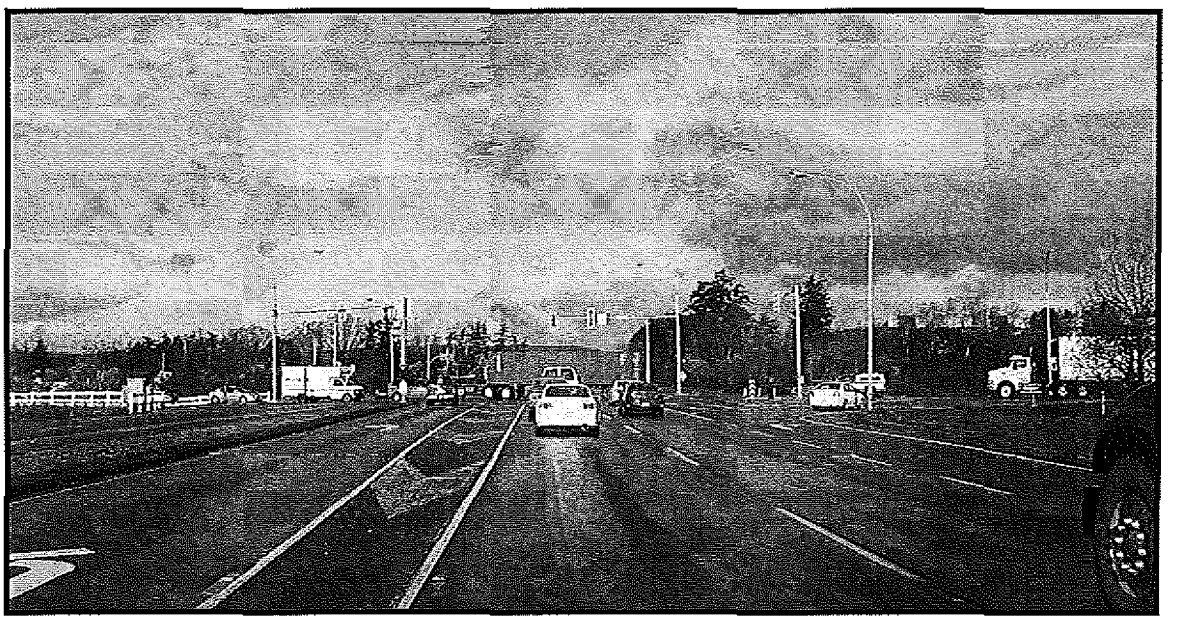
FINAL REPORT

BRITISH COLUMBIA

Ministry of Transportation

Highway 1 Corridor Long-Term Strategic Options

(Millstream Road to Tillicum Road)



1961.0216.04 / July 23, 2007

URBANSYSTEMS.
2353 - 13353 Commerce Parkway
Richmond BC V6V 3A1
Telephone: 604-273-8700
Fax: 604-273-8752

2353 - 13353 Commerce Parkway, Richmond, BC V6V 3A1
Telephone: 604-273-8700 Fax: 604-273-8752

URBANSYSTEMS.

August 2, 2007 File: 1961.0216.04

Ministry of Transportation
3rd Floor - 2100 Labieux Road
Nanaimo, BC V9T 6E9

Attention: David Edgar, P.Eng., Transportation Planning Engineer

RE: Highway 1 Corridor Long-Term Strategic Options - Final Report

We are pleased to provide you with 4 copies of the above-noted report. This technical study outlines existing and future conditions along the Highway 1 corridor without significant changes to the Highway and the surrounding area network. The study also examines potential long-term improvement strategies for the Highway 1 corridor between Millstream Road and Tillicum Road, including the provision of additional capacity for general purpose traffic, bus lanes, high occupant vehicles and other priority modes. Recommendations for development of long-term strategies are presented for consideration and discussion with the Ministry of Transportation and other local transportation agencies.

We would like to thank you for the opportunity to work on this assignment, and if you have any questions, please do not hesitate to contact the undersigned.

Yours truly,

URBAN SYSTEMS LTD.

John Steiner, M.Eng., MCIP
Principal

/gd

U:\Projects_VAN\1961\0216\04\R-Reports-Studies-Documents\Final\2007-08-02_DEdgar_Final Report Transmittal.doc

TABLE OF CONTENTS

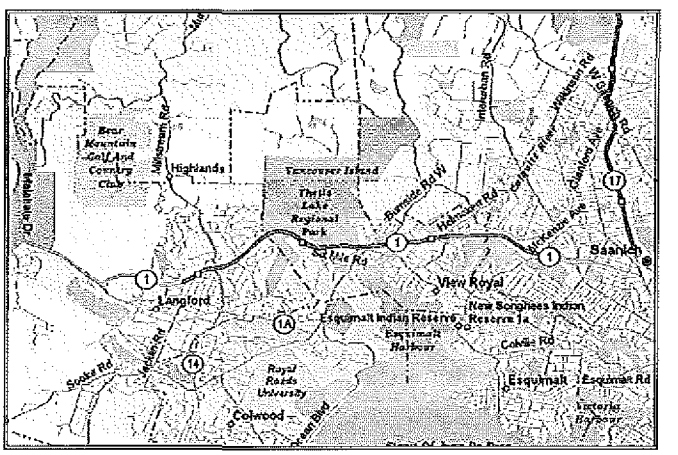
APPENDICES

LIST OF FIGURES

LIST OF TABLES

EXECUTIVE SUMMARY

Purpose & Objectives



This study of the Highway 1 corridor between Millstream and Tillicum considers potential long-term improvement strategies to the Highway as well as the intersection of McKenzie and Highway 1. Because this is a technical study of long-term strategic options to assist with discussions of possible directions, available information and models are used as much as possible. This ensures that most effort is spent on examining potential constraints and opportunities. It should be recognized that the Ministry will eventually need a complete Multiple Account Evaluation and Business Case for any long-term direction that would be required for one or more of the candidate improvement strategies examined within this review.

The following study objectives were established at the outset of the assignment.

- To summarize existing travel and collision patterns along the Highway 1;
- To examine long-term traffic demands (2026) along the Highway 1 corridor;
- To identify potential long-term improvement opportunities for the corridor, including the provision of priority vehicle lanes, as well as the network connections with the intersection of Admirals and McKenzie;
- To provide recommendations for the Ministry of Transportation to guide the planning work of other agencies along the Highway 1 corridor as well as the surrounding area transportation system.

Problem Definition Summary

The assessment of historical, current and forecast conditions suggests that the status quo along the Highway 1 corridor and the ongoing lack of alternative east-west roadway network in the Capital Region to support local commuter trips will have a dramatic impact on mobility in the region. Specific to the Highway 1 corridor, forecast traffic volumes are projected to increase in the peak direction substantially as a result of regional and provincial growth on Vancouver Island.

Because of the lack of a municipal roadway network to support east-west travel demands in the Capital Region, a disproportional amount of the traffic growth is forced to use the Highway 1 corridor. In fact, the forecast traffic demands are beyond the theoretical capacity of the Highway even if it were widened to six travel lanes between the Millstream Interchange and Admirals/McKenzie.

East of McKenzie Avenue, there are no plans to expand the Highway or any major roadways within the City of Victoria and District of Saanich, other than local area improvements. In fact, the capacity of the Douglas Street corridor will be reduced with the implementation of median bus only lanes between Saanich Road and Downtown Victoria. With limited expansion of the capacity of the local area network and provision of an effective major road system beyond the Highway 1 corridor, the overall capacity of the network at the eastern end of the corridor will not be capable of handling significant increases in traffic volumes. Without change, the morning and afternoon corridor and intersection delays will increase dramatically.

Without new or significantly improved major roadways at the eastern end of the Highway 1 corridor, the effective benefits of increasing the Highway capacity could not be completely realized. The delays experienced along the adjacent roadway network that is in place today would only increase, thus marginalizing the benefits of any investment in capacity improvements along the Highway for general purpose traffic.

Rather than investing in capacity improvements for general purpose travel on the Highway through to Victoria and Saanich, the Ministry may want to give consideration to potential improvements for trips that are concentrated on the connection between Highway 1 and Highway 17 in addition to enhancements to reduce potential impacts on high priority vehicles including buses, high-occupant vehicles and trucks.

Candidate Improvement Strategies and Recommendations

It is recognized that the Ministry of Transportation is not planning to implement specific capital improvements for the Highway 1 corridor at this time. Rather, the following discussion summarizes the potential range of long-term strategic directions and provides recommendations to guide current and future planning work, such as BC Transit's review of alternative bus lane concepts.

a. Do Nothing

The "Do Nothing" strategy means maintaining the four general purpose lanes on the Highway 1 corridor between the Millstream Interchange and Saanich Road, that will ultimately connect with the center bus lane concept planned along Douglas Street to Downtown Victoria. Maintaining the

status quo along the Highway corridor and the adjacent roadway network will eventually result in the following outcomes that should be considered in a long-term strategy:

- Traffic growth along the Highway 1 corridor will increase by as much as 70% between today and 2026.
- The delays along the Highway and the Old Island Highway will increase dramatically in the long-term.
- The average travel speeds in peak periods along the Highway 1 corridor is projected to decrease from approximately 52km/hr today to less than 16km/hr in 2026. Assuming that the projected travel demands continue to rise as projected, vehicle emissions will increase exponentially with the significant decrease in vehicle speeds.
- Peak directional travel times for all traffic along the Highway 1 corridor between the Millstream Interchange and Saanich Road during the peak hour will increase from slightly less than 15 minutes today to almost 40 minutes in 2026. As the capacity of the Highway can not support the projected demands, the peak periods will become longer within the region and travel times will increase and as a result will the impact individual travel choices – when and how people travel.
- The major roadway network connecting to the Highway 1 corridor in the City of Victoria and District of Saanich can not support the significant increases in traffic volumes. In fact, the capacity of the Douglas Street corridor will also be reduced with the introduction of a centre-median bus lane.

The "Do Nothing" option is not recommended due to the significant increases in delays and congestion along the Highway 1 corridor, as well as the surrounding area networks. Travel times along the Highway 1 corridor between the Millstream Interchange and Saanich Road will increase dramatically (from approximately 15 minutes today to almost 40 minutes in 2026), peak periods will become longer and priority modes such as transit and goods movement will be negatively impacted. Overall, these patterns will result in significantly reduced average travel speeds along many of the major roads in the Region that will in turn increase greenhouse gas emissions.

b. Bus Only Lanes

In 2004, BC Transit began work with the City of Victoria, District of Saanich and the Ministry of Transportation on the development of the BRT (Bus Rapid Transit) system along the Douglas Street corridor. This facility and service will give transit a competitive edge over using the automobile for travelling into the core area of the region, and provide a more affordable and sustainable transportation approach to accommodating growth in the region. The specific components of the planned facility will be implemented in phases as follows:

- Central traffic control system to improve traffic flow on Douglas Street and the implementation of signal priority for buses.
- Dedicated transit only lanes in the centre of Douglas Street from downtown to Saanich Road.
- Develop a rapid bus service network along the Highway 1 corridor through to Langford.

In order to advance planning for the western extension of BRT, BC Transit has been working with the Ministry of Transportation and other agencies on the development and evaluation of transit only lanes concepts along the Highway 1 corridor. In general, these concepts have included both dedicated bus only lanes operating in the centre lanes as well as shoulder busway facilities as illustrated in Figure E.1.

In general terms, the following table (Table E.1) highlights the anticipated services as well as resulting capacity and short-term ridership with BRT facilities along the Highway 1 corridor. As indicated, transit services would be increased and the travel times between Langford and Downtown Victoria would decrease by approximately 18 minutes (a reduction by almost 40%). With increased services, reduced travel time and enhanced reliability, it is anticipated that ridership would also increase by as much as 25% in the short-term.

Table E.1
Proposed Transit System Changes with BRT

Transit System Features	Today	With Dedicated BRT Lanes
Service Frequency *(along Highway 1)*	8 min	5 min
Langford to Downtown		
Travel Distance	19 km	19 km
Travel Time	48 min	30 min
Average Speed	24 km/hr	38 km/hr
Transit System Capacity *(along Highway 1)*	1600 passengers	1800 passengers
Transit Ridership *(peak hour on Highway 1)*	1200 passengers	1600 passengers

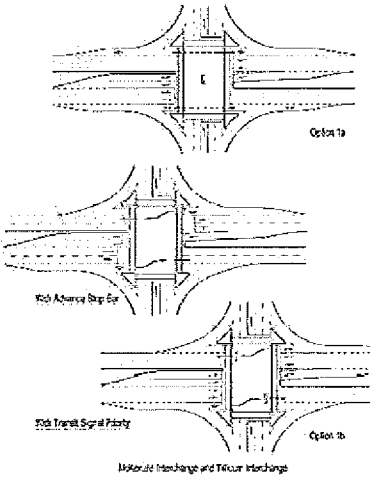
It is expected that this strategic direction can reduce delays and congestion forecast with a "do nothing" scenario and will minimize greenhouse gas impacts. Based on the preliminary assessment of priority treatments examined by BC Transit along the Highway 1 corridor, shoulder bus lanes would provide significant transportation system benefits for approximately $8 million. Other options for outside and median bus lanes are more costly and provide comparable benefits to the shoulder lane option. The outside bus lane would likely only be required if the Ministry chose to preserve the potential for high priority vehicle usage. The median option would limit the

range of potential longer term improvements for the Admirals/McKenzie intersection if desired to address capacity and safety issues. The Ministry should continue to work with BC Transit in the development and evaluation of these strategic short to medium-term improvement options.

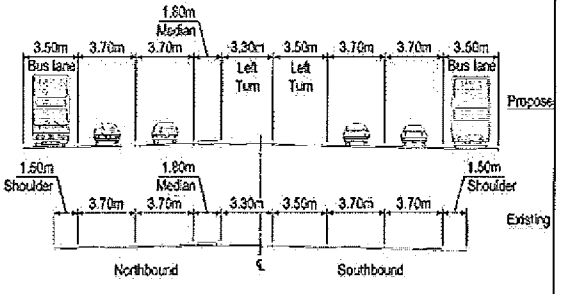
Figure E.1
Potential Transit System Enhancements

1. Queue Jumpers

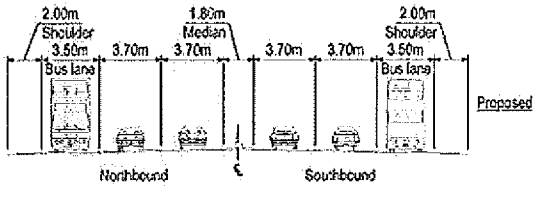
a. Southbound queue jumpers at McKenzie and Tillicum.
b. Modified southbound queue jumpers at McKenzie and Tillicum



2. Shoulder bus lanes – Thetis Interchange to Saanich Road

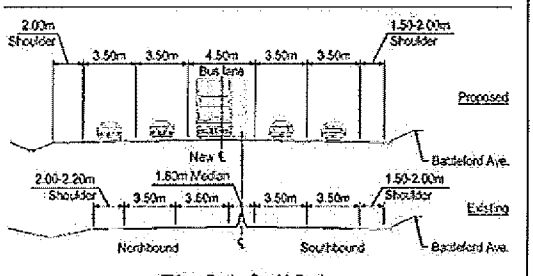


3. Outside bus lanes – Thetis Interchange to Saanich Road

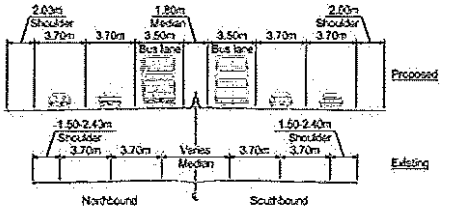


Typical Cross-Section
(Widening takes place in a similar manner as Option 2, for each segment of the corridor)

4. Reversible median bus lane – McKenzie Avenue to Saanich Road



Tillicum Road - Saanich Road

5. Median Bus Lanes – Thetis Interchange to Saanich Road	6. Outside bus lanes (Thetis to Tillicum) and Median Bus Lane (Tillicum Road to Saanich Road)
	

c. High Priority Lanes

Future expansion of the Highway 1 corridor may also include provisions for other high priority vehicles in dedicated lanes along the Highway, either centre lane or outside lane facilities. In connection with this policy direction, the TravelChoices strategy identified an inter-municipal network of roads in the Capital Region that are designed to serve priority vehicles – such as HOVs, transit, trucks and bicycles. In other words, the importance of these corridors in serving priority modes of travel is recognized and potential improvements along these routes should ideally be designed to support these modes. The Highway 1 corridor was identified as a priority corridor supporting provincial as well as inter-municipal travel in the Capital Region.

High priority vehicle lanes for HOV and/or trucks along the Highway 1 corridor may be considered further by the Ministry as a longer-term use where there is strong commitment from local municipalities to expand the network of high priority vehicle facilities as well as support strategies to encourage ridesharing as identified within the TravelChoices Strategy.

d. Improvements for General Purpose Traffic

As previously described, many background studies (including the TravelChoices Strategy) have anticipated that the Highway 1 corridor would eventually be widened from four to six lanes between the Thetis Interchange and McKenzie Avenue. It is acknowledged however that no policy direction for the operation of the additional lanes has been developed. In addition to the widening of the Highway, consideration has also been given toward some form of major upgrade to the intersection of Highway 1 at McKenzie Avenue and Admirals Road. These improvements ranged from additional eastbound and westbound through lanes to complete grade-separation such as the provision of a diamond interchange. Figure E.2 summarizes the six options that were identified in a recent study based on discussions with the Ministry of Transportation.

Even with the widening of the Highway and provision of an interchange at Admirals/McKenzie, the majority of the increase in long-term peak traffic along the Highway 1 corridor is generated to and from areas east of McKenzie Avenue to the Victoria and southern areas of Saanich – such as Town

and Country. In fact, background transportation models examined as part of this study indicate that the growth in traffic between Highway 1 west and Highway 17 is relatively modest.

Figure E.2
Potential Improvement Options for McKenzie Intersection*

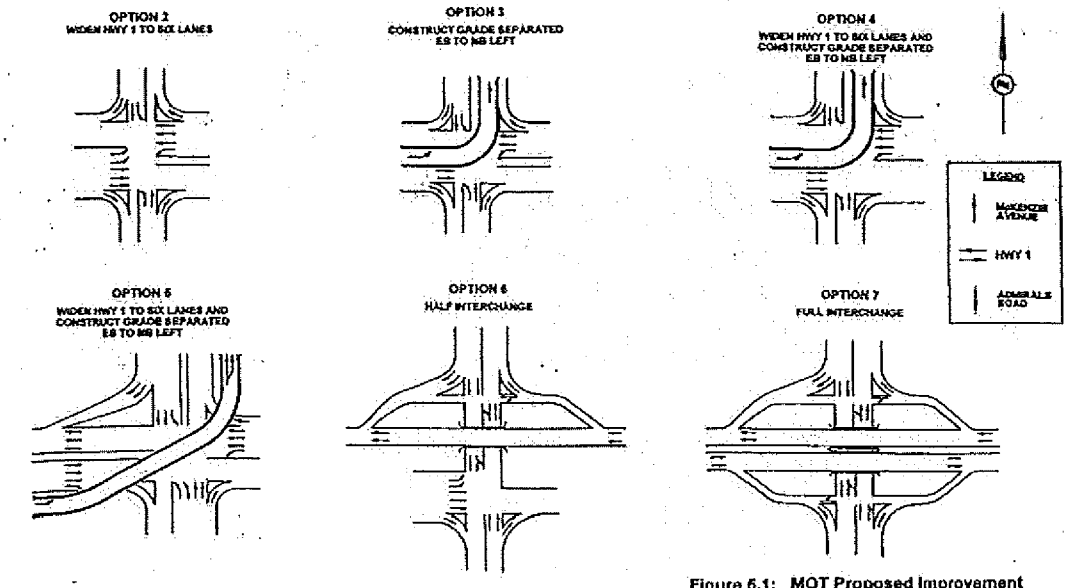


Figure 5.1: MOT Proposed Improvement Options for McKenzie Intersection

*Source: McElhanney Highway 1 Bus Lanes, Victoria – Conceptual Planning Report (April, 2007)

Capacity improvements at the Highway 1 and Admirals/McKenzie intersection should continue to be preserved and planned by the Ministry of Transportation. However, the potential range of improvements that are considered should reflect the fact that the capacity of downstream intersections of the Highway at Tillicum Road and Saanich Road can not support significant growth in traffic and that this capacity will be reduced with the implementation of bus rapid transit facilities along the Douglas Street corridor. Additionally, the intersection of Burnside Road at McKenzie Avenue will also constrain potential growth in travel between Highway 1 and McKenzie Avenue. Based on forecast growth patterns, it is anticipated that the through traffic demands and turning movements will continue to grow and the delays at this location would increase substantially.

The Ministry may want to continue to preserve for and examine various forms of long-term at-grade and partial grade separated improvement for the Highway 1 and Admirals/McKenzie intersection. These improvements should be concentrated on serving provincial travel between

Highway 1 and Highway 17 in a manner consistent with the guiding principles for the Highway outlined in the report. Any further examination of intersection improvements should likely confirm that the Highway 1 corridor between the Millstream Interchange and Admirals/McKenzie will not be widened for general purpose traffic.

e. Local and Regional Improvement Strategies

In addition to those highway based improvement strategy options, there are a range of local and regional transportation system improvements identified in the TravelChoices Strategy that should be promoted and supported by the Capital Regional District and area municipalities. The following summary highlights those strategies that would support planned growth and development of the Capital Region and promote the use of priority vehicles.

- ***Municipal roadway expansion and upgrades.*** As previously indicated, the limited local area network results in a disproportional amount of growth in traffic using the Highway 1 corridor relative to the increase in population projected in the Capital Region. As such, the delays along the Highway increase at a rate that exceeds the growth in population and employment in the Region. In order to support local area growth and development, local municipalities should coordinate the development of an expanded roadway network as well as upgrades to the major roadways to support priority modes, including the movement of goods and services.

- ***TDM initiatives.*** The TravelChoices Strategy describes various initiatives to encourage walking, cycling, transit, ridesharing and other alternatives to driving alone. Key TDM initiatives include a range of incentives, facilities and policies that will be directed to support the overall transportation objectives of the region.

Support strategies such as the provision of an enhanced municipal roadway network must be encouraged in order to support the significant increase in travel generated by planned growth and development within the Capital Region. The Ministry of Transportation should continue to encourage local agencies to develop new and enhanced major roadways that will provide alternative east-west routes that are largely reliant on the Highway 1 corridor today. Additionally, the Ministry should encourage and monitor the development of regional TDM strategies that encourage walking, cycling, transit use and ridesharing within the Capital Region.

1.0 INTRODUCTION

As part of the Vancouver Island Highway Project (VIHP), the Highway 1 corridor in Greater Victoria was upgraded in the mid 1990's. Millstream Road to Helmcken Road was rebuilt as a four lane freeway with the ability to expand in the future to a six lane facility using the depressed median.

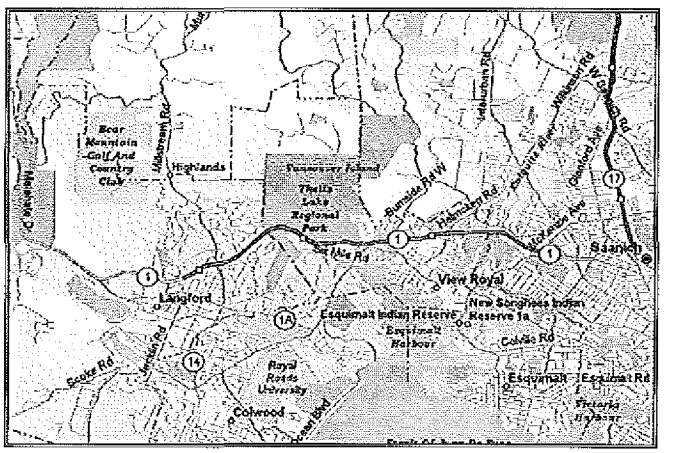
At that time there was also interest in providing continuity from Highway 1 to Highway 17 (Pat Bay Highway). There were two alternatives for such continuity: the Helmcken-Wilkinson Road alignment and the McKenzie Avenue alignment. The option of a Helmcken-Wilkinson Road connection met with significant resistance. The McKenzie Road alternative was therefore selected.

Originally, the Highway 1/Admirals/McKenzie intersection was envisioned as ultimately being upgraded to an interchange. However, there was resistance from the District of Saanich as well as other issues related to laning in the eastbound direction and its impact on Cuthbert Holmes Park. The VIHP Project Team examined a range of options for improving the intersection and determined that a flyover for the eastbound left turns from Highway 1 onto McKenzie Avenue would be the most cost-effective solution. However, as a result of the Capital Review Process, the construction of the flyover was subsequently deleted from the VIHP.

The Highway 1 corridor through the Malahat is experiencing a number of pressures; there is an increasing level of congestion, a significant number of crashes with severe consequences and reliability is compromised through the road closures resulting from the crashes. This situation is expected to get worse with growth in commuter travel over the Malahat, the tourist industry expanding, and general commercial and personal travel increasing as the population of South Island communities continues to grow. These issues and increasing pressures give rise to a need for a long-term transportation strategy for the corridor over the Malahat and the study addressing those specific issues is now complete.

The Ministry of Transportation is also carrying out a study of potential improvements to the Highway 1 corridor, from Millstream Interchange to Sooke Lake Road. Although conducted simultaneously with the Malahat Study, this project has a different scope, focusing mainly on the specific segment of the highway.

The area is experiencing significant population growth due to developing communities north of the Malahat and at the Bear Mountain and Millstream residential areas. Commuter traffic from these communities and the increased demand to access the Millstream shopping area has resulted in peak traffic volumes in excess of the current highway capacity.



This study of the Highway 1 corridor between Millstream and Tillicum considers potential long-term improvement strategies to the Highway as well as the intersection of McKenzie and Highway 1. Because this is a technical study that considers the long-term alternatives to assist with discussions of possible directions for the short-term, available information and models are used rather than modifying and expanding on background data and information. This ensures that most effort is spent on examining potential constraints and opportunities. It should be recognized that the Ministry will eventually need a complete Multiple Account Evaluation and Business Case for any long-term direction which would be required for one or more of the candidate improvements examined through this review.

The following study objectives were established at the outset of the assignment.

- To summarize existing travel and collision patterns along the Highway 1;
- To examine long-term traffic demands (2026) along the Highway 1 corridor;
- To identify potential long-term improvement opportunities for the corridor, including the provision of priority vehicle lanes, as well as the network connections with the intersection of Admirals and McKenzie;
- To provide recommendations for the Ministry of Transportation to guide the planning work of other agencies along the Highway 1 corridor as well as the surrounding area transportation system.

This report describes a broad range of possible strategies for the Highway corridor to assist the Ministry in providing direction and guidance on medium-term and long-term transportation improvement initiatives.

2.0 CONDITIONS ASSESSMENT

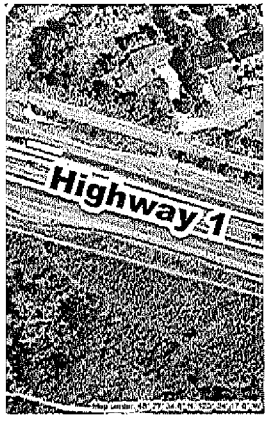
2.1 Existing Conditions Summary

This section of the report provides a summary of historical and existing traffic patterns along the Highway 1 corridor (Millstream Road to Tillicum Road), as well as corridor collision patterns (and intersections where appropriate). The levels of service for the corridor and intersections are analyzed for the purpose of identifying and defining current problem areas. This intersection analysis is prepared using a micro-simulation model (Synchro) to ensure that the impacts of nearby intersection delays and queues are well understood. As part of this study task, travel patterns are described using the regional EMME/2 model as well as background intersection counts.

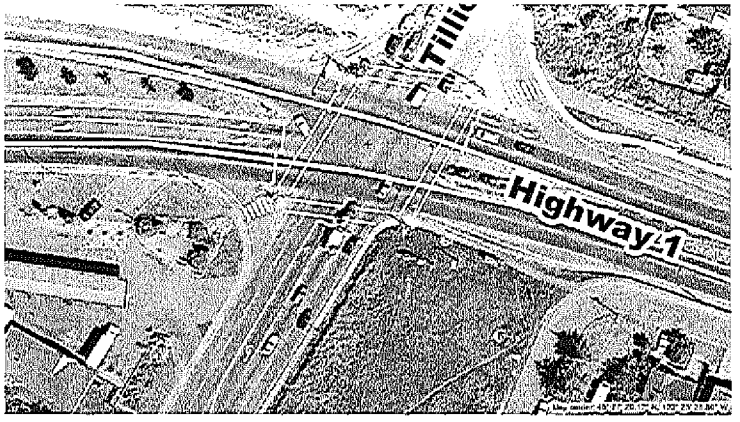
The Highway

The Highway 1 corridor is classified as a primary highway and is part of the National Highway System serving the movement of people, goods and services across British Columbia, including travel throughout Vancouver Island. Within the study area (see Figure 2.1), Highway 1 is a four-lane urban divided freeway between the Millstream Interchange and east of the McKenzie Avenue intersection. Grade separated interchanges are located at Millstream Road, Thetis Lake Road and Helmcken Road. Between McKenzie Avenue / Admirals Avenue and Tillicum Road, the Highway is a four-lane urban arterial with a posted speed of 80 km/hr. The intersections of Highway 1 at Admirals/McKenzie and Tillicum Road are signalized with double left-turn lanes to support the significant morning and afternoon peak period travel demands.

Within the Capital Region's Strategic Transportation Plan – TravelChoices – Highway 1 is identified as an inter-municipal corridor to serve priority modes such as the movement of goods and services as well as transit. In this regard, TravelChoices supports improvements along the corridor that encourage and accommodate priority modes within the region as much as possible before increasing capacity for general purpose traffic. The TravelChoices strategy also recognizes the lack of an east-west network to accommodate inter-municipal trips within the Capital Region. Without further development of an effective network of inter-municipal serving streets, it was acknowledged that much of the increase in traffic and congestion would be concentrated on the Highway in the long-term. To support this projection, TravelChoices recommended the provision of rapid transit facilities along the Highway corridor and surrounding area (Bus Rapid Transit in the short-term and LRT in the long-term). Additionally, strategies to accommodate inter-municipal travel would either consider widening of the Highway or an expanded local area network to support growth within the region.



ve Intersection



2 - Highway 1 & Tillicum Rd Intersection

3 - McKenzie Ave

Historical Patterns & Corridor Volumes

This section of the report documents historical and existing demographic, travel and collision characteristics along the Highway 1 corridor. This discussion provides the context for considering future travel patterns and identifying problem areas.

- ***The population in the Capital Region has grown by approximately 0.7% per year over the last 10 years, with Langford growth at approximately 2.0% per year.*** Figure 2.2 shows the growth rates in the areas of Langford, Victoria, Saanich and Sidney compared to the growth in the Capital Region District. Table 2.1 displays the absolute population increases as well as the percent annual increases in each of the select areas.

Figure 2.2
Growth Rates in Select Areas

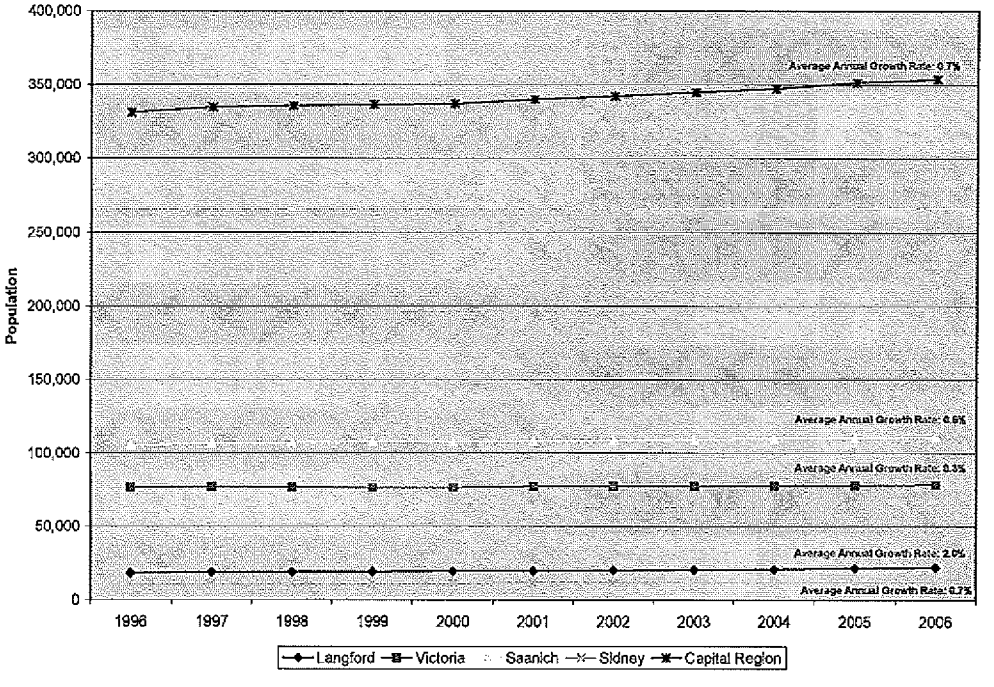


Table 2.1
Population Growth in Select Areas (1996 - 2006)

Area	Population Increase	Average Annual Growth Rate
Capital Region District	22,613	0.7%
Langford	4,023	2.0%
Victoria	1,982	0.3%
Saanich	5,485	0.5%
Sidney	787	0.7%

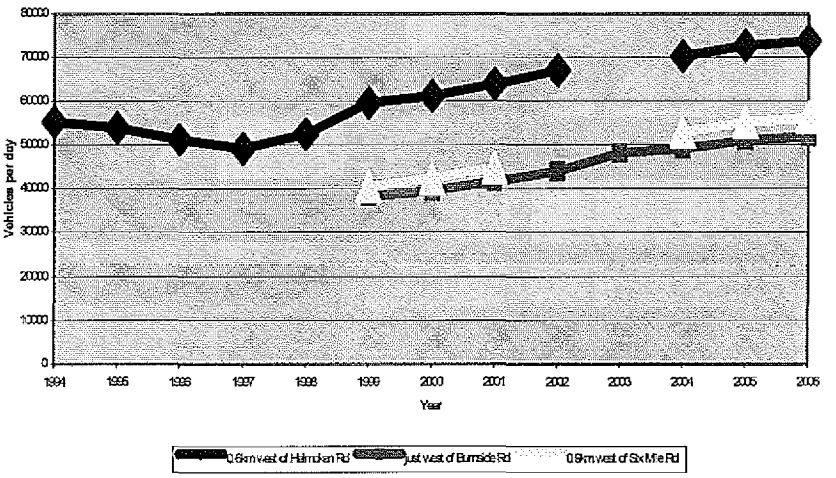
- ***Population.*** Table 2.2 summarizes the 2006 population for the Capital Region by municipality. Overall, there are over 353,000 people in the Capital Regional District, and the municipalities of Saanich and Victoria account for almost 55% of that population. It is worth noting that the Western Communities account for approximately 15% of the population within the Region today.

Table 2.2
2006 Population by Municipality

Municipality	Population 2006 (BC Stats)	% of Region
Sidney	11,315	3.20%
N Saanich	10,823	3.06%
C Saanich	15,745	4.45%
Saanich	108,265	30.61%
Oak Bay	17,908	5.06%
Victoria	78,057	22.07%
Esquimalt	16,840	4.76%
View Royal	8,768	2.48%
Highlands	1,903	0.54%
Colwood	14,687	4.15%
Langford	22,459	6.35%
Metchosin	4,795	1.36%
Sooke	9,704	2.74%
Other	32,441	9.17%
Total CRD	353,710	100.00%

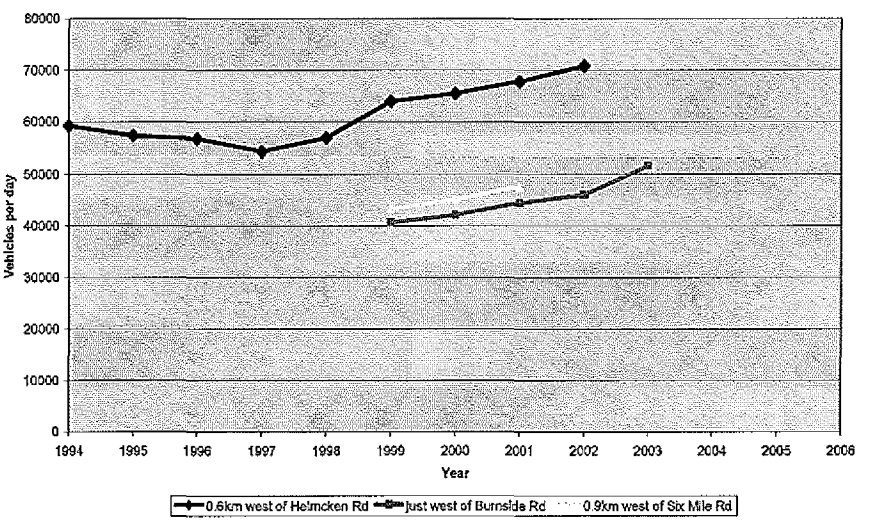
- ***AADTs along Highway 1 have grown by over 35% over the last 10 years.*** Figure 2.3 summarizes daily traffic volumes recorded at Ministry count stations along the Highway. These patterns indicate that between 1999 and 2006, the average daily traffic volumes have increased by approximately 3% per year, despite population growth rates of approximately 0.7% per year in the Capital Regional District as previously noted. This pattern strongly supports the findings of the TravelChoices Strategy that the Highway 1 corridor accommodates a disproportional amount of the increase in traffic because of the limited east-west network in the Capital Region.

Figure 2.3
Highway 1 Historic AADT



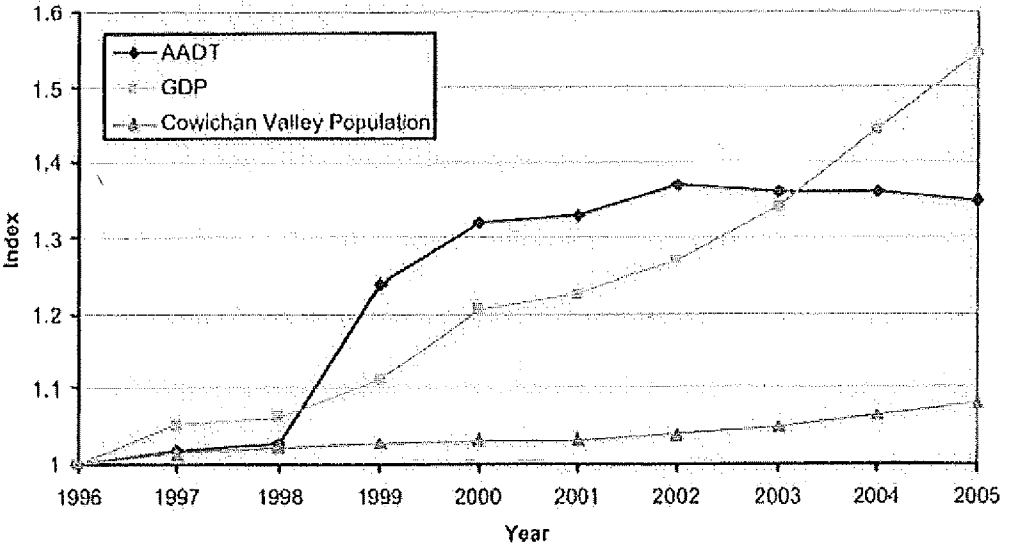
- ***SADTs along Highway 1 have also grown and are only slightly above the AADTs.*** Figure 2.4 summarizes the historical SADTs along the Highway 1 corridor at Ministry count stations. These results indicate that the summer average daily traffic on the Highway corridor is moderately higher than the AADTs previously noted. This pattern is typical of a highway facility that serves commuter travel in most urban areas of the Province. Although the recent SADTs were not available for the last four years, the historical rates of growth are very similar to the AADT patterns between 1994 and 2002.

Figure 2.4
Highway 1 Historic SADT



- ***Traffic growth along the Malahat has reportedly stabilized over the last 5 years to approximately 1.3% per year.*** The historical rates of growth in traffic volumes along the Malahat between 1996 and 2005 were reported in the Malahat Travel Demand Study and illustrated in Figure 2.5. These patterns suggest that after the year 2000, the traffic growth rates levelled off at slightly more than 1.3% per year. This rate of change would be slightly above the average rate of historical population growth on Vancouver Island, but significantly less than the rate of growth experienced on the Highway 1 corridor within the study area.

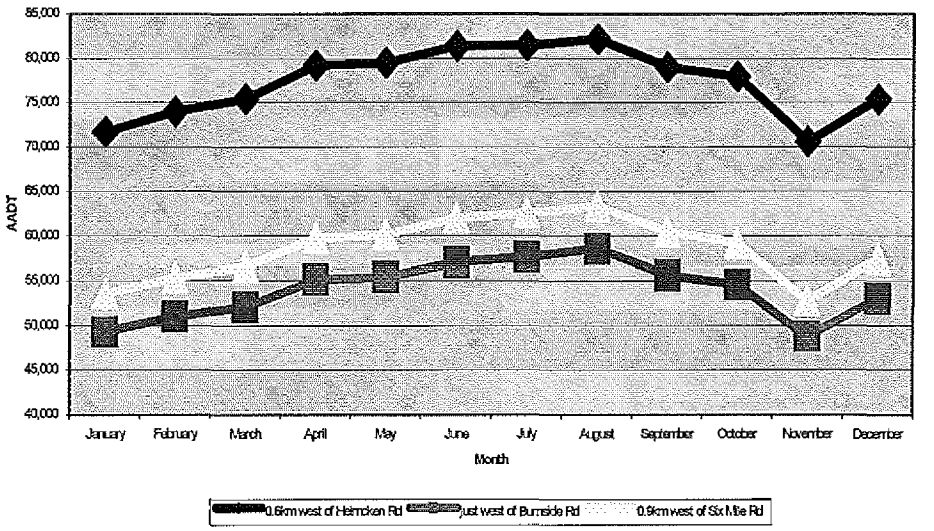
Figure 2.5
Growth Factor Comparisons*



*Source: Malahat Travel Demand Study – Assessment of Inter-Regional Transit Options – Halcrow Consulting Inc. Nov. 2006

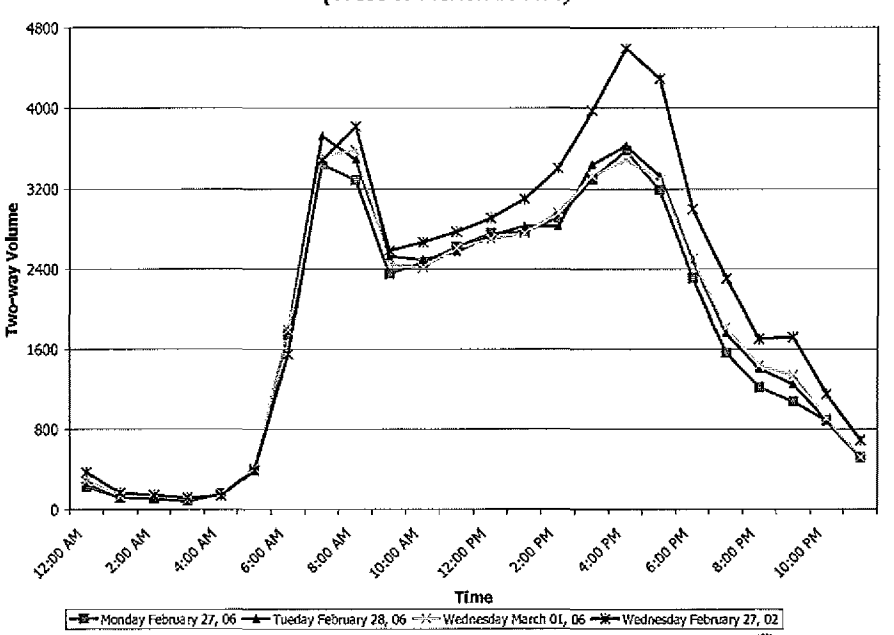
- ***The daily traffic volumes on the Highway 1 corridor typically vary by anywhere from 15,000 to 20,000 vehicles between the busiest (late spring and summer) and least busy months (December & January) of the year.*** Figure 2.6 summarizes the monthly average daily traffic volumes for each of the Ministry count stations located between Millstream Road and Tillicum Road. These results indicate that the daily volumes are highest late spring and early summer periods and lowest during the winter months of January and December. Although the difference in monthly traffic volumes can vary significantly at each station, it is anticipated that the peak period volumes do not vary as much.

Figure 2.6
Highway 1 Average Daily Traffic Volumes by Month (2006)



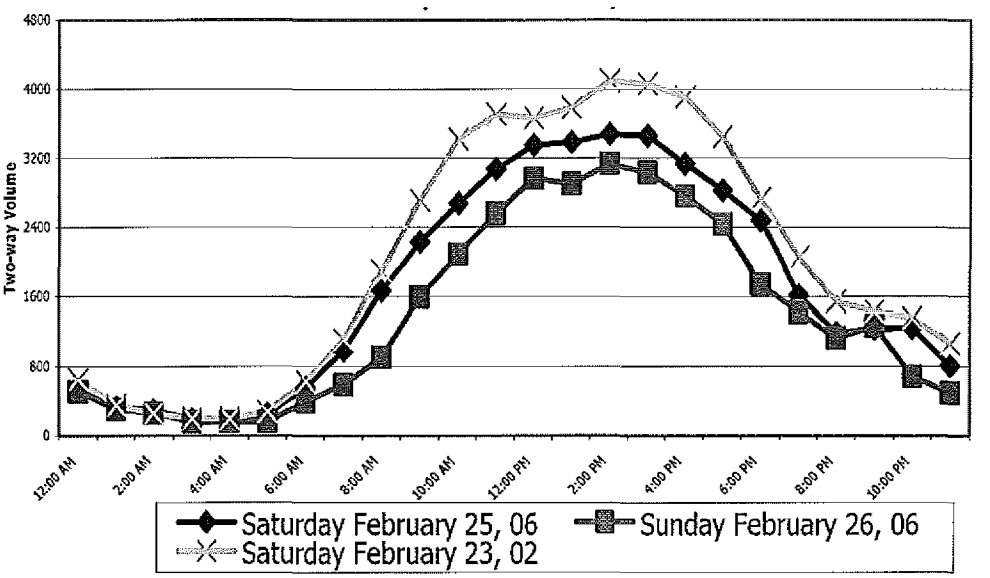
- ***Weekday corridor traffic volumes along Highway 1 during the morning (7 to 9 am) and afternoon (3 to 6 pm) peak periods are found to be generally consistent with each other at approximately 3,700 vehicles per hour.*** Figure 2.7 highlights the daily corridor traffic volumes along the Highway 1 corridor immediately west of the Admirals/McKenzie intersection during a typical weekday. These patterns indicate that the morning and afternoon peak hour traffic conditions extend for approximately two hours in the morning and three hours in the afternoon peaks.

Figure 2.7
Highway 1 Two-way Traffic (Hourly)
(West of McKenzie Ave)



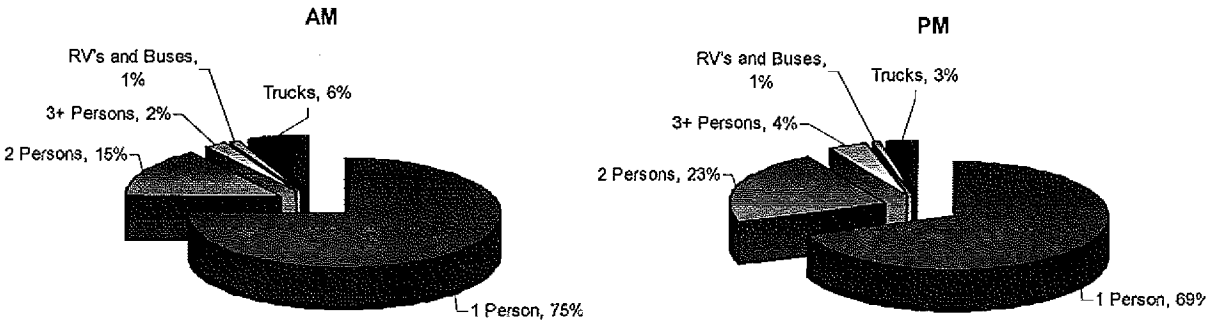
- ***Peak hourly traffic volumes during the weekend are only moderately lower than a typical weekday, but generally occur during the mid-afternoon periods.*** Figure 2.8 highlights the weekend daily traffic volumes along Highway 1 immediately west of the intersection of Admirals / McKenzie. These patterns suggest that the peak hour volumes are only slightly below the corridor volumes experienced during a typical weekday and that the peak period occurs between 1:00pm and 4:00pm.

Figure 2.8
Highway 1 Weekend Two-Way Traffic (Hourly)
(West of McKenzie Ave)



- ***The average daily vehicle occupancy level along Highway 1 is approximately 1.2 persons / vehicle during the morning and afternoon peak periods.*** Figure 2.9 below summarizes the 2007 AM and PM composition of vehicles on the Highway 1 corridor, immediately west of the Helmcken Interchange (see Appendix A for detailed results). These results indicate that the average occupancy of passenger vehicles using the highway is 1.2 people / vehicle in the morning and 1.3 in the afternoon. Overall, single occupant vehicles account for approximately 69% to 75% of all vehicles in both the morning and afternoon, 15% to 23% with two passengers and approximately 3% with three or more people. Truck traffic accounted for 3% to 6%.

Figure 2.9
Highway 1 AM / PM Peak Period Vehicle Composition
(West of Helmcken Ave)



Historical Collision Patterns

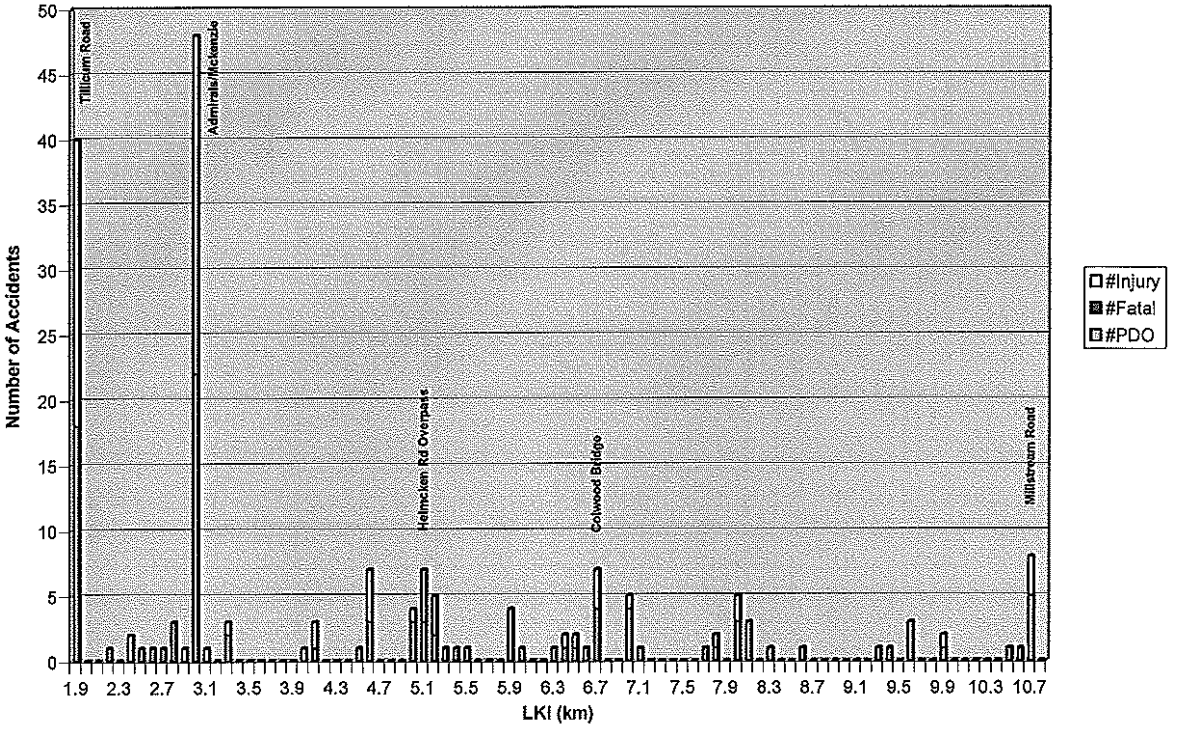
The Highway Accident System (HAS) provides information on all motor vehicle collisions along Highway 1. This section summarizes some of the key safety indicators for the corridor based on HAS data from January 2002 through December 2006.

The analysis provides a corridor-level scan of safety conditions to identify key issues and patterns. The results are also compared against province-wide statistics to gauge the performance of Highway 1 versus similar corridors throughout BC. These findings provide insight into the magnitude of any safety issues that are identified.

The analysis of safety conditions is geographically based on the Ministry's Link Kilometre Indicator (LKI) system, which breaks down the corridor into 100-m segments. This allows the identification of location-specific issues.

- ***Collision Frequency.*** The frequency of collisions provides an indication of where collisions are occurring more often, potentially helping to identify those specific locations where safety is a significant issue. The following figures (Figures 2.10 – 2.12) summarize collision frequencies for all LKI segments within the study area between 2002 and 2006. These results clearly show that the highest collision areas are within the urban section of the Highway, with most collisions occurring at the intersections of Admirals/McKenzie and Tillicum. Most other locations of the Highway have less than five collisions reported during the five year period.

Figure 2.10
Highway 1 Corridor Collision Frequency (2002-2006)



The collision types for the Highway 1 and Admirals/McKenzie intersection are summarized in the graph below and illustrated in greater detail to support the review of improvement opportunities. These patterns indicate that the most of collisions (56%) are rear-end collisions, the majority of which are occurring in the westbound direction on Highway 1. Only one of the reported thirty-two westbound rear-end collisions occurred within the merge area on the west side of the intersection of McKenzie Avenue.

Figure 2.11
Highway 1 and McKenzie Avenue
Collision Percentages (2002-2006)

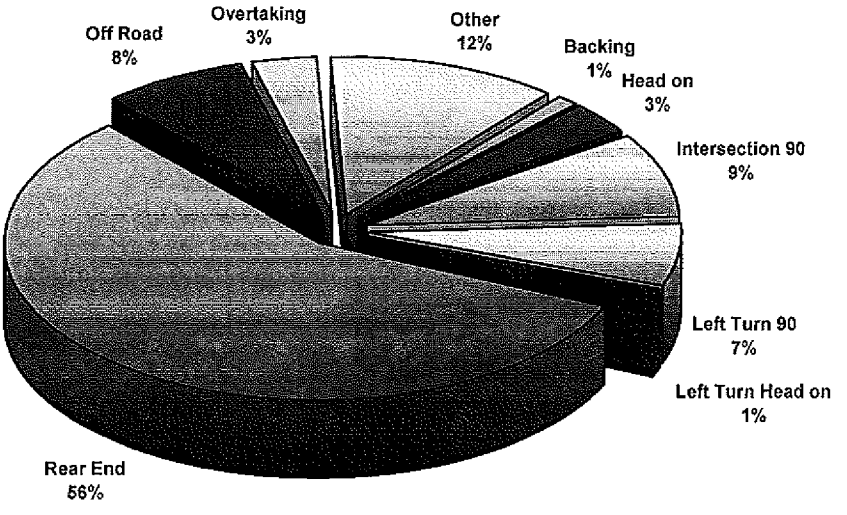
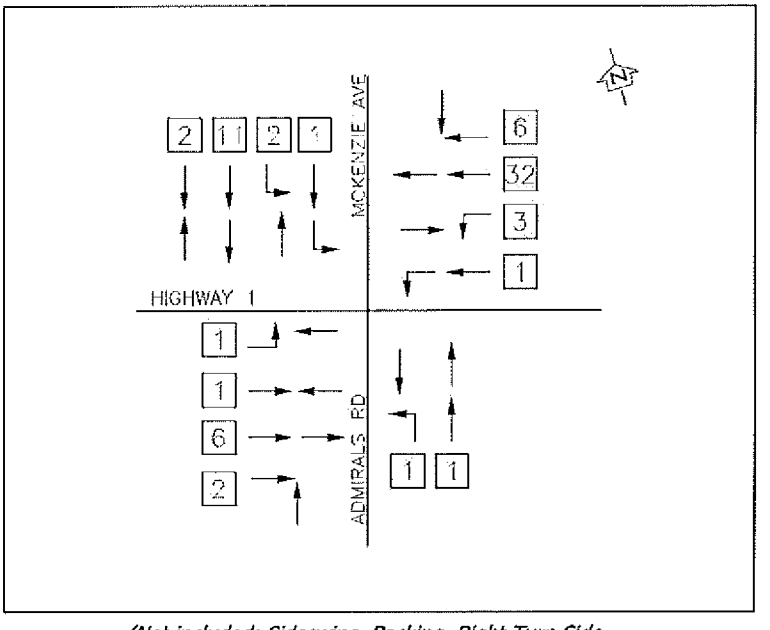


Figure 2.12
Highway 1 and McKenzie Avenue
Number of Collisions by Type and Direction (2002-2006)



(Not included: Sideswipe, Backing, Right Turn Side, Overtaking, Off Road, "Other")

- ***Collision Rate.*** The collision rate is measured in collisions per million vehicle-kilometres. It provides a similar indication as frequency, but reflects the traffic demands along the corridor. Therefore, two comparable corridors with similar collision frequency but different volumes will have different collision rates. The corridor with the lower volumes will have a higher rate and be of greater concern.

  Collision rates have been measured for corridors throughout the province and have been categorized based on physical characteristics (urban or rural, two lanes or four lanes, etc.). This allows the corridor under analysis to be compared against the provincial average for corridors of the same characteristics to gauge safety performance.

  Table 2.3 summarizes the collision rates for the four segments of Highway 1 and illustrates that the rate is below the provincial average for all five segments. However, the collision rate for the intersection of Highway 1 and Admirals/McKenzie is above the provincial average. For completeness, the critical collision rates are listed in the table, but since the calculation is based on the provincial average, the collision rates for each segment are inherently still below these values.

Table 2.3
Collision Rates for Highway 1 Segments (2002 – 2006)

Segment	LKI Range	Collision Rate (collisions/million vehicle-km)	Provincial Average Collision Rate (collisions/million vehicle-km)	Critical Collision Rate	Class
Tillicum - McKenzie	1.9 - 3.0	0.74	1.34	1.51	UAD4
McKenzie - Helmcken	3.1 - 5.1	0.12	0.34	0.41	UFD4
Helmcken-Burnside E	5.2 - 5.7	0.10	0.34	0.46	UFD4
Burnside E - Six Mile	5.8 - 7.8	0.14	0.34	0.41	UFD4
Six Mile - Millstream	7.9 - 10.7	0.10	0.34	0.40	UFD4
Highway 1 and McKenzie	Intersection	0.39	0.25	-	UFD4

- ***Collision Severity.*** The collision severity index provides a clearer indication of the types of collisions that are occurring throughout the study corridor. The index applies weightings to injury and fatal collisions to emphasize the consequences of collisions at specific locations, particularly emphasizing fatalities. The calculation is as follows for each LKI segment in the corridor:

CSI = (100 X # Fatal Collisions) + (10 X # Injury Collisions) + # PDO Collisions / Total Collisions

As in the case of collision rates, provincial average collision severity indices can be determined for a variety of different corridors. Table 2.4 summarizes the collision severity indices for the Highway 1 segments and compares them to provincial average and illustrates that the rate is lower than the provincial average for four of the five segments. The Tillicum to McKenzie section is noted to be higher than the provincial average. The severity index for the intersection of Highway 1 and Admirals/McKenzie is above the provincial average.

Table 2.4
Collision Severity Indices for Highway 1 Segments (2002 – 2006)

Segment	LKI Range	Collision Severity Index	Provincial Average Collision Severity Index
Tillicum - McKenzie	1.9 - 5.1	5.78	5.22
McKenzie - Helmcken	3.1 - 5.1	5.67	5.67
Helmcken-Burnside E	5.2 - 5.7	4.38	5.67
Burnside E - Six Mile	5.8 - 7.8	4.00	5.67
Six Mile - Millstream	7.9 - 10.7	3.00	5.67
Highway 1 and McKenzie	Intersection	5.88	5.23

Existing Volumes & Highway Corridor Performance

The regional transportation model (EMME/2) generally provides a reasonable representation of existing PM peak hour corridor volumes along Highway 1 as illustrated in Appendix A. As summarized in Table 2.5 below, these patterns clearly show that the westbound corridor volumes on Highway 1 essentially double between the Saanich to Tillicum and the McKenzie to Helmcken sections, from 1,450 to 3,150 vehicles. East of Helmcken, traffic volumes decline gradually at the Thetis and Millstream Interchanges. Overall, the peak directional volumes are approaching the corridor capacity along the sections each of Helmcken through to Saanich Road.

Table 2.5
PM Peak Hour Highway 1
(Westbound Corridor Volumes)

Highway Segment	Capacity (veh./dir.)	Volume (veh.)	Performance (V/C)
Saanich to Tillicum	1,600	1,450	0.90
Tillicum to McKenzie	2,400	2,050	0.85
McKenzie to Helmcken	3,400	3,150	0.93
Helmcken to Thetis	3,400	2,600	0.76
Thetis to Millstream	3,400	2,600	0.74

In addition to examining corridor volumes, the performance of signalized intersections is also examined to assess existing conditions. Figures 2.13 through 2.16 illustrate the morning and afternoon peak hour turning movement volumes and levels of service at the signalized intersections of Highway 1 at McKenzie Road and Tillicum Road, as well as at McKenzie Road at West Burnside Road. In the morning peak hour, most of the traffic is headed in the eastbound direction toward the urban area, while about 25% (or approximately 650 vehicles) are turning left along McKenzie Avenue. Westbound corridor volumes along the Highway 1 corridor are approximately half the morning peak direction. The intersection of Highway 1 and Admirals/McKenzie experiences significant delays with a LOS F during the morning peak hour levels. The remaining intersections operate at reasonable levels of service during the morning peak hour.

Although the afternoon peak directional traffic volumes along the Highway 1 corridor are not as high as the morning, the off-peak flows and turning movements are higher during the PM peak hour at each of the study intersections. The intersection analysis indicates that the Highway 1 corridor intersections are operating at LOS E, and McKenzie at West Burnside is operating at LOS D.

Figure 2.13
Existing AM Peak Hour Intersection Volumes

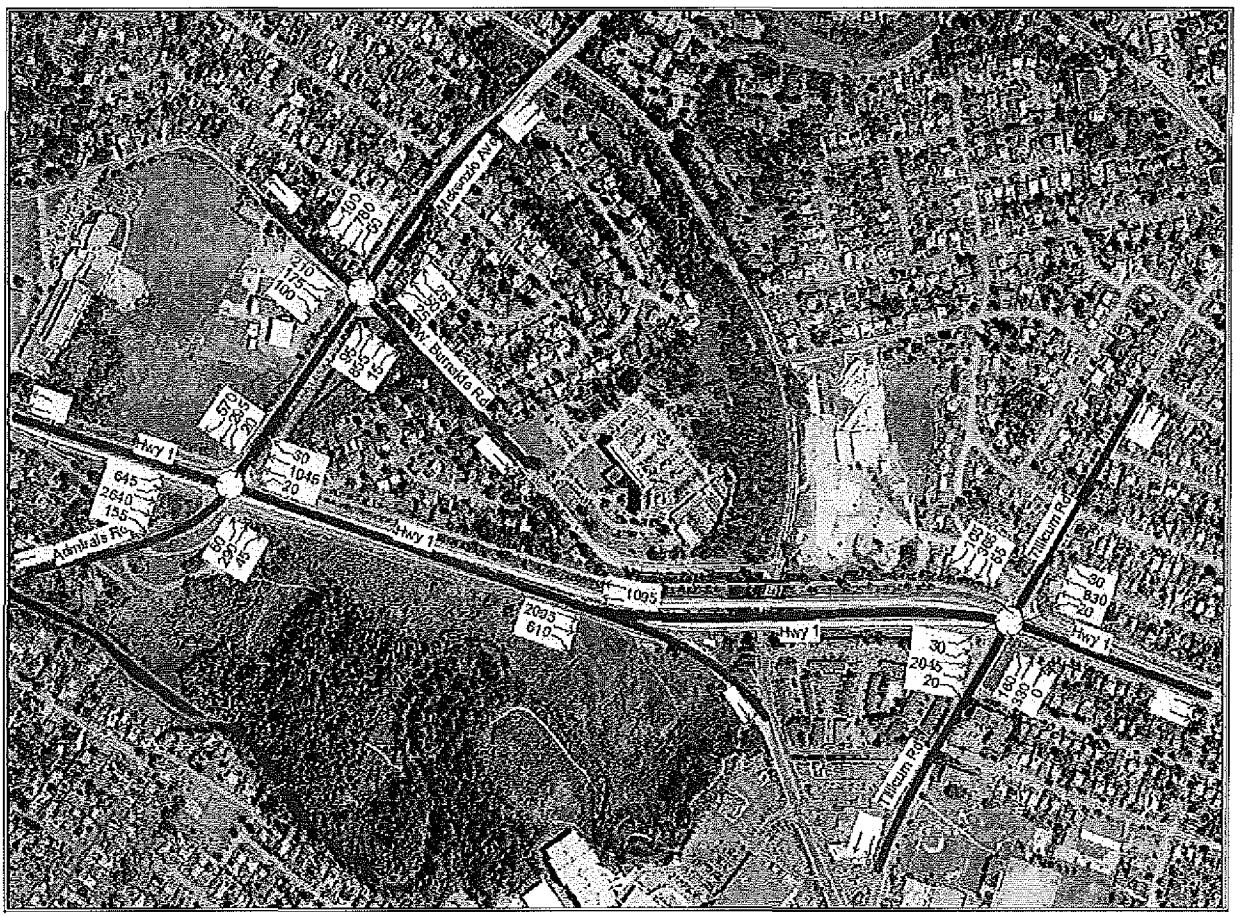


Figure 2.14
Existing AM Peak Hour Intersection Levels of Service and Movement Delays
(seconds / vehicles)

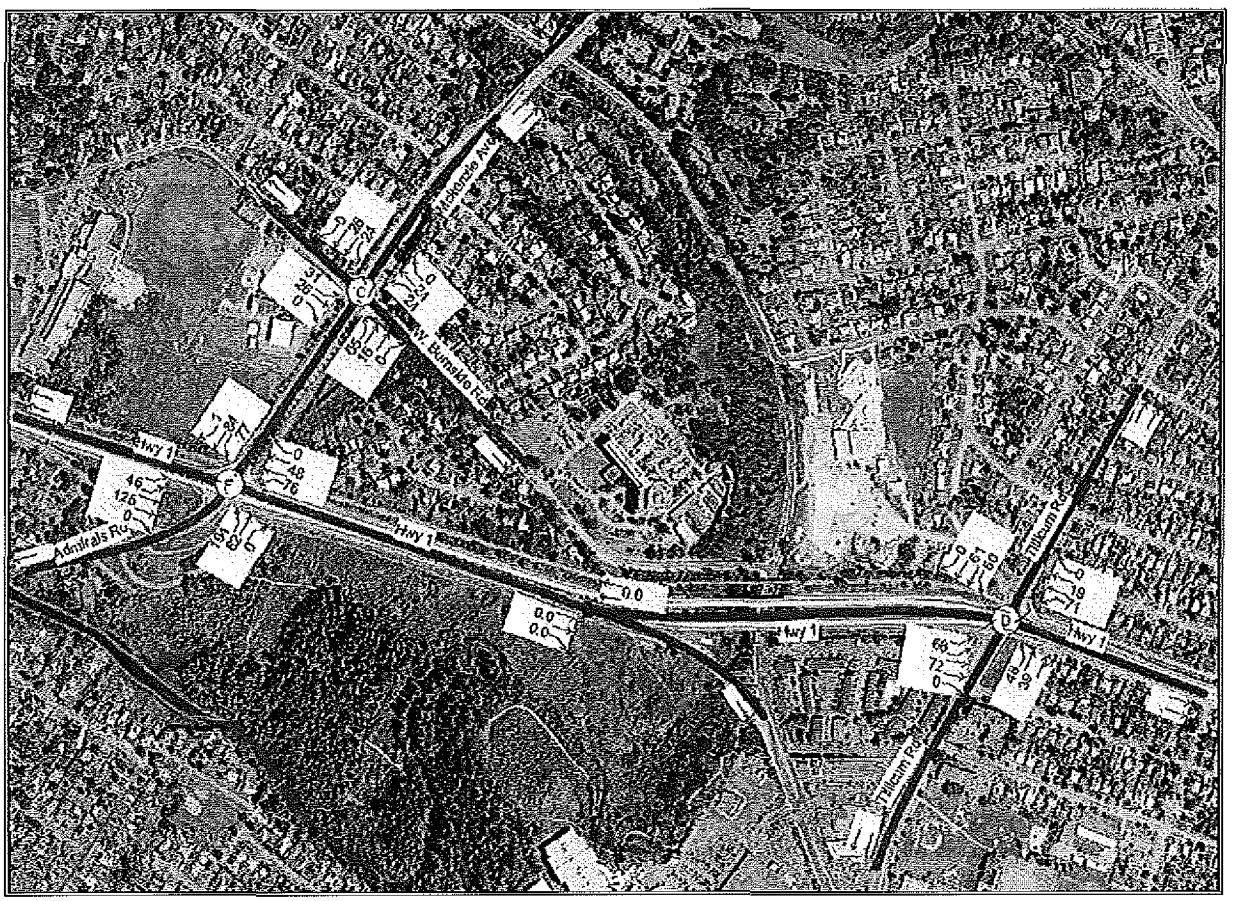


Figure 2.15
Existing PM Peak Hour Intersection Volumes

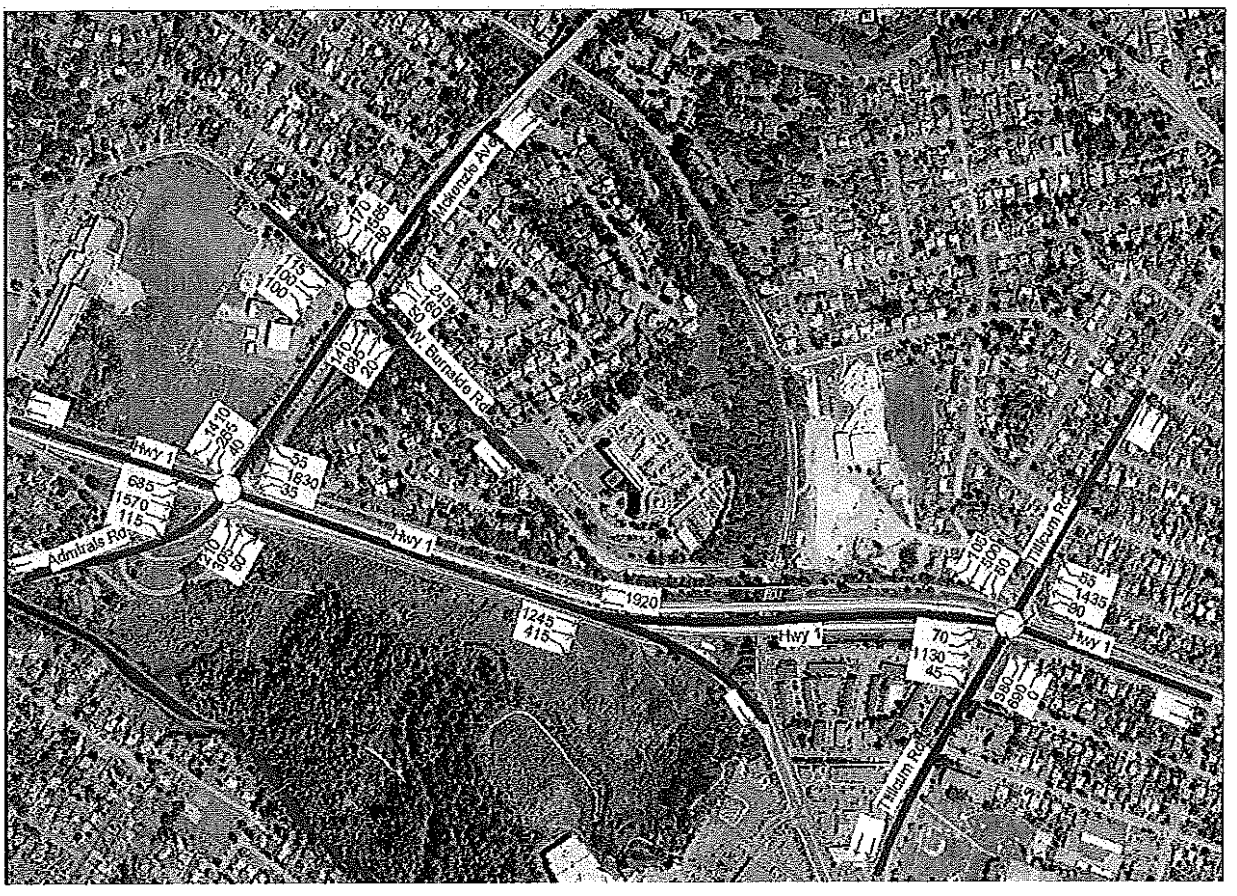
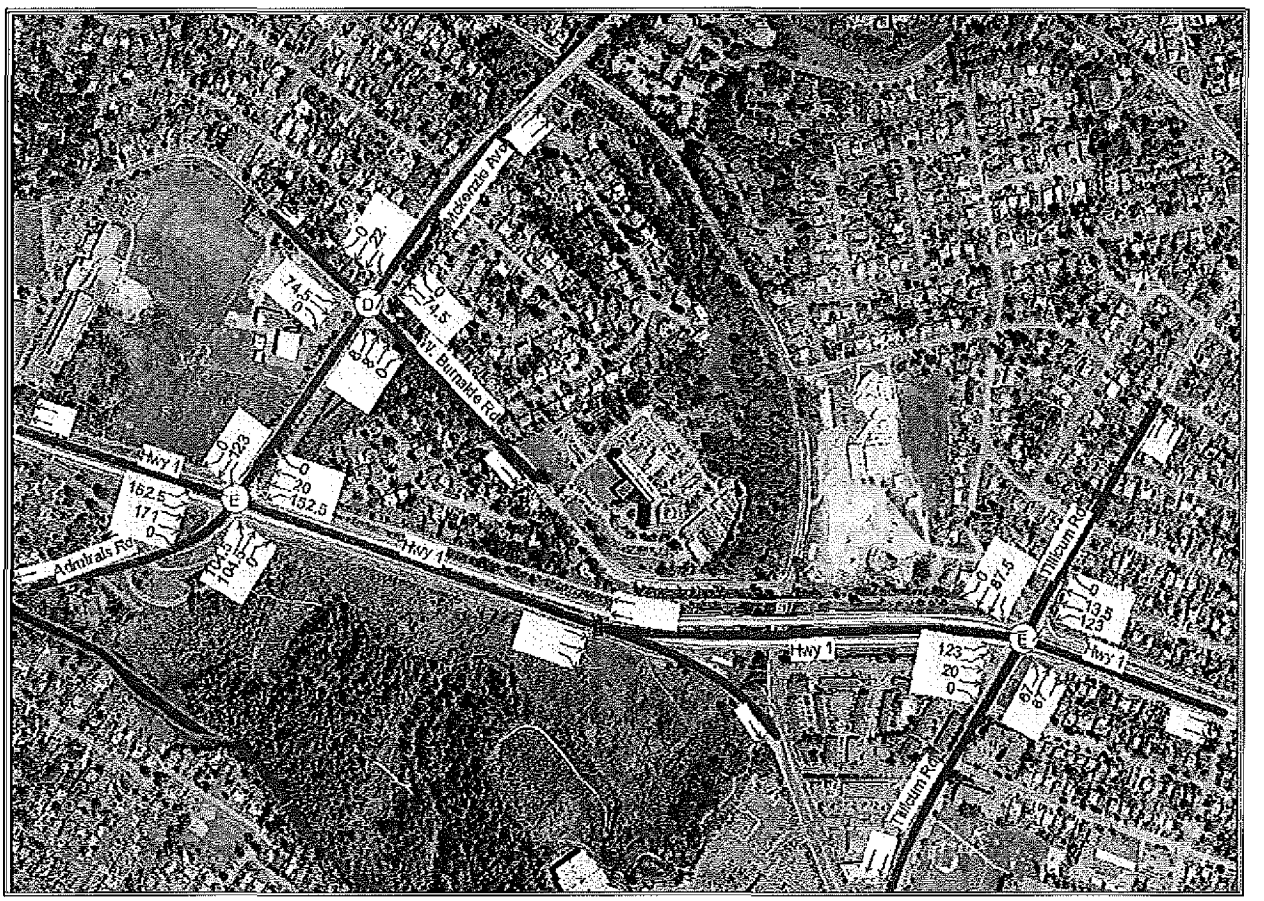


Figure 2.16
Existing PM Peak Hour Intersection Levels of Service and Movement Delays
(seconds / vehicle)



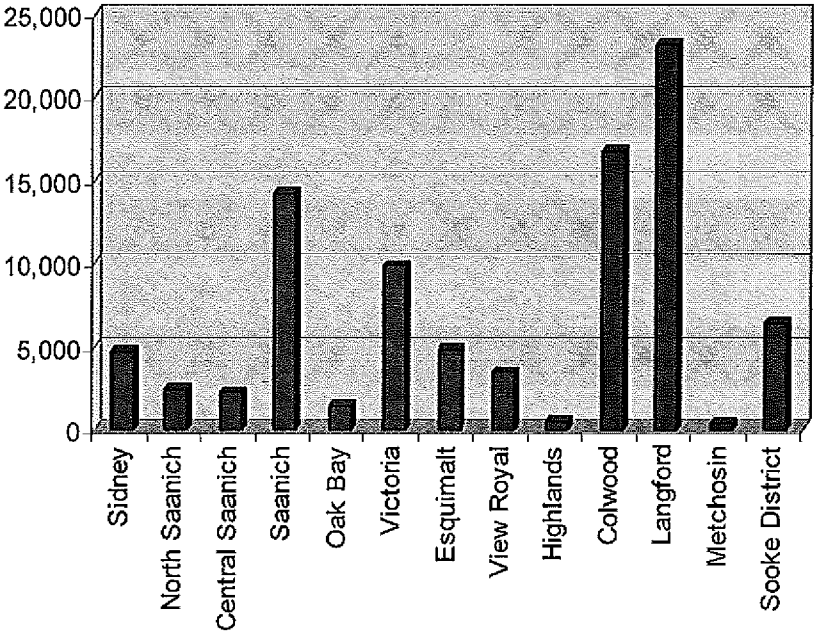
2.2 Planned Growth

This section of the report examines the planned growth in the region. Population and employment numbers are derived from the CRD Regional Transportation Model (April 2004). The following observations may be made regarding forecast 2026 traffic patterns and conditions.

- ***By 2026, population is expected to rise by as much as 115% in some municipalities while others grow by as little as 6%.*** Figure 2.17 shows the projected population growth in each municipalities between 2003 and 2026. In 2003, there were reportedly 330,370 people living in the Capital Regional District. Over the next 20 years, the population of the region is projected to be 423,410 people. The patterns illustrated in Figure 2.17 indicate that Langford is expected to experience the largest population growth, with

projected increases of approximately 23,000 people and Colwood at approximately 14,000 people. Within the core areas of the region, the primary growth areas of Saanich and Victoria are projected increases by approximately 14,000 and 9,000 people respectively.

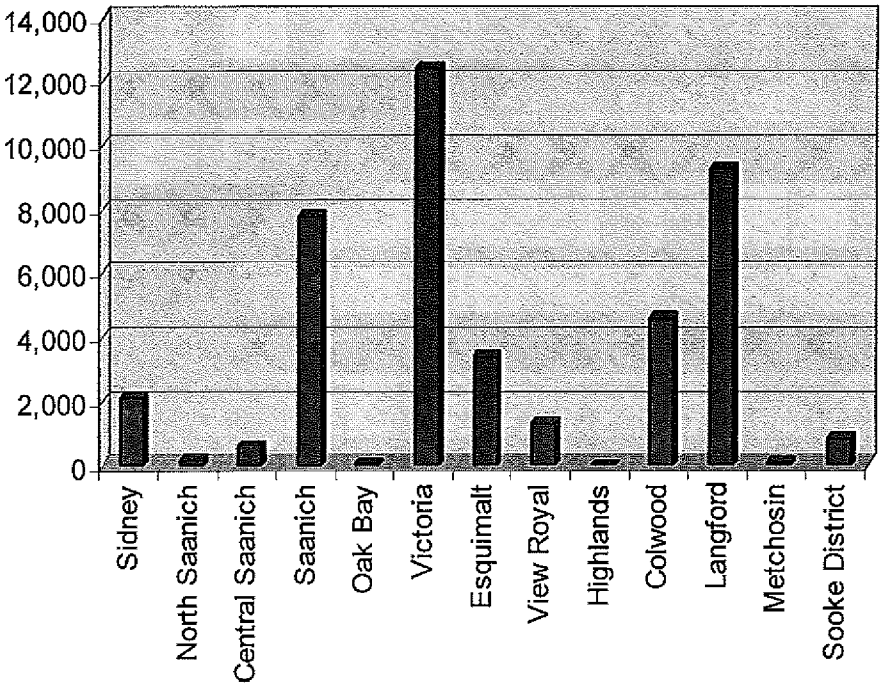
Figure 2.17
Projected Population Growth (2003-2026)*



*Source: CRD Regional Transportation Model – (April 2004).

- ***The core areas of the City of Victoria are expected to account for a large proportion of the regional employment growth over the next 20 years, followed by Langford and Colwood.*** Figure 2.18 shows the expected employment growth from 2003 to 2026 as provided from the CRD Regional Transportation Model (April 2004). Overall, the regional employment levels are projected to increase by 43,450 before 2026 (from 156,450 jobs in 2003 to 199,900 jobs). Based on these projections, the employment levels in Victoria are projected to increase by approximately 12,000 jobs over the next 20 years, and approximately 8,000 jobs in Saanich. The employment growth in Langford and Colwood are projected to increase by approximately 13,000 jobs during the same period. It should also be noted that there is very little employment growth expected in other local municipalities.

Figure 2.18
Projected Employment Growth (2003-2026)*



*Source: CRD Regional Transportation Model -- (April 2004).

2.3 Forecast Traffic Patterns and Conditions

This section of the report examines forecast peak hour traffic patterns through the study area using the most current version of the EMME/2 model. This assessment includes a review of general travel and traffic patterns, corridor demands and capacity conditions, as well as intersection vehicle queues and delays. The forecast constraints along the highway as well as through the intersections along Highway 1 between Admirals/McKenzie and Tillicum are also discussed.

It should be recognized that the forecast trip distribution patterns projected within the EMME/2 model are constrained by the capacity of the network. In other words, a portion of the forecast trips generated by Langford in 2026 may not be distributed to Victoria within the model due to the capacity of the transportation system. As such, the forecast travel patterns are constrained more than today's trip patterns which may suppress the actual travel demand patterns and traffic forecasts along the Highway 1 corridor that are described in this document. Despite these capacity constraints, the model will assign more traffic to roadways that are already at a theoretical capacity.

As previously described in Section 2.1, the historical growth rate along the Highway 1 corridor substantially exceeds the growth of the region at approximately 3% per year. The primary reason is that the highway accommodates a disproportionate amount of the growth in traffic from the Western Communities and beyond. In other words, if there was a complete network of support roads to serve regional traffic, the growth in traffic would be otherwise shared among several routes.

Through previous studies conducted by the Ministry and regionally, most plans have always assumed that the Highway 1 corridor would be widened with two additional lanes and that an interchange would be implemented at Admirals/McKenzie to connect with Highway 17. In fact, the regional transportation model has always included the widening of the Highway 1 corridor from four to six travel lanes by 2026. Using the 2026 base model that has been developed, the forecast patterns along the corridor provide a perspective of the amount and direction of traffic. Forecast 2026 and existing corridor traffic volumes are provided in Appendix B.

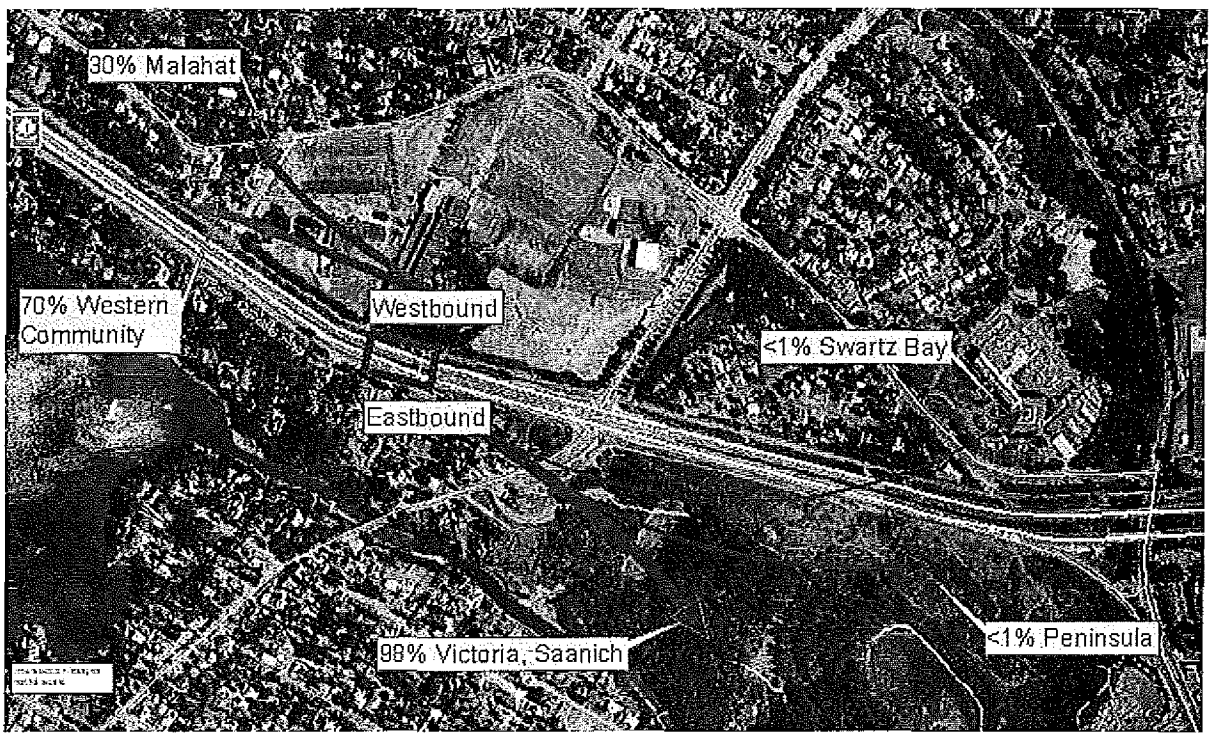
The following observations may be made regarding forecast 2026 traffic patterns and conditions.

- ***The projected increases in population and employment in the core areas and Western Communities yield a corresponding increase in overall travel patterns generated by these communities over the next 20 years.*** Appendix B summarizes the PM peak hour origin-destination tables and differences for all modes of travel based on the EMME/2 model projections between 1996 and 2026. These patterns highlight the increased travel generated by the communities of Victoria, Saanich, Langford and Colwood, with the most significant relative increases being in the Western Communities. In fact, the interaction between these communities is also projected to increase significantly during this time period.

- ***During the afternoon peak hour, 70% of the westbound traffic along Highway 1 is going to the Western Communities, and the remaining 30% through to the Malahat. In the eastbound direction, the majority of the trips are destined toward the Victoria and Saanich areas.*** Figure 2.19 shows the expected future distribution of traffic for Highway 1 in the vicinity of McKenzie Avenue during the PM peak hour based on the EMME/2 model. It should be recognized that although the model was not specifically calibrated to examine these patterns in detail, the general distribution of vehicle trips is considered reasonable. These forecast patterns indicate that a significant majority of afternoon peak hour eastbound traffic along the Highway 1 corridor immediately west of the Admirals and McKenzie intersection are

destined to the City of Victoria and District of Saanich areas – approximately 98%. Of the forecast 5,000 westbound vehicle trips along the Highway 1 corridor, approximately 70% are reportedly destined to the Western Communities and 30% north along the Malahat. In general, these patterns confirms that the Highway 1 corridor serves a significant regional function during the peak hour periods, supporting trips between the Western Communities and the core areas of the Capital Region.

Figure 2.19
Forecast 2026 PM Peak Hour Highway 1 Traffic Distribution Patterns



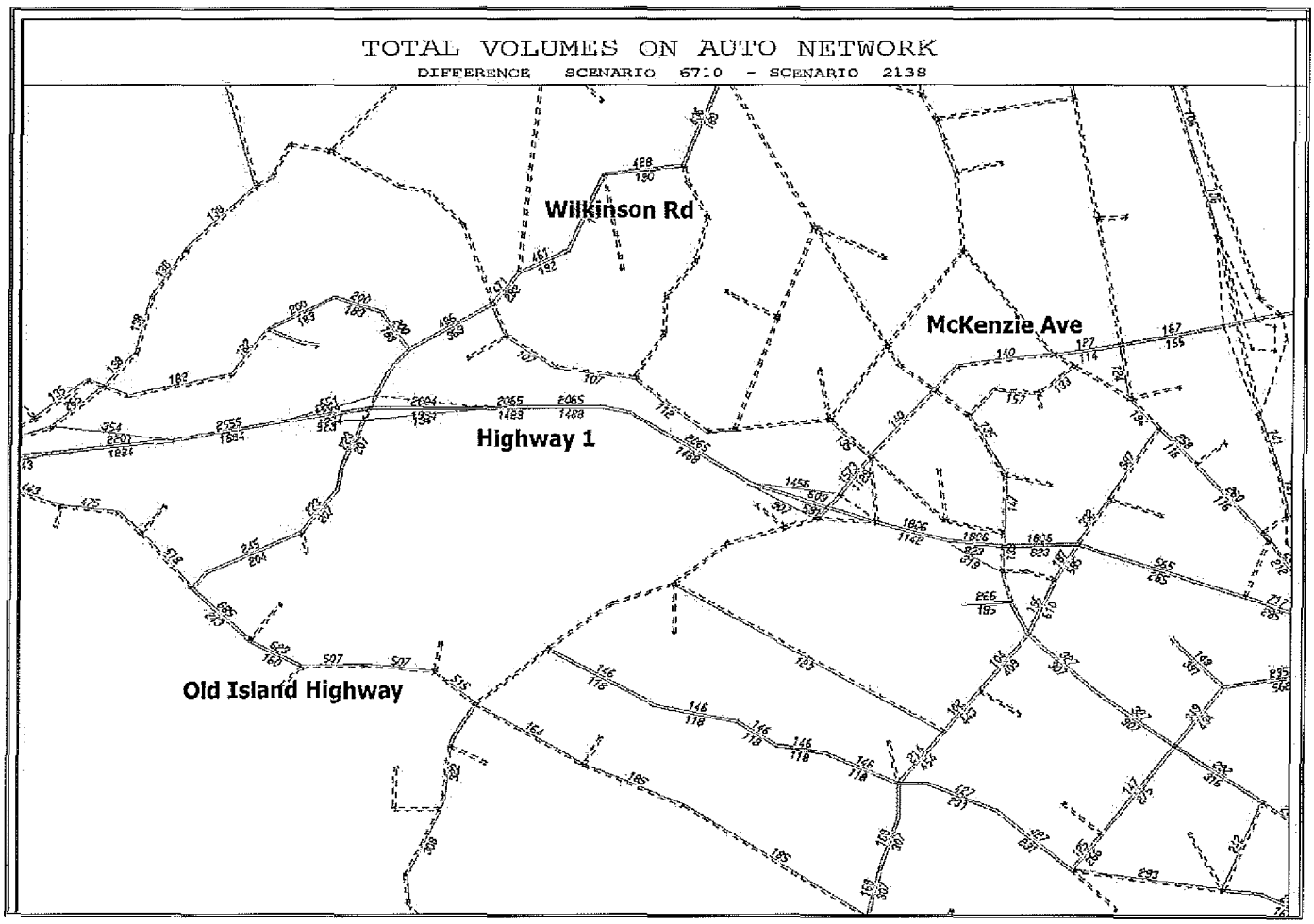
- ***The widening of the Highway 1 corridor west of McKenzie Avenue would result in significant increases in traffic volumes.*** Table 2.6 summarizes the forecast PM peak hour volumes along Highway 1 if the westbound corridor were widened to six lanes with a grade separated interchange at Admirals / McKenzie. Although these corridor volumes projected from the EMME/2 model are theoretically not achievable, all projected volumes exceed the theoretical capacity of the highway.

Table 2.6
2026 PM Peak Hour Westbound Corridor Volumes
with Highway 1 Widening

Highway Segment	Existing Condition		2026 Widening		
	Directional Volume (veh.)	Direction Capacity (veh.)	Volume (veh.)	Capacity (veh.)	Performance (V/C)
Saanich to Tillicum	1,450	1,600	2,000	1,600	1.25
Tillicum to McKenzie	2,050	2,400	3,800	3,400	1.12
McKenzie to Helmcken	3,150	3,400	5,200	3,400	1.53
Helmcken to Thetis	2,600	3,400	5,100	3,400	1.50
Thetis to Millstream	2,500	3,400	5,000	3,400	1.47

- ***Much of the growth in traffic along the Highway 1 corridor is between the Western Communities or Malahat and the City of Victoria or southern areas of Central Saanich.*** Figure 2.20 illustrates the forecast changes along the Highway 1 and surrounding area corridors during the PM peak hour between now and 2026. These patterns clearly highlight that the Highway 1 corridor supports the majority of growth in east-west traffic among all the approaches from the Western Communities. In fact, a large majority of the additional eastbound and westbound trips is generated to and from areas east of McKenzie Road toward Tillicum Road. It is also worth noting that other east-west corridors also accommodate a significant growth in peak directional traffic, such as Craigflower Road and the Old Island Highway.

Figure 2.20
Forecast Growth of PM Peak Hour Traffic Volume – Between 2003 to 2026



- ***Traffic volumes along McKenzie during the PM peak hour are projected to increase by slightly more than 10% over the next 20 years.*** Today, two-way traffic volumes along McKenzie Avenue during the afternoon peak hour are in the range of approximately 2,000 vehicles. Not surprisingly, approximately 80% of these vehicles are generated to or from Highway 1. In the long-term, the EMME/2 forecasts suggest that although the highway traffic volumes increase significantly during the afternoon peak hour with the widening of Highway 1 (by approximately 75%), the traffic volumes along McKenzie Avenue increase moderately.

- ***During the PM peak hour, the westbound travel time between Saanich Road and the Millstream Interchange is projected to increase from approximately 12 minutes today to almost 40 minutes in 2026.*** Based on a comparison of link travel

speeds within the EMME/2 model, the afternoon peak hour travel times along Highway 1 are projected to increase substantially in the westbound direction without any changes to the highway or the surrounding area transportation system. The average travel speed is projected to decrease from approximately 52 km/hr to less than 16 km/hr in 2026. As a result, the travel time for all westbound traffic is projected to increase by almost three times. It should be recognized that this increase in travel time will affect all traffic, including transit vehicles. Although there is no AM peak hour model, it is expected that the eastbound travel times during the morning peak period would increase by similar levels.

The forecast 2026 AM and PM peak hour intersection volumes and levels of service are illustrated in Figures 2.21 through 2.24 for the urban area of the corridor between Admirals/McKenzie and Tillicum. These estimates have been prepared by factoring up the observed turning movement volumes today with the forecast changes identified through the EMME/2 model. Although it was previously recognized that the corridor capacity could not likely handle the forecast traffic volumes even with the widening of the Highway, the AM and PM peak hour intersection analysis indicates that the forecast traffic could not be supported with the existing intersection configurations. In fact, all intersections along the Highway at Admirals/McKenzie and at Tillicum would operate at LOS F during the peak periods. The intersection of McKenzie at West Burnside is forecast to operate at LOS C and E during the morning and afternoon peak periods without significant growth in traffic along McKenzie Avenue.

Figure 2.21
Forecast 2026 AM Peak Hour Intersection Volumes

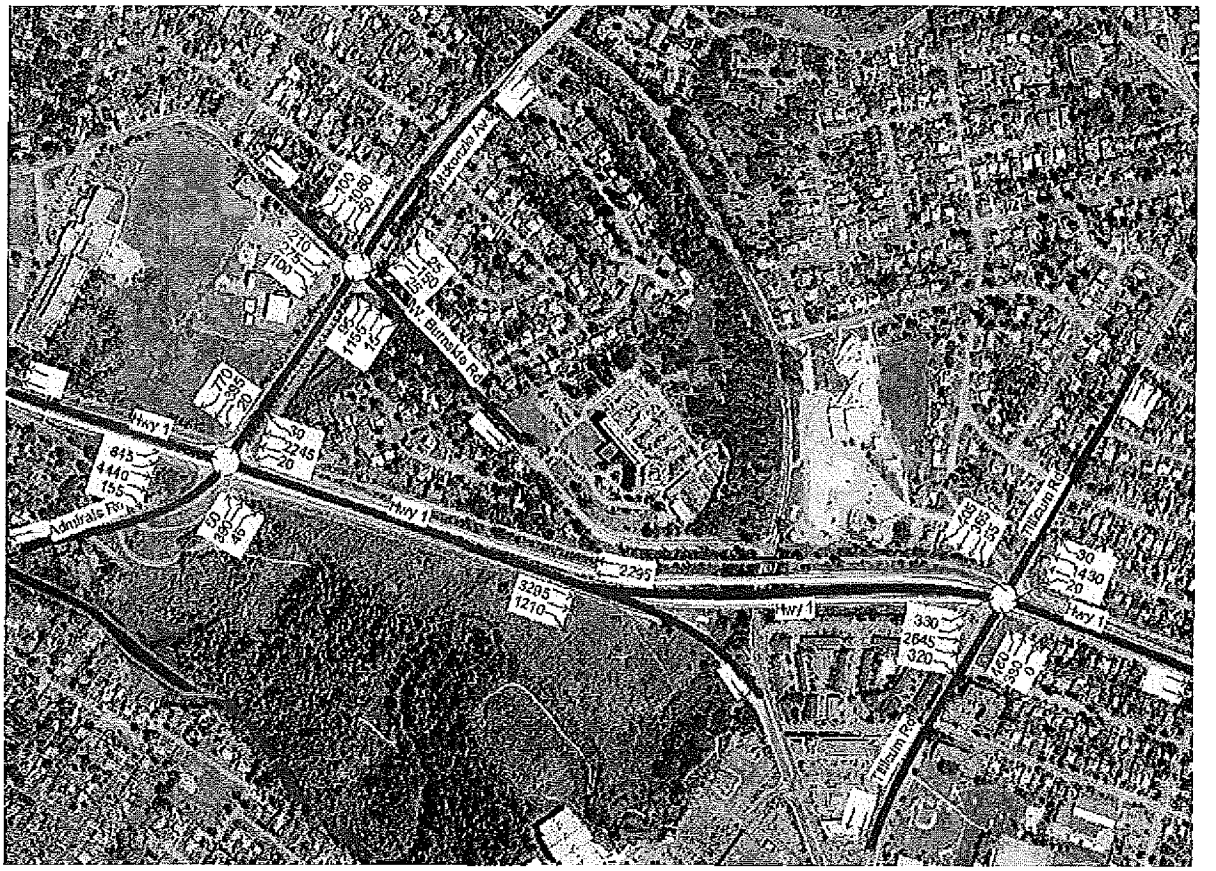


Figure 2.22
Forecast 2026 PM Peak Hour Intersection Volumes

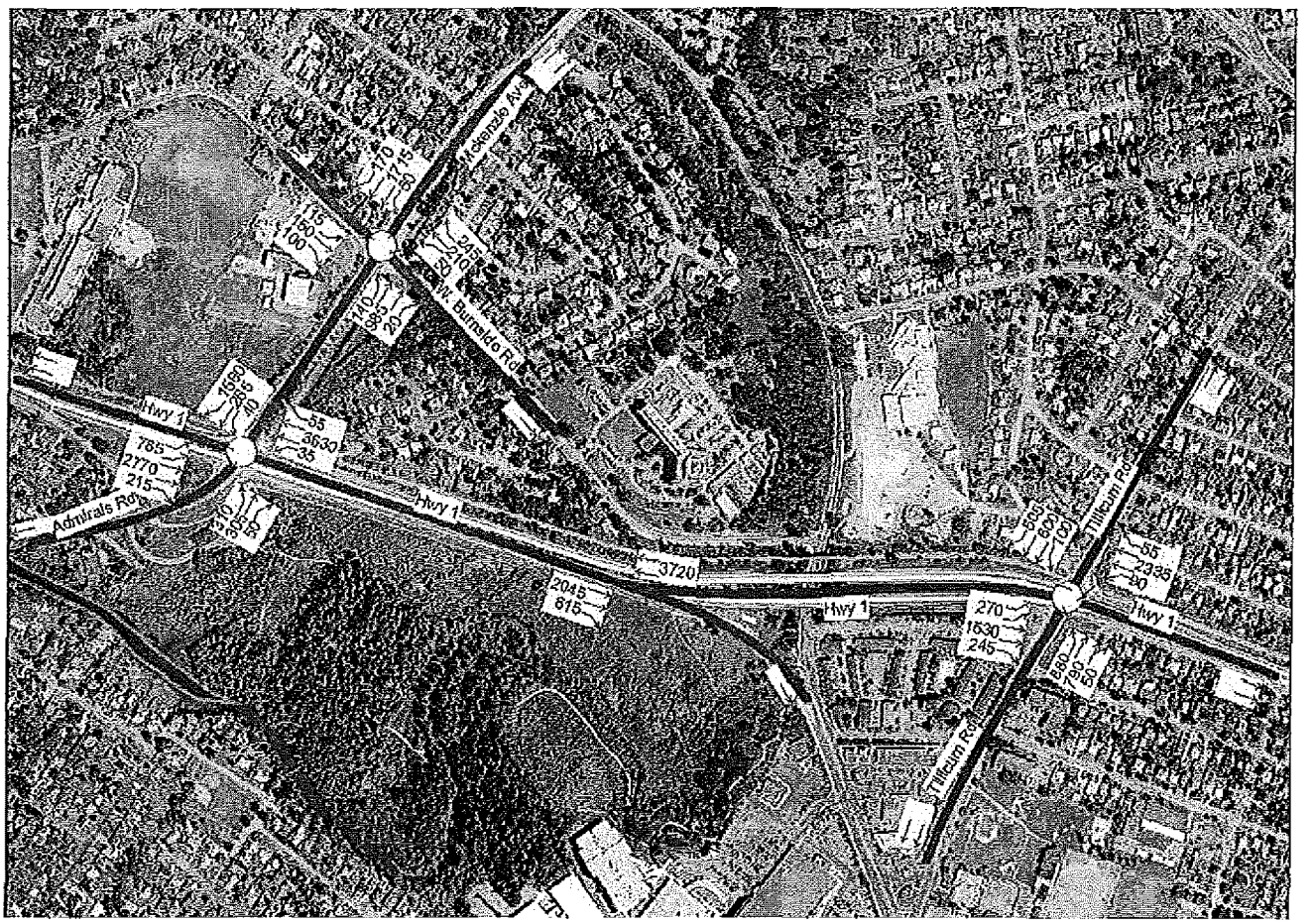


Figure 2.23
Forecast 2026 AM Peak Hour Intersection Levels of Service and Movement Delays
(seconds / vehicle)

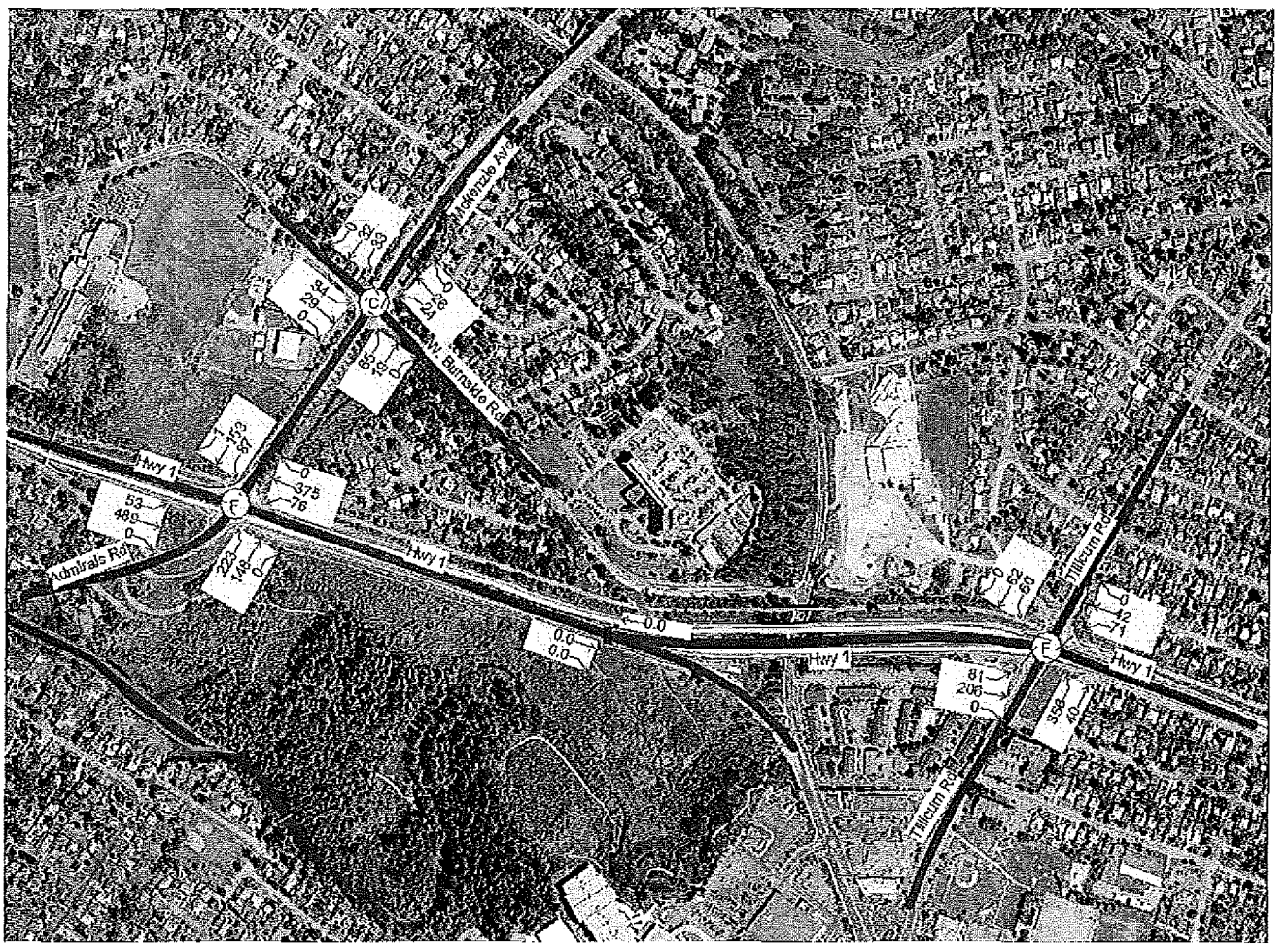
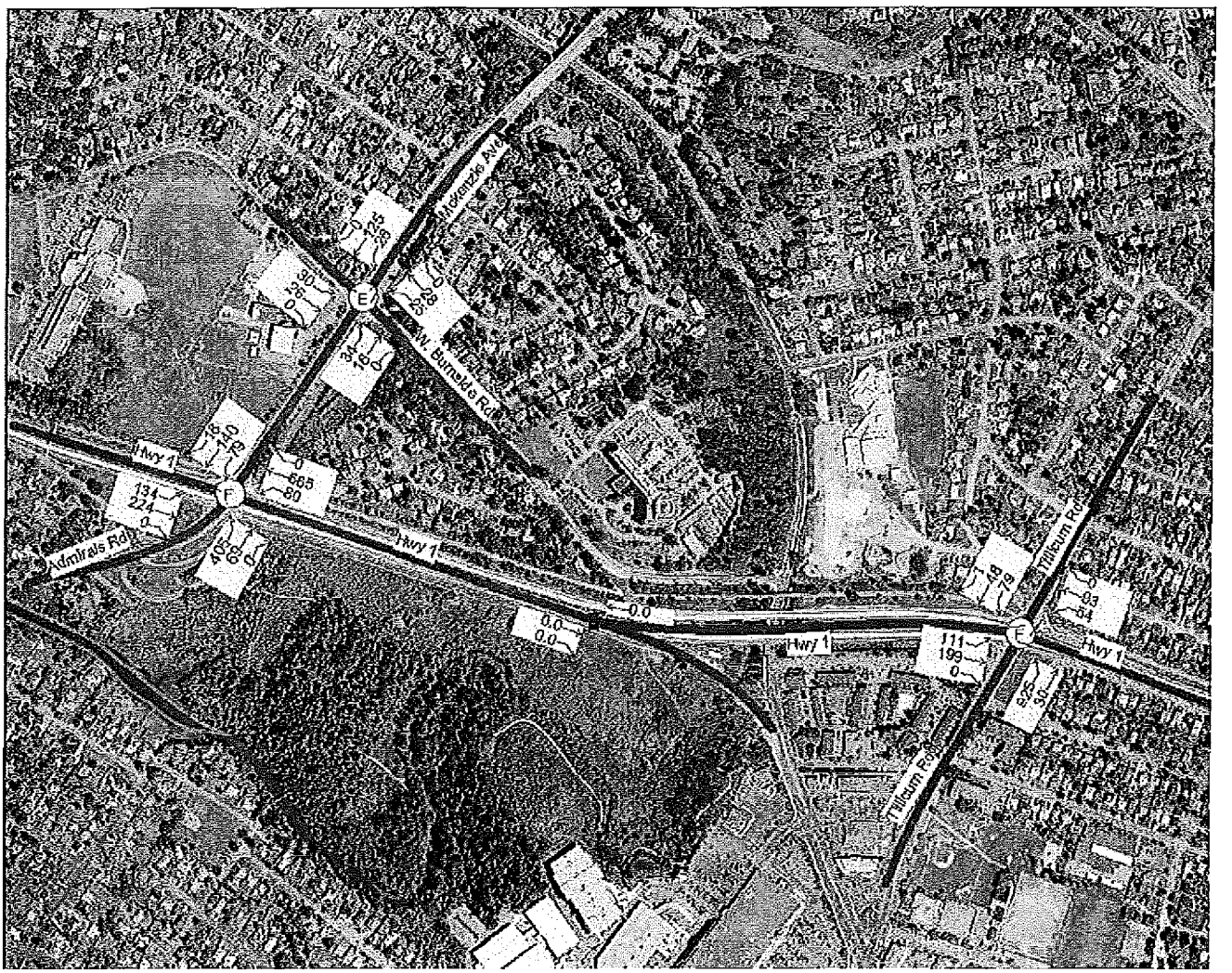


Figure 2.24
Forecast 2026 PM Peak Hour Intersection Levels of Service and Movement Delays
(seconds / vehicle)



2.4 Problem Definition Summary

These results suggest that the status quo along the Highway 1 corridor and the ongoing lack of alternative east-west roadway network in the Capital Region to support local commuter trips will have a dramatic impact on mobility in the region. Specific to the Highway 1 corridor, forecast traffic volumes are projected to increase in the peak direction substantially as a result of regional and provincial growth on Vancouver Island. Because of the lack of a municipal roadway network to support east-west travel demands in the Capital Region, a disproportional amount of the traffic

growth is forced to use the Highway 1 corridor. In fact, the forecast travel demands are projected to increase beyond the theoretical capacity even if it was widened to six lanes between the Millstream Interchange and Admirals and McKenzie.

East of McKenzie Avenue, there are no plans to expand the highway or major roadways within the City of Victoria and District of Saanich, other than local area improvements. In fact, the capacity of the Douglas Street corridor will be reduced with the implementation of median bus only lanes between Saanich Road and Downtown Victoria. With limited expansion of the capacity of the local area network and provision of an effective major road system beyond the Highway 1 corridor, the overall capacity of the network at the eastern end of the corridor will not be capable of handling significant increases in traffic volumes. Without change, the 2026 PM peak hour V/C ratios along the roadways leading to and from the Highway 1 corridor are projected to increase substantially as illustrated in Table 2.6 and the intersection delays at the McKenzie Avenue and Tillicum Road intersections with the Highway will increase dramatically.

Without new or significantly improved major roadways at the eastern end of the Highway 1 corridor, the complete travel time benefits of increasing the Highway capacity could never be realized. The delays experienced along the adjacent roadway network that is in place today would only increase, thus marginalizing the benefits of any investment in capacity improvements along the Highway for general purpose traffic.

Rather than investing in capacity improvements for general purpose travel on the Highway through to Victoria and Saanich, the Ministry may wish to give consideration to potential improvements for trips that are concentrated on the connection between Highway 1 and Highway 17 in addition to enhancements to reduce potential impacts on high priority vehicles including buses, high-occupant vehicles and trucks. It should be recognized that any improvements for high priority vehicles require support strategies that extend beyond the Highway, such as the provision of attractive bus services, carpool/vanpool programs as well as a range of TDM initiatives. A combination of new support services and programs along with enhancements to the Highway 1 corridor for priority vehicles would reduce projected travel times and encourage desired travel choices.

3.0 CORRIDOR PRINCIPLES

The following discussion summarizes the guiding principles or vision for the Highway 1 corridor and surrounding networks that will be used shape the discussion regarding potential long-term improvement strategies.

- Support Highway 1 corridor as a primary highway and part of the National Highway System serving communities throughout Vancouver Island and key connections to Highway 17 and the Swartz Bay Ferry Terminal.
- Maintain the Freeway standard configuration from Goldstream Park to the intersection of Admirals Road and McKenzie Avenue.
- Maintain the four-lane Urban Divided Arterial condition from the intersection of Admirals Road and McKenzie Avenue to Tillicum Road.
- Ensure that planned changes to the Highway 1 corridor are developed in recognition of the broader municipal network that interfaces with the highway such as the Douglas Street corridor.
- Encourage multi-modal travel along the Highway 1 corridor as a strategy to increase the people carrying capacity of the highway as well as the movement of goods and services. This will support the provincial goal of reducing greenhouse gas emissions by 33% of their current levels by 2020.
- Maintain and support the efficient movement of emergency response vehicles at all times of day.
- Encourage further the development of a municipal roadway network system that supports the movement of priority vehicles as identified within the TravelChoices Strategy.
- Maintain priority to promote cycling on the Galloping Goose Trail, which parallels Highway 1 from Town and Country to the Thetis Interchange. With this more attractive and comfortable option, provision of bicycle facilities along the Highway through this section may be secondary to other priority vehicle treatments.

4.0 CANDIDATE IMPROVEMENT OPPORTUNITIES

It is recognized that the Ministry of Transportation is not planning to implement specific capital improvements for the Highway 1 corridor at this time. Rather, the Ministry is considering potential long-term directions for the Highway 1 corridor in order to provide guidance to current and future planning work, such as BC Transit's review of alternative bus lane concepts.

This section of the report provides a general discussion of potential long-term directions to consider before identifying specific improvement concepts that may be preserved in the long-term. In this regard, policy questions such as the potential use and priorities for specific types of traffic may be addressed in order to achieve the guiding principles presented in Section 3. In general, there are five categories of improvements that are broadly discussed within this section of the report – the "do nothing option," transit only lanes, priority vehicle lanes, improvements for general purpose traffic and other support strategies.

4.1 Do Nothing

The "Do Nothing" option means maintaining the four general purpose lanes on the Highway 1 corridor between the Millstream Interchange and Saanich Road that connect with the center bus lane concept planned along Douglas Street to Downtown Victoria. Section 2.2 describes the future base conditions along Highway 1 for all modes of travel without any changes to the corridor. In short, maintaining the status quo along the Highway corridor and the adjacent roadway network will eventually result in the following outcomes that should be considered in a long-term strategy:

- Traffic growth along the Highway 1 corridor will increase by as much as 70% between today and 2026.
- The delays along the Highway and the Old Island Highway will increase dramatically in the long-term.
- The average travel speeds along the Highway 1 corridor is projected to decrease from approximately 52km/hr today to less than 16km/hr in 2026. Assuming that the projected travel demands continue to rise as projected, vehicle emissions will increase exponentially with the significant decrease in vehicle speeds.
- Peak directional travel times along the Highway 1 corridor between the Millstream Interchange and Saanich Road during the peak hour will increase from slightly less than 15 minutes today to almost 40 minutes in 2026. Although the capacity of the Highway can not support the projected demands, the peak periods will become longer within the region and travel times will increase and as a result will the impact individual travel choices – when and how people travel.

- The major roadway network connecting to the Highway 1 corridor in the City of Victoria and District of Saanich can not support the significant increases in traffic volumes. In fact, the capacity of the Douglas Street corridor will also be reduced with the introduction of a centre-median bus lane.

4.2 Bus Only Lanes

The Regional Transportation Strategy - *TravelChoices* – identified the need for an east-west rapid transit connection between downtown Victoria and Langford in order to reduce and minimize the growth of SOV trips. Although the long-term vision included the provision of LRT that would connect with the Douglas Street corridor, the implementation of bus rapid transit (BRT) was identified as an interim measure to provide a high speed transit service. BRT essentially includes the provision of dedicated transit facilities – such as traffic signal priority, queue jumpers, and bus only travel lanes – designed to minimize delays to buses and transit customers. The BRT system also includes the provision of frequent and high capacity transit services with stops that are separated more than conventional transit routes in order to increase speeds and to reduce total travel times for longer distance trips.

In 2004, BC Transit began work with the City of Victoria, District of Saanich and the Ministry of Transportation on the development of the BRT system along the Douglas Street corridor. This facility and service will give transit a competitive edge over using the automobile for travelling into the core area of the region, and provide a more affordable and sustainable transportation approach to accommodating growth in the region. The specific components of the planned facility will be implemented in phases as follows:

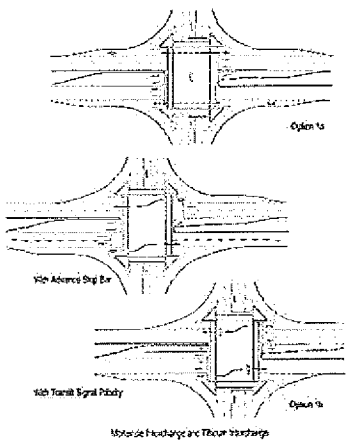
- Central traffic control system to improve traffic flow on Douglas Street and the implementation of signal priority for buses.
- Dedicated transit only lanes in the centre of Douglas Street from downtown to Saanich Road.
- Develop a rapid bus service network along the Highway 1 corridor through to Langford.

In order to advance planning for the western extension of BRT, BC Transit has been working with the Ministry of Transportation and other agencies on the development and evaluation of transit only lanes concepts along the Highway 1 corridor. In general, these concepts have included both dedicated bus only lanes operating in the centre lanes as well as shoulder busway facilities as illustrated in Figure 4.1 and briefly described below.

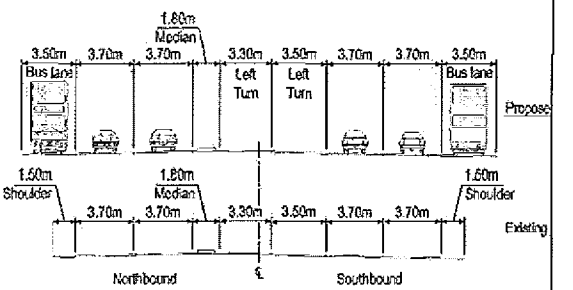
Figure 4.1
Potential Transit System Enhancements

1. Queue Jumpers

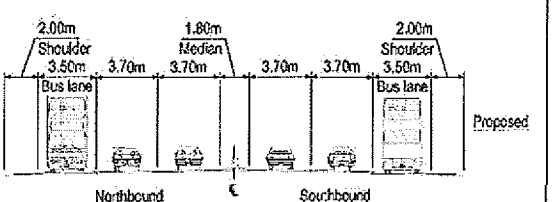
a. Southbound queue jumpers at McKenzie and Tillicum.
b. Modified southbound queue jumpers at McKenzie and Tillicum



2. Shoulder bus lanes – Thetis Interchange to Saanich Road

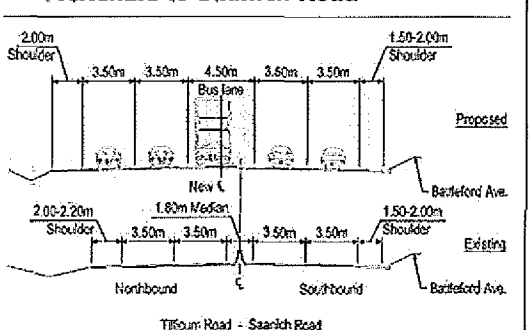


3. Outside bus lanes – Thetis Interchange to Saanich Road



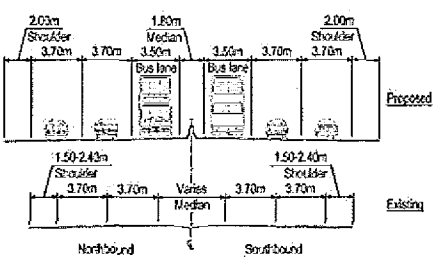
Typical Cross-Section
(Widening takes place in a similar manner as Option 2, for each segment of the corridor)

4. Reversible median bus lane – McKenzie to Saanich Road



Tillicum Road - Saanich Road

5. Median Bus Lanes – Thetis Interchange to Saanich Road



6. Outside bus lanes (Thetis to Tillicum) and Median Bus Lane (Tillicum Road to Saanich Road)

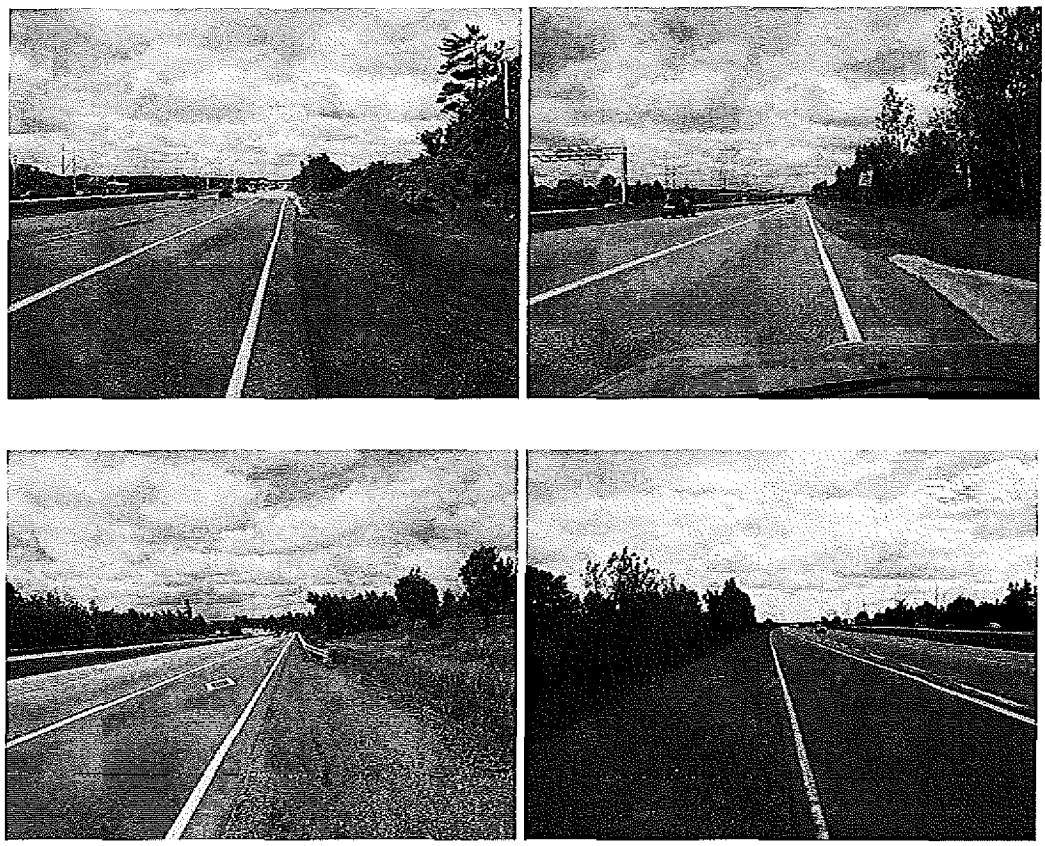
1. **Queue Jumper Lanes.** The queue jumper lanes that currently exist are not designed by length of the queues, rather, dictated by the constraints of upstream and downstream structures on the highway. Two options can still be explored within these confined areas:

    a. The first option would include one additional eastbound lane at McKenzie through the intersection for buses and a minor extension of the westbound queue jump lane that already exists today. A similar improvement would be provided at Tillicum Road. Assuming no changes to the signal timing, this option would not impact the existing capacity of the provincial traffic between Highway 1 and McKenzie Avenue. It is anticipated that this option would moderately reduce delays for buses.

    b. The second queue jump lane is similar to the first, but the queue jump lane for buses stops on the east side of the intersection to both McKenzie Avenue and Tillicum Road. Once again, this option does not negatively impact the existing capacity of the provincial traffic between Highway 1 and McKenzie Avenue.

2. ***Shoulder Bus Lanes*** **(Thetis to Saanich Road).** The shoulder lane in the eastbound direction begins at the on-ramp from the Thetis Interchange and ends at the Helmcken Road interchange for the westbound direction. The eastbound bus lane leaves the highway at Helmcken Road and returns again using the off-ramp and on-ramp respectively. The shoulder lanes extend through the intersections of McKenzie Avenue and Tillicum Road as additional eastbound and westbound lanes. Similar to the queue jump lane options, no impacts on the capacity and travel times for provincial traffic between Highway 1 west and McKenzie Avenue are anticipated with this option.

    Although shoulder bus lanes have been used in many cities throughout North America, they are not currently used on the highway system in British Columbia. The photos below illustrate example bus shoulder lanes located along the Highway 417 in the City of Ottawa.



3. ***Outside Bus Lanes (Thetis Interchange to Saanich Road).*** This concept is similar to the one previously described and includes the option of permitting HOV traffic to the shoulder lanes. Unlike most HOV lanes however, the shoulder lane concept forces westbound HOV trips to use the Helmcken Road off-ramp and on-ramp which would add further delay to HOV trips, but allow transit to pick-up and drop-off passengers. The additional shoulder lane for buses through the McKenzie Avenue and Tillicum Road intersections would not adversely impact the provincial travel between Highway 1 west and McKenzie Avenue. If utilized for HOVs, the delays at both intersections would be reduced for all traffic.

4. ***Reversible Median Bus Lane.*** The reversible bus median bus lane would begin and end immediately west of Tillicum Road. Although the travel time benefits for transit would be moderate, there would be no impact on provincial highway traffic between Highway 1 and McKenzie Avenue.

5. ***Median Bus Lane (Thetis Interchange to Saanich Road).*** This concept includes the provision of two centre median bus lanes that could also be utilized for HOVs along the Highway portion of the route. This median bus facility would connect with the two way median bus lanes being designed for the Saanich Road to downtown section of the project. With the provision of additional lanes for buses and other HOVs as desired, the existing travel lanes and capacity for trips between Highway 1 west and McKenzie Avenue are not expected to be dramatically impacted.

6. ***Outside Bus Lane (Thetis Interchange to Tillicum) and Median Bus Lane (Tillicum to Saanich).*** This concept is essentially a combination of concepts 3 and 5.

In general terms, the following table (Table 4.1) highlights the anticipated services as well as resulting capacity and ridership with BRT facilities along the Highway 1 corridor. As indicated, transit services would be increased and the travel times between Langford and Downtown Victoria would decrease by approximately 18 minutes (a reduction by almost 40%). With increased services, reduced travel time and enhanced reliability, it is anticipated that ridership would also increase by as much as 25% in the short-term.

Table 4.1
Proposed Transit System Changes with BRT

Transit System Features	Today	With Dedicated BRT Lanes
Service Frequency ***(along Highway 1)***	8 min	5 min
Langford to Downtown		
Travel Distance	19 km	19 km
Travel Time	48 min	30 min
Average Speed	24 km/hr	38 km/hr
Transit System Capacity ***(along Highway 1)***	1600 passengers	1800 passengers
Transit Ridership ***(peak hour on Highway 1)***	1200 passengers	1600 passengers

In the long-term, these bus lane facilities would not be impacted by the significant increase in travel times projected during the morning and afternoon peak periods as described in Section 2.

4.3 Priority Vehicle Lanes

Future expansion of the Highway 1 corridor may also include provisions for other high priority vehicles in dedicated lanes along the Highway, either centre lane or outside lane facilities. In connection with this policy direction, the TravelChoices strategy identified an inter-municipal network of roads in the Capital Region that are designed to serve priority vehicles – such as HOVs,

transit, trucks and bicycles. In other words, the importance of these corridors in serving priority modes of travel is recognized and potential improvements along these routes should ideally be designed to support these modes. The Highway 1 corridor was identified as a priority corridor supporting provincial as well as inter-municipal travel in the Capital Region.

Priority lanes for freeways have been designed and implemented in many communities throughout North America. These facilities vary not simply in terms of length and configuration, but also operating practices. Although most freeway priority lanes have largely been developed as HOV facilities – such as in the Vancouver area – some have also been implemented as bus only lanes in communities such as Ottawa and Pittsburgh. Additionally, the periods for operating priority lanes may also vary from a 24-hour condition that is in operation seven days a week through to peak only operation from Monday to Friday. Managed lanes generally refer to a variety of management tools and techniques used to improve freeway efficiency and meet specific corridor and community objectives. Some management tools and techniques typically used include High Occupancy Vehicle (HOV) lanes, value priced lanes, including High Occupancy Toll (HOT) lanes, and exclusive or special use lanes (such as express, bus-only, or truck-only lanes). Common themes that are utilized today include:

- A "freeway-within-a-freeway" facility, provides a set of lanes within the freeway cross-section that are physically separated from general purpose lanes.
- The facility provides operational flexibility, therefore being able to actively respond to future growth and changes.
- The three principal management strategies: pricing, vehicle eligibility, and access control.

Appendix B provides a summary of the general features and operational characteristics of select freeway priority lanes in North America. For comparison purposes, the distance between the Millstream Interchange and McKenzie Avenue on Highway 1 of approximately 7.5 km (and only 2.8 km between the Thetis Interchange and McKenzie Avenue) would be among the shortest HOV facilities that are not queue jumpers or priority lanes at toll facilities.

Before considering optional arrangements for priority vehicle lanes along the Highway 1 corridor, the Ministry will want to examine and discuss broad policy level considerations. The following discussion highlights some of those key considerations in the context of the Highway 1 corridor between the Millstream Interchange and McKenzie Avenue.

- ***Congestion.*** A major factor for establishing HOV lanes is severe and recurring congestion levels. The delays experienced by drivers must be significant enough to force a shift in mode choice to either carpooling or vanpooling, or to increase transit usage.

Although the growth forecast for the Highway 1 corridor previously described includes a widening from two to four general purpose lanes, the anticipated increase in PM peak directional traffic to over 5,000 vehicles per hour could not be accommodated by the existing two travel lanes west of McKenzie Avenue. In fact, drivers would experience significantly greater levels of congestion, defer travel to other periods or make greater use of transit which would experience similar delays without transit priority measures.

- ***Travel time savings.*** HOV lane should only be considered only if it would provide a reliable travel time reduction. Research suggests that that the time savings for HOV trips should be a minimum of over one and a half minutes per kilometre over a trip from origin to destination, with a total time savings of desirably more than eight minutes. Considering the potential of an HOV lane on Highway 1 between Millstream Road and McKenzie (approximately 7.5 km/hr) a travel time savings of 1.5 minutes/km would result in a travel time savings of over 11 minutes. Without the widening of Highway 1, it is anticipated that the travel time between the Millstream Interchange and McKenzie Avenue would increase substantially.

- ***Person throughput.*** A major goal of HOV is to increase the person moving capacity, while minimizing the delays. Research suggests that the projected number of person using the priority lane should exceed the average number of person carried in an adjacent mixed flow lane in the same direction. For example, this parameter would be met if 300 vehicles were using the HOV lane (2.5 person per vehicle) and 600 vehicles were in the general purpose lane (assuming 1 person per vehicle). It should be noted that detailed forecasts of HOV lanes should examine the impacts of policies for 2+ or 3+ occupancy levels.

- ***Vehicle throughput.*** Public acceptance of the HOV lane will be impacted by not only the effectiveness of the facility, but its usage. In particular, the public will react negatively to a policy that results in the 'empty lane' syndrome – such as may be the case with a bus only lane or an HOV lane with an unreasonable minimum vehicle occupancy. Research of freeway and arterial HOV lanes indicates that the initial usage of an HOV lane should be a minimum of 400 to 800. Lower numbers may be acceptable when bus transit volumes are in the range of 30 to 45 buses per hour (or headways of 80 seconds to 2 minutes). The two primary operational strategies to make better overall use of HOV lanes may include lower vehicle occupancy or changes to the hours of operation.

- ***Capacity improvement.*** Rather than taking away general purpose lanes from the freeway, an HOV lane is reasonable to consider whenever new lanes are being added. In

this regard, widening Highway 1 from four to six travel lanes to support transit and HOVs could be considered without significantly increasing travel times of existing trips. Rather, priority vehicles are provided with shorter travel times by using dedicated HOV and transit priority lanes. If additional lanes were added along Highway 1 for priority vehicles today between the Thetis Interchange and McKenzie Avenue, travel times for general purpose traffic would change marginally (or may improve slightly) and improve significantly for priority vehicles.

- ***Local agency and public support.*** A strategy for priority lanes along any Highway should only be implemented when supported by local, regional and provincial agencies. Most successful priority lane projects have multiple agency involvement at a policy level as well as some of the operational and with support facilities. In the case of Highway 1, planning for HOV lanes would require local area support in the Western Communities and beyond for the provision of park-and-ride or park-and-pool facilities at key interceptor locations.

- ***Enforcement.*** Dedicated or lane managed facilities for priority vehicles should only be implemented when the resources and commitment for effective enforcement is in place. This is required to achieve and maintain acceptable levels of compliance. Failure to support HOV or other priority lanes with enforcement in severely congested areas will increase violations and the effectiveness of the dedicated lanes. Once policy decisions are made regarding the provision of priority lanes, enforcement agencies should be part of the planning and design for any priority facility.

- ***Optional facility types.*** Consistent with the options previously examined and described for bus only lanes along Highway 1, there are a range of potential concepts for considering priority vehicle lanes that include: lane conversions, shoulder conversions, reversible lanes, contra flow, queue bypasses and exclusive ramps. For the Highway 1 corridor, centre lane and outside lane operations were considered as part of the concept development stage.

- ***Other considerations.*** Once the policy decisions have been made to provide dedicated lanes or space for priority vehicles, the Ministry should also consider several other factors such as the support systems to connect with dedicated lanes (i.e. park-and-pool lots, preferential treatments at ramps, ridematching, etc.), safety, staging improvements, technology for dedicated or lane managed facilities, etc.

As a slight variation to bus only lanes, some highway authorities – including the Ministry of Transportation – have implemented dedicated lanes for other priority vehicles, typically in the form of HOV lanes that would also serve transit. This section of the document highlights some of the potential features of dedicated lanes for other priority vehicles along the Highway either as a static condition or through managed lanes.

4.4 Improvements for General Purpose Traffic

As previously described, many background studies (including the TravelChoices Strategy) have anticipated that the Highway 1 corridor would eventually be widened from four to six lanes between the Thetis Interchange and McKenzie Avenue. It is acknowledged however that no policy direction for the operation of the additional lanes has been developed. In addition to the widening of the Highway, consideration has also been given toward some form of major upgrade to the intersection of Highway 1 at McKenzie Avenue and Admirals Road. These improvements ranged from additional eastbound and westbound through lanes to complete grade-separation such as the provision of a diamond interchange. Figure 4.2 summarizes the six historical options that were identified in a recent study based on discussions with the Ministry of Transportation.

Figure 4.2
Potential Improvement Options for McKenzie Intersection*

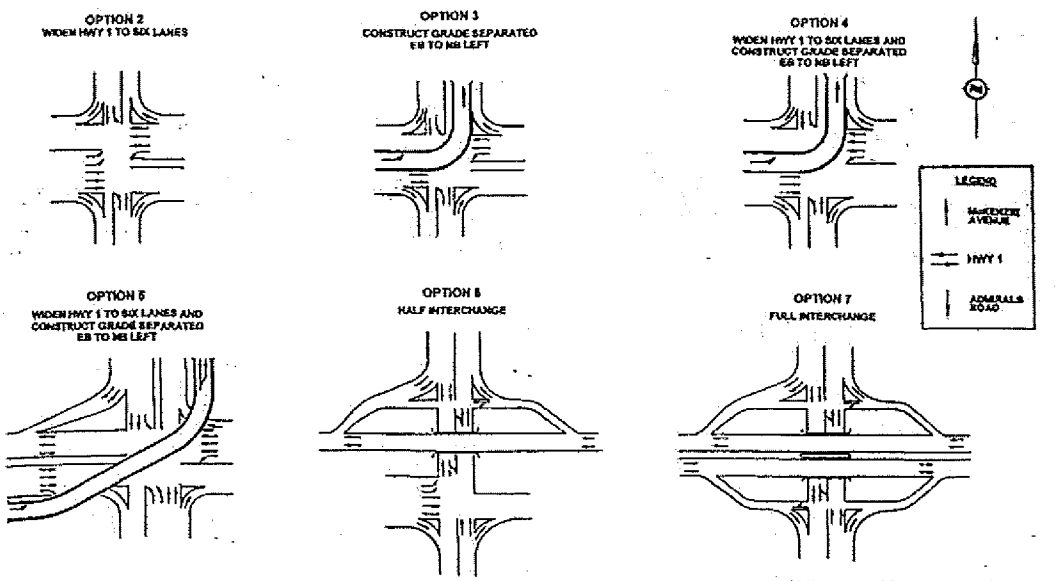


Figure 6.1: MOT Proposed Improvement Options for McKenzie Intersection

*Source: McElhanney Highway 1 Bus Lanes, Victoria – Conceptual Planning Report (April, 2007)

PM peak hour traffic forecasts previously described suggest that the majority of the increase in long-term traffic along the Highway 1 corridor is generated to and from areas east of McKenzie Avenue to the Victoria and southern areas of Saanich – such as Town and Country. In fact, background transportation models examined as part of this study indicate that the growth in traffic between Highway 1 west and McKenzie Avenue is modest. It should be acknowledged that the capacity of the Highway 1 to McKenzie Avenue left turn lane is restricted with a signal operation with either at-grade or future grade-separated concepts with a diamond interchange.

Approximately 1.1 km east of the McKenzie Avenue intersection, the Tillicum Road intersection is expected to remain as an urban signalized intersection without significant capacity improvements. Based on forecast growth patterns, it is anticipated that the through traffic demands and turning movements will continue to grow and the delays at this location would increase substantially.

4.5 Local and Regional Improvement Strategies

In addition to those highway based improvement strategy options, there are a range of local and regional transportation system improvements identified in the TravelChoices Strategy that should be promoted and supported by the Capital Regional District and area municipalities. The following summary highlights those strategies that would support planned growth and development of the Capital Region and promote the use of priority vehicles.

- ***Municipal roadway expansion and upgrades.*** As previously indicated, the limited local area network results in a disproportional amount of growth in traffic using the Highway 1 corridor relative to the increase in population projected in the Capital Region. As such, the delays along the Highway increase at a rate that exceeds the growth in population and employment in the Region. In order to support local area growth and development, the Ministry should expect that local municipalities will coordinate the development of an expanded roadway network as well as upgrades to the major roadways to support priority modes, including the movement of goods and services.

- ***TDM incentive programs.*** The TravelChoices Strategy describes various initiatives to encourage walking, cycling, transit, ridesharing and other alternatives to driving alone. Key TDM incentives identified in the Strategy are summarized in Table 4.2. Generally, these are all important elements of the TDM Strategy. Carsharing was identified as a separate initiative which is best pursued by a co-operative or other independent organization, rather than being operated as a government program.

Table 4.2
TDM Incentive Programs

TDM Incentive	Description	Application	Travel Choices Strategy
Flexible work arrangements	Flexible start and end times. Telecommuting and work from home.	Site	✓
Transit fare incentives	Significant fare reductions for groups purchasing passes.	Regional	✓
Ridematching	Assistance in finding carpool/vanpool partners.	Regional	✓
Carpool parking	Priority parking locations for carpools. Reduced price or free parking.	Site	✓
Vanpooling	Provide vans for groups of 8 persons travelling together daily.	Regional	✓
Guaranteed ride home	Ride home in case of emergency for persons who use other modes of travel.	Site	✓
Carsharing	Collective ownership and sharing of a fleet of automobiles.	Site	*

- ***TDM Facilities.*** The TravelChoices Strategy also identified physical measures which can be used to discourage drive-alone travel and encourage the use of other modes of travel. Key TDM facilities included in the Strategy are summarized in Table 4.3. Ramp metering is not identified as a component of the TDM Strategy at this time, as it is generally a facility management measure used in areas where levels of congestion on freeway networks are far more extensive and severe than what is forecast to be experienced in the Capital Region over the next 25 years.

Table 4.3
TDM Facilities

TDM Facility	Description	Application	Travel Choices Strategy
Bus/carpool lanes	Lanes on roadway designated for exclusive use of buses and/or carpools.	Municipal Regional	✓
Transit priority	Facilities which permit buses to bypass congested intersections and roadways.	Municipal Site	✓
Park-and-ride	Parking lots in suburban and rural areas served by frequent regional transit service.	Regional	✓
Bicycle parking	Secure parking to prevent theft or vandalism of bicycle.	Municipal Site	✓
Bicycle routes	Bicycle lanes, signed routes and pathways.	Municipal	✓
Pedestrian crossings and routes	Marked or signalized road crossings. Sidewalks and walkways.	Municipal Site	✓

- ***TDM Policies.*** The TravelChoices Strategy also identified several TDM Policies and other practices which can discourage drive-alone travel and encourage the use of other modes of travel. Generally, policy options offer the greatest long-term potential, and in many cases involve little or not cost to taxpayers. However, jurisdictional and legislative barriers and other obstacles make implementation of some policies difficult. Key TDM policies are summarized in Table 4.4.

Table 4.4
TDM Policies

TDM Policy	Description	Application	Travel Choices Strategy
Trip reduction programs	Mandatory or voluntary TDM programs implemented by employers and government agencies.	Municipal Regional Site	✓
Parking management	Pricing and supply strategies to make more efficient use of existing parking, minimize the need for new parking, and minimize automobile use.	Municipal Site	✓
Transportation allowance	Financial payment provided by employer to employees as a benefit, to be used for transportation needs.	Federal Site	×
Parking cash out	Option to receive financial payment in lieu of subsidized parking at workplace.	Federal Site	×
Road pricing	Tolls, taxes and other means of charging motorists based on actual use of roads.	Provincial Regional	×
Distance-based insurance	Automobile insurance priced based on use.	Provincial	×
Taxation	New or increased taxes on transportation-related items such as automobiles, licensing, gasoline, etc.	Provincial Federal	×

5.0 POTENTIAL DIRECTIONS

There are a range of strategic options for the Highway 1 corridor between Millstream Road and Tillicum Road for the Ministry to consider and where guidance on short-term initiatives, such as BC Transit's bus rapid transit facilities as well as on longer term planning, is required. The following discussion highlights the preliminary outcomes from the assessment of the possible short-term improvements and long-term opportunities for the Ministry of Transportation to plan and preserve as required.

- The "Do Nothing" option is not recommended due to the significant increases in delays and congestion along the Highway 1 corridor, as well as the surrounding area networks. Travel times along the Highway 1 corridor between the Millstream Interchange and Saanich Road will increase dramatically (from approximately 15 minutes today to almost 40 minutes in 2026), peak periods will become longer and priority modes such as transit and goods movement will be negatively impacted. Overall, these patterns will result in significantly reduced average travel speeds along many of the major roads in the Region that will in turn increase greenhouse gas emissions.

- Bus only lanes along the Highway will serve to enhance travel times in the short-term and the long-term between the Western Communities and the core areas of the Capital Region. The combination of increased transit services and the significant travel time savings with the provision of dedicated lanes along the Highway 1 corridor will make transit more attractive and in turn increase ridership. It is expected that this strategic direction can reduce delays and congestion forecast with a "do nothing" scenario and will result in less greenhouse gas impacts. Based on the preliminary assessment of priority treatments examined by BC Transit along the Highway 1 corridor, shoulder bus lanes would provide significant transportation system benefits for approximately $8 million in capital costs. Other options for outside and median bus lanes are more costly and provide comparable benefits to the shoulder lane option. The outside bus lane would likely only be required if the Ministry chose to preserve the potential for high priority vehicle usage. The median option is more costly than the shoulder lane facility and could limit the range of potential longer term improvements for the Admirals/McKenzie intersection if desired to address capacity and safety issues. The Ministry should continue to work with BC Transit in the development and evaluation of these strategic short to medium-term improvement options.

- High priority vehicle lanes for HOV and/or trucks along the Highway 1 corridor may be considered further by the Ministry as a longer-term use where there is strong commitment from local municipalities to expand the network of high priority vehicle facilities as well as

support strategies to encourage ridesharing as identified within the TravelChoices Strategy and highlighted in Section 4.5.

- Capacity improvements at the Highway 1 and Admirals/McKenzie intersection should continue to be preserved and planned by the Ministry of Transportation. However, the potential range of improvements that are considered should reflect the fact that the capacity of downstream intersections of the Highway at Tillicum Road and Saanich Road can not support significant growth in traffic and that this capacity will be reduced with the implementation of bus rapid transit facilities along the Douglas Street corridor. In this regard, the Ministry will want to consider a functional planning and design study of long-term at-grade and partial grade separated improvement options for the Highway 1 and Admirals/McKenzie intersection that is concentrated on serving provincial travel between Highway 1 and Highway 17 and supports the principles presented in Section 3 of the report. This study should assume that the Highway 1 corridor between the Millstream Interchange and Admirals/McKenzie will not be widened for general purpose traffic.

- Support strategies such as the provision of an enhanced municipal roadway network must be encouraged in order to support the significant increase in travel generated by planned growth and development within the Capital Region. The Ministry of Transportation should continue to encourage local agencies to develop new and enhanced major roadways that will provide alternative east-west routes that are largely reliant on the Highway 1 corridor today. Additionally, the Ministry should encourage and monitor the development of regional TDM strategies that encourage walking, cycling, transit use and ridesharing within the Capital Region. Specific attention should be given to the Galloping Goose Trail, which parallels Highway 1 from Town and Country to the Thetis Interchange. The Ministry should work with other agencies to maintain and enhance the safety, comfort and mobility of this trail. Trail users should be given priority over auto traffic and conflicts minimized between trail users and auto. With increasing use of the trail, further planning should examine how best to accommodate both recreational users and the daily commuters.

APPENDIX A

Highway 1 Vehicle Classification Counts

TRANSTECH DATA SERVICES OCCUPANCY/CLASSIFICATION SURVEY

TRANSTECH DATA SERVICES

Day/Date: **Tuesday, June 19, 2007** *Observer* Various

Location: **Route 1 West of Helmcken Interchange** *Weather:* Sun and clear

Direction: **Northbound** *File:* HelmckenIC-OccClass.xls

	Passenger Vehicles					Other Vehicles					
	No. of people in Vehicles					RVs	Buses	Light Trucks	Heavy Trucks	Total	End Hour Total
TIME	1	2	3	4+	?						
06:30 - 06:45	206	14	3	0	0	0	1	21	6	251	-
06:45 - 07:00	309	60	5	2	1	1	6	12	11	407	-
07:00 - 07:15	283	46	6	0	1	0	2	16	17	371	-
07:15 - 07:30	377	39	4	3	2	0	4	17	32	478	1507
07:30 - 07:45	348	55	5	1	1	1	8	18	25	462	1718
07:45 - 08:00	416	63	12	0	1	0	4	32	22	550	1861
08:00 - 08:15	340	65	9	0	1	0	4	20	13	452	1942
08:15 - 08:30	385	86	7	4	6	2	10	26	17	543	2007
08:30 - 08:45	427	74	3	3	3	1	9	23	15	558	2103
08:45 - 09:00	351	95	6	5	2	2	6	25	26	518	2071
09:00 - 09:15	313	104	12	2	0	1	10	27	19	488	2107
09:15 - 09:30	312	103	15	0	1	1	10	20	22	484	2048
TOTAL	4067	804	87	20	19	9	74	257	225	5562	2107
PERCENT	73.1%	14.5%	1.6%	0.4%	0.3%	0.2%	1.3%	4.6%	4.0%	100.0%	MAX HR
No. of People	4067	1608	261	80	19						

Avg Occ for Pass Vehs **1.2**

Pass Veh **4978** Pass **6016**

	Passenger Vehicles					Other Vehicles					
	No. of people in Vehicles					RVs	Buses	Light Trucks	Heavy Trucks	Total	End Hour Total
TIME	1	2	3	4+	?						
15:00 - 15:15	538	165	12	7	4	6	6	18	24	780	-
15:15 - 15:30	609	202	29	21	6	4	9	23	12	915	-
15:30 - 15:45	682	193	23	17	3	4	6	21	11	960	-
15:45 - 16:00	679	159	32	13	6	0	2	14	14	919	3574
16:00 - 16:15	740	211	27	18	1	3	4	12	11	1027	3821
16:15 - 16:30	783	207	29	17	9	1	8	22	14	1090	3996
16:30 - 16:45	813	210	23	15	2	3	2	18	9	1095	4131
16:45 - 17:00	793	223	22	14	1	0	4	14	10	1081	4293
17:00 - 17:15	773	210	26	18	1	3	6	10	12	1059	4325
17:15 - 17:30	759	190	29	18	8	2	5	5	8	1024	4259
17:30 - 17:45	751	197	34	11	6	3	8	14	11	1035	4199
17:45 - 18:00	642	237	40	25	1	3	1	13	6	968	4086
TOTAL	8562	2404	326	194	48	32	61	184	142	11953	4325
PERCENT	71.6%	20.1%	2.7%	1.6%	0.4%	0.3%	0.5%	1.5%	1.2%	100.0%	MAX HR
No. of People	8562	4808	978	776	48						

Avg Occ for Pass Vehs **1.3**

Pass Veh **11486** Pass **15124**

Notes: 06:30 - 06:45 First interverval not recorded for Slow Lane

TRANSTECH DATA SERVICES OCCUPANCY/CLASSIFICATION SURVEY

TRANSTECH DATA SERVICES

Day/Date: **Tuesday, June 19, 2007** *Observer* Various

Location: **Route 1 West of Helmcken Interchange** *Weather:* Sun and clear

Direction: **Southbound** *File:* HelmckenIC-OccClass.xls

	Passenger Vehicles					Other Vehicles					
	No. of people in Vehicles					RVs	Buses	Light Trucks	Heavy Trucks	Total	End Hour Total
TIME	1	2	3	4+	?						
06:30 - 06:45	773	120	11	3	0	0	6	10	20	943	-
06:45 - 07:00	876	188	10	3	0	1	12	16	14	1120	-
07:00 - 07:15	904	162	11	6	0	0	3	24	10	1120	-
07:15 - 07:30	828	168	17	11	0	0	8	18	14	1064	4247
07:30 - 07:45	823	153	15	4	1	0	3	19	14	1032	4336
07:45 - 08:00	802	151	17	5	1	1	6	23	24	1030	4246
08:00 - 08:15	760	197	43	11	0	1	5	22	22	1061	4187
08:15 - 08:30	670	140	19	9	0	1	3	15	21	878	4001
08:30 - 08:45	681	117	18	2	0	1	1	21	23	864	3833
08:45 - 09:00	541	107	17	6	0	1	3	21	19	715	3518
09:00 - 09:15	426	91	11	4	0	1	4	21	18	576	3033
09:15 - 09:30	423	102	7	7	0	2	3	24	22	590	2745
TOTAL	8507	1696	196	71	2	9	57	234	221	10993	4336
PERCENT	77.4%	15.4%	1.8%	0.6%	0.0%	0.1%	0.5%	2.1%	2.0%	100.0%	MAX HR
No. of People	8507	3392	588	284	2						

Avg Occ for Pass Vehs **1.2**

Pass Veh **10470** Pass **12771**

	Passenger Vehicles					Other Vehicles					
	No. of people in Vehicles					RVs	Buses	Light Trucks	Heavy Trucks	Total	End Hour Total
TIME	1	2	3	4+	?						
15:00 - 15:15	391	146	5	1	0	5	9	20	18	595	-
15:15 - 15:30	400	154	8	4	0	4	5	18	22	615	-
15:30 - 15:45	462	171	17	2	1	3	7	25	17	705	-
15:45 - 16:00	449	176	8	3	1	1	8	21	12	679	2594
16:00 - 16:15	502	165	17	7	1	1	9	23	13	738	2737
16:15 - 16:30	475	154	21	5	0	1	1	16	10	683	2805
16:30 - 16:45	534	189	12	5	0	3	6	17	8	774	2874
16:45 - 17:00	461	182	12	7	0	3	5	14	2	686	2881
17:00 - 17:15	519	176	16	7	1	1	3	12	4	739	2882
17:15 - 17:30	398	188	25	7	0	9	0	12	8	647	2846
17:30 - 17:45	423	170	24	10	1	2	0	11	5	646	2718
17:45 - 18:00	398	168	18	11	0	1	4	11	5	616	2648
TOTAL	5412	2039	183	69	5	34	57	200	124	8123	2882
PERCENT	66.6%	25.1%	2.3%	0.8%	0.1%	0.4%	0.7%	2.5%	1.5%	100.0%	MAX HR
No. of People	5412	4078	549	276	5						

Avg Occ for Pass Vehs **1.3**

Pass Veh **7703** Pass **10315**

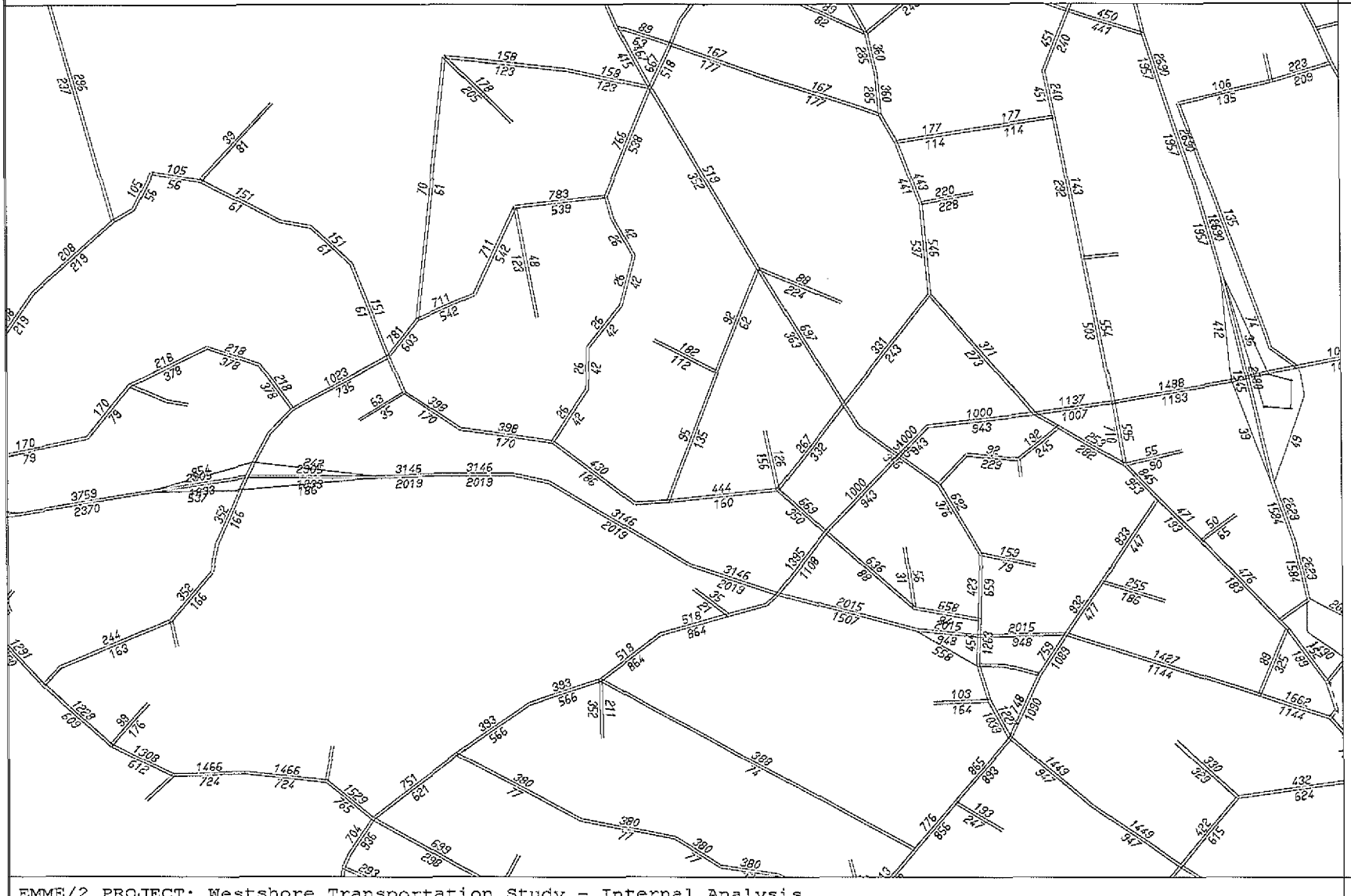
APPENDIX B

EMME/2 PLOTS AND REFERENCE TABLES

COMPOSED VOLUMES ON AUTO NETWORK

SUM OF AUTO AND ADDITIONAL VOLUMES

emme/2



LINKS:
all

WINDOW:
82.259/ 26.274
87.148/29.9408

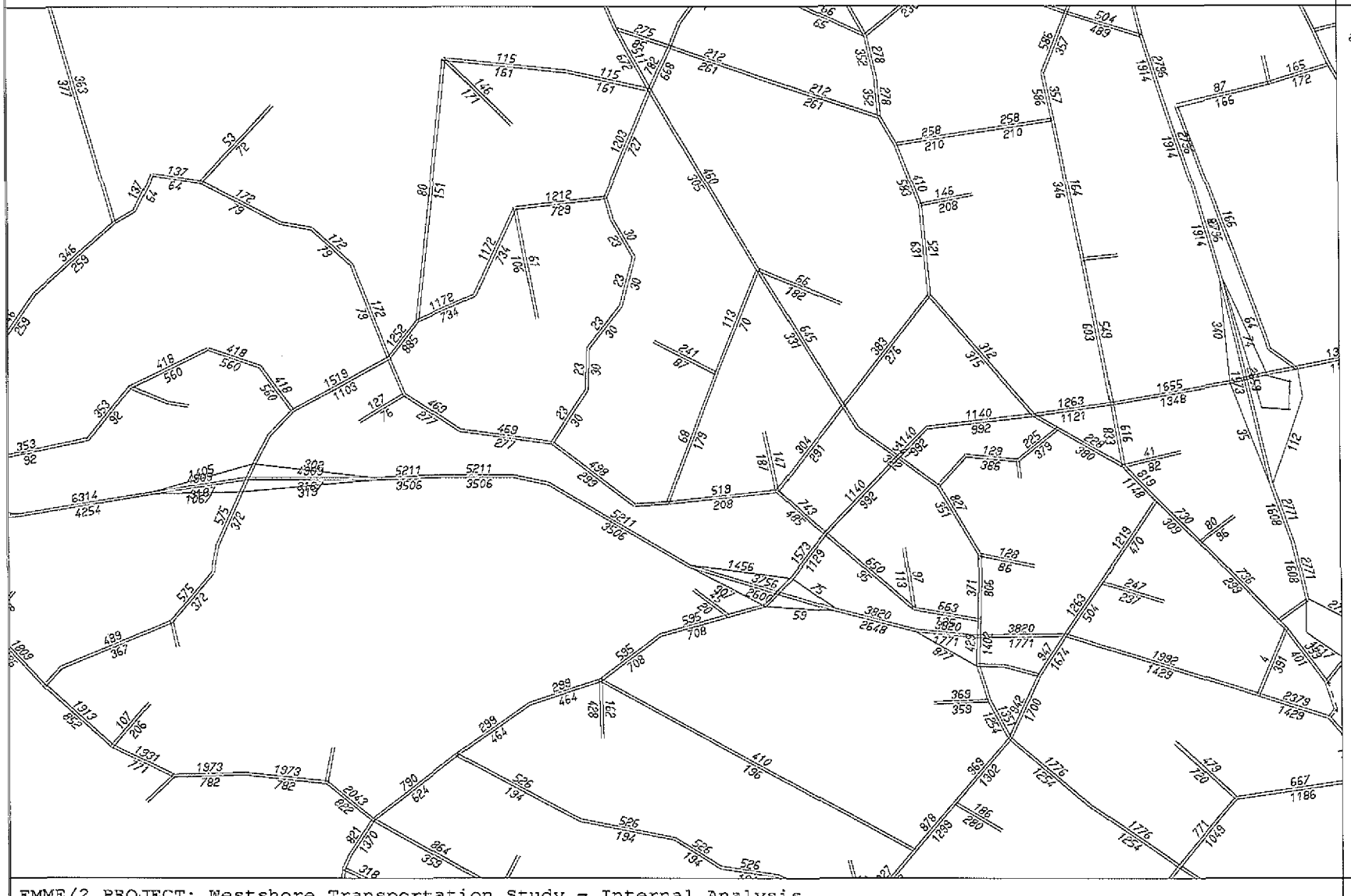
EMME/2 PROJECT: Westshore Transportation Study - Internal Analysis
SCENARIO 2138: 2003 PM ratio HOV w/ modhov7 w/ incr

07-05-03 17:26
MODULE: 6.12
URBANSYS....js

COMPOSED VOLUMES ON AUTO NETWORK

SUM OF AUTO AND ADDITIONAL VOLUMES

emme/2



LINKS:
all

WINDOW:
82.259/ 26.274
87.148/29.9408

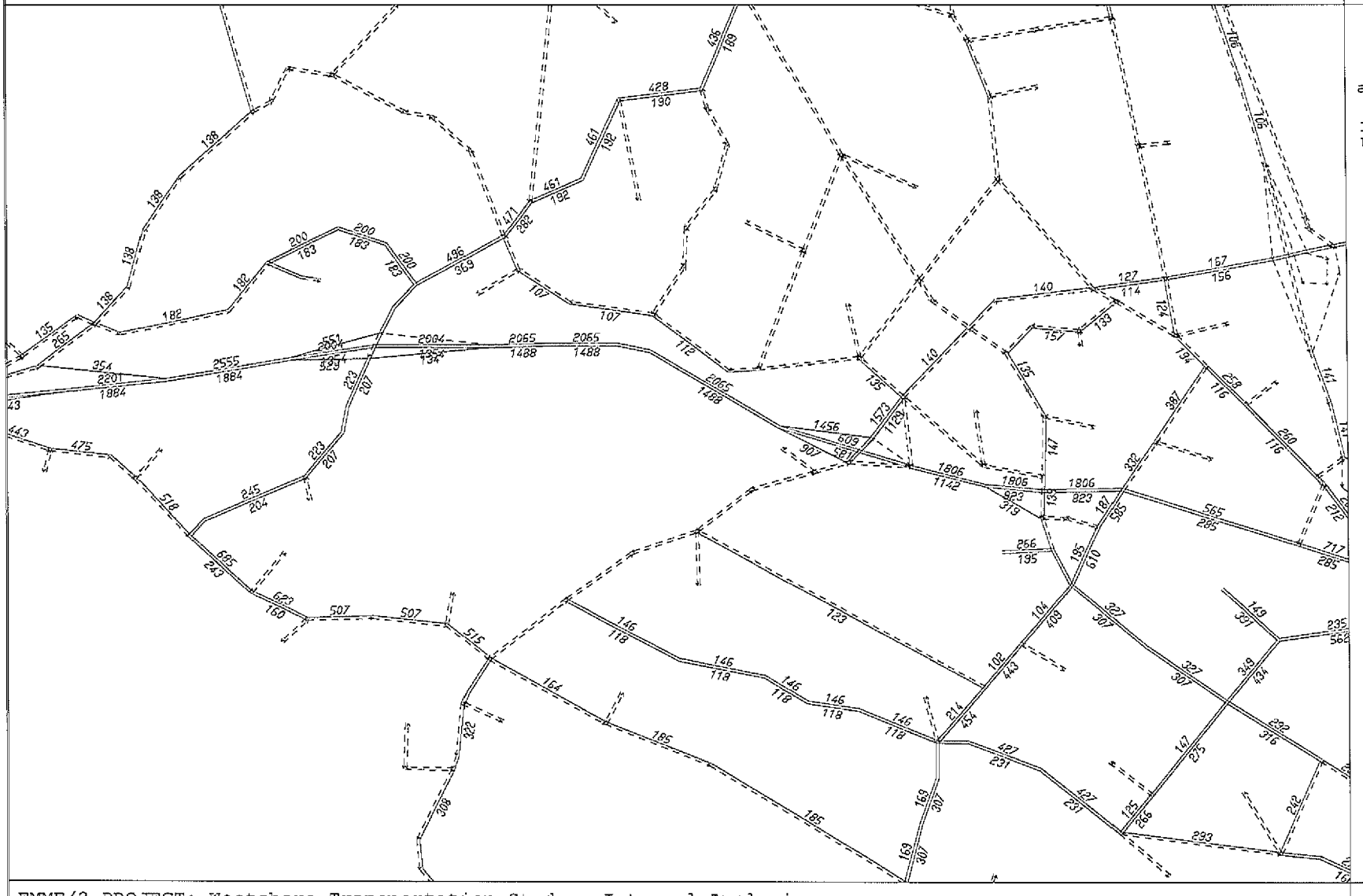
EMME/2 PROJECT: Westshore Transportation Study - Internal Analysis
SCENARIO 6710: c/o 5700; 2026PM - Base land use

07-05-03 17:24
MODULE: 6.12
URBANSYS....js

TOTAL VOLUMES ON AUTO NETWORK

DIFFERENCE SCENARIO 6710 - SCENARIO 2138

emme/2



DIFFERENCE:
6710 - 2138

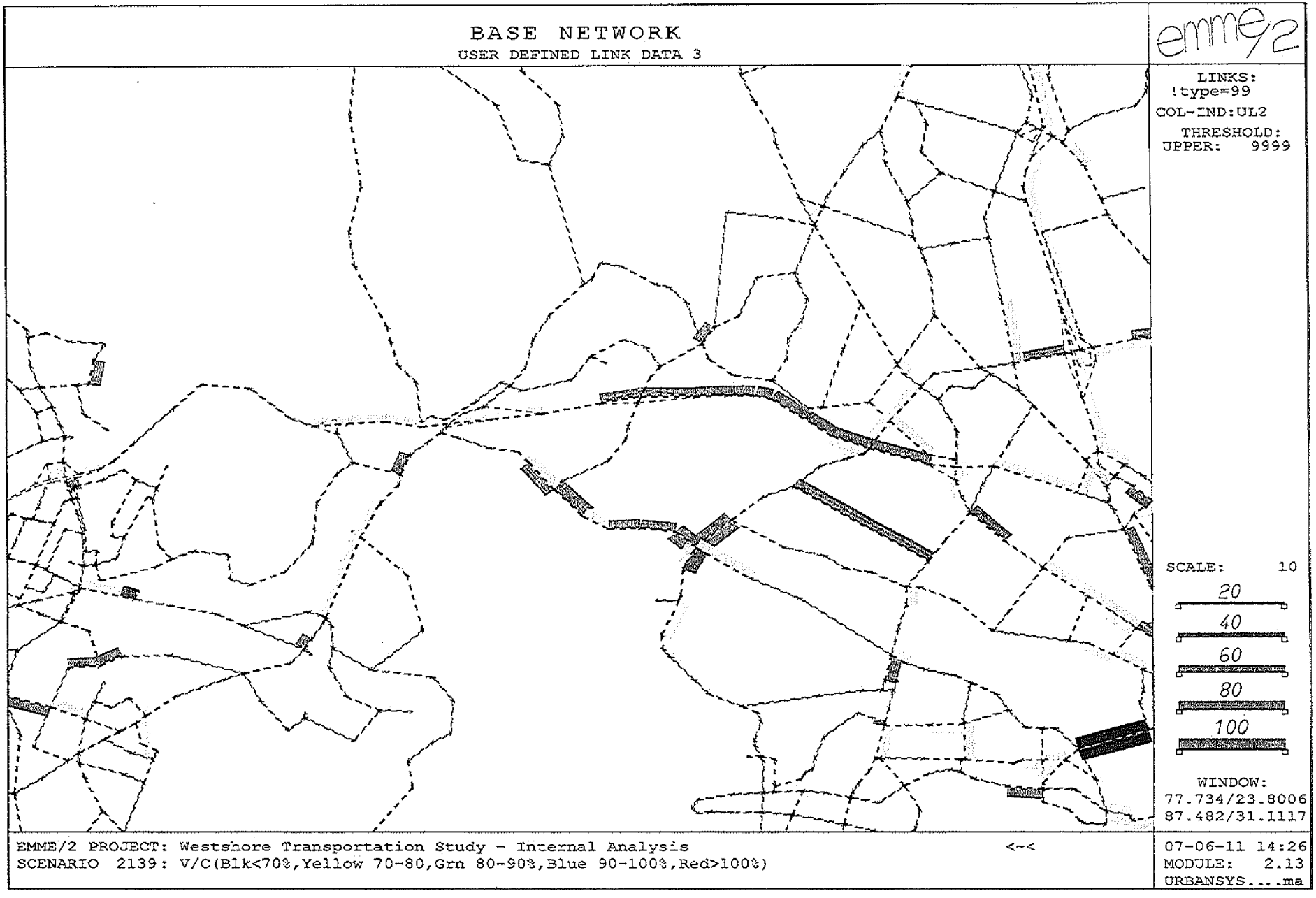
LINKS:
all

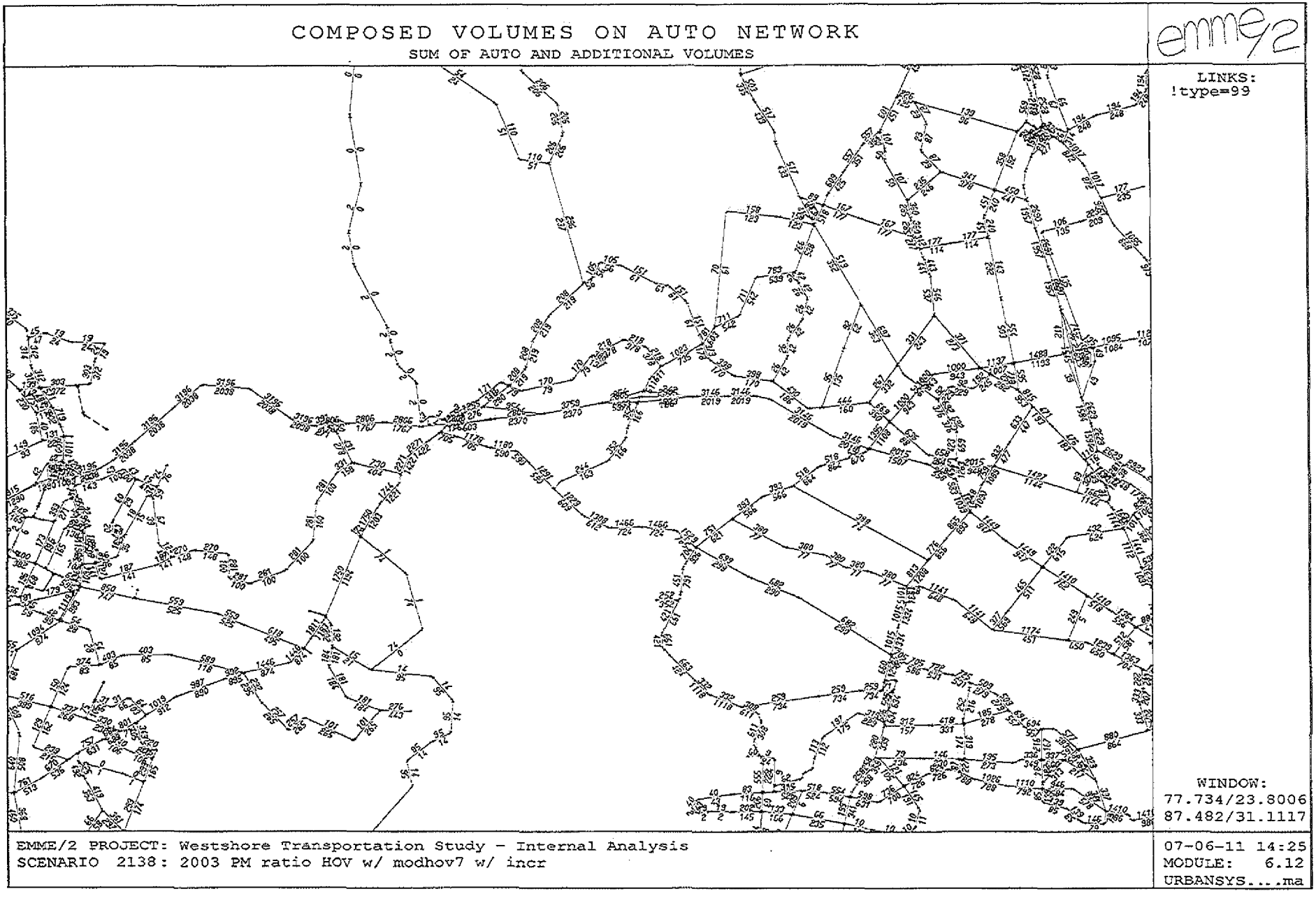
THRESHOLD:
LOWER: 100
UPPER: 3000

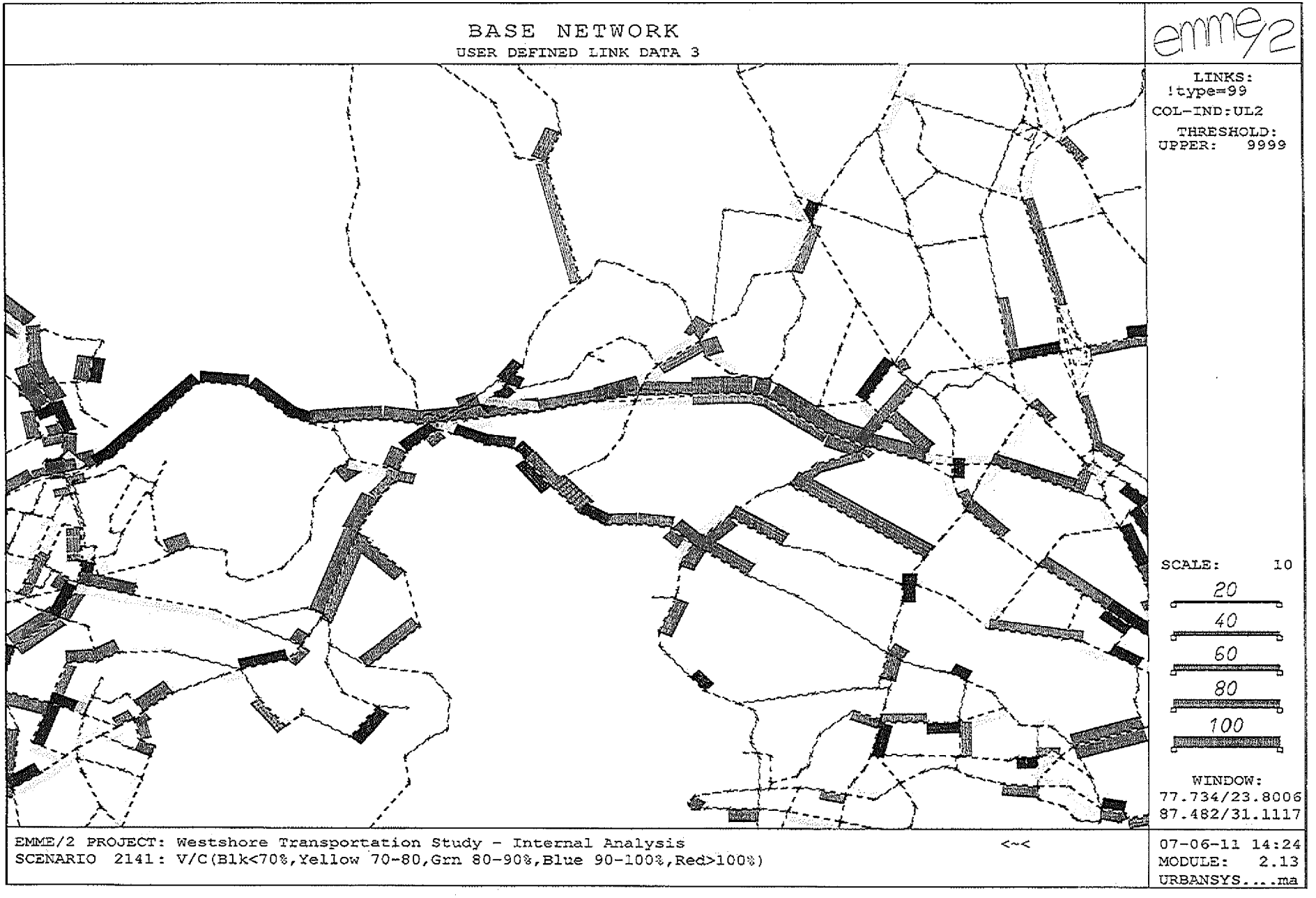
WINDOW:
81.661/25.4925
87.04/29.5269

EMME/2 PROJECT: Westshore Transportation Study - Internal Analysis
SCENARIO 6710: c/o 5700; 2026PM - Base land use
SCENARIO 2138: 2003 PM ratio HOV w/ modhov7 w/ incr

07-05-03 17:20
MODULE: 6.13
URBANSYS....js


BASE NETWORK
USER DEFINED LINK DATA 3
emme/2
LINKS:
!type=99
COL-IND:UL2
THRESHOLD:
UPPER: 9999
SCALE: 10
20
40
60
80
100
WINDOW:
77.734/23.8006
87.482/31.1117
EMME/2 PROJECT: Westshore Transportation Study - Internal Analysis
SCENARIO 2139: V/C(Blk<70%,Yellow 70-80,Grn 80-90%,Blue 90-100%,Red>100%)
<~<
07-06-11 14:26
MODULE: 2.13
URBANSYS...ma


COMPOSED VOLUMES ON AUTO NETWORK
SUM OF AUTO AND ADDITIONAL VOLUMES
emme/2
LINKS:
!type=99
WINDOW:
77.734/23.8006
87.482/31.1117
EMME/2 PROJECT: Westshore Transportation Study - Internal Analysis
SCENARIO 2138: 2003 PM ratio HOV w/ modhov7 w/ incr
07-06-11 14:25
MODULE: 6.12
URBANSYS....ma


BASE NETWORK
USER DEFINED LINK DATA 3
emme/2
LINKS:
!type=99
COL-IND:UL2
THRESHOLD:
UPPER: 9999
SCALE: 10
20
40
60
80
100
WINDOW:
77.734/23.8006
87.482/31.1117
EMME/2 PROJECT: Westshore Transportation Study - Internal Analysis
SCENARIO 2141: V/C(Blk<70%,Yellow 70-80,Grn 80-90%,Blue 90-100%,Red>100%)
<~<
07-06-11 14:24
MODULE: 2.13
URBANSYS...ma

TOTAL VOLUMES ON AUTO NETWORK

DIFFERENCE SCENARIO 6710 - SCENARIO 2138

emme/2

DIFFERENCE:
6710 - 2138

LINKS:
all

THRESHOLD:
LOWER: 100
UPPER: 3000

WINDOW:
71.88/23.6711
83.104/ 32.089

EMME/2 PROJECT: Westshore Transportation Study - Internal Analysis
SCENARIO 6710: c/o 5700; 2026PM - Base land use
SCENARIO 2138: 2003 PM ratio HOV w/ modhov7 w/ incr

07-05-03 17:18
MODULE: 6.13
URBANSYS....js

Trip Tables - Percent Change (2026 - 1996)
(Changes > 75% highlighted)

O/D	Sidney	N Saanich	C Saanich	Saanich	Oak Bay	Victoria	Esquimalt	View Royal	Highlands	Colwood	Langford	Metchosin	Sooke
Sidney	-11%	23%	19%	56%	71%	31%	45%	179%	30%	-4%	29%	-77%	-93%
N Saanich	-1%	34%	19%	51%	65%	22%	38%	183%	36%	9%	50%	-76%	-93%
C Saanich	3%	23%	-40%	25%	60%	10%	24%	144%	25%	108%	188%	-53%	-84%
Saanich	-4%	1%	-1%	-21%	27%	-31%	-17%	63%	12%	107%	172%	-43%	-80%
Oak Bay	236%	221%	152%	103%	6%	8%	140%	390%	195%	284%	401%	9%	-56%
Victoria	-14%	-17%	-15%	-2%	7%	-34%	-2%	112%	34%	63%	100%	-59%	-87%
Esquimalt	-10%	-14%	-12%	-2%	43%	-26%	-40%	86%	27%	149%	173%	-45%	-84%
View Royal	-16%	-15%	11%	36%	91%	12%	23%	54%	60%	5%	141%	-23%	-75%
Highlands	-35%	-22%	-38%	-28%	0%	-56%	-44%	28%	35%	73%	246%	36%	-49%
Colwood	-26%	-23%	-2%	33%	78%	-2%	-14%	-23%	48%	259%	317%	207%	356%
Langford	18%	28%	62%	81%	142%	30%	24%	89%	193%	341%	564%	325%	431%
Metchosin	-57%	-57%	-56%	-55%	-29%	-71%	-73%	-43%	-19%	80%	163%	8%	133%
Sooke	-72%	-74%	-74%	-75%	-59%	-84%	-85%	-69%	-56%	16%	25%	-9%	36%

Note: 2026 model assumes highway widening

Trip Tables - Absolute Change (2026 - 1996)
(Changes > 500 trips highlighted)

O/D	Sidney	N Saanich	C Saanich	Saanich	Oak Bay	Victoria	Esquimalt	View Royal	Highlands	Colwood	Langford	Metchosin	Sooke
Sidney	-349	231	101	183	9	37	12	24	2	-1	9	-4	-8
N Saanich	-13	319	91	136	7	22	8	20	3	2	12	-3	-7
C Saanich	16	109	-1331	291	21	33	18	65	7	71	158	-8	-19
Saanich	-16	3	-15	-4556	375	-3585	-267	388	13	681	1524	-62	-189
Oak Bay	37	30	61	1203	79	218	151	94	10	90	178	1	-7
Victoria	-49	-48	-110	-229	238	-13059	-61	609	33	443	970	-97	-244
Esquimalt	-5	-6	-16	-31	76	-748	-861	176	7	292	427	-21	-60
View Royal	-3	-3	6	264	29	52	45	143	9	19	347	-6	-28
Highlands	-1	-1	-8	-21	0	-22	-5	3	10	12	105	1	-1
Colwood	-5	-5	-1	210	24	-8	-21	-102	13	4255	3847	320	457
Langford	4	7	50	688	58	156	44	254	114	4344	16213	518	864
Metchosin	-1	-1	-4	-44	-1	-38	-16	-11	-1	134	241	15	109
Sooke	-1	-1	-5	-56	-2	-43	-18	-16	-2	19	46	-10	862

Note: 2026 model assumes highway widening

APPENDIX C

HOV EXPERIENCE ELSEWHERE

OPERATIONAL CHARACTERISTICS OF SELECTED FREEWAY/EXPRESSWAY HOV FACILITIES
JULY 2004

HOV Facility	Number of Lanes	Route Length km (miles)	HOV Operation Period[1]	General Eligibility Requirements	Changes In Rules Since Opening
Busway					
Miaml, FL (US 1, southwest corridor)	1 each direction	5 (3)	24 hours	Buses only	Feeds Metro rail line
Ottawa, Ontario, Canada 32.2 km (19.3 miles)					
Southeast Transitway	1 each direction	10 (6)	24 hours	Buses only	No
West Transitway	1 each direction	8.5 (5.1)	24 hours	Buses only	No
Southwest Transitway	1 each direction	3.6 (2.2)	24 hours	Buses only	No
East Transitway	1 each direction	6.6 (4)	24 hours	Buses only	No
Central Transitway	1 each direction	3.5 (2.1)	24 hours	Buses only	No
Pittsburgh, PA					
East Patway	1 each direction	9.9 (6.2)	24 hours	Buses only	No
South Patway	1 each direction	6.6 (4.1)	24 hours	Buses only	No
Airport Busway	1 each direction	8 (5)	24 hours	Buses only	No
Wabash reversible HOV/busway	1 reversible	1.6 (1)	Peak periods	2+ HOVs	No
Minneapolis, MN					
Univ. of Minnesota Intercampus Busway	1 each direction	5 (3.1)	24 hours	Buses only	Internal circulator
Dallas, TX					
SW Texas Med.Center elevated busway	1 each direction	1 (0.6)	24 hours	Buses only	Internal circulator
Seattle, WA					
E-3 Busway/downtown bus tunnel	1 each direction	3.5 (2.1)	24 hours	Buses only	No
Barrier-Separated (concrete): Two-Way					
Los Angeles, CA					
I-10 (El Monte) San Bernardino Fwy.	1 each direction	6.4 (4)	24 hours	3+ HOVs	Changed to 3+ peak hours, 2+ off peak
I-105/I-110 fwy/fwy connectors	1 each direction	1.6 (1)	24 hours	2+ HOVs	No
Orange County, CA I-5	1-2 each direction	7.2 (4.5)	24 hours	2+ HOVs	No
Houston, TX I-610/US 290 elevated, opposing flow not separated	1 each direction	2.4 (1.5)	5 am to 12 noon, 2-9 pm	2+ HOVs	No
Seattle, WA					
Seattle, WA I-90	1 each direction	2.4 (1.5)	24 hours	2+ HOVs	No
Seattle, WA I-5/I-90 ramps to bus tunnel	1 each direction	1 (0.7)	24 hours	2+ HOVs peak buses only reverse peak	No
Barrier-Separated: Reversible-Flow					
San Diego, CA I-15[5] HOV/toll facility	2 reversible	16.3 (9.8)	6-9 am SB, 3-6:30 pm NB	2+ HOVs/ toll SOVs	HOV/tolling demo in effect since 1996
Denver, CO					
US 36 (incl. connector to I-25)	1 lane reversible	2.0 (1.2)	5-10 am SB, M-F, 12 pm-3 am M-F& Sat-Sun	2+ HOVs	No
I-25	1 and 2 lanes reversible	8.3 (4.9)		2+ HOVs	No, cong pricing under study
Minneapolis, MN I-394	2 reversible	4.3 (2.7)	6-1 pm, 2-12 am weekends vary	2+ HOVs	No
Pittsburgh, PA I-279/579	1-2 reversible	6.6 (4.1)	5-9 am, noon-8 pm	2+ HOVs, all traffic NB after 8 pm during sports games	Originally 3+
Dallas, TX					
I-35E RL Thornton/Marvin D. Love Fwy.	1 lane reversible, downtown ramps	18.5 (11.1)	6-9 am, 3:30-7 pm	2+ HOVs	No
Houston, TX					
I-10 (Katy Freeway) HOV/toll facility (priced for 2-occupant buy-in during 3+ only operation periods)	1 reversible	25.8 (16)	5 am-12 noon EB, 5 am-5 pm WB; Sat. WB, Sun EB 5 am-9 pm.	3+ peak hours, 2+ other times, HOV-2 priced in peaks	Yes, started for authorized vehicles, then 3+, then 2+ prior to current operation
I-45 (Gulf Freeway)	1 reversible	21 (13.1)	5 am to 12 noon, 1-9 pm	2+ HOVs	Originally 3+
US 290 (Northwest Freeway)	1 reversible	21.6 (13.5)	same as I-10 above	same as I-10 above	same as I-10 above, HOV-2-is priced

(Continued)
OPERATIONAL CHARACTERISTICS OF SELECTED FREEWAY/EXPRESSWAY HOV FACILITIES
JULY 2004

HOV Facility	Number of Lanes	Route Length km (miles)	HOV Operation Period[1]	General Eligibility Requirements	Changes in Rules Since Opening
Barrier-Separated: Reversible-Flow (Continued)					
I-45 (North Freeway)	1 reversible	31.6 (19.7)	5 am to 12 noon, 1-9 pm	2+ HOVs	Peak periods expanded 12/99
US 59 (Eastex Freeway)	1 reversible	30.5 (18)	5 am to 12 noon, 1-9 pm	2+ HOVs	No
US 59 (Southwest Freeway)	1 reversible	20 (12.5)	5 am to 12 noon, 1-9 pm	2+ HOVs	Peak periods expanded 12/99
Northern Virginia					
I-95 (Shirley Hwy.)	2 lanes reversible	46 (27)	6-9 am NB, 3:30-6 pm SB	3+ HOVs	Was 4+, now mixed use on weekends
Norfolk, VA I-64	2 reversible	11.8 (7)	6-8 am, 4-6 pm	2+ HOVs	Peak hours reduced
Seattle, WA					
I-5 North (Express Lanes)	2-4 reversible	SB 6.9 (4.3), NB 3.1 (1.9)	5-11 am SB, noon-11 pm NB	GP in 3-4 lane section, 2+ HOVs on ramps and 2-lane portion	Originally 3+ NB
I-90	2 reversible	9.9 (6.2)	5-11 am, noon – 11 pm	GP to Mercer Island, 2+ HOVs beyond	No
Concurrent-flow: Buffer-Separated and Non-Separated					
Phoenix, AZ (all buffer separation)					
I-10 W	1 each direction	33.6 (21)	6-9 am, 4-7 pm	2+ HOVs	Originally 3+
I-10 E (91st to Chandler Rd.)	1 each direction	8 (5)	6-9 am, 4-7 pm	2+ HOVs	No
SR 202	1 each direction	14.4 (9)	6-9 am, 4-7 pm	2+ HOVs	Changed hours
I-17	1 each direction	11.2 (7)	6-9 am, 4-7 pm	2+ HOVs	Changed hours
Vancouver, BC, Canada					
H-1 Trans Canada Hwy.	1 each direction	4 (6)	24 hours	2+ HOVs	No
H-99	1 each direction	SB 6.4 (4), NB 1.6 (1)	24 hours	3+ HOVs	Originally bus only
Los Angeles County, CA (all buffer separation)					
I-10 (El Monte) San Bernardino Fwy.-(wide buffer separation)	1 each direction	12.8 (8)	24 hours	3+ peaks, 2+ HOVs off-pk	Now 3+ during peaks, 2+ off peak as of 1/01[5]
I-105	1 each direction	25.6 (16)	24 hours	2+ HOVs	No
I-110	2 each direction	17.8 (10.7)	24 hours	2+ HOVs	No
I-210	1 each direction	35.8 (21.5)	24 hours	2+ HOVs	No
I-405	1 each direction	75.6 (44.6)	24 hours	2+ HOVs	No
I-405 (San Fernando Valley)	1 each direction	5 (8)	24 hours	2+ HOVs	No
I-605	1 each direction	29 (17)	24 hours	2+ HOVs	No
SR-14[5]	1 each direction	10.8 (6.4)	5-9 am SB 3-7 NB	2+ HOVs	Demo. project for part time operation
SR-30	1 each direction	10 (6)	24 hours	2+ HOVs	No
SR 57	1 each direction	7.6 (4.5)	24 hours	2+ HOVs	No
SR 60	1 each direction	12 (7)	24 hours	2+ HOVs	No
SR 91	1 each direction	22.9 (14.3)	24 hours	2+ HOVs	Orig peak periods
SR 118	1 each direction	18.2 (11.4)	24 hours	2+ HOVs	No
SR 134	1 each direction	22.1 (13.3)	24 hours	2+ HOVs	No
SR 170	1 each direction	9.8 (6.1)	24 hours	2+ HOVs	No
Orange County, CA (all buffer separation)					
I-5	1-2 each direction	58 (34.3)	24 hours	2+ HOVs	No
I-405	1 each direction	38.4 (24)	24 hours	2+ HOVs	No
SR 55	1 each direction	19.7 (12.3)	24 hours	2+ HOVs	No
SR 57	1 each direction	19.2 (12)	24 hours	2+ HOVs	No
SR 91	1 each direction	15.7 (9.3)	24 hours	2+ HOVs	No
Orange County, SR 91 toll lanes[2]	2 each direction	16.2 (10.1)	24 hours	Toll SOVs w/ no HOV-3 toll	OCTA purchased private road in 2002

(Continued)
OPERATIONAL CHARACTERISTICS OF SELECTED FREEWAY/EXPRESSWAY HOV FACILITIES
JULY 2004

HOV Facility	Number of Lanes	Route Length km (miles)	HOV Operation Period[1]	General Eligibility Requirements	Changes in Rules Since Opening
Concurrent-flow (Continued)					
Riverside County, CA					
SR 91 (buffer sep.)	1 each direction	27.2 (17)	24 hours	2+ HOVs	No
San Bernardino County, CA (buffer sep.)					
I-10	1 each direction	17(10)	24 hours	2+ HOVs	opened 09/00
SR 30	1 each direction	NA	24 hours	2+ HOVs	No
SR 60	1 each direction	17 (10)	24 hours	2+ HOVs	No
SR 71	1 each direction	14.2 (8.4)	24 hours	2+ HOVs	No
Santa Clara/San Mateo Counties, CA					
US 101	1 each direction	51.6 (31)	5-9 am, 3-7 pm	2+ HOVs	No
SR 237	1 each direction	9.6 (6)	5-9 am, 3-7 pm	2+ HOVs	No
SR 85	1 each direction	38 (24)	5-9 am, 3-7 pm	2+ HOVs	No
I-280	1 each direction	17.6 (11)	5-9 am, 3-7 pm	2+ HOVs	No
Capitol Expy. (shoulders)	1 each direction	8.3 (5)	5-9 am, 3-7 pm	2+ HOVs	No
Lawrence Expy. (shoulders)	1 each direction	17 (10)	5-9 am, 3-7 pm	2+ HOVs	No
Montague Expy. (shoulders)	1 each direction	9.6 (6)	5-9 am, 3-7 pm	2+ HOVs	No
San Tomas Expy.(shoulders)	1 each direction	12.8 (8)	6-9 am, 3-7 pm	2+ HOVs	No
Alameda County, CA					
I-880	1 each direction	34 (20)	5-9 am, 3-7 pm	2+ HOVs	No
I-680	1 each direction	20.8 (12.3)	6-9 am , 3-6 pm	2+ HOVs	No
I-580	1 each direction	9.8 (6.1)	7-8 am EB, 5-6 pm WB	2+ HOVs	No
Contra Costa County, CA					
I-80	1 each direction	7.1 (4.2)	5-10 am WB, 3-7 pm EB	3+ HOVs	No
Marin County, CA US 101 (2 projects)	1 each direction	16.7 (10)	6:30-8:30 am SB, 4:30-7 pm NB	2+ HOVs	Changed from 3+
Sacramento, CA					
I-80	1 each direction	6.7 (4)	6-10 am, 4-7 pm	2+ HOVs	No
SR 99	1 each direction	6.2 (3.9)	6-10 am, 4-7 pm	2+ HOVs	Reduced hours
US 50	1 each direction	11 (7)	6-10 am, 4-7 pm	2+ HOVs	opened Aug 02
San Diego County, CA					
I-5	1 each direction	5 (3)	3-7 pm NB	2+ HOVs	No
SR 54	1 each direction	5.4 (3.2)	6-9 am WB, 3-7 pm EB	2+ HOVs	No
SR 163	1 ent. ramp	0.7 (0.4)	24 hours	2+ HOVs	No
Denver, CO, US 36 (buffer separated)	1 each direction	5.6 (3.3)	24 hours	2+ HOVs	Opened 3/01
Hartford, CT					
I-84 (wide buffer separation)	1 each direction	18.4(11.5)	24 hours	2+ HOVs	Extension opened '01
I-91 (wide buffer separation)	1 each direction	14.4 (9)	24 hours	2+ HOVs	No
Ft. Lauderdale, FL I-95 (buffer separated)	1 each direction	43.2 (27)	7-9 am, 4-6 pm	2+ HOVs	No
Miami, FL					
I-95	1 each direction	52 (32)	7-9 am SB, 4-6 pm NB	2+ HOVs	No
I-95 freeway/freeway ramp	2-way	5 (3)	7-9 am SB, 4-6 pm NB	2+ HOVs	No
Orlando, FL I-4	1 each direction	48 (30)	7-9 am SB 4-6 pm NB	2+ HOVs	No
Atlanta, GA (buffer separated)					
I-20	1 each direction	14 (8.5)	WB 6:30-9:30 am, EB 4:30-7 pm	2+ HOVs	No
I-75/I-85 central section	1 each direction	12.5 (7.5)	24 hours	2+ HOVs	No
I-75	1 each direction	19.3 (11.6)	24 hours	2+ HOVs	No
I-85	1 each direction	41 (23.9)	24 hours	2+ HOVs	No

(Continued)
OPERATIONAL CHARACTERISTICS OF SELECTED FREEWAY/EXPRESSWAY HOV FACILITIES
JULY 2004

HOV Facility	Number of Lanes	Route Length km (miles)	HOV Operation Period[1]	General Eligibility Requirements	Changes In Rules Since Opening
Concurrent-flow (Continued)					
Honolulu, HI					
Moanaloa Fwy.	1 each direction	3.8 (2.4)	6-8 am, 3:30-6 pm	2+ HOVs	No
Kalanianaole Hwy.	1 (WB only)	3.2 (2.0)	5-8:30 am	2+ HOVs	No
H-1	1 each direction	12.8 (8)	6-8 am, 3:30-6 pm	2+ HOVs	No
H-2	1 each direction	13.1 (8.2)	6-8 am, 3:30-6 pm	2+ HOVs	No
Maryland (buffer separated)					
US 29 (shoulders)	1 each direction	4.8 (3)	Peak periods only	Buses only	No
I-270	1 each direction	25.8 (15.5)	SB 6-9 am, NB 3:30-630 pm	2+ HOVs	No
I-270 (western spur)	1 each direction	5 (3)	SB 6-9 am, NB 3:30-630 pm	2+ HOVs	No
I-270 (eastern spur)	1 each direction	5 (3)	SB 6-9 am, NB 3:30-630 pm	2+ HOVs	No
US 50 (Prince George's County)	1 each direction	12 (7.5)	24 hours	2+ HOVs	No
Boston, MA I-93 North	1 (SB only)	1.8 (1.1)	6:30-9:30 am	2+ HOVs	Changed from 3+
Minneapolis, MN					
I-35W	1 each direction	NB 9.2 (5.7), SB 10.1 (6.3)	NB 6-9 am & 3-6 pm, SB 6-9 am & 3-6 pm	2+ HOVs	No
I-394	1 each direction	EB 12.4 (7.7), WB 9.8 (6.1)	EB 6-9 am, WB 3-6 pm	2+ HOVs	No
New Jersey Turnpike	1 each direction	16 (10)	Peak periods only	3+ HOVs	No
New York City, NY[6]					
Gowanus Expy	1 inbound only	2.2 (1.3)	6-10 am	2+ HOVs	No
Staten Island Expy	1 inbound only	1.6 (1)	6-10 am	Bus only	Opened in 2000
Suffolk and Nassau County, NY I-495 (buffer separated)	1 each direction	50 (30)	6-10 am, 3-8 pm	2+ HOVs	Yes, changed hours 10-mile ext. opened in 1999
Portland, OR, I-5	1 northbound	5 (3)	NB (PM) peak period only	2+ HOVs	Opened 10/98, partial lane conversion
Ottawa, Ontario, Canada					
Hwy. 417 (outside shoulders)	1 each direction	4.8 (3)	Peak periods	Buses only	No
Road 174 Orleans (outside shoulders)	1 each direction	4.8 (3)	Peak periods	Buses only	No
Toronto-Mississauga, Ontario, Canada Hwy. 403 (outside shoulders)	1 each direction	4 (2.6)	Peak periods	Buses only	Opened Nov. 03
Memphis, TN I-40	1 each direction	13 (8)	7-9 am WB, 4-6 PM EB	2 + HOVs	No
Nashville, TN					
I-65 (South)	1 each direction	11.5 (7.2)	7-9 am NB, 4-6 pm SB	2+ HOVs	No
I-40	1 each direction	8.3 (5)	7-9 am WB, 4-6 pm EB	2+ HOVs	No
Dallas, TX (buffer separated)					
US 67 Marvin D. Love Fwy.	1 each direction	6.4 (4.0)	24 hours	2+ HOVs	Opened Aug. 2000
I-35E (Stemmons Freeway)	1 each direction	SB 11.7 (7.3), NB 9.7 (6.0)	24 hours	2+ HOVs	No
I-635 (LBJ Freeway)	1 each direction	EB 11 (6.8), WB 9.8 (6.1)	24 hours	2+ HOVs	No
Houston, TX					
I-10 Katy (narrow buffer separated)	1 each direction	9.3 (5.5)	5 am-12 noon EB, 2-9 pm WB, Sat WB, Sun. EB.	3+ peak hours, 2+ other times	Opened March 2001

HOV Facility	Number of Lanes	Route Length km (miles)	HOV Operation Period[1]	General Eligibility Requirements	Changes in Rules Since Opening
Concurrent-flow (Continued)					
Salt Lake City, UT, I-15 (buffer separated)	1 each direction	10 (16)	Peak periods only	2+ HOVs	opened in summer '01
Seattle, WA (single solid stripe separated)					
I-5 North	1 each direction	22.5 (13.3)	24 hours	2+ HOVs	North end changed from 3+ in 1993
I-5 South (Kent-Des Moines to downtown)	1 each direction	40.6 (24)	24 hours	2+ HOVs	5 miles added 10/02
I-90	1 each direction	10.6 (6.3)	24 hours	2+ HOVs	No
I-405 (median only-used to be right side in some sections)	1 each direction	45 (26.5)	24 hours	2+ HOVs	Median conversion occurred in 1999
SR 167	1 each direction	16.1 (10)	24 hours	2+ HOVs	No
SR 520 (median east of I-405)	1 each direction	9 (5.4)	24 hours	2+ HOVs	Opened Feb. '00
SR 520 (shoulder)	1 WB only	3.7 (2.3)	24 hours	3+ HOVs	Changed from bus only in AM peak period
Northern Virginia					
I-66 (outside Beltway)[4]	1 each direction	30 (18.5)	EB 5:30-9 am WB 4-6 pm	2+ HOVs	Reduced operating periods
I-66 (inside Capital Beltway) 2 HOV lanes during restricted periods	2-3 each direction	15.2 (9)	EB 6:30-9 am, WB 4-6 pm	2+ HOVs	Was 4+, then 3+
I-267 (Dulles Toll Road)	1 each direction	22 (13)	6:30-9 am, 4-6:00 pm	2+ HOVs	No
I-267 (Dulles Toll Road connector)	Inbound only	2.5 (1.6)	AM peak period	buses only	
Norfolk/Hampton/Virginia Beach, VA					
I-64 Hampton/Newport News	1 each direction	13.5 (8)	6-8 am, 4-6 pm	2+ HOVs	
I-64 Norfolk/Vir Beach/Chesapeake	1 each direction	12 (7)	6-8 am, 4-6 pm	2+ HOVs	
I-264 Norfolk/Virginia Beach	1 each direction	12 (7)	6-8 am, 4-6 pm	2+ HOVs	
I-264 Norfolk	1 each direction	6.7 (4)	6-8 am, 4-6 pm	2+ HOVs	
Vancouver, WA, 1-5	1 each direction	6 (4)	6-8 am	2+ HOVs	Opened Nov. 2001
Vancouver, British Columbia, Canada Trans Canada Highway	1 each direction	12.8 (8)	NA	NA	No
Contraflow					
Honolulu, HI					
H-1(moveable barrier)	1	EB 10 (6)	AM period only	3+ HOVs	Opened 8/98
Kalanianaole Hwy.	1	WB 7 (4.4), EB 1.6 (1)	5-8:30 am, 4-6:30 pm	2+ HOVs	Changed from 3+
Kahekili Hwy.	1	1.8 (1.1)	5:30-8:30 am, 3:30-7 pm	2+ HOVs	No
New Jersey, Rte. 495 (to Lincoln Tunnel)	1 EB only	4 (2.5)	6-10 am	Buses only	No
New York City, NY					
I-495 Long Island Expy.	1	6.4 (4)	7-10 am	Buses, vanpools taxis	Moveable barrier pending
Gowanus Expressway/Brooklyn Battery Tunnel, (moveable barrier)	1 inbound only	10.4 (6.2)	6-10 am	2+ HOVs	Originally buses & taxis only
Dallas, TX I-30, (East R.L. Thornton Fwy.) moveable barrier	1 each peak direction	8.3 (5.2)	6-9 am, 4-7 pm	2+ HOVs	No
Boston, MA I-93 Southeast Expy. (moveable barrier)	1 each peak direction	9.6 (6)	6-10 am, 3-7 pm	2+ HOVs	Additional hour added in AM period, lowered to 2+ HOVs on 6/99
Montreal, Quebec, Canada Rte. 10/15/20 Champlain Bridge	1	6.9 (4.3)	6:30-9:30 am NB, 3:30-7 pm SB	Buses only	Speed limit reduced

HOV Facility	Number of Lanes	Route Length km (miles)	HOV Operation Period[1]	General Eligibility Requirements	Changes in Rules Since Opening
Queue Bypasses					
Bay Area, CA					
S.F./Oakland Bay Bridge toll plaza, I-80 and I-880	3	1.4 (0.9)	5-10 am, 3-7 pm	3+ HOVs	Number and location of lanes reoriented
Dumbarton Bridge toll plaza, SR 84	1	3.2 (2)	5-10 am, 3-6 pm	2+ HOVs	Changed from 3+
San Mateo Bridge toll plaza, SR 92	1	3.2 (2)	5-10 am, 3-6 pm	2+ HOVs	Changed from 3+
SR 4	1	0.8 (0.5)	Peak periods	3+ HOVs	No
SR 160 Antioch Bridge	1	NA	5-10 am, 3-6 pm	3+ HOVs	No
SR 80 Carquinez Bridge	1	0.1	5-10 am, 3-7 pm	3+ HOVs	No
SR 680 Benicia/Martinez Bridge	1	0.1	5-10 am, 3-7 pm	3+ HOVs	No
Various freeway entrance ramps	1	0.2 (0.1)	When demand warrants	2+ HOVs	No
Los Angeles and Orange Counties, CA					
Over 250 freeway entrance ramps	1	0.2 (0.1)	When demand warrants	2+ HOVs	No
San Diego, CA					
Various entrance ramps			As warranted	2+ HOVs	No
Coronado Bridge toll plaza	1 (WB only)	0.2 (.1)	24 hours	2+ HOVs	No
A Street entrance ramp to I-5 freeway	1	0.6 (0.4)	24 hours	Buses only	No
I-5/Mexico port of entry	4 gates	0.2 (0.1)	24 hours M-F	4+ HOVs	No
Honolulu, HI, H-2	1 (SB only)	1.3 (0.8)	6-8 am, 3:30-6 pm	2+ HOVs	No
Illinois, Chicago, I-90 toll plaza	1 (EB only)	0.8 (0.5)	Peak periods	Buses only	No
Minneapolis, MN, Various entrance ramps and bus-only use of right shoulders during selected hours under congested conditions	78 entrance ramps and various fwy routes	varies	Peak periods	2+ HOVs	No
Minneapolis, MN, Bus-only use of right shoulders on I-35W and other routes during selected hours under congested conditions	varies	varies	Peak periods	Bus only	No
New Jersey					
Ft. Lee, I-95 (to George Washington Br.)	1 (EB only)	1.6 (1)	7-9 am	3+ HOVs	No
Ottawa, Ontario, Canada					
Hwy. 417 Bus only ramp (Acres Rd)	1	0.3 (0.2)	24 hours	Buses only	No
Dallas, TX, I-35E Stemmons reversible lane	1 (NB and SB)	1.0 (0.7)	6-9 am, 4-7 pm	2+ HOVs	No
Union, Rte. 495 (Lincoln Tunnel toll plaza)	1 (WB only)	0.5 (0.3)	6-10 am	Buses only	No
Seattle, WA					
SR 509 shoulder	1 (NB only)	1.3 (0.8)	24 hours	2+ HOVs	Changed from 3+
SR 526	1	0.8 (0.5)	24 hours	Buses only	No
Freeway entrance ramps (69)[3]	1	0.2 (0.1)	24 hours	2+ HOVs	No
Ferry terminal docks, downtown and other locations	2	0.2 (0.1)	Peak hours	Registered car/ vanpools only	No

Footnotes
[1] Part-time periods are 5-day week, typically in both directions or in peak directions as noted.
[2] This project is a privatized toll road with congestion pricing. Registered 3+ HOVs can travel for a reduced toll.
[3] Included are 39 metered ramps and 30 non-metered ramps.
[4] Portions of HOV lane are converted from left side general purpose lane, while outside shoulder becomes a general purpose lane.
[5] Due to state legislation, the SR 14 HOV lanes are undergoing an 18-month demonstration project of part-time hours. The demonstration started January 2001. The southbound hours are 5-9 am and the northbound hours are 3-7 pm.
[6] A number of HOV lanes were operated temporarily over various New York City bridge and tunnel crossings following the 9-11 terrorist attack. Most of these lane treatments had been suspended by the end of 2001 and are not reported in this inventory.