stakeholder interviews:
Lake Louise: Most frequently suggested locations:
Rail – existing station (Sentinel Rd)
Bus – Samson Mall
Bus – Lake Louise overflow parking lot
Other suggested locations: Bus – Lake Louise Ski Hill, Upper Lake Louise
Bus stops to major trailheads such as Johnson Canyon, Baker Creek and the Plain of Six Glaciers teahouse hike were also suggested
Banff: Most frequently suggested locations:
Rail – Banff Train Station (Railway Ave and Lynx Street)
Bus – Banff Train Station as a transit hub
Other suggested locations: Bus – Banff Ave and Wolf Street
Canmore: Most frequently suggested locations:
Rail – limited suitable or available locations. Potential at overflow parking area between Canadian Tire and Save-on-Foods, NE of Gateway Ave
Bus – Elevation Place
Bus – a regional transit hub/park and ride at the “moustache lands” West of Palliser trail, between Palliser and the Trans-Canada highway
Other suggested bus locations - 17th St. and Industrial Pl, and the Travel Alberta visitors centre at the northern end of the town
Morley: Most frequently suggested locations:
Rail – along existing CP ROW in Morley (there was historically a station in Morley)
Bus – Central Morley near other amenities
Bus – The interchange of 133X and the Trans-Canada Highway
Bus – the Stoney Nakoda Casino
Cochrane: Most frequently suggested locations:
Rail/Bus – the Town has acquired land on Railway Street with the long-term vision of creating a transit hub
Calgary: Most frequently suggest locations:
Crowfoot LRT Station
Sunalta Station (west of Downtown Calgary)
Rail Town (east of Downtown Calgary)</td></tr>
<tr><td>3.3. Seasonality</td><td>Most stakeholders described the need for year-round service.</td></tr>
</table>

Theme	Supporting Feedback
	• From a tourism perspective, there is a desire to increase visitors during the winter months, and a mass transit service could support this. • Many also saw a mass transit service as a potential benefit to commuters; this type of service would need to be available at a consistent level of service year-round. • Some also pointed out the need to make efficient use of infrastructure; using stops/stations and buses for only four months a year means underutilized assets. • Others noted that the number of winter visitors to the Park is increasing at a greater rate than in the summer; a transit system should support this (Theme 1.8)
3.4. Frequency	There was not a clear consensus among stakeholders on the frequency of the service; it largely varied according to the group each stakeholder served. • For those focused on serving the tourism industry and Parks, there was an emphasis on service early in the morning and late in the day, to capture day-trippers, with few mid-day trips. • Others emphasized the need for regular service throughout the day and week, to capture a broader range of users. In support of this, others mentioned that visitors from outside southern Alberta who fly in 'arrive when they arrive', any time of day and a mass transit service must be available outside of morning and evening peak hours to attract this market. • Some suggested phasing in greater service levels over time – starting with more limited service but expanding as demand grows.
3.5. Fare	Few stakeholders could comfortably make an estimate as to what the exact fare might be, although it was frequently noted that it must be competitive with other options to be viable. • An example noted by multiple stakeholders was a rental vehicle: if the cost of taking transit is not lower than a rental vehicle, few would be likely to take transit. • Many also suggested offering free passes to visitors through hotels or other attractions, integrating it with other costs. • The potential for family rates and discounted fares for regular users (through a monthly pass or a book of tickets) were both described by multiple stakeholders. • Costing models – give a discount to those who use all the time vs one-time users. • The importance of fare integration with other services was also mentioned, to make the user experience seamless and as straightforward as possible.
3.6. Rail: Advantages and Challenges	In discussion of the comparative advantages and challenges associated with a rail-based service, the following were the most commonly raised by stakeholders: • **Advantages of Rail:** o Often seen as a more desirable mode of travel when compared to bus – would be more attractive to many. (See theme 1.7). o Potentially lower operating costs than bus (depending on ridership). o Rail has much greater capacity than bus. o Rail speed could potentially be higher than that of bus service (does not compete with traffic).

Theme	Supporting Feedback
	o Rail could potentially reach more central destinations, such as downtown Calgary. • **Challenges of Rail:** o Much slower to get established. o Working with CP freight operations and infrastructure challenges (Theme 2.1). o Much higher capital costs.
3.7. Bus: Advantages and Challenges	In discussion of the comparative advantages and challenges associated with a bus-based service, the following were the most commonly raised by stakeholders: • **Advantages of Bus:** o A bus service would be agile and scalable; it would be comparatively simple to add more buses and adapt schedule to needs. o Bus was also described by many as an interim or incremental solution – a bus-based system could be established quickly, and rail could be established when greater demand was demonstrated. o A bus service could allow for a greater number of stops or multiple route options. • **Challenges of Bus:** o Less desirable when compared to rail – less of an experience. o Bus service would be impacted by traffic congestion.

Conclusion

Stakeholder input was used to understand the needs and perspectives of those living, working and travelling in the Bow Valley corridor as they relate to a potential mass transit system. As well, in support of the study and to complement the issues raised during the consultations, stakeholders provided or pointed to data sources that could be used by the study. In summary, nearly all stakeholders saw benefits from mass transit for residents, visitors or the sectors their organization represents, although stakeholders associated with the tourism industry saw more opportunities associated with mass transit than those communities more reliant on natural resources, where the local economy relies heavily on freight rail. Specific characteristics of a mass transit service envisioned by stakeholders varied. Preference was generally for rail, although bus was seen as either:

- an interim solution to rail;
- a part of the rail solution (e.g., supplement rail service); or
- a less desirable, but more feasible option.

Appendix B. Stakeholder Consultation Material

Appendix C. Context for Travel in the Bow Valley

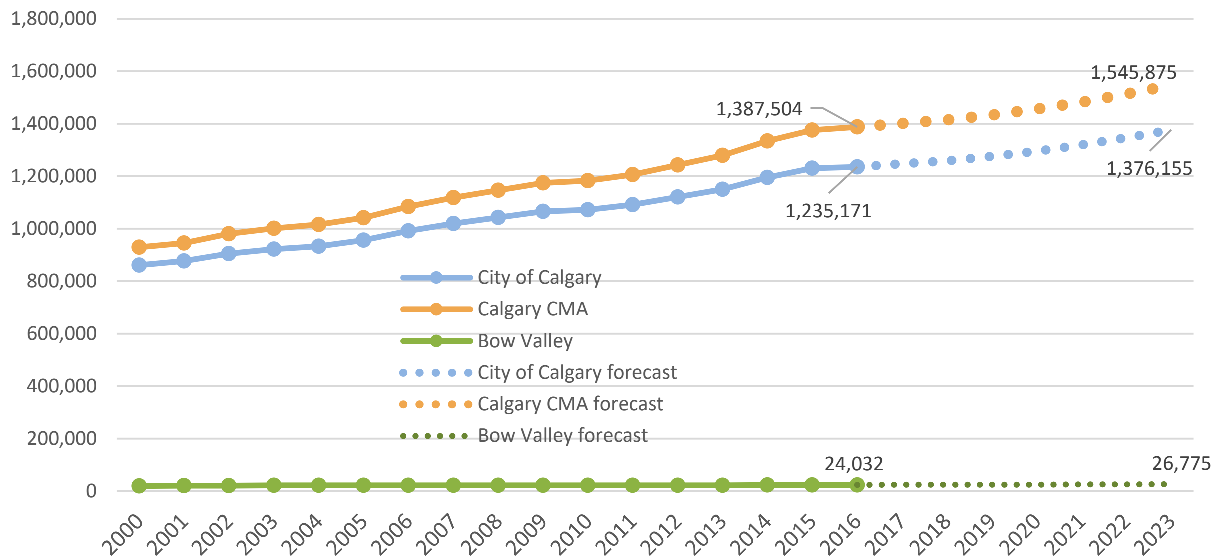
Regional Population and Growth

Calgary's population has been among the fastest growing in Canada, and this growth is expected to continue in the near future. Over the past decade, international migration has been the main driver to the increase in population. As illustrated in Figure C-1, the City of Calgary's population grew by about 2.3% per year between 2000 and 2016 and reached 1.24 million. The Calgary Census Metropolitan Area (CMA) population, which includes eight communities surrounding the City, increased at a slightly higher rate of 2.5% and totaled 1.39 million in 2016. Meanwhile, Bow Valley communities located west of Cochrane and up to Lake Louise saw their population grow at a smaller rate of about 1%.

Looking forward, by 2023 Statistics Canada population growth forecasts[121] suggest that total population in the Calgary CMA could continue to increase at a rate of nearly 1.6%. The City of Calgary estimates a slightly higher growth rate. The City of Calgary's Forecasting Toolbox estimates an annual growth rate for the region of 2.3% between 2015 and 2028, and 1.4% between 2028 and 2039, or approximately 1.9% per year over the next 25-year horizon. Provided the shift towards the post-urban economy[122] materialises in the near future, population growth rates in Bow Valley communities could increase and reach the same levels as Calgary CMA.

[121] *Source:* Calgary Economic Development, Historical and Forecast Population - Calgary Economic Region.
[122] For further information on impacts of the post-urban economy, see: Harris *et al.,* 2016, *Spatial Economics: The Declining Cost of Distance,* 24 pages.

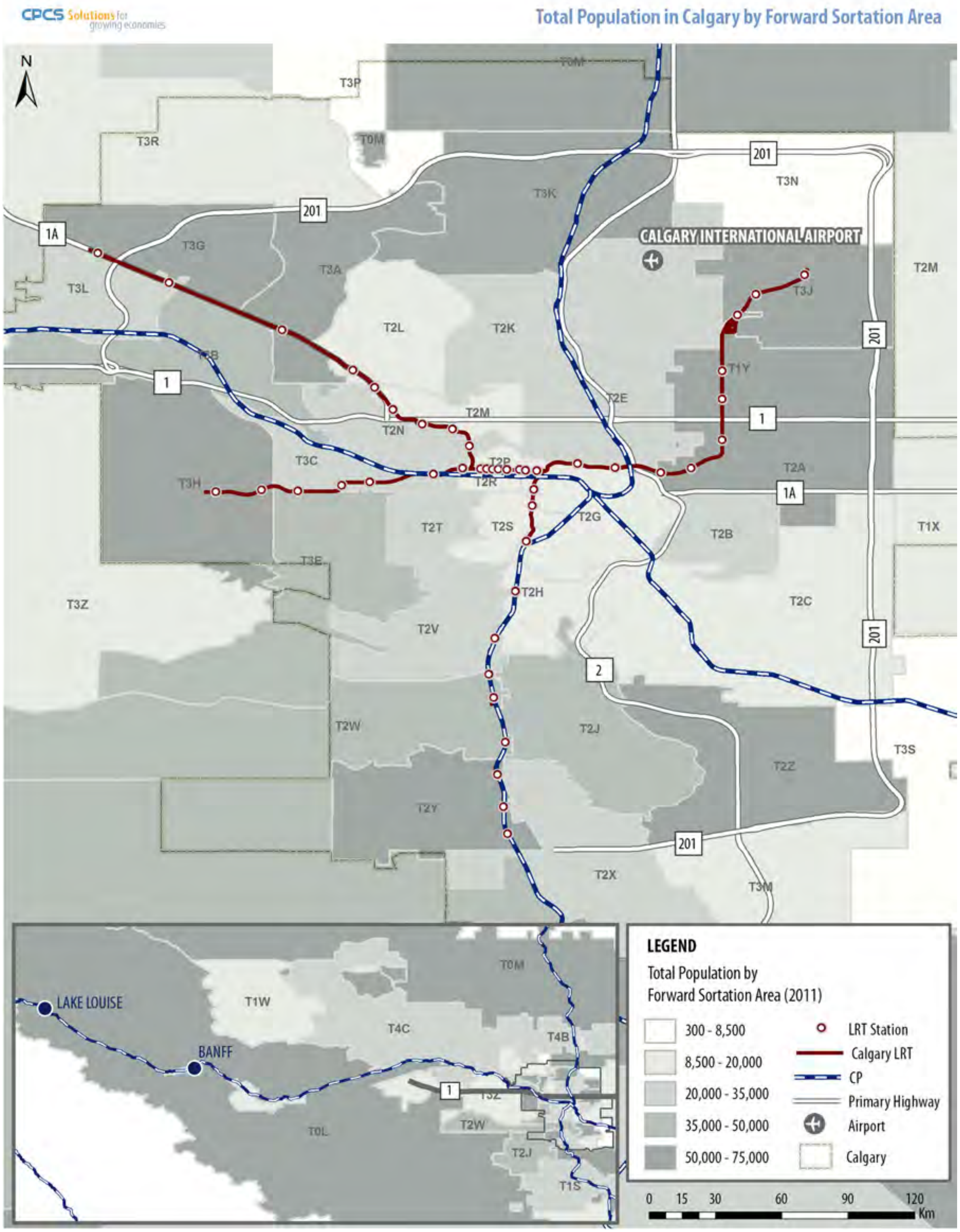
Figure C-1: Recent Population Growth and Forecast for the City of Calgary, Calgary CMA and Bow Valley



Source: CPCS, from Alberta Municipal Affairs and City of Calgary data

Figure C-2 shows the distribution of population in Calgary by forward sortation area (FSA, i.e. the first three postal code digits). Areas with the largest population are distributed along the ring road (Stoney Trail), with several of these zones located in northwest and southwest Calgary.

Figure C-2: Population Distribution in Study Area by Forward Sortation Area, 2011



Source: CPCS summary of Statistics Canada data

Existing and Future Local Transportation

Calgary

Existing

The transit system in Calgary is operated by Calgary Transit, a business unit of the City of Calgary with approximately 3,300 employees.[123] Calgary Transit operates buses and light rail transit (LRT) vehicles. The Calgary Transit network is briefly summarized in Figure C-3 below.

Figure C-3: Calgary Public Transit Networks

Transport Mode	Lines/Routes	Annual Ridership (2017)*
LRT	Two lines, 45 stations	88 million trips
Bus	155 routes	70 million trips

*Annual ridership reported in unlinked trips. Bus and LRT ridership does not sum to total ridership, as a trip might involve more than one mode.
Sources: Calgary Transit. Statistics
APTA. Public Transportation Ridership Report, Fourth Quarter, 2017.

Ensuring connectivity between the proposed service and Calgary Transit is an important consideration to ensure effective usage. To this end, of note, Calgary's LRT system (known as the "CTrain") is comprised of two lines (Red Line and Blue Line) with a total system length of 60 km (Figure C-4). Both lines overlap in a transit mall in Downtown Calgary, along 7 Avenue South, approximately two blocks north of the CP mainline. This distance corresponds to an approximately five-minute walk.

CTrain service operates primarily at grade and terminates in the northwest at Tuscany (Red Line) and in the west at 69 Street (Blue Line). The Red Line consists of two legs that connect Northwest Calgary and South Calgary with the downtown area. The pilot bus service between Banff and Calgary operates via the Somerset-Bridlewood CTrain station (in the southeast) and the Crowfoot CTrain station, the first stop west of the interchange between the Stoney Trail ring road and Crowchild Trail. All of the CTrain stations between Brentwood and Tuscany, inclusive, have parking locations.[124]

The Blue Line connects Northeast Calgary and West Calgary with the downtown area. Its terminus at 69 Street also has a large park and ride, with over 800 stalls.

[123] Calgary Transit. Our Organization
[124] Calgary Transit. Park and Ride locations.

Figure C-4: CTrain Map

Source: Calgary Transit

In addition to CTrain service, Calgary Transit operates the Route 300 bus-rapid transit route between the Calgary International Airport and downtown. The service currently operates on 20-minute headways during the peak periods. The downtown portion of the route passes by or near potential stop locations for a mass transit service downtown.

Future

In 2007, Calgary City Council approved the Terms of Reference for an Integrated Land Use and Mobility Plan which expands Calgary's previous transportation plan (*The Go Plan*, 1995) into what is the Municipal Development Plan (MDP) and the Calgary Transportation Plan (CTP).

The plans set a long-term (60-year) strategy "of a more sustainable city form for Calgary and the transportation networks needed to serve it. This is supported by a 30-year plan for managing growth and change, public investment and land use approval decisions. Finally, short-term, 10-year, corporate decision-making, business planning, implementation, and accountabilities are aligned to the strategies and plan to support Calgary's move to be a more sustainable city."[125]

The Calgary Transportation Plan makes several references to the possibility of commuter rail service in the future. First, it references work done by the now-defunct Calgary Regional Partnership (CRP) in developing a Calgary Metropolitan Plan:

> The CRP has identified enhanced regional transit services within and between its communities, integrated with growth corridors and nodes, as a cornerstone of the proposed Calgary Metropolitan Plan.
>
> The short-term regional transit goal is to implement an integrated, regional Bus Rapid Transit (BRT) service that would provide two-way service between key destinations within The City of Calgary and adjacent regional communities. These services would be connected through a network of Transit Mobility Hubs. Transit Mobility Hubs are a place of connectivity where different modes of transportation (i.e., walking, cycling, bus and rail transit) come together seamlessly, and where there is an attractive, intensive and diverse concentration of housing, employment, shopping and other amenities around a major transit station. Regional transit hubs will be located to support other medium- and longer-term transit investments such as inter-city commuter rail and LRT services.
>
> The City of Calgary supports the development of an integrated, high capacity regional transit service, and will identify and acquire mobility corridors within Calgary for future regional and inter-city transit services. The City will also take a leadership role in the co-ordinated planning and development of regional transit services in collaboration with CRP communities.[126]

Figure C-5 shows this "vision" for a regional transit network, including the possibility of commuter rail between Calgary, Cochrane and communities to the west. It also shows the possibility of LRT connectivity to Cochrane. It notes the expected population growth in this corridor, including Banff, Canmore and Cochrane, is expected to be 116,000 over the next 60 years.

[125] This and the ensuing discussions are taken from *Amendment No. 17 to the Municipal Development Plan as adopted by Calgary City Council in September 2009,* accessed March 15, 2017 from http://www.calgary.ca/PDA/pd/Documents/planning_policy_information/mdp-municipal-development-plan.pdf

[126] City of Calgary. Calgary Transportation Plan. P. 3-13.

Figure C-5: Conceptual Calgary Regional Transit Plan

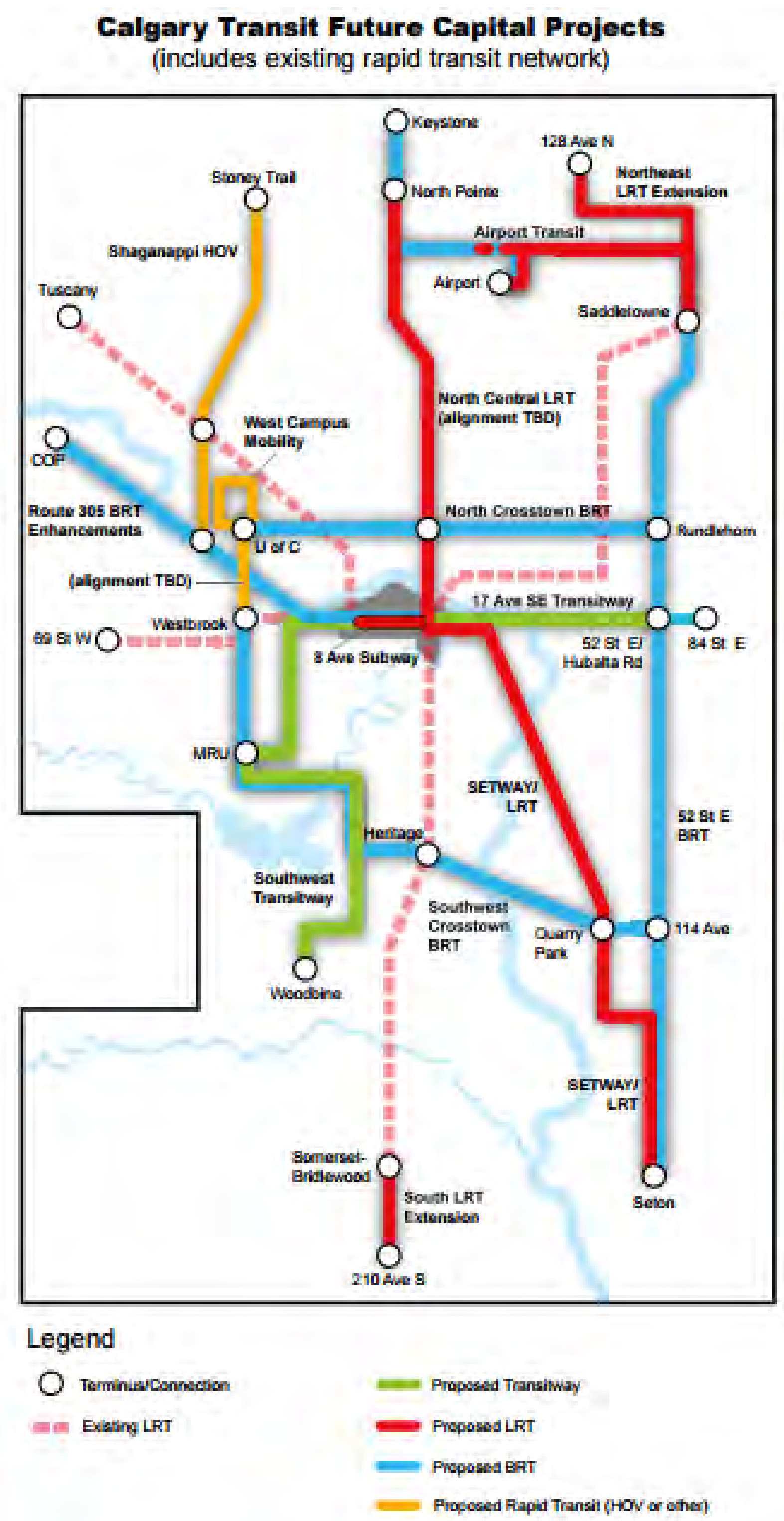
Source: City of Calgary. Calgary Transportation Plan

Currently, the potential for commuter rail service or an LRT to Cochrane is not found within the City of Calgary's Future Capital Projects within its Route Ahead Strategy, the City's "long-term plan to guide Calgary Transit over the next 30 years" (Figure C-6).[127] However, the City of Calgary identifies Sunalta CTrain Station, the intersection of 85 Street NW and the CP Laggan Subdivision, and Crowfoot CTrain as "Regional/Intercity Gateway Hubs" within its Primary Transit Network. The first two locations are adjacent to the CP Laggan Subdivision, identified as a "Regional Commuter Rail Corridor" in the Primary Transit Network.

Finally, it is important to note that a third LRT line (Green Line), which includes a north leg and southeast leg (both connecting through the current downtown corridor but through a tunneled right-of-way) has been proposed. The Green Line would run in close proximity to several station locations in downtown Calgary. It is also envisioned to eventually connect to the Calgary International Airport.

[127] City of Calgary. Route Ahead. A Strategic Plan for Transit in Calgary

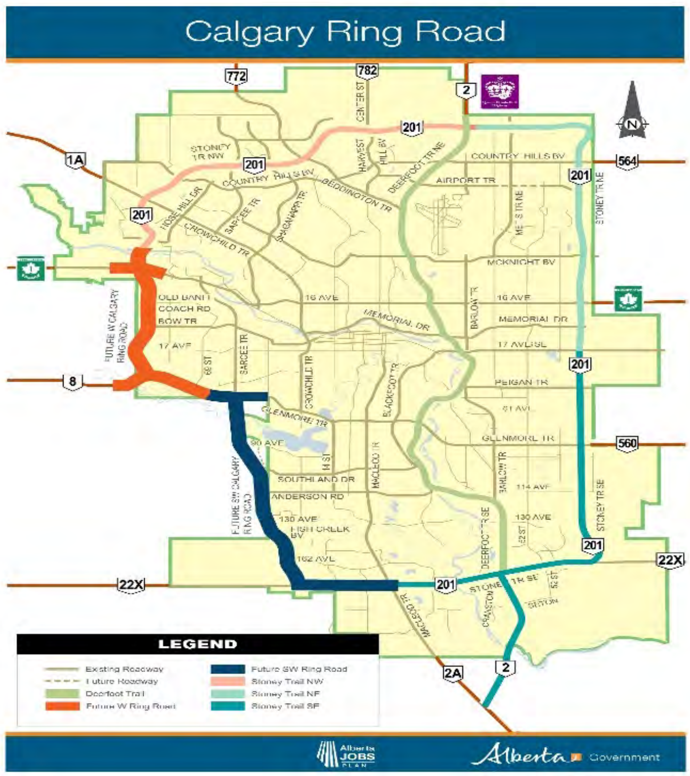
Figure C-6: Route Ahead Future Capital Projects



Note: The proposed new LRT alignment is currently subject to further revisions. Source: City of Calgary

Alberta Transportation is planning for completion of the southwest and west legs of Stoney Trail (Figure C-7). The southwest leg is expected to be completed in 2021, with the remaining west leg to be completed at a date to be determined.[128] There are no new connections between Calgary rail transit and the ring road. However, upon completion of the west leg of Stoney Trail, the intersection of Stoney Trail and Highway 1 in Western Calgary will likely become a convergence point for vehicles from Northwest and Southwest Calgary travelling to Banff. This location is just to the south of CP's Keith Yard, a possible rail station location.

Figure C-7: Alberta Transportation Stoney Trail Ring Road Completion



Source: Alberta Transportation.

Cochrane

Existing

The Town of Cochrane is located northwest of Calgary and has a population of approximately 26,000[129] people. Cochrane does not currently have a municipal transit agency, and local transit service within the town is not available. Commuter bus services, operated by Southland Transportation, are provided to Cochrane residents. This includes three daily commuter runs between various locations in Cochrane to downtown Calgary. The service operates inbound from Cochrane to Calgary during the weekday

[128] Alberta Transportation. Calgary Ring Road.

[129] Based on 2016 census data.

morning and in the reverse direction during the afternoon peak periods. For persons with disabilities, the Town also provides paratransit service using the Rocky View Handi Bus.

Future

In 2011, the Town approved $9 million in funding to establish a local and regional transit service and to construct a new transit terminal by 2021. Council received a Transit Alternatives Analysis Report in 2013 which endorsed a system eventually consisting of five routes. In early 2017, the Town retained a consultant to conduct a Transit Feasibility Study to assess a staging plan for implementing and preparing routes with proposed bus stops and shelters. The transit terminal is expected to be located on Railway Street West between Fifth Avenue and Centre Avenue, south of the CP tracks.

Bow Valley

The Bow Valley Regional Transit Services Commission (BVRTSC) provides local transit service in the Bow Valley, including Canmore, Banff and Lake Louise, under the branding Roam Transit. It is a government agency, governed by towns of Banff and Canmore and Improvement District #9 (ID#9), with Parks Canada as a non-voting representative. Roam Transit operates six local and inter-municipal routes. Fares for local services are $2.00. Fares for Route 3 (Banff-Canmore Regional) are $6.00. Service is provided free of charge on Route 6 Lake Minnewanka (funded by Parks Canada).

Canmore

Existing

The Town of Canmore is a community of almost 14,000 residents[130] located approximately 20 kilometres southeast of Banff. The town is serviced by one Roam local route (Route 5) and one regional route connecting Canmore with Banff (Route 3). A small transit terminal, consisting of one bus bay, a passenger shelter, covered bicycle parking and public washroom facilities, exists in Downtown Canmore on 9th Street.

The local transit service, Route 5 (Figure C-8) services both sides of the Bow River and the Trans-Canada Highway. It operates on weekdays with 30-minute headways during peak periods and hourly during off-peak periods between 10:00am and 3:00pm and 7:00 to 10:30pm. On Saturdays, Route 5 operates on a 40-minute frequency between approximately 8:00am and 8:00pm. On Sundays, Route 5 operates on a 75-minute frequency between approximately 8:00am and 8:00pm.

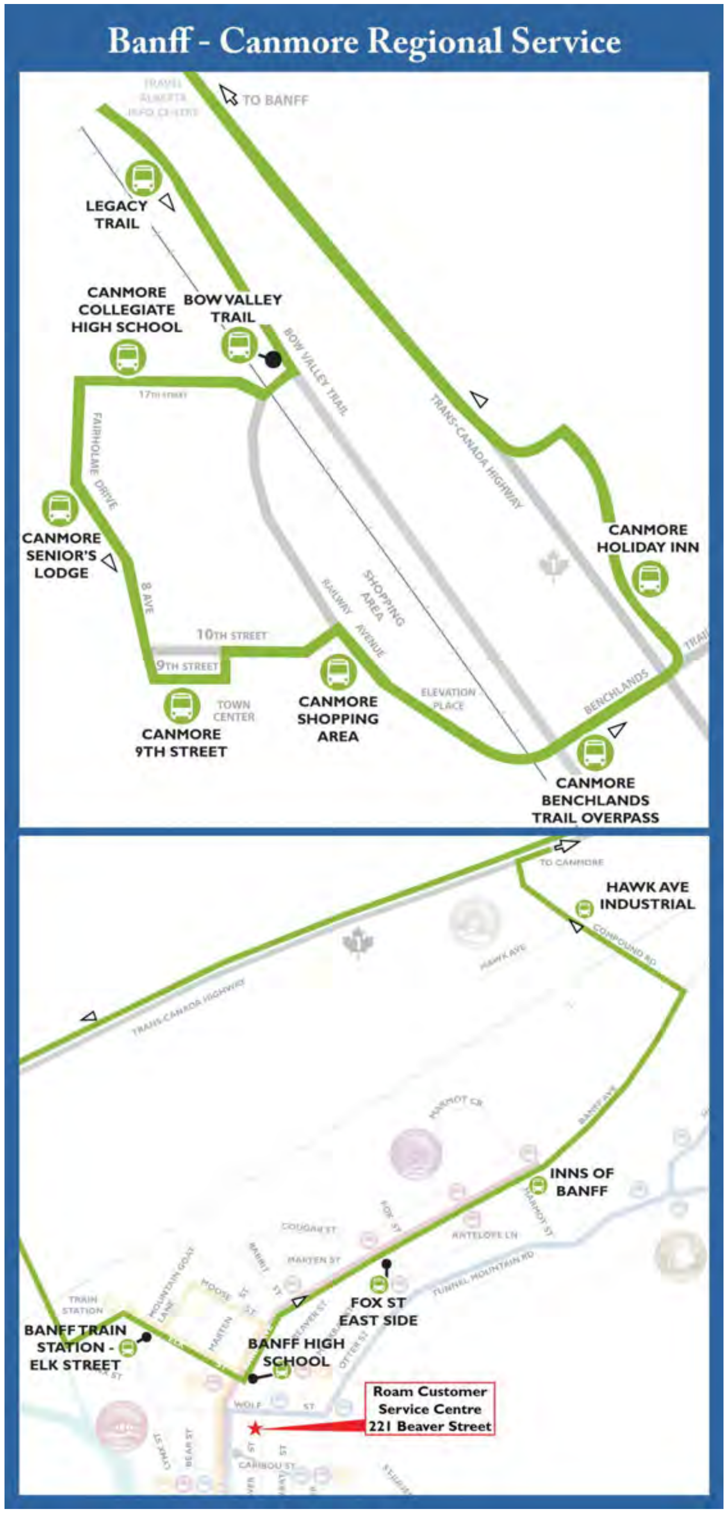
The Route 3 regional service (Figure C-9), links the Towns of Banff and Canmore along the Trans-Canada Highway. Within Banff, Route 3 completes a one-way counter-clockwise loop and services the train station and several stops along Banff Avenue (eastbound). In Canmore, Route 3 services Bow Valley Trail (eastbound), the 9th Street Transit Terminal, and Railway Avenue (eastbound). The transit travel time between the two towns is between 20 and 25 minutes. On weekdays, Route 3 operates on a 30-minute frequency during peak periods and hourly off-peak. Service is provided between approximately 6:00am and 11:00pm. On Saturdays, Sundays and holidays, Route 3 operates on an hourly frequency between approximately 6:00am and 11:00pm.

[130] Based on 2016 Census data.

Figure C-8: Roam Transit Route 5

Source: Roam Transit

Figure C-9: Roam Regional Service Map



Source: Roam Transit

Future

Currently, no plans exist to introduce additional local service in Canmore or regional service between Canmore and Banff.

Banff

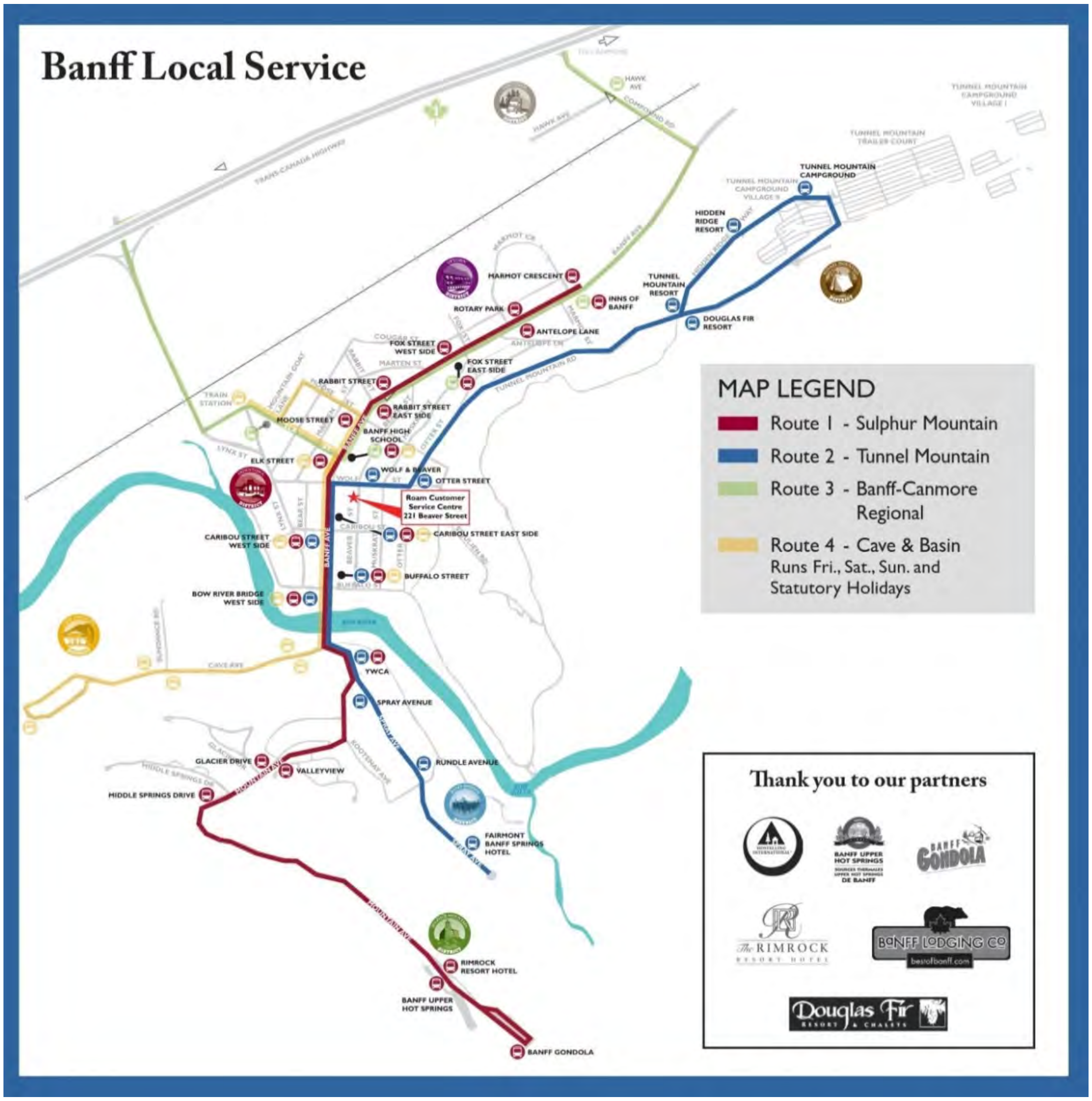
Existing

The Town of Banff is served by three local routes (Routes 1, 2 and 4) and one regional route (Route 3), in addition to a seasonal route (Route 6). The majority of the service in Banff is in the downtown corridor along Banff Avenue. There is no centralized terminal for vehicle layovers, with vehicles instead laying over at their respective final destinations. Local services are summarized as follows:

- *Banff Local Route 1* – Sulphur Mountain serves Banff Avenue and Mountain Avenue, connecting the Banff Gondola and Banff Upper Hot Springs to the central portion of the town as well as several hotels on Banff Avenue. Route 1 operates seven days a week on a 40-minute headway between approximately 6:00am and 11:30pm.
- *Banff Local Route 2* – Tunnel Mountain serves Banff Avenue, Tunnel Mountain Road and Spray Avenue, connecting the Fairmont Banff Springs Hotel and the Tunnel Mountain neighbourhood to the central portion of the town. Route 2 operates seven days a week on a 40-minute headway between approximately 6:15am and 11:30pm.
- *Banff Local Route 4* – Cave & Basin serves Banff Avenue and Cave Avenue, connecting the Banff Train Station and the Banff Cave & Basin to the central portion of the town. Route 4 is a summer-only service that operates Friday through Sunday on a 30-minute headway between approximately 9:00am and 6:30pm.
- *Banff Regional Route 6* – Lake Minnewanka serves Banff Avenue and loops north along the Trans-Canada Highway toward Lake Minnewanka, a major tourist destination. Major stops include the Banff Train Station, the Banff High School, and Minnewanka Park and Ride. The service is offered seven days a week from 8:00am and 8:00pm, May 19 to September 10.

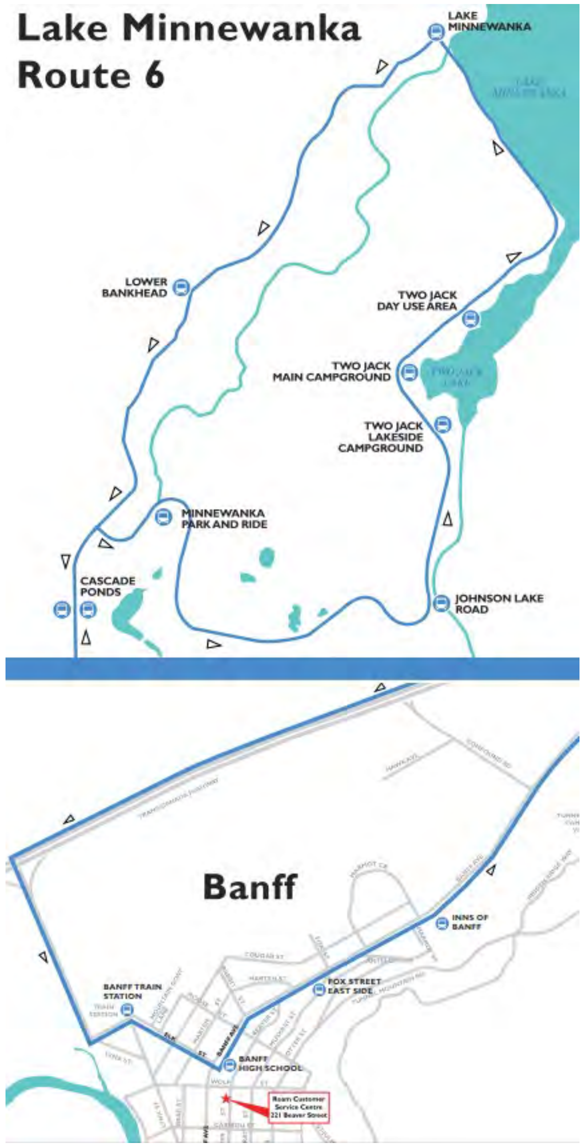
Maps of these routes are shown in Figure C-10 and Figure C-11.

Figure C-10: Roam Local Banff Service



Source: Roam Transit

Figure C-11: Roam Banff Regional Routes



Source: Roam Transit

Future

The BVRTSC has recently completed a review of its local transit service in the Town of Banff. The study outlines options for potential service improvements, new routes and strengthened connections to inter-municipal services.

For 2018, approval has been provided for three new buses to improve local service. An additional two buses have been approved for 2020. This will help improve the frequency of service for residents and visitors to Banff. Additional recommendations for service improvements will be identified in the ongoing transit service review.

Lake Louise

Existing

The BVRTSC does not operate a local transit service in Lake Louise. However, Parks Canada operated a free seasonal shuttle service within Lake Louise and to Moraine Lake during the summer of 2017. Between May 19 and September 10, the service connected the overflow parking lot on the Trans-Canada Highway (south of Lake Louise) to Chateau Lake Louise, and provided service every 15 minutes between 8:00am and 6:00pm. Between September 11 to October 9, the route was modified and connected the overflow parking lot to Moraine Lake.

The Lake Louise Ski Resort operates a shuttle that links the resort, the Samson Mall and the Chateau Lake Louise. The shuttle runs year-round and offers departures every 30 to 60 minutes between approximately 9:00am and 4:00pm. The shuttle is free to ride for all members of the public.

Between Banff and Lake Louise, travel options are limited to private automobile, carpool, bicycle, taxi or infrequent bus (except in 2017, in which a free shuttle was offered by Parks Canada). Greyhound Canada and Brewster Travel offer three to four bus trips each day, with prices for a one-way adult ticket ranging between $12.00 and $30.00. Greyhound buses run on the Calgary to Vancouver route and stop at the Samson Mall. Brewster Travel buses connect to both Downtown Calgary and Calgary International Airport, and stop at Samson Mall, the Chateau Lake Louise and four other hotels in the village.

“Hop On Banff” is a tourist-oriented bus service that connects a number of key tourist destinations along the Bow Valley Parkway for a $50.00 all-day adult ticket. The service operates using school buses and offers four trips during the summer tourist season. In Banff, the service stops at the Banff Train Station and the Moose Hotel, while in Lake Louise, the Gondola, the Samson Mall, the Chateau Lake Louise and Moraine Lake are all served.

Future

In 2017, the BVRTSC approved a report examining the establishment of a transit service connecting Banff and Lake Louise. Two service scenarios were developed, and service was recommended year-round. Service is envisioned to be offered between 7:00am and 10:00pm along both the Trans-Canada Highway corridor, as well as along the Bow Valley Parkway connecting the several trail heads (summer only). Depending on the service scenario implemented, service is expected to be provided every 45 or 60 minutes along the Trans-Canada Highway route. Adult one-way fares are recommended to be $12.00, with numerous concessions available for round-trips, families, and multi-day passes. The service was recommended to begin the summer of 2018.

There has been considerable discussion about Parks Canada funding a permanent local transit service within Lake Louise which would provide opportunities to connect to the Upper Village, Moraine Lake and potentially the Lake Louise Ski Resort. Once this service is in place, additional connection opportunities with the local Lake Louise services will exist for Calgary-Bow Valley passengers. Based on discussions with the BVRTSC, it is not anticipated that a local service will be in place by 2018.

Existing Intercity Transportation

Visitor Oriented

Existing Bus

Figure C-12 summarizes existing bus services between Calgary and the Bow Valley. There are currently up to 20 daily departures from the Calgary International Airport (YYC) and eight daily departures from around downtown Calgary. Travel times between downtown Calgary and Banff are typically advertised between 1:30 and 1:40.

Figure C-12: Calgary-Bow Valley Bus Services

Service Provider	Calgary Origin	Bow Valley Destinations	Frequency	Advertised Travel Times (h:mm)	Ancillary Services	Approximate capacity
Banff Airporter	YYC	Canmore, Banff	10 daily	Canmore: 1:40 Banff: 2:00	Power outlets	Minibus (~30 seats)
Brewster	YYC	Kananaskis, Stoney Nakoda Resort, Canmore, Banff, Lake Louise	10 daily	Canmore: 1:20 Banff: 1:45 Lake Louise: 3:15	Onboard lavatory	Coach
	Downtown		4 daily	Canmore: 1:15-1:20 Banff: 1:30-1:40[2] Lake Louise: 3:15[3]	Onboard lavatory	Coach
Greyhound [5]	Downtown-west/Sunalta	Morley Jct,[4] Canmore, Banff, Lake Louise	4 daily	Canmore: 1:15 Banff: 1:40 Lake Louise: 2:30-2:45	Onboard Lavatory	Coach

[1] Not all intermediate stops made each trip. [2] When direct from downtown and not via YYC. [3] Includes 45-minute stop in Banff. Travel time between Banff and Lake Louise between 45 minutes and 1 hour. [4] Not all services stop here. [5] As of July 2018, Greyhound has indicated that it is discontinuing bus service in western Canada. Source: CPCS summary of Banff Airporter, Brewster

Figure C-13 summarizes existing one-way fares of bus services between Calgary and the Bow Valley. Fares from Calgary to Banff can range from $17.40 to $69.00. The lower end represents fares purchased in advance, whereas the higher end represents a more premium service (more legroom/recline, power outlets).

Figure C-13: One-Way Fares ($)

Service Provider	Route	Adult	Senior	Children	Young Children
Banff Airporter	YYC-Banff	62.99	53.54	31.50	Free (0-2)
Brewster	Calgary-Banff/Canmore	69.00	N/A	35.00	Free (0-5)
	Calgary-Lake Louise	95.00	N/A	48.00	Free (0-5)
Greyhound	Calgary-Canmore	16.30-36.90	Concession discounts on higher-cost fares		
	Calgary-Banff	17.40-39.40			
	Calgary-Lake Louise	22.50-54.10			

Source: CPCS summary of Banff Airporter, Brewster, Greyhound. (For Greyhound, selected July 15, 2017 on April 20, 2017. Lower-cost fares are usually advance booking/non-refundable.)

Pilot Bus Service

The Calgary Regional Partnership (CRP)[131] implemented its On-It pilot bus service between Calgary and Banff in the summer of 2017, which was funded by Banff, Canmore and Parks Canada, with in-kind management support from the CRP. The Calgary-Banff service was offered on weekends and holidays between June 16 and September 4, 2017. The service was planned to align with Canada's 150th birthday and the anticipated influx of tourism in national parks such as Banff. In addition, the service was intended to help ease high-traffic congestion expected on the Trans-Canada Highway.

Two separate routes were provided as part of the Calgary-Banff service (Figure C-14). The express route connected Crowfoot Station on the NW CTrain line in Calgary and Banff Train Station in Banff. The regional route provided connections to other major destinations such as Okotoks, Cochrane and Canmore, in addition to the express route stops. In total, 10 westbound trips and 13 eastbound trips were offered on weekdays and holidays (Figure C-15). The fare was $10 one-way.

[131] The CRP was a partnership between multiple municipalities in the Calgary region including Calgary, Airdrie, Cochrane, Strathmore, Chestermere, Okotoks and High River, but was wound down voluntarily subsequent to the creation of the Alberta-regulated Calgary Metropolitan Regional Board (CMRB). The original branding, On-It Regional Transit, continues "under the management of Southland Transportation."
CRP. 2018. Calgary Regional Partnership 2004 – 2018.

Figure C-14: Summer 2017 Calgary-Banff Pilot Bus Routes

Source: Calgary Regional Partnership

Figure C-15: Summer 2017 Calgary-Banff Pilot Bus Schedule

TO BANFF

BUS #	OKOTOKS RECREATION CENTRE	CALGARY SOMERSET-BRIDLEWOOD LRT	CALGARY CROWFOOT LRT	COCHRANE 1 ST AVE	CANMORE BENCHLANDS TRAIL	BANFF TRAIN STATION	BANFF HIGHSCHOOL
C1		5:49 AM	6:30 AM			8:15 AM	8:18 AM
C2	6:09 AM	6:34 AM	7:15 AM	7:37 AM	8:42 AM	9:08 AM	9:11 AM
C3	6:54 AM	7:19 AM	8:00 AM			9:45 AM	9:48 AM
C4		8:04 AM	8:45 AM	9:07 AM	10:12 AM	10:38 AM	10:41 AM
C5		8:49 AM	9:30 AM			11:15 AM	11:18 AM
C6			10:45 AM			12:30 PM	12:33 PM
C7			12:45 PM			2:30 PM	2:33 PM
C8			2:45 PM			4:30 PM	4:33 PM
C9			4:12 PM			5:57 PM	6:00 PM
C10			6:30 PM			8:15 PM	8:18 PM

Calgary/Banff Regional Calgary/Banff Express

TO CALGARY

BUS #	BANFF HIGH SCHOOL	CANMORE BENCHLANDS TRAIL	COCHRANE 1 ST AVE	CALGARY CROWFOOT LRT	CALGARY SOMERSET-BRIDLEWOOD LRT	OKOTOKS RECREATION CENTRE
B1	9:26 AM			11:11 AM		
B2	10:53 AM			12:38 PM		
B3	12:45 PM			2:30 PM		
B4	2:45 PM			4:30 PM		
B5	4:45 PM			6:30 PM		
B6	5:30 PM			7:15 PM		
B7	6:15 PM			8:00 PM		
B8	7:00 PM	7:26 PM	8:31 PM	8:53 PM		
B9	7:45 PM			9:30 PM	10:11 PM	10:36 PM
B10	8:30 PM	8:56 PM	10:01 PM	10:23 PM	11:04 PM	11:29 PM
B11	9:15 PM			11:00 PM	11:41 PM	
B12	10:00 PM	10:26 PM	11:31 PM	11:53 PM	12:34 AM	
B13	10:45 PM			12:30 AM	1:11 AM	

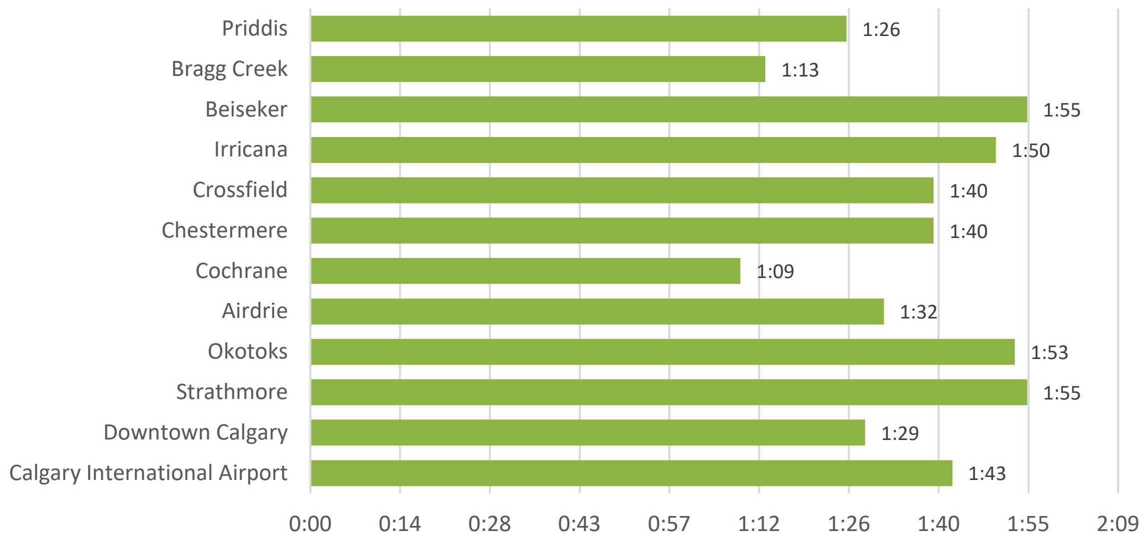
Calgary/Banff Regional Calgary/Banff Express

Source: Calgary Regional Partnership

Automobile

Travel times by automobile to Banff from the Calgary CMA are very similar to the ones published by regular bus services (Figure C-16). As shown in the figure below, it takes about 1:30 to drive from downtown Calgary to Banff.

Figure C-16: Automobile Travel Times to Banff for Selected Origins



Source: CPCS, travel times calculated by Google Maps

Calgary Commuter Oriented

Southland Transportation operates three commuter-oriented routes between Cochrane and Calgary, once per day each. Fares are $15 per one-way trip. One-way monthly, monthly and yearly rates are available for $180, $256, and $2,816 respectively. Seating is not guaranteed for those purchasing a one-way ticket.[132] From the last stop in Cochrane on Route 1 to Calgary 9 Avenue and 2 Street SW (Plus 15) is approximately 42 minutes. It would be approximately an eight-minute walk from there to 5 Avenue and 4 Street SW,[133] for a total travel time of at least 50 minutes.

It is also possible to drive to a CTrain station (e.g. Crowfoot) and take the CTrain downtown. The approximate travel time for this trip (from downtown Cochrane to Downtown Calgary) is approximately 52 minutes (Figure C-17).

Figure C-17: Cochrane to Calgary Drive, Then CTrain Schedule

Trip Component	Estimated Time
Drive from Downtown Cochrane to Crowfoot CTrain	16-24 minutes
Walk time from middle of parking lot	2 minutes
Waiting time at Crowfoot CTrain (approximately half the frequency)	2 minutes
CTrain Crowfoot to 3 Street SW	24 minutes
Walk to Downtown	4 minutes
Total (based upon mid-point driving time)	52 minutes

Source: CPCS analysis using Google Maps

[132] Southland Transportation. Commuter Services.
[133] Location selected as a consistent reference point in downtown Calgary.

Driving from downtown Cochrane to Calgary is also another possible route. Based upon Google Maps, the typical travel time at 7:20 and 8:00am on a weekday can be between 35 to 60 minutes, and 30 to 55 minutes, respectively.

Appendix D. Demand Analysis Notes and Additional Survey Results

Visitor Origin – Additional Data

Parks Canada

Parks Canada collected visitor origin data based upon point of sale information between early April and mid-September 2016. These data were reported by transactions at the East Gate (closest to Calgary [351,115 transactions]) as well as all other gates (168,641 transactions). Based upon these data, between 14% (other gates) and 27% (East Gate) came from the City of Calgary (Figure D-1).[134] Assuming the samples of records taken are representative, approximately 23%[135] of visitors to Banff National Park in the summer of 2016 came from the City of Calgary.[136] However, this survey may underestimate Calgary visitors because it does not capture visitors entering BNP who have already purchased a Park Pass.

Figure D-1: Calculation of Percentage of Visitors from the City of Calgary

Location of Entry	Percentage of Canadian Visitors (Out of Sample)	Percentage of Alberta Visitors (Out of Canadian Visitors)	Percentage of City of Calgary Visitors (Out of Alberta Visitors)	Percentage of Visitors from City of Calgary
East Gate	65%	73%	56%	27%
Other Gates	44%	65%	49%	14%

Source: CPCS analysis of Parks Canada data

Zins Beauchesnes and Associates

In 2008 and 2015, Zins Beauchesnes and Associates (ZBA) undertook a detailed study of visitor experience in the Banff area. These data were used when no other sources were available.

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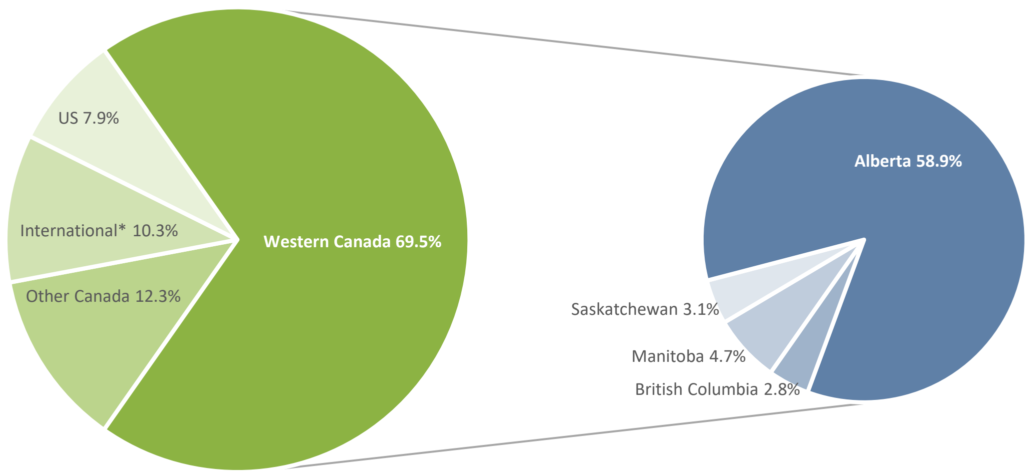
134 At the East Gate, approximately 1% of transactions (4,445 records) contained valid records for analysis. At other gates, 4% of transactions (7,094 records) were valid for analysis.

135 This fraction is higher than that estimated by the ZBA study, which found that 26.6% of visitors in the summer of 2016 came from *Alberta* in total. The ZBA study was based on survey responses rather than point-of-sale data, so potentially fewer Albertans were identified in the data collected.

136 The value for the Calgary CMA would likely be about three percentage points higher, based upon the relative population ratios between the City of Calgary and the CMA.

During winter, residents of Alberta account for nearly 60% of visitors to Banff. They are followed by Canadians domiciled in other provinces, notably in Manitoba, Ontario, Québec and British Columbia. Origins of visitors to Banff in the winter of 2015 are illustrated in Figure D-2.

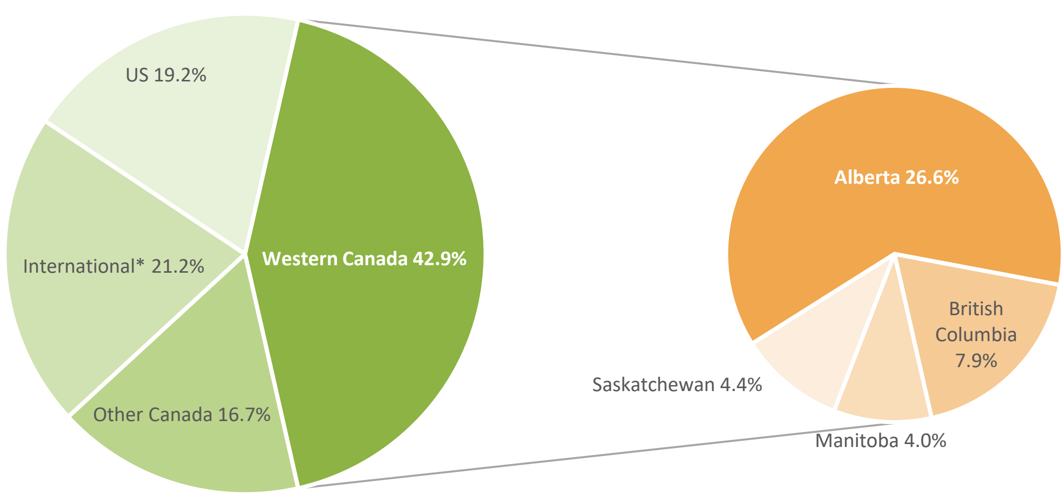
Figure D-2: Origin of Visitors to Banff (Winter 2015)



Source: CPCS, adapted from ZBA *Outside of US and Canada

During summer, the situation is slightly different as more visitors originate from further away (Figure D-3). Changes in the methodological approach to the survey also partially explain the lower ratio of Western Canada visitors.[137]

Figure D-3: Origin of Visitors to Banff (Summer 2015)



Source: CPCS, adapted from ZBA *Outside of US and Canada

[137] In the summer 2015 survey, residents from Jasper and Canmore were excluded.

Survey Result – Calgary Residents

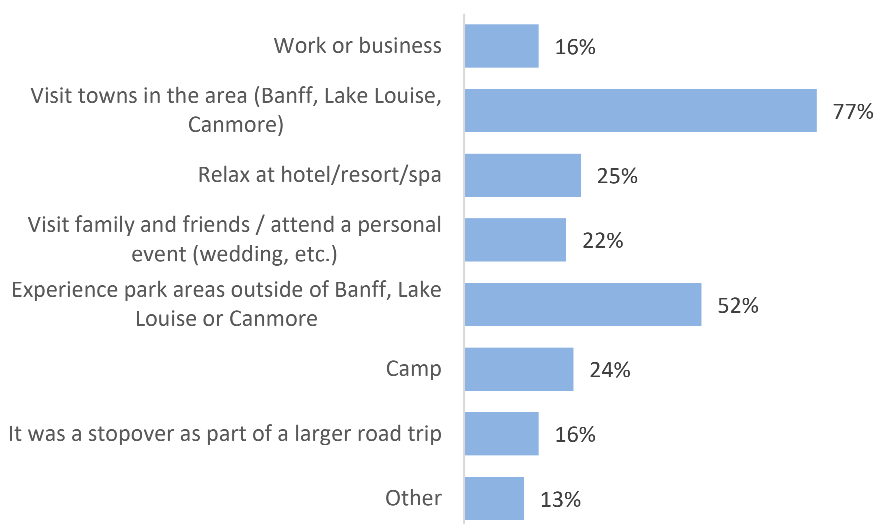
Destinations

Summer

In the online survey, there were 314 responses from Calgary Region residents indicating that they had made at least one summer trip to Banff National Park in 2016/2017. Figure D-4 shows the summer trip purpose of Calgary visitors responding to the online survey. Most (71%) indicated that they visited towns in the area, but a large proportion (48%) indicated that they also visited areas outside of the towns.

Importantly, from the perspective of a mass transit service, 15% of respondents indicated that their trip to Banff National Park was part of a larger road trip, a group of people who would be unlikely to use a mass transit service to Banff National Park. Likewise, many respondents who camp may be unlikely to use a mass transit service, given requirements for their gear and to access backcountry areas.

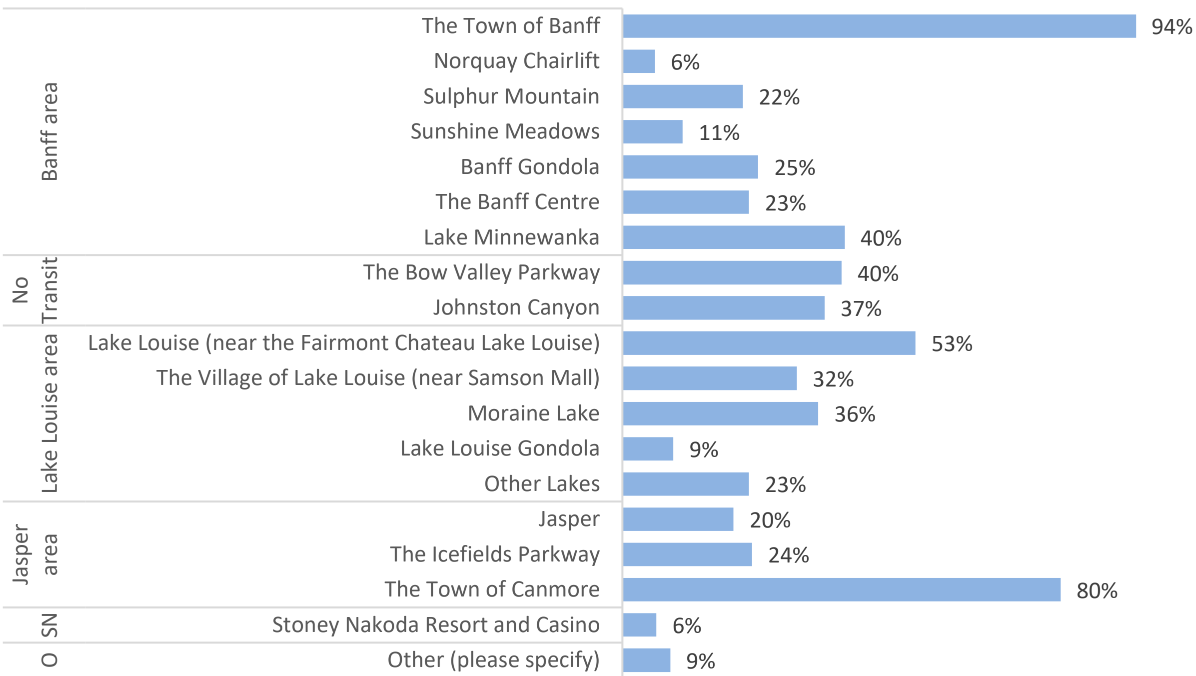
Figure D-4: Calgary Visitors – Summer Trip Purpose (Online Survey Respondents)



Source: CPCS analysis of online survey results

Figure D-5 summarizes the trip destination of online survey respondents. Most respondents travel to the Town of Banff.

Figure D-5: Calgary Visitors – Summer Trip Destinations

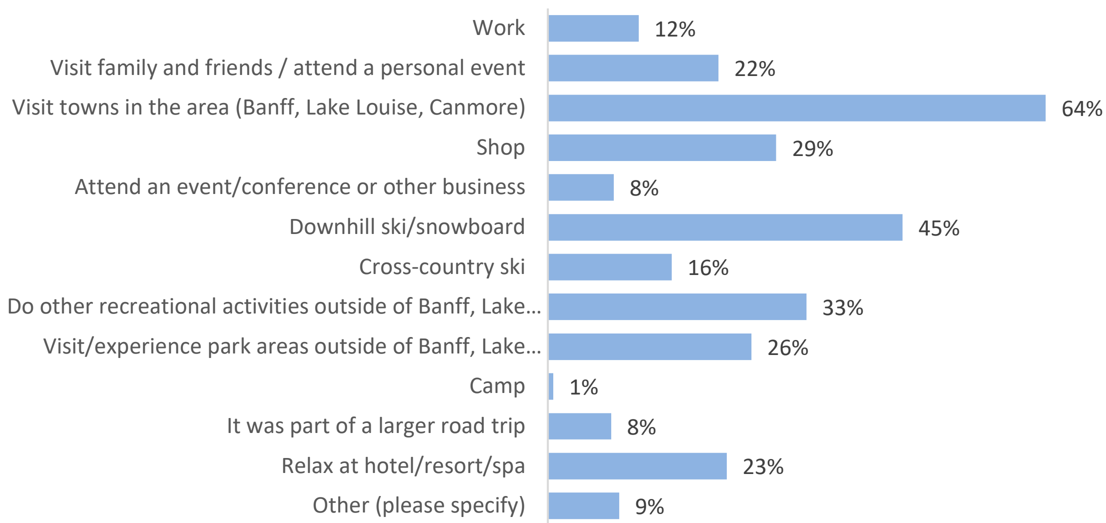


Source: CPCS analysis of online survey results

Winter

There were 263 responses from Calgary Region residents indicating that they had travelled to the Bow Valley in the winter of 2016/2017. Figure D-6 summarizes the winter trip purpose of Calgary Region residents from the online survey. Most (64%) indicate that their purpose includes visiting towns in the region, followed by downhill ski (45%). For a mass transit service to increase demand, it must offer connectivity to ski areas, and provide access for ski equipment.

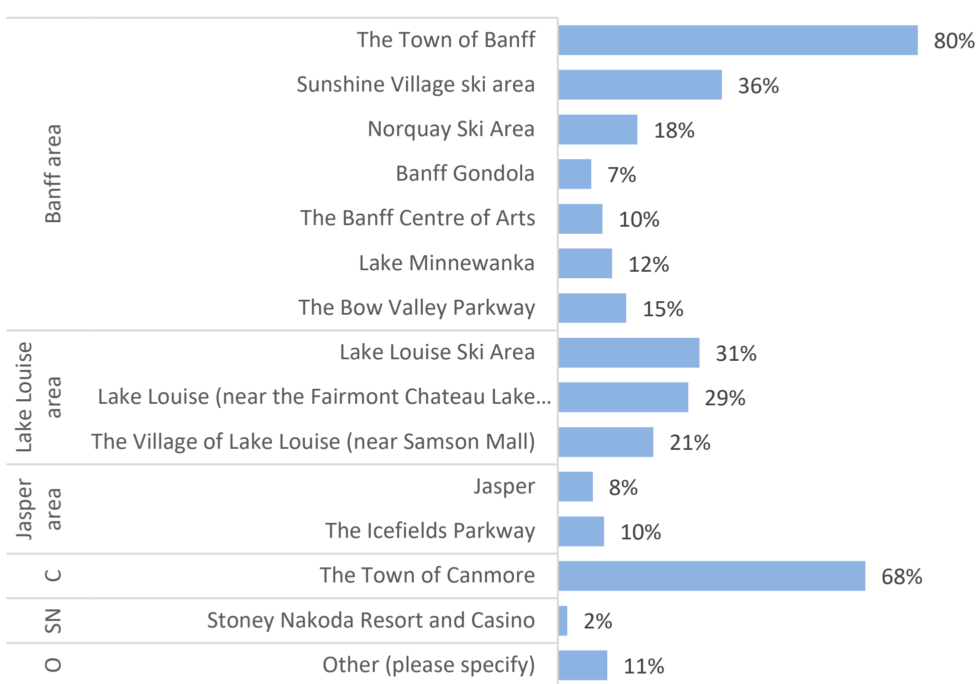
Figure D-6: Calgary Visitors – Winter Trip Purpose (Online Survey Respondents)



Source: CPCS analysis of online survey results

Figure D-7 summarizes the winter trip destinations of online survey respondents. Most respondents indicated that they visited the Town of Banff (80%) followed by the Town of Canmore (68%). In the winter, as expected, a larger fraction of trips were made to the ski resorts around Banff and Lake Louise.

Figure D-7: Calgary Visitors – Winter Trip Destinations (Online Survey Respondents)



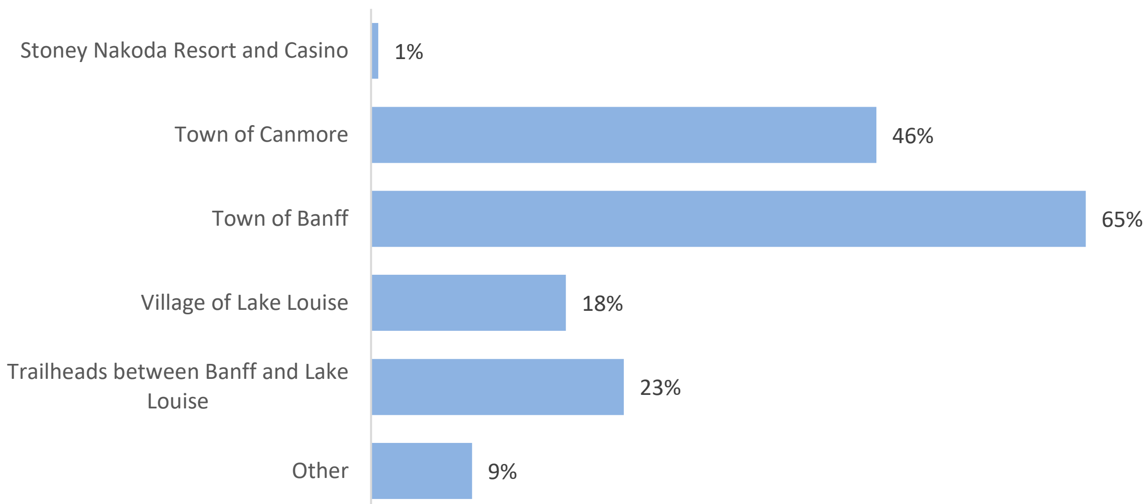
Source: CPCS analysis of online survey data

In-Person Survey Responses

In the in-person survey, there were 177 responses from Calgary visitors. Of these responses, 86% of respondents to the survey indicated that they were staying within the Bow Valley (i.e. not continuing their trip further). This figure is consistent with the response from the online survey.

Figure D-8 summarizes the destination of Calgary visitors reported on their current trip. Compared to the online survey, a smaller proportion visit Banff, though the overall distribution is similar to the online survey results.

Figure D-8: Calgary Visitors – Trip Destinations



Source: CPCS analysis of in-person survey responses

Group Size

For further analysis of both the required size of park and ride and other indicators, average vehicle occupancy of visitors to the Bow Valley is also an important factor. Survey data and other sources provide some estimates. In the in-person survey, the average occupancy of Calgary visitors to the Bow Valley who travelled in their own car was 2.8 persons per vehicle (Figure D-9). Estimates by Parks Canada have found that the average vehicle occupancy is closer to 2.5 persons per vehicle, across all vehicle types.

Figure D-9: Calgary Visitors – Average Vehicle Occupancy

Mode of Arrival	Adults	Children	Total
Own car, rented, or carpool	2.5	0.3	2.8
Own car only	2.5	0.3	2.8

Source: CPCS analysis of in-person survey results

Willingness to Use Transit

Existing Modes of Travel

For Calgary visitors, the predominant mode of travel is travelling in a family car, followed by a carpool (Figure D-10). Currently, only approximately 3% of Calgary visitors travel by bus to the Bow Valley.

Figure D-10: Calgary Visitors – Existing Mode of Travel

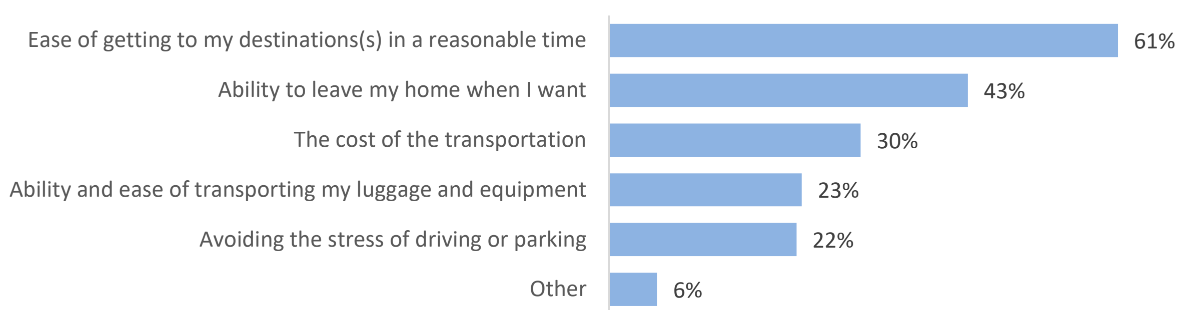
	Own / Family Car	Carpool	Rented Car	Bus / Airport Shuttle	Other
In-Person	90.8%	4.6%	0.7%	2.6%	1.3%
Online	90.1%	4.3%	0.3%	3.6%	1.7%

Source: CPCS analysis of online and in-person survey results

Factors in Selecting Mode of Travel

In order to gather information about individuals' interest in transit, respondents were asked to identify the two most important factors affecting their mode of travel (generally speaking, not specifically related to transit). As shown in Figure D-11, most respondents identified "convenience" and "flexibility" related attributes before "affordability" related considerations. In fact, approximately 80% of respondents selected ease of getting to their destinations(s) in a reasonable time *or* ability to leave their home when they want as their two most important factors.

Figure D-11: Calgary Visitors – Factors in Selecting Mode of Travel



Source: CPCS analysis of online survey results

Interest in a Mass Transit Service

Online survey respondents were also asked about their interest in using various mass transit service scenarios, such as the example provided in Figure D-12. Between scenarios, most of the modal attributes remained fixed, except for the following:

- **Frequency:** respondents were asked about both a once per day service and an all-day service (as shown)
- **Fares:** respondents were asked about one-way fares of $20 (as shown), $35 and $50.

In addition, approximately half of the survey respondents were asked about these scenarios presented as though they would be provided by a train and the other half presented with a highway coach bus. The purpose of this "A/B" test was to understand the potential difference in interest between bus and train options.

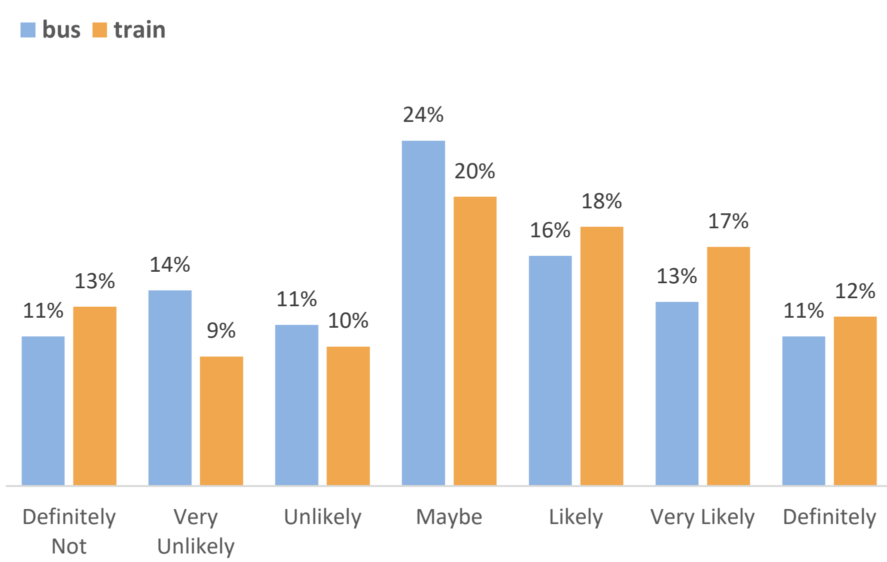
Figure D-12: Example Scenario

Calgary **downtown** and **park-and-ride (near Stoney Trail NW)** stations
Stops in **Canmore** and **Banff** and improved **local transit connections** around **Banff** and **to Lake Louise**
Calgary to Banff travel times of between **1 ½ and 2 ¼ hours**
All-day departures every **30 to 120 minutes in the summer** (Only morning departures from Calgary and evening departures from Banff in the winter)
One-way fare of **$20 per person**; discounts for children and families

Source: CPCS

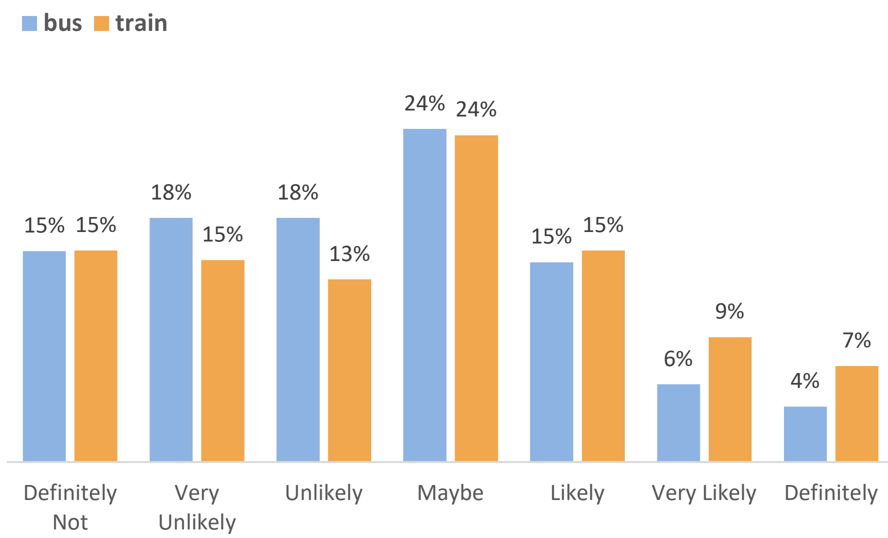
Figure D-13 summarizes the interest in mass transit (bus and train) scenarios with all-day service and a $20 one-way fare, during the summer. Likewise, Figure D-14 summarizes the interest in a one trip per day service with a $20 one-way fare, and Figure D-15 summarizes interest in an all-day service with a $50 one-way fare.

Figure D-13: Calgary Visitors – Interest in Mass Transit Service (all-day service, $20 one-way fare) – Summer



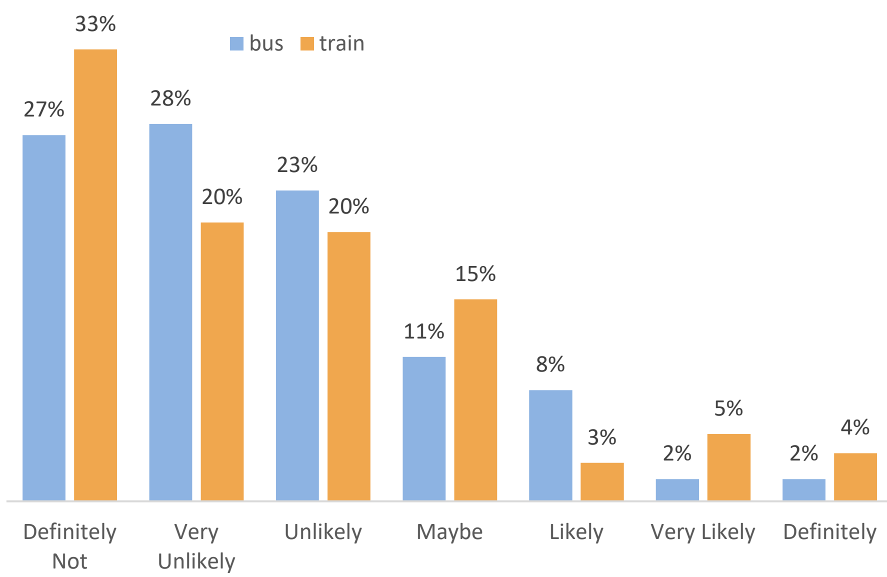
Source: CPCS analysis of online survey results

Figure D-14: Calgary Visitors – Interest in Mass Transit Service (one trip per day, $20 one-way fare) – Summer



Source: CPCS analysis of online survey results

Figure D-15: Calgary Visitors – Interest in Mass Transit Service (all-day service, $50 one-way fare) – Summer

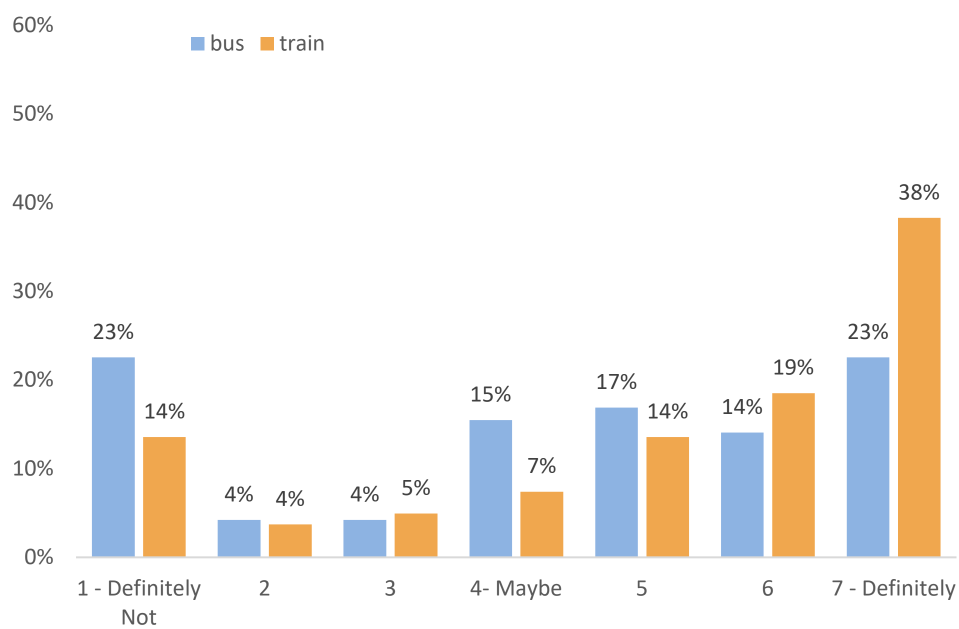


Source: CPCS analysis of online survey results

A first observation is that the interest in a train service, all else equal, is marginally higher than for a highway coach bus service. Second, the frequency of service would have a notable impact on the potential demand for a service. The number of respondents who would definitely use a once per day service drops from 12% to 7% for a train service and 11% to 4% for a bus service. Third, Calgary Region residents are sensitive to price: increasing fares from $20 one-way results in a drop of definite responses, which is also in line with the results in Figure D-19 below.

Similar scenarios were also presented in the in-person survey. In the in-person survey, a much higher proportion of Calgary visitors indicated that they would "definitely" take mass transit (Figure D-16). There are several reasons suspected for this higher response. In particular, because the surveyor specifically noted the "definitely" option within the interview questions (in order to provide respondents an indication of the scale), respondents may have anchored on this point. Further, in the case of Calgary visitors, because of their familiarity and preference for the CTrain, they may have likewise strongly preferred train to buses.

Figure D-16: Calgary Visitors – Interest in Mass Transit Service (all-day, $20 one-way fare) – In-Person Survey



Source: CPCS analysis of in-person survey response

Figure D-17 summarizes the proportion of respondents who answered "definitely" to each scenario. In general, the team notes that in their experience, respondents tend to somewhat overestimate their interest in riding a new service. In particular, given the results of the online survey question that stated that convenience factors were top of mind for most individuals, a capture rate of over 20% is highly unlikely.

Figure D-17: Proportion of Respondents Selecting "Definitely" or "7"

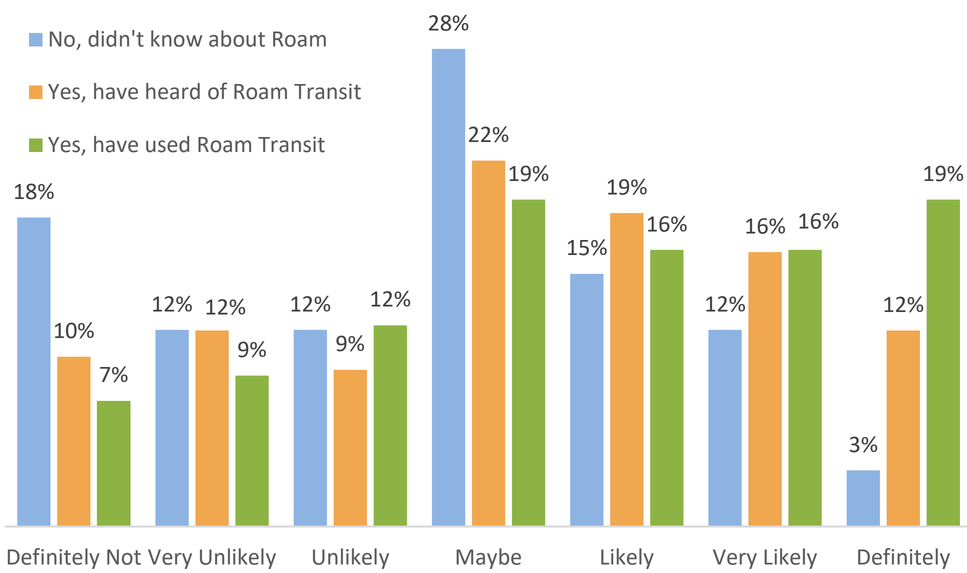
		Summer				Winter			
	Fare Frequency	$20 All-Day	$35 All-Day	$50 All-Day	$20 One-Trip	$20 All-Day	$35 All-Day	$50 All-Day	$20 One-Trip
Online	bus	11%	2%	2%	4%	11%	2%	2%	4%
	train	12%	4%	4%	7%	11%	6%	3%	8%
In-person	bus	23%	Not asked	13%	8%	Only asked about current trip.			
	train	38%		17%	21%				

Source: CPCS analysis of online and in-person survey results

Interest in Transit Given Knowledge of Transit in the Bow Valley

Figure D-18 summarizes the interest in a Calgary-Banff mass transit service (all day, $20 one-way fare) based on the knowledge of Roam Transit. Approximately one quarter of respondents were not aware of Roam Transit. It is clear from these graphics that knowledge of Roam Transit and other private-sector shuttle services is an imperative for maximizing the potential ridership of a Calgary-Banff service.

Figure D-18: Interest in Transit Given Knowledge of Roam

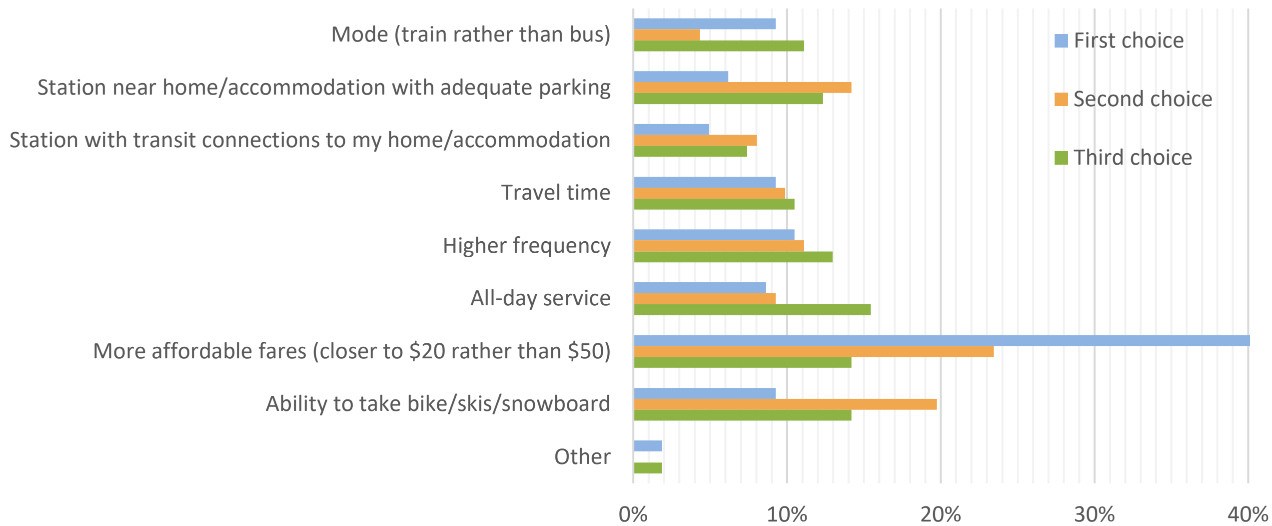


Source: CPCS analysis of online survey results

Important Attributes of a Transit Service

Respondents were asked to rank the most important attributes of a mass transit service from the list shown in Figure D-19. As shown, most respondents selected "more affordable fares" as their top choice. On average, the next most important choice was the ability to take bikes/skis/snowboards.

Figure D-19: Most Important Attributes of a Transit Service – Calgary Region Residents



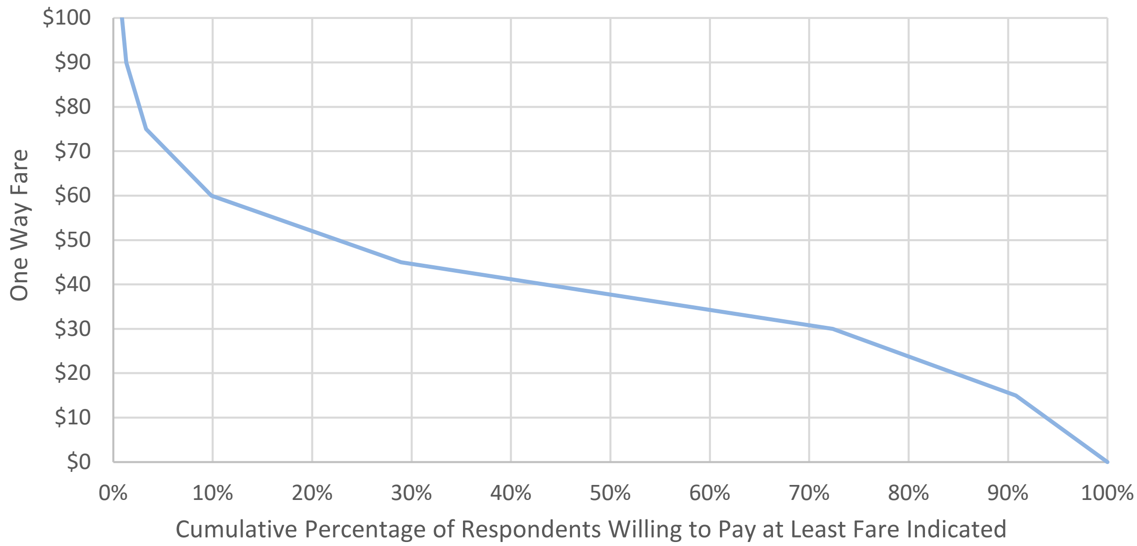
Source: CPCS analysis of in-person survey data

In addition, on average, about 60% more respondents indicated that a station with adequate parking was an important characteristic rather than a station with transit accessibility. This finding suggests that while transit accessibility is desirable, most individuals are likely to access a station in Calgary by driving.

Willingness to Pay for a Transit Service

Respondents were asked about the most they would be willing to pay for a mass transit service, per person, for a one-way trip (e.g. $0, $15, $30, etc.). Figure shows the cumulative percentage of respondents willing to pay the fare indicated (e.g. 72% of respondents would pay $30 per direction). This graphic should not be used to infer modal split but rather how demand might vary based on fare. However, it does illustrate that most respondents would entertain a one-way transit fare under $30, but above this the demand drops off precipitously (i.e. is highly “elastic”).

Figure D-20: Calgary Visitors – Willingness to Pay for Transit



Source: CPCS analysis of in-person survey responses

Other Visitors

Willingness to Use Transit

Existing Modes of Travel

Figure D-21 summarizes the existing modes of travel for other visitors to the Bow Valley. Reflecting the importance of regional visitors, arrival by "own / family car" has the highest share (57%), followed by "rented car". The mode share of "bus / airport shuttle" is approximately 4.6%. If visitors passing through Calgary are separated out, the "bus / airport shuttle" for this segment decreases to 3.6%, while the "bus / airport shuttle" modal share for the remaining visitors increases. This finding would be expected – i.e. visitors passing through would be more likely to be driving their own car – though the survey may have picked some visitors coming from the airport.

Figure D-21: Other Visitors – Existing Modes of Travel

Sub-segment	Own / Family Car	Carpool	Rented Car	Bus / Airport Shuttle	Other
Other visitors overall	57.4%	2.8%	31.5%	4.6%	3.7%
Visitors passing through	75.0%	0.0%	16.1%	3.6%	5.4%
Staying in Calgary or from airport	38.5%	5.8%	48.1%	5.8%	1.9%

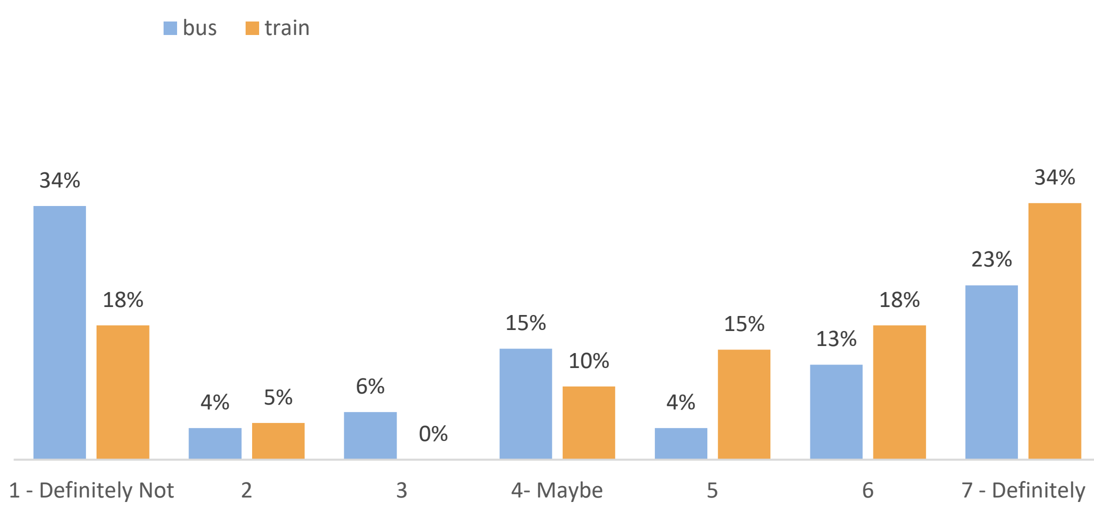
Source: CPCS analysis of in-person survey results

Interest in a Mass Transit Service

During the in-person survey, other visitors to the Bow Valley were asked about their interest in using a mass transit service similar to the one shown in Figure D-12. Similar to the online survey, half of the respondents were shown a bus option, and the other half a train option. Otherwise, the options were identical.

Figure D-22 summarizes respondents' interest in a scenario involving a $20 one way fare and an all-day transit service on a seven point scale from "0 – definitely not" to "7 – definitely".[138] In the in-person survey, 23% of other visitors indicated that they would definitely take a bus, whereas 34% indicated that they would definitely take a train.

Figure D-22: Other Visitors – Interest in Mass Transit Service (all-day, $20 one-way fare)



Source: CPCS analysis of in-person survey responses

The percentage of other visitors who responded definitely is similar to the subset of results for Calgary visitors. As noted, however, it is anticipated that this response overestimates the demand for mass transit.

Important Attributes in a Transit Service

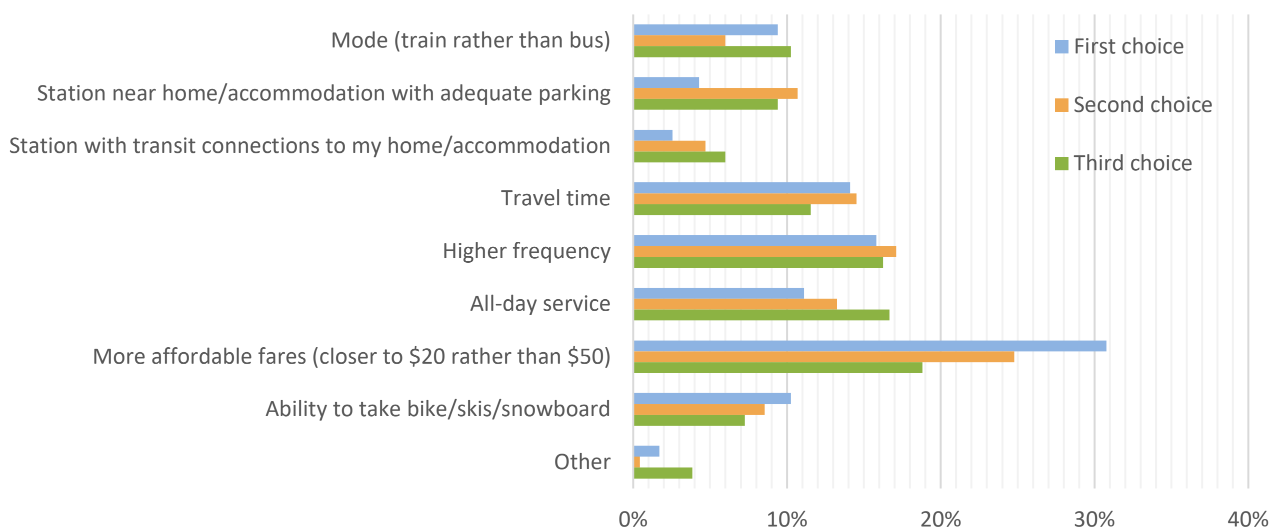
Respondents were asked about the top three attributes of a transit service. Figure D-23 shows the important service attributes identified by respondents. Overall, the distribution of responses is similar to that of Calgary visitors:

- Affordability is the most important attribute identified;
- Frequency (and travel time) are more important than the mode of travel; and

[138] Respondents who travelled beyond Banff National Park were excluded from the responses for analysis.

- Access to a park-and-ride location is more important than access by transit, though this is likely driven by the high proportion of regional visitors.

Figure D-23: Other Visitors – Most Important Attributes of a Transit Service

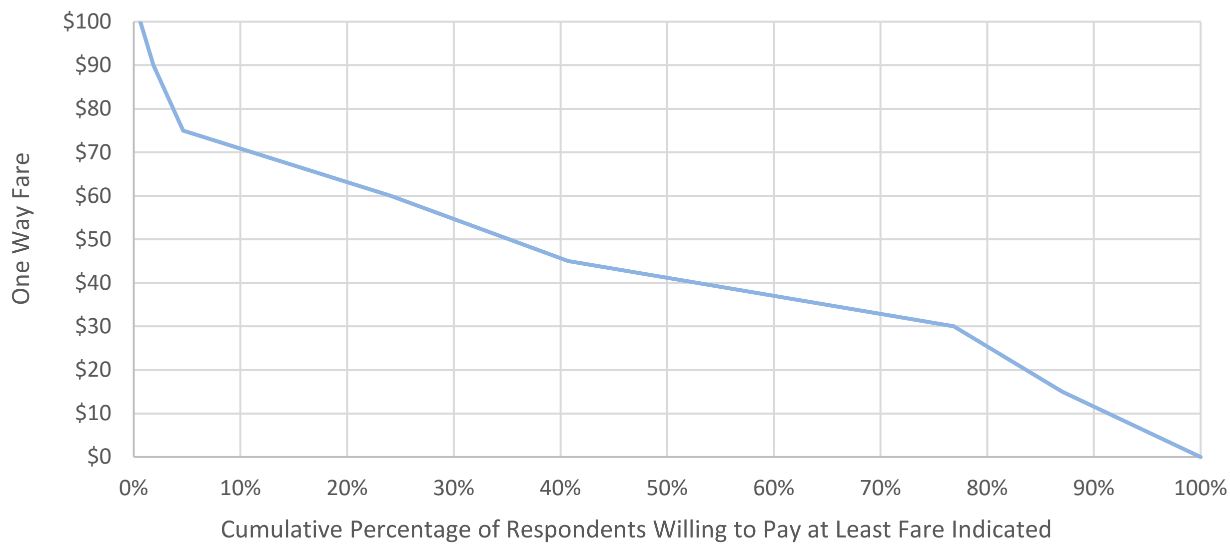


Source: CPCS analysis of in-person survey responses

Willingness to Pay for a Transit Service

As shown in Figure D-24, as with Calgary visitors, approximately $30 per person per direction is the highest fare that most visitors would be willing to consider.

Figure D-24: Other Visitors – Willingness to Pay for Transit Service



Source: CPCS analysis of in-person survey responses

Group Size

For further analysis of the required size of park and rides and other indicators, average vehicle occupancy is also an important factor. In the in-person survey, the average vehicle occupancy of other visitors travelling in their own car was estimated to be 2.8 persons per vehicle (Figure D-25). It was higher for other visitors travelling in their own car, a rental car or as a member of a carpool at 3.2 persons per vehicle.

Figure D-25: Other Visitors – Average Vehicle Occupancy

Mode of Arrival	Adults	Children	Total
Own car, rental, or carpool	2.7	0.5	3.2
Own car only	2.3	0.5	2.8

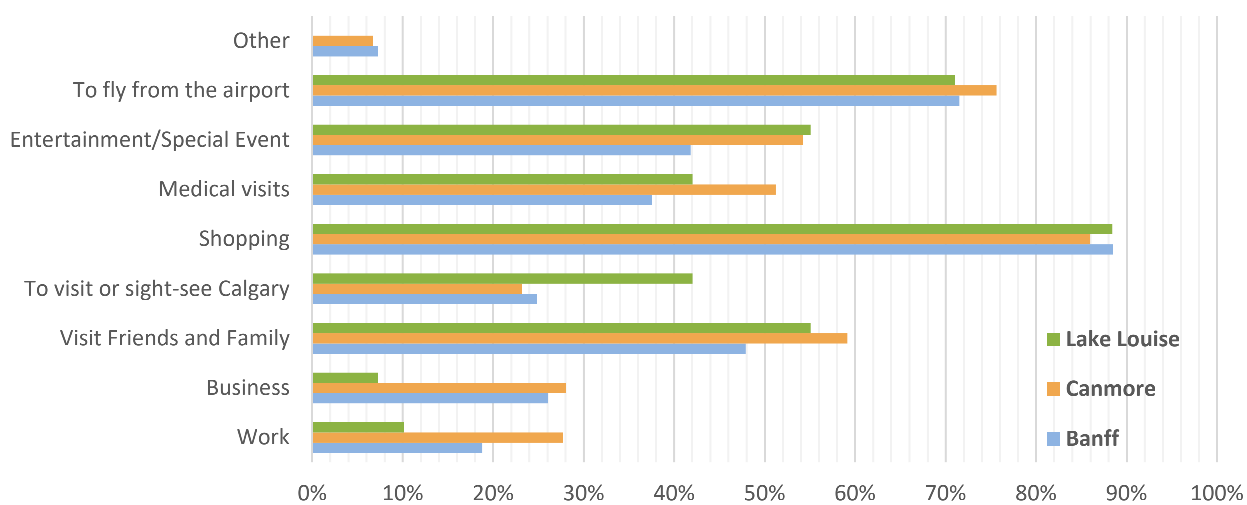
Source: CPCS analysis of in-person survey results

Bow Valley Residents

Destinations and Trip Purpose

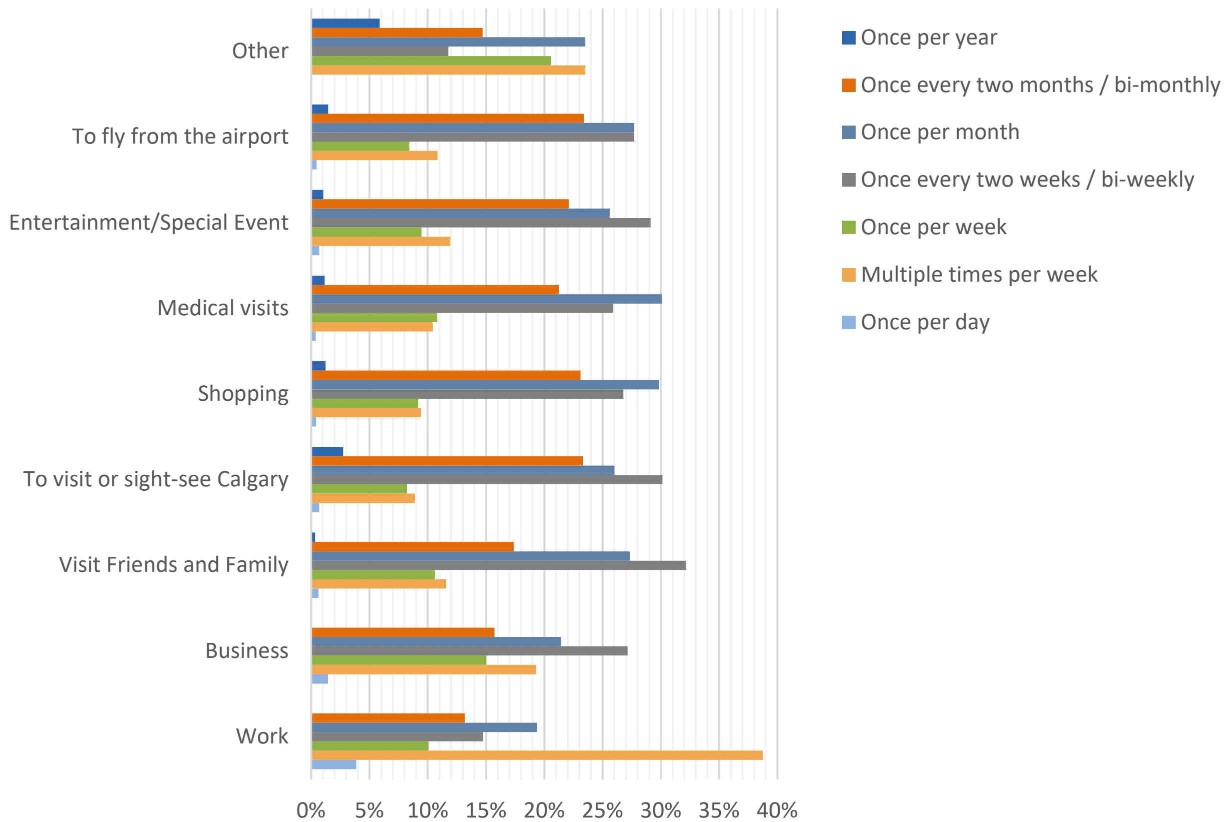
Figure D-26 and Figure D-27 summarize the trip purpose and frequency of trips made by Bow Valley residents. Though shopping is the most cited trip purpose, they are less frequent than work trips, 39% of which occur on a "multiple times per week" basis.

Figure D-26: Bow Valley Residents – Trip Purpose



Source: CPCS analysis of online survey results

Figure D-27: Bow Valley Residents – Trip Frequency Given Trip Purpose



Source: CPCS analysis of online survey results

Willingness to Use Transit

Existing Modes of Travel

For Bow Valley residents the predominant mode of travel is travelling in a family car, followed by a bus or airport shuttle (Figure D-28).

Figure D-28: Bow Valley Residents – Existing Mode of Travel

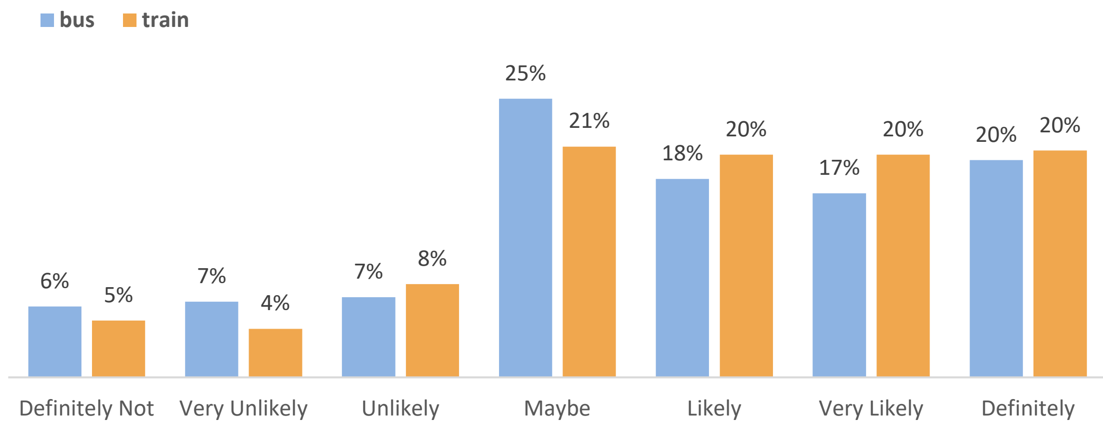
Own / Family Car	Carpool	Rented Car	Bus / Airport Shuttle	Other
77%	6%	3%	11%	3%

Source: CPCS analysis of online survey results

Interest in Mass Transit

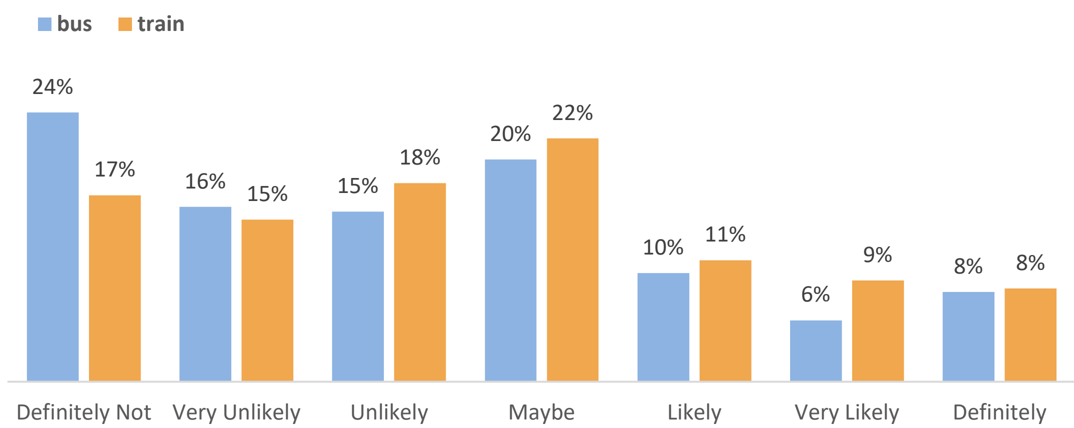
Figure D-29 and Figure D-30 summarize the interest in mass transit options based on $20 and $50 one-way fare, respectively.

Figure D-29: Bow Valley Residents – Interest in Mass Transit Service (all-day, $20 one-way fare)



Source: CPCS analysis of online survey responses

Figure D-30: Bow Valley Residents – Interest in Mass Transit Service (all-day, $50 one-way fare)



Source: CPCS analysis of online survey responses

Cochrane Commuters to Calgary

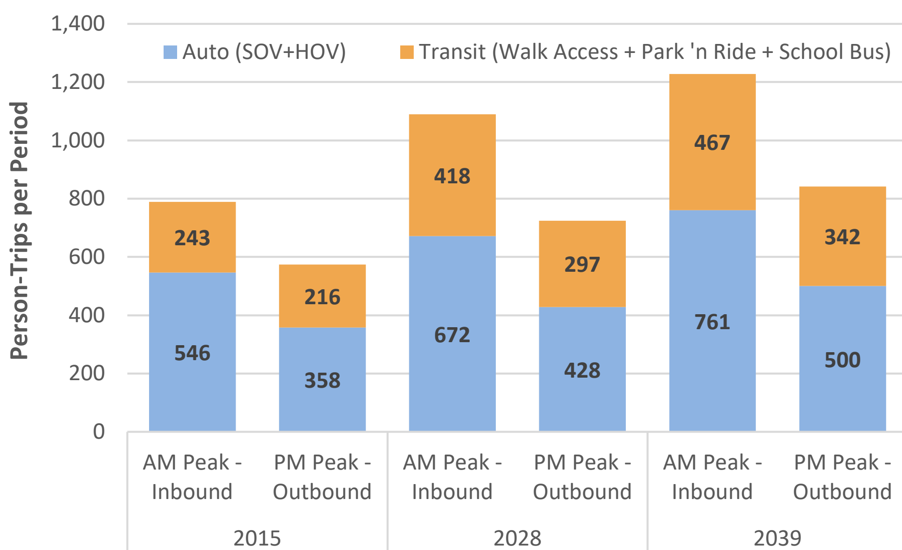
Cochrane does not gather similar information in its municipal census. Information from the City of Calgary's Transportation Forecasting can be instructive as to the order of magnitude of trips between Cochrane and Calgary downtown/central business district.[139]

[139] The City of Calgary's transportation forecasting model allows for grouping by transportation analysis zones. Trips from Cochrane to the Calgary Central Business District were identified for analysis as this origin-destination pair represents the potential catchment area for a commuter rail service. Previous studies have shown that travellers will walk up to about 1,200 metres (El-Geneidy et al.) to a commuter rail at origin. Footnote 18 provides further rationale for this assumption. El-Geneidy, A., Grimsrud, M., Wasfi, R., Tétreault, P., & Surprenant-Legault, J. (2014). New evidence on walking distances to transit stops: Identifying redundancies and gaps using variable service areas. *Transportation,* 41(1), 193-210.

Between 2015 and 2039, the model estimates that approximately 243 and 467 person-trips would be made during the morning (AM) peak three-hour period by transit between Cochrane and downtown Calgary (Figure D-31). This modal share is based on the following assumptions regarding bus service between Cochrane and Calgary:

- 2015 Base Scenario: 3 bus routes between Cochrane and City of Calgary downtown. Inbound in AM Peak and Outbound in PM Peak (50 min headway).
- 2028 & 2039 Horizon: 2 public routes within Cochrane, 1 route between Cochrane Downtown and Crowfoot LRT Station in Calgary with the following headway
- 2028 Horizon: 40 min in AM & PM peak periods, 60 min in OFF Peak
- 2039 Horizon: 30 min in AM & PM Peak periods, 45 min OFF Peak

Figure D-31: Person-Trips between Cochrane and Calgary Central Business District (2015-2039)



SOV and HOV = Single- and High-Occupancy Vehicle. Source: CPCS analysis of City of Calgary Transportation Forecasting Data

Overall, the demand for transit between Cochrane and downtown Calgary would not be sufficient to warrant the need for a commuter train service during the next 25-year horizon. For example, in 2039, if 30-minute headway train service between Cochrane and Calgary could be provided, there would only be approximately 78 people per train – assuming the entire transit share used commuter rail – which is less than the capacity of a single train car. At the limit, even if the entirety of the auto demand were to shift to transit, there would only be approximately 200 people per train.[140] On its own, this demand would not be sufficient to justify the significant capital costs of infrastructure investments

[140] At similar frequencies, the train service would likely be more attractive than a bus service as it could likely operate into downtown Calgary quicker (assuming it had a dedicated track). As well, all else equal, research generally suggests that individuals prefer trains to buses. Therefore, it could be expected that a train service could attract a greater share of the total trips, though it is highly unlikely that it would capture 100%.

that would be required to provide rail capacity to operate a 30-minute frequency. However, it is worth considering how this demand could fit within a service plan for a rail service between Calgary and the Bow Valley.

Appendix E. Survey Forms and Aggregate Results

Appendix F. Online Survey Selection of Open-Ended Responses

This appendix summarizes some of the responses from the open-ended question in the online survey. The purpose of doing so is to articulate the overarching themes heard, as well as identify any insights that could inform this feasibility study or any future work. However, the summary is *not* intended to be a comprehensive summary of all opportunities and issues that might be raised by the public regarding a potential mass transit system.

In total, approximately 400 respondents from the online survey provided open-ended responses to the following:

> Please share with us any suggestions or comments regarding a potential transit service between Calgary and the Bow Valley, including any opportunities and challenges you see.

Starting with a sampling of approximately 50 responses, these have been classified into four themes. A selection of verbatim responses communicating a theme are listed in each section below.

Service

Train improves convenience in some respects (avoids hassle of parking), but "on-train" sports equipment compartment (or equivalent) important

- The train would be an incredibly amazing idea. Getting to Calgary would be easy and convenient and we'd save fuel! I love it
- Great idea, in Lake Louise. We could hardly find parking.
- If I ride transit, I want my bikes to come with me so I have transportation when I get there
- I think it would be neat to see a "seasons pass" where you could get a summers worth of trips for a couple hundred bucks…
- ...that and being able to transport bikes and skis is critical for me.
- …availability of wifi to allow work on bus/train would also be ideal

Connectivity with the Calgary International Airport, transit in the Bow Valley and other hubs important

- need to easily connect to the airport…
- ...also a once per day or bi weekly trip to and from High River to Canmore/Banff.
- It would be good to have a link to the airport.
- A train between Calgary and Canmore/Banff that was connected to public transport in those areas would be fantastic.
- Don't forget the international pull of the national park and therefore the need to connect seamlessly with YYC. Must stop in Canmore. Must be quicker and cheaper than other forms of transit, taxi / Airporter
- I think this would be a great service. There needs to be some indication of how to get to final destinations (ie ski hills, hot springs, hotels) and approximate cost of that
- The biggest challenge is Calgary transit – unless you're on a CTrain line – bus service to the CTrain is not always very direct
- There must be efficient links to transit at both ends. e.g. we can't just "drop" people off in Banff or Canmore from Calgary and expect them to find their way to ski hills, attractions, etc on their own. It must be a total system that is friendly, efficient, affordable all along the way.
- Transit stops in Calgary that include Malls like Chinook, Cross Iron Mills, or Southcentre Mall would make me more likely to use a mass transit system. Also stops at entertainment venues like University of Calgary (MacEwan Hall), Southern Jubilee Auditorium and Calgary Saddledome for concerts, with that would need late night services to get home. With added Calgary stops and a moderate to low fare would more likely make me want to stay overnight if service wasn't later but started early in the AM.
- I visit Banff every summer by driving out, however I would love to come in the winter; but the thought of driving that far turns me off. So it would be awesome to have a bus service or train from the airport. Would make the travel less stressful.
- Stops near main shopping centres would be very convenient (Crossiron Mills, Chinook, Southcentre Mall). Cheaper service to airport would also be great.
- it must be convenient, frequent, AND comparable in cost to taking my own vehicle in order to attract me to taking it.
- There are an estimated 2,000-3,000 people in Canmore that routinely commute to Calgary, most are daily across the work week. Service would need to be high frequency during morning and evening rush hours, and be cost effective relative to my vehicle costs….
- …if it's a bus, and affected by weather the same as my car, then I don't care.

- Regular stops in Canmore are needed, not just limited to 2 stops per day as is currently happening with the On-It bus.
- A stop in Cochrane is important.
- I live in Cochrane. The only reason I said I wouldn't use any of the service is that I wouldn't drive into Calgary to catch transit. If the service stopped in Cochrane I would use it all the time.
- I would like to see a train that could also stop in Cochrane, or at least pick up off Highway 1 and Highway 22….
- …to downtown Calgary daily.
- Stop to board in Cochrane would be great. Availability of wifi to allow work on bus/train would also be ideal.

Fare Considerations

There should be concession discounts for seniors, children and Bow Valley residents, and multi-use passes should be considered

- “Multi-pak”, family, seniors pricing; seasons pass. Price has inverse correlation with convenience; fares must be more economical than driving.
- I strongly encourage being able to purchase monthly or yearly service. Both my husband and I commute into Calgary from Canmore 2-3 times a week.
- Should have a frequent commuter rate option. Should gather data of frequent commuters through additional methods to this survey.
- Kids and seniors rates…
- …also a once per day or bi weekly trip to and from High River to Canmore/Banff.
- I think it would be neat to see a "seasons pass" where you could get a summer’s worth of trips for a couple hundred bucks…
- …that and being able to transport bikes and skis is critical for me.
- Discounts for Bow Valley locals
- The limited options currently provided from Banff to Calgary mean Brewster and the Airporter can charge what they like and people will pay it. The New $10 bus available is great but would like it to stop closer to downtown for certain services or at popular times as currently it is a hassle to get downtown from where it stops.
- …and I have my fuel costs down to $20/day at present, and do not pay parking. So you would need the service to get me virtually door to door round trip for that, otherwise my use would only be intermittent and during severe weather in winter….

- There are an estimated 2,000-3,000 people in Canmore that routinely commute to Calgary, most are daily across the work week. Service would need to be high frequency during morning and evening rush hours, and be cost effective relative to my vehicle costs….
- …make it more appealing for Bow Valley residents going to Calgary; it sounds too expensive for regular use

Fares need to be less expensive than the cost of driving

- The economic advantage to taking mass transit needs to be easily justified. People will not be inclined to use mass transit if a one-way fare is double what their fuel consumption costs would be to make the trip. The financial benefits of transit need to offset the convenience of taking one's vehicle. As I would be travelling in the opposite direction as most (towards Calgary as the destination) the convenience of my vehicle is too great as it is easy to drive in the city and parking can be found just about anywhere.
- Public transit is not as convenient as driving your own vehicle. It must be cheaper than driving otherwise there's no point.
- Most people from either of these places own their own vehicles and would be very price sensitive.
- While this may prove beneficial to young singeltons, to families, the cost involved is likely to be ridiculous for a whole family to travel one way.
- I love the idea of having a train or bus but would take it as a novelty as the convenience is high and the cost low of driving my car.

Environmental

Concern about wildlife; less people desirable

- Respect the people and wildlife of the Bow Valley.
- We are at a critical time right now where decisions like this need to be very thought out; by bringing a train to Banff I truly believe will be ruining the natural and protected park that we need to cherish, we need less people not more
- We already get too many visitors

Other Considerations

"Do-it" – but not to the exclusion of other modes. There were limited and mixed responses to whether a service should be subsidized by government.

- Get this done, it's needed

- Train transportation options are going to be the crux of success for this initiative.
- Taking the train would be better than a bus. A train is an experience, Canadian, historical, part of our identity and would be a tourist attraction.
- Train would be awesome – similar to European routes!
- I think ridesharing options should be explored. The reason why it's so expensive is distance/isolation. But there's enough people who need to go back and forth. UBER!!! Or something along those lines.
- Greyhound is expensive and not always reliable, and only has a few runs a day. Better options would be amazing.
- An interesting proposal. I would definitely see the value in this potential service for Calgarians!
- I have friends and family in both Banff and Canmore so I set my own agenda as to times of travel and length of time I stay in each area coming and going. But I do like to have a choice if skiing is good and roads are not favourable for travel.
- A train would be great. They are well used in the Ontario, Quebec and Europe. Very useful when done right
- Do not subsidize it with taxpayer money.
- It is important to have rail service, 4-6 round trips per day, and subsidized by the federal government.

Appendix G. Rail Infrastructure

At-Grade Crossings

Figure G-1 summarizes the at-grade crossings between Calgary and Lake Louise. Crossings with passive protection have stop signs and crossbucks, whereas crossings with active protection may include flashing lights (FL), bells (B), and gates (G).

Figure G-1: At-Grade Crossings Between Calgary and Lake Louise

Access	Mile	Location	Road Authority	Protection	Freight Trains Daily	Vehicles Daily	Train Max Speed (mph)	Road Speed (km/h)	Lanes	Tracks
PUBLIC	1.12	11 Street SW	CALGARY	Active - FLBG	24	12000	25	50	3	2
PUBLIC	1.92	Bow River Path @ 19 Street	CALGARY	Active - FLB	24	1	30	5	1	1
PUBLIC	2.4	Pedestrian Pathway in Cgy	CALGARY	Active - FLB	24	1	30	5	1	1
PUBLIC	3.56	Bow River Pathway in Cgy	CALGARY	Active - FLB	24	1	30	5	1	1
PUBLIC	4.43	Ped Xing Edworthy Park	CALGARY	Active - FLB	24	1	30	5	1	1
PUBLIC	6.25	32 Avenue W 67 Street NW	CALGARY	Active - FLBG	24	3600	45	50	2	2
PRIVATE	10.5	PRIVATE-TRANS ALTA	Beneficiary (AB)	Passive Crossing	24	100	45	15	2	2
PUBLIC	22.63	River Avenue in Cochrane	COCHRANE	Active - FLBG	24	4300	60	50	2	1
PUBLIC	23.08	4 Avenue	COCHRANE	Active - FLBG	24	1000	40	50	2	2
PUBLIC	23.14	5 Avenue	COCHRANE	Active - FLBG	24	8528	40	50	2	2
PRIVATE	25.1	EMR ACC RD Horse Creek Rd	COCHRANE	Passive Crossing	24	10	40	25	1	2
PUBLIC	31.63	Unknown	STONEY 142/143/144 IR 6642	Passive Crossing	24	25		80	2	1
PUBLIC	32.71	George Fox Trail	STONEY 142/143/144 IR 6642	Passive Crossing	24	25		80	2	1
PUBLIC	34.4		STONEY 142/143/144 IR 6642	Passive Crossing	24	25	50	80	2	1
PRIVATE	35.45	Private (On reserve)	Beneficiary (AB)	Passive Crossing	24	10	70	25	2	1
PRIVATE	38.29	Private (On reserve)	Beneficiary (AB)	Passive Crossing	24	5	70	10	2	1

Access	Mile	Location	Road Authority	Protection	Freight Trains Daily	Vehicles Daily	Train Max Speed (mph)	Road Speed (km/h)	Lanes	Tracks
PRIVATE	40.38	Private (On reserve)	Beneficiary (AB)	Passive Crossing	2	300	30	30	2	1
PUBLIC	45.73	Ozada Road	STONEY 142/143/144 IR 6642	Active – FLB*	24	50	50	80	2	1
PUBLIC	47.9	Gravel Road S. Mainline	STONEY 142/143/144 IR 6642	Passive Crossing	24	10	50	80	1	1
PRIVATE	51.34	Private (On reserve)	Beneficiary (AB)	Passive Crossing	24	10	70	25	2	1
PRIVATE	51.5	Private Road - unnamed	BIGHORN MD NO. 8	Passive Crossing	24	10	50	40	1	1
PUBLIC	57.04	Laurie Mountain Road	BIGHORN MD NO. 8	Active - FLB*	24	300	45	50	2	2
PUBLIC	66.25	Water Treatment Facility	CANMORE	Active - FLB	24	100	45	80	1	1
PUBLIC	66.85	Spring Creek Drive	CANMORE	Active - FLBG	24	25	45	50	2	1
PUBLIC	67.13	Railway Avenue	CANMORE	Active - FLBG	24	5000	45	50	4	1
PUBLIC	67.5	Pedestrian Crossing	CANMORE	Active - FLBG	24	25	45	5	2	2
PUBLIC	67.9	Railway Avenue	CANMORE	Active - FLBG	24	5500	45	50	4	2
PUBLIC	80.61	Buffalo Paddock Road	PARKS CANADA	Active - FLBG	24	2000	40	50	2	2
PUBLIC	82.04	Bow Avenue @ Banff (Norquay)	PARKS CANADA	Active - FLBG	24	5500	40	50	2	2
PUBLIC	99.91	Highway 93 near Banff	PARKS CANADA	Active – FLB*	24	2220	50	50	2	1
PUBLIC	114.78	Emergency Access Hwy 1	PARKS CANADA	Passive Crossing	24	1	40	50	1	1

*Team to confirm whether gates are also present. CPCS summary of Transport Canada Grade Crossings Database, 2016

Bridges and Structures

Figure G-2 summarizes the location, length, and type of structures on or over the Laggan Subdivision.

Figure G-2: Crossings

Milepost	Length (feet)	Crossing Name	Type	Road over Rail: Abutments - single/double track
0.1	80*	1 Street West	rail over road	4 depot tracks
0.4	115*	4 Street West	rail over road	4 depot tracks

Milepost	Length (feet)	Crossing Name	Type	Road over Rail: Abutments - single/double track
0.47	137*	5 Street West	rail over road	4 depot tracks
0.8	78*	8 Street West	rail over road	4 depot tracks
1.4	100*	14 Street West	rail over road	2 main tracks
1.45	elevated	LRT blue line	track over track	2 LRT tracks over two main tracks
2.25	800*	9 Avenue Eastbound	road over rail	4 road lanes over 1 main track
2.3	809*	9 Avenue Westbound	road over rail	3 road lanes over 1 main track
2.59	957*	Crowchild Trail	road over rail and Bow River on the north	6 road lanes over 1 main track
6.04	248	Trans-Canada Highway	rail over road	1 main track over 4 road lanes
6.83	109	Bowness Road	rail over road	1 main track over 2 road lanes
7.7	216	Bow River	rail over water through trusses 2 spans	1 main track
7.8	216	Bow River	rail over water through trusses 2 spans	1 main track
8.2	181	85 Street NW	road over rail	2 road lanes over 1 main track
8.99	480*	Stoney Trail Northbound	road over rail	4 road lanes over 1 main track and 3 storage
9.02	465*	Stoney Trail Southbound	road over rail	4 road lanes over 1 main track and 3 storage
23.6	30	Horse Creek	rail over water 1 span	1 main track
23.82	160*	Highway 22 Cowboy Trail	road over rail	3 road lanes over 1 main track and siding
25.7	428*	Bow River	rail over water through trusses 2 spans	1 main track
41.3	155*	Morley Road	rail over road	1 main track over 2 road lanes - built for double track
51.8	201	Kananaskis River	rail over water - 2 spans	1 main track
51.97	195	Highway 1X	road over rail	2 road lanes over 1 main track
53.1	475	Bow River	rail over water through trusses 3 spans	1 main track
56.99	70	Hudson's Creek Exshaw	rail over water 1 span long - 2 bridges	1 main track 1 yard track = two bridges
65.9	366	Trans-Canada Highway Westbound	road over rail	2 road lanes over 1 main track
65.95	366	Trans-Canada Highway Eastbound	road over rail	2 road lanes over 1 main track
66.1	90	Cougar Creek Canmore	rail over water 1 span	1 main track
73.1	70	Carrot Creek BNP	rail over water - 1 span	1 main track
79.4	372*	Banff Avenue BNP	rail over road - 2 spans - 2 bridges	1 main track over 4 road lanes - built for double track

Milepost	Length (feet)	Crossing Name	Type	Road over Rail: Abutments - single/double track
82.1	60	40 Mile Creek BNP	rail over water - 1 span	1 main track
85.7	634*	Trans-Canada Highway Eastward	road over rail - then over Bow River	2 road lanes over 1 main track
85.75	618*	Trans-Canada Highway Westward	road over rail, then over Bow River	2 road lanes over 1 main track
96.3	70	Johnson's Creek BNP	rail over water - 1 span	1 main track
108.4	60	Baker Creek BNP	rail over water - 1 span	1 main track
114.3	205*	Trans-Canada Highway Westbound	road over rail	2 road lanes over 1 main track
114.35	222*	Trans-Canada Highway Eastbound	road over rail	2 road lanes over 1 main track
116.04	153*	Lake Louise Drive	rail over road	1 main track over 2 road lanes
116.1	130	Pipestone Creek	rail over water - 2 spans	1 main track

*Estimated based on Google Earth imagery. Source: CPCS summary of various sources

Appendix H. Lessons Learned from Other Jurisdictions

Whistler

Similar to Banff, Whistler is a resort community located approximately two hours from Metro Vancouver. According to Tourism Whistler, "Whistler receives approximately 2.7 million overnight and non-overnight visitors each year (approximately 44 per cent in winter and 56 per cent in summer)."[141] The travel distance between Vancouver and Whistler is similar to that between Calgary and Banff. (Figure H-1)

Figure H-1: Travel Distances between Vancouver, Vancouver Airport (YVR) and Whistler

Origin/Destination	Distance	Car Travel Time (h:mm)
Downtown-Whistler	121 km	1:37
YVR-Whistler	136 km	2:07

Source: CPCS analysis of Google Maps estimates

Whistler is served by over 10 bus services daily from Vancouver.[142] Figure H-2 shows a non-exhaustive list of many of the services that operate. Fares for one-way bus services can range from $17 to $79 per adult for a one-way service.

Figure H-2: Vancouver to Whistler Bus and Shuttle Services

Company	Origins	Trip Frequency	Adult Fares (one-way)	Notes
Whistler Shuttle and Bus	YVR and Vancouver	4 daily (based on summer)	$55-$64	Summer schedule Higher fare based on departure from YVR
Whistler Connection	YVR	12+ daily (based on winter)	$64	Service not scheduled. Provides maximum headway guarantee of one hour during winter days (7:30-20:00)

[141] Tourism Whistler. Stats & Facts.
[142] Tourism Whistler. Stats & Facts.

Company	Origins	Trip Frequency	Adult Fares (one-way)	Notes
Epic Rides	Vancouver and UBC	6-7 daily (summer/ winter)	$24	Trailers for bike and ski equipment.
Whistler Rides	Vancouver	6/5 daily (summer/winter)	$17.99+	
Greyhound	Vancouver and Coquitlam	4 daily (summer)	$27.00+	
Snowbus	Vancouver	2 daily (winter)	$38	
Perimeter	YVR and Vancouver	4/9 daily (summer/winter)	$55-$79	Higher fare based on departure from YVR

Source: CPCS team summary of various sources

Niagara Region

Niagara Region has a population of just under half a million residents and is located in an area with a number of tourist attractions. Niagara Falls, one of the world's foremost tourist destinations, receives over 12 million visitors annually according to Statistics Canada. The travel distance of approximately 130 kilometres between Toronto and Niagara Falls is similar to that between Calgary and Banff.

Niagara Falls is served by both rail and buses. Figure H-3 shows a non-exhaustive list of many of the services that operate. Fares for trips between Toronto and Niagara Falls can range from $5 to $30 per adult for a one-way service, although the average ticket price falls in the $15 to $20 range.

Figure H-3: Toronto to Niagara Falls Bus and Rail Services

Company	Origins	Trip Frequency	Adult Fares (one-way)	Notes
GO Transit - Rail	Union Station (Toronto)	3 daily on weekends (summer only)	$18.75 ($16.65 with PRESTO)	Year-round all-day GO Rail service to Niagara Falls to be implemented by 2023
GO Transit - Bus	Burlington (train connection to Toronto)	18 daily	$18.75 ($16.65 with PRESTO)	Burlington-Niagara Falls GO Bus Route 12 connects to Lakeshore West train service
VIA Rail	Union Station (Toronto)	1 daily	$22	Amtrak train to/from New York City
Megabus (Coach Canada)	Toronto Coach Terminal	12 daily	$5-22	Route continues on to Buffalo, New York City, Philadelphia, and Washington
Greyhound	Toronto Coach Terminal	6/5 daily	$14-30	Some buses continue into the United States
Safeway Tours	Various GTA locations	15 daily	$8-$25	Intended for use by Fallsview Casino Resort patrons

Source: CPCS Team summary of various sources

As noted, the Metrolinx is planning to introduce all-day GO Transit service to Niagara Falls by 2023. Based on its Initial Business Case, the capital and operating cost of this service is expected to be $166 million and $15.5 million per year (2031), respectively. The estimated cost recovery ratio (revenues to costs) is expected to be 0.29 in 2031, and the benefit-cost ratio of the project is 0.41.[143] This is significantly less costly than an original concept ($1.14 billion in capital cost), which originally assumed that a new Welland Canal grade separation would be required to avoid delays due to St. Lawrence Seaway vessel traffic.[144]

Denver Rail Train

In early 2017, Amtrak, in collaboration with state, municipal, resort and host railroad partners, re-introduced seasonal once-daily round-trip rail service between Denver and Winter Park Resort, Colorado. The road distance between Denver and Winter Park is approximately 105 km. The Denver-Aurora-Lakewood, CO Metropolitan Statistical Area had a population of approximately 2.8 million in 2015, though the City of Denver itself is much smaller at 0.7 million.

The service, called the Winter Express, has the following characteristics are as follows:

- 26 round-trips will run Saturday and Sunday, from Jan. 7 to March 26, with Monday service on holidays in January and February.
- The 500-passenger Winter Park Express Amtrak train will leave Denver's Union Station at 7am, arrives at the resort around 9am, leaves 4:30pm and returns to Denver at 6:40pm.
- Adult tickets start at US$39 each way and children ages 2-12 ride for half price with a ticketed adult.
- One-way tickets allow passengers to book single or multiple-day trips.[145]

The service had previously operated between 1940 and 2009. Challenges cited in discontinuing the service included "rising insurance costs, declining profits and the challenges of squeezing passenger service on the busy freight route." It was noted that the subsequent re-introduction of the rail service took 18 months of negotiation between the Winter Park ski area and Union Pacific Railroad, the host railway to achieve track access.

The service departs from Denver Union Station, which was recently reconstructed partly to offer commuter rail service in the Denver area. In Winter Park, a new accessible platform was required, costing approximately US$3.5 million. Both public and private funds were used for the reconstruction:

- $1.5 million grant from the Colorado Department of Transportation,
- $100,000 from the city of Denver,

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[143] Metrolinx. 2015. GO Rail Niagara Service Expansion: Initial Business Case.
[144] Forsyth, P. 2015. 'Very, very viable business case' for expanding GO rail to Niagara.
[145] Blevins, J. 2016. Tickets to ride the Winter Park Express ski train between Denver, Winter Park start at $39. The Denver Post.

- $100,000 from the Town of Winter Park,
- $1,000 from the Colorado Rail Passengers Association and
- [$1.8 million] paid by Intrawest, the operator of Winter Park ski area. [146]

Because the service was targeted towards skiers, the loading/unloading time is considerable. Amtrak provides the following instructions to passengers:

- Passengers should arrive 45 minutes before departure in order to load ski equipment.
- Loading will begin at 6:15am at the front of the train, or the north end of Track 5.
- There is no checked baggage service.
- Passengers must bring ski equipment and baggage with them to the platform for loading.
- Ski equipment will be stored on the lower level of the train.
- All ski equipment must be labelled with the passenger's name and phone number.
- All other baggage will be taken to your coach seat for storage.[147]

According to Amtrak, approximately 15,000 people rode the train in the first month of operations, and several train runs were sold out. [148]

Mont Tremblant

Mont Tremblant is a popular resort destination in the Laurentian Mountains north of Montreal. Mont Tremblant offers the largest skiable terrain in Eastern North America, but is also a popular destination in the summertime. The travel distance of approximately 145 kilometres between Montreal and Tremblant is similar to that between Calgary and the Bow Valley.

Mont Tremblant is served by buses from Downtown Montreal as well as from Montreal's Pierre Elliot Trudeau International Airport. Figure H-4 shows a list of the two services that operate. Fares for one-way adult tickets between Montreal and Mont Tremblant range from $32 for the regularly scheduled inter-city bus service to $100 per adult for the express shuttle service from the Montreal Airport.

[146] Ibid.
[147] Amtrak. Winter Park Express Passenger Information.
[148] BizJournal. 2017. Winter Park Express ski train an 'eye-popping' success, Amtrak says.

Figure H-4: Montreal to Mont Tremblant Bus and Shuttle Services

Company	Origins	Trip Frequency	Adult Fares (one-way)	Notes
Autobus Galland	Station Centrale (Downtown Montreal)	3 daily (2 daily on Tuesday, Wednesday, Saturday)	$32	Montreal- Mont Laurier Route
Autocars Skyport	YUL (Montreal airport)	3/2 daily (winter only)	$100	Direct service between YUL and Mont Tremblant hotels

Source: CPCS Team summary of various source

Appendix I. Track Unit Costs

The cost estimates of the various scenarios for rail passenger service between Calgary and Banff have been based upon a matrix of unit costs, summarized as Figure I-1.

Figure I-1: Unit Costs for New Track Construction in the Calgary-Banff Corridor

Item	Unit	Unit cost ($'000)
New track construction adjacent to main track, prairie grasslands, no S&C	mile	2,950
New track construction adjacent to main track, forested, no S&C	mile	3,500
New track construction adjacent to main track, over wet area	mile	4,800
New track construction adjacent to main track, urban area	mile	9,200
New track construction adjacent to main track, cutting into earth slope	mile	8,800
New track construction adjacent to main track, cutting into rock	mile	12,500
New track construction on existing track bed	mile	2,800
New track on new embankment with CTC	mile	2,982
Add new track to CTC	mile	182
Relocate switch	switch	16
New #15 switch (dual control)	switch	240
New #20 switch (dual control)	switch	331
Signal changes to extend siding	siding	193
Pedestrian underpass for new track	foot	3.8
Level crossing surface for 2nd track (crossings usually 40 ft)	foot	0.71
Change crossing protection to add additional track	crossing	115
Change crossing protection for increase in train speeds	crossing	16
Additional crossover - track	crossover	810
Additional crossover - signals	crossover	100
Add intermediate signal in single track	signal	99
Add intermediate signal in double track	signal	165
Widen existing overhead structure	structure	3,000
CMP culvert	foot	1.15
Bridge support bents	bent	49
Single track concrete bridge span	foot	7.92

Source: CPCS team analysis based on various sources

These cost estimates have been developed through an amalgam of sources and escalated to 2017 dollars. The cost estimates were developed through the authors' familiarity with engineering department unit construction cost estimates from two North American Class 1 railroads. Other sources were:

- Actual and estimated costs provided by Canadian Pacific for the construction of three siding extensions over the past 4-5 years in their Brooks, Laggan and Mountain Subdivisions in Alberta and British Columbia.

- Report: “Calgary-Edmonton High Speed Rail Project”, December, 2003
- Report: “Alternative Scenarios to Enhance the Performance of Passenger Rail in Canada”, CPCS, January, 2017.

Appendix J. List of Federal Rail Regulations, Rules and Standards

Regulations[149]

- Locomotive Emissions Regulations (SOR/2017-121)
- Railway Safety Administrative Monetary Penalties Regulations (SOR/2014-233)
- Railway Safety Management System Regulations, 2015 (SOR/2015-26)
- Grade Crossing Regulations (SOR-2014-275)
- Railway Operating Certificate Regulations (SOR-2014-258)
- Mining Near Lines of Railways Regulations (SOR/91-104)
- Notice of Railway Works Regulations (SOR/91-103)
- Railway Prevention of Electric Sparks Regulations (1982-8 Rail) (SOR/82-1015)
- Ammonium Nitrate Storage Facilities Regulations (No. 0-36)(C.R.C., c. 1145)
- Anhydrous Ammonia Bulk Storage Regulations (No. 0-33)(C.R.C., c. c.1146)
- Chlorine Tank Car Unloading Facilities Regulations (No. 0-35) (C.R.C., c. 1147)
- Flammable Liquids Bulk Storage Regulations (No. 0-32) (C.R.C., c. 1148)
- Liquefied Petroleum Gases Bulk Storage Regulations (No. 0-31) (C.R.C., c. 1152)
- Railway Safety Appliance Standards Regulations (No. 0-10) (C.R.C., c. 1171)
- Joint Use of Poles Regulations (C.R.C., c. 1185)
- Wire Crossings and Proximities Regulations (No. E-11) (C.R.C., c. 1195)
- Handling of Carloads of Explosives on Railway Trackage Regulations (SOR/79-15)
- Service Equipment Cars Regulations (1986-9 Rail) (SOR/86-922)
- Height of Wires of Telegraph and Telephone Lines Regulations (C.R.C., c. 1182)
- Prevention and Control of Fires on Lines Works Regulations (SOR/2016-317)

Other relevant regulations made under different acts

- Transportation Information Regulations (SOR/96-344)
- Railway Employee Qualification Standards Regulations (1987-3 Rail) (SOR/87-150)

[149] Transport Canada.

Rules

Figure J-1 lists rules made pursuant to the *Railway Safety Act*.

Figure J-1: Rules Made Pursuant to the *Railway Safety Act*

Date	Rules
February 12, 2016	*Rules Respecting Key Trains and Key Routes*
December 14, 2016	Canadian Rail Operating Rules
November 2, 1990	Pull-By Inspection Rules
February 27, 2006	Railway Equipment Reflectorization Rules
October 27, 2014	Railway Freight and Passenger Train Brake Inspection and Safety Rules
December 9, 2014	Railway Freight Car Inspection & Safety Rules
July 3, 2015	Railway Locomotive Inspection & Safety Rules
December 22, 2006	Railway Medical Rules for Positions Critical to Safe Railway Operations
November 8, 2001	Railway Passenger Car Inspection & Safety Rules
March 31, 2000	Railway Passenger Handling Safety Rules
June 16, 2000	Railway Rules Governing Safety Critical Positions
July 28, 1995	Rules for the Control and Prevention of Fires on Railway Rights-of-Way
December 5, 1994	Rules for the Installation, Inspection & Testing of Air Reservoirs (Other than on Locomotives)
November 25, 2011	Rules Respecting Track Safety
February 23, 2011	Work/Rest Rules for Rail Operating Employees

Source: Transport Canada

Engineering Standards

Figure J-2 lists engineering standards made pursuant to the *Railway Safety Act*.

Figure J-2: Engineering Standards Made Pursuant to the *Railway Safety Act*

Date	Standards
February 5, 2010	Engineering Standards for "Walk Light" Grade Crossing Warning Systems
October 28, 2010	Engineering Standards for Grade Crossing Warning Systems Used at Restricted Grade Crossings
June 4, 2007	Railway Signal & Traffic Control Systems Standards
May 14, 1992	Standard Respecting Railway Clearance
June 21, 2000	Standards Respecting Pipeline Crossings Under Railways
October 10, 2003	Transport Canada Standard For LED Signal Modules at Highway/Railway Grade Crossings
July 2014	Grade Crossings Standards

Source: Transport Canada