MULTI-MODAL CORRIDOR TRANSPORTATION STUDY HORSESHOE BAY TO HIGHWAY 97

VOLUME 1 SUMMARY REPORT

Prepared for:

Ministry of Transportation & Highways
South Coast Region
7616 Sixth Street
Burnaby, BC
V3N 4N8

Prepared by:

Reid Crowther & Partners Ltd.
Consulting Engineering Worldwide
300 - 4170 Still Creek Drive
Burnaby, BC V5C 6C6

Phone: (604) 298-6181
Fax: (604) 294-8597

March 30, 2001

Project No. 34906-00 (03)

SECTION 1.0
INTRODUCTION

1.1 THE CORRIDOR

The 307 km long transportation corridor running from Horseshoe Bay to Highway 97 plays a critical role in the provincial economy. Encompassing both Highway 99 North and the BC Rail mainline, it is a unique resource. While the corridor was originally developed to support the traditional resource industries of south-western BC, its role has broadened and changed considerably over the decades and now includes:

- Alternate provincial highway route to the interior of British Columbia for external traffic (with the paving/improvement of the Duffey Lake Road);
- Destination corridor, part of a scenic “loop” route, assisting in generating substantial tourist revenue in the region;
- Commuting corridor for the residents of Horseshoe Bay, Lions Bay, Furry Creek, Britannia Beach, Squamish, Whistler, and Pemberton, both to and from the Lower Mainland and within the region;
- Goods movement corridor to support the traditional resource-based industries, as well as the vibrant tourism industry in the corridor;
- Access to North America’s top-rated ski resort at Whistler for international, national, Lower Mainland and local visitors;
- Access to important recreational opportunities along the route, such as Garibaldi Provincial Parks, and the Cayoosh and Garibaldi ski development proposals;
- Access to Whistler Olympic venues, if 2010 bid is successful; and
- Primary arterial route within municipal road networks.

Since the current highway route is one of the very few feasible alignments for infrastructure in this region, it also serves as the main utility corridor. BC Rail freight and passenger trains share the corridor with the highway route for much of its length as well, making it a truly multi-modal corridor.

The changes in the role of the corridor over time are indicative of the underlying maturation and diversification of the regional economy that has occurred. However, this changing role has also resulted in substantially increased travel demand. Passenger demand has typically taken the form of higher vehicular traffic volumes, particularly in the Horseshoe Bay to Squamish and Squamish to Whistler sections of the corridor. The Horseshoe Bay to Squamish section suffers from the most congestion and, coincidentally, is the section with some of the most challenging terrain and the highest potential environmental and community impacts.

1.2 THE STUDY

1.2.1 Context

The corridor is very unique, blessed with both staggering natural and recreational resources but challenged by its own success. The original economy of the corridor was based on resource extraction and processing – primarily mining and forestry. However, starting in the early 1980's world-class recreational resources of the corridor began to come into their own. In the southern corridor from Horseshoe Bay to Whistler, recreation and tourism activity centres are now substantial economic generators, challenging or even eclipsing the traditional resource extraction industries. Traditionally, the recreational use of the corridor was based on the ski resort industry in the winter months and hiking/camping in the summer months. However, the recreational industry has grown and expanded in the corridor and now operates year-round without shoulder seasons. In tandem with the high profile recreational and lifestyle opportunities in the corridor has come enormous pressure for urban development. This is particularly true in those parts of the corridor where proximity to Greater Vancouver can be combined with diverse recreational opportunities.

By itself, the growth in population and in the recreation industry in the southern portion of the corridor would be remarkable. However, the entire corridor – and particularly that portion of the corridor where recreational and urban growth are strongest, includes some of the most difficult road-building terrain in Canada. Squamish was accessible only by water until well into the 1950's; both the railway and the existing 2-lane highway cling to the steep and winding shore of Howe Sound. The traffic demands, as well as highway and railway geometry, combine with numerous debris torrent and rockfall hazard locations, to make further corridor development very challenging.

The corridor is characterised by:

- Poor average travel speeds in many of the 2-lane rural sections south of Whistler, particularly within the Cheakamus Canyon and along Howe Sound;
- Congestion and lower speeds through urban sections with traffic signals;
- Limited reserve passenger capacity during peak periods of travel;
- Highway accident rates and severities which exceed Provincial averages in many sections of the corridor; and

- Significant reliability problems, particularly in the Howe Sound, Cheakamus Canyon and Duffey Lake Road sections.

The geographic challenges in the corridor result in some of the highest costs for highway construction in Canada. Previous technical work assessing the upgrading of this corridor to a 4-lane expressway standard from Horseshoe Bay to Whistler consistently resulted in construction cost estimates measured in the billions of dollars.

From a traditional engineering viewpoint, the need for more passenger capacity in the corridor is apparent; current highway traffic volumes during high demand periods on winter and summer afternoons routinely overwhelm the capacity of the highway, particularly in the southbound direction. The highway's ability to recover from motor vehicle accidents or other unforeseen incidents is now relatively poor during peak periods of demand as queues take longer and longer to dissipate.

While bed-unit development in Whistler is approaching its pre-determined limit, growth in the corridor will continue. The Official Community Plans of the communities in the corridor indicate a growth in population almost three time current levels, or 200%, over the next 25 years; much of that growth is proposed to be concentrated in Squamish and along Howe Sound, already two of the busiest sections of the highway. During this study, significant announcements were made regarding the development of two additional ski resorts in the corridor: Cayoosh Ski Resort (which has obtained provincial environmental approval) and the Garibaldi at Squamish proposed ski/residential development. In addition, the potential success of the Whistler/Vancouver 2010 Winter Olympics bid underscores the need to develop a clear strategy for future travel in the corridor.

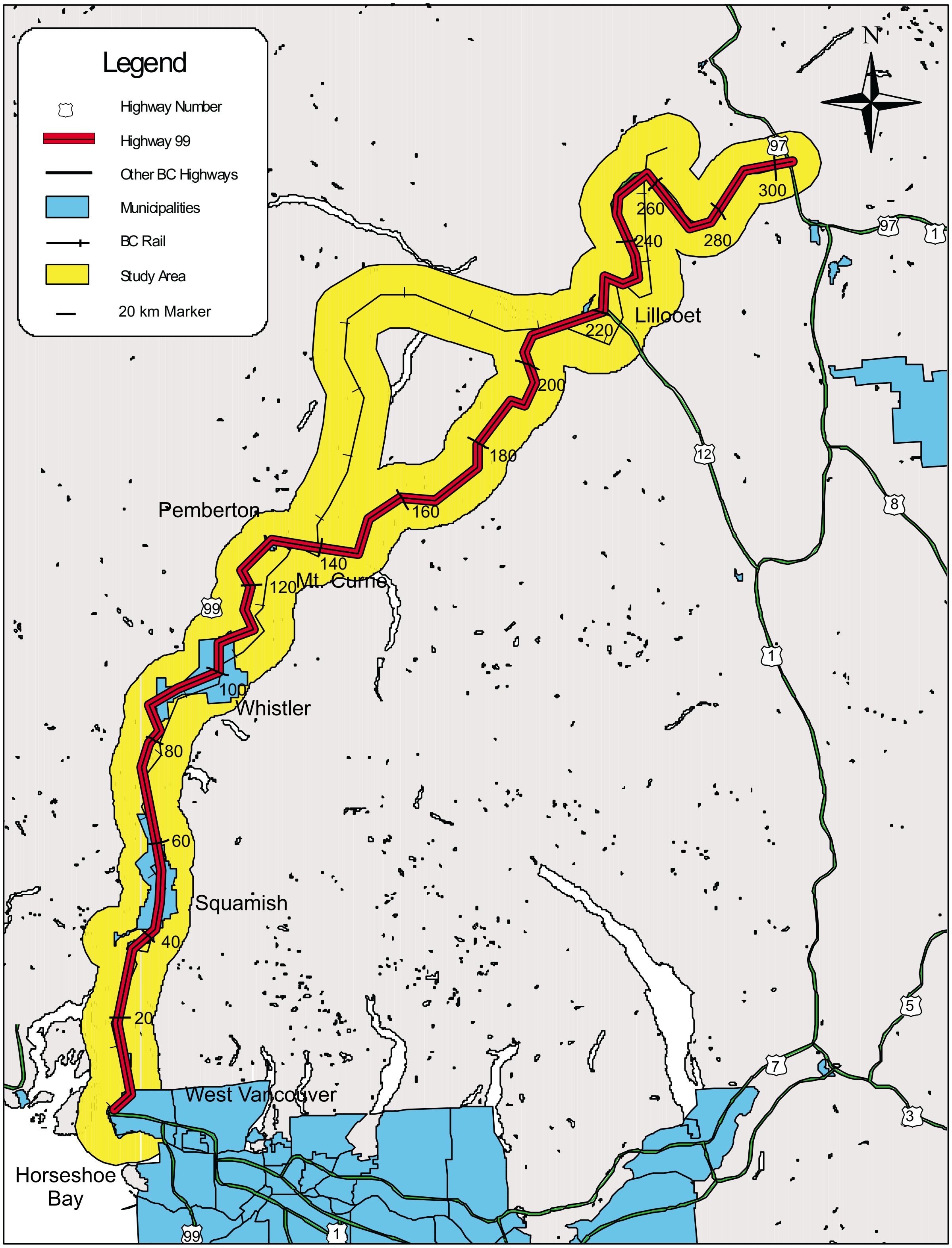
1.2.2 Scope

In the fall of 1999, in response to requests from the mayor and councils of communities in the corridor, the BC Ministry of Transportation & Highways (MoTH) prepared a Terms of Reference for a corridor study. Reid Crowther & Partners Ltd., was engaged by the MoTH to carry out the major multi-modal transportation study. The study limits were Horseshoe Bay in West Vancouver in the south and the intersection of Highway 99 North with Highway 97, just north of Cache Creek, in the north. **Figure 1.1** illustrates the full study area under consideration during the study.

North of Whistler, highway traffic volumes are relatively light, and relate primarily to long-distance recreational travel and the resource-based economy of the region. The southern corridor exhibits significantly different road and travel demand conditions. The combination of large resident populations and intensive, rapidly growing

Study Area

MULTI-MODAL CORRIDOR TRANSPORTATION STUDY:
Horseshoe Bay to Highway 97



H:\projects\tra\3490600\03\Reports\Technical\Final Report\ volume 1\figures\Figure 1.1

Reid Crowther

Figure 1.1
Volume 1:
Summary Report

recreational activities has produced high and very intense, peak period travel volumes on this very constrained transportation corridor.

The predominant modes of transportation in the corridor are the private automobile and bus (south of Whistler only). However, they are by no means the only feasible means of passenger travel. With its existing rail line and passenger rail service, extensive navigable waters in Howe Sound, and a number of small airports, the potential for the development of alternative, non-highway based modes is substantial. Therefore, the Ministry concluded that a new type of transportation study was justified and appropriate.

The Ministry's Terms of Reference and Reid Crowther's response required a unique approach to planning for travel in the corridor. MoTH desired a comprehensive overview of corridor options to support future decision-making and planning for the corridor over the next twenty-five years. The resulting study was, therefore, unique for the Ministry in that it embodied:

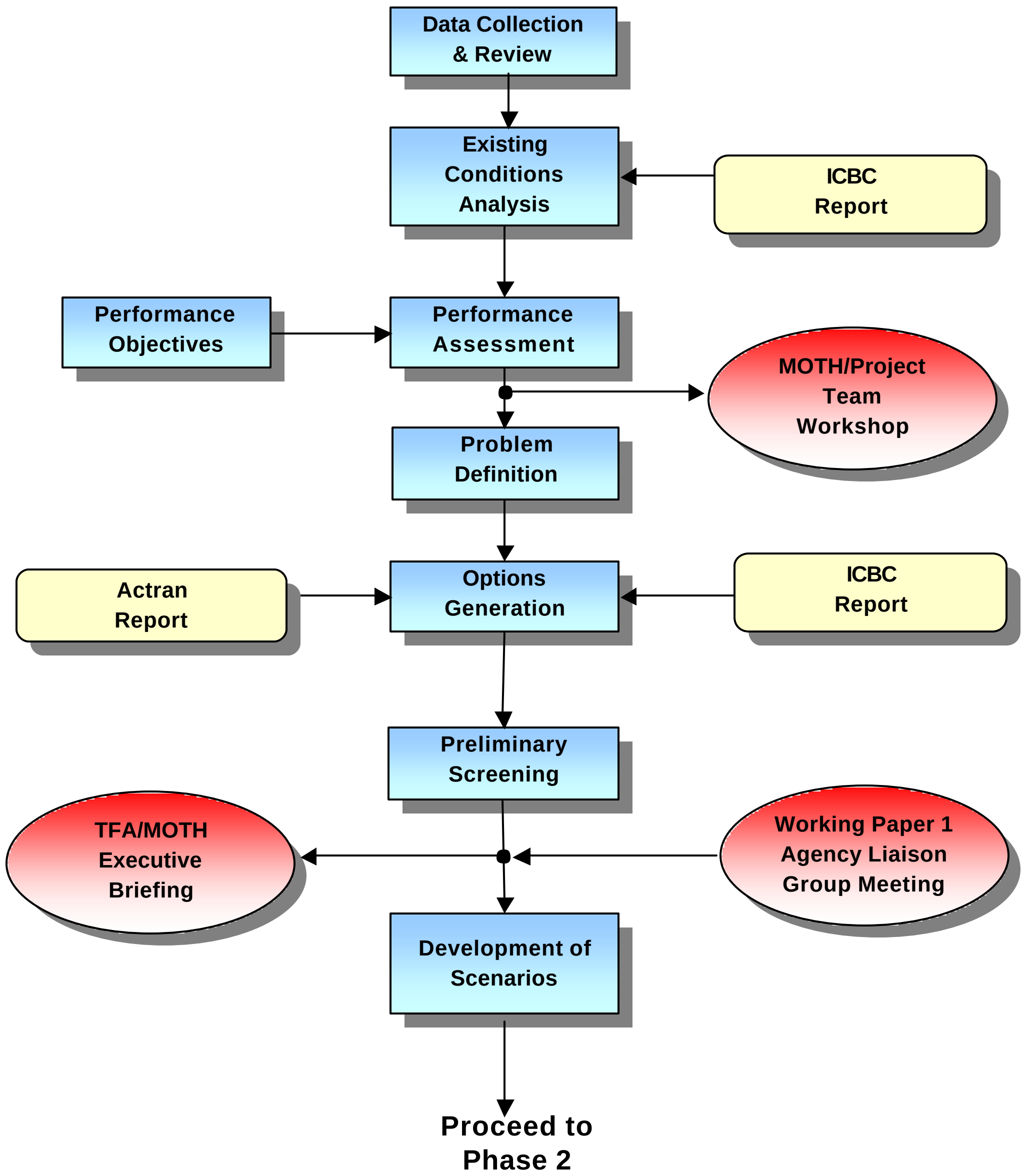
- A full multi-modal approach to transportation considering highway, rail, marine, air and highway bus modes; and
- A top-down approach, which did not pre-suppose that forecast travel demand would be met with new highway construction, but rather considered the full range of strategic, operational, and infrastructure responses to growth in travel demand – including transportation demand and growth management, new infrastructure construction, operational strategies, reduced levels of corridor growth, and acceptance of higher levels of congestion.

This study was a high-level strategic planning effort to investigate potential alternatives for increasing passenger capacity, mobility, safety and reliability in the corridor. Its main purpose was to provide direction to future planning efforts. The scope of the study included investigation and comparison of multi-modal opportunities for improving performance characteristics, as well as traditional, highway-based solutions. Sufficient information was generated to focus future decision-making and establish a proposed implementation process.

1.2.3 Methodology

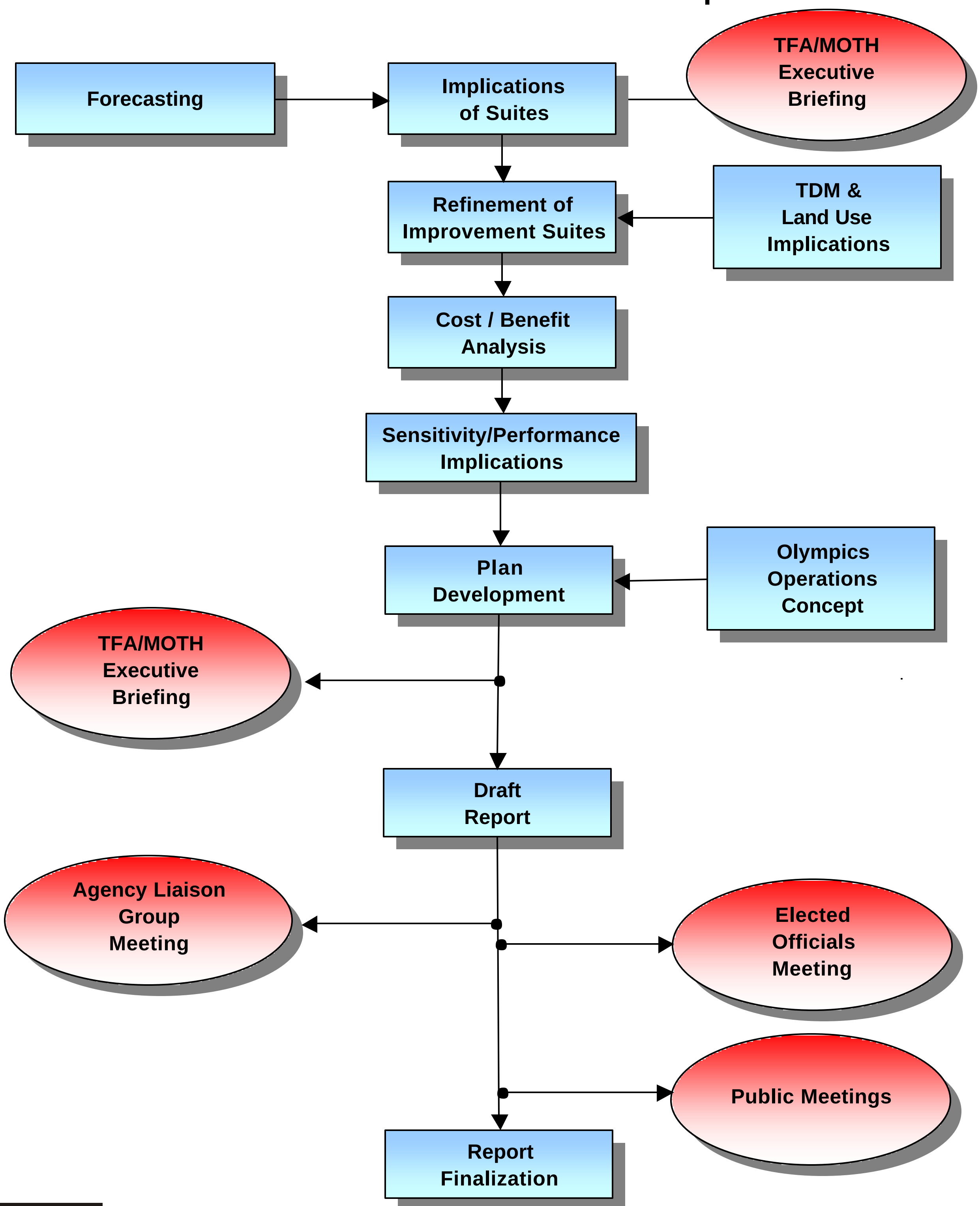
Figures 1.2 and **1.3** are flowcharts that illustrate the basic tasks carried out in the two phases of study. Reid Crowther's approach to the assignment was to first understand the existing corridor and performance deficiencies (in travel time, capacity safety and mobility). The next step was to develop several distinctly different "Scenarios" for the future of transportation in the corridor. Each of these Scenarios gave rise to a suite of

Phase 1: Scenario Development



Reid Crowther

Phase 2: Scenario Characterization & Plan Development



Reid Crowther

H:\PROJECTS\TRA\3490600\03\Reports\Technical\Final Report\Volume 1\Figures\1_2 1_3.xls Fig 1.3
MD
06/15/2001
9:42 AM

Figure 1.3

associated improvement options, describing the nature of future transportation in the corridor. The Scenarios were intended to represent relatively extreme and competing planning philosophies for the corridor. Then each Scenario was analysed to define its implications for capacity, mobility, reliability and safety in the future. In addition, the Project Team developed broad-based cost estimates and analysed benefits and costs at the corridor-level to compare the Scenarios.

The rationale behind this methodology was to ensure a clear understanding of the implications of a number of fundamentally different approaches to future travel demand in the corridor in order to shed light on their differences, advantages and disadvantages. The Project Team sought to establish and analyse these competing Scenarios for transportation in the corridor, so a good understanding of the relationships between transportation policy, infrastructure and future system performance could be realized.

This study is intended to initiate and inform public debate and policy development aimed at developing a comprehensive view for future transportation in the corridor. It will also doubtless lead to further transportation planning work to assist in the selection of a preferred transportation Scenario for the corridor.

1.2.4 The Report

This Volume of the report provides an overview of the study, its results and findings. Technical documentation is also provided in a series of background reports. The full report is comprised of five volumes, as listed below:

- Volume 1: Summary Report
- Volume 2: Existing Corridor Conditions
- Volume 3: Corridor Performance and Scenario Development
- Volume 4: Forecasting, Evaluation and Plan Development
- Volume 5: Appendices

1.3 ACKNOWLEDGEMENTS

Reid Crowther would like to acknowledge the important contributions of the following individuals to the completion of this study:

Ministry of Transportation and Highways

- Dan Doyle, Assistant Deputy Minister, Highway Operations

- John Dyble, Assistant Deputy Minister, Planning and Major Projects
- Christine Legault, Project Director (Director of Planning, Region 1)
- Don Smith, Project Manager, (Corridor Planning Engineer, Region 1)
- Lorne Holowachuk, Project Technical Team (Highway Planning, MoTH Headquarters)
- Nicholas Vincent, Project Technical Team (Rail Policy, MoTH Headquarters)
- Jim Richardson, Project Technical Team (Highway Planning, Region 2)
- Doug Peterson, Project Technical Team (Highway Planning, MoTH Headquarters)
- Tom Kearns, Manager, Economic Analysis, Systems Planning and Policy Branch
- Pete Puhallo, Manager of Highway Planning, MoTH Region 2
- Dan Mayberry, Communications Co-ordinator

BC Transportation Finance Authority

- Frank Blassetti, Vice President Planning and Evaluation

Agency Liaison Group

- Allan Le Fevre, Ministry of Municipal Affairs
- Rick Beauchamp and Steve Olmstead, Squamish-Lillooet Regional District
- Raymond Nothstein and Gordon MacKay, District of West Vancouver
- Bernice Pullen, Village of Lions Bay
- Grant McRadu and Margaret Thornton, District of Squamish
- Bob McPherson and Steve Black, Resort Municipality of Whistler
- Brian Kirk, Village of Pemberton
- Hedley Crowther, Lillooet
- Paul de Leur, Insurance Corporation of British Columbia

Elected Officials

- Mayor Ron Wood, District of West Vancouver
- Mayor Brenda Broughton, Village of Lions Bay
- Mayor Corinne Lonsdale, District of Squamish
- Mayor Hugh O'Reilly, Resort Municipality of Whistler
- Mayor Elinor Warner, Village of Pemberton

- Susan Gimse, Pam Tattersfield, Squamish-Lillooet Regional District
- Mayor Kevin Taylor, Lillooet

Project Team

The following members of Reid Crowther's Burnaby, BC, Transportation division staff played substantial roles in the execution of this study and in the preparation of this report:

- Ian Rokeby, Project Director
- Rob Ahola, Project Manager
- Jane Farquharson, Transportation Planning Engineer
- Norm Richard, Highway Design Engineer
- Steve Brown, Nikki Scott, Gordon Foy and Dean MacMillan, Technical Support

Sub-Consultants

- Peter Lyall, Apex Engineering (Travel Demand Forecasting, Benefit/Cost Analysis)
- Blake Hudema and Gordon Harris, Harris Hudema (Population Forecasting)
- George Clarke, ACTRAN Consultants (Non-Highway Modes)
- Rick Cook, Davidson Yuen Simpson (Tourism Forecasting)
- Demming Smith, DK Smith & Associates (Transportation Demand Management)
- Wally Atkinson, Manop Services Ltd. (Bus Mode)
- David Sutherland (Rail Mode)
- Mit Page, Mit Page & Associates (Rail Mode)
- Laurie Brown (Air Mode)

Sub-Consultant Reports Submitted Under Separate Cover:

- Geoff Buck, Thurber Engineering (Geotechnical)
- Glenn Stewart, Enkon Environmental Ltd. (Environmental)

SECTION 2.0
WHERE ARE WE NOW?

2.1 TODAY'S TRAVEL DEMAND CHARACTERISTICS

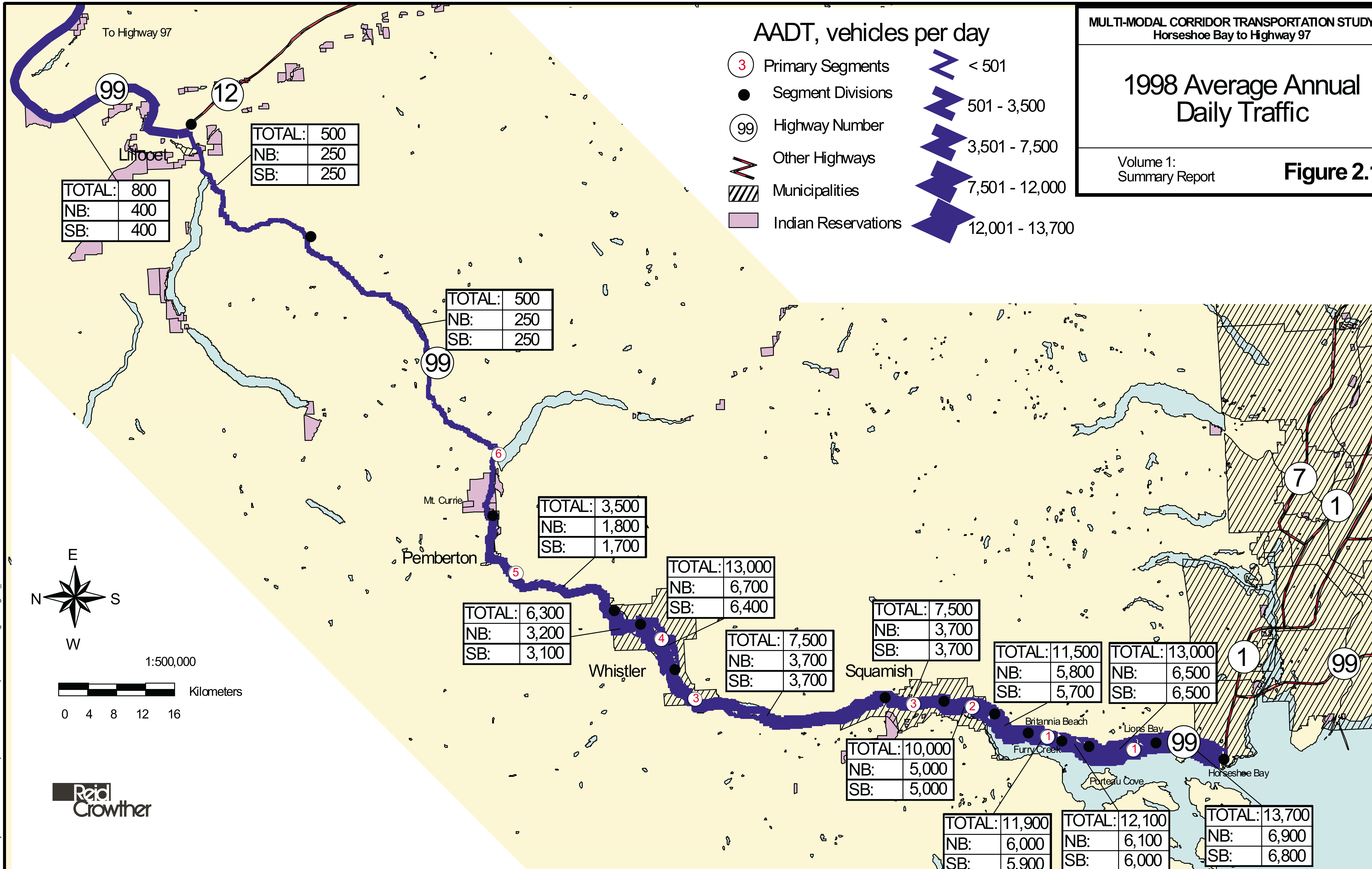
Understanding the existing operations of the corridor was critical to developing policy for the future. In order to quantify the performance of the present transportation corridor and to provide a basis for predicting its performance in the years ahead, the Project Team undertook a comprehensive review of present passenger travel demand in the corridor. Because travel in the corridor relates to the movement of people, and the vast majority of the travelling public presently use the highway, the efforts of this task were heavily focused on highway performance, but also included a thorough inventory of infrastructure, services, existing ridership, and the potential for growth for all modes: auto, bus, rail, marine and air.

New traveller survey data was not available for this study. The team relied extensively on previous data collection efforts and analytical work including highway traffic volume data, speed studies and auto occupancy surveys. The Project Team was required to make informed assumptions/judgements to estimate passenger demand, regarding such items as vehicle occupancy and average load factors for alternative modes.

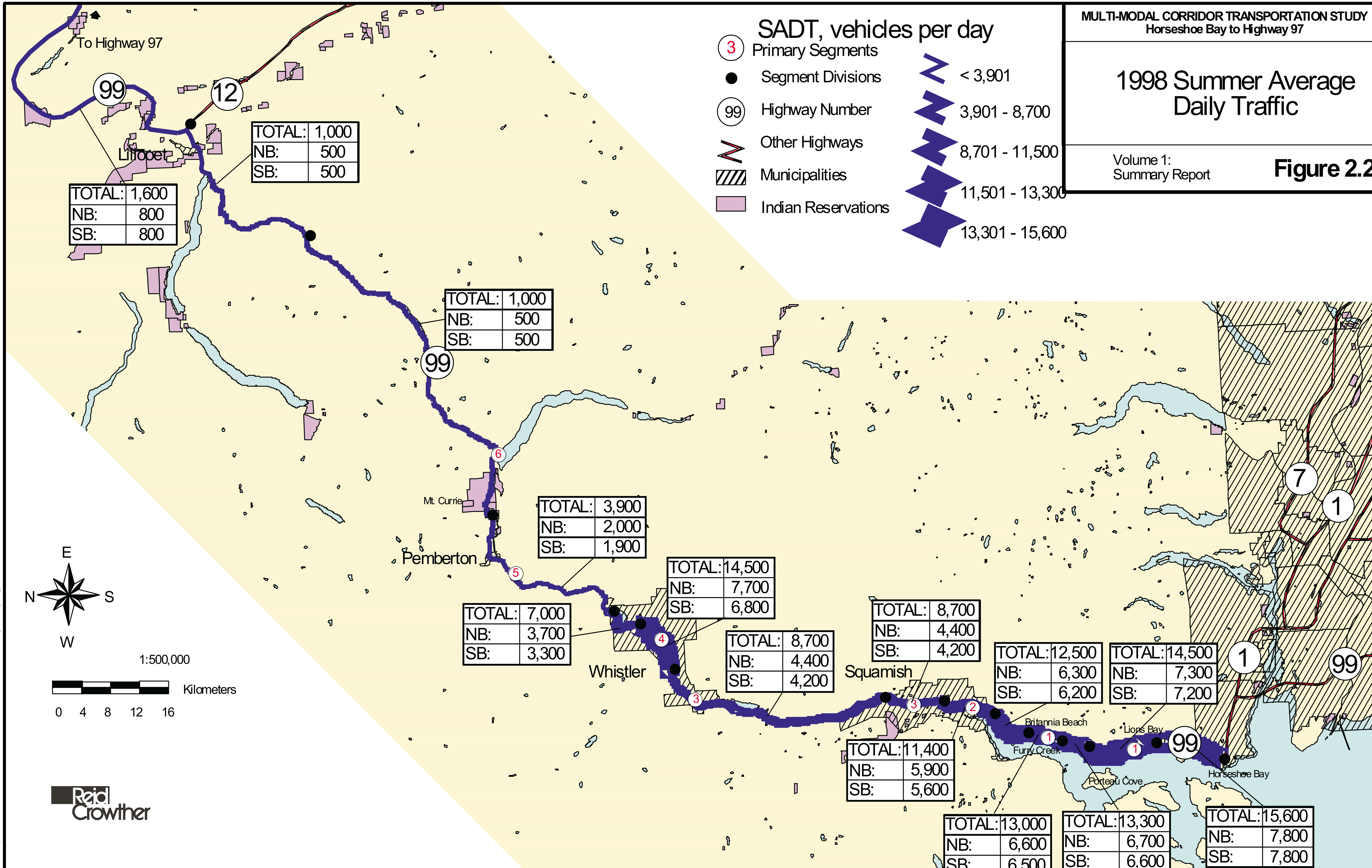
2.1.1 Annual and Seasonal Travel Demands

Most of the passengers travelling on the corridor choose the private automobile, limousines, taxis, vans, or buses on Highway 99 North. Very few choose rail or air. Therefore, the current characteristics of Highway 99 North traffic demand generally represent the overall characteristics of passenger demand for the corridor.

Figure 2.1 shows the 1998 Average Annual Daily Traffic Volumes (AADT) throughout the corridor, while **Figure 2.2** illustrates the Summer Average Daily Traffic Volumes. The busiest sections of the corridor are the southern segments between Horseshoe Bay and Squamish and the urban sections of Squamish and Whistler. Very low average daily volumes are evident between Pemberton/Mount Currie and Lillooet over the Duffey Lake Road. Traffic volumes increase somewhat between Lillooet and Highway 97 due to external highway traffic joining the corridor. Typically, rural sections of 2-lane highways are considered for 4-laning when the AADT reaches 15-20,000. It is clear that the southern segments of Highway 99 North are approaching these limits, particularly in the summer season when daily traffic is 8-15% higher than in the winter.



H:\Projects\Tra\3490600\03\Reports\Technical\Final Report\Volume 1\Figures\Figure_2.1.cdr



H:\Projects\Tra\34906\00\03\Reports\Technical\Final Report\Volume 2\Figures\Figure_2.2.cdr

Between 1989 and 1998, AADT and SADT between Horseshoe Bay and Squamish grew about 3.7%/year. However, between Squamish and Whistler, AADT and SADT grew at a much faster rate, about 6.5%/year. North of Squamish, the corridor is dominated by recreational rather than commuter trips, so this pattern of growth indicates that recreational travel demand probably grew much faster than the mix of recreational/commuter/shopping and personal business travel demand found in the southern segments of the corridor. Commuter traffic north of Squamish has increased along with the recreational growth at Whistler.

2.1.2 Peak Travel Demands

2.1.2.1 Daily

The Project Team's review of the daily traffic patterns in the corridor indicated:

- The summer season is the busiest in terms of total daily volumes on Highway 99;
- Winter is typically the second-busiest season for total daily volumes, except in Whistler where average winter weekend traffic is very close to the summer demand;
- Fall is the least busy season for travel demand on the highway;
- Weekend daily volumes are 10-45% higher than weekday volumes, depending on the location in the corridor. The highest difference between weekend and weekday volumes is just north of the Cheekeye Bridge in Squamish, while the least difference is within the urban area of Whistler.

Figure 2.3 illustrates the range of daily profiles for two-way traffic volumes on Highway 99 North at various locations on the corridor for peak summer and winter days. The afternoon peak period is clearly the dominant peak period, although the time of the peak demand varies depending on the location in corridor. The farther south in the corridor, the later the peak period; however, it tends to occur between 2 and 8 p.m. in the summer, and 3-7 p.m. in the winter. The dominant direction of travel during these periods is always the southbound direction. In the summer the directional split is about 65% southbound, 35% northbound on Sundays, the peak weekend day. In the winter, the directional split is much more focussed toward the southbound direction, with 70% southbound, 30% northbound on an average Sunday.

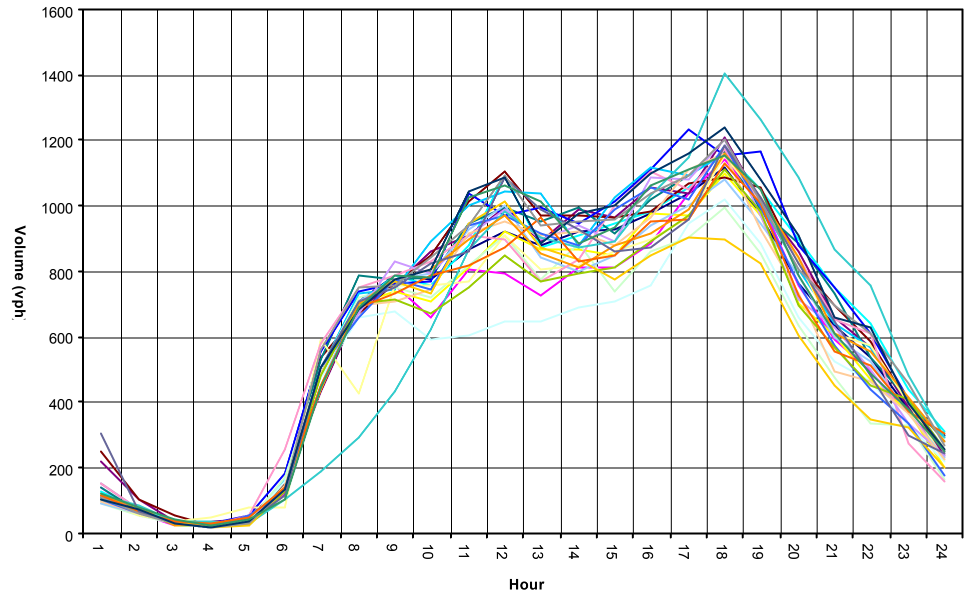
2.1.2.2 Hourly

Figure 2.4 shows 1998 average hourly passenger demand volumes southbound at Horseshoe Bay, the busiest location and busiest direction of travel in the corridor, during the four peak periods of interest: Summer Sundays, Summer weekdays, Winter Sundays and Winter weekdays. Even though Summer Sunday vehicle traffic volumes

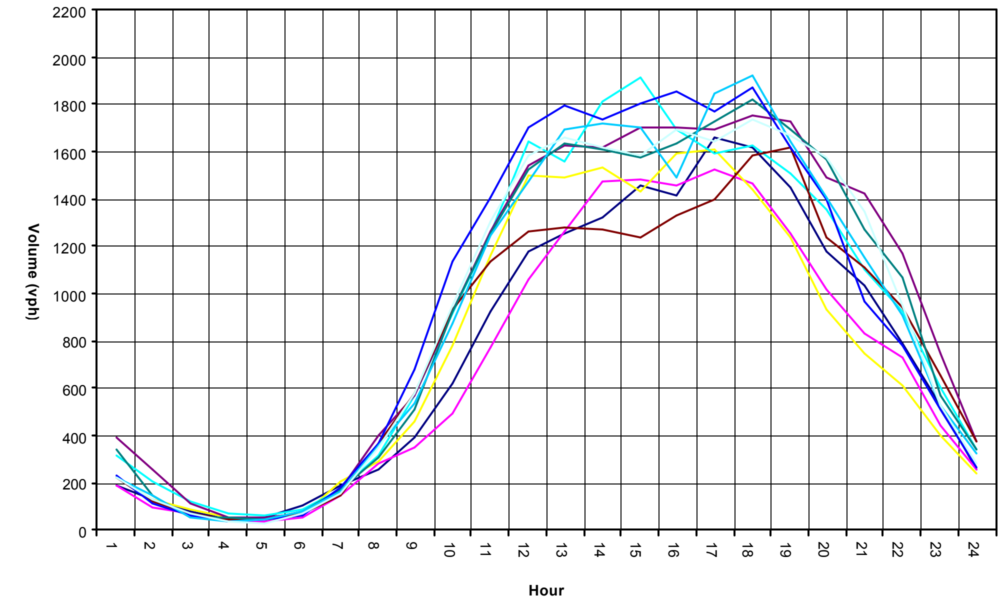
Daily Traffic Distribution Profiles, Just North of Horseshoe Bay

MULTI-MODAL CORRIDOR TRANSPORTATION STUDY: Horseshoe Bay to Highway 97

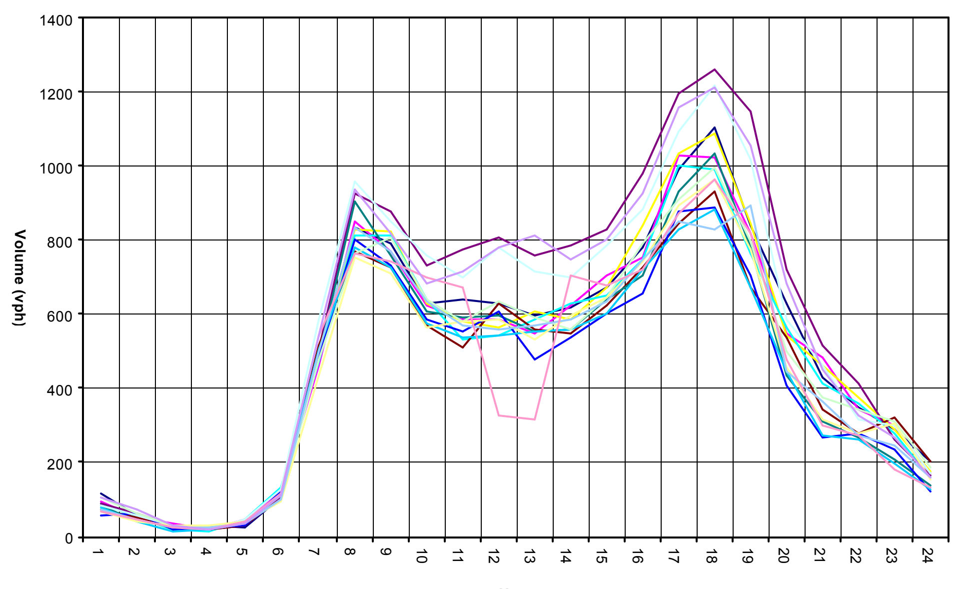
Summer Weekdays, July - August, 1998
Permanent Counter Location P15-5
1.5 km North of Horseshoe Bay



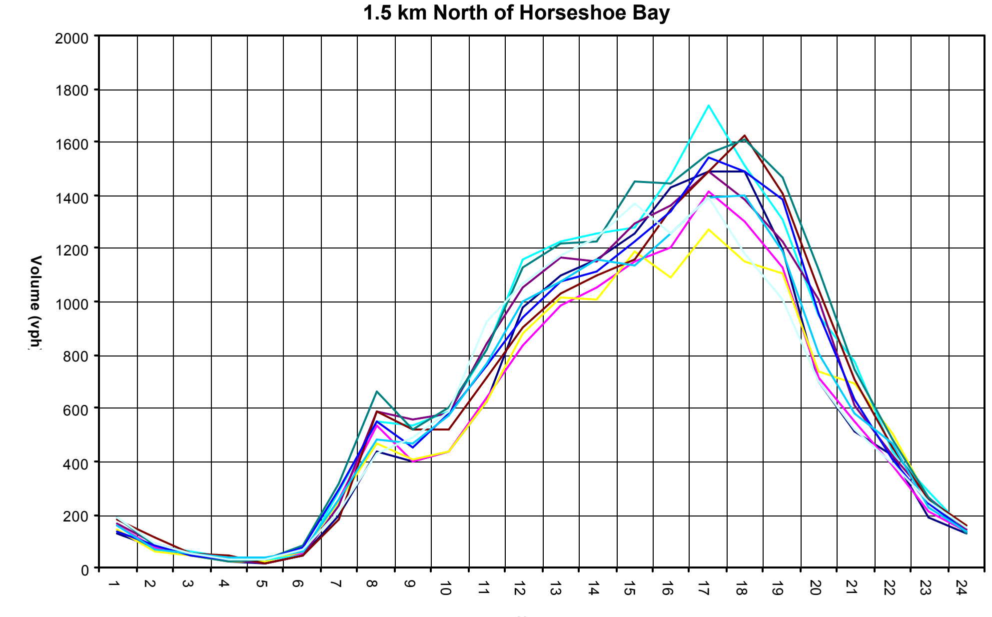
Summer Sundays, July & August, 1998
Permanent Count Station 15-5
1.5 km North of Horseshoe Bay



Winter Weekdays, February - March, 1998
Permanent Counter Location P15-5
1.5 km North of Horseshoe Bay



Winter Sundays, February and March, 1998
Permanent Count Station 15-5
1.5 km North of Horseshoe Bay

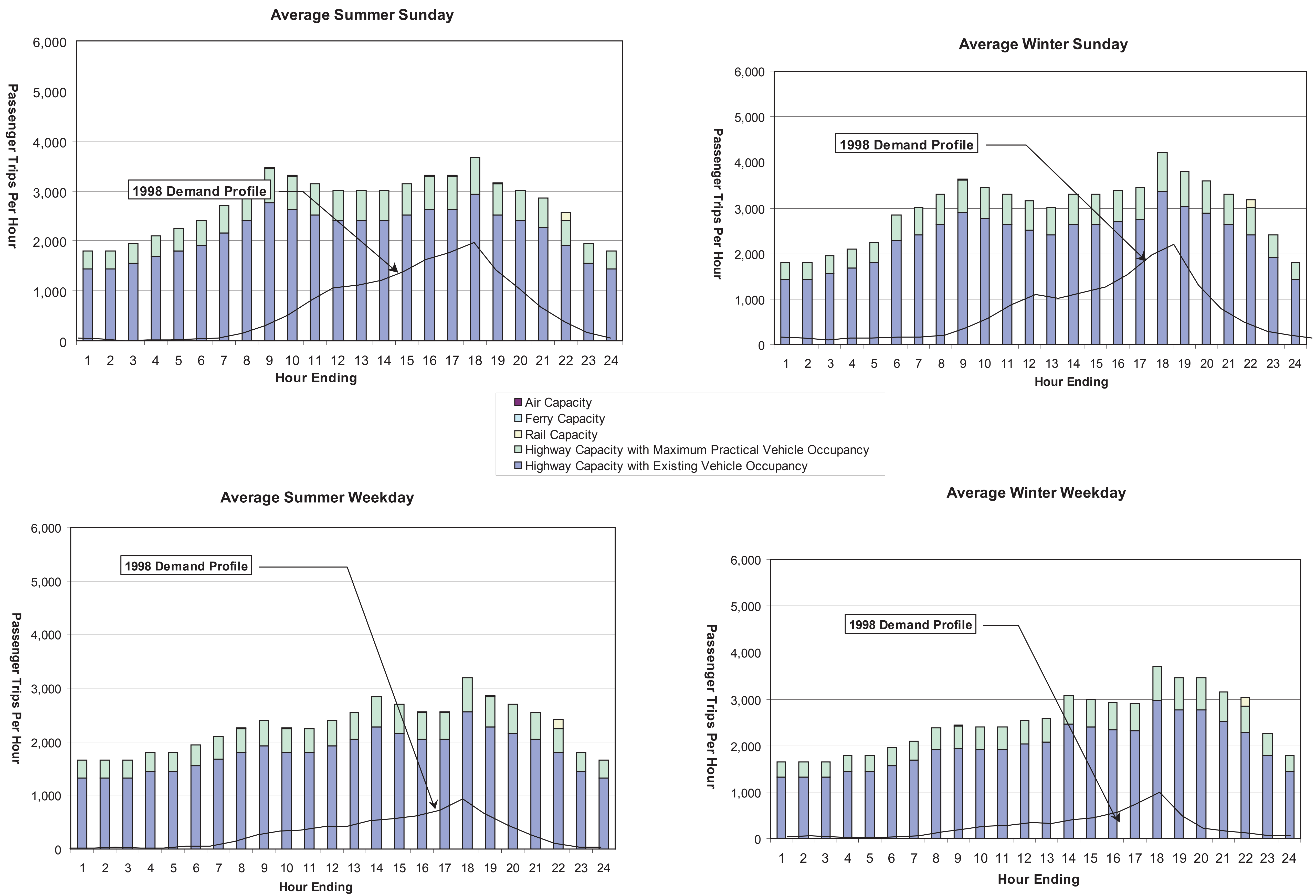


Reid Crowther

Figure 2.3
Volume 1: Summary Report

1998 Passenger Demand vs 1998 Capacity: Existing Corridor
Southbound Trips at Horseshoe Bay

MULTI-MODAL CORRIDOR TRANSPORTATION STUDY: Horseshoe Bay to Highway 97



Reid Crowther

H:\projects\tra\3490600\reports\technical\final report\volume 1\Figures\figure_2.4

Figure 2.4

Volume 1:
Summary Report

at Horseshoe Bay are higher during this period than they are during the same time period on Winter Sundays, vehicle occupancies are higher in the winter, which results in a higher overall passenger demand. Estimated corridor passenger capacity for the same time period is also graphed on **Figure 2.4**. On an average peak hour basis, the capacity of the corridor is closest to being reached during Winter Sunday afternoons.

The hourly vehicle volume that can be adequately serviced without major congestion is exceeded many times during the year. On this 2-lane highway, the peak direction of travel can service about 1,200 vph before significant problems in vehicle traffic flow begin to occur. In 1998, 1,200 vph was exceeded 46 times just north of Horseshoe Bay on 18 different days of the year, primarily in the southbound direction on summer Sundays, but also on spring Sundays. The highest winter Sunday southbound traffic varies typically 1,000 to 1,100 vph at Horseshoe Bay, but congestion has been observed to be much worse in the winter season. This leads to the conclusion that Highway 99 North vehicle capacity is lower in the winter afternoons, possibly due to worse lighting and weather conditions than those experienced in the summer.

The highway has experienced the effect of peak "spreading" caused by increasing congestion during the peak demand period for travel; peak hour traffic volumes are growing at lower rates than daily traffic. For example, the highest vehicle traffic hour of the year has only been growing at 0.3 to 2% per year since 1989. People have chosen to travel earlier or later in the day to avoid peak hour congestion, and the length of the afternoon peak period in the corridor has grown by about 1-2 hours, typically into the early afternoon period.

2.1.3 Origin-Destination, Trip Purpose and Vehicle Occupancy/Classification Characteristics

Highway Modes

There were very little origin-destination and trip purpose data available on Highway 99 North travellers. Available data were either too old or collected during the wrong season or time period of interest. However, the following key findings were made:

- Long-distance traffic (defined as vehicle traffic to/from the Lower Mainland with an origin or destination north of Pemberton) on the southern sections of the corridor was negligible in the winter and very low even in the summer;
- Just north of Squamish, well over 90% of all traffic originated from, or was destined to, Whistler;

- Summer and winter origin-destination patterns in the corridor were very different. In the winter, activities were very concentrated to/from the communities in the corridor, particularly Whistler. In the summer, origins and destinations were more spread out through the corridor;
- In Whistler (and likely in Squamish), there is a high level of travel demand on Highway 99 North which could be considered "local", having both an origin and destination within the community (30-45% in the summer afternoon peak period in Whistler);
- In the winter, about 8% of drivers in Whistler during Saturday afternoon peak periods had origins or destinations to Vancouver International Airport; in the summer, this percentage dropped significantly;
- About 40% of total winter Sunday daily traffic (or 5,600 vehicle trips) at Horseshoe Bay was estimated to be auto trips made by visitors (non-residents of the corridor) to/from Whistler. Between Squamish and Whistler, this travel market was estimated to account for 60% of total winter Sunday traffic; and
- The Project Team estimated that there were about 3,700 commuter vehicles using the corridor each day in 1996. The majority (about 60%) of these commuters travelled on the segment between Squamish and Horseshoe Bay. These commuters represented about 17% of average weekday daily traffic volumes at Horseshoe Bay; however, this percentage was higher in the peak hours of travel, particularly the AM Peak Hour.

The results of March, 1999 vehicle classification surveys on Highway 99 North are summarized in **Table 2.1** below.

Table 2.1: Highway 99 North Corridor Vehicle Classification, March 1999

Vehicle Type	Winter Weekday PM Period	Winter Weekend PM Period
Autos: Cars/ Pick-ups/ Vans	86.3% - 96.0%	86% - 98.9%
Recreational Vehicles	0.0% - 0.8%	0.0% - 0.2%
Light Trucks	1.6% - 2.6%	0.2% - 8.3%
Heavy. Trucks	0.9 - 2.3%	0.1% - 4.6%
Buses	0.0 - 2.0%	0.0% - 3.1%
Motorcycles	0.0% - 1.1%	0.0%

Source: MoTH Vehicle Classification Surveys, March 1999, of AM, noon and PM peak periods combined

The higher percentages of buses were found in the segments within and south of Whistler; the higher percentages of autos and trucks were in the segments north of

Whistler. Recreational vehicles and motorcycles were almost non-existent during the winter surveys.

Table 2.2 provides a summary of the results of the auto occupancy information collected during the March, 1999 vehicle classification surveys. Note that bus occupancy information was not collected.

Table 2.2: Highway 99 North Auto Occupancy, March 1999 (Combined Directions)

Segment	Winter Weekday PM Period	Winter Weekend PM Period
Horseshoe Bay to Squamish	1.5-1.7	1.7
Squamish	*1.4*	*1.6*
Squamish to Whistler	1.6	1.9
Whistler	*1.7-1.8*	2.1
Whistler to Pemberton	1.5	1.7
Pemberton to Lillooet	*1.7*	*1.7*
Lillooet to Highway 97	1.7	1.7

Sources: MoTH Vehicle Occupancy Surveys, March, 1999 and Whistler CTS surveys, February, 1997. Values in italics estimated using judgement.

The highest auto occupancy in the corridor occurred in the southbound direction, just north of Horseshoe Bay, during the afternoon Peak Hour of winter weekends, and was about 2.6 persons/vehicle. The occupancies in the above table represent higher than average auto occupancies on rural, 2-lane highways in the Province.

2.1.4 Mode Split

Highway Modes

Passenger volumes using the highway mode were established by multiplying vehicle volumes by estimated vehicle occupancies corresponding to the vehicle type. Occupancies of buses and light/heavy trucks were estimated using engineering judgement and information obtained from the bus companies utilizing the corridor.

Table 2.3 provides a summary of estimated mode split (to highway modes only).

Table 2.3: Highway Mode Split at Selected Locations, Winter Weekend PM Peak Period, March 1999

Type	Location			
	Segment 1 Horseshoe Bay	Segment 3 Cheekeye Bridge	Segment 4 Whistler	Segment 7 North of Lillooet
Cars, Pick-ups, Vans	81.0%	66.6%	64.9%	93.5%
Recreational Vehicles	0.1%	0.1%	0.0%	0.0%
Light Trucks	0.2%	0.2%	0.3%	0.1%
Heavy Trucks	0.02%	0.1%	0.1%	0.2%
Buses	18.7%	33.1%	34.7%	6.1%
Motorcycles	0.0%	0.0%	0.0%	0.0%

Source: Estimated by multiplying estimated vehicle occupancy by estimated vehicle volumes. Refer to ***Appendix E of Volume 5*** *for full estimates.*

Buses are the primary non-auto travel mode in the corridor at the present time. From the information in the table above, it is evident that the bus mode plays a very important role in the corridor within and south of Whistler. During the peak hour on a typical winter weekend, busses serve 19% of the passenger demand on the highway between Horseshoe Bay and Squamish, and 33% of the passenger demand between Squamish and Whistler. These percentages are very high for a 2-lane rural highway; even typical urban areas such as the Lower Mainland experience only 8-12% transit mode share during peak periods. The mode split to bus is substantially reduced to 6% in segments north of Whistler, due to a lack of regular services.

This large demand for bus traffic in the southern segments of the corridor has been brought about recently by increases in numbers of “destination-type” visitors to Whistler with package trips that include the bus fare. Also, Whistler has begun to market itself very strongly as a resort where a car is not needed, overnight hotel parking charges have increased, and the local transit system has grown dramatically. The increasing amount of congestion on the highway has also played a role, making travel by auto less desirable for many people. For individuals or small groups, the bus is less expensive than renting a car for several days. Unlike the local bus service in urban areas, the majority of this service is provided (unsubsidized) by the private sector servicing Whistler and multiple destinations in the Lower Mainland.

Greyhound Canada provides seven trips per day between Vancouver and Whistler during the winter months, plus an additional commuter-oriented trip from Squamish to Whistler. Four of these runs continue to Pemberton and one to Mount Currie. About half of the passengers on this service are Lower Mainland residents. The remainder are visitors from other points in Canada, the U.S., and overseas. Perimeter Transportation Ltd. operates a scheduled service to Whistler from Vancouver International Airport under an exclusive contract with the airport authority. Service frequency ranges from 5 trips per day during the summer months to 11 per day on winter weekends. Several carriers provide charter bus services in the corridor. School trips to Whistler represent the largest single charter market, but motor coach tours and convention groups also generate a substantial volume of charter bus activity.

No data is available on the size of the bus market in the corridor, but it appears that current volume is in excess of 600,000 passengers per year and may be as high as 900,000.

Non-Highway Modes

The scheduled services for alternative modes currently operating in the corridor are summarized in **Table 2.4**.

Table 2.4: Scheduled Services of Alternative Modes in Highway 99 North Corridor

Mode	Service	Location	Season		Trips per Day	Max. Daily Passenger Capacity (1 way)	Role of Service
			Year-rnd.	Summer Only			
Rail	Van. – Pr. George *(Cariboo Prospector)*	N. Vancouver – Lillooet & beyond	•		1	292	Serves a diverse market, from local to long-haul travel in the Highway 99/97 corridors.
	Whistler Explorer	Whistler – Kelly Lake		•	1	178	Primarily aimed at motor coach tour traffic.
	BC Rail steam train	Vancouver – Squamish		•	1		An attraction in its own right, does not function as a transport service.
	BC Rail dinner train	Vancouver – Porteau Cove		•	1		An attraction in its own right, does not function as a transport service.
Bus	From Pacific Central Station.	Vancouver – Mt. Currie	•		6 - 7	380+	Links 9 corridor communities to Vancouver.
	From Vancouver International Airport	Vancouver – Whistler	•		5 - 11	600+	Links Van. International Airport to Whistler.
	Public Transit	Lions Bay, Squamish, Whistler & Pemberton	•		3 from Lions Bay, 2 from Pemb erton		Links Lions Bay to Vancouver and provides local mobility in Squamish and Whistler. Pemberton to Whistler in place. BC Transit reviewing commuter needs between Squamish And Whistler
Marine	Downtown to downtown	Vancouver – Squamish		•	1	300	Functions as an attraction rather than a transportation service.
Air	Floatplane from downtown Vancouver	Vancouver – Whistler		•	2	12	Links Whistler to downtown Vancouver.

Source: ACTRAN Report, December, 1999. Bus services are included in this table for information only; they are considered a "highway" mode

Those services shown shaded in the table are considered true "transportation" services. which provide an alternative to the highway modes, while the others are really tourist attractions, or "destination" services. The focus of this study was on transportation services only.

While daily passenger capacities are provided in the table above, very little information is available regarding actual passenger demands for the various services during peak demand periods. Key information that was available indicated that:

- *Rail:* BC Rail's primary service is the Cariboo Prospector – a daily service that operates the full length of the corridor and serves 26 points between North Vancouver and Lillooet en route to Prince George. The service is constrained by a number of factors including track alignment, the 13-hour run to Prince George, and railcars that are more than 40 years old and near the end of their service life. The number of passengers using the service has declined – dropping from a peak of about 105,000 in 1992 to 60,000 in 1998. Peak capacity provided varies with the season and day of the week; on average, about 215 passenger seats are provided in each direction, each way.

- *Air*: Whistler Air Services operate the only scheduled airline service in the corridor. This is a seasonal floatplane service from downtown Vancouver to Green Lake in Whistler. It operates during the summer season only, since snow and ice conditions on the lake make it impossible to operate on skis during the winter months. The service has been operating for only two years, and it is not yet clear whether it can be sustained. Two return flights a day are provided, with about 6 seats/flight available.

SECTION 3.0
WHERE ARE WE GOING?

3.1 INTRODUCTION

The southern portion of the corridor has undergone substantial growth in population and economic activity over the last two decades and there is every indication that this trend will continue. In order to provide a realistic appraisal of what the future performance of the transportation system will be, the Project Team forecasted future corridor growth and resulting travel demand, then compared the future travel demand to the existing transportation resources in the corridor.

3.2 UNCONSTRAINED GROWTH FORECASTS

At the time of writing, the Squamish-Lillooet Regional District (SLRD) does not have a growth management plan with population targets for individual communities. Hence, individual Official Community Plans of the corridor municipalities and Official Settlement Plans of unorganized areas were used as the best available guides to forecasting future growth.

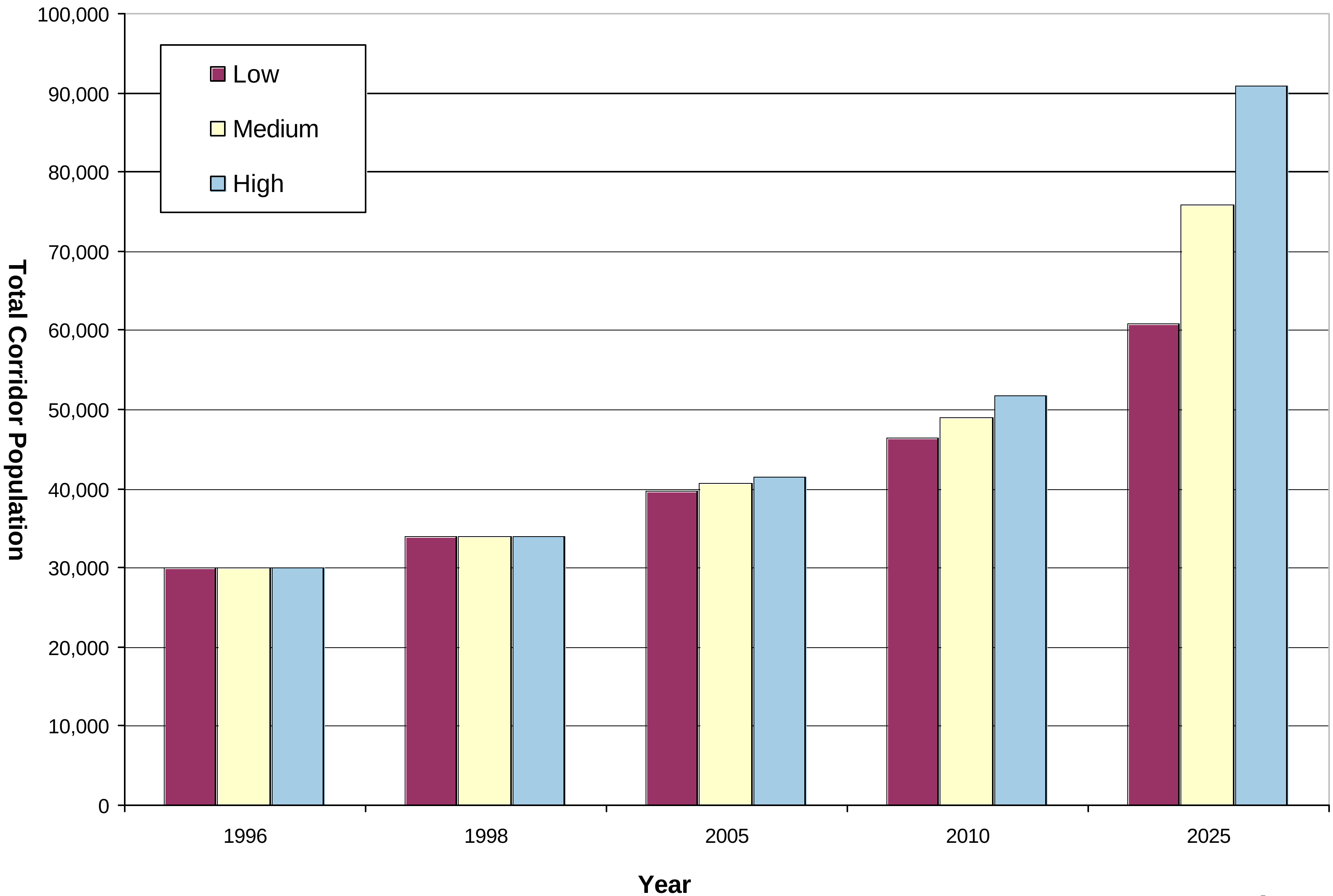
It is recognized that other factors will be in play than just community plans. Experience over the last two decades and economic analysis suggests that most suitable land in the corridor between Horseshoe Bay and Whistler will eventually undergo pressure for development, therefore the supply of developable land and control of development will be a major factor influencing actual growth trends. In addition, the provision (or non-provision) of additional transportation capacity in the corridor, and the timing of this additional capacity, will impact growth trends and ultimate limits to growth. However, in the context of this high-level study, OCP and Area Plans were used as a starting point for forecasting as they represented the current growth aspirations of corridor communities.

Uncertainty exists regarding the timing of growth and the extent to which some population growth may be "double-counted" (i.e. adjacent municipalities are both making provision in their respective OCP's for growth that may only happen in one of them). In response to this, the Project Team developed Low, Medium, and High forecast for each of the chosen horizon years, as shown in **Figure 3.1**.

When combined together, the OCP's and Area Plans for the corridor communities indicated a population growth potential almost three times higher than the existing corridor population of about 32,500. This forecast was considered the "High" level

Corridor Population Growth Projections

MULTI-MODAL CORRIDOR TRANSPORTATION STUDY: Horseshoe Bay to Highway 97



Reid Crowther

Figure 3.1

Volume 1: Summary Report

forecast. In addition to annual incremental growth of existing communities, there are significant proposals moving towards approval for major discrete developments such as Cayoosh, Garibaldi at Squamish, Porteau Cove, and Britannia Beach; these individual proposals have also been included in the "High" forecast, layered on top of the annual community growth. "Medium" and "Low" forecasts were then developed by modifying assumptions regarding the amount and pace of growth in existing communities and by eliminating/reducing proposed new developments. The 2025 population forecasts for the entire corridor range between 61,000 (Low) and 91,000 (High), a substantial increase from today's population. Growth rates are anticipated to be highest in the southern portion of the corridor, particularly in Squamish and along Howe Sound.

The ultimate corridor growth has been assumed to occur before the last study horizon year of 2025. However, the timeframe for the corridor growth is less than certain as it will depend on many factors, including transportation supply, congestion on Highway 99 North and market forces. Also, these forecasts do not reflect the implementation of a growth management plan; therefore, they are considered "Unconstrained" forecasts in the sense that they represent ultimate corridor growth with no market, supply or highway congestion constraints.

3.3 TRAVEL DEMAND FORECASTS

The Project Team proceeded to develop an understanding of future year travel demand in the corridor using the "Unconstrained" population forecasts. In doing so, there was an explicit consideration of the following for each municipality:

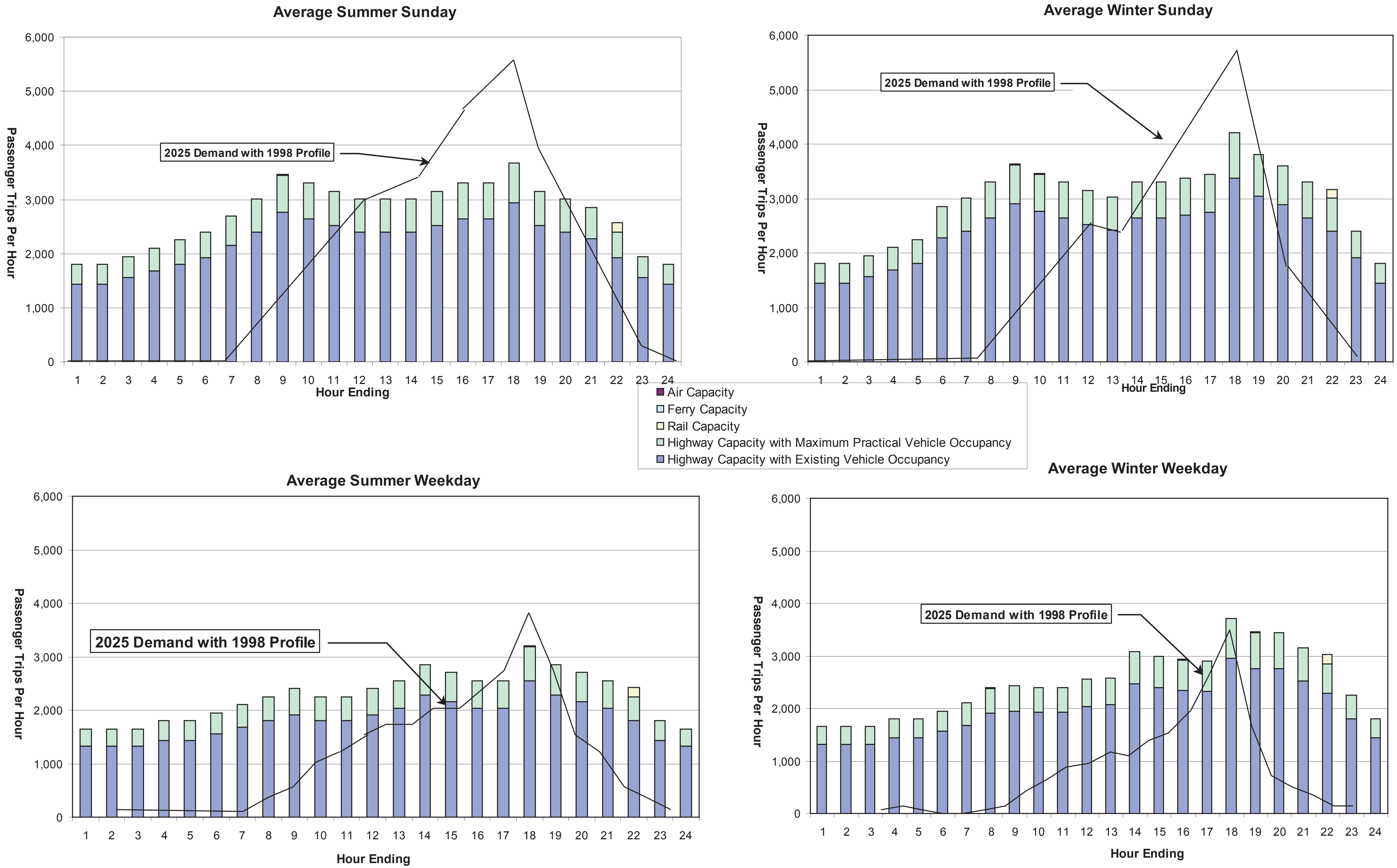
- Currently planned population growth;
- Type and size of currently planned major developments;
- Propensity to travel (average annual trips/person).

From this understanding, a regression-based forecast of future travel demand between individual pairs of communities (an AADT trip table) was developed for each horizon year: 2000, 2010 and 2025. This information was then used to develop peak day and peak hour forecasts for each segment of the corridor, using formulas and factors. The result was an "Unconstrained" passenger demand forecast using the "Medium" corridor growth Scenario.

Figure 3.2 illustrates the forecasted 2025 unconstrained hourly passenger demand, graphed assuming the same daily patterns as today, for the four average design days: Summer Sundays, Summer weekdays, Winter Sundays and Winter weekdays. These

2025 Passenger Demand vs 1998 Capacity: Existing Corridor Southbound Trips at Horeshoe Bay

MULTI-MODAL CORRIDOR TRANSPROTATION STUDY: HORSESHOE BAY TO HIGHWAY 97



Reid Crowther

Figure 3.2
Volume 1:
Summary Report

H:\Projects\Tra\3490600\Reports\Technical\Final Report\Volume 1\Figures\Figure_3.2

graphs clearly illustrate that the existing corridor will not be able to accommodate the forecasted demand even during periods of average peak volumes.

SECTION 4.0
WHAT ARE THE NEEDS?

4.1 INTRODUCTION

In developing any program of proposed transportation improvements it is important to first understand the specific deficiencies in the performance of the existing facility. The performance objectives of interest in the corridor were mobility, safety, reliability, and capacity.

4.2 CORRIDOR PERFORMANCE

4.2.1 Mobility

Mobility exists when one can travel freely and conveniently to a selected destination at a time of one's choosing. In general, major challenges to mobility on the corridor are congestion, road closures, and travel speed. Of these, the biggest anticipated challenge is congestion. At present, some people elect to travel at off-peak periods rather than when they might otherwise choose, due to highway congestion. As highway congestion grows, this trend will continue if no additional corridor capacity is provided.

Figure 4.1 illustrates average travel speed information gathered in the spring of 1999 by the MoTH, between Horseshoe Bay and Whistler (data north of Whistler were suspect or unavailable). It is evident that slower speeds in the corridor occurred in 2-lane rural sections with sub-standard geometrics, in urban sections with traffic signals or lower posted speeds, or in congested sections. However, the average travel speeds recorded were very close to the calculated speed if each driver adhered to the posted limits. Therefore, the Project Team concluded that there are likely many sections of the highway between Horseshoe Bay and Whistler where drivers exceed the posted limit. The Insurance Corporation of British Columbia (ICBC) study referenced in the following section identified spot speed problems in several sections of the corridor, typically in the 3-lane and 4-lane sections where drivers are passing, and on long tangent sections. Many drivers likely try to make up for "lost time" in the sections with poor mobility by increasing their operating speeds in sections with more favourably geometry/without traffic signals.

Winter Weekend Average Travel Speed (PM Peak Period) by Secondary Segment March 27-28, 1999

MULTI-MODAL CORRIDOR TRANSPORTATION STUDY: Horseshoe Bay to Highway 97

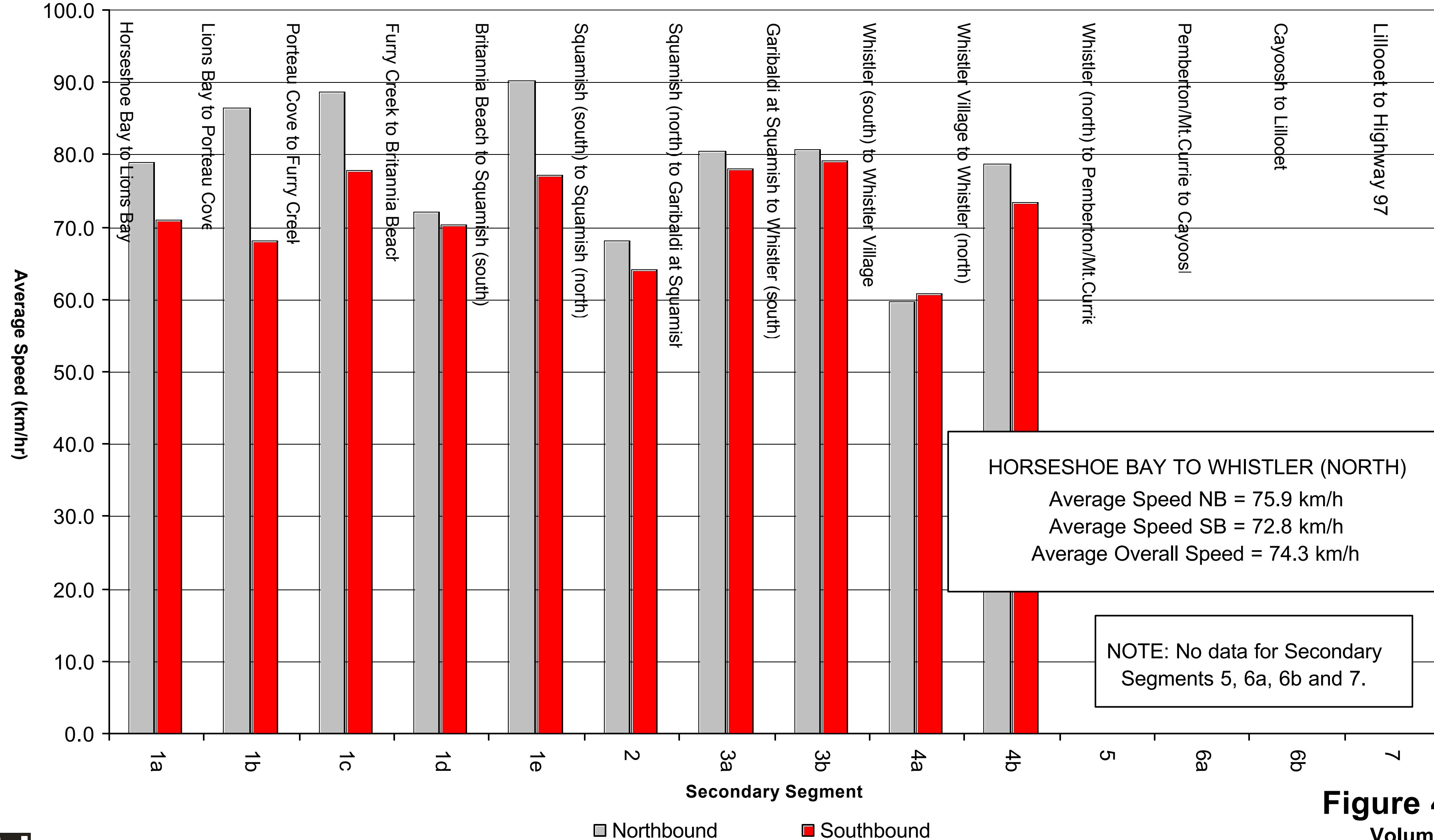


Figure 4.1

Volume 1: Summary Report

Reid Crowther

4.2.2 Safety

Statistically, accident rates in the corridor are presently lower than Provincial average accident rates for 2-lane highways when calculated over the entire length of the corridor. However, when the corridor is broken down into shorter distances, it is clear there are some sections with higher accident rates and higher accident severity value that the Provincial averages; refer to **Table 4.1**. ICBC conducted a safety evaluation of Highway 99 North and produced a comprehensive list of countermeasures and recommendations for infrastructure improvements. These improvements should be included with whatever future short term capital improvement program that may be undertaken.

Table 4.1: Summary of Collision Characteristics, 1993-1997

Type	Provincial Average	Critical Performance Measures	Highway 99 North Corridor	Segments with Problem Areas
Frequency (total number of collisions)	N/A	N/A	2,155	N/A
Collision Rate (coll/mvk)	0.70 (1)	CCR = 1.0 coll/mvk for segments, 0.90 for intersections	0.67	• Horseshoe Bay to Squamish CR = 1.0
Severity Ratio	5.50	CSR = 8.0 for Segments and intersections	6.69	• Horseshoe Bay to Squamish SR = 7.3; • Squamish to Pemberton SR = 6.1 • Pemberton to Lillooet SR = 6.5 • Lillooet to Highway 97 SR = 8.9
Density (coll/km/year)	1.30	Minimum density = 5.0 coll/year/km	1.40	• Horseshoe Bay to Squamish CD = 3.5 • Squamish to Pemberton = 2.5

(1) Average collision rates for mountain passes in BC are approximately 50% higher than this rate (per Apex Engineering)

N/a = "Not Applicable"

Source: "Safety Planning Review: Highway 99 North", Hamilton Associates. Note that after 1995, the RCMP in the Lower Mainland have not been attending every motor vehicle accident; however, Hamilton Associates advised Reid Crowther that the RCMP in Squamish and Whistler have continued to attend almost every accident in the corridor; therefore, the data set between 1995 and 1997 was considered acceptable for use in Hamilton's analysis.

As can be seen, the overall corridor collision rate was less than the Provincial average, but exceeded it between Horseshoe Bay and Squamish. The severity ratio exceeded the Provincial average in the corridor overall, with a number of locations considerably above the Provincial average. These findings were consistent with a relatively heavily-travelled 2-lane highway with challenging terrain and significant geometric deficiencies.

4.2.3 Reliability

Reliability is characteristic of the corridor pertaining to the continuous availability of the transportation facility. Road closures, either full or partial closures, reduce reliability.

Figure 4.2 summarizes full highway closures throughout the corridor by segment, for both the number and total duration of closures in hours, between 1995 and 1998. The southern part of the corridor experienced a large number of closures, but the total duration was relatively small since the closures were due mainly to automobile accidents and emergency response was relatively quick. The reliability through the urban areas was reasonably good with few closures. The area between Pemberton and Lillooet exhibited few closures, but durations of closure were much longer since they were primarily due to avalanches or washout problems that typically take some time to resolve. The segment between Squamish and Whistler did not experience as many closures as the Horseshoe Bay to Squamish section, nor was the total duration as high as the Pemberton to Lillooet segment, but this section has poor reliability between Culliton Creek and the Cheakamus Canyon, in particular.

Note that partial closures related to highway maintenance and other planned activities were not included in the data, and could have significantly increased delay for the travelling public. Partial closures are controlled by MoTH and are typically scheduled for off-peak hours and limited durations.

It should be noted that the period in question didn’t include the numerous and extended debris torrent closures experienced in the early to mid 1980’s between Horseshoe Bay and Squamish. Although the reliability of the highway in terms of closures due to natural events is not expected to change substantially over the time frame of this study, long term closures will have an increasing effect in terms of the amount of overall delay as traffic volumes grow.

4.2.4 Practical Capacity

Figure 4.3 compares hourly forecast southbound travel demand at Horseshoe Bay in 2025 during afternoon peak periods, plotted with existing corridor capacity for each peak day of interest. In contrast to **Figure 2.4**, this figure indicates that without significant capacity enhancements, the corridor capacity will be significantly exceeded, for each of the average peak hour periods illustrated. When higher-than-

Number and Duration of Full Highway Closures by Cause (1995 to 1998)

MULTI-MODAL CORRIDOR TRANSPORTATION STUDY: Horseshoe Bay to Highway 97

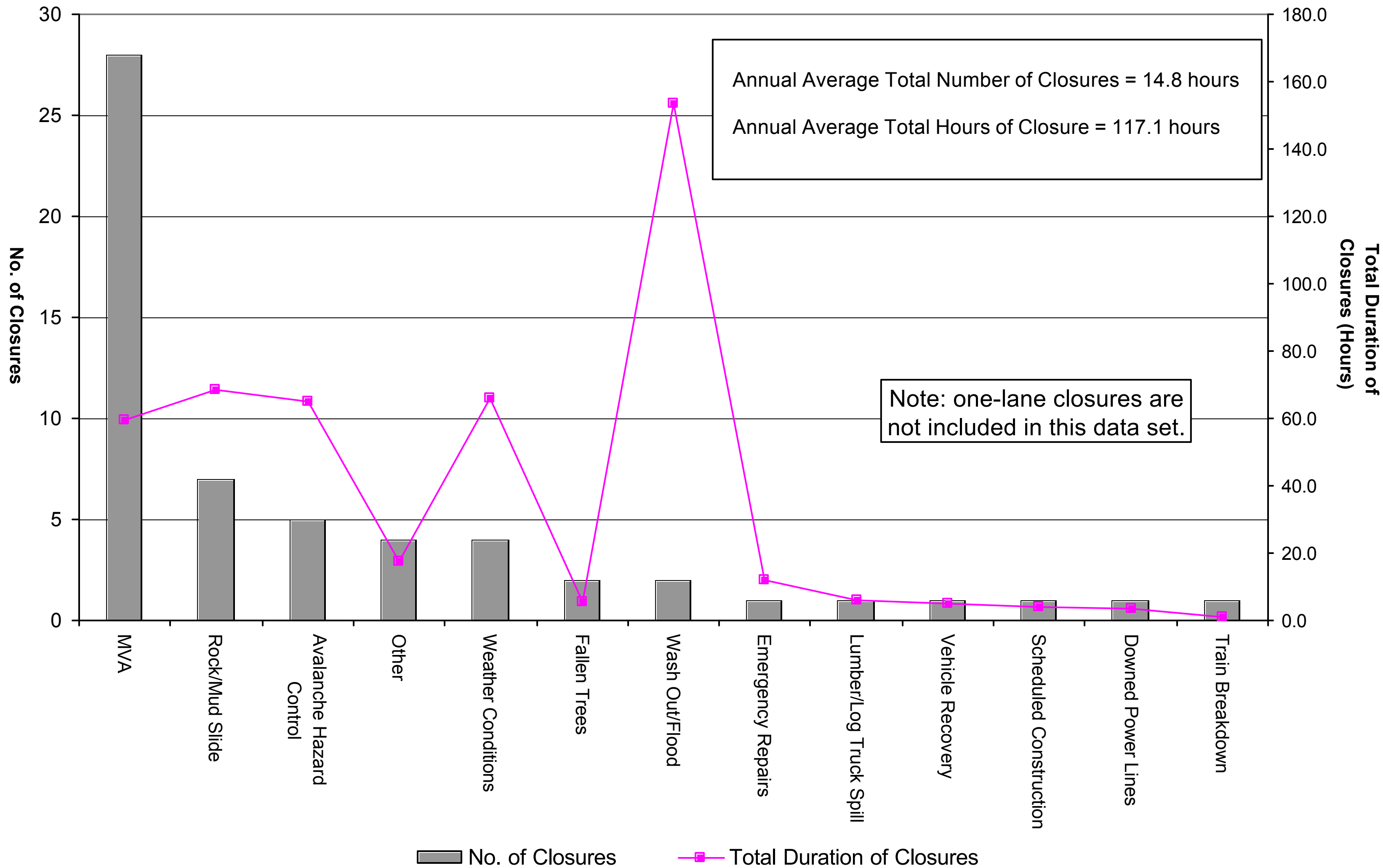
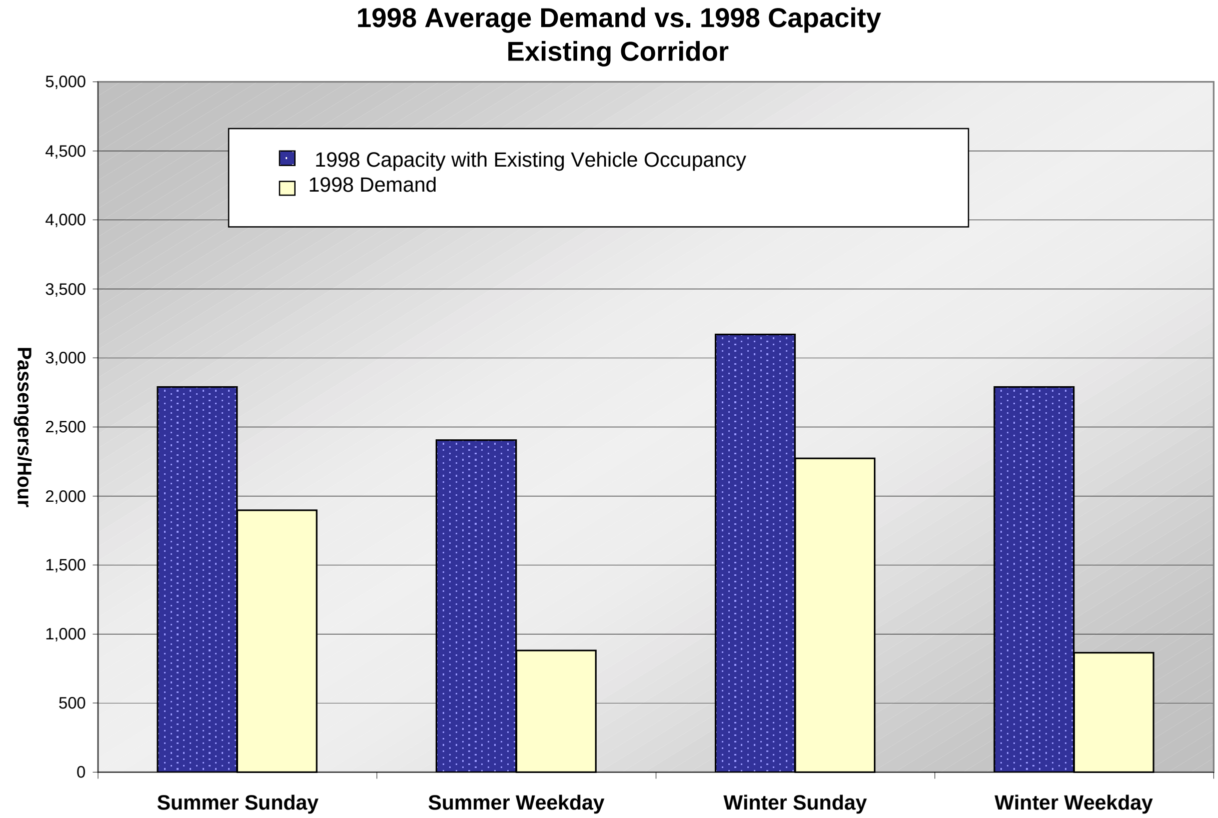
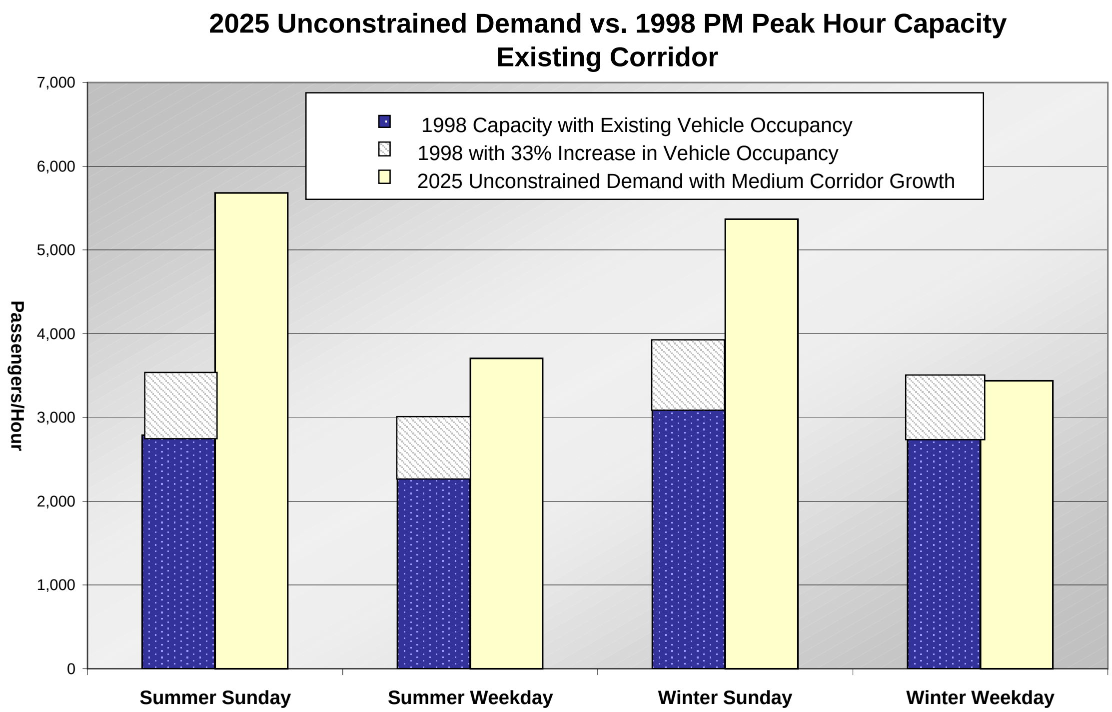


Figure 4.2
Volume 1: Summary Report

1998 Average PM Peak Hour Passenger Demand vs. Capacity Southbound Trips at Horseshoe Bay

MULTI-MODAL CORRIDOR TRANSPORTATION STUDY: Horseshoe Bay to Highway 97





Reid Crowther

Figure 4.3

Volume 1: Summary Report

H:\Projects\Tra\3490600\03\Reports\Technical\Final Report\Volume 1\Figures\Fig 4.3 & 7.2.xls
06/15/2001 3:05 PM
MD

average travel demand is realized, the shortfall in system capacity will be even more pronounced than that shown. The forecast capacity shortfall is less severe as one moves northward in the corridor, and is not expected to be an issue north of Whistler.

In response to the limited capacity situation illustrated on Figure 4.3, people will either travel at off-peak times, not travel, accept longer travel times, increase vehicle occupancy, change modes, etc. Another possible response is a reduction in population and recreational activity levels in the corridor to levels substantially below those anticipated by the “Medium” population growth forecasts (i.e. planned developments may not materialise because of the constrained transportation resource).

4.3 PROBLEM IDENTIFICATION

Table 4.2 following provides a matrix which identifies locations of performance problems identified in previous sections, by mode and by segment, on the basis of the performance criteria for the corridor: mobility, safety, reliability and practical system capacity.

Table 4.2: Summary of Problem Identification

No.	Description	Performance Criteria			
		Mobility	Safety	Reliability	Practical Capacity
Origin in Lower Mainland to Horseshoe Bay		• Rail speeds low through North Shore to Horseshoe Bay • Rail, bus and air mode transfers and wait time increase travel times from Lower Mainland		• Reliability of highway mode depends significantly on reliability of Burrard crossings which suffer significant congestion resulting in unreliable travel times	• Capacity of Burrard crossings impacts capacity from Horseshoe Bay northwards
1	Horseshoe Bay to Squamish (South)	• Slow highway travel speed between Furry Creek to Britannia Beach • 17% of all annual hours on the highway are congested • Highest Total Delay (person-hours) experienced on the highway	• Spot highway speeds between Porteau Cove and Britannia Beach on 3-4-lane sections are very high • Highway collision rate higher than provincial average and highest in corridor • Highway severity index higher than provincial average • Highway collision density almost three times provincial average and highest in corridor • High collision risk locations in this segment: Horseshoe Bay to Porteau Cove	• High number of highway closures between Horseshoe Bay and Porteau Cove (although average time of closure is low) • High number of rockfalls onto rail tracks between Horseshoe Bay and Squamish	• Second highest highway V/C ratio during winter peak demand hours in this segment • Existing Peak Hour practical vehicle capacity of the highway is reached about 50 times per year • Peak hours of highway travel demand have been shifting (peak spreading) which serves to increase the daily/annual capacity of the highway mode. • Existing Peak Hour highway passenger capacity on this segment is reached during Winter PM Peak Hour periods in the southbound direction. Increases in overall passenger capacity without widening the highway can only be achieved through increasing vehicle (auto and bus) occupancy or increasing capacity of non-highway modes.
2	Squamish Urban Area	• Second slowest highway segment on the corridor • Second highest Total Delay (person-hours)			• Highest highway V/C ratio during summer PM Peak Hour in this segment. • Second lowest PM Peak Hour practical passenger capacity on highway in this section; lowest annual practical passenger capacity • Existing Peak Hour practical vehicle capacity has already been reached.
3	Squamish (North) to Whistler (South)	• Low spot speeds in Cheakamus Canyon, in 2 lane sections	• High spot speeds on 3-4-lane sections in this segment • Highway severity index higher than provincial average • Highway collision density higher than provincial average • High collision risk location in this segment: Cheakamus Canyon	• Second longest annual hours of highway closure in Cheakamus Canyon • Highest number of highway closures in this segment • High number of rockfalls onto rail tracks between Horseshoe Bay and Squamish	•
4	Whistler Urban Area	• Third lowest highway travel speed on the corridor • 26% of all annual hours on the highway are congested • Second highest highway Delay Rate (min./km) • Second highest highway Total Delay (person-hours)		• Three quarters of southbound trains arrive late to Whistler	• Highest winter PM Peak Hour V/C ratio in this segment, south of Lorimer Road • Existing Peak Hour practical vehicle capacity has already been reached • Peak hours of travel demand have been shifting (peak spreading) in order to increase the daily capacity of the highway
5	Whistler to Pemberton		• Highway severity index higher than provincial average • Highway collision density higher than provincial average		• No regular air service • Lowest highway practical vehicle capacity and passenger capacity in this section.
6	Pemberton/Mount Currie to Lillooet	• Slowest highway segment on the corridor, lowest posted speed • Highest delay rate for highway (min./km) • Lowest person-speed (people-km/h) on highway in the corridor • Slowest rail speed	• High collision risk location in this segment: Cayoosh Creek Bridge to Seton Lake Dam Road	• Longest hours of highway closures on Duffey Lake Road. • Highest number of closures	• No regular air service • Lowest highway practical vehicle capacity and passenger capacity in this section.
7	Lillooet to Highway 97	• Second lowest person-speed on highway in the corridor			• No rail service • no regular air service • Lowest highway practical vehicle capacity and passenger capacity in this section.
Overall Corridor		• Average travel speed on highway is only "fair" and is lower than provincial average • Rail travel speed is typically 33% lower than highway speed and is not competitive with auto/bus travel	• 85th percentile speed is likely in excess of posted limit throughout much of the southern sections of the corridor • 90% of all collisions recorded are south of Pemberton • Highway collision severity ratio is almost 20% higher that provincial average • Highway collision density is about 10% higher than provincial average	• Average total annual hours of highway closures are far in excess of provincial average • Highest number of closures in winter months but highest duration of closures in spring	• Corridor dominated by highway practical capacity; other modes are not providing sufficient capacity to offer a reasonable alternative • Rail capacity in peak periods is only 210 passengers.

4.4 PROBLEM DEFINITION

"Problem Definition" is the description of the causal factors for the identified performance deficiencies. **Tables 4.3** through **4.6** below provide summaries of the defined problems in the corridor, by segment, for each of the Performance Criteria. Letter codes are noted in the tables; these codes refer to the comments below each table under "Notes" which provide explanatory text regarding the defined problems.

Table 4.3: Summary of Problem Definition: Mobility

No.	Description	Causal Factors of Poor Mobility				
		High V/C Ratio	Geometry and Grades, Low Posted Speed	Delays at Traffic Signals	Limited Passing Opportunities	Frequent Access
1	Horseshoe Bay to Squamish (South)	A	B			
2	Squamish Urban Area	D	E	F		
3	Squamish (North) to Whistler (South)		G		C	
4	Whistler Urban Area	H	I	J		K
5	Whistler to Pemberton		L		N	
6	Pemberton/Mount Currie to Lillooet		M			
7	Lillooet to Highway 97				N	

Notes:

A: Highest highway traffic volumes in this section

B: Section south of Porteau Cove has numerous advisory signs warning of curves, 27 Northbound and 25 Southbound. Average posted speed is second lowest of all rural sections. Horseshoe Bay to Porteau Cove, and Britannia to Squamish are the worst within Segment 1. Britannia Beach and Lions Bay communities have 50 km/h speed zones.

C: Average distance between northbound passing opportunities is 16 km, only 4 passing lanes in entire segment.

D: Local traffic mixes with highway traffic. In some locations, between Valley View and Mamquam Road, about 50% of vehicle traffic is locally-generated due to lack of alternative north-south routes in Squamish. Squamish is impacted by heavy peaking of traffic to/from Whistler.

E: Posted speed through urban section of Squamish is reduced to 70 km/h

F: Five traffic signals contribute to through traffic delays

G: Cheakamus Canyon is a narrow, 2-lane section with substantially sub-standard cross section. Spot speeds drop considerably through the Canyon; however, average speeds in the segment are the highest in the corridor due to significant passing opportunities immediately to the north and south of the Canyon

H: Highest peak hour traffic volumes in the corridor are experienced between Village Gate Boulevard and Lake Placid Road. There is no reasonable alternative north-south route in Whistler.

I: Posted speed drops to 60 km/h in Whistler's urban sections.

J: Five traffic signals within Whistler municipality increase delays for through highway traffic.

K: Frequent access points to Whistler residential subdivisions, some without left turn bays, which increase delays to highway through traffic.

L: Several locations of low advisory speed zones due to high curvature or poor cross section. Average posted speed is only 76.5 km/h.

M: Worst section for geometrics on the corridor. Average posted speed is 60.5 km/h. High numbers of very low advisory speed zones as well as one lane bridges.

N: No passing lanes available.

Table 4.4: Summary of Problem Definition: Safety (Excluding Driver and Weather Factors)

No.	Description	Poor Collision Stats	Causal Factors of Safety Problems					Number of High Potential Collision Locations
			Unsafe Speed on Highway	Congest-ion on Highway	Poor Geometry or Cross Section	Lack of Passing Opport-unties	Rockfalls on Train Tracks	
		A	●	●	●	●	●	**1**
2	Squamish Urban Area	**B**		●				**3**
3	Squamish (North) to Whistler (South)	**C**	●		●	●	●	**2**
4	Whistler Urban Area	**D**		●				**4**
5	Whistler to Pemberton	**E**	●		●	●		**4**
6	Pemberton/Mount Currie to Lillooet		●		●			**3**
7	Lillooet to Highway 97	**F**	●		●	●		**N/a**

Notes:
The causal factors of accidents were not established by highway segment in the ICBC Report by Hamilton. The circle in the matrix above represent Reid Crowther's opinion as to the major causal factors of crashes, excluding weather and driver factors. The right-most column provides ranking of segments for the number of high potential collision locations, according to Hamilton.

A: Highest Collision Density in the Corridor, over 2.7 times that of average provincial rate. Highest Collision Rate and second highest Collision Severity Ratio in the corridor, all over provincial average.
B: Highest Collision Density in the Corridor, over 2.7 times that of average provincial rate. Highest Collision Rate and second highest Collision Severity Ratio in the corridor, all over provincial average.
C: Second highest Collision Density in the Corridor, over 1.8 times that of average provincial rate. Second highest Collision Rate and highest Collision Severity Ratio in the corridor, all over provincial average.
D: Second highest Collision Density in the Corridor, over 1.8 times that of average provincial rate. Second highest Collision Rate and highest Collision Severity Ratio in the corridor, all over provincial average. Highest Collision frequency
E: Highest Collision Severity Ratio in the corridor

Table 4.5: Summary of Problem Definition: Reliability

No.	Description	Causal Factors of Poor Reliability				
		MVA	Washout /Flood	Rock Fall or Mud/ Slide	Ava-lanche	Weather /Fallen Trees
1	Horseshoe Bay to Squamish (South)	**1**		**2**		**3**
2	Squamish Urban Area	**1**				
3	Squamish (North) to Whistler (South)	**1**		**2**		**3**
4	Whistler Urban Area	**1**				
5	Whistler to Pemberton					**1**
6	Pemberton/Mount Currie to Lillooet		**2**		**1**	**3**
7	Lillooet to Highway 97	**N/a**	**N/a**	**N/a**	**N/a**	**N/a**

Notes:
Numbers in the table refer to ranked causes of full 2-lane closures, by segment. Segment 7 closures are included as "other" in the Ministry's database so the causes cannot be confirmed. Typically, one lane closures are focussed on Segments 1-5 in the corridor.

Table 4.6: Summary of Problem Definition: Practical Capacity

No.	Description	Causal Factors Impacting Capacity				
		# Through Lanes on Highway Insuffi-cient	Left tuners delay through vehicles	Presence of Traffic Signals	Poor Geomet-rics Impact Capacity	Lack of Passing Oppor-tunities
1	Horseshoe Bay to Squamish (South)	**1**	**3**		**2**	**4**
2	Squamish Urban Area	**1**		**2**		
3	Squamish (North) to Whistler (South)				**2**	**1**
4	Whistler Urban Area	**1**	**3**	**2**		
5	Whistler to Pemberton				**1**	**2**
6	Pemberton/Mount Currie to Lillooet				**1**	**2**
7	Lillooet to Highway 97					**1**

Notes:
Numbers in the table refer to ranked factors causing a decrease in practical capacity related to the dominant highway mode. Currently, only Segments 1, 2 and 4a could be considered to have insufficient practical capacity. The lack of reasonable alternative modes is also a factor which impacts practical capacity throughout the corridor.

4.5 CORRIDOR NEEDS

The study team concluded that while many significant performance gaps will be apparent for the existing corridor in the coming 25 years, the most important corridor needs are improved capacity and safety, particularly between Horseshoe Bay and Pemberton/Mount Currie. Mobility concerns can largely be addressed if capacity and safety issues are resolved. While spot improvements will be required to address reliability throughout the corridor between Horseshoe Bay and Highway 97, their scope and physical impacts are relatively modest compared with that of the required safety and capacity enhancements.

Of the identified corridor deficiencies, addressing mobility and capacity deficiencies are by far the most costly. For example, previous work has consistently identified budgets in excess of $1 billion for a major highway capacity enhancement between Horseshoe Bay and Whistler.

SECTION 5.0
DEVELOPMENT OF SCENARIOS

5.1 MANAGING SUPPLY AND DEMAND

In considering future travel in the corridor, it is important to consider the various means by which capacity shortfalls may be addressed. These include:

- Increasing capacity to meet the unconstrained demand;
- Reducing corridor growth to meet transportation capacity;
- Influencing travel behaviour through Transportation Demand Measures (to shift travel modes, increase vehicle occupancy, spread travel demand out); or
- Accepting more congestion and managing congestion better.

The traditional solution to transportation capacity shortfalls is to increase capacity to meet demand, which is typically accomplished by widening existing roadways or construction of new roads. This approach presumes that travel demand should be met by providing more highway capacity. Because of the multi-modal nature of this study, the Project Team wanted to avoid a "demand-driven" highway-oriented approach to addressing travel demand. Instead, a more holistic and comprehensive process was developed to include consideration of the full range of possible policy responses to increasing travel demand, as outlined above.

The three future transportation Scenarios which are described below include elements of all four policy responses.

5.2 ANALYTICAL APPROACH

In developing the future Scenarios for addressing performance problems, the Project Team did not simply assume that unconstrained travel demand would be met. The Project Team wanted a process which would consider the implications of a range of different approaches to addressing future travel in the corridor. That understanding could then be used to guide the selection of a preferred "Scenario" for future corridor travel. There was particular interest in exploring the range of different techniques available to address the impending shortfall in corridor capacity expected between 2005 and 2010 (in the southern segments of the corridor).

The Project Team proceeded to develop a technique to guide the analytical work of the technical team and structure our investigations. The following principles were observed:

- It was not possible to study every conceivable combination of improvement options (called "Scenarios") in depth. It was therefore necessary to select representative options for investigation with care to illustrate the fundamental relationships between their key differences and the system performance.
- By studying a limited number of Scenarios that embodied contrasting approaches to dealing with transportation in the corridor, knowledge applicable to the entire realm of choices could be obtained.

These principles gave rise to the model described in the following section.

5.3 THE CONTINUUM MODEL

One of the prime objectives of this study was to develop alternative "Scenarios" for transportation in the corridor. A "Scenario" was defined as a group or suite of complimentary improvements, which embodied a particular vision or philosophy for transportation in the corridor. As such, the preferred Scenario would have a critical role in strategic planning, representing a desired end state towards which all future actions would be directed. In this study, "Scenarios" consisted of selected policy and operations changes, as well as capital investments which, when combined together, defined alternative futures for transportation in the Horseshoe Bay to Highway 97 corridor.

The Project Team developed a graphic model designed to illustrate the range of different approaches to transportation planning and to guide the analytical work of the study, as seen in **Figure 5.1**. Each point within and on the axes of the triangle represented a possible combination of policy, operations, and capital initiatives, which embodied a particular approach to addressing future performance deficiencies.

There were two dimensions to the Continuum Model. Moving down the left side of the triangle indicated increasing investment in alternative, non-auto modes. Moving down the right side of the triangle indicated increased investment in highway capacity. If the Scenario was closer to the left side of the triangle there was an increased requirement for changing travel demand characteristics. For both sides of the triangle, moving towards the bottom indicated higher passenger capacity; moving towards the top of the triangle indicated lower passenger and possibly higher levels of congestion.

Update of Scenario Continuum Model: Development of Scenarios
MULTI-MODAL CORRIDOR TRANSPORTATION STUDY: Horseshoe Bay to Highway 97

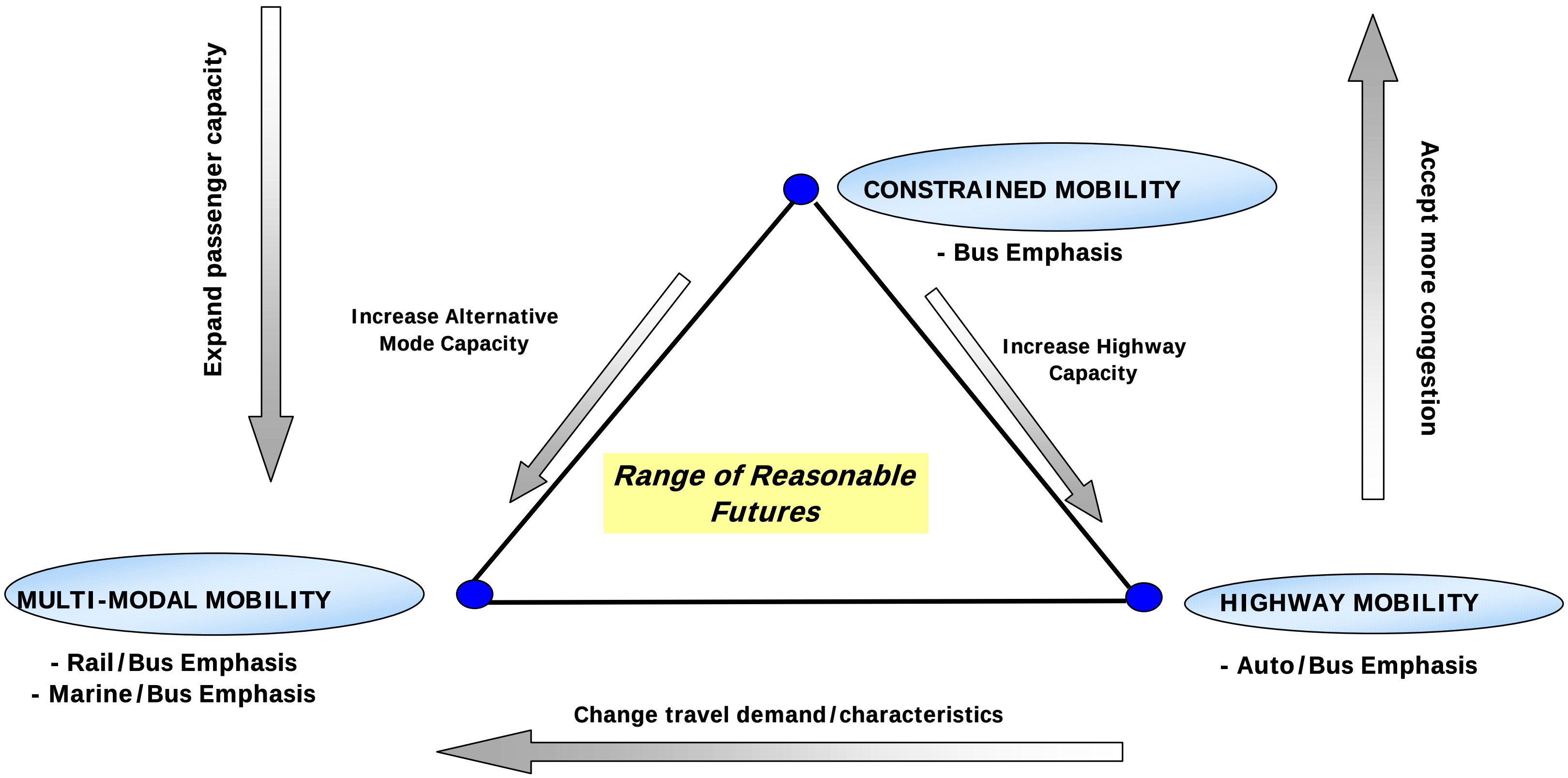


Figure 5.1
Volume 1:
Summary Report

Reid Crowther

The corners of the Continuum Model in Figure 5.1 are three defining Scenarios for relatively extreme, competing philosophies for future transportation in the corridor; the key features of these three Scenarios are summarized in **Table 5.1** below. These three "Scenarios" were ultimately selected for analysis to support better understanding of the implications of future choices.

Table 5.1: Scenario Philosophies

CONSTRAINED MOBILITY	MULTI-MODAL MOBILITY	HIGHWAY MOBILITY
• **least capital cost**	• **efficient mode choice**	• **auto dominant**
• do minimum, demand-side solution	• maximise non-auto mode capacity	• highway focussed, supply side solution
• non-traditional	• non-traditional	• traditional
• limit highway capacity to existing levels; maximize utilization of bus mode	• must choose most efficient combination of modes	• most benefits to auto and bus modes
• minimize public capital investment, no subsidies of alternative modes except bus. Private sector must respond to increasing travel demands	• public subsidies of alternative modes may be required, as well as increase in subsidy to bus mode	• no subsidies of alternate modes, limited risk • continued subsidy of auto and bus modes
• reduced land development opportunities unless private sector responds	• managed land development to maximize utilization of alternative modes will be required	• unconstrained development in corridor could continue
• TDM intensive, with both "carrots" and "sticks" to reduce/spread out overall travel demand	• maximum choice/diversity in travel modes will require intensive mode shift TDMs to change travel choices	• maximum personal mobility with minimal change in today's travel choices

The Scenarios selected for detailed analysis were developed for the purpose of describing potential long term trends, capacity requirements and costs. Ultimately, the preferred Scenario for transportation in the corridor may resemble one of the Scenarios; alternatively, it may represent some "middle ground" which is proven to be more cost effective, i.e., a point somewhere in middle of the Continuum triangle.

5.4 SCENARIO ELEMENTS AND PRE-SCREENING

A substantial body of previous work existed regarding possible improvements in the corridor. By and large, previous planning and design efforts presupposed a demand-driven, highway-centred approach to future corridor transportation. As such, while not directly applicable to this study, the previous work was a source of ideas with which to populate the highway components of the Scenarios. After considerable review of historical references, an internal Project Team workshop and input from specialist sub-consultants, individual projects (capital, operating, and policy changes) were selected or developed for their compatibility with the Scenario philosophies described above.

5.4.1 Auto/Bus Modes

Elements considered for inclusion in the Scenarios were:

- Safety Improvements
- Passing / Climbing Lanes
- Widening With Centre Median
- Highway Tunnels
- Access Management
- Grade Separations
- New Bus Services
- High-Occupancy-Vehicle (HOV) or Bus-Only Lanes
- Bus or HOV Queue Jumpers
- Bus Bays
- Bus Terminals

5.4.2 Non-Highway Modes

There is an existing transportation rail service along the corridor with the Cariboo Prospector Passenger Train, however, there is presently only one train per day with low ridership and growing problems with reliability due to ageing equipment. There is also the Starlight dinner train and the Royal Hudson; however, these are primarily tourist services. To make the passenger rail service a viable alternative to the auto or bus modes, a number of issues must be addressed, such as inter-modal transfers, competition with freight trains, increasing operating speeds to decrease travel time, and geometric/safety upgrades to deal with challenging geometry, rock fall hazards and community impacts such as road/pedestrian crossings and noise.

There is currently limited scheduled air service in the corridor, with two floatplane flights from Coal Harbour to Green Lake on summer days only. There are more charter flights in the corridor, but all flights are limited by weather conditions and lack of navigational aids at the small municipal airports in the corridor. There is a potential market for air connections for skiers arriving at the Vancouver International airport and travelling to Whistler, but Whistler does not have a suitable airport. Flights could be directed to Squamish or Pemberton, but neither would be a direct connection, creating further mode transfers and wait times. Helicopter service in the corridor is an option since landing may be less restrictive.

There is also the possibility of creating a marine ferry service between Vancouver and Squamish that could focus on commuter and some recreational travel.

5.4.3 Transportation Demand Management

Because the Scenarios developed for analysis do not presuppose a demand-driven response to growth, in many cases there is a requirement for demand modification (reduction, mode shift, etc). Thus, it was critical to develop a group of Transportation Demand Management (TDM) initiatives for the corridor. Elements considered included:

- Park & Ride car / pool program
- Rideshare programs
- Employer-based trip reduction programs
- Public awareness / marketing programs
- Incentives / disincentives

SECTION 6.0
SCENARIOS

6.1 INTRODUCTION

The guiding principles and key elements of each of the three Scenarios are described below. Note that with the Multi-Modal Mobility Scenario, there was more than one way to address future capacity shortfalls using non-highway modes. Therefore, two options were developed for the Multi-Modal Mobility corner of the Continuum Triangle, one with a rail mode emphasis (with varying levels of investment) and one with a marine (ferry) mode emphasis. **Volume 3** of this report provides more information as to the individual elements within each Scenario; the reader is directed to that document for further details.

6.2 CONSTRAINED MOBILITY

6.2.1 Principles

The Constrained Mobility Scenario will have the least capital cost since it is based on limiting the highway capacity and accepting more congestion. The guiding principles of this Scenario are to manage travel demand intensively and maximize the use of the bus mode to address capacity shortfalls.

6.2.2 Key Elements

The Constrained Mobility Scenario will require highway spot improvements in rural areas to address safety and passing issues. Also, the urban sections of the highway in Squamish and Whistler should be widened to three/four lanes to counter the reduction in capacity due to their traffic signals and to equalize/exceed capacity of the rural sections. The Squamish municipal arterial/collector network may have to be significantly strengthened , particularly in the north-south direction, to provide more choices for growing intra-municipal traffic and preserve operations of the highway. New bus facilities such as terminals, lay-bys and acceleration/deceleration lanes should be constructed to help maximize bus usage. The rail service will be maintained as it currently exists but with new, higher-capacity rolling stock. Extensive growth and travel demand management is a critical component of this Scenario.

6.3 MULTI-MODAL MOBILITY: RAIL OPTION WITH MEDIUM INVESTMENT

After studying the passenger rail potential in the corridor, the Project Team identified three potentially viable levels of rail investment, each with different performance and costs. After the Project Team and MoTH/TFA reviews, the "medium investment" level package of improvements was selected as the most likely to provide a cost-effective option, and hence suitable for analysis.

6.3.1 Principles

The Multi-Modal Mobility: Medium Rail Investment Scenario focuses on increasing passenger capacity in the corridor through substantially expanded passenger rail service. Existing rural highway capacity is maintained, but with expanded urban section capacity. The rail service will be concentrated on relieving peak period travel demand for both commuter and recreational traffic. Bus mode share would remain fairly high. Travel demand and growth will be managed carefully to maximize the use of rail and decrease highway congestion.

6.3.2 Key Elements

The rail service will be substantially increased with 100 – 150 seat bi-level cars and (up to) 10 car trains. Five trains per day to Squamish and/or Whistler will be provided (four in the peak periods of travel, one mid-day), with the schedule and service configuration depending on the day of week and season. One train per day will continue past Whistler to Lillooet, to replace the Prospector service. Central train control, track protection and road/rail crossing improvements will be major elements.

The Multi-Modal Mobility: Rail Scenario will also require highway spot improvements in rural areas to address safety issues and passing needs. The urban highway sections in Squamish and Whistler should be widened to 4-lanes and/or bypasses or partial bypasses constructed to counter the reduction in capacity due to traffic signals and to equalize/exceed capacity with the rural areas. (This approach recognizes the difficulty of addressing local intra-municipal travel demand using passenger rail.). The Squamish municipal arterial/collector network may have to be significantly strengthened if a bypass is not implemented, particularly in the north-south direction to provide more choices for growing intra-municipal traffic. New bus facilities will be constructed to help maximize bus use and extensive feeder bus systems to the major rail terminals provided. Intensive growth management and TDM measures will be put in place to reduce highway mode travel demand and increase mode shift to rail.

6.4 MULTI-MODAL MOBILITY: MARINE OPTION WITH PASSENGER FERRY

6.4.1 Principles

The Multi-Modal Mobility: Marine Scenario increases corridor capacity through a regularly scheduled ferry service between the Lower Mainland and Squamish connecting to a new bus service between Squamish and Whistler. Highway capacity is limited and there is a higher acceptance of highway congestion. The ferry capacity is spread over the day rather than focussed on the peak travel demand periods.

6.4.2 Key Elements

The Multi-Modal Mobility: Marine Scenario has the same highway improvements as the rail option, with minimal highway improvements in rural areas and widening and/or bypasses in the urban sections of Squamish and Whistler. The Squamish municipal arterial/collector network may have to be strengthened, particularly in the north-south direction if a bypass is not implemented, to provide more choices for growing intra-municipal traffic. A new fast ferry passenger-only service with seating capacity for 250 passengers/trip would be in place. The service will run from the Waterfront station in downtown Vancouver to a new Squamish terminal, providing nine daily round-trip sailings. Also, a new bus service from Squamish to Whistler will be available to allow those travellers destined to Whistler to complete their journey. New bus facilities such as inter-modal terminals in Squamish and Whistler will be constructed to help maximize bus use. The existing rail service will be maintained through refurbishment of the existing RDC rolling stock. Travel demand and growth management will reduce auto travel demand and encourage mode shift to ferry and the bus modes.

6.5 HIGHWAY MOBILITY

6.5.1 Principles

The Highway Mobility Scenario increases corridor passenger capacity through the traditional approach of widening the highway. This Scenario also involves supporting the bus mode to help maintain its present mode share.

6.5.2 Key Elements

The Highway Mobility Scenario provides four highway lanes from Horseshoe Bay to Whistler in the rural sections, combined with safety improvements. The urban section through Squamish will require four or six lanes with some grade separations at major intersections; alternatively, a bypass or partial bypass could be implemented. The Squamish municipal arterial/collector network may not have to be strengthened as much as required in the other Scenarios as the highway capacity would be greater; however, a continuous north-south route on the east side of Squamish may still be required to support Squamish growth aspirations. Within Whistler, 4-laning and/or a partial bypass will be implemented which would serve as an alternative north-south route. New bus terminals and facilities should be constructed in the corridor communities to help maintain the bus mode share. The existing rail service will be maintained through refurbishment of the existing RDC rolling stock.

6.6 SCENARIO REFINEMENT

To ensure that the detailed analysis focused on viable Scenarios, the MoTH hosted an internal project workshop, with participation by Ministry/BCTFA staff and corridor Elected Officials. As a result of this process, a number of minor refinements were made to the specific improvement assumed in each Scenario. In addition, based on poor peak period capacity performance compared to rail, severe operational difficulties and negative response by the Elected Officials Group, the Multi-Modal Mobility: Marine Scenario was removed from further consideration.

SECTION 7.0
EVALUATION OF SCENARIOS

7.1 CONSTRAINED GROWTH FORECASTS

The Scenarios exhibited different "practical" passenger capacities due to their different mixes of travel modes. The supply of travel capacity in the corridor is expected to impact travel demand and mode choice, particularly during peak periods when the highway mode is congested. The "Medium" population forecasts represent "unconstrained" growth conditions; therefore, another step in the forecasting work was required to determine what corridor population could be supported by each Scenario's capacity supply. This recognises that a reduction in corridor horizon population is a probable consequence of those Scenarios which do not fully address forecasted "Medium" travel demand.

To determine these new population estimates, the following was taken into account:

- Potential increase in vehicle occupancy on the highway;
- Annual load factors on alternative mode services;
- Increased peak spreading effect over time as more and more people shift their time of travel to avoid congestion;
- The peak hour practical capacity of the highway;
- The number of hours per year that the highway's practical capacity would be exceeded (i.e. acceptance of more frequent highway congestion).

The typical approach used in transportation planning is to develop a demand-based forecast, and respond to that forecast by providing more capacity in the system. However, in this study, the "Constrained" forecasts were supply-based. To develop this forecast, the Project Team first assumed that the highway mode would be the first choice for most travellers, so travel demand was first assigned to the highway. Then, when the highway reached its practical capacity, additional demand was assigned to available alternative modes based upon the capacity provided by that alternative mode and the presumption that the service was successful. The Project Team's approach was supply-based by assuming that the alternative mode services would have relatively high load factors, particularly in the peak demand periods. Demand-based forecasts that take origins, destinations, travel markets and mode choice into account are still necessary to confirm whether this approach was reasonable.

The resulting "Adjusted", supply-based population forecasts are summarised on **Figure 7.1**. It can be seen that the Highway Mobility Scenario is the only Scenario that could support the "Medium" population growth forecast of approximately 75,000 in 2025. The Constrained Mobility Scenario could support a 70% increase in population over present levels or approximately 58,000, while the Multi-Modal Mobility: Rail Scenario is estimated to support approximately 100% population increase to 67,000 by 2025. Focussing the high-capacity rail services on the peak periods of travel demands permits a higher population than the Constrained Mobility, even though the highway capacity is approximately the same in both Scenarios.

7.2 PASSENGER DEMAND VS. SUPPLY

Figure 7.2 compares the forecasted passenger trip demand and available capacity in the horizon year of 2025 for each of the Scenarios, during a Winter Sunday PM Peak Hour for southbound travel at Horseshoe Bay. This capacity is derived from all modes that contribute to the various Scenarios. The horizontal black line indicates "Unconstrained" 2025 travel demand with "Medium" corridor growth and no peak spreading.

As indicated, for the Constrained Mobility Scenario, unconstrained demand exceeds capacity. Due to this restriction, the 2025 demand was adjusted as shown in the grey bar until demand equalled capacity. The shortfall in capacity would be addressed through a combination of higher levels of congestion, higher vehicle occupancies, increased use of highway buses, travel demand peak shifting, reduced corridor population and/or reduced propensity to travel.

The Multi-Modal Mobility: Medium Rail Investment Scenario resulted in peak hour capacities that were almost equal to the "Unconstrained " demand while the Highway Mobility Scenario would have a substantial excess of capacity. This indicates that the Highway Mobility Scenario could support a much greater corridor growth than the other Scenarios, likely similar to the "High" forecast.

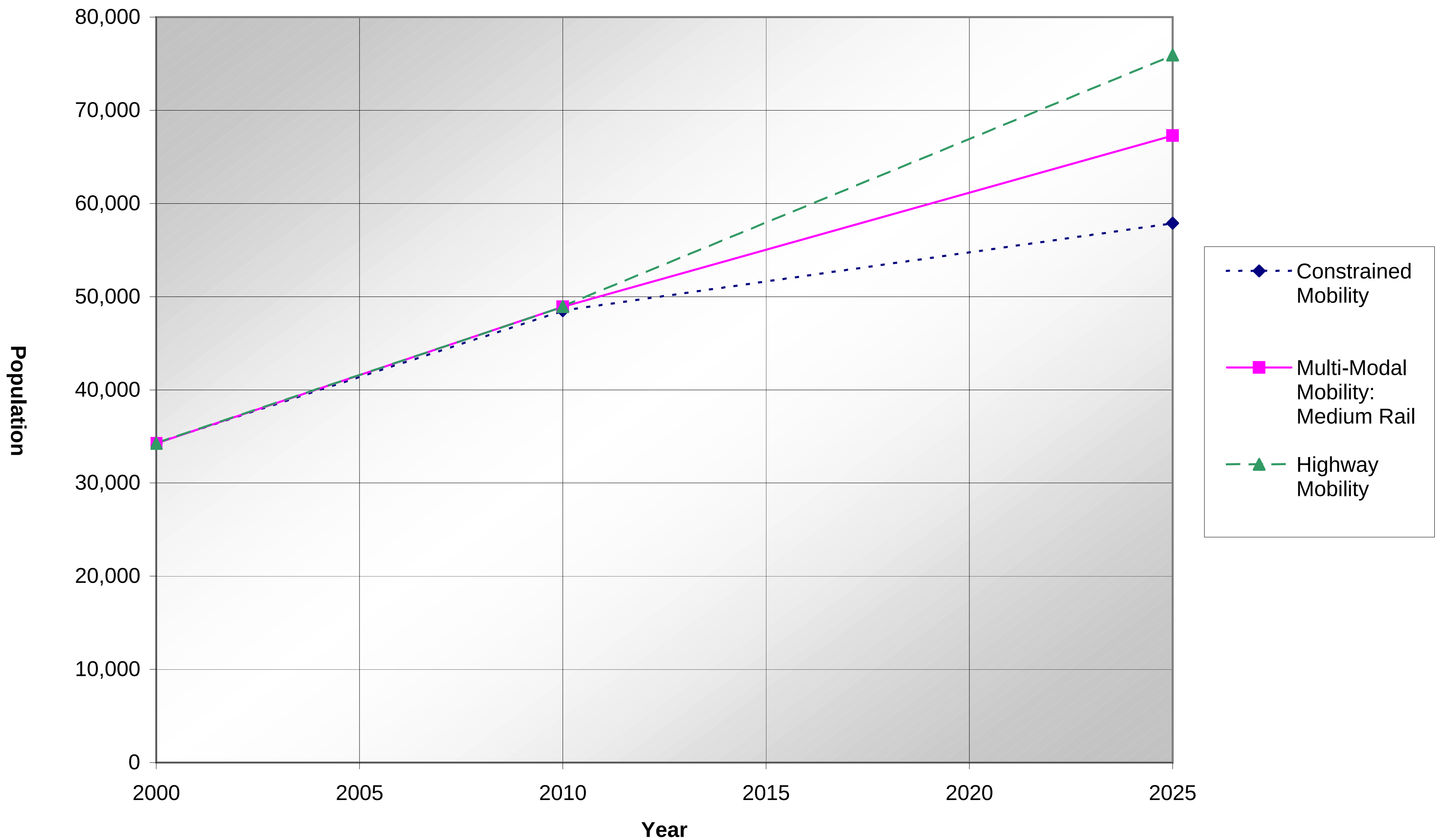
7.3 EVALUATION OVERVIEW

The three Scenarios were evaluated based on their positive and negative aspects. The following section discusses the advantages and disadvantages of the Constrained Mobility, Multi-Modal Mobility and the Highway Mobility Scenarios. Note that one person's "advantage" may be another person's "disadvantage", depending on their point of view. For example, a Scenario which supports more corridor growth may be positive to somebody who supports development in the corridor, while it would be a

Corridor Population Supported

MULTI-MODAL CORRIDOR TRANSPORTATION STUDY: Horseshoe Bay to Highway 97

H:\Projects\Tra\3490600\03\Reports\Technical\Final Report\Volume 1\Figures\Fig 7.1.xls
06/15/2001 3:09 PM
MD

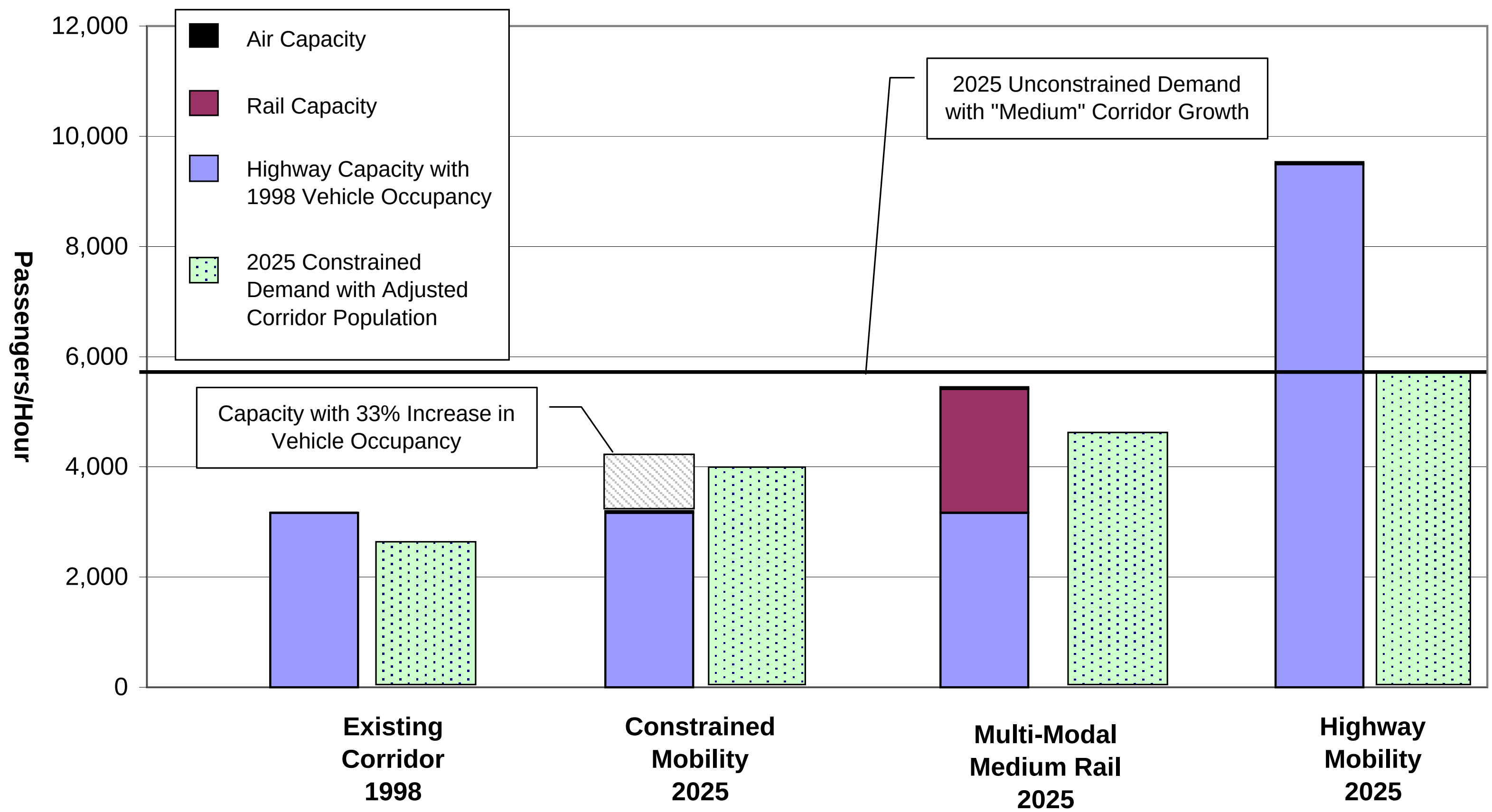


Reid Crowther

Figure 7.1

Volume 1: Summary Report

2025 Average PM Peak Hour Passenger Demand vs. Capacity for Scenarios
Winter Weekend PM Peak Hour Southbound Trips at Horseshoe Bay
MULTI-MODAL CORRIDOR TRANSPORTATION STUDY: Horseshoe Bay to Highway 97



Reid Crowther

Figure 7.2
Volume 1: Summary Report

negative to another who wanted to control growth to limit environmental impact in the corridor. The Project Team tried not to judge the Scenarios from any particular viewpoint, but instead to identify specific characteristics and implications of each Scenario which may be viewed either positively or negatively.

7.3.1 Constrained Mobility

The Constrained Mobility Scenario has the lowest capital cost since the majority of the highway will not be improved except for safety upgrades and local urban capacity enhancements along the corridor. This Scenario also allows for deferment of investment to the future. However, there is a risk for increased costs if developments in progress or developable land have to be bought out in order to fully protect the corridor from development. Also, if this Scenario "fails" in the sense that Growth Management and TDM do not limit/curb highway travel demand, and the Province eventually subsequently decides to widen the highway, it may end up being very expensive to obtain right-of-way in the future as land values rise over time.

By not investing money in a major rural highway infrastructure program the public may perceive that little is being done. Good communications regarding the intent of this Scenario may be necessary to counter potential negative public perception.

Under this Scenario, the highest level of investment in Transportation Demand Management (TDM) programs will be made and subsidies for alternative mode initiatives limited to bus only (through terminal and bus stop improvements). This Scenario relies on co-operation on transportation policies and growth controls across multiple agencies and on the implementation of TDM techniques in the corridor. There is an emphasis on the private sector providing alternative mode services, such as more buses, that may not materialise.

Maintaining the highway as it currently exists will help limit growth and preserve the character and recreational values of the corridor. The Scenario will fully preserve the world-class views in the corridor from development, and will minimise environmental and community impacts as well as traffic disruption during construction.

The practical capacity of the corridor is the lowest of all the Scenarios. The proposed 2010 Olympics will require additional capacity and service improvements.

7.3.2 Multi- Modal Mobility: Rail

The Multi-Modal Mobility: Rail Scenario provides the benefit of a unique corridor experience while reducing environmental impacts and helping to preserve the environment. Maintaining the highway as it currently exists will help in limiting unconstrained growth and preserve the character and recreational values of the corridor, although less so that with “Constrained Mobility” as the additional rail capacity will support more growth. The Scenario will preserve the world-class views in the corridor from development, and will reduce environmental and community impacts as wells as traffic disruption during construction.

Even though existing rail infrastructure can be utilised, many rail system upgrades will be necessary, requiring significant capital investment. Once these investments are made, there is no guarantee that the required mode shift from the private automobile to rail will occur. Travel time by rail will not be substantially improved over existing times without investing an additional $250 million to $300 million in tunnels, etc. so competition with the private automobile will be very challenging. Mode shift may occur by shifting passengers from the privately operated bus services, which may end up suffering from business loss. Also, since the passenger trains will be operating on the BC rail line there will be a loss in potential freight capacity (albeit not currently used). A high investment in fixed rail infrastructure and in supporting shuttle bus services in corridor communities is necessary to address peak passenger demands.

7.3.3 Highway Mobility

The Highway Mobility Scenario is the most traditional response to dealing with congestion. This Scenarios is the only one which supports the current growth aspirations of the corridor communities. It has a very high capital cost due to the difficult task of widening the highway throughout the corridor. This option provides the greatest annual and peak hour practical capacity and the maximum mobility, but also has the biggest impact on the environment. Views will be lost or altered and community impacts due to bypasses and/or a wider highway with high-capacity intersections or interchanges will be substantial.

There may also be large impacts on the Burrard inlet crossings in the Lower Mainland as the increased highway capacity may increase corridor development and the number of corridor commuters. However, a new highway will allow consideration of introducing tolls to assist in funding and help manage peak traffic demand. There is also a short-term mode shift risk with this Scenario, in that existing bus passengers may switch back to private automobiles when the highway mobility increases after widening. However, this risk is considered small since the majority of current bus passengers either don’t own a car, are school children, or are visitors with pre-paid package tours.

7.4 PROS AND CONS

The following table summarizes the key advantages and disadvantages of each of the Scenarios discussed above.

Table 7.1: Summary of Pros and Cons

Advantage or Disadvantage	Constrained Mobility	Multi-Modal Mobility with Medium Rail Investment	Highway Mobility
Pros	• Lowest capital costs; • Defer major investment; • Minimal environmental impacts; • Corridor preservation; • Opportunities for privately –funded alternative modes.	• Could utilize existing rail infrastructure; • Corridor preservation; • Unique visitor experience.	• High capacity provided; • Maximum mobility and highway reliability; • Support for growth in corridor; • Little mode shift risk; • Tolls as revenue source are possible..
Cons	• Political challenge; • TDM risk; • Private sector must respond; • Limits corridor capacity; • Lowest personal mobility with increased travel times; • Lowest reliability.	• Higher capital cost; • Mode shift risk; • Introduction of competing alternative modes to a successful bus system; • Loss of BC Rail freight capacity; • May require operating subsidies for alternative modes; • Increased travel times; • Low reliability for highway travel.	• Highest capital cost; • Impacts on Burrard Inlet crossings; • Highest community and environmental impacts; • Difficult construction which would have biggest short term impacts on traffic flows. • Small chance of undermining existing successful private bus services.

7.5 COSTS

Table 7.2 provides a summary of the capital costs, by mode. For each Scenario, the highest modal share of capital cost was for highway improvements. This reflected the substantial cost of basic safety and local capacity enhancements that are largely common to the two non-traditional Scenarios. The Highway Mobility Scenario exhibited the highest highway cost and the highest overall capital cost of the Scenarios. The Multi-Modal Mobility: Rail Scenario included higher highway improvement costs than the Constrained Mobility Scenario, because it included extensive by-pass work in Squamish and Whistler, in contrast to the on-line improvements of the Constrained Mobility Scenario.

Table 7.2: Cost Summary by Mode

Component	Estimated Average Capital Cost (rounded to nearest $10 M, Year 2000 dollars)		
	Constrained Mobility	**Multi-Modal Mobility: Medium Rail Investment**	**Highway Mobility**
Highway	$320 M	$430 M	$1,310 M
Rail	$30 M	$300 M	$30 M
TDM [3]	$10 M	$10 M	$0 M [1]
Bus	$10 M	$10 M	$0 M [2]
Total[4]	**$360 M**	**$740 M**	**$ 1,340 M**

[1] Estimate of $40,000 rounds to $0 M.
[2] Estimate of $2.2 M rounds to $0 M.
[3] Transportation Demand Management capital costs relate to supporting infrastructure elements such as park and ride facilities, etc. Annual program costs for TDM are not included in these totals.
(4) Total may not equal sum of components due to rounding.

Table 7.3 provides a breakdown of the Scenario capital costs by corridor segment. It indicates that most of the capital improvement costs for each Scenario were located between Horseshoe Bay and Whistler and that, in the case of the Highway Mobility Scenario, the cost of the capital improvements between Horseshoe Bay and Squamish was very high.

Table 7.3: Cost Summary by Segment

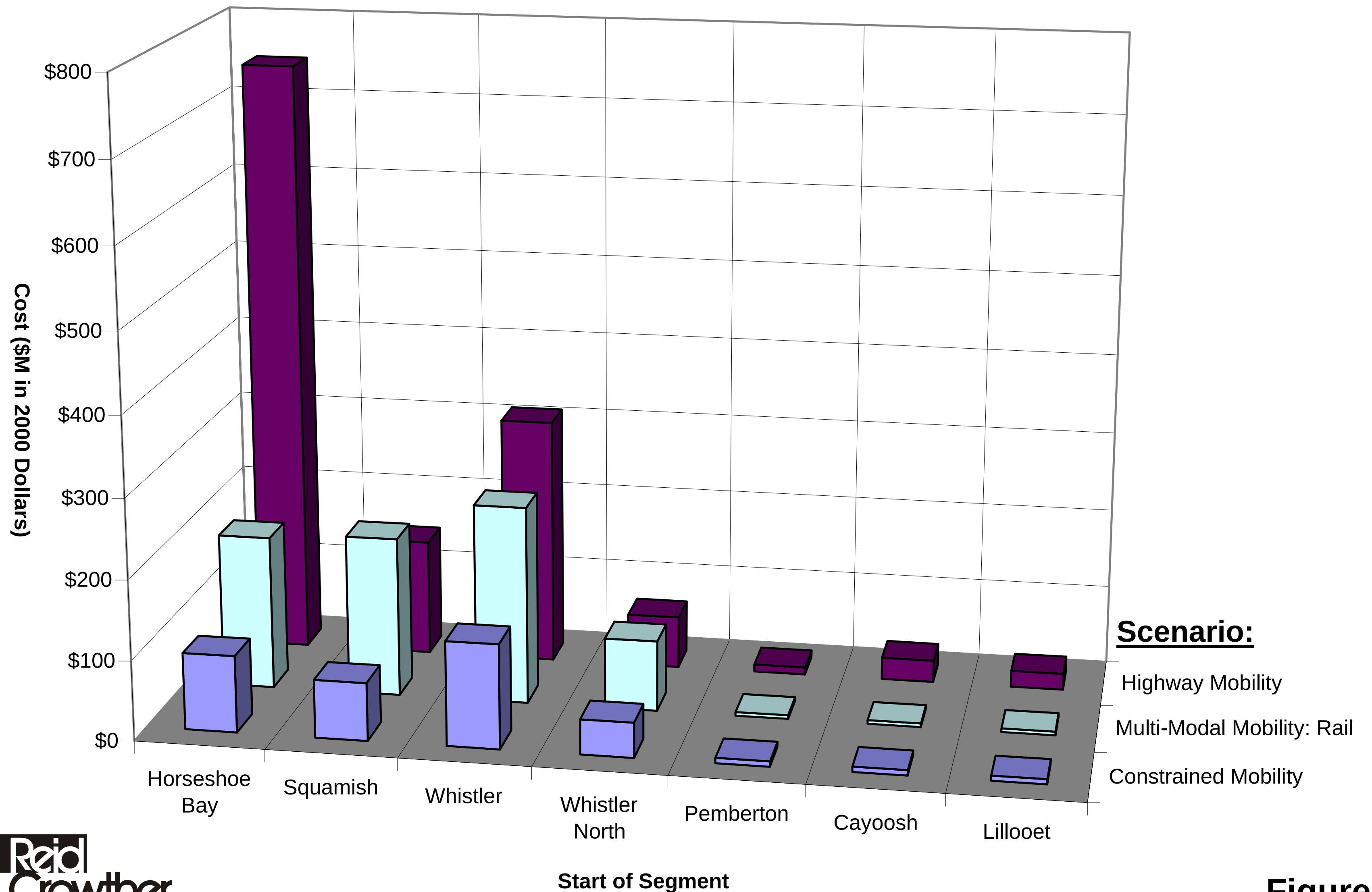
Scenario	Estimated Average Capital Cost (rounded to nearest $10 M, Year 2000 dollars) [1]							
	1	**2**	**3**	**4**	**5**	**6**	**7**	**Total[3]**
	Horseshoe Bay to Squamish	**Squamish Urban Area**	**Squamish to Whistler**	**Whistler Urban Area**	**Whistler to Pemberton /Mt.Currie**	**Pemberton /Mt. Currie to Lillooet**	**Lillooet to Highway 97**	
Constrained Mobility	$100 M	$70 M	$130 M	$40 M	$10 M	$10 M	$10 M	**$360 M**
Highway Mobility	$750 M	$150 M	$310 M	$70 M	$10 M	$30 M	$20 M	**$1,340 M**
Multi-Modal Mobility: Medium Rail Investment	$190 M	$200 M	$250 M	$90 M	$0 M [2]	$0 M [2]	$0 M [2]	**$740 M**

[1] Capital Costs of TDM infrastructure were allocated to Segments between Horseshoe Bay and Pemberton by pro-rating the total costs by segment distances.
(2) Value is less than $5 M.
(3) Total may not equal sum of components due to rounding.

Figures 7.3 through **7.5** graphically illustrate the cost breakdown of the three Scenarios.

Cost Summary By Segment

MULTI-MODAL CORRIDOR TRANSPORTATION STUDY: Horseshoe Bay to Highway 97



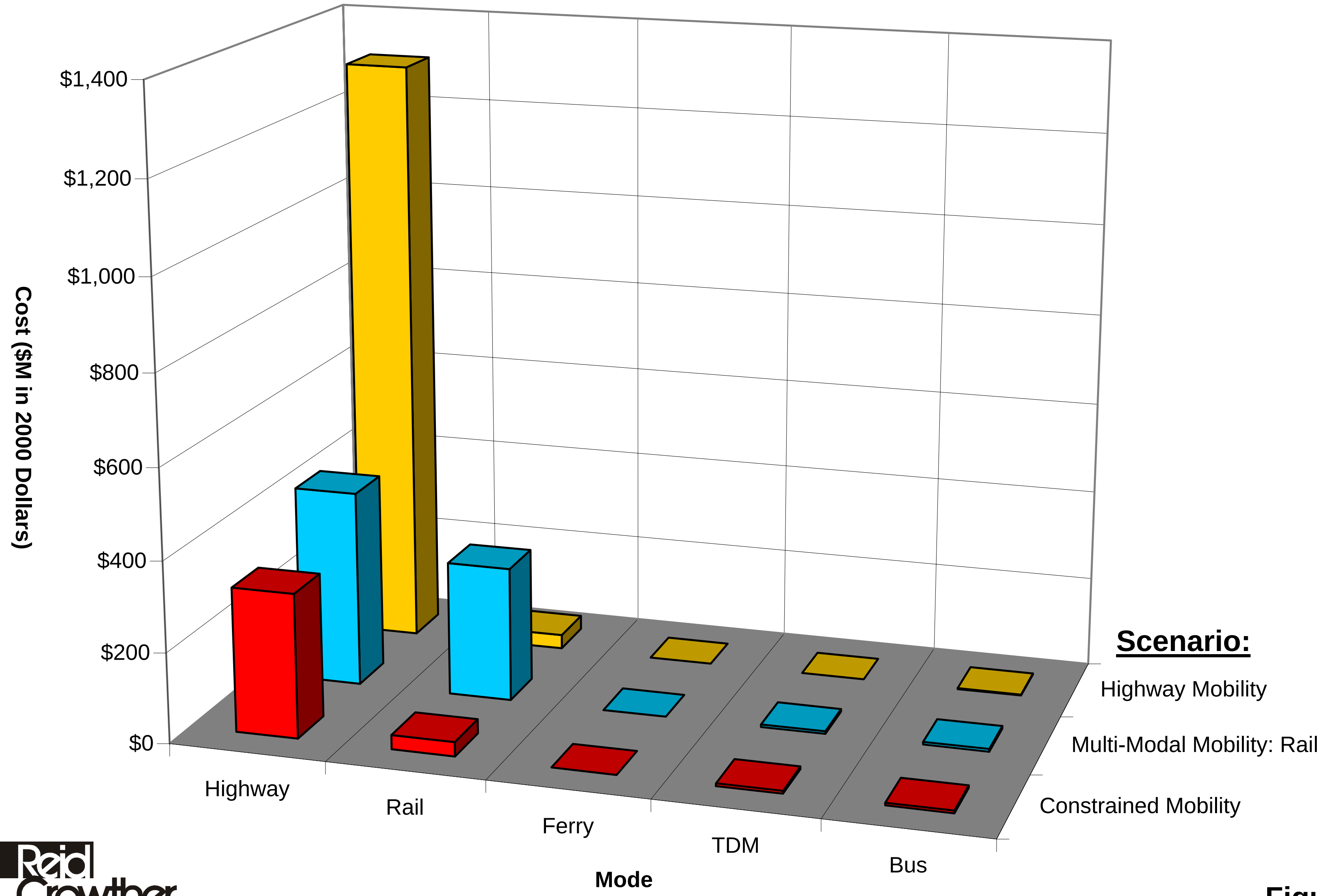
Reid Crowther

Figure 7.3

Volume 1: Summary Report

Cost Summary by Mode

MULTI-MODAL CORRIDOR TRANSPORTATION STUDY: Horseshoe Bay to Highway 97



Reid Crowther

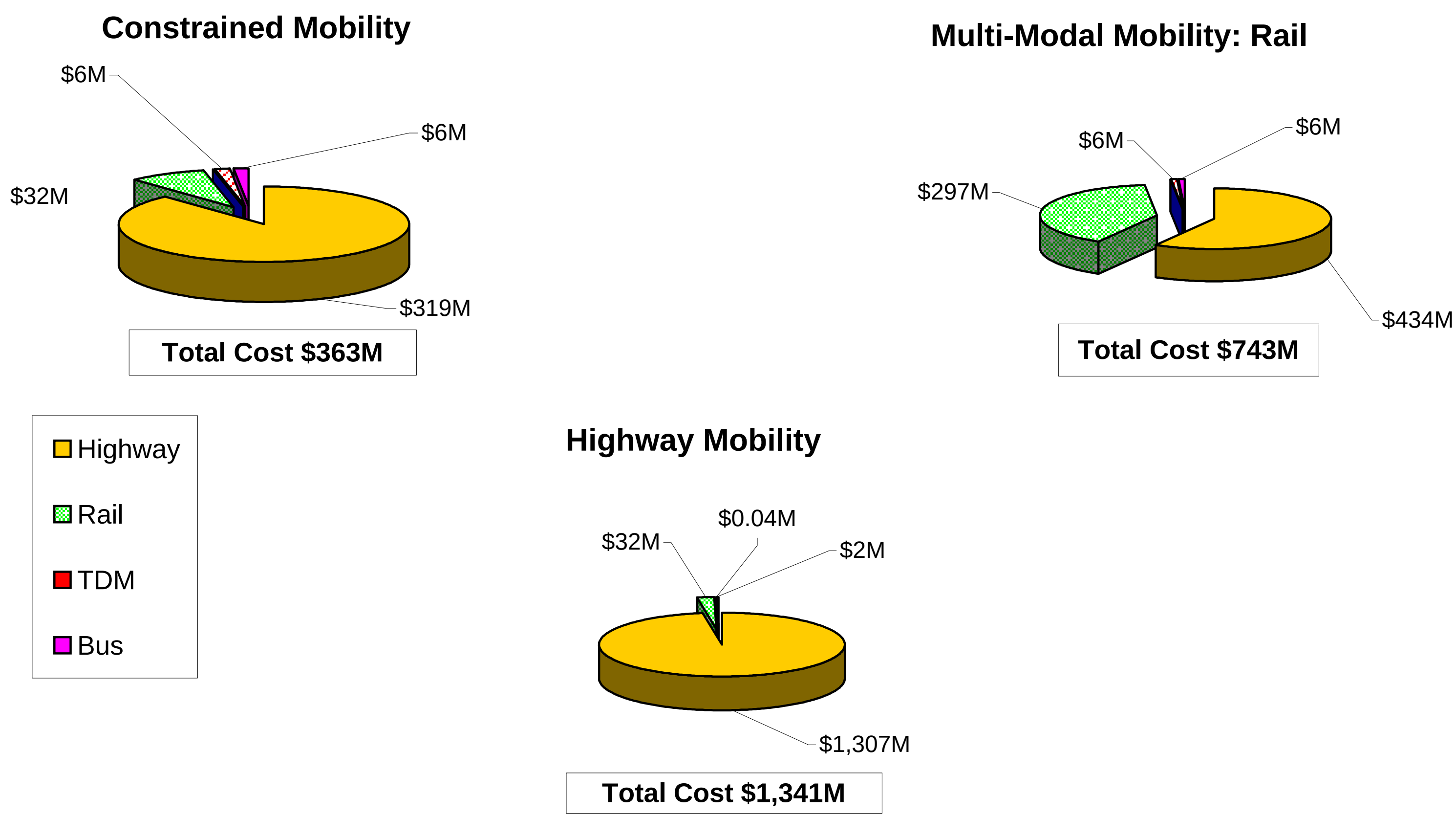
Figure 7.4

Volume 1: Summary Report

H:\Projects\Tra\3490600\03\Reports\Technical\Final Report\Volume 1\Figures\Fig 7.3 to 7.5.xls - Fig 7.4 - By Mode
DTM 06/15/2001 - 3:13 PM

Total Cost Comparison By Mode

MULTI-MODAL CORRIDOR TRANSPORTATION STUDY: Horseshoe Bay to Highway 97



Reid Crowther

R:\3490600\03\Reports\Technical\Final Report\Volume 1\Figures\Fig 7.3 to 7.5.xls - Pies
DTM
06/15/2001 3:14 PM

Figure 7.5
Volume 1:
Summary Report

7.6 COST/BENEFIT ANALYSIS

Table 7.4 summarises the results of the Benefit/Cost analysis for the three Scenarios at the system level, using a simplified version of MicroBencost. Note that this analysis assumes that all corridor improvements would be in place in the year 2001, so that the costs and benefits accrue immediately and extend fully over the 25 year time horizon; this approach was taken in order to provide a direct Scenario comparison

Table 7.4: Summary of Benefit/Cost Analysis ($M)

	OPTION	Constrained Mobility	Multi-Modal Medium Rail	Highway Mobility
FINANCIAL ACCOUNT			(25 Years, 6%)	
	Highway, Bus and TDM			
			Costs	
	Capital Cost	$331	$446	$1,310
-	Salvage	$62	$83	$244
+	Op & Mtce	$143	$128	$64
=	Present Value	$412	$491	$1,130
	Rail			
	Capital Cost	$32	$282 (1)	$32
-	Salvage	$6	$53	$6
+	Op & Mtce	$51	$205	$22
-	Revenue	$39	$217	$24
=	Present Value	$39	$217	$24
	COSTS: Total Highway, Bus, TDM + Rail Costs	**$451**	**$708**	**$1,154**
CUSTOMER SERVICE				
	Highway			
			Benefits	
	Time Cost	$291	$302	$374
+	Accident Cost	$244	$249	$383
+	Vehicle Operating Cost	$25	$26	-$32
	Benefit	$560	$577	$725
ECONOMIC DEVELOPMENT		$0	$157	$290
	BENEFITS: Total Customer Service + Economic Development Benefits	**$560**	**$734**	**$1,015**
	B/C Ratio	**1.2**	**1.0**	**0.9**
	NPV	**$109**	**$26**	**-$139**

Note: Costs (and benefits) are presented in the table as incremental values, not absolute values.
(1) Only half the capital costs of the proposed new SeaBus and supporting feeder bus systems in Vancouver and corridor communities are included in this total, as it was assumed that these services/facilities could be utilised for other purposes outside the peak periods of travel demand.

The Constrained Mobility Scenario returned the highest Benefit/Cost (B/C) ratio and Net Present Value, primarily due to the lower cost improvements. However, this Scenario will result in peak travel demands exceeding "practical" capacity in the rural segments of the highway more frequently than today and for increasingly longer periods of time over the 25 year horizon.

The Multi-Modal Mobility: Rail Scenario returned a B/C ratio of 1.0, but a positive Net Present Value. Compared to the Constrained Mobility Scenario, benefits increased 31% and costs increased 81%. The Multi-Modal Mobility: Rail Scenario has a much higher mode shift risk than the other options, in terms of the real potential for achieving an annual average daily rail mode share of 12%. This risk is not reflected in the benefit/cost work summarised above.

The Highway Mobility Scenario conveys substantial benefits of about $1,015 million. These are offset by higher costs of $1,330M. This Scenario returns a B/C ratio of 0.9, suggesting that if a highway-based Scenario is preferred, it should have a reduction in improvement costs in order to make if more financially viable. The cost reduction could be achieved by 4-laning only between Horseshoe Bay and Squamish within the timeframe of the study. This refinement would overall benefits as well as costs, but costs would be reduced in a higher proportion, resulting in a better B/C ratio. Forecasts suggest that north of Squamish and south of Function Junction in Whistler, a 2-lane highway could operate reasonably well within the 25 year time horizon of this study, so degradation in corridor performance would not be a major issue. Alternatively, 4-laning between Horseshoe Bay and Squamish/Whistler could be further delayed beyond the point at which the currently defined "failure" point is reached. The financial analysis results also suggest deferral of full implementation of this Scenario.

7.7 FIGURES OF MERIT

In order to compare additional features of the Scenarios, "Figures of Merit" were developed by the Project Team. **Table 7.5** presents comparative figures for each Scenario, including capacity, trip and population unit costs.

Table 7.5: Figures of Merit

Figures of Merit	Constrained Mobility	Multi-Modal Mobility: Rail	Highway Mobility
Equivalent Annual Cost ($millions)	$32.23	$38.39	$88.38
$/Unit Capacity Added:			
(SB Annual)	$119.47	$21.30	$3.47
(SB Peak Hr)	N/A	$16,843	$10,451
$/Trip Added			
(SB Annual)	N/A	$41	$33
(SB Peak Hr)	N/A	$33,086	$59,545
$/Population Added			
Medium Growth Forecast	75,927	75,927	75,927
Corridor Population Supported	57,892	67,273	75,927
Increment	none	9,381	18,035
$EAC/Increment	n/a	$4,092	$4,900

Note: EAC = Equivalent Annual Cost, used in calculating the other entries in the table

"Equivalent Annual Cost" (EAC) is the financial account expressed as an equivalent annual amount instead of a present value. The amounts reported in the table do not include customer service or economic benefits.

"Cost/Unit Capacity Added" is the EAC divided by the incremental capacity added in 2025 to the critical SB direction just north of Horseshoe Bay. The Highway Mobility Scenario offers high capacity at all time periods and returns the lowest unit capacity cost on an annual basis. The Multi-Modal Mobility Medium Rail Investment Scenario, which is structured to provide additional capacity in the form of rail service during the peak demand periods, has a relatively high cost per unit of annual capacity but performs better when measured on the basis of $/unit peak hour capacity. The Constrained Mobility option shows relatively high costs per unit capacity since most of the cost in this option is directed toward increasing safety, not increasing capacity (except through the urban sections of Squamish and Whistler). It should be noted that the marginal value of this incremental capacity, especially for the Highway Mobility Scenario, is not clear at this time.

"Cost/Trip Added" is the EAC divided by the number of annual or peak hour passenger trips served by each Scenario in 2025. This measures cost on the basis of how many people are using the facility instead of the capacity it offers. In 2025, the Highway Mobility Scenario is anticipated to achieve the lowest unit cost/trip added. The margin between Multi-Modal Mobility and Highway Mobility narrowed when compared to $/unit capacity. The Multi-modal option is operating near capacity while the Highway Mobility option still has 50% reserve capacity, which is an additional benefit in that it could support further growth beyond the time horizon of this study.

"$/Population Added" is the EAC divided by the incremental corridor population supported by each transportation Scenario. In other words, this is the cost per person to support additional development in the corridor beyond what the current system can provide. The Multi-Modal Mobility and Highway Mobility Scenarios are similar but the Multi-Modal Mobility Scenario carries a much higher mode share risk as well as almost no residual capacity in 2025. If 12% annual average daily mode split to rail is not achieved, the Multi-Modal Mobility Scenario would not be able to support the assumed population growth and the difference in this Figure of Merit compared to the Highway Mobility Scenario would increase.

7.8 SUMMARY OF EVALUATION

7.8.1 Constrained Mobility

This Scenario addresses spot safety and capacity improvements in the corridor as well as improvements to rail operations. It returns a B/C ratio >1.0 suggesting that it is a positive project. While this is acceptable in purely economic terms, this Scenario does not satisfactorily meet the meet "Medium" forecast travel demand in the corridor. Even with a reduced "Adjusted" population forecast, the functional failures (which will occur several hundred hours per year) are not likely to be tolerated by the public, even though the corridor may function at an acceptable level for most hours of the year.

7.8.2 Multi-Modal Mobility: Rail

This Scenario relies heavily on corridor users shifting to rail as a result of congestion on the highway and TDM initiatives. Until a marketing research effort is done to assess the true potential for a high rail mode share, this option carries a high risk. The average rail mode share in this Scenario is 12%. By way of comparison, the average daily transit share in the GVRD is 9%.

The Multi-Modal Mobility: Rail Scenario needs to compete on its own merits, offering comfort and ease of travel, rather than try to compete with the highway travel time. As it is structured, this Scenario addresses peak period demand which tends to stimulate travel during the peak and lead to under-utilised capital resources in off-peak periods. Use of the rail system in the peak period is also contingent on the congestion on the highway. As soon as highway congestion is relieved, the incentive to use rail is reduced. The forecasts indicate, however, that the highway would be operating at or above capacity in this Scenario. Thus, the Scenario as a whole is unlikely to meet the unconstrained forecast travel demand in the corridor without some moderation in travel behaviour or constraint to development.

7.8.3 Highway Mobility

This Scenario returns a B/C ratio less than 1.0 which suggests that its implementation may be premature (by about 5 to 10 years), or that it is less desirable than the other Scenarios which have higher ratios. The Scenario provides strong benefits to the highway user in terms of mobility, safety, reliability and development potential for the corridor and carries the least functional risk. It also provides reserve capacity beyond the 25-year analysis period - something which is lacking in the other Scenarios. The benefits are offset by very high construction costs, increasing auto dependence and greater environmental and social impact. In addition, the compatibility of the large incremental capacity with corridor growth management objectives has not been clarified.

7.8.4 Moving Towards a Preferred Scenario

Ultimately, the preferred Scenario may involve elements of all three Scenarios analyzed here. Experience has shown that there is a contingent of travellers who would prefer to take rail if it were comfortable, reliable and accessible, regardless of the congestion on the highway. Also, the Highway Mobility analysis suggests that 4-laning would not be required beyond Squamish. Modifying this Scenario to eliminate the section of 4–laning between Squamish and Whistler would reduce costs while maintaining the maximum benefit in the congested southern portion of the corridor. The Constrained Mobility Scenario shows the importance of having self-contained communities, which do not have to rely on the highway for obtaining goods and services. It also focuses highway improvements in the problem areas to reduce the main bottlenecks in the system, such as capacity through Squamish and Whistler and safety improvements, such as Culliton Creek to Cheakamus Canyon.

SECTION 8.0
OLYMPICS OPERATIONAL CONCEPT

8.1 INTRODUCTION

This section describes the assessment of the Sea to Sky corridor with respect to its ability to accommodate the 2010 Olympic travel demands. The approach used in the analysis is to establish the maximum capacity that could be realized by fully utilizing the available modes. This approach was adopted because travel projections from the Olympic Bid Committee have not been finalized at this time. Once the Olympic demand projections and periods are prepared they can be compared with the available capacity as described in this section and strategies can be developed for the addressing any deficiencies.

8.2 2010 CORRIDOR SCENARIO

The first step in the assessment is to assess what facilities will most likely be in place in 2010. The “build out” time horizon for all three scenarios presented in this report was the year 2025. In the year 2010, the implementation plan for each scenario results in variations of available modes and performance. For this Olympic review it is assumed that a Multi-Modal Mobility type scenario would have been chosen as the preferred transportation system, and its implementation plan would have been initiated and advanced to a stage where a rail facility would be in place.

8.3 METHODOLOGY

The analysis focuses on a northbound peak period where Olympic travel demand would be the most concentrated. Within this peak period the maximum capacity of the highway and rail facilities are determined. The highway will consist mainly of intercity buses with capacity for vehicles such as cars, vans and smaller buses.

8.3.1 Assumptions

In the analysis assumptions have been made for a number of the factors used in the calculations. These assumptions are presented as follows.

Peak Period

The peak period used is from 06:00 to 09:00 AM. resulting in a 3 hour AM northbound representation. This timeframe is critical since spectators and other participants have to be transported to the Whistler area for the first events which start approximately 10:00 AM.

Mode Characteristics

Bus

- Bus size is 55 passengers.
- Bus load factor is 90%.
- Headway 15 seconds.
- Bus equivalency is 2.0.

Rail

- Cars per train is 10.
- Capacity per train is 130 passengers.
- Load factor is 90% for the peak period.
- Maximum trains per hour is 2 representing a 30 minute headway.
- No freight service is operating in the corridor during peak periods.

Highway Vehicles

- Occupancy is 3.5 persons per vehicle. These highway vehicles are assumed to consist of cars, vans and small buses.

Highway Characteristics

- Highway capacity is 1200 vehicles per lane.
- Capacity was measured at Horseshoe Bay, which is the entrance portal to the corridor and carries the highest volumes.
- Volume/Capacity ratio is 0.9.

Background Traffic

Background travel is assumed to be controlled during the event but is accommodated within an overall Olympic transportation strategy encompassing a high level of bus and train usage. The background local traffic for communities such as Squamish, Lions Bay, and Furry Creek as well as local traffic destined to Whistler was not subtracted from the corridor capacity to arrive at a capacity figure available for Olympic demand. The total capacity is provided which is made up of Olympic events and northbound background traffic. The capacity provided to the local traffic should be reviewed by the Olympic Bid Committee once the event demands are known. This would most likely be an issue during the peak period. Southbound commuters should not be impacted since they are travelling opposite to the peak demand. A typical 1998 northbound volume, for the peak period, is 800 vehicles at Horseshoe Bay.

8.4 ANALYSIS

Based on the above assumptions the resulting analysis indicates that the available capacity varies from approximately 26,000 to 49,000 for the 3 hour peak period with varying bus headways. This is represented in **Figure 8.1**. The capacity includes bus, rail and other highway vehicles.

Figure 8.2 provides an indication of the capacity for each mode based on a 15 second bus headway and 30 minute rail headway. The 36,000 passenger figure represents a fleet of 720 buses each making one trip in the peak period.

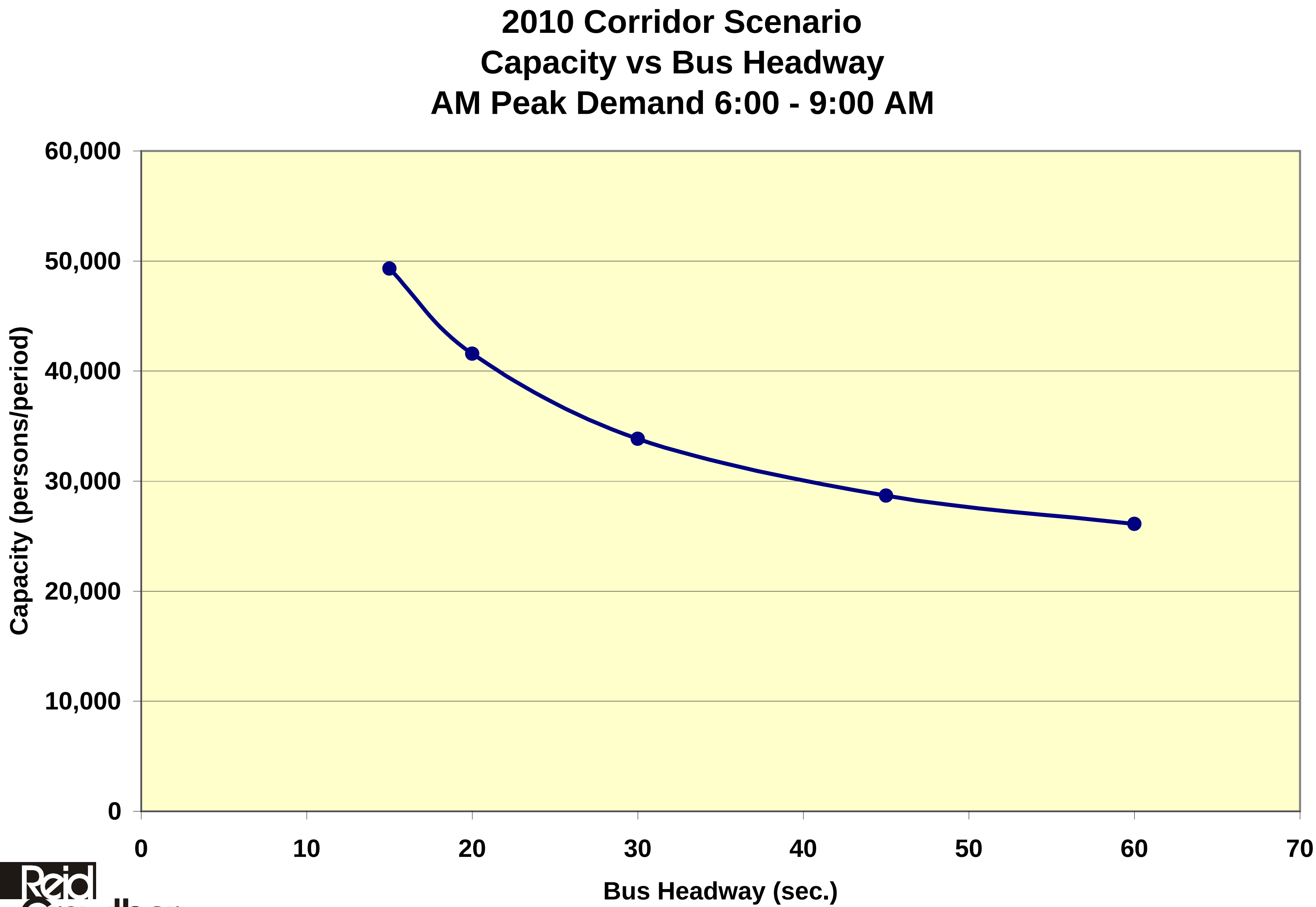
8.4.1 Sensitivity

To test the sensitivity of the analysis, the bus equivalency factor was used as a variable with other variables held constant. The bus equivalency value was tested in a range from 1.0 to 4.0 with the bus headway set at 15 seconds. The resulting capacity is not extremely sensitive to the bus equivalency value which varies from 44,200 to 51,800 or 5%.

As mentioned above, the train headway used in the analysis was 30 minutes. Should it be determined that rail operations can be structured with a 15 minute headways the added rail capacity would double from 7,020 to 14,040 passengers in the 3 hour peak period. The total corridor capacity would increase from 49,300 to 56,300.

2010 Corridor Scenario - Capacity vs Bus Headway

HIGHWAY 99 NORTH CORRIDOR STUDY



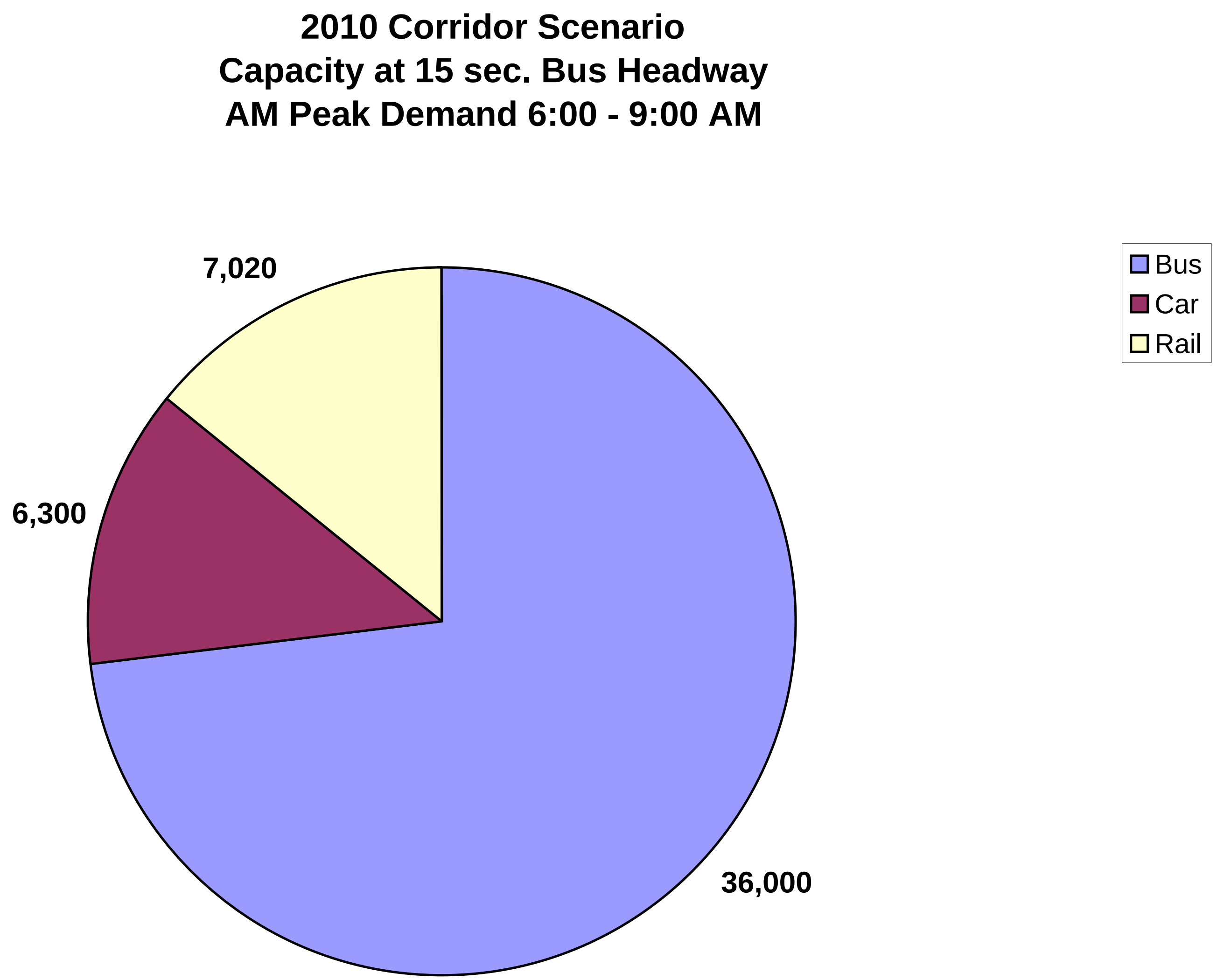
Reid Crowther

Figure 8.1
Volume 1:
Summary Report

H:\Projects\Tra\3490600\03\Reports\Technical\Final Report\Volume 4\Figures\Fig 8.1 to 8.2.xls 8.1
06/15/2001 3:17 PM
DTM

2010 Corridor Scenario - Capacity at 15 Sec. Bus Headway

HIGHWAY 99 NORTH CORRIDOR STUDY



Reid Crowther

H:\Projects\Tra\3490600\03\Reports\Technical\Final Report\Volume 4\Figures\Fig 8.1 to 8.2.xls 8.2
06/15/2001 3:18 PM
DTM

Figure 8.2

8.5 CONSIDERATIONS

Implementing these high levels of highway capacity will require an operational plan that considers a number of measures. These considerations are presented as follows.

- **Excellent incident management**. Any disruption in the high performing highway traffic flow would impact the traffic for the remaining peak period.
- **Traffic management**. Urban sections would require traffic management measures such as manual overide of signals to ensure high performance.
- **Prompt snow removal**. The highway performance is dependent upon uninterrupted flow which necessitates prompt snow removal and sanding of the highway.
- **Frequent vehicle pullouts**. To maintain performance, pull outs would be required for non passenger vehicles to assist in allowing traffic to proceed unimpeded.
- **Controlled access**. Possible monitoring and control of access or ramp metering to the corridor should be reviewed in order to keep the highway operating efficiently at slightly below capacity.
- **Travel advisory**. Travel information systems would assist in advising on demand/capacity status.
- **Contingency plans**. A backup plan for Duffey Lake Road, the Porteau emergency ferry terminal and a ferry service to Squamish would be required should Highway 99 be blocked due to large rockfalls.
- **Goods movement**. With controlled passenger service, the movement of goods will be have to occur at non peak periods.
- **Emergency service**. With all traffic operations plans there will be a need to accommodate emergency vehicles.

Implementing the rail capacity will require the following considerations.

- **Terminal facilities**. Enhanced terminal facilities at Whistler and Vancouver would be required to handle the large numbers of passengers and luggage in short periods of time.

- **Procuring trains**. For 30 minute headways, 6 train sets of 10 cars each will be required for 3 hour peak period.

- **Storage and maintenance.** Facilities for the train sets will be required. Should trains not be able to turn around at each terminus, 2 locomotives/train set (one leading one trailing) will be required.

- **Feeder buses: Whistler**. A fleet of feeder buses will be require to support the rail service at Whistler by transporting passengers to a number of events.

- **Feeder buses: Vancouver**. Equivalent capability feeder system at Vancouver which may take the form of buses in conjunction with Seabuses.

- **Reservations.** In order to provide the most efficient service, a reservation system will be required where passengers are assigned a train and seat specific to events.

- **Terminals.** The need for terminals at Callahan Valley and Whistler will require review, as well as a terminal at Squamish.

- **BC Rail operations**. In order for frequent passenger service the existing BC Rail movement of goods will have to be rescheduled.

Implementing the bus capacity will require the following considerations.

- **Procurement.** There will be a challenge in procuring a large number of buses and drivers.

- **Storage and maintenance.** There will be a need to determine where and how the large number of buses will stored and maintained.

- **Reservations.** As with trains, in order to provide the most efficient service, a reservation system will be required where passengers are assigned a bus, seat and an event.

8.6 SUMMARY

Based on the assumptions and subsequent analysis the capacity available to accommodate the transportation of passengers results in a maximum of approximately 49,000 people during the 3 hour AM peak period. The largest capacity is provided by the bus mode and represents 73% of the total. Rail and non-bus, highway vehicles provide 14% and 13% respectively.

The capacity provided is not extremely sensitive to bus equivalency. The most sensitive variable is the bus headway.

SECTION 9.0
SELECTING A FUTURE

9.1 INTRODUCTION

The next major step in the planning process after this study will be to select a preferred future for transportation in the corridor, based on one or more of the Scenarios analyzed in the preceding sections. The Scenario that is ultimately selected may be close to one of the scenarios analyzed in this study, but could also represent elements of two or more. While further technical studies need to be carried out to further our knowledge and understanding of opportunities and challenges in the corridor, much of the activity in this next step will take place in the public realm and will involve many diverse stakeholders with divergent interests. Selection of a scenario for implementation will involve major financial commitments, will have implications for growth in the corridor and requires support of the provincial government, regional districts, local communities and First Nations in the corridor.

9.2 CONSULTATIONS TO-DATE (MARCH, 2001)

The Project Team consulted with staff from corridor municipalities and elected officials throughout the project to begin to outline the range of possible “futures” for travel in the corridor and to obtain feedback. This input has substantially shaped the work to-date. Given the implications of the choices outlined for residents of the corridor, public opinion will be even more critical to the process of selecting a future.

Public open houses were held in the Fall of 2000 at four locations in the corridor: Lions Bay, Squamish, Whistler and Pemberton. The number of questionnaires completed were low, due to low attendance numbers; as well, the majority of questions were open-ended, therefore, it is difficult to establish trends in attendees’ answers. There was a large range of responses for each question and, in many cases, it was not possible to collapse individual responses into generic categories. Many questions have a large number of answers, with only one or two people in each category. In general, of the 74 attendees, the representatives from Lions Bay and Squamish preferred the Highway Mobility Scenario, while the attendees from Whistler preferred the Multi-Modal or Constrained Mobility Scenario.

9.3 HYBRID SCENARIOS

In the process of carrying out this study and reviewing it with elected officials in the corridor, a number of hybrid Scenarios or variations on elements within the Scenarios emerged as potential "internal points" within the Continuum Triangle, and possible contenders for implementation. These include:

- *Widen highway from Horseshoe Bay only to the northern end of Squamish*. This variation addresses all capacity concerns in the corridor through to 2025, maintains reasonable system capacity for Squamish commuters, but doesn't include the relatively high cost of widening all the way to Whistler. With this variation, lower overall capital cost combined with most of the Highway Mobility benefits are expected.
- *Reduce Highway 99 North widening in Whistler from 4 to 3-lanes in the urban section of Whistler*. This variation is part of the Whistler Comprehensive Transportation Strategy (CTS). The RMOW's plan includes an additional permanent southbound lane on Highway 99 North between Village Gate Boulevard and Creekside to be constructed in the short/medium term. During the development of the Whistler CTS, it was found that this variation resulted in good benefits at lower costs and reduced impacts. RMOW's plan also includes protection of right-of-way for the proposed Nita Lake Parkway (a partial bypass concept), but not the actual construction of the bypass; the municipality would prefer to avoid construction of the bypass altogether. RMOW is embarking on a campaign to reduce reliance on the automobile and maximize use of other modes; this includes Transportation Demand Management (TDM) programs with pay parking. The hope is that this approach, if successful, will eliminate the need to construct the Nita Lake Parkway. The estimated cost reduction for this variation is in the order of $20 - $30 million.
- *Utilization of existing highway infrastructure when 4-laning*. This variant is similar to the Highway Mobility Scenario, but in the sections where two, 2-lane tunnels were suggested on a new alignment, it is proposed that an alternative approach be used: the construction of a single 2-lane tunnel for northbound traffic, and retention of the existing alignment to service southbound traffic. The result would be a reduction in capital cost from previous estimates for a 4-lane highway facility. The geometric standards would not be consistent between northbound and southbound lanes, but they would be consistent for the direction of travel. While the existing highway alignment for southbound traffic would have slightly lower speeds and capacity, there would be also be benefits in safety and operation due to the separation of traffic. The estimated cost reduction for this variation is in the order of $170 million.

- *Remove highway tunnel at Eagle Creek:* One of the highway tunnels included in the Highway Mobility Scenario is at Eagle Creek; it provides a by-pass of the Horseshoe Bay access to the village area and ferries. This tunnel section, which includes roadwork, an interchange and bridge structures, has a cost in the order of $190 to $210 million. This proposal is partially beyond the limits of the study area and the high costs associated with it would not be justified in terms of benefits to the corridor alone. The primary benefits would relate to the improvement of operations for the Horseshoe Bay ferry terminal, in terms of traffic/queue management. The deletion of this option should be explored since it is beyond the scope of this project.

9.4 FUTURE PLANNING PROCESS

Figure 9.1 illustrates a proposed methodology and tasks for further planning in the corridor, to move towards adopting a preferred Scenario and developing a strategic plan. Tasks which are proposed for early initiation are displayed on the left side of the flow chart; these should be undertaken prior to selecting a preferred Scenario for transportation in the Highway 99 North corridor. These tasks are described below.

9.4.1 Short Term Tasks

Forecasting

The forecasts were based on population projections from OCPs and Area Plans rather than a detailed assessment of the supply of developable land in the corridor. Also, as noted previously, the forecasts in the Multi-Modal Corridor Transportation Study were "supply-based"; that is, if modal facilities and/or services were available within a certain Scenario, it was assumed that this mode would have sufficient demand to ensure a "successful" service. The forecasts do not reflect what actual demand could be based upon competition between various modes and people's real reaction to congestion on Highway 99 North.

There are several outstanding tasks that are required to complete/confirm the forecasting work:

- Establish land use/population options within the corridor which are based upon an understanding of the supply of developable land in the corridor, that also conform to an agreed Growth Management Strategy (see below);

- Develop a travel demand forecasting model which covers peak time periods and seasons on Highway 99 North (ideally, this model could also be used for assessment of the Olympic impact);

Implementation Process
MULTI-MODAL CORRIDOR TRANSPORTATION STUDY:
Horseshoe Bay to Highway 97

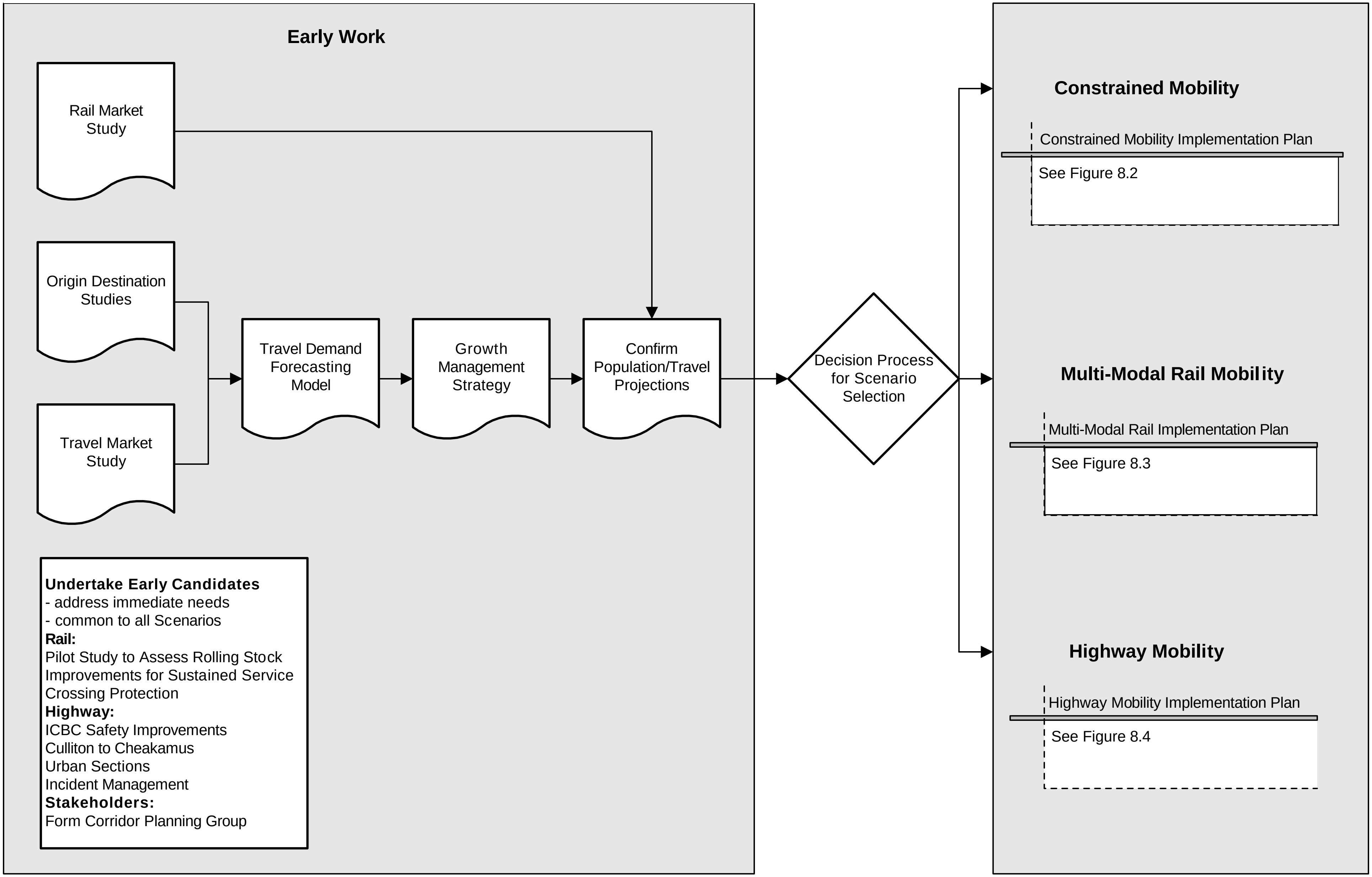


Figure 9.1
Volume 1: Summary Report

R:\3490600\03\Reports\Technical\Final Report\Volume 1\Figures\Fig 9.1 DTM Oct. 03, 00

- Review the model results and adjustment/refinement of Scenarios to better reflect the demand forecast.
- Test the Scenarios analyzed (and any hybrid Scenarios or variants) with the new model to assist in re-evaluation of corridor performance, cost/benefit analysis and the development of new "Figures of Merit";
- Refine/adjust the travel "supply" provided in the Scenarios to correspond with the demand-based forecast results.

These tasks will require the following background data:

- Completion of Origin/Destination studies throughout the corridor during the peak periods of travel demand, for both summer and winter, to establish a more accurate picture of existing travel patterns, purposes and vehicle occupancies throughout the corridor. Such surveys would include highway roadside surveys and bus/rail/air patron surveys;
- Completion of travel market studies to understand the existing markets for the various modes, underlying factors behind current mode choices, and the potential for mode shift under congested/non-congested highway conditions; in particular, a Rail Market study is required to determine the feasibility of attaining adequate ridership to support a high-capacity rail service in the corridor.

Growth Management

The development of a Growth Management Strategy for the corridor is imperative, as expected growth in the corridor will guide future travel demand capacity needs and the timing of required improvements. Of particular importance are population and employment targets for the communities in the corridor and the unincorporated areas, as well as general land use designations. This plan should be developed in concert with a transportation strategy for the corridor. The Corridor Planning group described in previous sections could take ownership of the development of a Growth Management strategy.

This study has highlighted the concern that if the population projections in the OCPs of the communities in the corridor are fully realized, the existing capacity of the corridor is nowhere near sufficient to handle the resulting travel demand without massive changes in travel behaviour. This study has also demonstrated that the Scenarios based on mode shift to alternative modes would not be able to handle the passenger demand projected for the "Medium" unconstrained growth Scenario. Thus, the current growth aspirations of the corridor communities must be carefully reviewed and rationalized.

Confirm Population/Travel Projections

With the refined understanding of travel patterns, potential market size and penetration by alternative modes, and the potential for and nature of growth management initiatives in the corridor, it will then be possible to revisit the body of population and travel demand forecasting work carried out for this study and provide a more market-oriented assessment of these competing Scenarios. This should be carried out prior to selection of a Scenario for implementation.

Early Construction Candidates

Early Construction Candidate projects can be undertaken in the short term since these are essentially common to all Scenarios, and would permit the commencement of a staged improvement program, even prior to selection of the preferred Scenario.

These Early Candidate projects (also identified by their reference to Table 9.2) would include the following:

- Culliton Creek to Cheakamus Canyon (H1)
- ICBC Safety Improvements (S1 to S20)
- Additional laning in Squamish and Whistler (SQ2a and W1)
- Incident Management (TM1)

There are several studies that should be initiated to assist in refining the Scenarios further, which could be considered "constituent studies" carried out in support of strategic planning for the corridor, as follows:

- Further exploration and quantification of the economic benefits to the province and individual communities related to growth and development in the corridor.
- More detailed option development and evaluation within the urban sections of Squamish and Whistler, particularly related to the choice between widening the existing highway and/or bypasses, traffic controls and access management. Also, potential locations and costs of new or improved terminals for bus and rail modes should be investigated.
- Determination of optimum locations for highway cross section/alignment spot improvements and additional passing/climbing lanes.
- Background data-gathering studies to support a full Multiple Account Evaluation which will eventually be required to obtain funding support from the provincial government.

9.4.2 Decision Process for Scenario Selection

Our analysis indicates that significant capacity shortfalls will become a consistent problem between 2005 to 2010 in the southern portions of the corridor. Thus, decisions and actions need to be taken on a schedule compatible with addressing this development.

Upon completion of the above items, enough information will be available to select a Scenario. If the Rail Marketing Study indicates sufficient ridership could be expected to support a viable rail servvice, the Multi-Modal Mobility: Rail option should be studied further. If the Rail Marketing Study shows that rail is not a viable option, further consideration should be given to both the Constrained Mobility and Highway Mobility scenarios. If intensive Growth Management and Transportation Demand Management appear feasible and effective, then the Constrained Mobility Scenario could be pursued. If not, the Highway Mobility Scenario (or a hybrid variation) could be developed further.

At this point in time, the Scenarios developed in this report should go forward for scrutiny, refinement, development of funding mechanisms, and ultimately adoption of a preferred Scenario. Key considerations will include the level of ridership forecast, the anticipated effectiveness of the rail investment at replacing peak period automobile use in the corridor, the ability to establish funding mechanisms in the corridor, staging/ construction impacts, public input, etc.

9.5 IMPLEMENTATION PRINCIPLES

With the selection of a preferred Scenario, as well as functional design and evaluation of its constituent projects, a logical process for implementation can then be developed. In general, the following key principles should be observed:

- Safety improvements in the corridor should be accorded highest priority and addressed as funding becomes available, except where such improvements could result in expensive “throw-away” costs if made redundant by other planned project work.
- The southern portions of the corridor, from Horseshoe Bay to (and including) Squamish have an urgent need for additional passenger capacity. This can be addressed by a number of means (increased bus capacity, passenger rail, highway), as described in the various scenarios outlined above, but should be in place by 2005 or shortly thereafter in the southern sections of the corridor. By this time, the practical capacity of the existing two-lane highway will be exceeded over 200

times per year. The provision of additional passenger capacity should progress from Horseshoe Bay northward.

- In developing a corridor strategy and resultant capital and operating improvements, care must be taken to balance the need for capacity with appropriate, cost-effective solutions. To that end, use of tools such as value engineering and the “ambient standards” approach to highway design will be critical to identifying ultimate system improvements which are affordable. In addition, identifying the appropriate mix of capital and operating improvements will also improve affordability.
- The proposed rail service is a “quantum investment”, which will not begin to make the crucial inroads into changing travel choices until a high-quality and high-capacity service (at least from Horseshoe Bay to Squamish and preferably to Whistler) is fully in place. Hence, staging options for the rail-based Scenario are somewhat limited. It will be possible, however, to increase the size and number of trains incrementally as demand for this mode increases over time. The initial focus should be on providing service during the peak periods of demand, together with the corresponding education, marketing and other transportation demand management measures to effect a mode shift in time to address the pending highway capacity shortfalls.

9.6 IMPLEMENTATION PLAN

Figures 9.2, 9.3, and 9.4 were prepared to illustrate schematically the physical projects proposed for inclusion in each of the Scenarios analyzed for this study. Although it should be stressed that the Scenario ultimately selected for implementation is unlikely to correspond exactly to one of the three developed in this study, it gives an indication of the scope, nature, and location of the anticipated projects for each Scenario. **Table 9.1** provides more detail on the description, performance objectives and specific corridor location for each element.

Figure 9.2, prepared for the Constrained Mobility Scenario, indicates a limited list of highway improvements focused in the early years of the project. Traffic Management and Transportation Demand Management programmes will be key to the successful implementation of this Scenario and extend through out the project planning horizon. Similarly, bus improvements and rail rolling stock improvements are anticipated to be a key part of the early year’s capital plans. Because this Scenario presupposes a highly developed and uniformly implemented approach to corridor land use planning and growth management issues, the report also indicates the early establishment of a

Implementation Plan: Constrained Mobility

MULTI-MODAL CORRIDOR TRANSPORTATION STUDY: Horseshoe Bay to Highway 97

(Note: Code descriptions within bars refer to elements listed in Table 9.2)

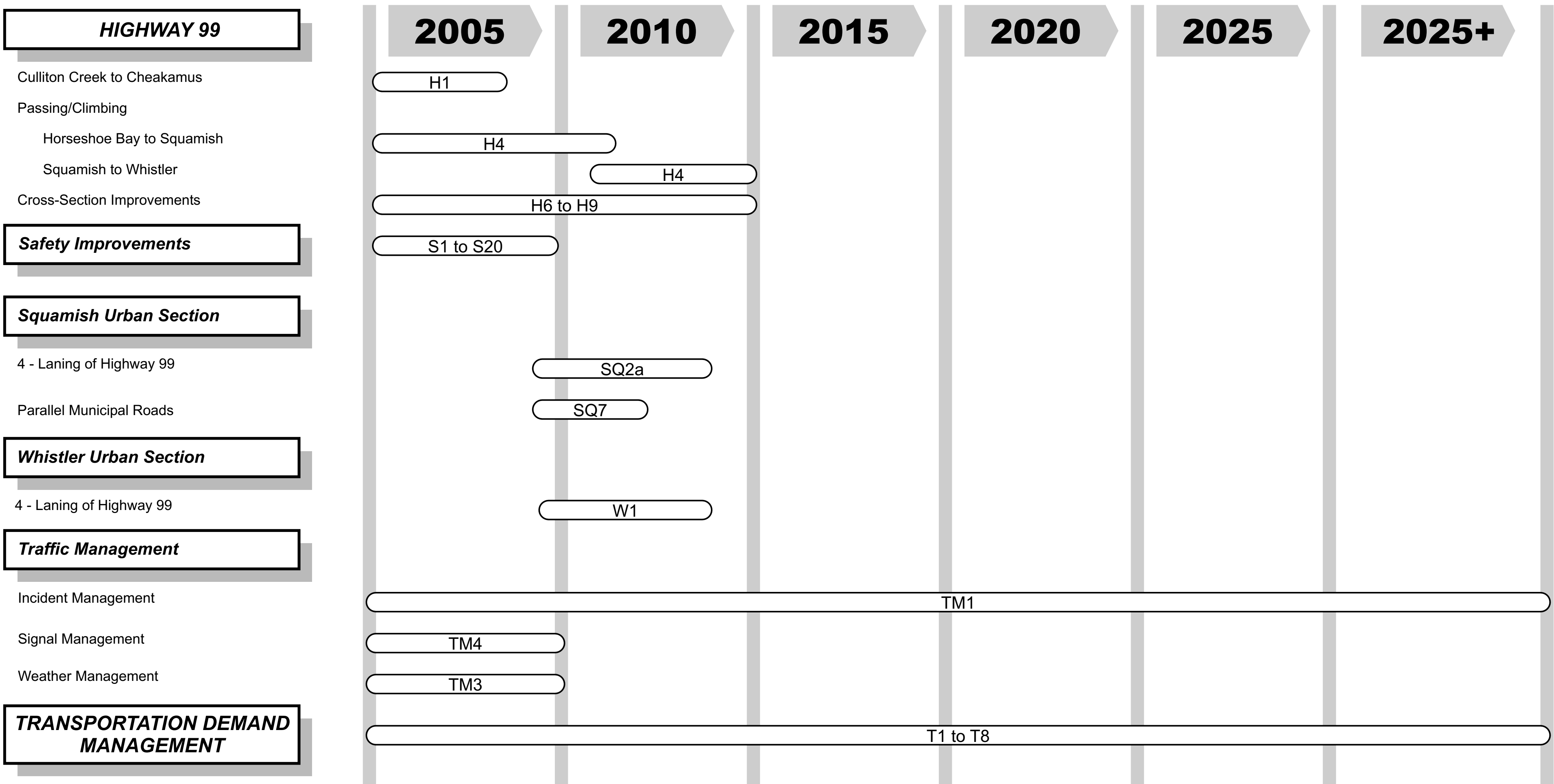


Figure 9.2

Volume 1: Summary Report

Implementation Plan: Constrained Mobility (Cont'd)

MULTI-MODAL CORRIDOR TRANSPORTATION STUDY: Horseshoe Bay to Highway 97

(Note: Code descriptions within bars refer to elements listed in Table 9.2)

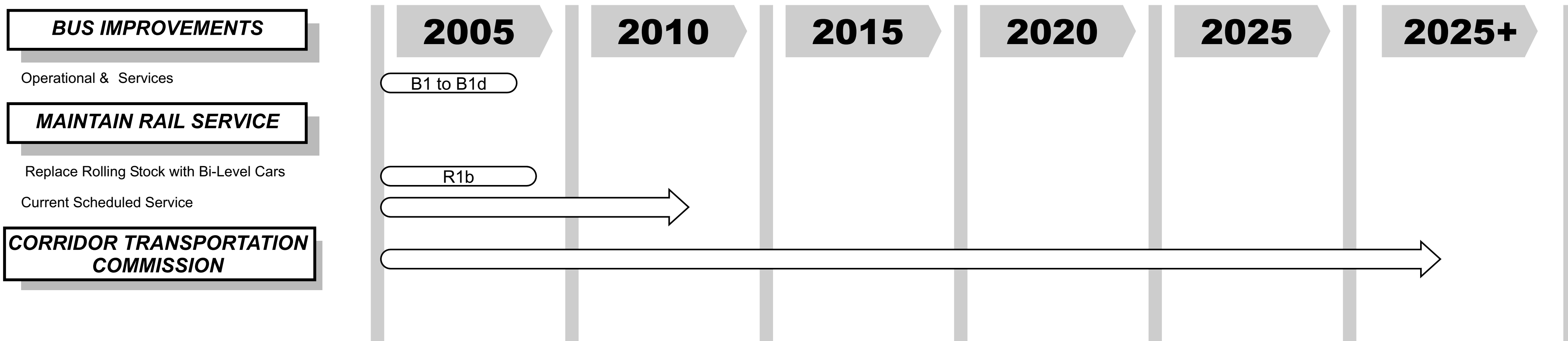


Figure 9.2

Volume 1: Summary Report

Implementation Plan: Medium Rail Investment
MULTI-MODAL CORRIDOR TRANSPORTATION STUDY: Horseshoe Bay to Highway 97

(Note: Code descriptions within bars refer to elements listed in Table 9.2)

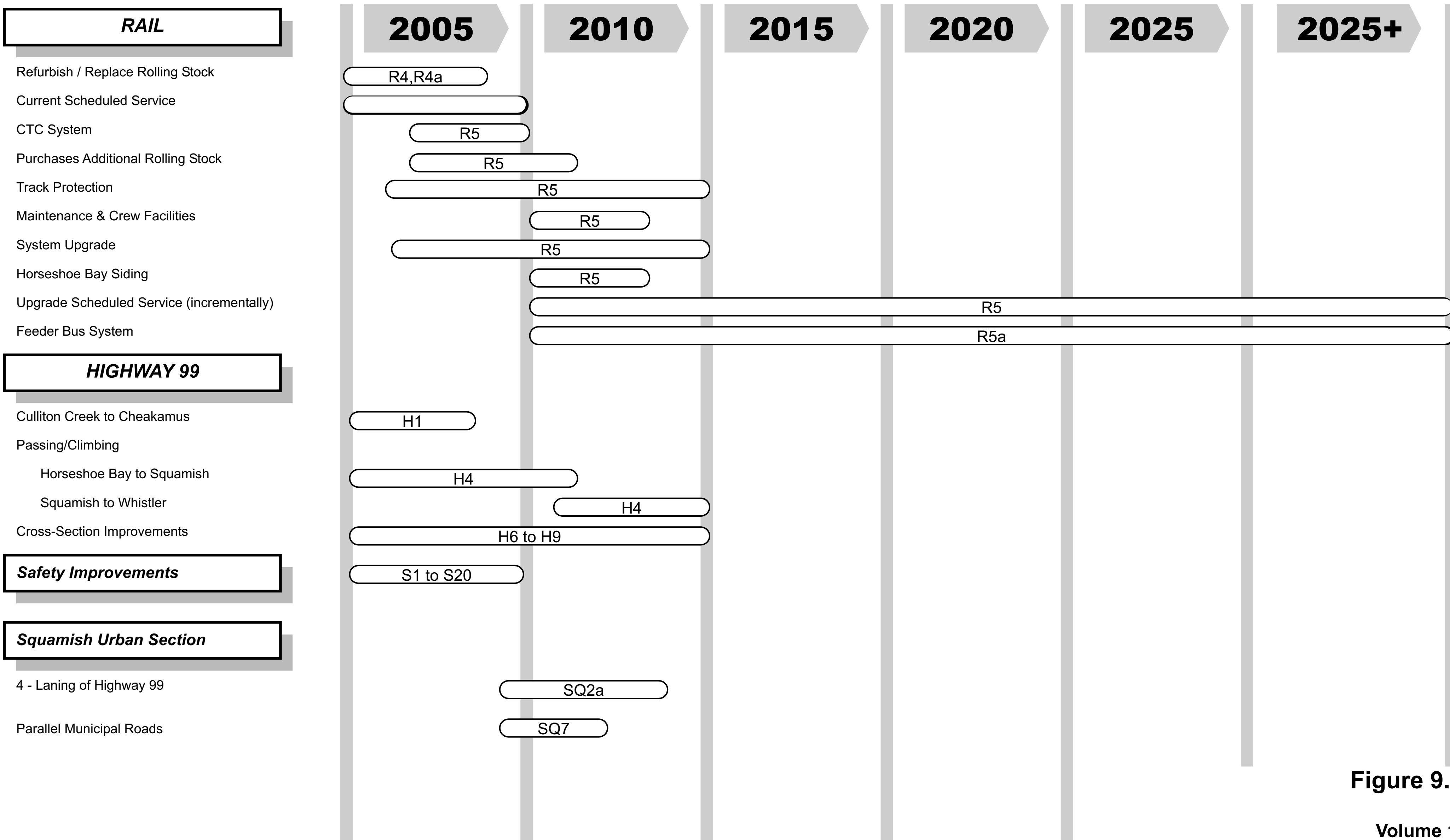


Figure 9.3

Volume 1: Summary Report

R:\3490600\03\Reports\Technical\Draft Report\Volume 1\Figures\Fig 9.3.cdr

Reid Crowther

Implementation Plan: Multi Modal Mobility - Rail (Cont'd)

MULTI-MODAL CORRIDOR TRANSPORTATION STUDY: Horseshoe Bay to Highway 97

(Note: Code descriptions within bars refer to elements listed in Table 9.2)

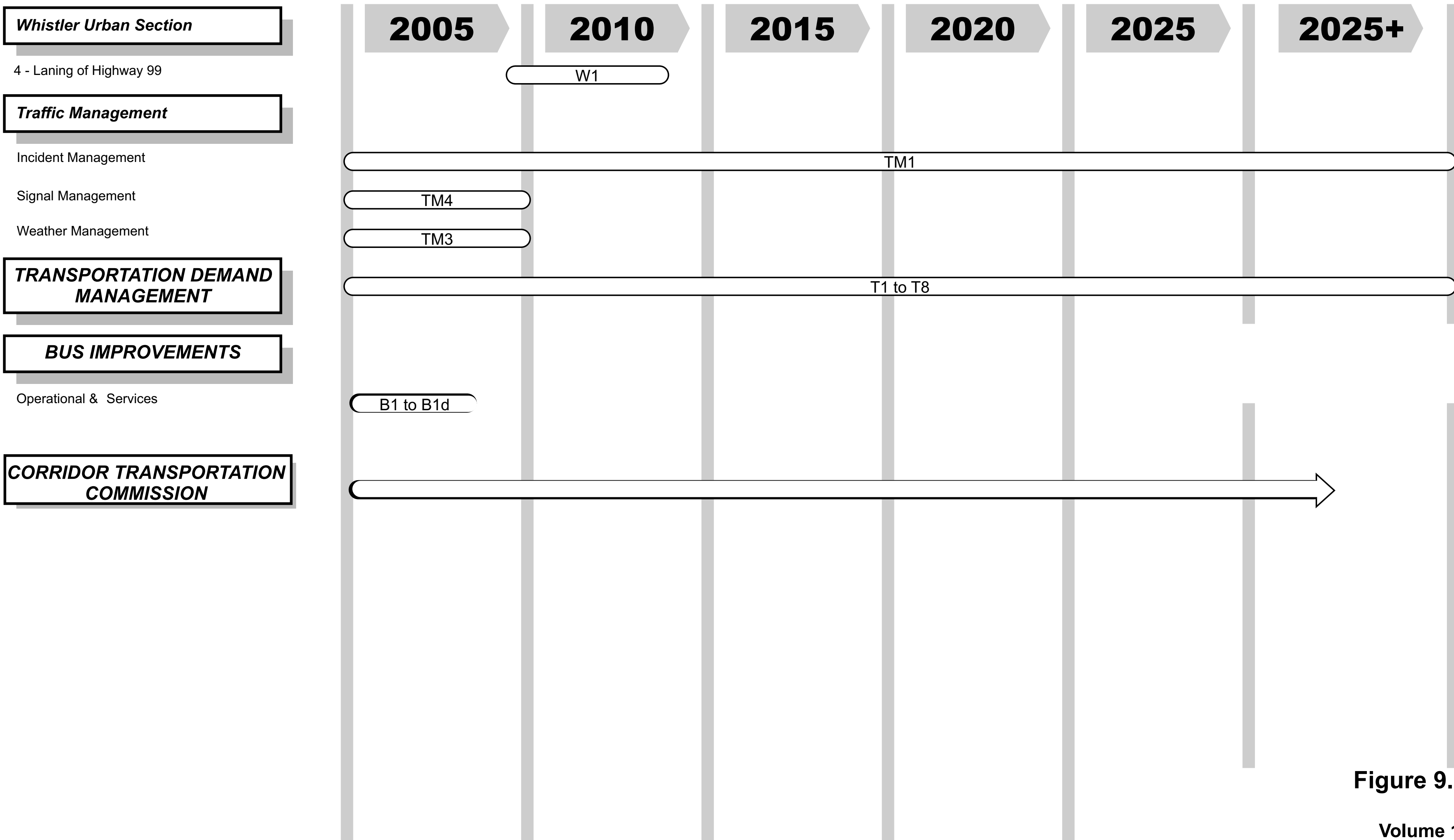


Figure 9.3

Volume 1: Summary report

Implementation Plan: Constrained Mobility

MULTI-MODAL CORRIDOR TRANSPORTATION STUDY: Horseshoe Bay to Highway 97

(Note: Code descriptions within bars refer to elements listed in 9.2)

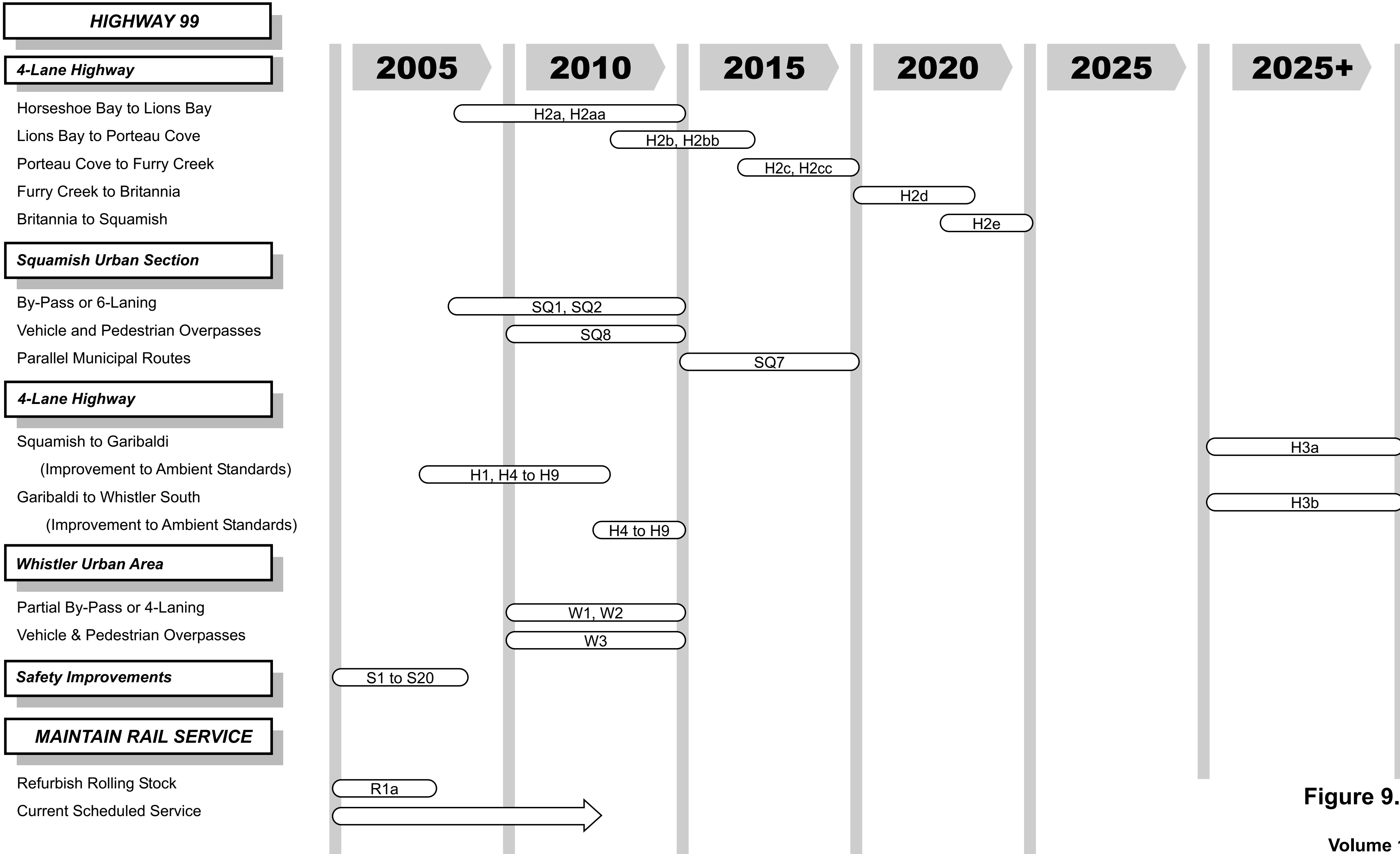


Figure 9.4

Volume 1: Summary Report

Implementation Plan: Highway Mobility Scenario

MULTI-MODAL CORRIDOR TRANSPORTATION STUDY: Horseshoe Bay to Highway 97

Reid Crowther

(Note: Code descriptions within bars refer to elements listed in Table 9.2)

	2005	2010	2015	2020	2025	2025+
HIGHWAY 99						
4-Lane Highway						
BUS IMPROVEMENTS						
Operational & Services	B1 to B1d					

Figure 9.4

Volume 1: Summary Report

Potential Improvement Option Elements

MULTI-MODAL CORRIDOR TRANSPORTATION STUDY: Horseshoe Bay to Highway 97

Code	Option Description	Performance Objective Addressed	Segment 1	2	3	4	5	6	7	LKI Seg	LKI Start	LKI End	km Station Start	km Station End
HIGHWAY MODE														
W1	4 lane Highway 99	Mobility				4				2930			98.0	103.0
W2	Partial Bypass with Connections to Village	Mobility				4				2930			98.0	109.0
W3	Overpasses and Pedestrian Overpasses	Mobility				4				2930			98.0	103.0
W4	Access Management	Mobility				4				2930			102.0	110.0
W5	Parallel Municipal Routes	Mobility				4				2930			102.0	110.0
SQ1	Four Lane bypass of Squamish	Mobility		2						2930			42.0	55.0
SQ2	Widen Highway 99 to 6 lanes	Mobility		2						2930			44.0	55.0
SQ2a	Widen Highway 99 to 4 lanes	Mobility		2						2930			44.0	55.0
SQ3	Widen Garibaldi and Mamquam at Highway 99 for separate left turn lanes	Mobility		2						2930			47.0	48.0
SQ4	Widen Clark at Highway 99 for separate left turn lanes	Mobility		2						2930			43.0	
SQ5	Signalization of Centennial and Highway 99	Mobility		2						2930			46.0	
SQ6	North Access to Highway 99 and Signalization	Mobility		2						2930			50.0	
SQ7	Completion of Pioneer Connection	Mobility		2						2930			46.0	
SQ8	Overpasses and Pedestrian Overpasses	Mobility		2						2930			46.0	47.0
S1	Horseshoe Bay - Improve NB clearzones, widen shoulders and improve intersection illumination	Safety	1							2920	0.0	1.1	0.0	1.1
S2	Magnesia Creek - Improve NB clearzones, widen shoulders and install post mounted NB delineators	Safety	1							2920	13.0	13.9	13.0	13.9
S3	Yahoo Creek - Improve NB clearzones, widen shoulders and review passing lane geometry at NB termination	Safety	1							2920	14.1	14.9	14.1	14.9
S4	Loggers Creek - Improve roadside NB clear zones, widen shoulders, increase skid resistance and install post mounted NB delineators	Safety	1							2920	15.8	17.2	15.8	17.2
S5	Brunswick Point - Improve roadside clear zones and widen shoulders	Safety	1							2920	18.9	19.4	18.9	19.4
S6	Minaty Bay Hill - Review passing lane geometry at NB termination point and improve pavement markings near NB passing lane termination point	Safety	1							2920	29.3	29.9	29.3	29.9
S7	Thistle Creek - Pave NB shoulders, install post mounted delineators NB and review need for roadside barriers NB	Safety	1							2920	31.0	31.6	31.0	31.6
S8	Mamquam Rd. Intersection - Increase skid resistance	Safety		2						2930	3.9		47.9	
S9	Garibaldi Way Intersection - Increase skid resistance	Safety			3					2930	4.5		48.5	
S10	Culliton Creek Bridge - widen NB shoulders and install sign indicating SB passing lane	Safety			3					2930	21.2	22.0	65.2	66.0
S11	Brandywine Park - Widen NB shoulders, install additional chevron markers after railway crossing and improve pavement markings	Safety			3					2930	40.3	41.2	84.3	85.2
S12	Millar Creek - Improve NB clearzones, widen NB shoulders and improve pavement markings	Safety			3					2930	49.9	50.5	93.9	94.5
S13	Cheakamus Lake Rd. Intersection - Review need for NB advance warning flasher	Safety			3					2930	50.5		94.5	
S14	Lake Placid Rd. Intersection - Improve intersection pavement markings and improve pedestrian crossing facilities	Safety			3					2930	54.0		98.0	
S15	Whistler Way Intersection - Improve intersection pavement markings and install left turn prohibited sign SB	Safety				4				2930	57.3		101.3	
S16	Whistler Village - Widen shoulders SB and improve intersection illumination	Safety				4				2930	57.8	58.2	101.8	102.2

Code	Option Description	Performance Objective Addressed	Segment 1	2	3	4	5	6	7	LKI Seg	LKI Start	LKI End	km Station Start	km Station End
S17	Village Gate Boulevard - review need for SB left turn protected phase	Safety				4				2930	58.1		102.1	
S18	Alta Creek - Increase intersection illumination	Safety					5			2930	60.7	61.4	104.7	105.4
S19	Green River R/R Crossing - Install post mounted delineators NB and improve pavement markings	Safety					5			2930	74.2	74.6	118.2	118.6
S20	Suicide Hill - Improve pavement markings, install additional chevron alignment markers on curve SB and review need for roadside barriers SB	Safety					5			2930	84.0	84.4	128.0	128.4
H1	Cheakamus Canyon to Culliton Creek - 4 laning and twinning of Culliton Creek Bridge	Mobility, Safety, Reliability			3					2930	21.4	27.2	65.4	71.2
H2a	Four Lane Highway 99 Horseshoe Bay to Lions Bay	Mobility, Safety, Reliability	1a										0.0	11.2
H2aa	Four Lane Highway 99 Horseshoe Bay to Lions Bay (Two Lane Tunnel)	Mobility, Safety, Reliability	1a										0.0	11.2
H2b	Four Lane Highway 99 Lions Bay to Porteau	Mobility, Safety, Reliability	1b										11.2	24.0
H2bb	Four Lane Highway 99 Lions Bay to Porteau (Two Lane Tunnel)	Mobility, Safety, Reliability	1b										11.2	24.0
H2c	Four Lane Highway 99 Porteau to Furry Creek	Mobility, Safety, Reliability	1c										24.0	26.6
H2cc	Four Lane Highway 99 Porteau to Furry Creek (Two Lane Tunnel)	Mobility, Safety, Reliability	1c										24.0	26.6
H2d	Four Lane Highway 99 Furry Creek to Britannia	Mobility, Safety, Reliability	1d										26.6	32.2
H2e	Four Lane Highway 99 Britannia to Squamish South	Mobility, Safety, Reliability	1e										32.2	39.2
H3a	Four Lane Highway 99 Squamish to Garabaldi	Mobility, Safety, Reliability		3a									47.2	56.5
H3b	Four Lane Highway 99 Garabaldi to Whistler	Mobility, Safety, Reliability		3b									56.5	93.8
H4	Passing/Climbing Lanes	Mobility, Safety	1	2	3	4	5						0.0	140.3
H5	Replace signalized intersections in Squamish and Whistler with grade seperation	Mobility, Safety	1	2	3	4	5						0.0	140.3
H6	Pullouts	Mobility, Safety	1	2	3	4	5						0.0	140.3
H7	Widen Shoulders	Mobility, Safety	1	2	3	4	5						0.0	140.3
H8	Clear Zone Improvements	Mobility, Safety	1	2	3	4	5						0.0	140.3
H9	Median Barrier	Mobility, Safety	1	2	3	4	5						0.0	140.3
TM1	Incident Management	Mobility, Safety	1	2	3	4	5						0.0	140.3
TM2	Peak Skier Day Traffic Management	Mobility, Safety	1	2	3	4	5						0.0	140.3
TM3	Weather Management System	Mobility, Safety	1	2	3	4	5						0.0	140.3
TM4	Signal Management: Optimization and Coordination	Mobility, Safety	1	2	3	4	5						0.0	140.3
RAIL MODE														
R1a	Sustain Existing Service - New self propelled cars (10 cars)	Capacity	1	2	3	4	5	6					0.0	233.0
R1b	Sustain Existing Service - Locomotive hauled passenger cars	Capacity	1	2	3	4							0.0	233.0
R2a	Make Rail Service More Accessible - Extend Service to Lonsdale Quay	Capacity	1	2	3	4	5	6					0.0	
R3a	Improve Rail Service - Add second train	Mobility	1	2	3	4	5	6					0.0	133.0
R3b	Improve Rail Service - Use Westcoast Express on weekends	Capacity	1	2	3	4							0.0	133.0
R3c	Improve Rail Service - Add commuter train	Capacity	1	2									0.0	45.0
R3d	Improve Rail Service - Operate commuter train and 3 trains/day to Whistler	Capacity	1	2	3	4							0.0	133.0
R3e	Improve Rail Service - Provide faster service by 1/2 hour	Capacity	1	2	3	4							0.0	133.0
R4	Minimum Investment	Capacity	1	2	3	4	5	6	7				0.0	233.0

Potential Improvement Option Elements

MULTI-MODAL CORRIDOR TRANSPORTATION STUDY: Horseshoe Bay to Highway 97

Code	Option Description	Performance Objective Addressed	Segment							LKI Seg	LKI Start	LKI End	km Station Start	km Station End
			1	2	3	4	5	6	7					
R4a	Rail Feeder Buses	Capacity												
R5	Medium Investment	Capacity	1	2	3	4	5	6	7				0.0	233.0
R5a	Rail Feeder Buses	Capacity												
R5c	Seabus Link	Capacity												
R6	Maximum Investment	Capacity	1	2	3	4	5	6	7				0.0	233.0
FERRY MODE														
F1	Fast Ferry - Seabus Terminal to Squamish	Capacity	1	2									0.0	49.0
F1A	Ferry Feeder Buses	Capacity												
F2	Fast Ferry - Seabus Terminal to Squamish, commuter service only	Capacity	1	2									0.0	49.0
F3	Fast Ferry - Squamish to Tsawwassen	Capacity	1	2									0.0	49.0
F4	Fast Ferry - Iona Island to Squamish	Capacity	1	2									0.0	49.0
F5	Fast Ferry - Squamish to North Arm of Fraser Passenger Only	Capacity	1	2									0.0	49.0
F6	Fast Ferry - Squamish to North Arm of Fraser Vehicles	Capacity	1	2									0.0	49.0
AIR MODE														
A1	Fixed Wing Service to Pemberton	Capacity	1	2	3	4	5						0.0	133.0
A2	Helicopter Service to Whistler	Capacity	1	2	3	4							0.0	109.0
A3	Fixed Wing Service to Squamish	Capacity	1	2									0.0	49.0
BUS MODE														
B1	Expanded Lions Bay Service	Capacity	1											
B2	Squamish to Whistler Connector	Capacity		2	3	4							49.0	109.0
B3	Whistler to Pemberton Connector	Capacity				4	5						109.0	133.0
B4	Construct Whistler Intermodal terminal	Mobility				4							109.0	
B5	Improve shoulder pickup locations	Mobility	1	2	3	4							0.0	109.0
B6	Redesign access at Horseshoe Bay ferry terminal	Mobility	1										0.0	
B7	Create bus only lane or busway	Mobility				4							95.0	109.0
B8	Queue Jumpers	Mobility	1	2	3	4							0.0	109.0
B9	Lay-bys	Mobility	1	2	3	4	5	6	7				0.0	233.0
B10	Acceleration/Deceleration Lanes	Mobility	1	2	3	4	5	6	7				0.0	233.0
B11	Passenger Information Lines	Mobility	1	2	3	4	5	6	7				0.0	233.0
B12	Ticketing Systems	Mobility		2		4								
B13	Baggage Handling Systems	Mobility		2		4								
B14	Shelters	Mobility	1	2	3	4	5	6	7				0.0	233.0
TDM														
T1	Provide Regional van/shuttle service for visitors from Vancouver to Squamish, Pemberton and Whistler	Capacity	1	2	3	4	5						0.0	140.0
T2	Establish park and ride lots / carpooling	Capacity	1	2	3	4	5						48.0	109.0
T4	Visitot Tourist Trip Reduction Strategies	Capacity	1	2	3	4	5						0.0	140.0
T5	Employer Based Vanpool Programs / Trip Reduction	Capacity	1	2	3	4	5						0.0	140.0
T6	Rideshare Program	Capacity	1	2	3	4	5						0.0	140.0
T7	Public Awareness / Marketing / Education	Capacity	1	2	3	4	5						0.0	140.0
T8	Incentives to Alternate Modes	Capacity	1	2	3	4	5						0.0	140.0

Table 9.1

Volume 1: Summary Report

Corridor Transportation Commission to oversee these issues as they affect the transportation resource in the corridor.

Figure 9.4 provides a comparable level of description for the Multi-Modal Mobility Scenario (Medium Rail Investment). Predictably, it indicates a significant capital programme in the rail area extending over the next decade, in parallel with a relatively modest highway improvement programme. Traffic Management and Transportation Demand Management initiatives are essentially comparable to those proposed for the Constrained Mobility Scenario. Bus improvements and the Corridor Transportation Commission are also indicated to be put in place in the early years of this scenario.

Figure 9.5 provides the time frame description for the Highway Mobility Scenario. Rural highway improvements between Horseshoe Bay and Squamish would proceed from the south to the north over the next 20 years. Urban section improvements are assumed to be put in place between 2005 and 2015. North of Squamish, 4-laning of the existing highway is anticipated to happen beyond 2025, although improvements to the present highway in this section are anticipated in the interim. Alternate mode improvements are indicated soon in order to preserve the existing passenger rail service in the corridor and ensure support of the existing bus services to maintain the high mode share to bus.