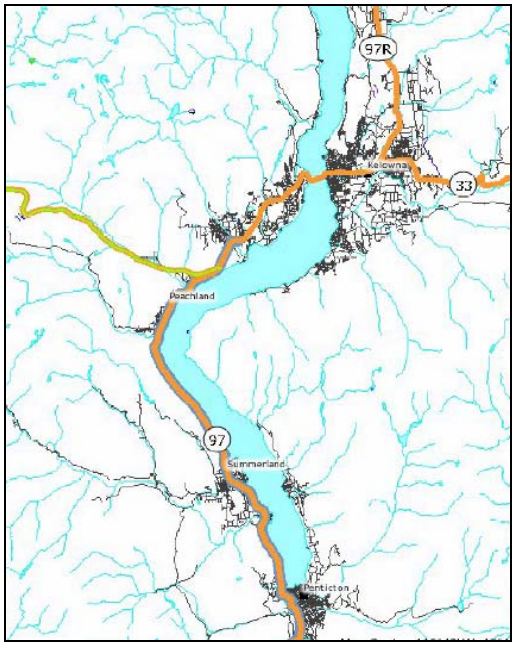
Business Case

Highway 97
Bentley Road to Deep Creek
4-Laning

LKI Segment 1115, km 31.51 to 46.50



Prepared for:

Ministry of Transportation
Southern Interior Region

Project No. MOT-65
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Apex Engineering Limited
Vancouver BC

Executive Summary
Highway 97 - 4-Laning Summerland to Peachland

The overall project involves 4-laning 15 km of Highway 97 between Summerland and Peachland, making it consistent with the highway cross section to the north and south. The intention of the project is to increase capacity and safety consistent with travel demand in the corridor.

2003 AADT is estimated to be 11,700 with 2% linear growth, The existing geometry of Highway 97 between Summerland and Peachland is constrained by steep terrain along the west shore of Lake Okanagan and has frequent speed advisories. Traffic volume is high for a 2-lane facility and combined with the curvilinear alignment along the lake shore, results in negligible passing opportunity during peak periods. Peak period speeds are often 10 km/hr below the posted speed. Existing operation is LOS 'E' and projected is 'F' within the forecast period.

The existing accident rate and severity are close to expected values for a 2-lane rural highway but at this traffic volume, a 4 lane design, which potentially reduces fatal accidents by 32% and total accidents by 4%, is justified. This amounts to saving one fatal accident every 6.5 years.

Average posted speed will increase 11% from 80 to 90 km/hr which is more consistent with expectations for a high speed rural highway. Increases in travel speed during peak periods will be more pronounced with increases of 20 to 30 km/hr.

The planning estimate of staging and costs is summarized below.

Staging	Section	Project Cost ($millions)
1	Okanagan Lake Park	$ 15.3
2	Bentley Road to Okanagan Lake Park	$22.8
3	Greata Ranch to Deep Creek	13.2
	Total	$ 51.4

Overall, the project returns a benefit cost ratio of 1.22. 56% of benefits stem from time savings due to increased speed and capacity and some reduction in traveled distance. 39% of benefits stem from a reduction in accident severity and some reduction in accident rate.

Recommended project staging starts with the Okanagan Lake Park section which is already designed, is the most constructable and enjoys local support. The second stage Bentley Road to OK Lake section would make continuous the existing 4-laning from Penticton through to OK Lake Park. The third stage would complete 4-laning through to Peachland.

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1 Introduction

1.1 Background

The overall objective is to increase capacity and safety consistent with travel demand (11,000+ AADT) in the corridor over 15 km of existing 2-lane highway between Summerland and Peachland. Highway 97 to the north and south of this project is 4 lanes. The intention is to 4-lane the remaining 2-lane sections in stages. For staging purposes, the project is broken down into 5 sections and a business case is presented for each section as well as an overall summary for the project as a whole.

1.2 Project Description and Location

This project includes upgrading 14.98 km of rural Highway 97 (Segment 1115 LKI 31.51 to 46.49) between Peachland and Summerland from a 2 lane 80/90 km/hr with frequent speed advisories to a 4-lane 100 km/hr standard, posted 90 km/hr. The general location and staging sections are shown in Exhibit 1-1.

1.3 Previous Studies

Transportation in the Okanagan Valley has been investigated through a series of previous studies which have led up to the current project.

The Okanagan Valley Transportation Plan completed in 1997 provided a comprehensive review of travel characteristics and demand forecasts throughout the Okanagan Valley and an evaluation of broader corridor strategies evaluated at a system level. These concluded with the strategy to maintain and improve mobility of the existing highway corridor. Alternative routes were examined but were not recommended.

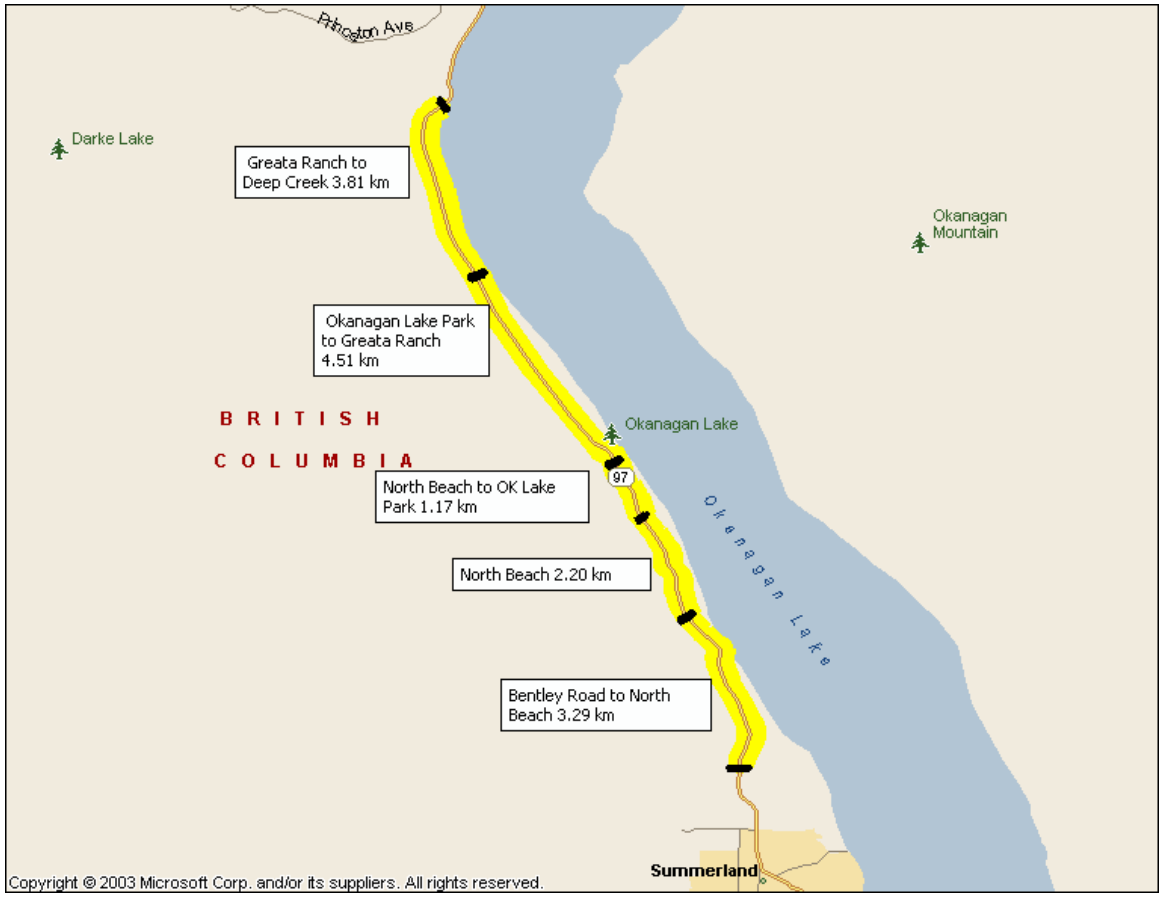
The more recent South Okanagan Corridor Management Plan[1] (SOK CMP) identified the Summerland to Peachland section as the most congested part of the Highway 97 Corridor south of Peachland. Summerland to Peachland is a 2-lane highway bounded at either end by 4 lane highway to the south and north, leaving this 2-lane section as the remaining

[1] "South Okanagan Corridor Management Plan" prepared by Urban Systems Ltd For MoT Southern Interior Region, January 2003.

choke point. It is operating at level of service 'E' and will decline to 'F' during the forecast period. The Corridor Plan specifically recommends 4-laning this section.

Design work and cost estimates for part of the study area at Okanagan Lake Park have been prepared by McElhanney Engineering[2] for a 4 lane, flush median, 100 km/hr design with a total cost of $15.3 million (excluding sunk costs).

Exhibit 1-1 General Location



[2] "Okanagan Highway No. 97 - Okanagan Lake Park to Greata Ranch", prepared by McElhanney Engineering Ltd For MoT Southern Interior Region, MoT Project 20283-0001, October 17, 2003.

1.4 Other Alternatives

Alternative routes were considered at the system level in the 1997 Okanagan Valley Transportation Plan but were not recommended. Other options such as selective passing lanes are possible but at current traffic levels, they will only provide limited relief during peak demand periods. The investment in passing lanes (3-lane sections) may be lost if it cannot be incorporated into a future 4-lane scenarios required during the forecast period. The proposed improvement is an isolated 4 lane section and acts as a long passing lane section providing relief within the treated section and to downstream 2 lane sections. The investment in this option can also be incorporated directly into the ultimate plan for continuous 4-laning.

2 Problem Statement

2.1 Corridor Role and Function

The Highway 97 corridor is a gateway for north-south international trade intended to provide an uncongested high quality route, with limited delay through urban areas. It links the United States to the northern half of British Columbia as well as regions east and west. The corridor serves development, recreation, and resource areas throughout the Okanagan. It links communities and urban centres including Osoyoos, Penticton, Kelowna, Vernon, Salmon Arm as well as serving commuter demands between rural areas and population centres. Traffic includes agriculture, tourism, recreation, forestry and mining.

Changes in demographic and economic trends are putting increasing pressure on the corridor. Population is projected to grow rapidly through the Okanagan Valley. This population growth will lead to further diversification of the economy through expansion in retail trade, construction and service industries. Spillover in recent growth from the Central Okanagan is now throughout the valley. Much of this growth has been fueled by the retirement industry . Continued expansion in the tourism sector is projected.

The heavy population growth in the Okanagan Valley is placing increasing traffic demands on Highway 97. Expansion of commuter sheds to more rural areas will increase conflicts between local and long distance travel, and increase the cost of moving freight. Expansion in tourism will add to congestion experienced, especially during peak summer periods.

2.2 Traffic Characteristics

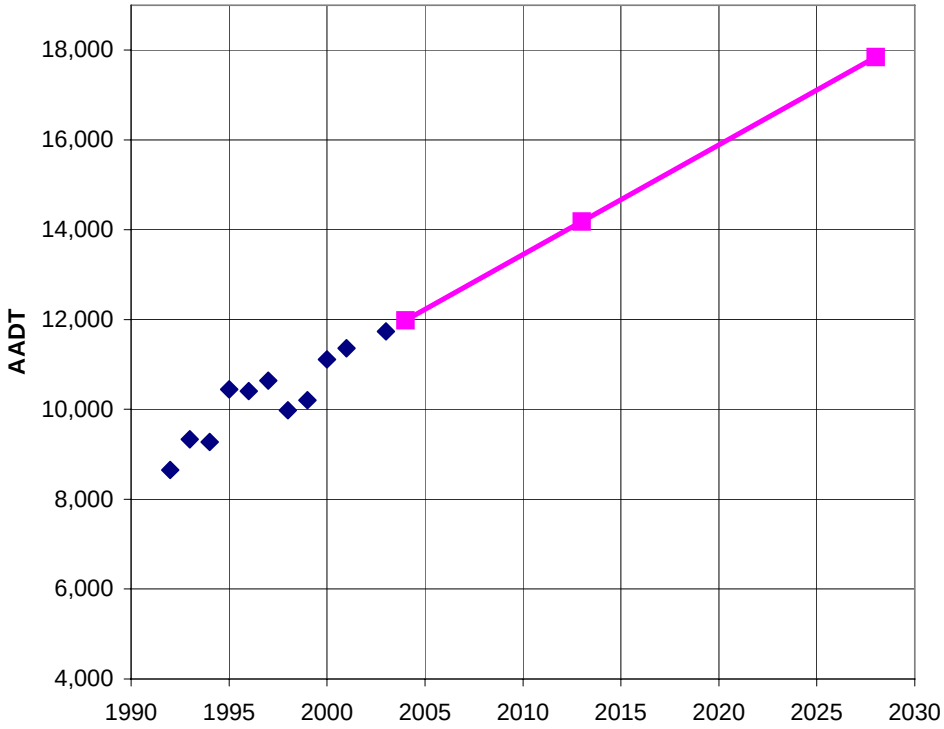
Current and projected traffic volumes from the SOK CMP are:

Exhibit 2-1 Traffic Volume

	2000	2025
AADT	11,420	18,736
SADT	13,330	19,341
DHV	1,256	2,061

Traffic volume at counter 25-002 south of Peachland in 2001 was 11,359 AADT and 12,963 SADT with about 3.5% trucks and 10% recreational vehicles. Historical and projected traffic volumes based on 2001 counts are presented in Exhibit 2-2. Historical traffic is subsequent to the opening of the Coquihalla Connector in 1991.

Exhibit 2-2 Historical and Projected AADT



2.3 Mobility

Highway 97 from Summerland to Peachland is the most congested section of Highway 97 south of Peachland. It presently operates at LOS 'E' and is projected to LOS 'F' in 2025[3] For rural highways, the desirable level of service is 'C'. Posted speeds are presently 90 km/hr and observed speeds are regularly travelling at 10 km/hr below posted speeds. A high percentage of recreational traffic combined with limited passing opportunity due to opposing traffic volume and geometry result in heavy platooning in this section. There

[3] "South Okanagan Corridor Management Plan" prepared by Urban Systems Ltd For MoT Southern Interior Region, January 2003.

are a number of speed advisories between Bentley Road and Deep Creek with reduced speed curves at the south end as low as 60 to 70 km/hr.

Average travel speed between Kaleden and Peachland is 80 km/hr which is at the lower threshold of desired corridor speed. This is the result of reduced rural speeds and lack of passing opportunity in this section and delays in the urban Summerland area. The objective for this section is to safely attain consistent, high rural travel speeds at 90-100 km/hr.

3 Bentley Road to North Beach

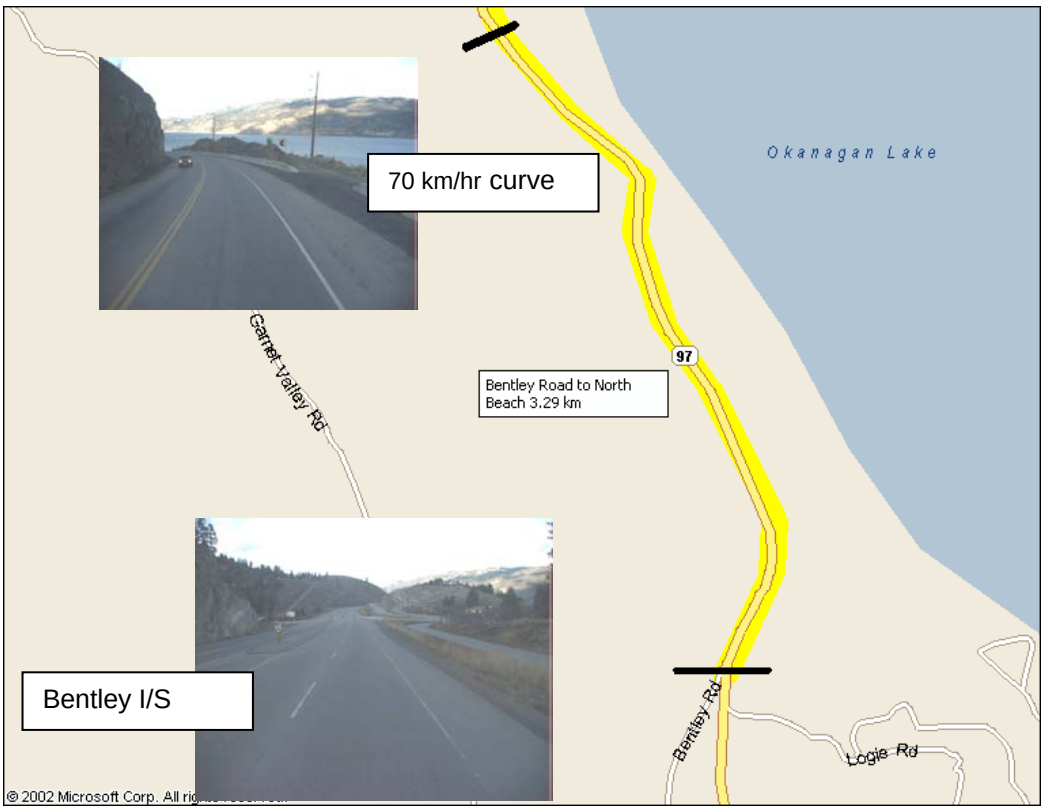
3.1 Purpose

The purpose of this business case is to advance the project to preliminary design and costing. No detailed design has been completed for this section yet.

3.2 Project Description and Location

This project includes upgrading 3.29 km of rural Highway 97 from Bentley Road at the north end of Summerland to North Beach south of Okanagan Lake Park (Segment 1115 LKI 31.51 to 34.80) between Peachland and Summerland. The upgrade is from a 2 lane 90 km/hr with 70 km/hr advisories to a 4 lane 100 km/hr standard. The general location is shown in Exhibit 3-1.

Exhibit 3-1 Bentley Road to North Beach



3.3 Mobility

This section is part of the overall Summerland to Peachland segment identified in the SOK CMP as deficient with LOS 'F" projected for 2025. Specific to this section are low truck speeds related to grades in both directions north of Bentley Road. There are also two 70 km/hr advisories totaling 2.7 km out of the 3.3 km section length. The average posted speed is 74 km/hr. The existing posted speeds identified from the 1999 Intranet Photolog, Traversal H97 are summarized below. Proposed posted speeds are 90 km/hr and design speed 100 km/hr.

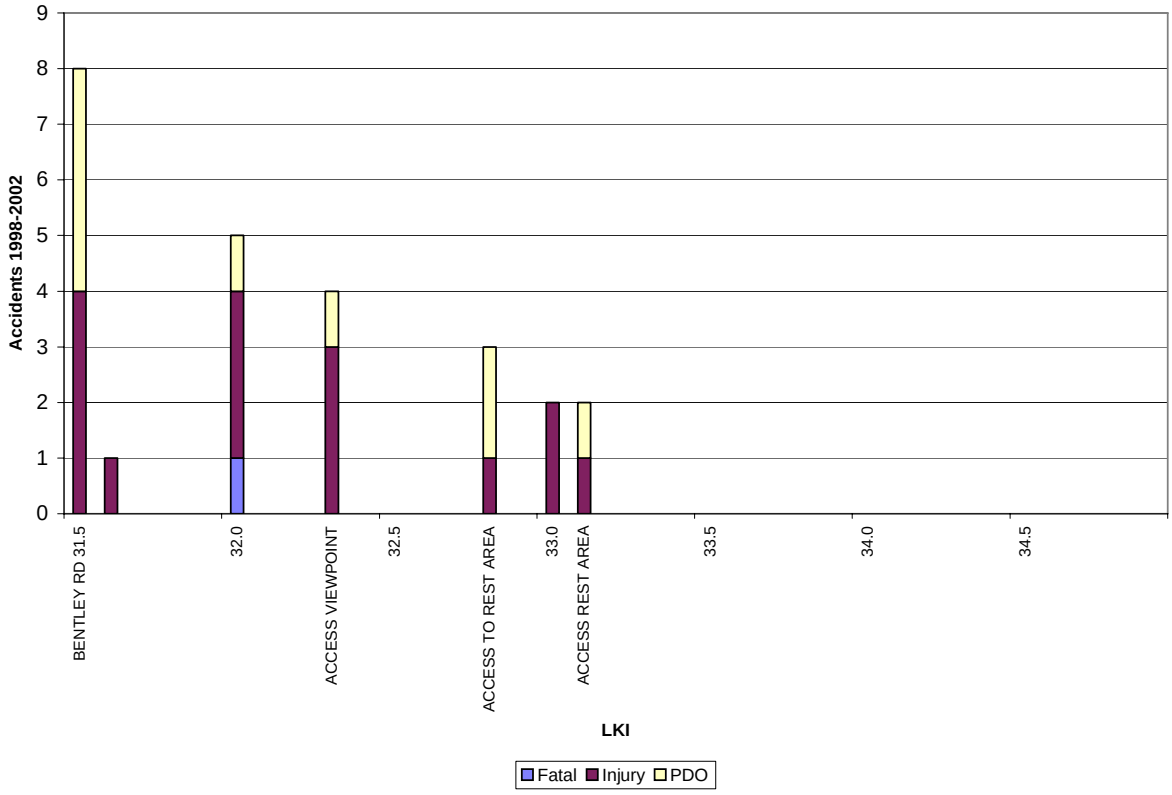
Exhibit 3-2 Posted Speed Advisories

	LKI	*Length*	*Existing Posted*	*Proposed Posted*
Bentley Road intersection	*31.51*	*0.226*	*70*	*90*
Start 2 lane NB	*31.74*	*0.163*	*70*	*90*
70 km/h Advisory Warning NB	*31.90*	*0.154*	*70*	*90*
70 km/h Advisory NB	*32.05*	*0.42*	*70*	*90*
End 70 km/h Advisory	*32.47*	*0.624*	*70*	*90*
90 km/h Posted	*33.10*	*0.584*	*90*	*90*
70 km/h Advisory NB	*33.68*	*0.604*	*70*	*90*
Continued Advisory (no sign)	*34.29*	*0.515*	*70*	*90*
Continue 70	*34.80*			
	Wtd Av Posted		*73.6*	*90.0*

3.4 Safety Performance

The existing accident rate in this section is not above the expected rate for a 2 lane highway with this access density. The expected rate is 0.33 a/mvk and the observed rate is 0.28 a/mvk. The accident histogram shows clustering at intersections and accesses and at the first reduced speed curve in the NB direction. Expected safety improvements stem from a reduction in severity with construction of a 4-lane cross section.

Exhibit 3-3 Accident Histogram 1998 to 2002 - Bentley Road to North Beach



The SOK CMP did not identify any accident prone locations in this section based on 1991 to 1995 data. The accident analysis for the current business case report uses data for 5 years from 1998 to 2002. The estimated existing accident rate in this section is 0.28 a/mvk which is below the expected rate of 0.33 a/mvk for this section. but the severity appears greater than expected. Fatal and injury accidents compose 72% of the 18 accidents between 1998 and 2002. Normal expectations for fatal and injury accidents would be 52% for this road class and intersection density. Nine of the 18 accidents between 1998 and 2002 in this segment are head-on and run-off-road accidents which is typical for winding rural 2-lane but can be improved considerable with better alignment and wider cross section. There are 3 accesses in this segment including Bentley Road, one viewpoint and one rest area.

Existing and proposed safety performance is summarized in Exhibit 3-4. The approach used to estimate accident rates is summarized in Appendix A.

Exhibit 3-4 Accident Rates Used for Analysis

	Fat	Inj	PDO	Fat & Inj	All
	Number of Accidents (5 years)				
Observed Base Case Accidents (1998 to 2002)	*1*	*12*	*5*	*13*	*18*
Predicted Base Case Accidents (RAU2)	*0.59*	*10.5*	*10.2*	*11.1*	*21.3*
Base Case Estimate used for Analysis	*0.52*	*9.0*	*8.7*	*9.5*	*18.1*
Predicted Accidents for Proposed Case (RAU4)	*0.35*	*9.1*	*8.1*	*9.5*	*17.6*
Accident Reduction Potential (5 yrs)	*0.16*	*-0.1*	*0.6*	*0.0*	*0.6*
	Accident Rate (a/mvk)				
Observed Base Case Accidents (1998 to 2002)	*0.015*	*0.18*	*0.08*	*0.20*	*0.28*
Predicted Base Case Accidents (RAU2)	*0.009*	*0.16*	*0.16*	*0.17*	*0.33*
Base Case Estimate used for Analysis	*0.008*	*0.14*	*0.13*	*0.15*	*0.28*
Predicted Accidents for Proposed Case (RAU4)	*0.005*	*0.14*	*0.12*	*0.15*	*0.27*
Accident Reduction Potential (5 yrs)	*32%*	*-1%*	*6%*	*0%*	*3%*

3.5 Summary of Deficiencies

Criteria	*Description*
Safety	The accident rate is close to but below the expected value for a 2 lane rural highway. Severity is close to the expected value.
Mobility	Corridor Mobility was measured at 77.7 km/hr during peak periods while the desired rural corridor speed is 80 km/hr. Average posted speed in this section is 73.6. Trucks speeds are low due to grades in both directions. This section is 3.3 km long posted 90 km/hr but with two 70 km/hr advisory curves totaling 2.7 km.
Geotechnical	Alignment is physically constrained by the steep slopes on the west side of Lake Okanagan
Infrastructure	No substandard structures. Local pavement condition is good with a PCR rating close to 8.

3.6 Option Evaluation

The preferred option is a 4 lane undivided 100 km/hr design consistent with the overall plan to upgrade Highway 97 between Peachland and Summerland. This will provide a level of service and safety consistent with projected traffic volumes for the long term.

The existing section is 3.29 km long. The estimated project costs for this section are $11.3 million assuming 3.22 km of new construction at $3.5 million/km along a slightly shorter alignment.

Results of the Benefit Cost Analysis are presented in Exhibit 3-5 followed by an interpretation of the results.

Exhibit 3-5 Benefit Cost Analysis Highway 97 - Bentley Road to North Beach

Discounted Costs (2003 $millions)	
Construction	$10.646
Salvage Value	$2.229
Mtce & Rehabilitation	$0.318
Total Discounted Cost	$8.735
Discounted Benefits	
Delay Reduction	$8.870
VOC Reduction	$0.665
Accident Reduction	$3.271
Total Discounted Benefits	$12.806
Net Present Value (NPV)	$4.07
NPV/Project Cost	0.36
B/C Ratio	**1.5**
MicroBencost File	BENTLEY

The project returns a benefit cost ratio of 1.5. Ratios greater than 1.0 are deemed to be economically beneficial to society. Benefits stem mainly first from time savings and second from reduced accident costs. Travel time savings derive from eliminating the 70 km/hr advisories, increasing the capacity and shortening the traveled distance slightly.

Accident cost savings stem from a reduction in accident rate and severity associated with the higher design standard. There is an estimated 3% overall reduction in accidents but an estimated 32% reduction in fatal accidents. The wider cross section and higher design speed will help to reduce the number and severity of accidents.

3.7 Sensitivity Analysis

This is intended to show the impact of alternative project assumptions on the results. In this case, NPV remains positive over the range of input assumptions tested.

Exhibit 3-6 Sensitivity Analysis

	Sensitivity Option						
	Baseline NPV	4% Discount Rate	8% Discount Rate	+25% Construc-tion Cost	-25% Construc-tion Cost	Traffic Growth 2.2%	Traffic Growth 1.2%
	Net Present Value (millions $)						
NPV	4.1	7.2	1.8	1.2	6.9	4.8	3.4

3.8 Project Timing

The optimum timing is the implementation year that would maximize the net present value of the investment. It is measured as the year when the annual rate of return (annual benefits) exceeds the discount rate. A straight line interpolation of annual benefits suggests that this section is near its optimum timing.

Exhibit 3-7 Optimum Timing

Discount Rate	Optimum Timing
4%	1979
6%	1993
8%	2007

3.9 Conclusions and Recommendations

The improvements have the potential reduce accidents by 3% and fatal accidents by 32%. The added capacity will relieve congestion for the planning period and beyond and contribute to the corridor's role as a high speed north/south route consistent with long term planning objectives.

Based on the positive results of the benefit cost analysis, the growing congestion and bottleneck effect of the Peachland to Summerland section, the Bentley Road to North Beach Project should proceed within the context of an overall improvement program for Summerland to Peachland.

4 North Beach Project

4.1 Purpose

The purpose of this business case is to advance the project to design and engineering. No detailed design has been completed for this section.

4.2 Project Description and Location

This project includes upgrading 2.20 km of rural Highway 97 In the vicinity of North Beach Road on Highway 97 north of Summerland (Segment 1115 LKI 34.8 to 37.0) from a 2 lane 90 km/hr with speed advisories as low as 60 km/hr to a 4 lane 100 km/hr standard. The general location is shown in Exhibit 4-1.

Exhibit 4-1 North Beach Project

4.3 Mobility

This section is part of the overall Summerland to Peachland segment identified in the SOK CMP as deficient with LOS 'F" projected for 2025. Specific to this section are low truck speeds related to grades and frequent speed advisories. The average posted speed is 73 km/hr.

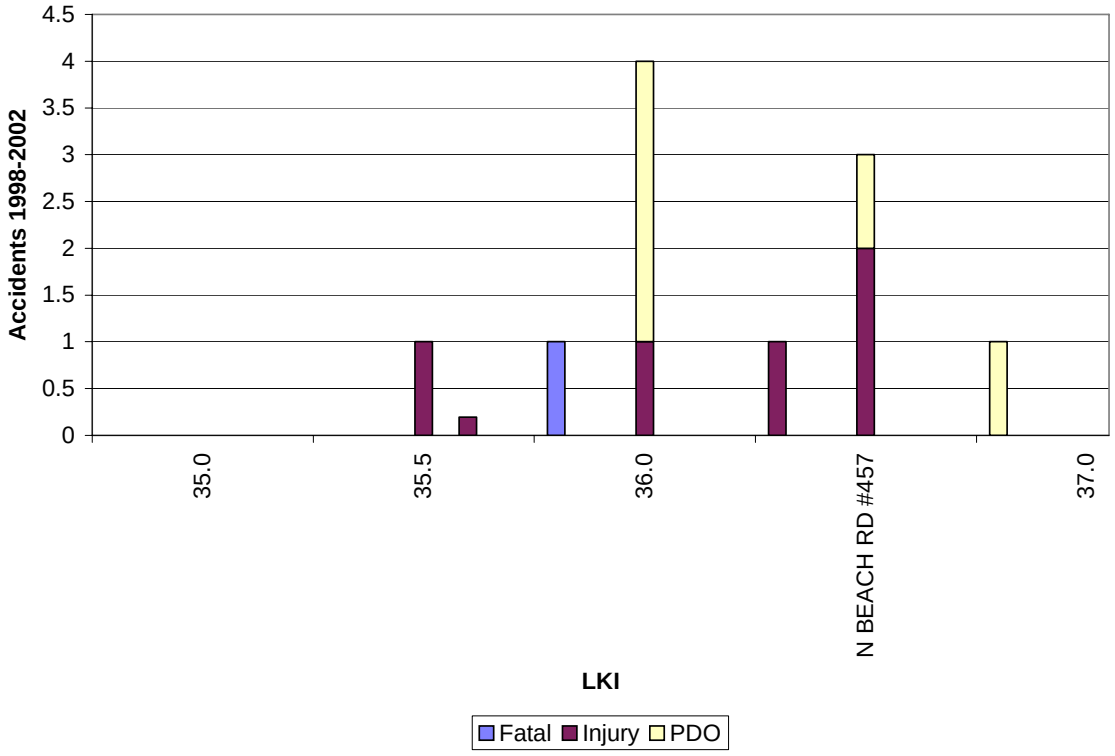
Exhibit 4-2 Posted Speeds

	LKI	Length (km)	Existing	Proposed
Continued Advisory (no sign)	34.80	0.377	70	90
End of 70 km/h Advisory (anticipated)	35.18	0.512	90	90
80 km/h Advisory NB	35.69	0.246	80	90
Continued Advisory (no sign)	35.94	0.102	80	90
Continued Advisory (no sign)	36.04	0.072	80	90
Start 60 km/h Advisory NB	36.11	0.583	60	90
End 60 km/h Advisory (anticipated)	36.69	0.163	70	90
North Beach Road intersection	36.86 37.00	0.145	50	80
	Wtd. Avg. Posted		72.6	89.34

4.4 Safety Performance

The existing accident rate in this section is not above the expected rate for a 2 lane highway with this access density. The expected rate is 0..31 a/mvk and the observed rate is 0.26 a/mvk. The accident histogram shows clustering at North Beach Road and the 60 km/hr advisory zone. The South Okanagan CMP did not identify any accident prone locations or in this section.

Exhibit 4-3 Accident Histogram 1998 to 2002 - Highway 97 North Beach



The SOK CMP did not identify any accident prone locations in this section based on 1991 to 1995 data. The accident analysis for the current business case report uses data for 5 years from 1998 to 2002. The estimated existing accident rate in this section is 0.26 a/mvk which is below the expected rate of 0.28 a/mvk, assuming approach volume on North Beach Road equivalent to 3% of Highway 97 volume. While the accident rate is not higher than expected, 10 of the 11 accidents between 1998 and 2002 are run-off-road accidents potentially suggests some alignment issues. There has been 1 fatal accident in this section in the 5 year data period. Existing and proposed safety performance is estimated in Appendix A and summarized in Exhibit 4-4.

Exhibit 4-4 Accident Rates Used for Analysis

	Fat	Inj	PDO	Fat & Inj	All
	Number of Accidents (5 years)				
Observed Base Case Accidents (1998 to 2002)	*1*	*5*	*5*	*6*	*11*
Predicted Base Case Accidents (RAU2)	*0.36*	*5.9*	*5.7*	*6.3*	*12.0*
Base Case Estimate used for Analysis	*0.31*	*5.5*	*5.3*	*5.8*	*11.1*
Predicted Accidents for Proposed Case (RAU4)	*0.20*	*4.9*	*4.4*	*5.1*	*9.5*
Accident Reduction Potential (5 yrs)	*0.11*	*0.6*	*0.9*	*0.7*	*1.6*
	Accident Rate (a/mvk)				
Observed Base Case Accidents (1998 to 2002)	*0.023*	*0.11*	*0.11*	*0.14*	*0.25*
Predicted Base Case Accidents (RAU2)	*0.008*	*0.14*	*0.13*	*0.14*	*0.28*
Base Case Estimate used for Analysis	*0.007*	*0.13*	*0.12*	*0.13*	*0.25*
Predicted Accidents for Proposed Case (RAU4)	*0.005*	*0.11*	*0.10*	*0.12*	*0.22*
Accident Reduction Potential (5 yrs)	*35%*	*11%*	*16%*	*12%*	*14%*

4.5 Summary of Deficiencies

Criteria	*Description*
Safety	The accident rate and severity is close to the expected value for a 2 lane rural highway with 1 intersection. Run-off-road accidents are over-represented.
Mobility	With the speed advisories, the average posted speed in this section is 72.6 km/hr compared to a desired 80 km/hr. Truck speeds are low due to grades in both directions.
Geotechnical	Alignment is physically constrained by the steep slopes on the west side of Lake Okanagan
Infrastructure	No substandard structures. Local pavement condition is good with a PCR rating close to 8.

4.6 Option Evaluation

The preferred option is a 4 lane undivided 100 km/hr design consistent with the overall plan to upgrade Highway 97 between Peachland and Summerland. This will provide a level of service and safety consistent with projected traffic volumes for the long term.

The existing section is 2.20 km long. The estimated project costs for this section are $7.5 million assuming 2.16 km of new construction at $3.5 million/km.

Results of the Benefit Cost Analysis are presented in Exhibit 4-5 followed by an interpretation of the results.

Exhibit 4-5 Benefit Cost Analysis Highway 97 - North Beach

Discounted Costs (2003 $millions)	
Construction	$7.119
Salvage Value	$1.491
Mtce & Rehab C	$0.016
Total Discounted Cost	$5.644
Discounted Benefits	
Delay Reduction	$6.239
VOC Reduction	$0.508
Accident Reduction	$2.329
Total Discounted Benefits	$9.076
Net Present Value (NPV)	$3.43
NPV/Project Cost	0.45
B/C Ratio	**1.6**
MicroBencost File	NBEACH

The project returns a benefit cost ratio of 1.6. Ratios greater than 1.0 are deemed to be economically beneficial to society. Benefits stem mainly from time savings and secondly from reduced accident costs. Travel time savings derive from improving the alignment to eliminate advisory speed zones, from increasing the capacity and from shortening the traveled distance slightly.

Accident cost savings stem from a reduction in accident rate and severity associated with the higher design standard. There is an estimated 14% overall reduction in accidents and an estimated 35% reduction in fatal accidents. The wider cross section and higher design speed will help to reduce the severity of accidents while the improved alignment would help reduce the number.

4.7 Sensitivity Analysis

This is intended to show the impact of alternative project assumptions on the results. In this case, NPV remains positive over the range of input assumptions tested.

Exhibit 4-6 Sensitivity Analysis

	Sensitivity Option						
	Baseline NPV	4% Discount Rate	8% Discount Rate	+25% Construc-tion Cost	-25% Construc-tion Cost	Traffic Growth +0.5%	Traffic Growth -.5%
	Net Present Value (millions $)						
NPV	3.4	5.7	1.8	1.5	5.3	3.9	3.0

4.8 Project Timing

The optimum timing is the implementation year that would maximize the net present value of the investment. It is measured as the year when the annual rate of return (annual benefits) exceeds the discount rate. A straight line interpolation of annual benefits suggests that this section is near its optimum timing.

Exhibit 4-7 Optimum Timing

Discount Rate	Optimum Timing
4%	1977
6%	1991
8%	2004

4.9 Conclusions and Recommendations

The improvements have the potential to reduce accidents by 14% and fatal accidents by 35%. The added capacity will relieve congestion for the planning period and beyond and contribute to the corridor's role as a high speed north/south route consistent with long term planning objectives.

Based on the positive results of the benefit cost analysis, the growing congestion and bottleneck effect of the Peachland to Summerland section, the North Beach Project should proceed within the overall improvement program for Summerland to Peachland.

5 North Beach to Okanagan Lake Park

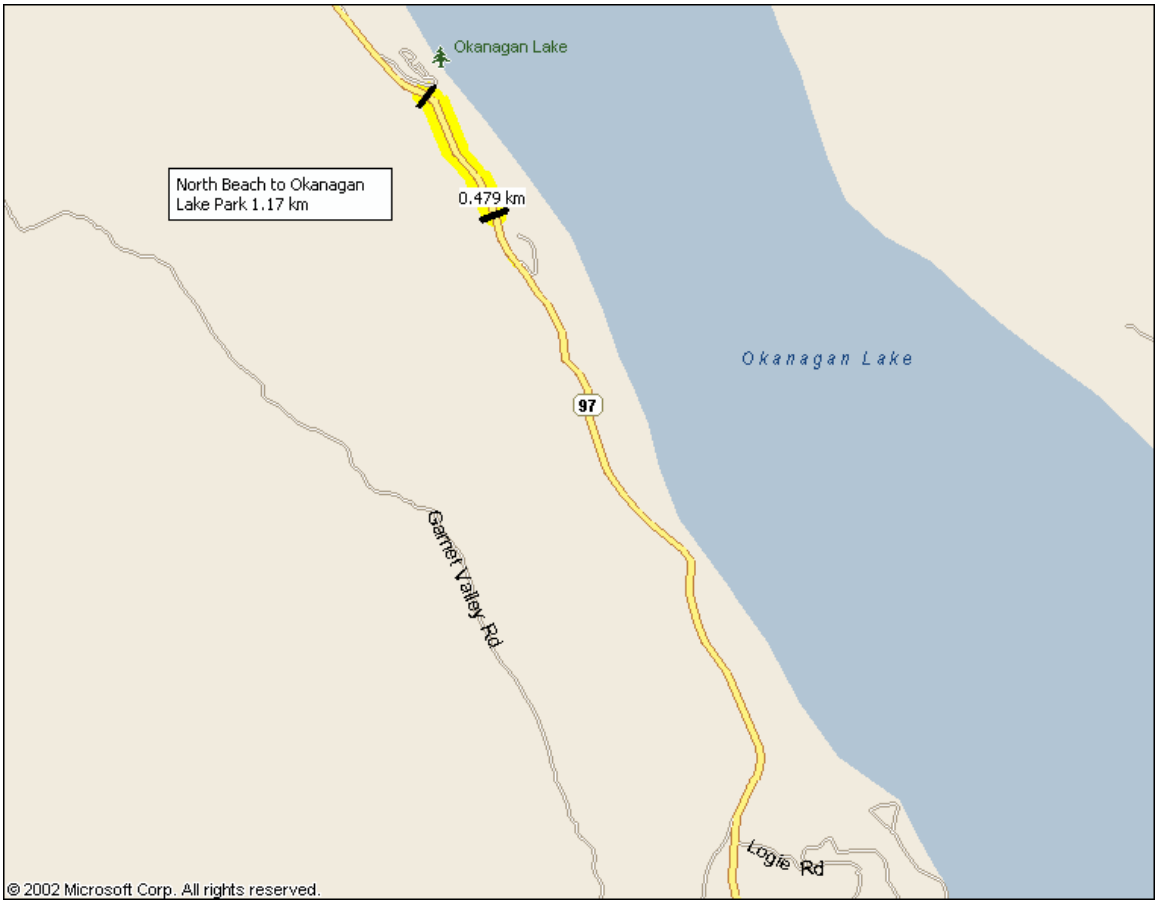
5.1 Purpose

The purpose of this business case is to advance the project to preliminary design and cost estimating. No detailed design has been completed for this section.

5.2 Project Description and Location

This project includes upgrading 1.17 km of rural Highway 97 south of Okanagan Lake Park. between Summerland and Peachland (Segment 1115 LKI 37.0 to 38.17) from a 2 lane 80 km/hr with reduced speed curves to a 4 lane 100 km/hr standard. The general location is shown in Exhibit 5-1.

Exhibit 5-1 North Beach to Okanagan Lake Park



5.3 Mobility

This section is part of the overall Summerland to Peachland segment identified in the SOK CMP as deficient with LOS 'F" projected for 2025. The average posted speed is 77.3 km/hr assuming some influence from the 60 km/hr at the north end of the section.

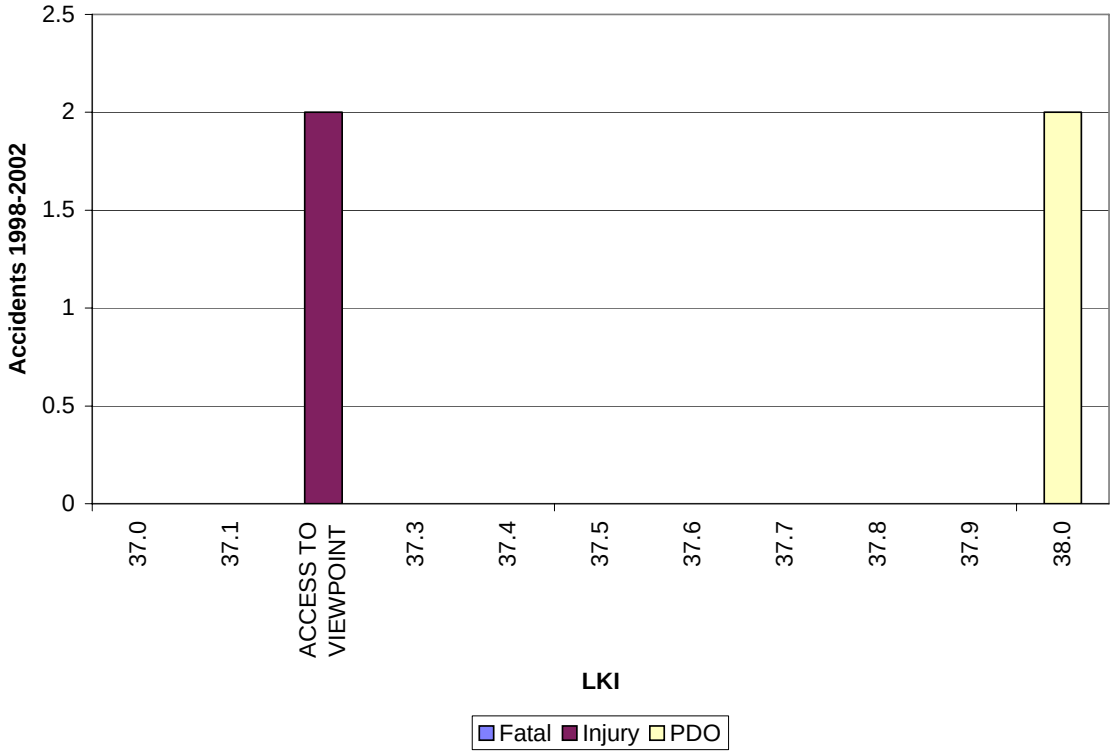
Exhibit 5-2 Posted Speeds

	LKI	Length (km)	Existing	Proposed
Start of section	37.00	0.6	80	90
Advance Warning SLOW sign	37.60	0.414	80	90
60 km/h Advisory NB	38.01	0.156	60	90
End of Section	38.17		60	90
	Wtd. Avg. Posted		77.3	90

5.4 Safety Performance

The existing accident rate in this section is not above the expected rate for a 2 lane highway with this access density. The expected rate is 0.27 a/mvk and the observed rate (based on 4 accidents in 5 years) is 0.17 a/mvk. The rate used for analysis is 0.19 a/mvk. The accident histogram in Exhibit 5-3 shows clustering at the viewpoint access and at the reduced speed curve.

Exhibit 5-3 Accident Histogram 1998 to 2002 - North Beach Road Area



The SOK CMP identified the viewpoint access as a high severity location, but caution should be used since this is likely based on a limited sample size. Existing and proposed safety performance is estimated in Appendix A and summarized here. The proposed case assumes a reduction in accident severity due to the wider cross section but no decrease in rate since the existing rate is already low. It may be that traffic has slowed down by this point due to the upstream speed reductions at reduced speed curves and there is a corresponding reduction in accidents in this section. This situation would reverse if upstream sections are improved leaving this as an isolated 2-lane section.

Exhibit 5-4 Accident Rates Used for Analysis

	Fat	Inj	PDO	Fat & Inj	All
	Number of Accidents (5 years)				
Observed Base Case Accidents (1998 to 2002)	*0*	*2*	*2*	*2*	*4*
Predicted Base Case Accidents (RAU2)	*0.19*	*3.1*	*3.0*	*3.3*	*6.3*
Base Case Estimate used for Analysis	*0.12*	*2.1*	*2.1*	*2.3*	*4.3*
Predicted Accidents for Proposed Case (RAU4)	*0.07*	*2.3*	*2.0*	*2.4*	*4.3*
Accident Reduction Potential (5 yrs)	*0.05*	*-0.1*	*0.1*	*-0.1*	*0.0*
	Accident Rate (a/mvk)				
Observed Base Case Accidents (1998 to 2002)	*0.000*	*0.09*	*0.09*	*0.09*	*0.17*
Predicted Base Case Accidents (RAU2)	*0.008*	*0.13*	*0.13*	*0.14*	*0.27*
Base Case Estimate used for Analysis	*0.005*	*0.09*	*0.09*	*0.10*	*0.19*
Predicted Accidents for Proposed Case (RAU4)	*0.003*	*0.10*	*0.08*	*0.10*	*0.19*
Accident Reduction Potential (5 yrs)	*39%*	*-7%*	*5%*	*-4%*	*0%*

5.5 Summary of Deficiencies

Criteria	*Description*
Safety	The accident rate and severity is below the expected value for a 2 lane rural highway with 1 intersection.
Mobility	With the speed advisories, the average posted speed in this section is 77.3 km/hr compared to a desired 80 km/hr. Truck speeds are low due to grades in both directions.
Geotechnical	Alignment is physically constrained by the steep slopes on the west side of Lake Okanagan
Infrastructure	No substandard structures. Local pavement condition is good with a PCR rating close to 8.

5.6 Option Evaluation

The preferred option is a 4 lane undivided 100 km/hr design consistent with the overall plan to upgrade Highway 97 between Peachland and Summerland. This will provide a level of service and safety consistent with projected traffic volumes for the long term.

The existing section is 1.17 km long. The estimated project costs for this section are $4.0 million assuming 1.15 km of new construction at $3.5 million/km.

Results of the Benefit Cost Analysis are presented in Exhibit 5-5 followed by an interpretation of the results.

Exhibit 5-5 Benefit Cost Analysis Highway 97 - North Beach to Okanagan Lake Park

Discounted Costs (2003 $millions)	
Construction	$3.786
Salvage Value	$0.793
Mtce & Rehab C	$0.123
Total Discounted Cost	$3.116
Discounted Benefits	
Delay Reduction	$2.510
VOC Reduction	$0.326
Accident Reduction	$0.910
Total Discounted Benefits	$3.746
Net Present Value (NPV)	$0.63
NPV/Project Cost	0.16
B/C Ratio	**1.2**
MicroBencost File	NBCH2OKL

The project returns a benefit cost ratio of 1.2. Ratios greater than 1.0 are deemed to be economically beneficial to society. Benefits stem mainly from time savings due to the improved alignment, eliminating advisory speed zones, increasing the capacity and from shortening the traveled distance slightly.

Accident cost savings are minor since the existing accident rate is already lower than expected. As suggested previously, it may be that traffic has slowed down by this point due to the upstream speed reductions at reduced speed curves and there is a corresponding reduction in accidents in this section. Benefits stem from a reduction in accident severity associated with the higher design standard. There is an estimated 39% reduction in fatal accidents, 7% increase in injury accidents and 5% reduction PDO accidents. The wider cross section and higher design speed will help to reduce the severity of accidents and improve consistency with upstream and downstream sections.

5.7 Sensitivity Analysis

This is intended to show the impact of alternative project assumptions on the results. In this case, NPV is sensitive to discount rate and construction cost.

Exhibit 5-6 Sensitivity Analysis

	Sensitivity Option						
	Baseline NPV	4% Discount Rate	8% Discount Rate	+25% Construc-tion Cost	-25% Construc-tion Cost	Traffic Growth +0.5%	Traffic Growth -.5%
	Net Present Value (millions $)						
NPV	0.6	1.5	0.0	-0.4	1.6	0.8	0.4

5.8 Project Timing

The optimum timing is the implementation year that would maximize the net present value of the investment. It is measured as the year when the annual rate of return (annual benefits) exceeds the discount rate. A straight line interpolation of annual benefits suggests that this section is near its optimum timing. Ultimately this is a small section and timing should coincide with adjacent projects in order to avoid leaving an isolated 2-lane section which potentially would become accident prone.

Exhibit 5-7 Optimum Timing

Discount Rate	Optimum Timing
4%	1985
6%	2002
8%	2019

5.9 Conclusions and Recommendations

The improvements have the potential to reduce accident severity but not accident rate. It may be that traffic in this section has slowed down due to the upstream speed reductions at reduced speed curves in other sections and there is a corresponding reduction in accidents in this section. This situation would reverse if upstream sections are improved leaving this as an isolated 2-lane section

The added capacity will relieve congestion for the planning period and beyond and contribute to the corridor's role as a high speed north/south route consistent with long term planning objectives.

Based on the positive results of the benefit cost analysis, the growing congestion and bottleneck effect of the Peachland to Summerland section, the North Beach to Okanagan Lake Park section should proceed within the overall improvement program for Summerland to Peachland.

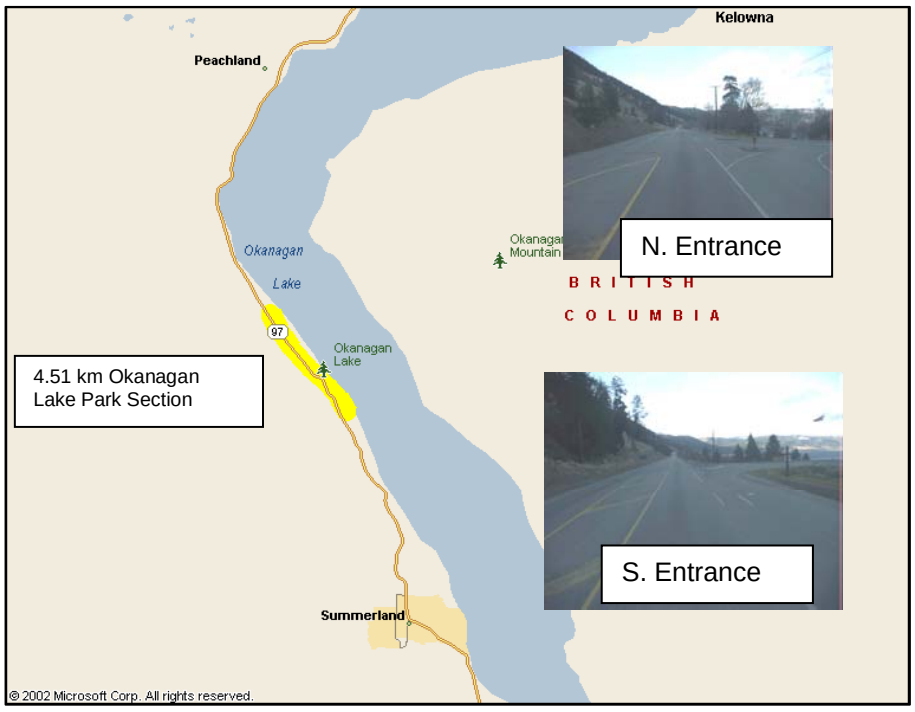
6 Okanagan Lake Park to Greata Ranch - 4 Laning Project 20283

6.1 Introduction

The purpose of this business case is to advance the project to Property Acquisition and Construction over three fiscal years 03/04, 04/05 and 05/06. This project includes upgrading 4.51 km of rural Highway 97 at Okanagan Lake Park (Segment 1115 LKI 38.17 to 42.68) between Peachland and Summerland from a 2 lane 90 km/hr (with a 70 km/hr advisory) to a 4 lane 100 km/hr standard. The general location is shown in Exhibit 6-1 .

Design work and cost estimates for this project have been prepared by McElhanney Engineering[4] for a 4 lane, flush median, 100 km/hr design with a total cost of $16.3 million (excluding sunk costs of $332,000). Subsequent modifications to allow for changes such as drainage plans, retaining walls and eliminating a proposed overpass structure bring the current estimate to $15.65 million.

Exhibit 6-1 General Location



[4] "Okanagan Highway No. 97 - Okanagan Lake Park to Greata Ranch", prepared by McElhanney Engineering Ltd For MoT Southern Interior Region, MoT Project 20283-0001, October 17, 2003.

6.2 Mobility

This section is part of the overall Summerland to Peachland segment identified in the SOK CMP as deficient with LOS 'F" projected for 2025. The average posted speed is 86.5 km/hr.

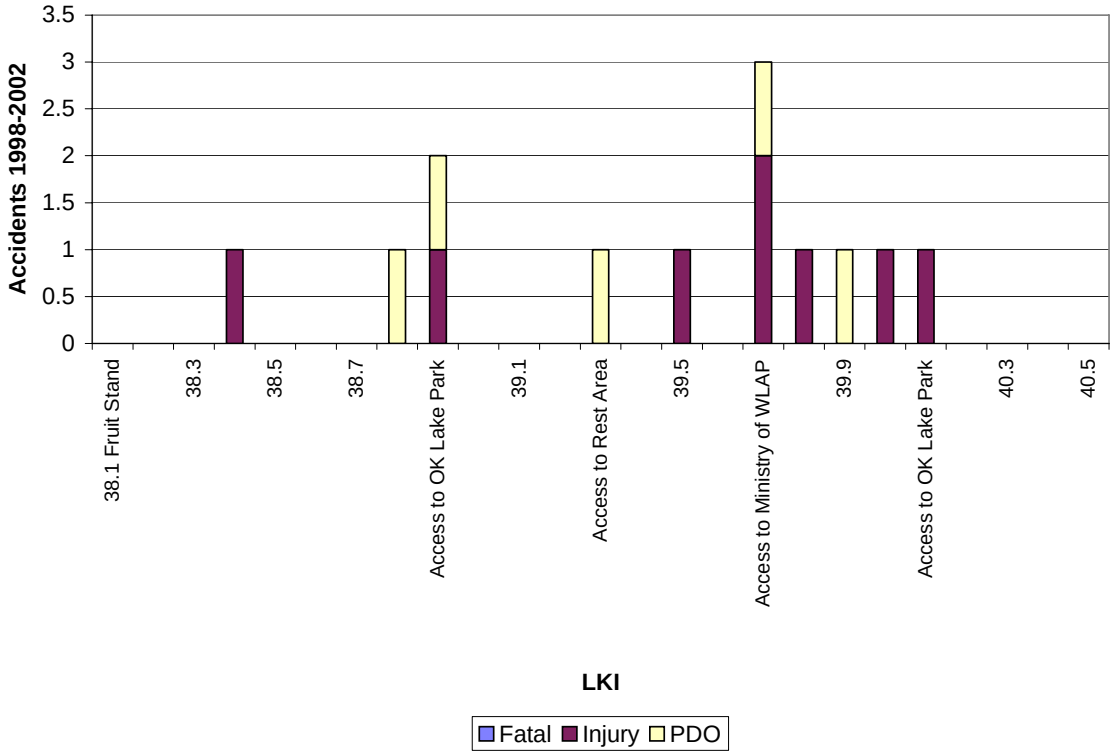
Exhibit 6-2 Posted Speeds

	LKI	Length (km)	Existing Posted	Proposed Posted
	38.17	0.374	90	90
60 km/h Advisory NB	38.54	0.522	60	90
End of 60 km/h Advisory	39.07	0.144	90	90
South Access to Okanagan Lake Park	39.21	0.657	90	90
Access to Provincial Park Office	39.87	0.243	90	90
North Access to Okanagan Lake Park	40.11	1.782	90	90
90 km/h Posted	41.89	0.788	90	90
	42.68			
		Wtd Av Posted	86.5	90

6.3 Safety Performance

The SOK CMP presents collision data from an earlier safety review conducted by MoT using 1991 to 1995 collision statistics. The analysis did not identify any accident prone locations in this section but identified the north access to Okanagan Lake Park as a high severity location based on a limited sample size.

Exhibit 6-3 Accident Histogram 1998 to 2002 - Okanagan Lake Park



The accident analysis for the current business case report uses data for 5 years from 1998 to 2002 for the Okanagan Lake Park section specifically, instead of the longer Bentley Road to Deep Creek Section. These accident statistics are also subsequent to introduction of animal fencing in the mid-1990's which has reduced animal collisions significantly, The estimated existing accident rate in this section is now 0.24 a/mvk which is below the predicted rate of 0.28 a/mvk for rural 2-lane highways but the severity appears greater than expected, confirming the previous findings. Fatal and injury accidents compose 67% of the 21 accidents between 1998 and 2002. Normal expectations for fatal and injury accidents would be 52% for this road class and intersection density. 15 of the 21 accidents between 1998 and 2002 in this segment are head-on and run-off-road accidents suggesting alignment and road width are issues.

There are 3 accesses in this segment including 2 to the Park on the east side and 1 to the office on the west side but these do not appear to be resulting in the right angle or rear-end accidents normally associated with access traffic. The accesses will be improved but remain open in the proposed case. The proposed case is modeled as the equivalent of 2 intersections in order to reflect the intersection improvements.

Existing and proposed safety performance is estimated in 5 steps using a procedure developed for ICBC and augmented by more recent accident algorithms developed for

Provincial MicroBencost[5] defaults from the Provincial HAS database. The steps are detailed in Appendix A and are summarized here in Exhibit 6-4

Exhibit 6-4 Accident Rates Used for Analysis

	Fat	*Inj*	*PDO*	*Fat & Inj*	*All*
	Number of Accidents (5 years)				
Observed Base Case Accidents (1998 to 2002)	2	12	7	14	21
Predicted Base Case Accidents (RAU2)	0.75	12.5	12.1	13.3	25.4
Base Case Estimate used for Analysis	0.60	10.5	10.1	11.1	21.2
Predicted Accidents for Proposed Case (RAU4)	0.39	8.9	8.1	9.3	17.4
Accident Reduction Potential (5 yrs)	0.21	1.6	2.0	1.8	3.8
	Accident Rate (a/mvk)				
Observed Base Case Accidents (1998 to 2002)	0.022	0.13	0.08	0.16	0.24
Predicted Base Case Accidents (RAU2)	0.008	0.14	0.14	0.15	0.28
Base Case Estimate used for Analysis	0.007	0.12	0.11	0.12	0.24
Predicted Accidents for Proposed Case (RAU4)	0.004	0.10	0.09	0.10	0.20
Accident Reduction Potential (5 yrs)	36%	15%	20%	16%	18%

[5] Lyall P., "2003 Update for MicroBencost Default Values" prepared by Apex Engineering Limited for BC MoT, Planning and Major Projects, May 2003.

6.4 Infrastructure

The alignment is physically constrained by the steep slopes on the west side of Lake Okanagan. Historically this section has also experienced some landslide activity but the identified locations are no longer active and the proposed project scope includes mitigation measures to improve stabilization of known slide areas.

There are no substandard bridge structures.

Pavement condition between Summerland and Peachland varies from fair to good with PCI between 6.3 and 7.5 with the majority below 7.0 (fair). No resurfacing for this section has been identified in the Ministry's Multi-Year Resurfacing Program (MYRP).

6.5 Summary of Deficiencies

Criteria	*Description*
Safety	Higher than expected severity with run-off-road and head-on accidents over represented possibly related to alignment and park access. Overall accident rate is not above expected rate for 2-lane highway.
Mobility	Presently operating at LOS 'E' . Will decline to 'F' during the forecast period. There is one 70 km/hr advisory curve in this section. Kaleden to Peachland average is 80 km/hr, due mostly to the low speeds in the Summerland to Peachland section. The target is 80 km/hr or higher.
Infrastructure	There are no substandard structures in this section. Pavement condition varies from fair to good with the majority rated fair. This section has experienced landslide activity but the sites are not currently active and will be mitigated in the scope of the project.

6.6 Recommended Improvements

The recommended option is a 4 lane undivided 100 km/hr design extending 4.51 km, spanning the limits of Okanagan Lake Park and Greata Ranch.. Features of the design include:

- Realigning to 100 km/hr including the 70 km/hr curve at the south end of the project. The cross section will be 4 x 3.6 m lanes, 2.6m flush median, 2.0 m shoulders
- Improving design of the south and north accesses to Okanagan Lake Park to provide channelization and protected acceleration and deceleration lanes for all movements, separating tuning traffic from though traffic.
- Reconstruction of about 1.2 km of park roads and frontage and allowance for future frontage roads.
- Improved access to Greata Ranch with a left-in deceleration lane a right-in slot and reconstruction of about 140 m of access road.
- Over 200m of retaining and slope retention walls
- Mitigation of potential slope instabilities

Transportation in the Okanagan Valley has been investigated through a series of previous studies which have led up to the current project.

The Okanagan Valley Transportation Plan completed in 1997 provided a comprehensive review of travel characteristics and demand forecasts throughout the Okanagan Valley and an evaluation of broader corridor strategies evaluated at a system level. These concluded with the strategy to maintain and improve mobility of the existing highway corridor. Alternative routes were examined but were not recommended.

The 2003 South Okanagan Corridor Management Plan specifically identifies capacity as an issue on Highway 97 between Summerland and Peachland and recommends 4-laning this section.

Exhibit 6-5 presents the summary of capital cost estimates. The total cost is estimated at $15.65 million. This is slightly lower than original estimates due primarily to changes in the drainage plans, retaining walls and elimination of a proposed overpass structure. For analysis purposes, only future costs are included. Sunk costs are excluded. Future costs are $15.3 million.

Exhibit 6-5 Cost Estimates as of November, 2003

Summary of Costs	Sunk (Past) Costs	2003/04	2004/05	2005/06	Total Excl. Sunk Costs	Total Incl. Sunk Costs
Property	27	1,400	10	0	1,410	1,437
Engineering	218	403	159	30	592	810
Construction	87	926	9,181	3,209	13,316	13,403
Total	332	2,729	9,350	3,239	15,318	15,650

6.7 Benefit Cost Results and Interpretation

At the corridor level, there is a mobility problem between Summerland and Peachland on Highway 97. The Okanagan Lake Park 4-laning project is a logical first step in addressing the overall solution. It has already been designed, enjoys local support and is the easiest segment to construct.

Results of the Benefit Cost Analysis are presented in Exhibit 6-6 followed by an interpretation of the results.

Exhibit 6-6 Benefit Cost Analysis Highway 97 - Okanagan Lake Park 4-Laning

Discounted Costs (2003 $millions)	
Construction	$13.59
Salvage Value	$3.09
Mtce & Rehab C	$0.23
Total Discounted Cost	$10.73
Discounted Benefits	
Delay Reduction	$5.9
VOC Reduction	$0.2
Accident Reduction	$4.3
Total Discounted Benefits	$10.4
Net Present Value (NPV)	-$0.36
NPV/Project Cost	-0.02
B/C Ratio	**1.0**
MicroBencost File	OKLAKEPK

The project returns a benefit cost ratio of 1.0. Ratios greater than 1.0 are deemed to be economically beneficial to society. Benefits stem mainly from time savings and reduced accident costs. Travel time is reduced as a result of increased capacity, increased design speed from 90 (with one 70 km/hr advisory) to 100 and from a 2% shorter traveled distance. Accident cost savings stem mainly from a reduction in accident severity. There is an estimated 18% overall reduction in accidents but an estimated 36% reduction in fatal accidents. The accident statistics for this analysis segment suggest that head-on and run-off-road accidents are over-represented. The wider cross section and higher design speed will help to reduce these accidents.

The scope of the project also includes mitigation of potential landslide sites. Benefits related to landslide mitigation have not been evaluated but would reduce the potential for highway closures and property damage.

6.8 Sensitivity Analysis

This is intended to show the impact of alternative project assumptions on the results. In this case, is marginally positive or negative depending on the assumptions.

Exhibit 6-7 Sensitivity Analysis

	Sensitivity Option						
	Baseline NPV	4% Discount Rate	8% Discount Rate	+25% Construc-tion Cost	-25% Construc-tion Cost	Traffic Growth +0.5%	Traffic Growth -.5%
	Net Present Value (millions $)						
NPV	-0.4	2.2	-2.2	-4.2	3.5	0.2	-0.9

6.9 Other Alternatives

Alternative routes were considered at the system level in the 1997 Okanagan Valley Transportation Plan but were not recommended. Other options such as selective passing lanes are possible but at current traffic levels, they will only provide limited relief during peak demand periods. The investment in passing lanes (3-lane sections) may be lost if it cannot be incorporated into a future 4-lane scenarios required during the forecast period. The proposed improvement is an isolated 4 lane section and acts as a long passing lane section providing relief within the treated section and to downstream 2 lane sections. The investment in this option can also be incorporated directly into the ultimate plan for continuous 4-laning.

6.10 Project Timing

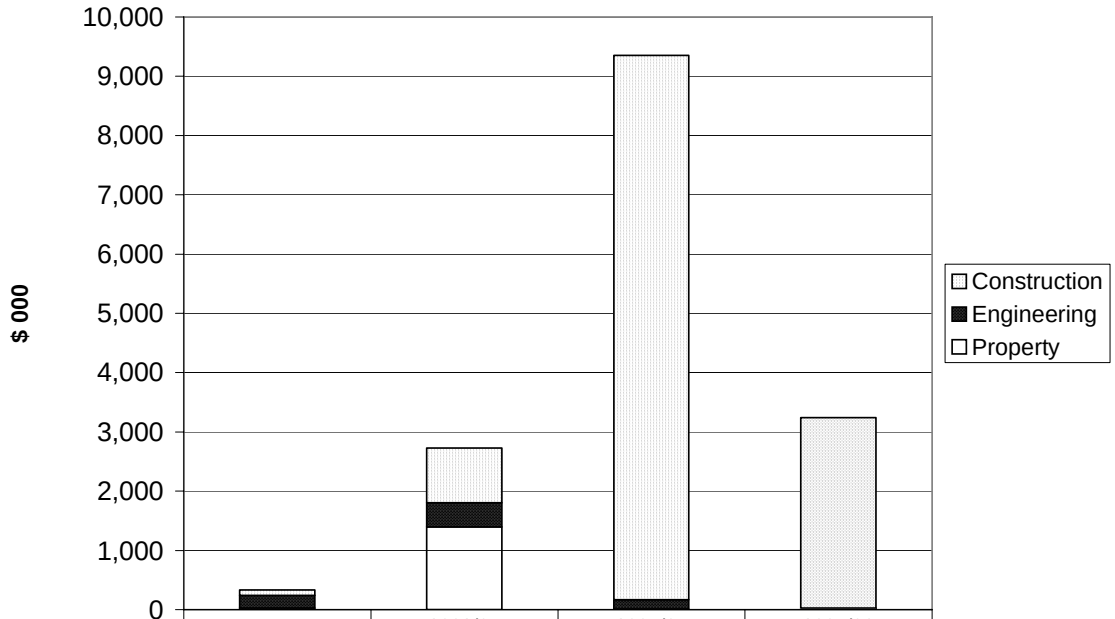
The project may be considered to be at it's optimum timing since it is approaching capacity, there is political and stakeholder support, this location is the easiest to construct between Peachland and Summerland and the project is designed and ready to proceed.

6.11 Implementation

The preferred delivery method of delivery is a conventional tender and unit price contract.

Exhibit 6-8 Delivery Schedule

Activity	Start	Complete
Property Purchase	November 2003 ROW drawings are available now for property purchase to proceed.	March 2004
Tendering	February 2004	February 2004
Construction	April 2004	May 2005



	Past	2003/04	2004/05	2005/06
Construction	87	926	9,181	3,209
Engineering	218	403	159	30
Property	27	1,400	10	0

6.12 Coordination with Other Projects

All of Highway 97 between Summerland and Peachland requires upgrading from 2 lanes to 4 lanes, consistent with traffic volumes and with the 4-lane highway to the north and south. The Okanagan Lake Park Project should proceed as the first stage towards this goal. The priorities for the balance of sections between Peachland and Summerland is now under review.

Coordination with the pavement resurfacing program is not anticipated within the timeframe of this project.

6.13 Stakeholder Communications

Stakeholder consultations conducted as part of the SOK CMP included:

Ministry of Transportation - Steering Committee including the ADM 's of operations, planning and policy, Regional Director Southern Interior Region, Director of Planning Projects, Regional Manager Planning and Partnerships and District Highway Managers. South Okanagan District Staff were also directly involved in the process.

Local and Regional Governments - Informal meetings and workshops involving local and Regional Government administrators, Planning and Engineering Staff, Economic Development and Elected Officials

First Nations - First Nations Communities potentially affected by the CMP area were invited to meeting and workshops and were provided with copies of the reports. MoT Staff met with the Penticton Indian Band.

Other Agencies - Other key stakeholders participated through the local and Regional Government workshops and meetings. These included Ministries of Water, Land and Air Protection, Agriculture, Food and Fisheries and Municipal Affairs, RCMP Detachments, transportation companies, and business, tourism and agriculture representatives

6.14 Technical Risks

Technical risks include:

- Project Delivery - The highway is the only connection between Penticton and Kelowna. In order not to impact this link over 2 seasons the project is scheduled for delivery in 1 year.
- Slide Areas - Three slide areas have been identified. These are being mitigated but still present some risk from loads imposed by added fill in these areas.
- Rock Blasting - There are some properties located below bast areas which will have to be monitored for vibration or blast impacts.

6.15 Conclusions and Recommendations

Based on the positive results of the benefit cost analysis, the growing congestion and bottleneck effect of the Peachland to Summerland section, the support for the project and the ease of construction and readiness for this section, the Okanagan Lake Park Project should proceed as the first step in the overall improvement program.

The improvements have the potential reduce accidents by 18% and fatal accidents by 36%. The added capacity will relieve congestion for the planning period and beyond and contribute to the corridor's role as a high speed north/south route consistent with long term planning objectives.

7 Greata Ranch to Deep Creek

7.1 Purpose

The purpose of this business case is to advance the project to preliminary design and Costing. No detailed design has been completed for this section.

7.2 Project Description and Location

This project includes upgrading 3.81 km of rural Highway 97 In the south of Peachland and north of Okanagan Lake Park (Segment 1115 LKI 42.68 to 46.49) from a 2 lane 90 km/hr with 70 and 50 km/hr speed advisories to a 4 lane 100 km/hr standard. The general location is shown in Exhibit 7-1.

Exhibit 7-1 Greata Ranch Section

7.3 Mobility

This section is part of the overall Summerland to Peachland segment identified in the SOK CMP as deficient with LOS 'F" projected for 2025. Specific to this section are low truck speeds related to grades and frequent speed advisories. The average posted speed is 84.8 km/hr. The average posted speed for the proposed case assumes some speed reduction on the approach to urban Peachland.

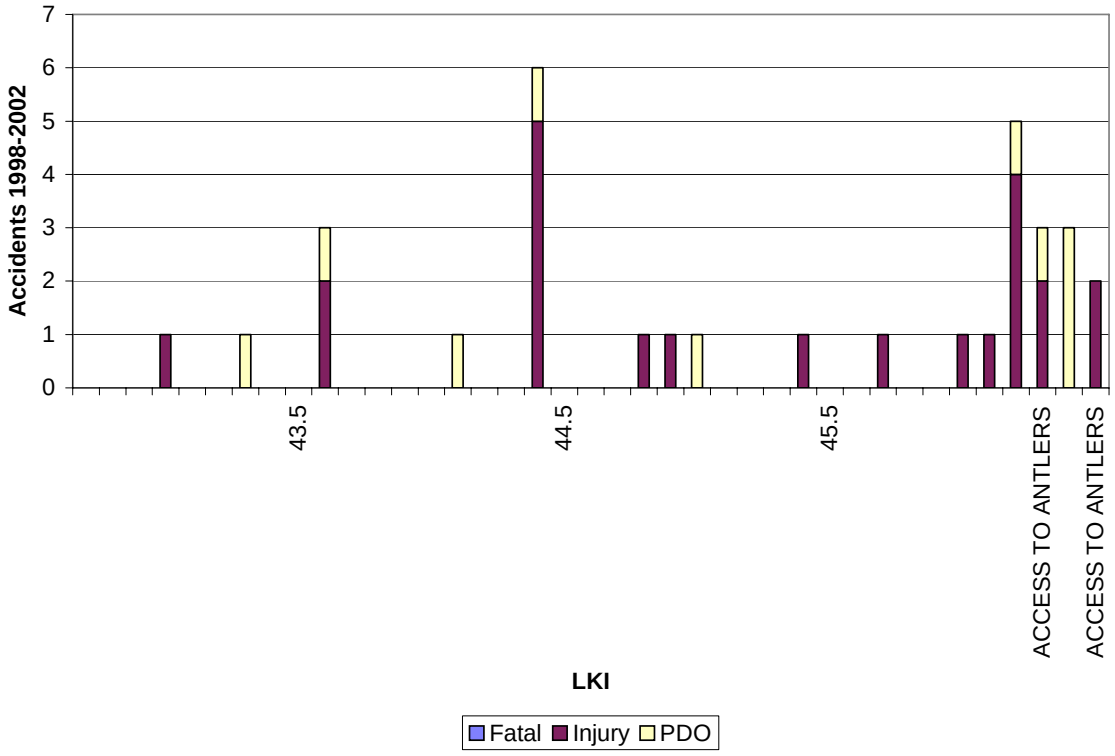
Exhibit 7-2 Posted Speeds

	LKI	Length (km)	Existing	Proposed
Start Section	42.68	1.286	90	90
Brent Road Intersection	43.97	0.819	90	90
Entering Peachland Sign	44.79	0.888	90	90
70 km/h Posted Speed	45.67	0.445	70	90
Antler's Beach Access	46.12	0.199	70	90
50 km/h Speed Advisory NB	46.32	0.173	50	70
End section	46.49			
	Wtd. Avg. Posted		84.8	89.09

7.4 Safety Performance

The existing accident rate is relatively higher than other sections due to the increasing access density and skewed intersections. The observed rate is .42 a/mvk, the expected rate with this access density is .44 a/mvk and the rate used for analysis is 0.43 a/mvk. The accident histogram shows accident clustering at the south and north entrance to Brent Road and at the entrances to Antler Beach Park.

Exhibit 7-3 Accident Histogram 1998 to 2002 - Greata Ranch Section



The SOK CMP identified these locations as accident prone based on 1991 to 1995 data. The accident analysis for the current business case report uses data for 5 years from 1998 to 2002. The estimated existing accident rate in this section is 0.43 a/mvk which is normal for a 2 lane road with this volume. There have been no fatal accidents in this section in the 5 year data period. Existing and proposed safety performance is estimated in Appendix A and summarized in Exhibit 7-4.

Exhibit 7-4 Accident Rates Used for Analysis

	Fat	Inj	PDO	Fat & Inj	All
	Number of Accidents (5 years)				
Observed Base Case Accidents (1998 to 2002)	*0*	*22*	*10*	*22*	*32*
Predicted Base Case Accidents (RAU2)	*0.85*	*16.5*	*15.9*	*17.4*	*33.3*
Base Case Estimate used for Analysis	*0.91*	*15.8*	*15.3*	*16.8*	*32.0*
Predicted Accidents for Proposed Case (RAU4)	*0.53*	*15.2*	*13.2*	*15.7*	*29.0*
Accident Reduction Potential (5 yrs)	*0.38*	*0.6*	*2.0*	*1.0*	*3.1*
	Accident Rate (a/mvk)				
Observed Base Case Accidents (1998 to 2002)	*0.000*	*0.29*	*0.13*	*0.29*	*0.42*
Predicted Base Case Accidents (RAU2)	*0.011*	*0.22*	*0.21*	*0.23*	*0.44*
Base Case Estimate used for Analysis	*0.012*	*0.21*	*0.20*	*0.22*	*0.43*
Predicted Accidents for Proposed Case (RAU4)	*0.007*	*0.20*	*0.18*	*0.21*	*0.38*
Accident Reduction Potential (5 yrs)	*41%*	*4%*	*13%*	*6%*	*10%*

7.5 Summary of Deficiencies

Criteria	*Description*
Safety	The accident rate is relatively high compared to the rest of the Summerland to Peachland corridor but is close to the expected value for a 2 lane rural highway with this access density. The OK CMP identified several accident prone locations, particularly at the skewed Antler Beach intersections.
Mobility	With the speed advisories, the average posted speed in this section is 82 km/hr compared to a desired 80 km/hr.
Geotechnical	Alignment is physically constrained by the steep slopes on the west side of Lake Okanagan
Infrastructure	No substandard structures. Local pavement condition is good with a PCR rating close to 8.

7.6 Option Evaluation

The preferred option is a 4 lane undivided 100 km/hr design consistent with the overall plan to upgrade Highway 97 between Peachland and Summerland. This will provide a level of service and safety consistent with projected traffic volumes for the long term.

The existing section is 3.81 km long. The estimated project costs for this section are $13.2 million assuming 3.77 km of new construction at $3.5 million/km.

Results of the Benefit Cost Analysis are presented in Exhibit 7-5 followed by an interpretation of the results.

Exhibit 7-5 Benefit Cost Analysis Highway 97 - Great Ranch Section

Discounted Costs (2003 $millions)	
Construction	$12.454
Salvage Value	$2.608
Mtce & Rehab C	$0.408
Total Discounted Cost	$10.254
Discounted Benefits	
Delay Reduction	$3.947
VOC Reduction	$0.684
Accident Reduction	$7.404
Total Discounted Benefits	$12.035
Net Present Value (NPV)	$1.78
NPV/Project Cost	0.13
B/C Ratio	**1.2**
MicroBencost File	GREATA

The project returns a benefit cost ratio of 1.2. Ratios greater than 1.0 are deemed to be economically beneficial to society. Benefits stem mainly first accident reduction and second from travel time savings. Travel time savings derive from improving the alignment to eliminate advisory speed zones, from increasing the capacity and from shortening the traveled distance slightly.

Accident cost savings stem from a reduction in accident rate and severity associated with the higher design standard. There is an estimated 10% overall reduction in accidents but an estimated 41% reduction in fatal accidents. The wider cross section and higher design speed will help to reduce the number and severity of accidents.

7.7 Sensitivity Analysis

This is intended to show the impact of alternative project assumptions on the results. In this case, NPV is negative for an 8% discount rate and +25% construction cost.

Exhibit 7-6 Sensitivity Analysis

	Sensitivity Option						
	Baseline NPV	4% Discount Rate	8% Discount Rate	+25% Construc-tion Cost	-25% Construc-tion Cost	Traffic Growth +0.5%	Traffic Growth -.5%
	Net Present Value (millions $)						
NPV	1.8	4.7	-0.4	-1.5	5.1	2.4	1.2

7.8 Project Timing

The optimum timing is the implementation year that would maximize the net present value of the investment. It is measured as the year when the annual rate of return (annual benefits) exceeds the discount rate. A straight line interpolation of annual benefits suggests that this section is near its optimum timing.

Exhibit 7-7 Optimum Timing

Discount Rate	Optimum Timing
4%	1989
6%	2004
8%	2020

7.9 Conclusions and Recommendations

The improvements have the potential to reduce accidents by 10% and fatal accidents by 41%. The added capacity will relieve congestion for the planning period and beyond and contribute to the corridor's role as a high speed north/south route consistent with long term planning objectives.

Based on the positive results of the benefit cost analysis, the growing congestion and bottleneck effect of the Peachland to Summerland section, the Greata Ranch Section should proceed within the overall improvement program for Summerland to Peachland.

8 Summary

8.1 Purpose

The purpose of this business case summary is to assess all 5 segments as a whole to advance the project to subsequent design and or construction stages. At this time, detailed design has been completed for the Okanagan Lake Park section only.

8.2 Project Description and Location

This project includes upgrading 14.98 km of Highway 97 between Peachland and Summerland (Segment 1115 LKI 31.51 to 46.49) from a 2 lane 90 km/hr with frequent speed advisories to a 4 lane 100 km/hr standard, posted 90 km/hr.

8.3 Mobility

This section is part of the overall Summerland to Peachland segment identified in the SOK CMP as deficient with LOS 'F" projected for 2025. There are several sections with low truck speeds related to grades and frequent speed advisories. The average posted speed is 80.5 km/hr. The proposed improvements will increase this by 11% to 89.7 km/hr and provide adequate capacity beyond the 25 year planning horizon.

Exhibit 8-1 Posted Speeds

	1 Bentley Rd to N. Beach	**2** N. Beach	**3** N.Beach to OK Park	**4** OK Park	**5** Greata Ranch	Total
LKI Segment	1115	1115	1115	1115	1115	1115
Start	31.51	34.80	37.00	38.17	42.68	31.51
End	34.80	37.00	38.17	42.68	46.49	46.49
Length (km)	3.29	2.20	1.17	4.51	3.81	14.98
	Average Posted Speed (km/hr)					
Existing	73.6	72.6	77.3	86.5	84.8	80.5
Proposed	90.0	89.3	90.0	90.0	89.1	89.7
% Increase	22%	23%	16%	4%	5%	11%

8.4 Safety Performance

The existing accident rate (0.28 a/mvk) is generally not above the expected rate for 2 lane rural highways (0.45 a/mvk). There is an estimated 4% overall accident reduction and a 32% fatal accident reduction. The accident histogram shows accident clustering at the south and north entrance to Brent Road and at the entrances to Antler Beach Park. Existing and proposed safety performance is summarized in Exhibit 8-3.

Exhibit 8-2 Accident Histogram 1998 to 2002 - Bentley Road to Greata Ranch

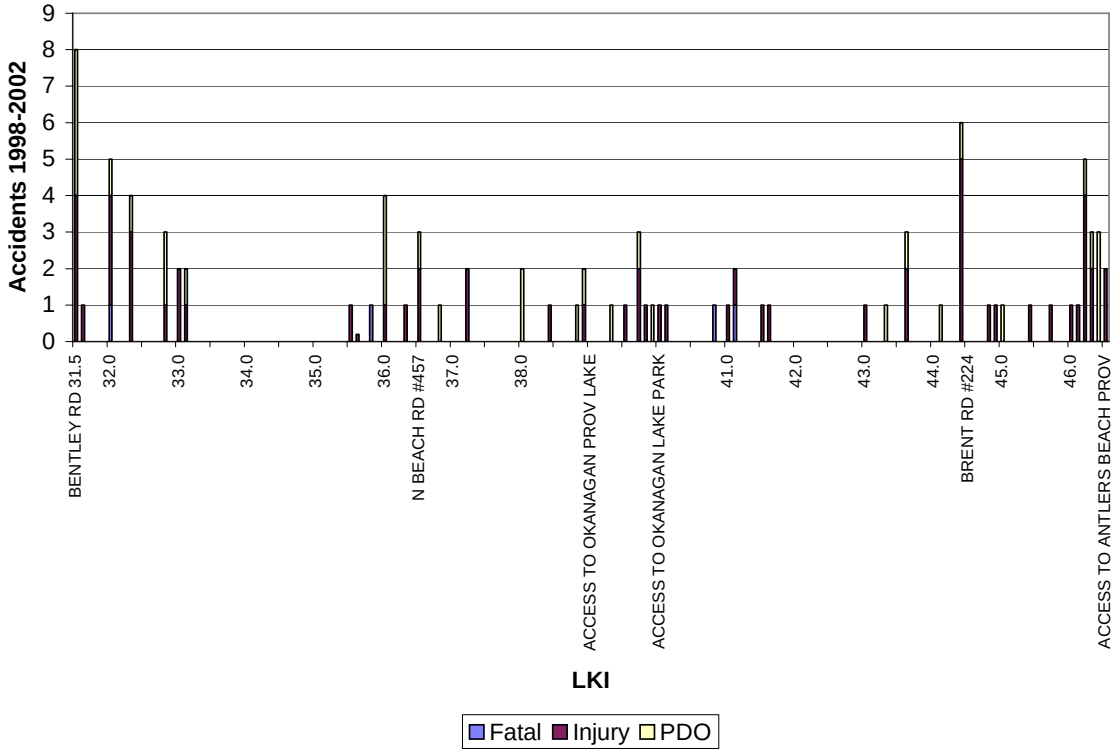


Exhibit 8-3 Accident Rates Used for Analysis

	Fat	Inj	PDO	Fat & Inj	All
	Number of Accidents (5 years)				
Observed Base Case Accidents (1998 to 2002)	*4*	*53*	*27*	*57*	*84*
Predicted Base Case Accidents (RAU2)	*2.83*	*51.3*	*49.4*	*54.1*	*103.5*
Base Case Estimate used for Analysis	*2.39*	*41.6*	*40.2*	*44.0*	*84.2*
Predicted Accidents for Proposed Case (RAU4)	*1.62*	*41.9*	*37.3*	*43.5*	*80.8*
Accident Reduction Potential (5 yrs)	*0.77*	*-0.3*	*2.9*	*0.5*	*3.4*
	Accident Rate (a/mvk)				
Observed Base Case Accidents (1998 to 2002)	*0.014*	*0.18*	*0.09*	*0.19*	*0.28*
Predicted Base Case Accidents (RAU2)	*0.010*	*0.17*	*0.17*	*0.18*	*0.35*
Base Case Estimate used for Analysis	*0.008*	*0.14*	*0.14*	*0.15*	*0.28*
Predicted Accidents for Proposed Case (RAU4)	*0.005*	*0.14*	*0.13*	*0.15*	*0.27*
Accident Reduction Potential (5 yrs)	*32%*	*-1%*	*7%*	*1%*	*4%*

8.5 Summary of Deficiencies

Criteria	*Description*
Safety	Accident rates are generally not above expected rates for a 2 lane highway. There is a higher frequency of run-off road and head-on accidents which may be the result of the frequent substandard curves. Generally there is accident clustering at these curves where they first appear and at major intersections.
Mobility	With the frequent speed advisories, average posted speed in the corridor is section is 80.5 km/hr compared to a desired 90 to 100 for high speed rural segments.
Geotechnical	Alignment is physically constrained by the steep slopes on the west side of Lake Okanagan. Some historical landslide sites have been identified in the Okanagan Lake Park Section.
Infrastructure	There are no substandard structures. Local pavement condition is generally good with a PCR rating close to 8.

8.6 Option Evaluation

The preferred option is a 4 lane undivided 100 km/hr design consistent with the overall plan to upgrade Highway 97 between Peachland and Summerland. This will provide a level of service and safety consistent with projected traffic volumes for the long term.

Overall, the 5 individual sections extend 14.98km between Summerland and Peachland. The estimated project costs are $51.4 million. Results of the individual Benefit Cost Analyses are presented in Exhibit 8-4 followed by an interpretation of the results.

Exhibit 8-4 Benefit Cost Analysis Highway 97 - Summary -Summerland to Peachland

	1 Bentley Rd to N. Beach	**2** N. Beach	**3** N.Beach to OK Park	**4** OK Park	**5** Greata Ranch to Deep Creek	Total
LKI Segment	1115	1115	1115	1115	1115	1115
from	31.51	34.80	37.00	37.98	42.48	31.51
to	34.80	37.00	38.00	42.48	46.50	46.50
Length (km)	3.29	2.20	1.00	4.51	4.02	15.02
MBC Results	**Discounted Costs (2003 $)**					
Project Cost	10.65	7.12	3.79	13.59	12.45	47.60
Salvage Value	2.23	1.49	0.79	3.09	2.61	10.22
Increased Mtce & Rehab Cost	0.32	0.02	0.12	0.23	0.41	1.10
Total Discounted Cost	8.74	5.64	3.12	10.73	10.25	38.48
	Total Discounted Benefits					
Delay Reduction	7.88	6.24	2.51	5.86	3.95	26.44
VOC Reduction	0.75	0.51	0.33	0.18	0.68	2.44
Accident Reduction	3.27	2.33	0.91	4.33	7.40	18.25
Total Discounted Benefit	11.90	9.08	3.75	10.37	12.04	47.13
Net Present Value (NPV)	3.17	3.43	0.63	-0.36	1.78	8.65
NPV/Project Cost	0.28	0.45	0.16	-0.02	0.13	0.17
B/C Ratio	1.4	1.6	1.2	1.0	1.2	1.22

The overall project returns a benefit cost ratio of 1.22. Ratios greater than 1.0 are deemed to be economically beneficial to society. Benefits stem first from time savings and second from accident savings. Travel time savings derive from improving the alignment to eliminate advisory speed zones, from increasing the capacity and from shortening the traveled distance slightly.

Accident cost savings stem from a small reduction in accident rate and a larger reduction in severity associated with the higher design standard. There is an estimated 4% overall reduction in accidents but an estimated 32% reduction in fatal accidents. The wider cross section and higher design speed will help to reduce the number and severity of accidents.

8.7 Sensitivity Analysis

This is intended to show the impact of alternative project assumptions on the results. In this case, NPV for the overall Summerland to Peachland Corridor becomes negative with a 25% increases in construction cost.

Exhibit 8-5 Sensitivity Analysis

	Sensitivity Option						
	Baseline NPV	4% Discount Rate	8% Discount Rate	+25% Construc-tion Cost	-25% Construc-tion Cost	Traffic Growth +0.5%	Traffic Growth -.5%
	Net Present Value (millions $)						
NPV	8.7	20.2	0.2	-4.2	21.5	11.2	6.3

8.8 Conclusions and Recommendations

The overall assessment for Four-laning Highway 97 between Summerland and Peachland returns a positive B/C ratio = 1.22 which supports proceeding with the project as a whole in the benefit cost perspective. It can also be supported operationally since this section of highway is now operating at LOS 'E' and has been identified in previous studies as the lowest level of service on Highway 97 south of Kelowna.

Overall, the project has the potential to reduce fatal accidents by 32% and total accidents by 4%. This amounts to one fatal accident every 6.5 years. Average posted speed will increase 11% from 80 to 90 km/hr. The increases in average travel speed during peak periods will be more pronounced with increases of 20 to 30 km/hr.

The comparative performance of each section is summarized in Exhibit 8-6.

Exhibit 8-6 Performance Summary by Section

	Bentley Rd to N. Beach	N. Beach	N.Beach to OK Park	Okanagan Lake Park	Greata Ranch to Deep Creek
Length (km)	3.29	2.20	1.17	4.51	3.81
Substandard Curves	2	2	1	1	2
Average Posted Speed (existing)	73.6	72.6	77.3	86.5	84.8
Existing Accident Rate (a/mvk)	0.28	0.25	0.19	0.24	0.43
Number of Accidents (1998-2002)	18	11	4	87	32
Accident Reduction Potential (5 yrs)	0.59	1.56	0.00	3.75	4.48
B/C Ratio	1.4	1.6	1.2	1.0	1.2
Project Cost ($millions)	11.3	7.5	4.0	15.3	13.2

With overall project costs estimated to be $51.5 million, the project will have to be completed in stages. The Okanagan Lake Park does not have the highest B/C ratio but is already designed, enjoys good local support and is the most constructable in the corridor making it the logical first priority for practical reasons.

For construction purposes, the second priority should be package which includes Sections 1, 2 and 3 from Bentley Road to Okanagan Lake Park. Collectively, these sections return a benefit cost ratio of 1.4. They are adjacent sections which facilitates construction and will make continuous the 4 lane highway to the south of Bentley Road all the way to the remaining Greata Ranch to Deep Creek Section.

The third priority is the Greata Ranch to Deep Creek Section, which has a generally better existing alignment compared to Bentley Road to Okanagan Lake Park section.

The initial improvements from Okanagan Lake to Greata Ranch will provide some relief in terms of passing opportunity but continued improvement of the remaining sections should be considered in order to address safety, driver expectations and construction efficiencies. It is recommended that the project proceed to preliminary design to confirm cost estimates and review project priorities.

Appendix A
Accident Rate Calculations

Existing and proposed safety performance is estimated in 5 steps using a procedure developed for ICBC and augmented by more recent accident algorithms developed for Provincial MicroBencost[6] defaults from the Provincial HAS database. The steps used for each segment are summarized here.

1. The accident rate and severity are calculated for the existing highway analysis section based on observed data.
2. A second calculation is done to predict what the expected base case safety performance would be using Provincial accident prediction algorithms for the existing service class and number of intersections in the analysis section.
3. A weighted average of the predicted and observed safety performance is calculated (empirical Bayes Estimate) in order to correct for sample size and regression to the mean. This average is used to represent the base case. Severity is based on Provincial average for RAU2 instead of the observed data. This corrects for the portion of fatal accidents which has the greatest impact on benefit cost results but is often based on the least amount of data
4. The proposed case accident rate is estimated using Provincial models for RAU4 to estimate the section (mid-block) accidents and the IHSDM model to predict intersection accidents.
5. The accident reduction potential is the number and severity of accidents expected to be prevented in 5 years.

[6] Lyall P., "2003 Update for MicroBencost Default Values" prepared by Apex Engineering Limited for BC MoT, Planning and Major Projects, May 2003.