Atlantic Road & Traffic Management

Traffic Engineering Specialists

Final Report

Highway 101 Exit 8A Alternatives Traffic Modeling and Benefit / Cost Analysis

Kings County, NS

Prepared for

NOVA SCOTIA

Transportation and Public Works

July 2004

0424

Table of Contents

Prepared by:

Atlantic Road & Traffic Management
PO Box 25205
Halifax, NS B3M 4H4

Phone (902) 443-7747
Fax (902) 443-7747
Email **traffic@ns.sympatico.ca**

Project Team Members
Ken O'Brien, PEng, Atlantic Road & Traffic Management
Greg O'Brien, PEng, Atlantic Road & Traffic Management
Jenifer Tsang, MCIP, The Terrain Group Inc.
John Walker, Ph.D, Jacques Whitford Environment Limited

Executive Summary

Background

The Nova Scotia Department of Transportation and Public Works (TPW) is finalizing plans for Phase 3 Highway 101 twinning from the current end of twinning at Ellershouse to Windsor and from Falmouth to Avonport. During twinning of the Falmouth to Avonport section, the Exit 8A (Ben Jackson Road) at-grade intersection will be eliminated. Three alternatives are being considered to remove the at-grade intersection, including a ***Tunnel*** without access to Highway 101, an ***Extension*** of Ben Jackson Road westerly to parallel the south side of Highway 101, and a full movement diamond ***Interchange***.

The objective of this study is to provide TPW with information needed to select the most cost effective alternative for elimination of the existing at-grade intersection. The Study has included social and economic reviews, traffic studies and benefit-cost analyses, to evaluate the impacts of each alternative.

Traffic Volumes

The 2004 Annual Average Daily Traffic (AADT) on the Ben Jackson Connector north of Highway 101 is approximately 1520 vehicles per day (vpd), while the volume on Ben Jackson Road immediately south of Highway 101 is approximately 700 vpd.

A manual turning movement count obtained at the intersection on April 29, 2004, indicated that during 12 hours 7:00 AM to 7:00 PM almost 1800 vehicles used the intersection to either cross, enter or exit Highway 101 at EXIT 8A. The majority of vehicles, about 1180 trips (66%), were to and from the Ben Jackson Connector (North) and Highway 101 west. The next highest movement included about 340 trips (19%) to and from Ben Jackson Connector south of the intersection and Highway 101 west. About 100 trips (6%) involved trips crossing Highway 101.

Intersection Users Prefer the Interchange Alternative

Meetings and telephone interviews were completed with officials from local municipalities, emergency response units, Glooscap First Nation, Canada Post, Annapolis Valley Regional School Board, and other stakeholders, to obtain their concerns for expected impacts of the three EXIT 8A alternatives.

The existing intersection has provided opportunities to access and cross Highway 101 for residents and businesses for almost 40 years. It is not surprising that those who use the intersection on a daily basis consider that the Tunnel and Extension alternatives will both have negative impacts on their quality of life and business opportunities. Concern has also been expressed for the impacts that diverted traffic could have on local roads not designed for use by heavy trucks. The general consensus is that the expected impacts of the Tunnel and Extension alternatives are not acceptable, and that the Interchange should be constructed to provide a permanent and safe access to Highway 101.

Noise Impacts are not Significant

The noise environment within about a half kilometre of Highway 101 is dominated by traffic on that highway, and the changes caused by variations in local traffic volumes are insignificant in comparison. There will not be any significant noise changes on local roads as a result of traffic volume changes that would occur for the EXIT 8A alternatives that have been studied.

Property Value and Development Impacts

Community livability is measured by several factors, including the perception of public safety, community character, community unity, transportation and land use convenience, and equity among the community members. Property value and development impacts were evaluated for impacts on value items, including retail, businesses, economic development, farm land, traffic volumes changes, residential property, and dividing the community by removal of the existing connection across Highway 101 provided by the Ben Jackson Connector.

After examination of the study area, research of municipal planning documents and property information, interviews with stakeholders, and professional analysis of criteria relating to land values, social impacts, settlement patterns, and economic realities, the following conclusion have been reached concerning impacts of each alternative on property values, development opportunities, and quality of life:

- The Extension has negative impacts
- The Tunnel also has some moderate negative impacts
- The Interchange brings some positive benefits.

Travel Distance Impacts of Alternatives

A licence plate match origin destination study was completed to determine the impacts to diverted traffic with regards to travel distances for each alternative. Although road section volume changes are not expected for the Interchange alternative, calculations were completed to calculate volume changes that would occur if the intersection were removed without provision of any other access changes. This provided a base for calculating benefits of the Interchange alternative.

If the intersection were removed without construction of any of the three alternatives, vehicles would have to travel almost two million additional vehicle-kilometres per year. The Tunnel and‘Extension alternatives will each require about one million additional vehicle-kilometres of travel per year.

Annual Road User Benefits

Road section length and travel time, daily volume change for each road section, and the values for travel, time and collisions savings, have been combined to produce estimated road user benefits for each of the three alternatives. Annual road user benefits (2004 dollars) for each alternative based on 2004 volumes include:

- Tunnel $ 439,300
- Extension $ 506,700
- Interchange $1,270,900

Roadway Costs of Alternatives

Roadway costs include direct capital construction costs, including any residual road improvements required in other parts of the road network as a result of the project, annual maintenance costs for the road. The capital cost estimates (2004 dollars) for the three alternatives are:

- Tunnel $3,340,000
- Extension $2,475,000
- Interchange $5,815,000.

Benefit / Cost Analyses

Benefit / Cost analyses for the three alternatives compare the present worth of annual road user savings for each alternative to the present worth of the capital cost and maintenance costs of each alternative. An analysis period of 25 years was used in this Study with a discount rate of 5% used in calculation of present worth. The present worth of benefits divided by the present worth of costs provides a benefit/cost ratio for each alternative. Results of the Benefit / Cost analysis are included in the following table.

Summary of Benefit / Cost Analyses

Alternative	Net Present Value of Benefits	Net Present Value of Costs	Benefit / Cost Ratio
Tunnel	7,495,000	2,492,000	3.0
Extension	8,645,000	1,969,000	4.4
Interchange	21,682,000	4,611,000	4.7

Conclusion

Although the Interchange is the highest cost alternative, Benefit / Cost analysis indicates that the Interchange provides the greatest benefit to the public for each dollar spent to eliminate the EXIT 8A intersection on Highway 101. The Extension is a close second in providing a similar Benefit / Cost ratio at a lower construction cost.

Impacts on property values, development opportunities, and quality of life must also be considered when choosing the alternative to eliminate the Ben Jackson intersection. The existing intersection has provided opportunities to access and cross Highway 101 for residents and businesses for almost 40 years. Removal of access to Highway 101 at this location will have negative impacts on area properties.

1.0 Introduction

Background

The Nova Scotia Department of Transportation and Public Works (TPW) is finalizing plans for Phase 3 Highway 101 twinning from the current end of twinning at Ellershouse to Windsor and from Falmouth to Avonport. During twinning of the Falmouth to Avonport section, the Exit 8A (Ben Jackson Connector) at-grade intersection will be eliminated.

The Ben Jackson Connector to Trunk 1 and the section of Highway 101 from Exit 8A to the Gaspereau River at Avonport are the oldest sections of Highway 101 roadway, having been constructed in the early 1960s. The Exit 8A intersection has existed since the section of Highway 101 from Falmouth to Ben Jackson Connector was opened to traffic in the fall of 1968. For 36 years, the intersection has provided access to Highway 101, as well as facilitated crossing the highway, for residents and businesses in communities on both sides of Highway 101 in the area between Hantsport and Avonport.

Three alternatives are being considered to remove the at-grade intersection, including a Tunnel without access to Highway 101, an Extension of Ben Jackson Road westerly to parallel the south side of Highway 101, and a full movement diamond interchange.

Study Objectives

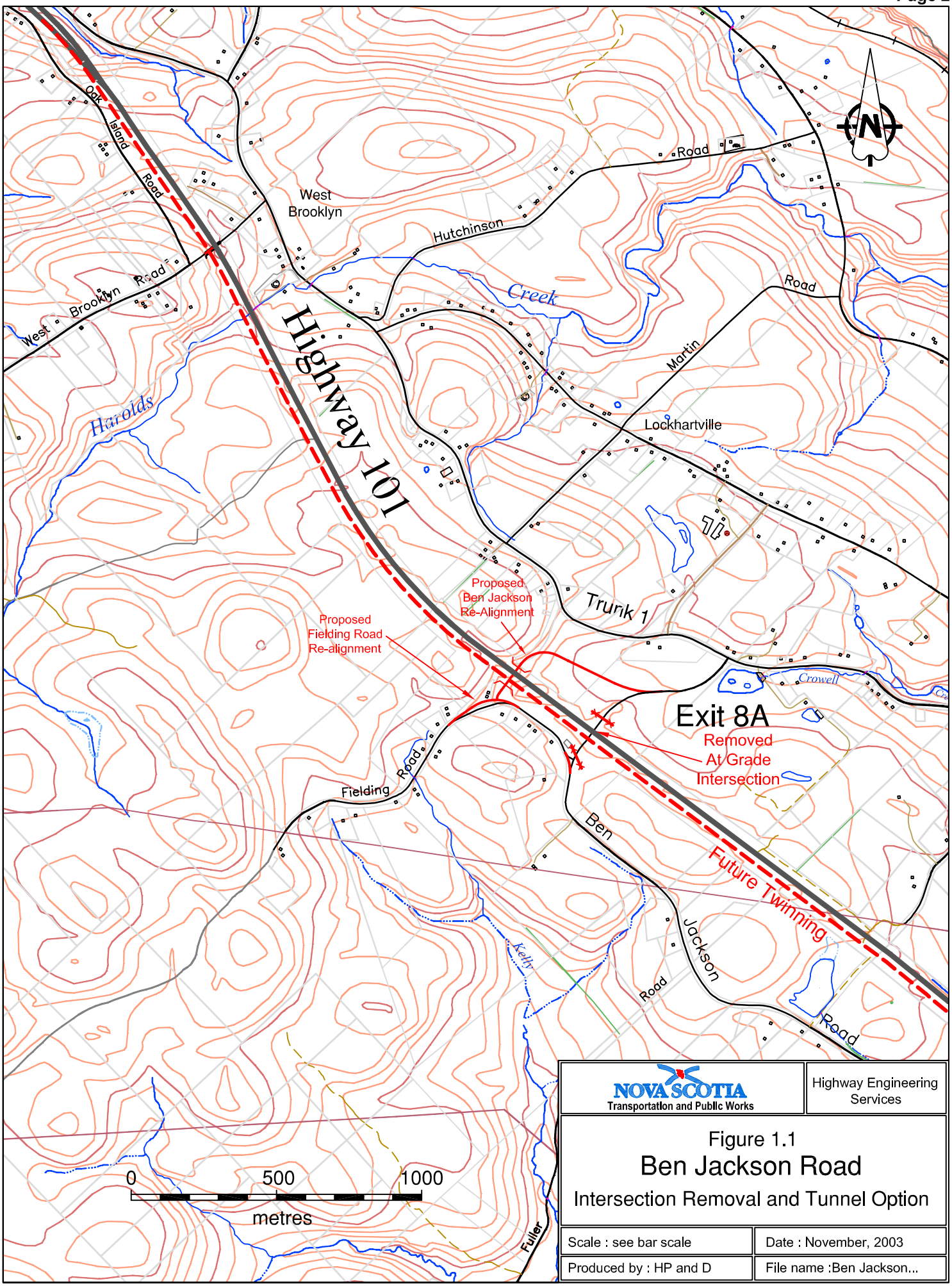
The objective of this study is to provide TPW with information needed to select the most cost effective alternative for elimination of the existing at-grade intersection. The Study has included social and economic reviews, traffic studies and benefit-cost analyses, to evaluate the impacts of each alternative.

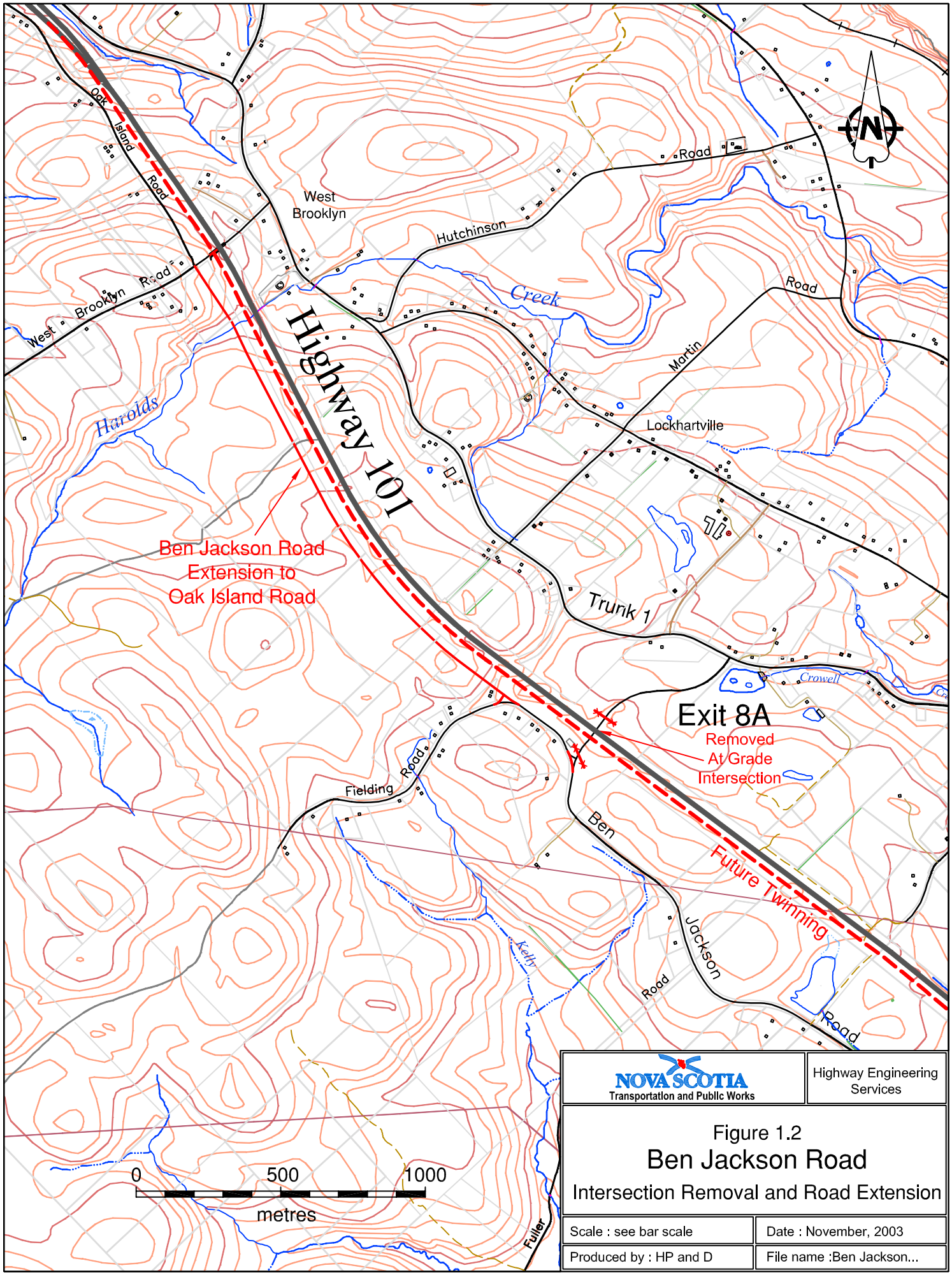
Alternatives that were Evaluated

1. ***Tunnel Structure*** (Figure 1.1) - This alternative involves construction of a tunnel under Highway 101 about 400 metres west of the existing intersection. The alternative also includes reconstruction of the Ben Jackson Connector, construction of a property access road, and reconstruction of Trunk 1 from Ben Jackson Connector to Avonport. Estimated cost is $3,340,000.

2. ***Ben Jackson Road Extension*** (Figure 1.2) - This alternative includes construction of a road paralleling the south side of Highway 101 from Ben Jackson Road to meet West Brooklyn Road at the Oak Island Road intersection. The alternative also includes upgrading Oak Island Road from West Brooklyn Road to Gaspereau River Road, and reconstruction of Trunk 1 from Ben Jackson Connector to Avonport. Estimated cost is $2,475,000.

3. ***Full Diamond Interchange*** (Figure 1.3) - This alternative involves construction of a full diamond interchange about 200 metres east of the existing intersection. The alternative also includes reconstruction of the Ben Jackson Connector and construction of a property access road. Estimated cost is $5,815,000.


Oak Island Road
West Brooklyn
West Brooklyn Road
Hutchinson Road
Creek
Harolds
Highway 101
Martin Road
Lockhartville
Trunk 1
Proposed Ben Jackson Re-Alignment
Proposed Fielding Road Re-alignment
Crowell
Exit 8A
Removed At Grade Intersection
Fielding Road
Ben Jackson Road
Future Twinning
Kelly
Fuller
0
500
1000
metres
N
NOVA SCOTIA
Transportation and Public Works
Highway Engineering Services
Figure 1.1
Ben Jackson Road
Intersection Removal and Tunnel Option
Scale : see bar scale
Date : November, 2003
Produced by : HP and D
File name :Ben Jackson...



NOVA SCOTIA
Transportation and Public Works

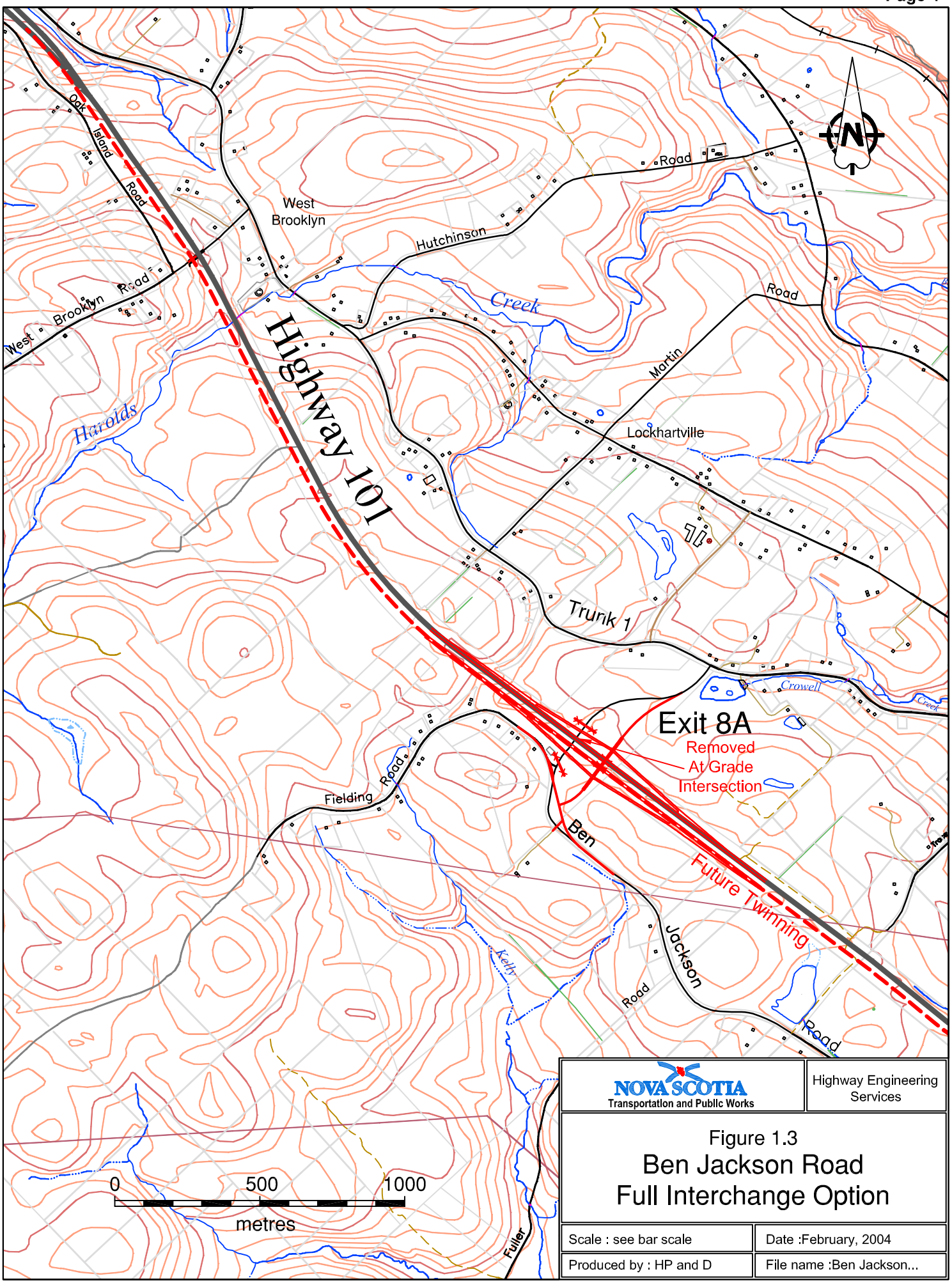
Highway Engineering Services

Figure 1.2

Ben Jackson Road

Intersection Removal and Road Extension

Scale : see bar scale	Date : November, 2003
Produced by : HP and D	File name :Ben Jackson...



NOVA SCOTIA
Transportation and Public Works

Highway Engineering Services

Figure 1.3
Ben Jackson Road
Full Interchange Option

Scale : see bar scale	Date :February, 2004
Produced by : HP and D	File name :Ben Jackson...

2.0 Stakeholder Interviews

Stakeholder Interviews

Meetings and telephone interviews were completed with officials from local municipalities, emergency response units, Glooscap First Nation, Canada Post, Annapolis Valley Regional School Board (AVRSB), and other stakeholders, to obtain their concerns for expected impacts of the three EXIT 8A alternatives. Interview results are summarized in the following paragraphs and a list of contacts is included in Appendix D.

Municipality of West Hants

The Municipality has close ties with the Town of Hantsport and many Hants County residents have close ties to Kings County. While the alternative intersection treatments had not yet been discussed at Council, there is an awareness of public concerns to retain access to Highway 101.

Municipality of the County of Kings

County officials indicated that while the extension of Ben Jackson Road to West Brooklyn Road could benefit one or two property owners by providing road frontage, the removal of access to Highway 101 could affect rumored future development involving land banking in the Fielding Road area. Residential development at Glooscap First Nation, as well as in the Hants Border area, could also be affected by access changes. They indicated that the local people certainly prefer a full interchange.

Town of Hantsport

Town officials indicated the following key concerns:

- Town residents, and those who work or do business in Hantsport, have developed a way of life that has included the Ben Jackson Connector access to Highway 101 for almost 40 years.
- The Ben Jackson Connector and EXIT 8A access have provided alternate access to the Town during flooding of the Halfway River at Trunk 1 and the north end of the EXIT 8 connector to Trunk 1.
- Existing access requirements, as well as on-going development at Glooscap First Nation, will force heavy trucks to use the Holmes Hill Road if they cannot access Highway 101 at EXIT 8A.
- Local residential development in Hants Border, and other areas between the Town and Avonport, could be jeopardized without access to Highway 101 at EXIT 8A.
- Interchanges at both EXIT 8 and 8A will improve development opportunities for the Town.
- The Town supports a full interchange at EXIT 8A and suggests that TPW should build the interchange while twinning Highway 101.

Glooscap First Nation

The following concerns of the Glooscap First Nation were provided during an interview and from two letters received from the Chief and Council:

- ***Access*** - Glooscap First Nation members living off-reserve make frequent trips to the community for visitation and social events. Although there is no signage providing directions to Glooscap at EXIT 8A, members, family and friends are familiar with the Ben Jackson turn-off. Removal of Highway 101 access at EXIT 8A

would be inconvenient for Band Members living in the community, as well as others who frequently visit the community.

- ***Signage*** - There is a lack of proper signage indicating the exit and directions to Glooscap. Any change in access location from the existing Ben Jackson Road exit will present a problem in communicating the 'new' route to members, as well as the public.
- ***Community Services*** - Removal of EXIT 8A access to Highway 101 will affect both the cost and access of essential Glooscap First Nation community services. For example, medical and school transportation, as well as policing services, are funded by a series of federal agreements, where costs are based on travel distance. Access to fire protection and other emergency measures services will also be affected by any change in access to Highway 101.
- ***Economic Development*** - With the provision of a reliable water source, Glooscap First Nation expects several new housing starts, as well as the potential for economic development in the community. Removal of access to Highway 101 at EXIT 8A may impact economic development opportunities and tourist potential.

Annapolis Valley Regional School Board (AVRSB)

The AVRSB operates at least four school bus routes in the Study Area. While loaded buses generally don't use the EXIT 8A intersection, empty buses use the intersection to cross the highway, or to access Highway 101 west of the intersection. Although some adjustments to travel habits may be needed, neither the 'Tunnel' nor 'Extension' alternatives is expected to have a significant impact on travel distances. The interchange alternative will not affect existing travel patterns, and may allow for improved routing since loaded buses would have a safe means to cross the highway and to access Highway 101.

Canada Post

Canada Post rural route drivers do not use the EXIT 8A intersection. They have been advised by their insurance company that it is not appropriate for them to cross or access Highway 101 at EXIT 8A.

Emergency Health Services

The nominal boundary between ambulance service being dispatched from either Wolfville or Windsor to the Study Area is between West Brooklyn Road and EXIT 8A. However, if an ambulance were dispatched from Wolfville to Ben Jackson Connector areas, either north or south of Highway 101, travel times and distance would be affected by both the 'Tunnel' and 'Extension' alternatives as illustrated below.

Sample Trip from Avonport to:	**Travel Time and Distance for Each Alternative**		
	Tunnel	**Extension**	**Interchange**
Intersection Ben Jackson Road and Ben Jackson Connector	5.6 min (6.1 km)	3.8 min (4.4 km)	2.4 min (4.4 km)
Intersection Ben Jackson Connector and Trunk 1	4.5 min (4.8 km)	4.5 min (4.8 km)	2.9 min (4.9 km)

Fire Protection Service

Fire protection in the Ben Jackson Road area and the east end of the Study Area is provided by Hantsport Fire Department and the western end of the Study Area is served by the Wolfville Fire Department. The 'dividing line' between the coverage areas is on a line that crosses Highway 101 about one kilometre west of EXIT 8A (at the weather station) and runs diagonally to the Trunk 1 / West Brooklyn Road intersection.

While neither the Tunnel nor Extension alternatives would affect Hantsport Fire Department response to areas on Trunk 1, lack of access or crossing Highway 101 at EXIT 8A may have some minor impacts on responses south of Highway 101 near Fielding Road. The Hantsport Fire Department can easily access Highway 101 at EXIT 8, or cross under Highway 101 at Bishopville Road. If a full interchange is not provided at EXIT 8A, however, the Tunnel alternative is considered to have less impact than the Extension alternative.

Since the Wolfville Fire Department's potential responses in the Study Area would be restricted to areas adjacent to Oak Island Road, West Brooklyn Road, and Trunk 1 in Avonport, they usually will not be affected by considered access treatments at EXIT 8A. The only impact to be considered is when they provide mutual aid to the Hantsport Fire Department in the event there is no access to Highway 101 at EXIT 8A.

Emergency Police Service

The patrol boundary between Windsor and New Minas RCMP detachments is near the Hants - Kings County Line. Police response in the eastern end of the Study Area should not be affected by access changes considered for EXIT 8A as response would be either from Windsor or the Hantsport Town detachments. However, New Minas RCMP have indicated that both the Tunnel and Extension alternatives will impact on daily patrols and hamper emergency response times for their areas of responsibility in Kings County, both north and south of Highway 101.

Comments from Other Interested Parties

Telephone, Emails, and letter contacts from citizens, land owners, business owners, and local MLA, included the following impact concerns:

- Residents of Oak Island Road and West Brooklyn Road are concerned with potential negative impacts as a result of traffic diverted to those roads if the Extension were constructed.
- A business owner expressed concern that impacts to businesses north of Highway 101 were not considered in the Study.
- A former truck driver wrote to indicate concern that failure to provide full access to Highway 101 will force heavy trucks to use local roads at times when school buses are loading and unloading.
- Some people are concerned that there will not be adequate winter maintenance on local roads that they will have to use if there is no access to Highway 101 at EXIT 8A.

3.0 Traffic Count and Plate Match Studies

Study Area

The Study Area for this project includes Highway 101 and adjacent roads between EXIT 8 and EXIT 9. Study area road sections, manual turning movement count locations, and licence plate match locations are shown on Figure 3.1. Road sections are described in Tables B-1 to B-4, Appendix B.

Machine Traffic Count Data

Available machine count data provided by TPW is recorded in Table 3.1. The 2004 Annual Average Daily Traffic (AADT) on the Ben Jackson Connector (North) is approximately 1520 vehicles per day (vpd), while the volume on Ben Jackson Connector immediately south of Highway 101 is approximately 700 vpd.

Table 3.1- Machine Count Data

Location	Table	Count Dates	Estimated AADT
Ben Jackson Connector - north of Highway 101	A-1	October 2000	1330
	A-3	April 2004	1520
Ben Jackson Connector - south of Highway 101	A-2	October 2000	660
	A-3	April 2004	700
Trunk 1 - 3 km East of Avonport	A-4	June 1997	650
	A-5	May 2000	610
Trunk 1 - west of Ben Jackson Connector	A-6	April 2004	840
Trunk 1 - east of Ben Jackson Connector	A-6	April 2004	2020
Bishopville Road - 1.0 km south of Highway 101	A-7	September 1995	590

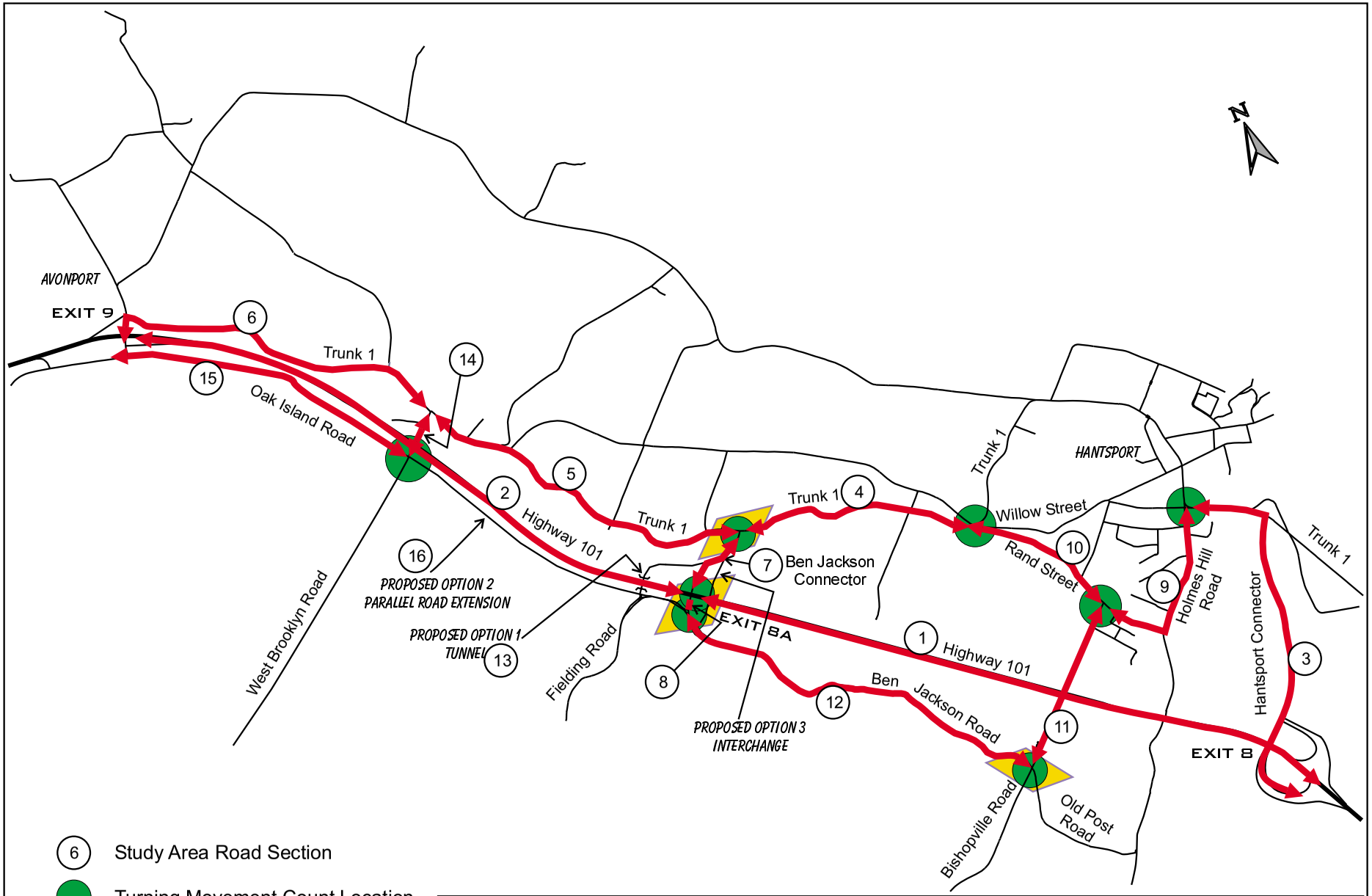
Manual Turning Movement Counts

June 2003

TPW obtained a manual turning movement count in June 2003 (Table A-8, Appendix A). During 12 hours 7:00 AM to 7:00 PM over 1600 vehicles used the intersection to either cross, enter or exit Highway 101. The majority of vehicles, about 1070 trips (66%), were to and from the Ben Jackson Connector (North) and Highway 101 west. The next highest movement included about 290 trips (18%) to and from Ben Jackson Connector south of the intersection and Highway 101 west.

April 2004

Another count was obtained at the intersection on April 29, 2004, during the Study (Table A-9). This count also indicated that the major movements were to and from Highway 101 west. During 12 hours 7:00 AM to 7:00 PM almost 1800 vehicles used the intersection to either cross, enter or exit Highway 101. The majority of vehicles, about 1180 trips (66%), were to and from the Ben Jackson Connector (North) and Highway 101 west. The next highest movement included about 340 trips (19%) to and from Ben Jackson Connector south of the intersection and Highway 101 west.



Atlantic Road & Traffic Management
Traffic Engineering Specialists

Benefit - Cost Study
Highway 101, Exit 8A Intersection Treatment

Figure 3.1

Study Area Road Sections and Intersections

July 2004

Manual counts were also obtained at the following intersections (see Figure 3.1) and are tabulated in Appendix A in the indicated tables:

Table Number	Intersection Location
A-10	Ben Jackson Road at Ben Jackson Connector
A-11	Ben Jackson Road at Bishopville Road
A-12	Trunk 1 at Ben Jackson Connector
A-13	Trunk 1 at Five Points
A-14	Bishopville Road at Rand Street
A-15	Trunk 1 at Holmes Hill Road
A-16	West Brooklyn Road at Oak Island Road

Estimation of AADT Volumes for Road Sections

Since machine traffic counts are not available for many road sections in the Study Area, AADT volumes have been estimated from manual turning movement counts obtained during the Study. It is generally accepted that a PM peak hour volume obtained during a manual count is approximately equal to 10% of the AADT volume at that location. This 'theory' was confirmed for the Study Area for the nine machine counts recorded in Tables A-1 to A-7, Appendix A. The upper section of Table A-17 includes the calculated PM peak hour percentage of AADT, with values of 9% to 11%, for each of the machine counts. Since the PM peak hours averaged 10% of AADT, this factor has been used to estimate AADT volumes for the road sections included in the bottom section of Table A-17.

Traffic Volume Annual Growth Rate is 2.0%

Machine count data obtained by TPW on Highway 101 west of EXIT 8A since 1970 are tabulated in Table A-18, Appendix A. Highway 101 AADT volumes have increased from 2850 vpd in 1970 to 11,500 vpd in 2003. Regression analysis completed with the historical data indicates that Highway 101 AADT volumes have increased by 260 vpd per year, equivalent to about 2.2% increase per year based on the 2003 volume of 11,500 vpd, or the estimated 2004 volume of 12,000 vpd. An annual growth rate of 2.0% has been assumed for all roads in the Study Area.

Licence Plate Match Origin - Destination Study

A licence plate match study was completed to estimate origins and destinations of vehicles using the EXIT 8A / Highway 101 intersection to cross, or turn to or from, Highway 101. Licence plate numbers were recorded for two-way traffic movements at the following intersections (see Figure 3.1):

- Ben Jackson Connector at Highway 101 - plate numbers for vehicles crossing or turning to from Highway 101- 10 movements.
- Ben Jackson Connector at Trunk 1 - plate numbers for vehicles turning to / from Ben Jackson Connector - 4 movements.
- Ben Jackson Road and Ben Jackson Connector - plate number for vehicles turning from Highway 101 were recorded.
- Ben Jackson Road at Bishopville Road - plate numbers for vehicles turning to / from Ben Jackson Road - 6 movements.

Data was collected from 7:00 AM to 10:00 AM, 11:00 AM to 2:00 PM and 3:00 PM to 7:00 PM. Data recorded for each of the selected data collection locations used a bound set of forms that included a separate

identified row for each minute of the survey period. Referring to a digital watch, the observer simply recorded the plate number of each passing vehicle in the appropriate row. Observers at intersections recorded plate numbers for the appropriate vehicle movements, such as left, straight, or right at the Ben Jackson Connector approach to Highway 101.

Plate Match Procedures

Data for each survey location was entered into a database and specialized plate-matching software was used to match plate numbers within reasonable time periods to track vehicle movements and provide estimates of trip origins and destinations. Plate match results for various traffic movements have been expressed as percentages (rounded to the nearest 5%) and are illustrated diagrammatically in Figures B-1 to B-3, Appendix B. The twelve diagrams included in the three figures each represent a traffic movement through the EXIT 8A intersection at Highway 101.

Diagrams in Figures B-1 to B-3 are best viewed starting from the 100% end of the traffic distribution 'arrows'. For example, when looking at the 'SB Through to Ben Jackson Road' in Figure B-1 (centre top row), start at the 100% end and work back along the arrow shaft to determine that 40% of trips for that movement come from Trunk 1 west and 60% of trips come from Trunk 1 east. Also, when reviewing the top panel of Figure B-3 which illustrates traffic movements from Ben Jackson Connector to turn left at the Highway 101 intersection, one can work back along the arrow shaft to determine that 35% of those trips originate on Bishopville Road south of Ben Jackson Road.

Calculation of Section Volumes Changes for Each Alternative

The percentage distribution of traffic movements at the Highway 101 - EXIT 8A intersection were used, together with AADT turning movement data for the intersection, to calculate volume changes for each affected road section in the Study Area for the Tunnel and Extension alternatives (Table B-1, Appendix B). No road section volume changes are expected with the Interchange alternative. To provide a base for comparison, as well as have a base for calculating benefits of the Interchange alternative, calculations were also completed to provide volume changes that would occur if the intersection were removed without provision of any other access changes.

Calculation of Annual Vehicle Kilometres of Travel for Each Alternative

Volume change and length of each road section were used to calculate annual changes in vehicle-kilometres of travel for the Tunnel and Extension alternatives, as well as for the Intersection Removal scenario. If the intersection were removed without construction of any of the three alternatives, vehicles would have to travel almost two million additional vehicle-kilometres per year (Table B-2). The Tunnel and Extension alternatives will each require about one million additional vehicle-kilometres of travel per year (Tables B-3 and B-4).

Vehicle-kilometres of travel information for each alternative form the basis for economic analyses described in Section 6.0.

4.0 Noise Impacts

Noise Study Principles

Noise is unwanted sound. Sound pressure level is measured in decibels, expressing the ratio of the sound pressure level to a reference sound pressure level (generally 20 mPa). The logarithm of the ratio, is expressed as decibels. To account for the differing sensitivity of the human ear to sounds of differing frequencies, a weighting system has been developed that allows sound pressure levels to be expressed as dBA; that is, as decibels on the A-weighted scale. The range of sound pressure levels is illustrated in Table 4.1. Noise is variable in the environment. Averaging is conventionally done by computing the steady sound pressure level that would have the same energy level as the measured level. This equivalent noise level is expressed as the Leq in units of dBA, and is often computed over a one hour interval.

Guidelines have been issued by the Nova Scotia Department of Environment and Labour to assist in planning of residential areas. These guidelines suggest Leq limits of 55, 60 and 65 dBA for the night, evening, and daytime hours, respectively, where the periods are defined at 23:00 to 07:00, 07:00 to 19:00 and 19:00 to 23:00.

Table 4.1 - Range of Sound Pressure Levels

Sound Pressure Level, dBA	Example of Noise Range
140	Threshold of pain
125	Jet takeoff at 100 m
100	Pneumatic chipper
95	Locomotive horn at 30 m
90	Leaf blower at 2 m
90	Pass-by of large truck
85	Power lawnmower at 2 m
85	Busy street traffic
75	Idling locomotive at 15 m
70	Auto, 50 km/h at 6 m
65	Business office
65	Busy downtown area
60	Home stereo/television
57	Conversational speech
45	Typical rural area, daytime background noise
43	Library
41	Very quiet suburban area at night
40	Living room (no television/radio etc.)
30	Quiet rural area, winter night, no wind
25	Bedroom
20	Empty recording studio
0	Threshold of hearing

Noise Impacts - General Discussion

The Tunnel or Extension alternative for reconstruction of the EXIT 8A intersection would result in changes to the traffic volumes on local roads as illustrated in Table B-1, Appendix B. Jacques Whitford Environment Limited (JWEL) was retained to estimate the relative noise changes that may result from traffic diversion that will occur with these alternatives.

Since noise evaluation for this project is considered a screening analysis, actual field noise measurements were not conducted. However, measurements were not necessary to provide the professional opinions and conclusions found in this study. The relative noise impacts of the alternatives have been estimated with computer analysis using the *Community Noise Model* of the *American Automobile Manufacturers Association*.

A site visit was conducted to become familiar with the roads under discussion and to experience the quality of the acoustic environment. In general, the roads can be considered to belong to three categories.

First, there are ***rural local roads***, such as Fielding, Ben Jackson, Oak Island, and Bishopville, which are characterized by speeds of 60 to 80 km/h, and traffic volumes low enough that the flow is clearly composed of individual vehicles rather than a steady flow of traffic. The noise environment is quite variable, consisting of very low background noise broken by individual vehicle passages.

The second category comprises the ***streets within Hantsport*** that would be affected by the Tunnel and Extension alternatives. These streets have relatively low volume of traffic at speeds of about 50 km/h. The traffic volumes are about twice those of the rural roads, but traffic is perceived as individual vehicles that provide intermittent increases to low noise levels consistent with a small town.

The third category is ***Highway 101***, a major highway with speeds of 100 km/h and higher, and volumes that are considerably higher than those of the other roads in the area. During busy periods, the traffic flow and noise are steady. During off-peak periods, vehicles on Highway 101 are still almost always audible from adjacent local streets and roads within about one-half a kilometre from the highway. West of West Brooklyn Road, the highway climbs about 50 metres in one kilometre, and heavy trucks on Highway 101 are distinctly audible along Oak Island Road.

The *Community Noise Model* was used to estimate noise on road segments listed in Table B-1, Appendix B, and modeled locations are marked on Figure 4.1. Each location was considered independently, using the speeds discussed above, and volumes from Table B-1. Flat terrain was assumed for all but the sections of Highway 101 and Oak Island Road along the hill west of West Brooklyn Road. Predictions were made for receptors located a nominal 30 m from the roadways. For Highway 101, the receptors were assumed to be 100 m from the roadway, corresponding to the houses along Oak Island Road.

The results for most of the locations (indicated by a 'circle' on Figure 4.1) indicate that volume changes resulted in small changes in noise level; that is, less than 3 dBA, and mostly about 1 dBA. These changes are not significant, as they would not be noticeable, and are within the range of uncertainty of the model. Other locations of interest (indicated by an 'X' on Figure 4.1) are discussed below.

Trunk 1 - Ben Jackson to West Brooklyn Road

Noise levels are predicted to be 51.6, 55.5, and 54.3 dBA, respectively, for existing Trunk 1 traffic volumes, and the increased volumes projected for Tunnel and Extension alternatives. On the basis of average noise level, differences between these values would not be noticed.

Tunnel Connector

The noise due to the tunnel connector would be about 49 dBA. As the noise from Highway 101 would be about 65 dBA at this location, the tunnel connector noise is not significant.

Rand Street - Bishopville Road to Holmes Hill Road

Noise levels are predicted to be 49.6, 52.8, and 53.5 dBA, respectively, for existing Rand Street traffic volumes, and the increased volumes projected for Tunnel and Extension alternatives. Although noise levels are increased marginally for the two alternatives, the difference is unlikely to be noticeable, and the values are within acceptable levels.

Oak Island Road - Avonport to West Brooklyn Road

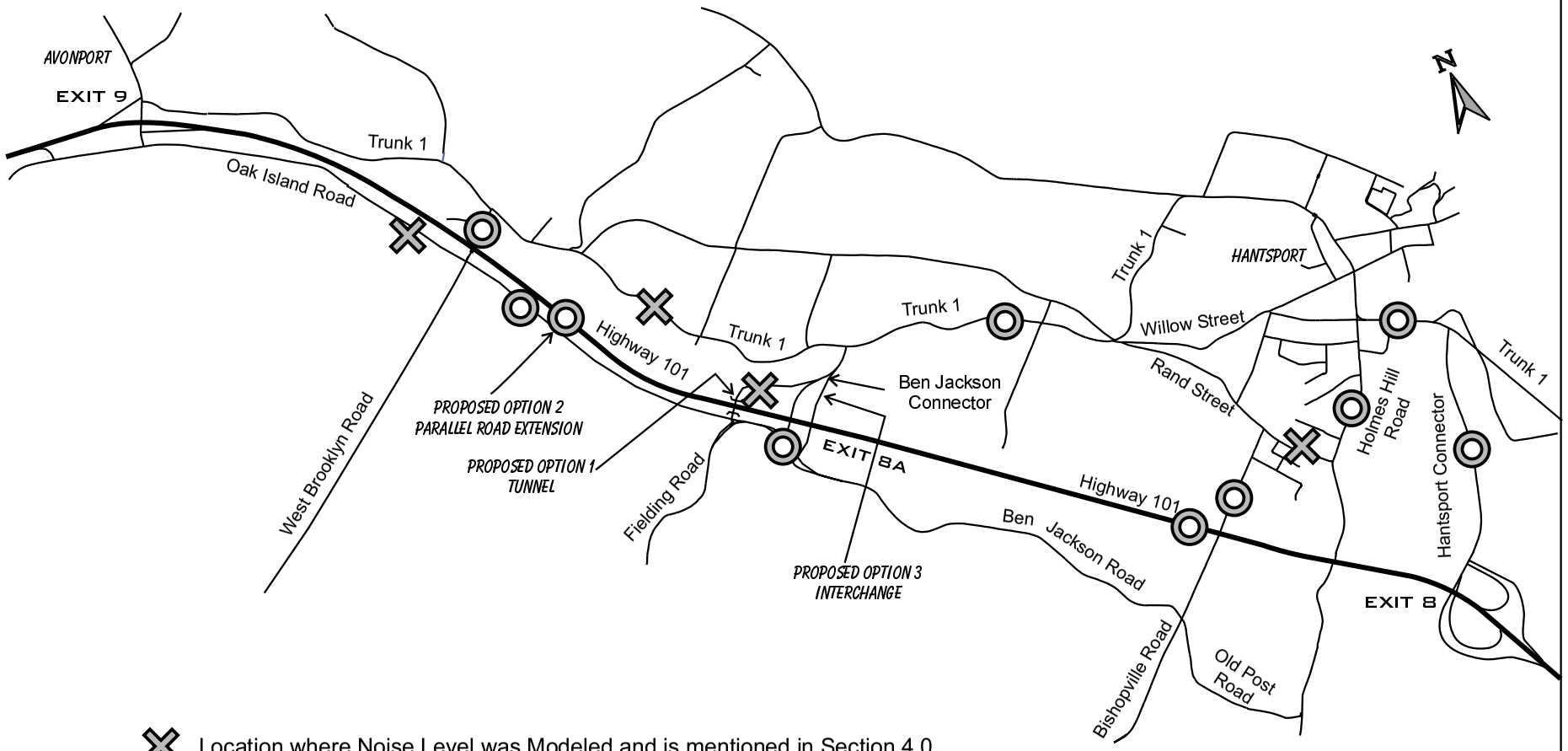
Noise levels are predicted to be 48.6 and 50.0 dBA, respectively, for existing Oak Island Road traffic volumes, and the increased volumes projected for the Extension alternative. Highway 101 traffic volumes, however, represent a greater influence on the noise environment on Oak Island Road. Including Highway 101 raises the noise levels, for both scenarios to 67.3 dBA. This is above the Provincial Guideline, however, the exceedance is close to the limits of accuracy of the model. Highway 101 dominates the sound environment for about a half kilometre either side of the highway, therefore, the additional traffic from the Extension alternative will not significantly add to the noise level in Oak Island Road and West Brooklyn Road areas.

Existing Noise Levels Adjacent to Highway 101 May be of Concern

Since some existing noise levels, such as 67.3 dBA on Oak Island Road, are above the Provincial Guideline, field measurements should be obtained during the Environmental Assessment for the twinning of Highway 101. However, any difference between measured and modeled noise levels will not affect the evaluation and conclusions reached for this Study using modeled values. The impact of traffic volume changes on noise levels is evaluated by the differences between modeled noise levels, not the actual calculated dBA values.

Summary and Conclusion

The noise environment within about a half kilometre of Highway 101 is dominated by traffic on that highway, and the changes caused by variations in local traffic volumes are insignificant in comparison. There will not be any significant noise changes on local roads as a result of traffic volume changes that would occur for the EXIT 8A alternatives that have been studied.



Atlantic Road & Traffic Management Traffic Engineering Specialists	**Benefit - Cost Study** **Highway 101, Exit 8A Intersection Treatment**	**Figure 4.1**
	Noise Modeling Locations	**July 2004**

5.0 Land Development Impacts

5.1 Community Livability and Development Patterns

General Overview of Property Value and Development Impacts

Professional planning staff from *The Terrain Group Inc.* have prepared this chapter to assess the potential land development impacts of EXIT 8A alternatives.

In undertaking an analysis of property values and economic development opportunities for this Study, several conditions must be considered. It is not a simple review of property assessments or assuming that new roads automatically generate new development. Transportation decisions can also impact social connections, community unity, and quiet enjoyment of property. Community livability is measured by several factors, including the perception of public safety, community character, community unity, transportation and land use convenience, and equity among the community members.

These factors are difficult to quantify with a dollar figure because they are subjective values. For example, if one were to ask a property owner to indicate how much they would be willing to pay to have less traffic on their road, they may say a certain small amount of money. However, if one were to ask the same property owner how much they would want to be paid to accept more traffic on their road, the amount will probably be considerably higher. Understanding this, the results of this Study are based on professional opinion in terms of estimating the magnitude of impacts and serve more as an illustration than an exact cost in dollars.

Rural areas tend to have lower densities than urban or suburban areas and are more dependent on the automobile. Sometimes rural communities lose public services through amalgamation or downsizing which can lead to higher social costs in terms of increased transportation costs and time spent to access the remaining service locations. So changes to transportation patterns can have significant impacts. As a general rule, people use services that they can reach within 10 minutes and try to choose jobs within a 40 minute commute. Therefore, changes to established transportation networks can have significant impacts on peoples' daily lives. Where a rural community relies on agriculture and forest products, they are more heavily dependent on the transportation network because of the trucking associated with their businesses. Preserving the transportation network is critical to these groups.

Considerations of economic development in rural areas differ somewhat from urban areas. For example, it is not uncommon to see the younger workforce move away from rural areas to find jobs in urban centers. When this occurs, rural areas generally strive to attract economic development in an attempt to create jobs for their young people. Transportation improvement projects usually enable economic development growth, however, in some cases an 'improvement' may

actually hinder economic development depending on its design, location, and accessibility. Improvement projects can bring various benefits for rural areas, such as improved access to services, customers for businesses, and reduced transportation costs. An improved transportation network can sometimes also bring access to higher wages for workers and greater net income for owners of local businesses.

Property and Development Patterns in the Area

The EXIT 8A intersection provides two significant access benefits to the 'community-of-interest'. The 'community-of-interest' for this Study includes communities on both the north and south sides of Highway 101 from EXIT 8 (Hantsport) to EXIT 9 (Avonport) as illustrated on Figures 3.1 and 4.1. The intersection provides direct access to Highway 101 and it provides access from one side of the highway to the other. Providing direct access to the highway, is most critical to the commercial businesses in the area. Providing an opportunity to cross Highway 101 at EXIT 8A is important to both commercial businesses and residents in the area. Removing either of the two access benefits will impact property owners and economic development opportunities.

A change in the access to Highway 101 at the EXIT 8A intersection could affect approximately 110 properties on the south side of Highway 101, including Bishopville Road, Ben Jackson Road, Fielding Road, West Brooklyn Road, and Oak Island Road. There are approximately 150 properties along Trunk 1 on the north side of Highway 101 that could be impacted. There are also the property owners affected in Hants Border, Hantsport and Avonport. The entire community-of-interest has an estimated population of 4000.

The settlement pattern in the area between Avonport and Hantsport was heavily influenced by the Ben Jackson intersection. The intersection has been in place for approximately thirty-six years and as such has influenced a generation of people living in the community-of-interest.

Hantsport provides goods and services including the only Tim Hortons restaurant and Primary to Grade 9 (P-9) school for the area. Avonport offers other goods and services such as an elementary school, clothing and discount stores, and a convenience store. In between Hantsport and Avonport are residential properties, farms, and several small commercial businesses along Trunk 1 and Ben Jackson Road. Few of the commercial land uses are taxed as commercial properties, and many of them are considered as home occupations. Commercial properties in the area include a Bed & Breakfast, a firewood/logging service, a tire service, riding stables which on occasion have provided horses for the film industry, personal service shops, and construction services. The most obvious commercial use that is visible from the Highway 101 is the Farmers Market (Anstrum Fruit & Vegetables Limited) located adjacent to EXIT 8A. In addition, Glooscap First Nation offers a variety of retail services, including the only gas station in the Study Area and a take out restaurant.

Residents of this community-of-interest have made business and residential decisions based on the existing EXIT 8A intersection. Transportation and social patterns have been established because of the existence of this intersection. The intersection has historical value to the community and there is strong public sentiment for a full access interchange.

Land Use Zoning

The study included the research of the Municipal Planning Strategy and Land Use By-law for the Municipality of the County of Kings and the Municipality of West Hants. As well, discussions were held with the Municipality of the County of Kings planning and development staff. In looking at the region and the commercial and residential development patterns in the area, Coldbrook and New Minas are the areas of commercial growth. The major stopping points for highway traffic on either end of this community-of-interest are Windsor and New Minas.

The majority of the land surrounding the EXIT 8A intersection is zoned Forestry. The Forestry designation and F1 Zone is 'to provide for forestry, forest industries and related land uses.' Development in the F1 Zone is limited to existing roads. The designation and zoning do allow for a variety of agricultural and residential uses, along with some additional uses that are subject to conditions. These include: Bed and Breakfast operations, Farm Market Outlets, Farm Tenement Buildings, Intensive Livestock operations, Recycling Depots and Rural Home Occupations. The intent of the designation and zoning is to preserve appropriate land for agricultural uses.

The two major development nodes in the surrounding area are Hantsport and Avonport; both communities are able to access Highway 101 by way of interchanges. Hantsport, at is east end of the Study Area, is the larger developed area and is located in the Municipality of West Hants. Avonport, at the western end of the Study Area, has been zoned a Town Hamlet, and is located in the Municipality of the County of Kings. Hants Border, the area just west of Hantsport, has been designated a growth area. According to local planning authorities, a new residential development of 50 to 60 lots is proposed in the Hants Border area, and is the only major residential growth the area has witnessed in recent years. It will take several years for the full development to be built out.

From one perspective, having an interchange at each end of the community-of-interest may seem adequate for transportation routing and commercial development, so that a third interchange at EXIT 8A would not be necessary. On the other hand, the interchange at EXIT 8 is remote in that it is located two kilometers away from Hantsport. Also, since the Hantsport Connector and Highway 101 are designated as controlled access highways, development probably will not occur on either the Connector or at EXIT 8. The interchange at EXIT 9 at Avonport is an unusual design and does not provide enough land around it to promote additional commercial development.

Discussions with the local County Councillor and Kings County Community Development Services indicated that the EXIT 8A community-of-interest does not have a high population growth. However, existing residential properties that have been on the market for a while are recently seeing an increase in sales volume. It is anticipated that the twinning of Highway 101 will increase the desirability of the Valley Area generally, and that may result in residential growth in the Ben Jackson Road and Ben Jackson Connector areas.

5.2 Positive and Negative Impacts of Access Change

Overview of Positive and Negative Impacts of Access Change

This evaluation has been based on research, interviews, and an economic analysis to understand land values and economic development impacts for each of the EXIT 8A alternatives. Impacts have been considered for several value items, and positive or negative impacts have been identified depending on the degree that each value item is affected by changes in access to Highway 101. Items that have been considered are described below, including explanation of each value item and impacts that may be expected. Impacts for all value items have been summarized in Table 5.1.

Impacts to Existing Retail Commercial Property

The farm market owned by Anstrum Fruit & Vegetables Limited is located on Ben Jackson Road at the Ben Jackson Connector intersection on the south side of Highway 101. It will be significantly impacted by the loss of direct access to the Highway. The owners estimate that 85% of the farm market customer base comes from the Highway 101 via the EXIT 8A intersection. Many are regular customers living in other parts of Nova Scotia who know the dangers of the intersection, but still choose to use it to visit the market due to its convenient location. The owners of the market believe that without direct highway access their business will fail. With such a high percentage of the business now using the EXIT 8A access to Highway 101, it is highly unlikely that regular customers or tourists traveling on Highway 101 will use either EXIT 8 or 9 and then the local road network to get to the market. Also, knowledge of the local road network, or a series of guide signs, would be necessary to find the market from either EXIT 8 or 9. Even if the full local customer base (15%) were to use the new routing, it is doubtful that the farm market would survive on that amount of business.

A farm market has been in this location since the creation of the EXIT 8A intersection 36 years ago. The current owners have been operating the market for the past 17 years and the value of the business has steadily grown over the years. The owners have had an interest in expanding their commercial operation through renovations and expansions to the market. They have also considered offering other commercial services. However, the unstable future of the intersection has prevented them from investing in the property or being able to plan for the future.

Tourism is important to all areas of Nova Scotia, including this community-of-interest. Adequate transportation networks that connect visitors to key attractions are critical to the success of tourism related businesses such as the farm market. Since both the Tunnel and Extension alternatives would limit customer access to the market, the two alternatives will have significant negative impacts on the business. Costs that would be incurred include reduced income from business, as well as loss in value for property and, in the event of business closure, building assets associated with the business. The Interchange alternative would allow the farm market to continue to operate and expand. Also, this would provide positive benefits, since there would be reasonable expectations for an increase in annual revenue given that improved access safety could encourage additional customers to use EXIT 8A.

Impacts to Non-Retail Existing Commercial - Loss of Clients

There are several local commercial businesses located along Ben Jackson Road, Trunk 1, and Fielding Road. There is also the gas bar and take-out located at Glooscap First Nation. These commercial uses benefit from both the direct access to Highway 101 and having access to the parts of the community located on both sides of the highway. Both the Tunnel and Extension alternatives will require farther travel for commercial deliveries, which has been addressed in the traffic costs analysis (Section 6.0). Also, with both of these alternatives businesses will experience a loss or reduction in customer base.

While it is difficult to quantify the impacts of loss of clientele without undertaking a detailed analysis of each commercial use, it is possible to provide a subjective evaluation of positive or negative impacts for each of the three access alternatives. The non-retail local businesses have been categorized together for this evaluation. The identified impacts are general in nature, based on an understanding of the area and expected magnitude of change in customer base as a result of EXIT 8A intersection access changes.

It is expected that the Extension alternative would have significant negative impacts on local businesses because of the loss of both access to Highway 101 and the existing EXIT 8A cross connection between the north and south sides of Highway 101. Since the Tunnel alternative would provide a safe and reasonably convenient connection between the north and south sides on the community, negative impacts are expected to be somewhat less than those considered for the Extension. On the other hand, the Interchange alternative would improve the access connection for both local and non-local clientele, which would have a positive impact on these businesses.

Impacts to Economic Development

The three alternatives impact new economic development opportunities, both commercial and residential. As a general rule, improved efficiency, convenience and safety of a transportation network will encourage new commercial and residential development. However, in a rural setting such as the community-of-interest, new economic opportunities will

probably develop slowly. The land around a future EXIT 8A interchange could likely see some commercial growth, particularly with the existing Farm Market already as an established business at that location. Also, there are other existing commercial uses located in the Ben Jackson Road area that benefit from the direct access to Highway 101. An interchange would offer a safer access to Highway 101, thereby making the area generally more attractive for local commercial businesses. The interchanges at EXIT 8 and EXIT 9 are not as well suited to commercial development due to their location or design as discussed earlier in this Report. It is estimated that a reasonable benefit for new commercial development around an interchange could include at least one new commercial enterprise, possibly a gas bar with convenience store. Also, possibly this location could be developed as a Rest Area similar to the one constructed recently adjacent to Highway 104 in Pictou County.

There is some discussion in the community that a developer has been considering the development of an integrated golf course and residential community that would utilize the EXIT 8A access. Also, the Extension would provide access to lands that are currently land locked, meaning they currently have no road frontage on which to develop. Amendments to County planning documents would be required to enable this type of project. The lands are currently zoned to preserve agricultural land by prohibiting new roads and development. As well, the market for residential or golf course development in the area will be driven more by other factors such as demographics, proximity to amenities, project quality, and views. The twinning of the highway may encourage residential development, but it is still difficult to determine how the metro Halifax commutershed will be affected. Existing residential lots may be adequate to meet the housing demand. Since the Tunnel and Extension alternatives are not expected to generate residential development on their own, neither positive nor negative values have been indicated in Table 5.1.

Land Use Impacts - Agricultural and Farmland Production

The lands in the Ben Jackson Road area are designated Forestry and zoned F1. The intent of this designation and zone is “to provide for forestry, forest industries and related land uses.” Development in the F1 Zone is limited to existing roads, so to enable residential development along the Extension alternative, amendments to the Municipal Planning Strategy and Land Use By-law would be required. From a land use planning point of view, there is a cost to allowing agricultural lands to be developed because it results in the permanent loss of land for agriculture. Each alternative would have a minor negative impact on agricultural lands with additional lands needed for road construction. If lands adjacent to the Extension alternative were to be rezoned for residential use, or if a golf course were considered for land near EXIT 8A, there would be an additional loss of farm acreage, although there would also be a potential return in tax revenue to the Municipality. Because residential development is driven by many factors other than transportation and access concerns, the amount of

land area that would be developed cannot be determined at this time, and a value has not been included in Table 5.1.

Impacts to Quality of Life - Increase in Traffic on Local Roads

A re-routing of traffic from the existing traffic patterns will impact property values in terms of a person's 'quiet enjoyment of property'. An increase in traffic on local roads is normally perceived as a negative impact to residential property owners, even if the actual vehicle counts are not increased beyond acceptable levels for the road classification. The roads affected and the expected volume changes for Tunnel and Extension alternatives are included in Table B-1, Appendix B. These roads can tolerate an increase in traffic volumes because current volumes are generally low. An estimation of value on the quality of life as it pertains to traffic volumes is very subjective and difficult to quantify. However, where all affected roads would experience minor increases of traffic volumes, all of which fall within the tolerances of the road classification, it is expected that impacts will either be insignificant, or only of a minor nature. Impacts in Table 5.1 have been indicated as 'minor negative'.

Impacts to Existing Residential Property

The Extension alternative would require the acquisition of lands. Most of the affected lands are vacant and zoned Forestry. However, there is one residential property on West Brooklyn Road near the Oak Island Road intersection that could be severely impacted. The property has a family home with remarkable views and could involve substantial replacement cost. From a property owner's point of view, there would also be a cost associated with loss of location. It is understood that the property has been in the same family for generations, and in fact, it was part of a larger parcel of family owned land which has been severed by the original construction of Highway 101. Applying a value to this property for this Study is subjective because it must balance the owner's opinion of value and the value that the property could sell for, both of which are subject to change. This value item has been indicated as 'negative' impact in Table 5.1.

Impacts to the Unity of the Community

Altering transportation patterns has an impact to the community when it changes the nature of routing and settlement patterns. The impact can be positive or negative depending on the situation. The Extension alternative would eliminate an important part of the community's road network that connects one side of Highway 101 to the other. This dividing of the community pattern would be a negative impact. The Interchange alternative would be a benefit to the community because it eliminates a potentially unsafe intersection and provides for more opportunities and a secure future in knowing that the access location is permanent.

Conclusion

The impacts of each EXIT 8A alternative on land development and community value items are summarized in Table 5.1. Impacts have been color coded with 'green' indicating a positive impact; 'yellow', a minor negative impact; and, 'red', a negative impact. Also, the intensity of the green and red colors indicates degrees of expected impacts, with

lighter shades suggesting 'possible impacts' and darker shades suggesting 'probable or certain' impacts.

The Tunnel and Extension alternatives both impact the community-of-interest negatively; the Extension to a greater degree than the Tunnel. The Interchange is dramatically different because it would have a positive impact by bringing a number of benefits to the community-of-interest.

These results have been derived from an examination of the Study Area, research of municipal planning documents and property information, interviews with stakeholders, and the professional analysis of criteria relating to land values, social impacts, settlement patterns, and economic realities.

Table 5.1 - Table Illustrating Positive and Negative Impacts on Value Items.

Value Item	Impacts on Value Items of Three Alternatives		
	Tunnel	**Extension**	**Interchange**
Existing Local Retail (Farm Market)	Probable closure of Business and loss of investment	Probable closure of Business and loss of investment	Possible expansion of Business and increase in revenue
Non-Retail Local Businesses - loss or reduction of clients	Loss of direct access to Highway 101	Loss of direct access to Highway 101 and EXIT 8A connection between north and south communities	Safe and convenient access to Highway 101 may increase client base
New Economic Development Opportunities	No impacts expected	No impacts expected	Possible business or Rest Area developments
Impact on Farm Land Production	Minor loss for road construction	Minor loss for road construction	Minor loss for road construction
Increase in traffic volumes on local roads, including Trunk 1	Minor negative impact	Minor negative impact	Not Applicable
Existing residential properties	Not Applicable	Negative impact for property acquisition	Not Applicable
Existing community connection provided by the Connector at EXIT 8A	Minor negative impact	Negative impact affecting both north and south communities	Positive impact by providing safe connection across Highway 101
Summary	**Moderate negative impacts on Value Items**	**Negative impacts on Value Items**	**Positive impacts on Value Items**

NOTE: Impacts of access change at EXIT 8A are summarized by color coding in Table 5.1. Impacts have been color coded with 'green' indicating a positive impact; 'yellow', a minor negative impact; and, 'red', a negative impact. Also, the intensity of the green and red colors indicates degrees of expected impacts, with lighter shades suggesting 'possible impacts' and darker shades suggesting 'probable or certain' impacts.

6.0 Benefit - Cost Analyses

Benefit - Cost Analysis Principles

A benefit - cost analysis compares the present worth (for an analysis period of 25 years) of road user savings for each improvement alternative to the present worth of the capital cost and maintenance costs of each alternative. The present worth of benefits divided by the present worth of costs provides a benefit - cost ratio for a particular improvement scenario. If the number is greater than 1.0, greater benefits will accrue to the public over the 25 years than the cost to government. When several alternatives are being compared, the alternative with the highest benefit cost ratio is generally considered to provide the best return on public investment.

Three Alternatives were Studied

Benefit-cost analyses were completed for the three alternative treatments being studied for elimination of the EXIT 8A - Highway 101 intersection. An analysis period of 25 years was used in this Study with a discount rate of 5% used in calculation of present worth.

Road User Benefits

Road user benefits are derived from savings in vehicle operating expenses, reduced travel time, and collision savings from using a 'safer' and more efficient road network.

Vehicle Operating Expenses - *Driving Costs* (Canadian Automobile Association, 2004) includes information on vehicle operating and ownership costs. While a vehicle driven 18,000 km per year costs about $0.1295 per km for operating expenses, the total cost for operation and ownership is about $0.504 per km. The analyses completed for this Study have used $0.34 per km, the current Nova Scotia government travel allowance rate.

Value of Time - A review of previous economic analyses studies completed for various TPW projects indicated that $13.50 per vehicle-hour is a reasonable rate to use for this Study.

Collision Savings - The provision of 'safer' roads will provide collision benefits to the public using those roads. Periodically TPW publishes collision rate statistics for various road classes. The table below illustrates collision rates per Hundred Million Vehicle Kilometres (HMVK) for three road classes for 2002.

Collision Rates per HMVK for Five Years to 2002

Class 1 - Wide Median Four Lane	28.4
Class 9 - Rural Trunks	79.1
Class 11 - Routes	98.6

A wide median four lane road has a collision rate 35% that for a trunk road and about 30% that of a collector or local route.

The number of collisions per year can be calculated for each alternative using vehicle-kilometres of travel and collision rates for the various road classes in each road network. Annual collision costs for each alternative can then be calculated using the 'average collision cost' for each road class included in Table 6.1.

Table 6.1 - Calculation of Collision Costs by Highway Classification

Road Type	Collision Severity	% Collisions by Severity [1]	2004 Cost per Collision by Severity [2]	Contribution to Combined Cost
100 Series - Four Lane Divided Highway	Property Damage Only	65.1	6500	4231
	Injury	33.4	63000	21042
	Fatal	1.5	4600000	69000
	Combined	100.0		**94274**
	Average Collision Cost on 100 Series Four Lane Divided Highways			**$94,000**
Rural Trunks	Property Damage Only	61.6	6500	4004
	Injury	37.3	63000	23499
	Fatal	1.1	4600000	50600
	Combined	100.0		**78103**
	Average Collision Cost on Rural Trunk Roads			**$78,000**
Routes	Property Damage Only	63.7	6500	4141
	Injury	35.7	63000	22491
	Fatal	0.6	4600000	27600
	Combined	100.0		**54232**
	Average Collision Cost on Collector and Local Routes			**$54,000**

NOTES: 1. Percentage of collisions by severity for each road class were provided from TPW 2002 Collision Rates records.
2. Average 1998 costs for Property Damage Only (PDO) ($5,620), injury ($54,800) and fatal ($3,988,400) collisions were obtained from *Highway User Benefits of the National Highway System*, Transportation Association of Canada, 1998. These costs were factored to provide 2004 costs using 1.151 cost of living increase since 1998.

Calculation of User Benefits

Road section length and travel time, daily volume change for each road section, and the values for travel, time and collisions detailed above, have been combined in Tables B-8 to B-11 to produce estimated road user benefits for each of the three alternatives. Benefits for each alternative are determined by comparing the user costs for each alternative to a base case where EXIT 8A has been removed without providing an alternative access. Annual road user benefits based on 2004 volumes are summarized in Table 6.2.

Table 6.2 - Annual Road User Benefits

Alternative	Annual Road User Benefits ($/year)			
	Travel Distance	Travel Time	Collision	Total
Tunnel	293,700	122,800	22,800	$439,300
Extension	328,600	144,500	33,600	$506,700
Interchange	659,600	469,200	142,100	$1,270,900

NOTE: Complete details of User Benefit calculations are included in Tables C-8 to C-11.

Roadway Costs

Roadway costs include direct capital construction costs for a project, including any residual road improvements required in other parts of the road network as a result of the project, annual maintenance costs for the road, plus periodic maintenance costs, such as bridge deck rehabilitation.

The capital cost estimates for the three alternatives which are detailed in Table 6.3 and include:

1. Tunnel $3,340,000
2. Extension $2,475,000
3. Interchange $5,815,000.

Table 6.3 - Estimated Capital Costs of Three Alternatives

Alternative	Details	Estimated Cost
Tunnel	Tunnel and connector	1,950,000
	Unpaved parallel access road	215,000
	Trunk 1 improvements	1,175,000
	Total Tunnel Cost Estimate	**$3,340,000**
Extension	Extension road	940,000
	Trunk 1 improvements	1,175,000
	Oak Island Road improvements	320,000
	Abandon existing connector	40,000
	Total Extension Cost Estimate	**$2,475,000**
Interchange	Interchange and connector	5,600,000
	Unpaved parallel access road	215,000
	Total Interchange Cost Estimate	**$5,815,000**

Maintenance Costs

Annual maintenance costs for different road classes are indicated as the annual cost to maintain a kilometre of two lane road. TPW annual road maintenance costs include:

Road Type	Annual Cost per 2-Lane Km
100 Series	13,000
Trunk	10,400
Route	7,400
Local	3,700

Other maintenance costs considered in this Study include bridge deck rehabilitation for the interchange structures after 15 years. Rehabilitation costs are estimated to be $100,000 per structure, or $200,000 for the twin structures.

Changes in annual road maintenance costs for each alternative are detailed in Table C-4.

Benefit / Cost Analyses

Benefit / Cost analyses for the three alternatives are detailed in Tables C-12 to C-14. The benefit - cost analyses compare the present worth of annual road user savings for each alternative (Table 6.2) to the present worth of the capital cost (Table 6.3) and maintenance costs of each alternative. An analysis period of 25 years was used in this Study with a discount rate of 5% used in calculation of present worth. The present worth of benefits divided by the present worth of costs provides a benefit - cost ratio for each alternative. Benefit / Cost analysis results are summarized in Table 6.4.

Table 6.4 - Summary of Benefit / Cost Analyses

Alternative	Net Present Value of Benefit	Net Present Value of Cost	Benefit / Cost Ratio
Tunnel	7,495,000	2,492,000	3.0
Extension	8,645,000	1,969,000	4.4
Interchange	21,682,000	4,611,000	4.7

7.0 Summary and Conclusions

Background

1. The Nova Scotia Department of Transportation and Public Works (TPW) is finalizing plans for Phase 3 Highway 101 twinning from the current end of twinning at Ellershouse to Windsor and from Falmouth to Avonport. During twinning of the Falmouth to Avonport section, the Exit 8A (Ben Jackson Road) at-grade intersection will be eliminated. Three alternatives are being considered to remove the at-grade intersection, including a ***Tunnel*** without access to Highway 101, an ***Extension*** of Ben Jackson Road westerly to parallel the south side of Highway 101, and a full movement diamond ***Interchange***.

   The objective of this study is to provide TPW with information needed to select the most cost effective alternative for elimination of the existing at-grade intersection. The Study has included social and economic reviews, traffic studies and benefit-cost analyses, to evaluate the impacts of each alternative.

Traffic Volumes

2. The 2004 Annual Average Daily Traffic (AADT) on the Ben Jackson Connector north of Highway 101 is approximately 1520 vehicles per day (vpd), while the volume on Ben Jackson Road immediately south of Highway 101 is approximately 700 vpd.

Intersection Users Prefer the Interchange Alternative

3. Meetings and telephone interviews were completed with officials from local municipalities, emergency response units, Glooscap First Nation, Canada Post, Annapolis Valley Regional School Board, and other stakeholders, to obtain their concerns for expected impacts of the three EXIT 8A alternatives.

   The existing intersection has provided opportunities to access and cross Highway 101 for residents and businesses for almost 40 years. It is not surprising that those who use the intersection on a daily basis consider that the Tunnel and Extension alternatives will both have negative impacts on their quality of life and business opportunities. Concern has also been expressed for the impacts that diverted traffic could have on local roads not designed for use by heavy trucks. The general consensus is that the expected impacts of the Tunnel and Extension alternatives are not acceptable, and that the Interchange should be constructed to provide a permanent and safe access to Highway 101.

Noise Impacts are not Significant

4. The noise environment within about a half kilometre of Highway 101 is dominated by traffic on that highway, and the changes caused by variations in local traffic volumes are insignificant in comparison. There will not be any significant noise changes on local roads as a result of traffic volume changes that would occur for the EXIT 8A alternatives that have been studied.

Property Value and Development Impacts

5. Community livability is measured by several factors, including the perception of public safety, community character, community unity, transportation and land use convenience, and equity among the community members. Property value and development impacts were evaluated for impacts on value items, including retail, businesses, economic development, farm land, traffic volumes changes, residential property, and dividing the community by removal of the existing connection across Highway 101 provided by the Ben Jackson Connector.

   After examination of the study area, research of municipal planning documents and property information, interviews with stakeholders, and professional analysis of criteria relating to land values, social impacts, settlement patterns, and economic realities, the following conclusion have been reached concerning impacts of each alternative on property values, development opportunities, and quality of life:
   - The Extension has negative impacts
   - The Tunnel also has some moderate negative impacts
   - The Interchange brings some positive benefits.

Travel Distance Impacts of Alternatives

6. A licence plate match origin destination study was completed to determine the impacts to diverted traffic with regards to travel distances for each alternative. Although road section volume changes are not expected for the Interchange alternative, calculations were completed to calculate volume changes that would occur if the intersection were removed without provision of any other access changes. This provided a base for calculating benefits of the Interchange alternative.

   If the intersection were removed without construction of any of the three alternatives, vehicles would have to travel almost two million additional vehicle-kilometres per year. The Tunnel and‘Extension alternatives will each require about one million additional vehicle-kilometres of travel per year.

Annual Road User Benefits

7. Road section length and travel time, daily volume change for each road section, and the values for travel, time and collisions savings, have been combined to produce estimated road user benefits for each of the three alternatives. Annual road user benefits for each alternative based on 2004 volumes include:
   - Tunnel $ 439,300
   - Extension $ 506,700
   - Interchange $1,270,900

Roadway Costs of Alternatives

8. Roadway costs include direct capital construction costs, including any residual road improvements required in other parts of the road network as a result of the project, annual maintenance costs for the road. The capital cost estimates for the three alternatives are:
   - Tunnel $3,340,000
   - Extension $2,475,000
   - Interchange $5,815,000.

Benefit / Cost Analyses

9. Benefit / Cost analyses for the three alternatives compare the present worth of annual road user savings for each alternative to the present worth of the capital cost and maintenance costs of each alternative. An analysis period of 25 years was used in this Study with a discount rate of 5% used in calculation of present worth. The present worth of benefits divided by the present worth of costs provides a benefit/cost ratio for each alternative.

   Benefit / Cost analysis results are:
   - Tunnel 3.0
   - Extension 4.4
   - Interchange 4.7

Conclusion

10. Although the Interchange is the highest cost alternative, Benefit / Cost analysis indicates that the Interchange provides the greatest benefit to the public for each dollar spent to eliminate the EXIT 8A intersection on Highway 101. The Extension is a close second in providing a similar Benefit / Cost ratio at a lower construction cost.

    Impacts on property values, development opportunities, and quality of life must also be considered when choosing the alternative to eliminate the Ben Jackson intersection. The existing intersection has provided opportunities to access and cross Highway 101 for residents and businesses for almost 40 years. Removal of access to Highway 101 at this location will have negative impacts on area properties.

Appendices

Contents

Appendix A

Traffic Volume Data

Table A-1 - Hourly Volumes Ben Jackson Connector - North of Highway 101
October 11 to 18, 2000

Hour	Days of the Week							Hourly Averages	
	Mon-16	Tue-17	Wed-18/11	Thu-12	Fri-13	Sat-14	Sun-15	Week	Weekday
0									
1	5	9	10	8	9	19	18	11	8
2	1	6	2	3	4	6	2	3	3
3	3	9	5	3	9	2	9	6	6
4	2	4	2	1	0	3	4	2	2
5	2	2	2	2	6	7	4	4	3
6	15	16	11	22	19	10	7	14	17
7	49	47	51	27	42	29	15	37	43
8	120	123	122	122	120	39	16	95	121
9	109	103	106	107	137	60	36	94	112
10	71	67	72	68	64	86	44	67	68
11	75	73	63	59	62	78	54	66	66
12	75	84	81	72	93	76	79	80	81
13	72	65	91	85	72	104	77	81	77
14	73	90	81	85	87	87	84	84	83
15	93	80	75	96	103	95	91	90	89
16	126	98	107	93	110	83	95	102	107
17	128	136	140	137	126	110	125	129	133
18	106	107	125	116	120	82	81	105	115
19	84	99	91	93	138	93	72	96	101
20	64	64	67	83	100	70	75	75	76
21	28	48	32	47	66	36	36	42	44
22	44	49	54	63	56	30	28	46	53
23	21	37	33	36	51	31	22	33	36
24	15	21	22	19	36	26	12	22	23
TOTALS	1381	1437	1445	1447	1630	1262	1086	1384	1468

Estimated 2000 AADT 1330

Table A-2 - Hourly Volumes Ben Jackson Connector - South of Highway 101
October 11 to 18, 2000

Hour	Days of the Week							Hourly Averages	
	Mon-16	Tue-17	Wed-18/11	Thu-12	Fri-13	Sat-14	Sun-15	Week	Weekday
0									
1	2	2	4	4	3	6	10	4	3
2	0	0	0	0	0	2	3	1	0
3	0	1	1	2	1	0	6	2	1
4	1	1	0	1	1	1	1	1	1
5	0	1	3	1	1	3	1	1	1
6	8	3	5	7	5	3	2	5	6
7	14	20	14	16	16	7	3	13	16
8	49	46	41	45	37	17	17	36	44
9	40	25	31	33	40	16	12	28	34
10	14	29	31	33	40	32	27	29	29
11	28	46	18	34	32	46	39	35	32
12	40	33	41	46	44	64	56	46	41
13	39	26	40	34	40	66	66	44	36
14	47	39	33	35	61	67	77	51	43
15	63	61	45	44	55	60	81	58	54
16	48	49	51	47	63	84	107	64	52
17	55	65	62	66	60	82	117	72	62
18	55	63	55	53	57	59	53	56	57
19	43	65	49	61	43	40	58	51	52
20	39	25	34	41	24	40	33	34	33
21	19	22	20	13	20	13	21	18	19
22	11	24	14	27	15	21	21	19	18
23	15	12	11	15	18	13	8	13	14
24	4	5	5	3	6	15	4	6	5
TOTALS	634	663	607	661	682	757	823	690	649

Estimated 2000 AADT 660

Table A-3 - Hourly Volumes Ben Jackson Connector
April 28 to 30, 2004

Hour	Ben Jackson Connector - North of Hwy 101				Hour	Ben Jackson Connector - South of Hwy 101			
	Wed-28	Thu-29	Fri-30	Average		Wed-28	Thu-29	Fri-30	Average
0					0				
1		8	14	11	1		3	9	6
2		3	8	6	2		3	6	5
3		1	5	3	3		0	2	1
4		2	2	2	4		2	3	3
5		4	8	6	5		0	0	0
6		9	10	10	6		4	7	6
7		37	36	37	7		13	15	14
8		106	85	96	8		35	37	36
9		118	119	119	9		37	28	33
10		91	68	80	10		34	24	29
11		87	89	88	11		27	44	36
12		78	77	78	12		28	31	30
13	77	88	77	81	13	38	37	34	36
14	91	91	94	92	14	44	39	46	43
15	77	92	87	85	15	41	34	36	37
16	95	97		96	16	29	41		35
17	137	141		139	17	63	45		54
18	128	99		114	18	47	53		50
19	84	114		99	19	35	50		43
20	81	73		77	20	38	40		39
21	45	88		67	21	28	34		31
22	42	56		49	22	18	19		19
23	27	29		28	23	11	11		11
24	13	23		18	24	8	13		11
TOTALS		1535		1477	TOTALS		602		604

Estimated 2004 AADT 1520

Estimated 2004 AADT 620 from two day count.
(Use 2004 AADT 700 for Study to account for short count and lower Farm Market Volumes in April)

Figure A-1 -Ben Jackson Connector
North and South of Highway 101

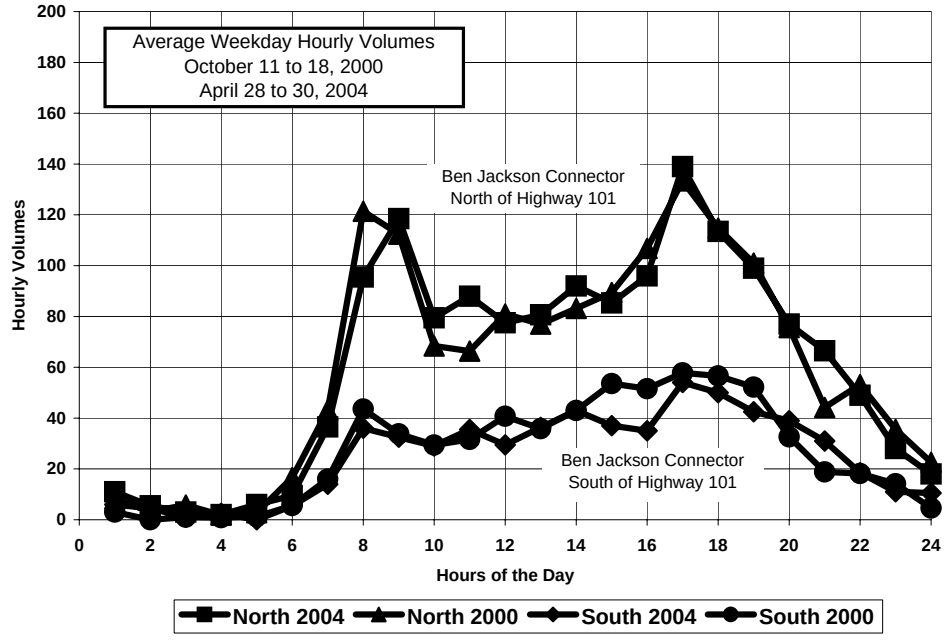


Table A-4 - Hourly Volumes Trunk 1 - 3 km East of Avonport
June 19 to 26, 1997

Hour	Days of the Week							Hourly Averages	
	Mon-23	Tue-24	Wed-25	Thu-26/19	Fri-20	Sat-21	Sun-22	Week	Weekday
0									
1	3	2	3	2	1	8	7	4	2
2	0	4	0	3	4	6	3	3	2
3	0	1	2	0	0	2	2	1	1
4	1	0	1	3	0	6	8	3	1
5	0	1	1	3	1	1	2	1	1
6	2	4	2	2	4	0	3	2	3
7	8	10	6	7	5	5	8	7	7
8	29	35	25	26	38	13	10	25	31
9	28	24	22	45	26	15	12	25	29
10	33	30	37	36	42	38	27	35	36
11	36	48	38	41	43	68	37	44	41
12	43	43	52	39	54	48	52	47	46
13	37	51	38	52	39	89	68	53	43
14	46	52	47	41	58	76	83	58	49
15	56	44	40	44	46	61	97	55	46
16	58	57	49	46	52	62	86	59	52
17	41	54	44	49	43	49	70	50	46
18	34	62	49	52	54	47	65	52	50
19	34	25	43	41	52	40	45	40	39
20	41	47	42	33	56	34	37	41	44
21	41	25	29	41	25	24	29	31	32
22	31	22	30	32	30	19	22	27	29
23	10	9	20	11	17	9	18	13	13
24	8	14	10	11	10	8	8	10	11
TOTALS	620	664	630	660	700	728	799	686	655

Estimated 2004 AADT 650

Table A-5 - Hourly Volumes Trunk 1 - 3 km East of Avonport
May 10 to 17, 2000

Hour	Days of the Week							Hourly Averages	
	Mon-15	Tue-16	Wed-17/10	Thu-11	Fri-12	Sat-13	Sun-14	Week	Weekday
0									
1	1	1	2	4	4	8	11	4	2
2	2	2	2	3	2	3	5	3	2
3	0	2	1	2	1	2	0	1	1
4	2	2	2	2	5	2	3	3	3
5	2	0	2	2	1	1	4	2	1
6	5	8	4	0	4	1	0	3	4
7	7	8	9	10	9	5	5	8	9
8	32	32	30	32	25	17	9	25	30
9	27	35	32	41	25	22	10	27	32
10	19	26	22	22	21	27	23	23	22
11	35	29	25	32	32	45	41	34	31
12	29	30	33	35	29	39	46	34	31
13	43	41	45	43	36	56	72	48	42
14	47	43	47	42	34	51	74	48	43
15	49	47	59	55	51	58	72	56	52
16	54	54	40	40	46	66	82	55	47
17	40	46	47	37	51	70	61	50	44
18	33	49	48	31	35	51	48	42	39
19	38	41	40	42	47	57	35	43	42
20	36	38	41	31	45	45	42	40	38
21	30	31	29	25	36	38	29	31	30
22	18	18	13	15	29	17	15	18	19
23	14	8	9	5	11	16	11	11	9
24	7	5	7	11	10	10	3	8	8
TOTALS	570	596	589	562	589	707	701	616	581

Estimated 2004 AADT 610

Table A-6 - Hourly Volumes - Trunk 1 - West and East of Ben Jackson Connector
April 28 to 30, 2004

Hour	West of Ben Jackson Connector				Hour	East of Ben Jackson Connector			
	Wed-28	Thu-29	Fri-30	Average		Wed-28	Thu-29	Fri-30	Average
0					0				
1		7	4	6	1		13	16	15
2		0	4	2	2		3	8	6
3		0	2	1	3		1	5	3
4		1	1	1	4		3	3	3
5		4	3	4	5		2	7	5
6		8	7	8	6		11	9	10
7		13	12	13	7		39	34	37
8		41	43	42	8		139	123	131
9		42	44	43	9		143	140	142
10		54	33	44	10		111	86	99
11		45	57	51	11		116	121	119
12		55	53	54	12	106	113	105	108
13	59	54	57	57	13	126	123	121	123
14	62	61	52	58	14	125	140	115	127
15	49	59	76	61	15	123	143	142	136
16	50	53		52	16	128	143		136
17	70	89		80	17	175	195		185
18	59	59		59	18	159	145		152
19	46	46		46	19	101	143		122
20	54	57		56	20	112	110		111
21	36	42		39	21	66	103		85
22	23	22		23	22	50	61		56
23	16	12		14	23	29	31		30
24	7	6		7	24	16	29		23
TOTALS		830		816	TOTALS		2060		1959
	Estimated 2004 AADT 840					Estimated 2004 AADT 2020			

(This count location is just west of Ben Jackson Connector)

Figure A-2 - Trunk 1 Average Weekday Hourly Volumes
West and East of Ben Jackson Connector

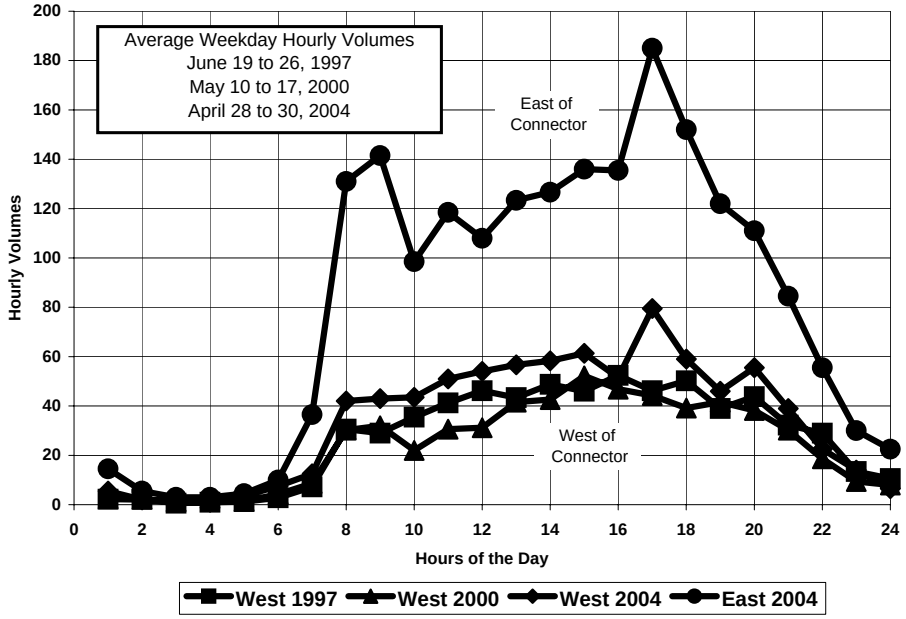


Table A-7 - Hourly Volumes Bishopville Road - 1.0 Km South of Highway 101
August 30 to September 5, 1995

Hour	Days of the Week							Hourly Averages	
	Mon-04	Tue-05	Wed-30	Thu-31	Fri-01	Sat-02	Sun-03	Week	Weekday
0									
1	9	4	10	5	5	16	11	9	7
2	3	3	1	0	5	6	7	4	2
3	1	0	1	0	1	8	3	2	1
4	1	2	0	3	1	1	1	1	1
5	0	0	3	2	1	0	0	1	1
6	2	2	2	3	6	2	1	3	3
7	2	11	6	9	7	6	6	7	7
8	11	34	37	39	31	17	3	25	30
9	10	48	41	36	37	18	14	29	34
10	31	24	26	39	25	21	28	28	29
11	33	46	41	33	31	41	36	37	37
12	45	44	48	48	49	65	40	48	47
13	39	51	38	54	52	50	35	46	47
14	61	45	64	62	48	44	59	55	56
15	71	49	40	62	59	68	67	59	56
16	50	48	61	53	49	55	59	54	52
17	46	52	62	57	70	46	49	55	57
18	46	50	55	51	55	45	52	51	51
19	39	49	63	62	52	52	42	51	53
20	54	38	72	59	83	40	60	58	61
21	34	45	53	33	46	37	45	42	42
22	13	27	21	23	36	22	29	24	24
23	11	9	18	8	23	10	17	14	14
24	1	12	11	5	12	21	6	10	8
TOTALS	613	693	774	746	784	691	670	710	722

Estimated 1995 AADT 590 (NOTE: September 4, 1995 was Labour Day)

Figure A-3 - Bishopville Road Average Weekday Hourly Volumes
1.0 Km South of Highway 101

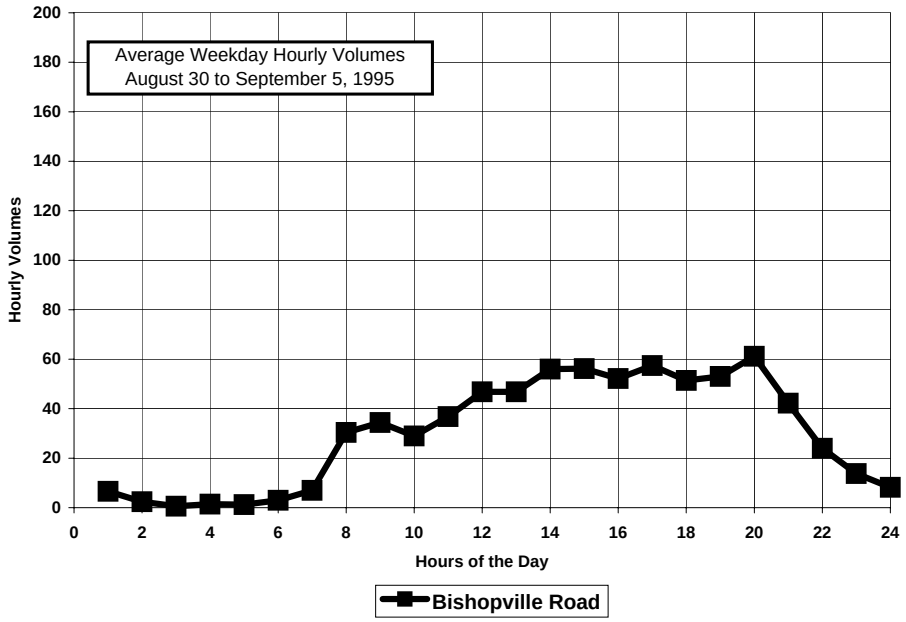
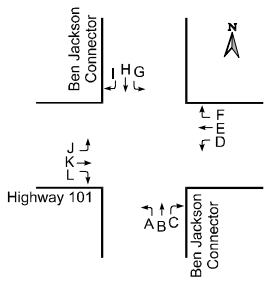


Table A-8

Highway 101
@
Ben Jackson Connector

Kings County, Nova Scotia

Tuesday, June 17, 2003



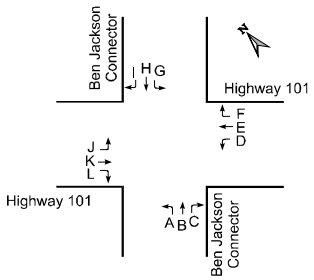
Time	Ben Jackson Connector Northbound Approach			Highway 101 Westbound Approach			Ben Jackson Connector Southbound Approach			Highway 101 Eastbound Approach			Total Vehicles
	A	B	C	D	E	F	G	H	I	J	K	L	
07:00-07:15	5	2	1	1	41	2	1	1	7	6	43	0	110
07:15-07:30	3	0	0	0	71	0	1	0	11	10	86	1	183
07:30-07:45	8	0	3	1	101	1	2	0	22	7	97	0	242
07:45-08:00	2	2	0	1	103	1	0	0	21	12	90	4	236
08:00-08:15	4	0	0	2	109	0	2	0	20	6	89	3	235
08:15-08:30	5	0	0	0	80	0	0	0	14	13	94	5	211
08:30-08:45	2	1	3	0	72	0	1	1	20	10	95	5	210
08:45-09:00	2	0	0	1	114	1	2	0	9	11	74	2	216
09:00 to 10:00	9	2	4	2	355	9	4	2	43	26	355	5	816
10:00 to 11:00	9	2	5	5	342	2	3	6	50	19	280	12	735
11:00-11:15	0	2	3	0	81	1	0	1	6	5	64	2	165
11:15-11:30	2	3	1	3	70	0	1	0	12	14	79	5	190
11:30-11:45	3	3	0	1	79	1	1	3	8	9	81	4	193
11:45-12:00	2	1	1	0	97	1	1	0	5	10	88	4	210
12:00-12:15	1	1	0	1	91	4	0	1	8	8	79	2	196
12:15-12:30	1	1	1	0	76	0	0	1	12	12	79	5	188
12:30-12:45	1	1	1	2	64	0	0	1	8	12	79	5	174
12:45-13:00	0	2	0	0	84	1	0	0	7	12	74	3	183
13:00 to 14:00	12	3	7	7	311	7	3	4	40	36	315	13	758
14:00 to 15:00	5	2	5	3	327	5	1	5	36	50	356	7	802
15:00 to 16:00	6	4	9	1	372	7	4	6	40	57	433	19	958
16:00-16:15	2	2	2	2	109	3	0	2	13	19	30	1	185
16:15-16:30	4	1	3	0	94	0	0	1	14	10	118	5	250
16:30-16:45	8	0	0	0	117	3	1	0	20	18	121	5	293
16:45-17:00	3	0	1	0	124	2	0	0	12	23	104	5	274
17:00-17:15	3	0	0	2	114	4	0	0	9	15	121	6	274
17:15-17:30	2	0	2	3	101	0	0	1	27	20	115	7	278
17:30-17:45	5	3	0	1	111	2	1	1	12	12	111	4	263
17:45-18:00	3	0	3	2	92	1	0	1	9	20	92	5	228
18:00 to 19:00	16	3	1	2	365	0	3	4	47	30	238	19	728
12 Hour Total	128	41	56	43	4267	58	32	42	562	512	4080	163	9984
AM Peak Hour	19	2	3	4	393	2	4	0	77	38	370	12	924
Noon Peak Hour	3	5	2	3	315	5	0	3	35	44	311	15	741
PM Peak Hour	16	0	3	5	456	9	1	1	68	76	461	23	1119

Table A-9

Highway 101
@
Ben Jackson Connector

Kings County, Nova Scotia

Thursday, April 29, 2004



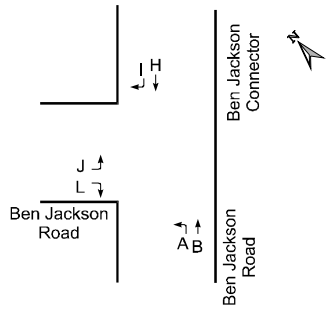
Time	Ben Jackson Connector Northbound Approach			Highway 101 Westbound Approach			Ben Jackson Connector Southbound Approach			Highway 101 Eastbound Approach			Total Vehicles
	A	B	C	D	E	F	G	H	I	J	K	L	
07:00-07:15	3	0	2	0		0	0	0	5	7		1	18
07:15-07:30	2	2	0	1		0	1	0	14	8		2	30
07:30-07:45	9	0	2	2		0	0	1	22	12		0	48
07:45-08:00	5	1	0	2		1	0	0	21	10		1	41
08:00-08:15	2	0	0	0		0	1	1	19	8		1	32
08:15-08:30	4	0	0	1		0	1	0	20	15		1	42
08:30-08:45	4	0	0	3		0	2	1	18	6		2	36
08:45-09:00	5	1	3	0		0	0	1	9	14		6	39
09:00-09:15	1	1	1	2		0	1	4	13	3		2	28
09:15-09:30	4	0	2	0		2	0	1	9	9		1	28
09:30-09:45	1	2	2	0		2	1	1	12	7		0	28
09:45-10:00	2	1	0	0		1	2	1	13	3		2	25
AM Peak Hour	15	1	0	6	0	1	4	2	78	39	0	5	151
10:00-10:15	0	0	2	0		1	1	2	7	2		1	16
10:15-10:30	2	1	0	2		3	1	1	16	5		2	33
10:30-10:45	3	3	2	0		0	0	1	10	8		1	28
10:45-11:00	0	1	1	0		1	1	0	4	7		0	15
11:00-11:15	0	3	0	0		0	1	2	13	6		2	27
11:15-11:30	4	2	0	0		0	0	0	3	7		5	21
11:30-11:45	2	2	0	0		2	1	1	8	6		4	26
11:45-12:00	0	0	0	0		0	0	2	8	8		0	18
12:00-12:15	2	0	1	0		0	0	1	6	9		3	22
12:15-12:30	3	1	2	0		1	1	0	9	11		2	30
12:30-12:45	2	0	0	1		2	0	1	5	10		3	24
12:45-13:00	5	2	1	1		2	2	2	11	13		5	44
13:00-13:15	2	2	1	1		0	1	3	12	8		4	34
13:15-13:30	7	1	1	0		0	0	0	4	7		1	21
13:30-13:45	3	1	0	0		1	0	3	11	10		2	31
13:45-14:00	4	0	0	0		1	2	0	14	8		3	32
Noon Peak Hour	12	5	4	3	0	5	4	6	37	42	0	14	132
14:00-14:15	3	0	1	0		0	0	1	4	6		6	21
14:15-14:30	4	0	0	0		2	2	0	5	14		3	30
14:30-14:45	4	0	1	0		1	1	0	0	12		5	24
14:45-15:00	0	0	1	1		2	2	1	1	2		1	11
15:00-15:15	2	0	0	1		1	0	0	13	14		4	35
15:15-15:30	4	1	1	0		1	0	3	9	8		3	30
15:30-15:45	2	1	0	1		1	1	0	12	11		5	34
15:45-16:00	2	0	1	1		1	0	0	12	8		5	30
16:00-16:15	5	1	3	0		5	0	0	13	15		1	43
16:15-16:30	2	0	1	1		3	0	2	16	10		3	38
16:30-16:45	3	2	0	1		0	1	1	16	19		6	49
16:45-17:00	0	0	2	2		1	1	1	13	18		9	47
17:00-17:15	2	0	1	1		2	0	0	8	5		8	27
17:15-17:30	2	0	1	1		2	1	0	15	11		12	45
17:30-17:45	2	0	1	1		1	1	0	12	13		7	38
17:45-18:00	2	2	2	1		1	0	1	13	11		5	38
18:00-18:15	7	0	0	0		0	0	2	15	17		2	43
18:15-18:30	3	2	1	1		1	1	2	8	7		2	28
18:30-18:45	10	1	1	1		3	0	1	10	19		3	49
18:45-19:00	3	0	3	2		0	0	1	8	13		1	31
PM Peak Hour	10	3	6	4	0	9	2	4	58	62	0	19	177
10 Hour Total	127	32	36	29	N/A	38	23	40	472	404	N/A	129	1330
12 Hour Total	170	43	48	41	N/A	54	39	54	634	541	N/A	167	1791

Table A-10

Ben Jackson Connector
@
Ben Jackson Road

Kings County, Nova Scotia

Thursday, April 29, 2004



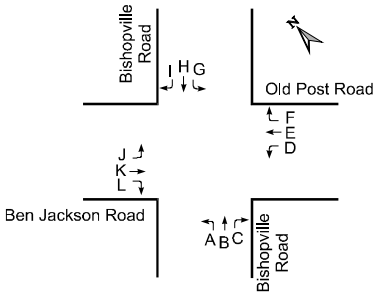
Time	Ben Jackson Road Northbound Approach		Ben Jackson Connector Southbound Approach		Ben Jackson Road Eastbound Approach		Total Vehicles
	A	B	H	I	J	L	
07:00-07:15	0	2	0	1	2	0	5
07:15-07:30	0	4	0	2	1	0	7
07:30-07:45	1	8	1	3	3	0	16
07:45-08:00	0	4	2	1	1	1	9
08:00-08:15	0	2	2	0	0	1	5
08:15-08:30	0	3	1	1	1	0	6
08:30-08:45	0	3	3	3	1	0	10
08:45-09:00	0	6	7	0	3	1	17
09:00-09:15	1	2	6	2	1	0	12
09:15-09:30	1	4	1	1	2	0	9
09:30-09:45	0	1	0	1	3	0	5
09:45-10:00	0	4	1	2	0	2	9
AM Peak Hour	2	15	17	6	7	1	48
11:00-11:15	0	1	1	3	1	1	7
11:15-11:30	0	4	5	0	2	1	12
11:30-11:45	2	2	4	1	1	1	11
11:45-12:00	0	0	1	1	0	1	3
12:00-12:15	2	2	3	1	1	0	9
12:15-12:30	1	4	1	1	2	0	9
12:30-12:45	0	2	3	2	0	0	7
12:45-13:00	0	4	5	3	4	0	16
13:00-13:15	1	2	5	3	3	0	14
13:15-13:30	0	7	0	1	2	0	10
13:30-13:45	0	2	3	1	2	0	8
13:45-14:00	0	4	4	0	0	0	8
Noon Hour Peak	1	15	13	8	11	0	48
15:00-15:15	1	2	4	1	0	0	8
15:15-15:30	0	6	3	2	0	1	12
15:30-15:45	0	1	5	1	2	1	10
15:45-16:00	0	2	4	1	1	0	8
16:00-16:15	0	7	0	1	3	0	11
16:15-16:30	1	2	4	2	1	3	13
16:30-16:45	0	4	6	1	1	1	13
16:45-17:00	0	1	8	2	1	0	12
17:00-17:15	1	2	7	3	1	1	15
17:15-17:30	2	2	11	2	0	0	17
17:30-17:45	1	2	8	0	0	1	12
17:45-18:00	0	7	6	1	0	0	14
18:00-18:15	0	5	3	1	1	0	10
18:15-18:30	0	5	4	1	3	0	13
18:30-18:45	0	6	3	2	4	1	16
18:45-19:00	1	5	4	0	1	1	12
PM Peak Hour	4	13	32	6	1	2	58
10 Hour Total	16	136	139	55	55	19	420

Table A-11

Ben Jackson Road
@
Bishopville Road

Hants County, Nova Scotia

Thursday, April 29, 2004



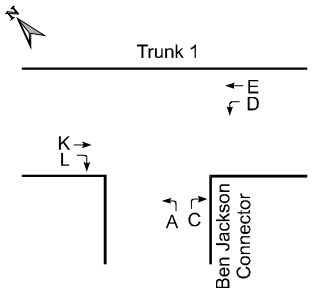
Time	Bishopville Road Northbound Approach			Old Post Road Westbound Approach			Bishopville Road Southbound Approach			Ben Jackson Road Eastbound Approach			Total Vehicles
	A	B	C	D	E	F	G	H	I	J	K	L	
07:00-07:15	2	1	1	0	4	0	0	1	0	0	1	0	10
07:15-07:30	1	6	1	2	0	0	0	3	2	0	1	0	16
07:30-07:45	5	5	0	1	1	1	1	0	1	0	0	1	16
07:45-08:00	2	12	0	2	2	1	1	0	1	3	1	2	27
08:00-08:15	1	10	1	0	2	0	0	7	1	3	0	1	26
08:15-08:30	0	5	1	0	0	2	0	2	0	1	0	0	11
08:30-08:45	1	4	2	0	2	0	0	6	1	0	1	2	19
08:45-09:00	1	3	0	1	2	0	1	3	0	3	0	5	19
09:00-09:15	2	4	1	1	1	0	0	3	0	1	1	3	17
09:15-09:30	3	4	1	0	0	1	0	3	0	0	0	3	15
09:30-09:45	2	3	1	1	0	0	1	3	0	0	0	0	11
09:45-10:00	1	6	1	0	1	0	0	6	0	1	0	2	18
AM Peak Hour	9	33	2	5	5	2	2	10	5	6	2	4	85
11:00-11:15	1	3	1	0	0	0	0	5	0	1	3	1	15
11:15-11:30	1	5	1	2	2	1	0	2	1	2	0	0	17
11:30-11:45	1	5	1	1	2	2	0	4	0	0	0	3	19
11:45-12:00	1	6	1	4	0	0	1	4	1	3	2	1	24
12:00-12:15	2	7	4	2	1	3	2	5	4	0	0	3	33
12:15-12:30	1	6	2	1	0	2	0	9	3	3	1	0	28
12:30-12:45	0	3	0	3	1	2	0	4	0	1	0	0	14
12:45-13:00	2	6	0	2	1	1	0	4	0	2	3	2	23
13:00-13:15	2	8	3	1	0	0	0	7	1	0	0	3	25
13:15-13:30	4	4	0	1	1	2	0	6	0	1	0	1	20
13:30-13:45	1	3	2	2	1	0	0	3	0	0	1	1	14
13:45-14:00	4	1	1	0	0	0	1	2	0	0	1	1	11
Noon Peak Hour	5	24	8	8	3	7	3	22	8	6	3	7	104
15:00-15:15	3	10	1	1	0	1	0	3	4	3	3	2	31
15:15-15:30	2	5	2	3	1	0	2	7	1	1	2	3	29
15:30-15:45	0	4	0	0	0	0	0	1	4	2	1	1	13
15:45-16:00	3	5	0	3	0	2	0	8	1	2	4	2	30
16:00-16:15	4	2	2	1	0	1	2	8	0	2	0	0	22
16:15-16:30	3	10	1	3	1	1	2	4	1	1	2	4	33
16:30-16:45	3	1	4	2	1	1	0	6	3	4	1	1	27
16:45-17:00	1	5	0	4	0	1	2	4	0	1	3	6	27
17:00-17:15	2	5	3	3	0	1	1	11	1	2	2	3	34
17:15-17:30	3	9	0	0	0	0	0	6	1	3	5	5	32
17:30-17:45	1	4	1	3	1	1	0	10	2	1	3	3	30
17:45-18:00	2	3	2	0	0	0	2	5	3	1	2	3	23
18:00-18:15	2	3	1	1	1	1	0	6	1	1	0	2	19
18:15-18:30	4	4	1	1	0	2	1	5	4	0	3	3	28
18:30-18:45	4	6	5	3	1	2	2	10	4	0	0	2	39
18:45-19:00	1	4	0	2	0	1	0	8	0	2	2	3	23
PM Peak Hour	7	23	4	10	1	3	3	31	4	7	13	17	123
10 Hour Total	79	200	49	57	30	33	22	194	46	51	49	78	888

Table A-12

Trunk 1
@
Ben Jackson Connector

Kings County, Nova Scotia

Thursday, April 29, 2004



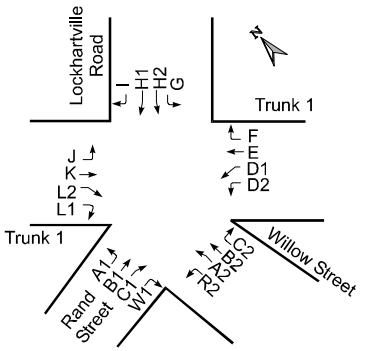
Time	Ben Jackson Connector Northbound Approach		Trunk 1 Westbound Approach		Trunk 1 Eastbound Approach		Total Vehicles
	A	C	D	E	K	L	
07:00-07:15	1	6	5	3	2	0	17
07:15-07:30	1	7	17	4	4	1	34
07:30-07:45	1	11	18	4	3	1	38
07:45-08:00	0	12	22	8	5	0	47
08:00-08:15	1	8	20	6	8	2	45
08:15-08:30	0	15	17	4	4	2	42
08:30-08:45	0	4	19	4	2	2	31
08:45-09:00	1	17	10	6	4	1	39
09:00-09:15	1	3	14	3	7	3	31
09:15-09:30	4	7	10	4	3	0	28
09:30-09:45	3	8	14	6	4	3	38
09:45-10:00	3	5	13	6	3	1	31
AM Peak Hour	2	46	77	22	20	5	172
11:00-11:15	2	7	15	6	9	1	40
11:15-11:30	0	10	4	2	6	1	23
11:30-11:45	4	6	9	6	8	0	33
11:45-12:00	1	7	9	4	6	2	29
12:00-12:15	0	9	6	2	5	0	22
12:15-12:30	1	12	8	2	10	1	34
12:30-12:45	2	10	6	9	5	2	34
12:45-13:00	1	16	10	4	5	3	39
13:00-13:15	2	8	14	7	3	2	36
13:15-13:30	0	9	4	6	7	0	26
13:30-13:45	0	11	13	8	9	2	43
13:45-14:00	1	8	13	4	8	2	36
Noon Hour Peak	6	46	38	22	23	8	143
15:00-15:15	1	14	13	7	6	0	41
15:15-15:30	2	8	12	5	10	1	38
15:30-15:45	1	12	12	5	2	1	33
15:45-16:00	0	9	12	10	2	0	33
16:00-16:15	6	15	11	4	10	1	47
16:15-16:30	3	10	20	19	10	1	63
16:30-16:45	2	21	14	5	8	1	51
16:45-17:00	2	15	14	4	8	1	44
17:00-17:15	2	5	8	3	7	0	25
17:15-17:30	3	12	18	7	8	1	49
17:30-17:45	1	11	11	6	6	0	35
17:45-18:00	1	13	15	8	4	1	42
18:00-18:15	1	16	15	4	10	0	46
18:15-18:30	1	9	11	4	5	1	31
18:30-18:45	3	20	10	3	4	0	40
18:45-19:00	0	13	9	4	4	1	31
PM Peak Hour	13	61	59	32	36	4	205
10 Hour Total	59	419	495	216	234	42	1465

Table A-13

Trunk 1
@
Willow / Rand / Lockhartville

Hantsport, Nova Scotia

Thursday, April 29, 2004



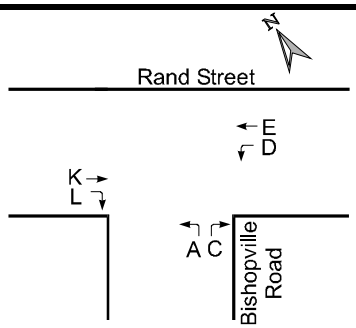
Time	Rand Street Northbound 1 Approach				Willow Street Northbound 2 Approach				Trunk 1 Westbound Approach				Lockhartville Road Southbound Approach				Trunk 1 Eastbound Approach				Total Vehicles
	A1	B1	C1	W1	R2	A2	B2	C2	D2	D1	E	F	G	H2	H1	I	J	K	L2	L1	
07:00-07:15	0	0	0			4	1	0	0	1	5	1	0	1	0	0	0	6	8	0	27
07:15-07:30	1	0	0			16	1	0	1	0	7	0	1	0	0	0	0	6	7	0	40
07:30-07:45	0	0	1			16	0	1	0	0	7	1	0	0	0	0	0	6	13	0	45
07:45-08:00	4	1	0			15	3	1	0	1	6	0	0	0	1	0	0	5	15	1	53
08:00-08:15	2	0	1			21	1	3	0	0	7	2	1	1	0	0	0	5	11	0	55
08:15-08:30	2	0	0			16	1	2	1	0	3	0	2	1	0	0	0	8	17	1	54
08:30-08:45	1	0	1			11	0	0	1	2	6	0	1	0	0	0	0	3	9	0	35
08:45-09:00	3	0	0			7	1	0	1	0	6	0	1	0	0	0	0	17	8	1	45
AM Peak Hour	8	1	2	N/A	N/A	68	5	7	1	1	23	3	3	2	1	0	0	24	56	2	207
11:30-11:45	4	0	1			6	1	0	0	0	14	3	2	0	0	0	0	8	9	0	48
11:45-12:00	1	0	0			7	2	0	0	0	9	1	2	0	0	0	0	10	5	1	38
12:00-12:15	1	0	1			13	5	0	1	0	6	2	0	0	0	0	0	6	7	0	42
12:15-12:30	2	1	0			8	1	1	1	0	9	1	2	2	0	0	0	9	8	2	47
12:30-12:45	0	0	0			7	2	1	0	1	2	1	1	0	0	0	0	5	7	4	31
12:45-13:00	1	0	0			10	2	3	0	2	8	1	1	0	0	0	0	14	14	2	58
13:00-13:15	3	1	0			8	1	0	0	2	11	1	1	3	0	0	0	4	12	1	48
13:15-13:30	2	0	0			8	1	2	0	0	5	0	0	0	0	0	0	7	7	0	32
Noon Hour Peak	6	2	0	N/A	N/A	33	6	5	1	5	30	4	5	5	0	0	0	32	41	9	184
16:00-16:15	2	0	0			10	2	1	0	1	12	3	1	2	0	0	0	9	14	0	57
16:15-16:30	0	1	2			20	2	1	0	0	14	0	0	3	0	0	0	13	13	2	71
16:30-16:45	3	1	0			15	1	0	1	1	5	0	1	0	0	0	0	12	6	6	52
16:45-17:00	2	1	0			14	6	1	0	0	10	1	0	0	1	0	1	12	11	4	64
17:00-17:15	0	0	0			10	1	1	1	2	8	2	0	0	0	0	0	4	6	1	36
17:15-17:30	3	2	0			12	1	0	1	0	10	0	1	2	1	0	0	3	14	4	54
17:30-17:45	3	0	0			13	4	1	3	0	5	1	0	0	1	0	0	12	10	1	54
17:45-18:00	0	0	2			13	3	1	0	0	10	0	2	0	2	0	0	11	9	5	58
PM Peak Hour	7	3	2	N/A	N/A	59	11	3	1	2	41	4	2	5	1	0	1	46	44	12	244

Table A-14

Bishopville Road
@
Rand Street

Hantsport, Nova Scotia

Thursday, May 6, 2004



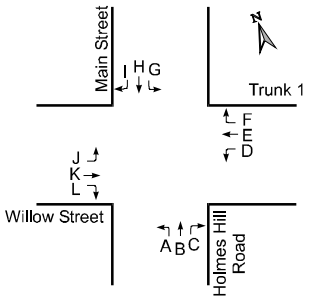
Time	Bishopville Road Northbound Approach		Rand Street Westbound Approach		Rand Street Eastbound Approach		Total
	A	C	D	E	K	L	
15:30-15:45	2	8	5	1	5	3	24
15:45-16:00	5	8	8	1	3	6	31
16:00-16:15	8	6	6	4	6	13	43
16:15-16:30	4	13	9	1	2	7	36
16:30-16:45	6	6	7	4	6	5	34
16:45-17:00	7	8	6	5	3	7	36
17:00-17:15	3	5	5	5	5	8	31
17:15-17:30	3	0	3	4	4	6	20
PM Peak	25	33	28	14	17	32	149

Table A-15

Trunk 1 / Willow Street
@
Main Street / Holmes Hill Road

Hantsport, Nova Scotia

Thursday, May 6, 2004



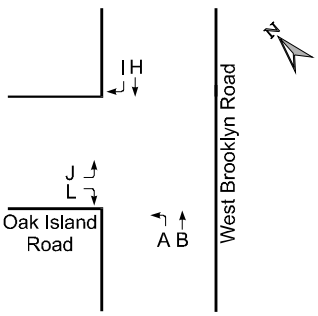
Time	Holmes Hill Road Northbound Approach			Trunk 1 Westbound Approach			Main Street Southbound Approach			Willow Street Eastbound Approach			Total Vehicles
	A	B	C	D	E	F	G	H	I	J	K	L	
15:30-15:45	1	11	5	5	2	23	17	10	4	3	0	0	81
15:45-16:00	4	11	4	11	2	17	21	11	1	0	6	0	88
16:00-16:15	1	11	6	3	5	12	34	23	2	1	5	2	105
16:15-16:30	0	19	4	5	5	22	17	13	4	1	3	0	93
16:30-16:45	4	14	6	8	7	22	29	15	4	0	5	1	115
16:45-17:00	1	10	8	7	3	18	32	15	1	0	2	1	98
17:00-17:15	1	11	4	6	3	25	21	16	0	2	4	1	94
17:15-17:30	0	8	4	8	2	22	21	16	1	1	6	1	90
PM Peak	6	54	24	23	20	74	112	66	11	2	15	4	411

Table A-16

West Brooklyn Road
@
Oak Island Road

Kings County, Nova Scotia

Thursday, May 6, 2004



Time	West Brooklyn Road Northbound Approach		West Brooklyn Road Southbound Approach		Oak Island Road Eastbound Approach		Total Vehicles
	A	B	H	I	J	L	
15:30-15:45	2	3	3	1	3	6	18
15:45-16:00	2	3	5	1	2	0	13
16:00-16:15	1	1	1	2	0	4	9
16:15-16:30	0	4	3	1	3	1	12
16:30-16:45	0	2	2	1	1	2	8
16:45-17:00	1	2	3	1	4	4	15
17:00-17:15	0	1	4	2	3	6	16
17:15-17:30	0	4	2	0	6	2	14
PM Peak Hour	1	9	11	4	14	14	53

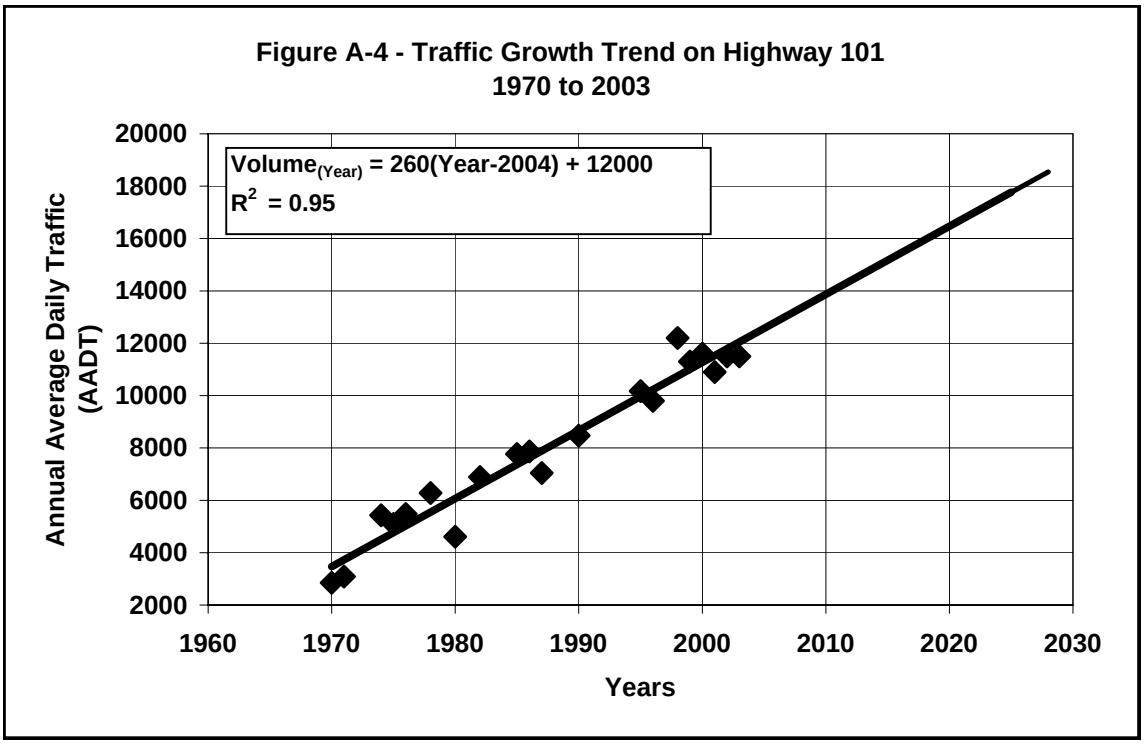
Table A- 17 - Intersection and Road Section Volumes

Road Section	Count Table Number	PM Peak Hour Volume	Estimated AADT	% PM Peak of AADT
Volumes from Machine Counts (AADT estimates were obtained from seven day machine counts and weekly Counter Group Factors)				
Ben Jackson Connector - north of Highway 101 - 2000	A-1	140	1330	11
Ben Jackson Connector - north of Highway 101 - 2004	A-3	141	1520	9
Ben Jackson Connector - south of Highway 101- 2000	A-2	66	660	10
Ben Jackson Connector - south of Highway 101- 2004	A-3	63	700 [1]	9
Trunk 1 - 3 km East of Avonport - 1997	A-4	62	650	10
Trunk 1 - 3 km East of Avonport - 2000	A-5	54	610	9
Trunk 1 - West of Ben Jackson Connector - 2004	A-6	89	830	11
Trunk 1 - East of Ben Jackson Connector - 2004	A-6	195	2020	10
Bishopville Road - 1995	A-7	62	590	11
Volumes from Turning Movement Counts (AADT estimates were obtained by assuming the counted PM peak hours represent 10% of the AADT)				
Ben Jackson Connector - north of Ben Jackson Road	A-10	52	700 [2]	-
Ben Jackson Road - south of Ben Jackson Connector	A-10	51	510	10
Ben Jackson Road - West of Ben Jackson Connector	A-10	13	130	10
Ben Jackson Road - West of Bishopville Road	A-11	49	490	10
Bishopville Road - South of Ben Jackson Road	A-11	92	920	10
Bishopville Road - North of Ben Jackson Road	A-11	71	710	10
Bishopville Road - South of Rand Street	A-14	118	1180	10
Trunk 1 - West of Five Points	A-13	180	1800	10
Willow Street - East of Five Points	A-13	123	1230	10
Rand Street - West of Bishopville Road	A-14	88	880	10
Rand Street - East of Bishopville Road	A-14	92	920	10
Holmes Hill Road - South of Trunk 1	A-15	177	1770	10
Willow Street - West of Holmes Hill Road & Main Street	A-15	58	580	10
Trunk 1 - East of Holmes Hill Road & Main Street	A-15	268	2680	10
Main Street (Trunk 1) - North of Willow & Trunk 1	A-15	319	3190	10
Oak Island Road - West of West Brooklyn Road	A-16	33	330	10
West Brooklyn Road - South of Oak Island Road	A-16	35	350	10
West Brooklyn Road - North of Oak Island Road	A-16	38	380	10

NOTE:
1. The AADT estimate in Table A-3 was obtained from two weekday counts in April. This AADT has been increased from 620 vpd to 700 vpd to compensate for the short count period and the lower than normal volumes to the Farmers Market.
2. This volume is the same as that for Ben Jackson Connector south of Highway 101 in the top portion of this Table.

Table A-18 - Traffic Growth Trend at Highway 101 - EXIT 8 to EXIT 8A

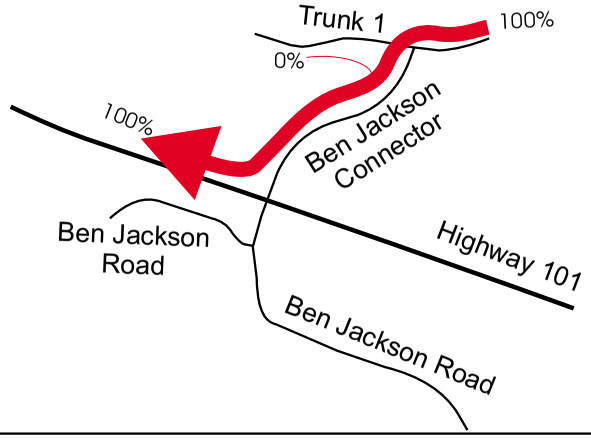
Year	Annual Average Daily Traffic
1970	2850
1971	3090
1974	5430
1975	5100
1976	5480
1978	6280
1980	4610
1982	6890
1985	7770
1986	7870
1987	7040
1990	8470
1995	10170
1996	9800
1998	12200
1999	11300
2000	11600
2001	10900
2002	11500
2003	11500



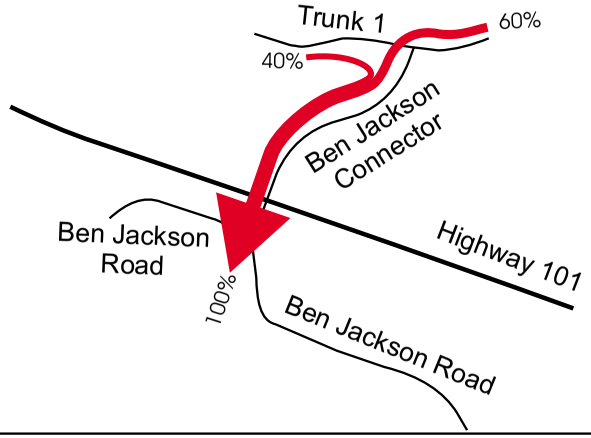
Appendix B

Plate Match Study Analyses

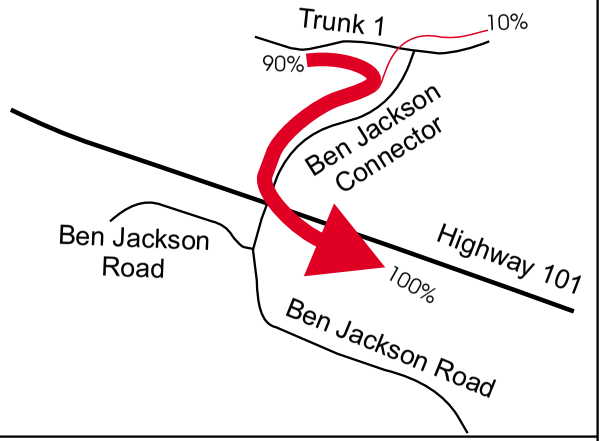
SB RIGHT TO HIGHWAY 101



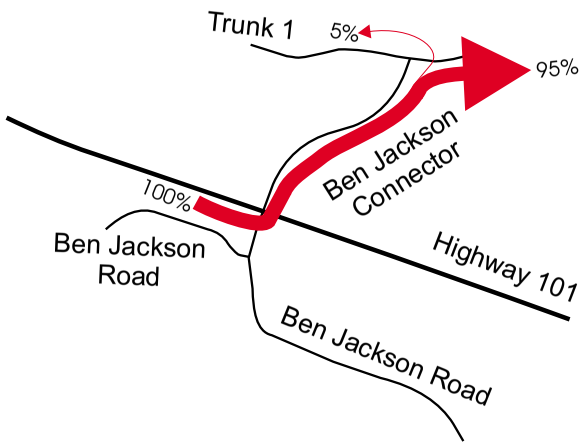
SB THROUGH TO BEN JACKSON ROAD



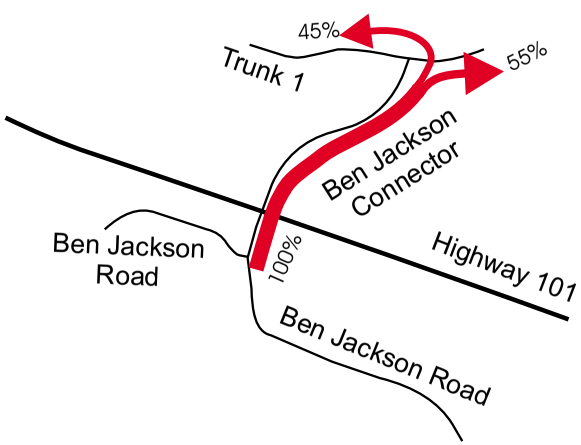
SB LEFT TO HIGHWAY 101



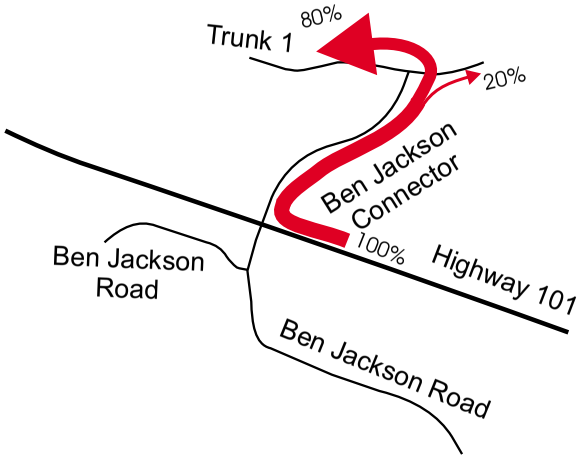
EB LEFT FROM HIGHWAY 101



NB THROUGH TO BEN JACKSON CONNECTOR



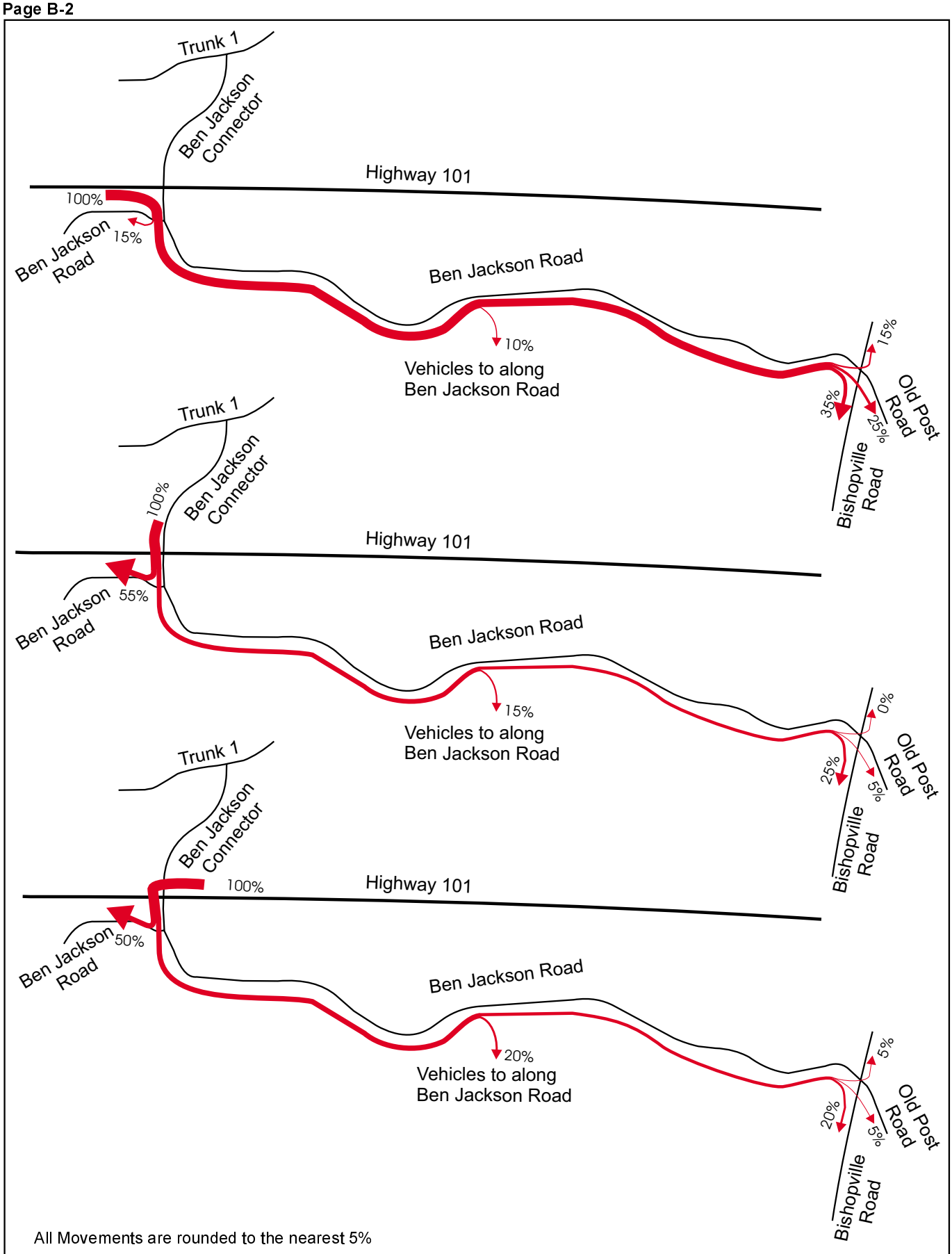
WB RIGHT TO FROM HIGHWAY 101



All Movements are rounded to the nearest 5%

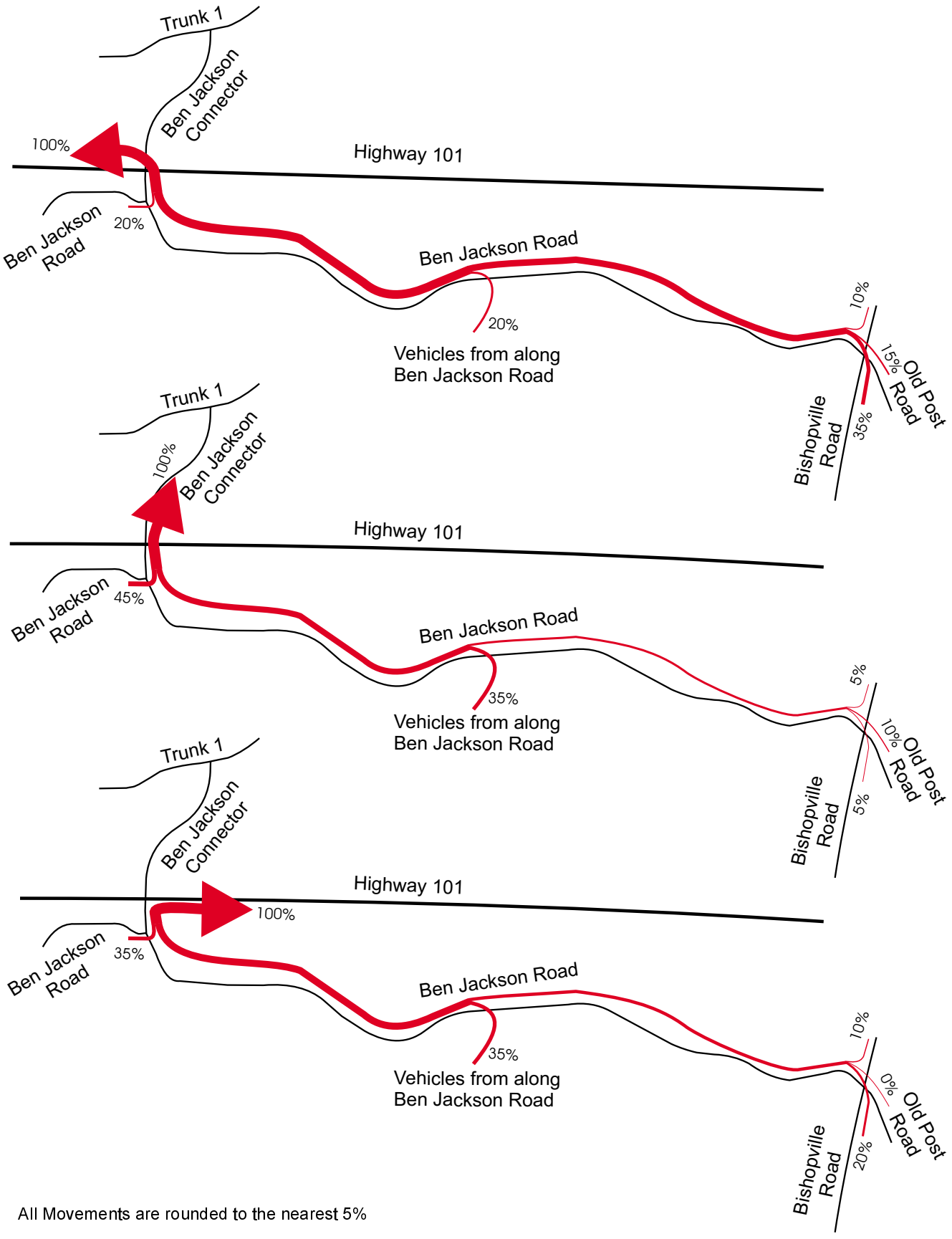
Atlantic Road & Traffic Management
Traffic Engineering Specialists

Benefit - Cost Study **Highway 101, Exit 8A Intersection Treatment**	**Figure B-1**
Plate Match Summary - To / From Trunk 1	**June 2004**



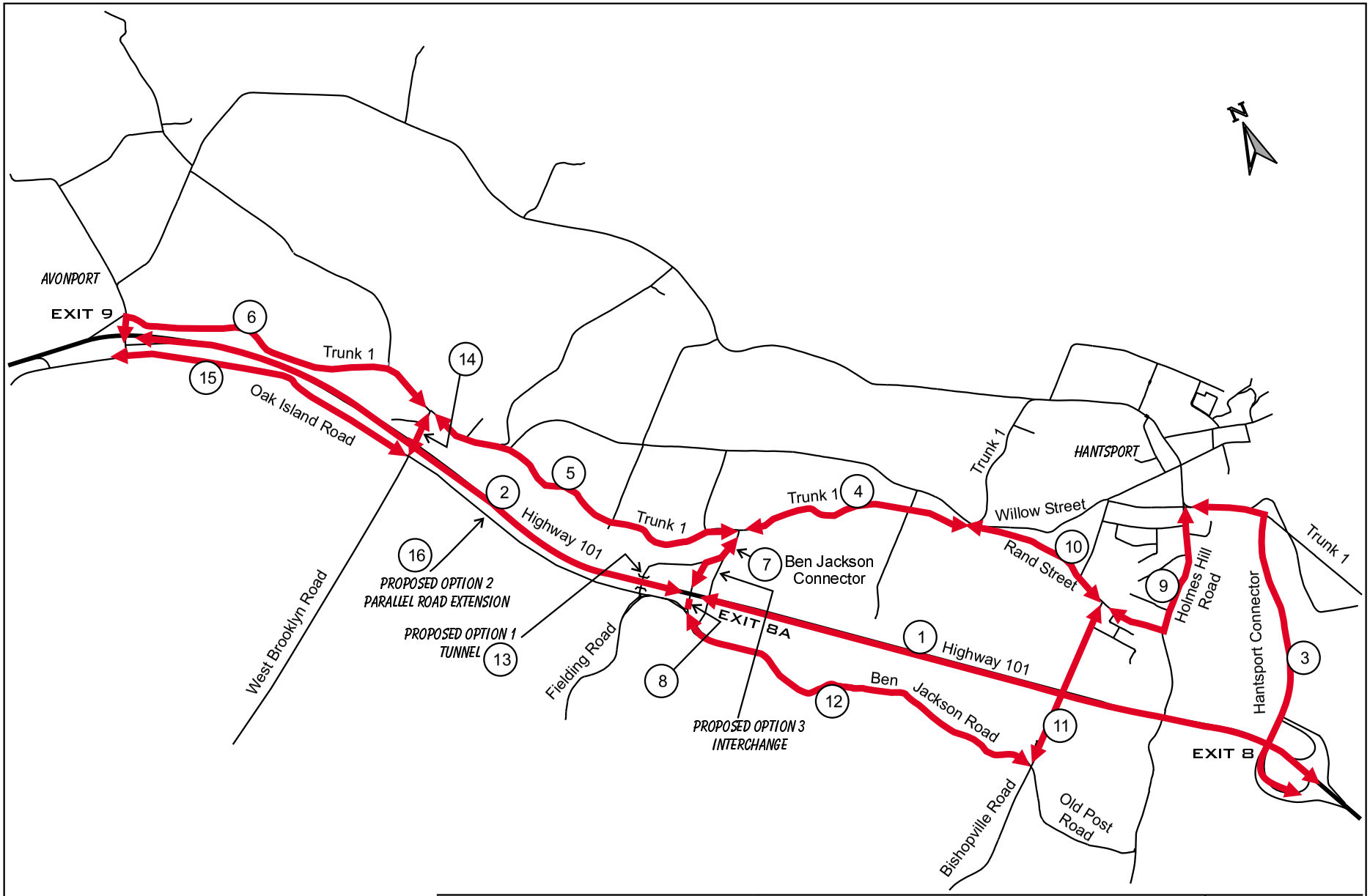
All Movements are rounded to the nearest 5%

Atlantic Road & Traffic Management *Traffic Engineering Specialists*	**Benefit - Cost Study** **Highway 101, Exit 8A Intersection Treatment**	**Figure B-2**
	Plate Match Summary - To Ben Jackson Road	**June 2004**



All Movements are rounded to the nearest 5%

Atlantic Road & Traffic Management *Traffic Engineering Specialists*	**Benefit - Cost Study** **Highway 101, Exit 8A Intersection Treatment**	**Figure B-3**
	Plate Match Summary - From Ben Jackson Road	**June 2004**



Atlantic Road & Traffic Management *Traffic Engineering Specialists*	**Benefit - Cost Study** **Highway 101, Exit 8A Intersection Treatment**	**Figure B-4**
	Study Area Road Sections	**June 2004**

Table B-1 - Diverted 2004 AADT Volumes

Road Section (See Figure B-4)		2004 AADT Volume	Intersection Removal		Option 1 Tunnel		Option 2 Extension	
No.	Description		Volume Change	Revised Volume	Volume Change	Revised Volume	Volume Change	Revised Volume
1	Highway 101 - EXIT 8 to EXIT 8A	10500	527	11027	273	10773	257	10757
2	Highway 101 - EXIT 8A to EXIT 9	12035	-1008	11027	-1262	10773	-1278	10757
3	Hantsport Connector - at EXIT 8 - to Main Street	2000	807	2807	553	2553	537	2537
4	Trunk 1 - Five Points to Ben Jackson Connector	2000	-219	1781	-203	1797	-393	1607
5	Trunk 1 - Ben Jackson Connector to West Brooklyn Road	800	1068	1868	1322	2122	952	1752
6	Trunk 1 - West Brooklyn Road to Oak Island Road	800	1188	1988	1442	2242	1072	1872
7	Ben Jackson Connector - Trunk 1 to Highway 101	1525	-1525	0	-1525	0	-1525	0
8	Ben Jackson Connector - Highway 101 to Ben Jackson Road	700	-700	0	-700	0	-700	0
9A	Rand Street - Bishopville Road to Holmes Hill Road	900	469	1369	173	1073	255	1155
9B	Holmes Hill Road - Rand St. to Trunk 1 / Main St.	1800	469	2269	173	1973	255	2055
10	Rand Street - Bishopville Rd. To Five Points	900	231	1131	93	993	12	912
11	Bishopville Road - Ben Jackson Road to Rand St.	800	570	1370	136	936	227	1027
12	Ben Jackson Road - Ben Jackson Connector to Bishopville Road	500	-60	440	-180	320	51	551
13	Tunnel Connector - Ben Jackson Road to Trunk 1	-	-	-	434	434	-	-
14	West Brooklyn Rd. - Oak Island Road to Trunk 1	400	0	400	0	400	47	447
15	Oak Island Road - Avonport to West Brooklyn Rd.	350	0	350	0	350	386	736
16	Extension - Ben Jackson Road to West Brooklyn Rd.	-	-	-	-	-	433	433

Table B-2 - 2004 Vehicle Travel Changes with Removal of Intersection, no Options Constructed

Section #	Road Section Description	Length (km)	Daily Volume Change	Change Distance Travelled per Year (km)
1	Highway 101 - Ben Jackson to Exit 8	4.3	527	827693
2	Highway 101 - Exit 9 to Ben Jackson	4.3	-1008	-1583140
3	Exit 8 Connector	2.4	807	707416
4	Trunk 1 Ben Jackson to 5-points	1.7	-219	-135983
5	Trunk 1 West Brooklyn to Ben Jackson Connector	2.4	1068	936209
6	Trunk 1 Exit 9 to West Brooklyn	2.4	1188	1041401
7	Ben Jackson Connector north of Highway 101	0.6	-1525	-334204
8	Ben Jackson Connector - south of Highway 101	0.1	-700	-25568
9	Rand Street east of Bishopville plus Holmes Hill Road	1.3	469	222693
10	Rand Street west of Bishopville Road	1.1	231	92810
11	Bishopville from Rand to Ben Jackson Road	1.2	570	249831
12	Ben Jackson Road from Bishopville to Ben Jackson Connector	2.7	-60	-59171
Total Annual Change in VKMT compared to existing intersection (2004 volumes)				**1,939,987**

Table B-3 - 2004 Vehicle Travel Changes with Option 1 - Tunnel Connection to Trunk 1

Section #	Road Section Description	Length (km)	Daily Volume Change	Change Distance Travelled per Year (km)
1	Highway 101 - Ben Jackson to Exit 8	4.3	273	428767
2	Highway 101 - Exit 9 to Ben Jackson	4.3	-1262	-1982066
3	Exit 8 Connector	2.4	553	484760
4	Trunk 1 Ben Jackson to 5-points	1.7	-203	-126048
5	Trunk 1 West Brooklyn to Ben Jackson Connector	2.4	1322	1158865
6	Trunk 1 Exit 9 to West Brooklyn	2.4	1442	1264057
7	Ben Jackson Connector north of Highway 101	0.6	-1525	-334204
8	Ben Jackson Connector - south of Highway 101	0.1	-700	-25568
9	Rand Street east of Bishopville plus Holmes Hill Road	1.3	173	82145
10	Rand Street west of Bishopville Road	1.1	93	37365
11	Bishopville from Rand to Ben Jackson Road	1.2	136	59609
12	Ben Jackson Road from Bishopville to Ben Jackson Connector	2.7	-180	-177512
13	New Tunnel to Trunk 1*	1.3	434	206074
Total Annual Change in VKMT compared to existing intersection (2004 volumes)				**1,076,244**

* 1.0 km of new road, plus 0.3 km extra travel on Ben Jackson Road

Table B-4 - 2004 Vehicle Travel Changes with Option 2 - Parallel Road Extension

Section #	Road Section Description	Length (km)	Daily Volume Change	Change Distance Travelled per Year (km)
1	Highway 101 - Ben Jackson to Exit 8	4.3	257	403638
2	Highway 101 - Exit 9 to Ben Jackson	4.3	-1278	-2007195
3	Exit 8 Connector	2.4	537	470734
4	Trunk 1 Ben Jackson to 5-points	1.7	-398	-247128
5	Trunk 1 West Brooklyn to Ben Jackson Connector	2.4	952	834523
6	Trunk 1 Exit 9 to West Brooklyn	2.4	1072	939715
7	Ben Jackson Connector north of Highway 101	0.6	-1525	-334204
8	Ben Jackson Connector - south of Highway 101	0.1	-700	-25568
9	Rand Street east of Bishopville plus Holmes Hill Road	1.3	255	121080
10	Rand Street west of Bishopville Road	1.1	12	4821
11	Bishopville from Rand to Ben Jackson Road	1.2	227	99494
12	Ben Jackson Road from Bishopville to Ben Jackson Connector	2.7	51	50295
14	West Brooklyn Road	0.3	47	5150
15	Oak Island Road	2.2	386	310170
16	New Extension Road*	2.2	433	347937
Total Annual Change in VKMT compared to existing intersection (2004 volumes)				**973,462**

* 1.9 km of new road, plus 0.3 km extra travel on Ben Jackson Road

Appendix C

Economic Analyses &

Benefit -Cost Study

Table C-1 - Values Used In Benefit - Cost Analysis

Value of Time per vehicle[1]	$13.50 per hour
Value of Travel per vehicle[2]	$0.34 per km

1. Aggregate of value calculated from Previous NSTPW Studies
2. NS Provincial Government Rate

Table C-2 - Collision Rates and Costs

Road Type	Collisions[1] Per 100MVKM	Cost[2] Per Collision
100 Series 4-Lane	28.4	$94,000
Trunk Highway	79.1	$78,000
Route / Local	98.6	$54,000

1. NSTPW Average Collision Rates for Road Type (2002)
2. Aggregate of collision severity costs for each Road Type, See Report, Section 6, Page 24

Table C-3 - Annual Maintenance Cost

Road Type	Annual Cost per 2-Lane km
100 Series	$13,000
Trunk	$10,400
Route	$7,400
Local	$3,700

Source: NSTPW Highway Operations, April 2003

Table C-4 - Change in Annual Road Maintenance Costs

	Length (km)	Cost per km	Total	
Option 1 - Tunnel				
New Tunnel and Road from Trunk 1 to Ben Jackson Road	1.3	3700	4810	
Ben Jackson Road, New Tunnel to Ben Jackson Connector	-0.3	3700	-1110	
Ben Jackson Connector North	-0.7	10400	-7280	
Total Estimated Maintenance Cost Change			**-$3,580**	per Year
Option 2 - Extension Road				
Extension Road from Oak Island Road to Ben Jackson Road	2.2	3700	8140	
Ben Jackson Road, New Tunnel to Ben Jackson Connector	-0.3	3700	-1110	
Ben Jackson Connector North	-0.7	10400	-7280	
Total Estimated Maintenance Cost Change			**-$250**	per Year
Option 3 - Interchange Estimated Cost Change				
Ramps[1]			**$10,400**	per Year
Bridge Rehab.			**$200,000**	in Year 15

Notes:
1. Estimated to be $10400 per Year assumed maintenance equivalent to a Trunk Highway and Ben Jackson Connector assumed to be maintained at same rate as existing

Table C-5 - Components of cost for Option 1 - Tunnel

	Item	Breakdown	cost	Item Cost	25 Year Salvage Value Rate	Salvage Value
1	Realign connector roads	property	10000		98%	9800
		engineering	20000		0%	0
		paved road	380000		75%	285000
		remove exist intersection	40000		0%	0
				450000		
2	Trunk 1 - From Exit 9 to Ben Jackson Connector	property	70000		98%	68600
		engineering	15000		0%	0
		construction - repaving	800000		60%	480000
		curve realignment	290000		75%	217500
				1175000		
3	Unpaved parallel road	property	75000		98%	73500
		engineering	15000		0%	0
		construction	125000		75%	93750
				215000		
4	Tunnel structure		1500000	1500000	95%	1425000
TOTAL COST				**$ 3,340,000**		**$ 2,653,150**
					Round	**$ 2,700,000**

Table C-6 - Components of cost for Option 2 - Extension Road

	Item	Breakdown	cost	Item Cost	25 Year Salvage Value Rate	Salvage Value
1	Extension Road	property	185000		98%	181300
		engineering	20000		0%	0
		paved road	690000		75%	517500
		Pave Ben Jackson (300m)	45000		60%	27000
				940000		
2	Oak Island Road	construction - repaving	320000	320000	60%	192000
3	Trunk 1 - From Exit 9 to Ben Jackson Connector	property	70000		98%	68600
		engineering	15000		0%	0
		construction - repaving	800000		60%	480000
		curve realignment	290000		75%	217500
				1175000		
4	Abandon connector		40000	40000	0%	0
TOTAL COST				**$ 2,475,000**		**$ 1,683,900**
					Round	**$ 1,700,000**

Table C-7 - Components of cost for Option 3 - Interchange

	Item	Breakdown	cost	Item Cost	25 Year Salvage Value Rate	Salvage Value
1	Unpaved parallel road	property	75000		98%	73500
		engineering	15000		0%	0
		construction	125000		75%	93750
				215000		
2	Interchange and Ramps	property	280000		98%	274400
		structures	2600000		95%	2470000
		Construction	2280000		75%	1710000
		pavement	390000		60%	234000
		misc/ engineering	50000		0%	0
				5600000		
TOTAL COST				**$ 5,815,000**		**$ 4,855,650**
					Round	**$ 4,900,000**

Table C-8 - Base Scenario - 2004 User Costs for Complete Cut off Ben Jackson Intersection

Section Number	Description	Length (km)	Assumed Speed (km/h)	Section Travel Time (min)	Daily Volume Change	Distance Traveled/year Change (km)	Change Veh operating cost per year	Change user Time cost per year	Change Annual Collision Cost
1	Highway 101- Exit 8 to Exit 8A	4.3	112.8	2.29	527	827693	$281,416	$99,179	$22,096
2	Highway 101 - Exit 8A to Exit 9	4.3	112.8	2.29	-1008	-1583140	-$538,268	-$189,701	-$42,264
3	Exit 8 Connector to Main Street	2.4		1.95	807	707416	$240,521	$129,325	$43,646
4	Trunk 1 - Ben Jackson Conector to 5-points	1.7		1.67	-219	-135983	-$46,234	-$30,056	-$8,390
5	Trunk 1 - West Brooklyn to Ben Jackson Connector	2.4		2.20	1068	936209	$318,311	$193,093	$57,762
6	Trunk 1 - Exit 9 to West Brooklyn Road	2.4		2.25	1188	1041401	$354,076	$219,670	$64,252
7	Ben Jackson Connector north of Highway 101	0.6		0.60	-1525	-334204	-$113,629	-$75,196	-$20,620
8	Ben Jackson Connector - south of Highway 101	0.1	60	0.10	-700	-25568	-$8,693	-$5,753	-$1,361
9	Rand Street east of Bishopville plus Holmes Hill Road	1.3	50	1.56	469	222693	$75,716	$60,127	$11,857
10	Rand Street west of Bishopville Road	1.1	50	1.32	231	92810	$31,555	$25,059	$4,942
11	Bishopville Road from Rand Street to Ben Jackson Road	1.2		1.20	570	249831	$84,943	$56,212	$13,302
12	Ben Jackson Road - Bishopville Road to Ben Jackson Connector	2.7		2.58	-60	-59171	-$20,118	-$12,722	-$3,151
Total Compared to Existing Travel Pattern						1939987	**$659,596**	**$469,238**	**$142,073**

Table C-9 - 2004 User Costs for Option 1 - Tunnel to Trunk 1

Section Number	Description	Length (km)	Assumed Speed (km/h)	Section Travel Time (min)	Daily Volume Change	Distance Traveled/year Change (km)	Change Veh operating cost per year	Change user Time cost per year	Change Annual Collision Cost
1	Highway 101- Exit 8 to Exit 8A	4.3	112.8	2.29	273	428767	$145,781	$51,377	$11,446
2	Highway 101 - Exit 8A to Exit 9	4.3	112.8	2.29	-1262	-1982066	-$673,902	-$237,502	-$52,913
3	Exit 8 Connector to Main Street	2.4		1.95	553	484760	$164,818	$88,620	$29,909
4	Trunk 1 - Ben Jackson Conector to 5-points	1.7		1.67	-203	-126048	-$42,856	-$27,860	-$7,777
5	Trunk 1 - West Brooklyn to Ben Jackson Connector	2.4		2.20	1322	1158865	$394,014	$239,016	$71,500
6	Trunk 1 - Exit 9 to West Brooklyn Road	2.4		2.25	1442	1264057	$429,779	$266,637	$77,990
7	Ben Jackson Connector north of Highway 101	0.6		0.60	-1525	-334204	-$113,629	-$75,196	-$20,620
8	Ben Jackson Connector - south of Highway 101	0.1	60	0.10	-700	-25568	-$8,693	-$5,753	-$1,361
9	Rand Street east of Bishopville plus Holmes Hill Road	1.3	50	1.56	173	82145	$27,929	$22,179	$4,374
10	Rand Street west of Bishopville Road	1.1	50	1.32	93	37365	$12,704	$10,089	$1,989
11	Bishopville Road from Rand Street to Ben Jackson Road	1.2		1.20	136	59609	$20,267	$13,412	$3,174
12	Ben Jackson Road - Bishopville Road to Ben Jackson Connector	2.7		2.58	-180	-177512	-$60,354	-$38,165	-$9,451
13	New Tunnel to Trunk 1*	1.3	70	1.11	434	206074	$70,065	$39,590	$10,972
Total Compared to Existing Travel Pattern						1076244	$365,923	$346,444	$119,231
Benefit Option 1 (compared to cutting road off)							**$293,673**	**$122,794**	**$22,841**
						Round to 100's	**$293,700**	**$122,800**	**$22,800**

* Includes 0.3 km of Ben Jackson Road west of Ben Jackson Connector

Table C-10 - 2004 User Costs for Option 2 - Extension Road

Section Number	Description	Length (km)	Assumed Speed (km/h)	Section Travel Time (min)	Daily Volume Change	Distance Traveled/year Change (km)	Change Veh operating cost per year	Change user Time cost per year	Change Annual Collision Cost
1	Highway 101- Exit 8 to Exit 8A	4.3	112.8	2.29	257	403638	$137,237	$48,366	$10,776
2	Highway 101 - Exit 8A to Exit 9	4.3	112.8	2.29	-1278	-2007195	-$682,446	-$240,513	-$53,584
3	Exit 8 Connector to Main Street	2.4		1.95	537	470734	$160,050	$86,056	$29,043
4	Trunk 1 - Ben Jackson Conector to 5-points	1.7		1.67	-398	-247128	-$84,024	-$54,623	-$15,247
5	Trunk 1 - West Brooklyn to Ben Jackson Connector	2.4		2.20	952	834523	$283,738	$172,120	$51,488
6	Trunk 1 - Exit 9 to West Brooklyn Road	2.4		2.25	1072	939715	$319,503	$198,221	$57,979
7	Ben Jackson Connector north of Highway 101	0.6		0.60	-1525	-334204	-$113,629	-$75,196	-$20,620
8	Ben Jackson Connector - south of Highway 101	0.1	60	0.10	-700	-25568	-$8,693	-$5,753	-$1,361
9	Rand Street east of Bishopville plus Holmes Hill Road	1.3	50	1.56	255	121080	$41,167	$32,692	$6,447
10	Rand Street west of Bishopville Road	1.1	50	1.32	12	4821	$1,639	$1,302	$257
11	Bishopville Road from Rand Street to Ben Jackson Road	1.2		1.20	227	99494	$33,828	$22,386	$5,297
12	Ben Jackson Road - Bishopville Road to Ben Jackson Connector	2.7		2.58	51	50295	$17,100	$10,813	$2,678
14	West Brooklyn Road	0.3		0.50	47	5150	$1,751	$1,931	$274
15	Oak Island Road	2.2		1.88	386	310170	$105,458	$59,637	$16,515
16	New Extension Road*	2.2	70	1.89	433	347937	$118,299	$67,255	$18,526
Total Compared to Existing Travel Pattern						973462	$330,977	$324,696	$108,467
Benefit Option 2 (compared to cutting road off)							**$328,619**	**$144,542**	**$33,606**
						Round to 100's	**$328,600**	**$144,500**	**$33,600**

* Includes 0.3 km of Ben Jackson Road west of Ben Jackson Connector

Table C-11 - 2004 User Costs for Option 3 - Interchange

	Change Veh operating cost per year	Change user Time cost per year	Change Annual Collision Cost
Benefit Option 3 (compared to cutting road off)	**$659,596**	**$469,238**	**$142,073**
Round to 100's	**$659,600**	**$469,200**	**$142,100**

Discount Rate: 5.0%

Table C-12 - Benefit / Cost Analysis for Option 1 - Tunnel to Trunk 1

		Costs		*Benefits*			
	Year	Construction cost and Annual Maintanance	Costs in Year 0 $	User Travel Cost Savings**	User Travel time Savings**	Annual Collision Cost Reduction**	Benefit in Year 0 $
	0	3340000	3340000				0
	1	-3580	-3410	299600	125300	23300	426857
	2	-3580	-3247	305400	127700	23700	414331
	3	-3580	-3093	311300	130200	24200	402289
	4	-3580	-2945	317200	132600	24600	390290
	5	-3580	-2805	323100	135100	25100	378678
	6	-3580	-2671	328900	137500	25500	367063
	7	-3580	-2544	334800	140000	26000	355909
	8	-3580	-2423	340700	142400	26400	344850
	9	-3580	-2308	346600	144900	26900	334165
	10	-3580	-2198	352400	147400	27400	323655
	11	-3580	-2093	358300	149800	27800	313330
	12	-3580	-1993	364200	152300	28300	303365
	13	-3580	-1899	370100	154700	28700	293533
	14	-3580	-1808	375900	157200	29200	284000
	15	-3580	-1722	381800	159600	29600	274661
	16	-3580	-1640	387700	162100	30100	265659
	17	-3580	-1562	393600	164600	30600	256891
	18	-3580	-1488	399400	167000	31000	248232
	19	-3580	-1417	405300	169500	31500	239933
	20	-3580	-1349	411200	171900	31900	231787
	21	-3580	-1285	417100	174400	32400	223944
	22	-3580	-1224	422900	176800	32800	216220
	23	-3580	-1166	428800	179300	33300	208821
	24	-3580	-1110	434700	181700	33700	201575
	25	-3580	-1057	440600	184200	34200	194605
Salvage Value	25	-2700000	-797317				
	NPV at Year 0 $		$2,492,226				$7,494,644

** Assume an Increase of 2% per year to account for traffic volume growth

Benefit-Cost Ratio: 3.0

Discount Rate: 5.0%

Table C-13 - Benefit / Cost Analysis for Option 2 - Extension Road

		Costs		***Benefits***			
	Year	Construction cost and Annual Maintanance	Costs in Year 0 $	User Travel Cost Savings**	User Travel time Savings**	Annual Collision Cost Reduction**	Benefit in Year 0 $
	0	2475000	2475000				0
	1	-250	-238	335200	147400	34300	492286
	2	-250	-227	341700	150300	34900	477914
	3	-250	-216	348300	153200	35600	463967
	4	-250	-206	354900	156100	36300	450265
	5	-250	-196	361500	159000	37000	436816
	6	-250	-187	368000	161800	37600	423403
	7	-250	-178	374600	164700	38300	410490
	8	-250	-169	381200	167600	39000	397846
	9	-250	-161	387700	170500	39600	385347
	10	-250	-153	394300	173400	40300	373259
	11	-250	-146	400900	176300	41000	361449
	12	-250	-139	407500	179200	41700	349917
	13	-250	-133	414000	182100	42300	338557
	14	-250	-126	420600	185000	43000	327587
	15	-250	-120	427200	187900	43700	316894
	16	-250	-115	433800	190700	44400	306431
	17	-250	-109	440300	193600	45000	296202
	18	-250	-104	446900	196500	45700	286335
	19	-250	-99	453500	199400	46400	276737
	20	-250	-94	460000	202300	47000	267328
	21	-250	-90	466600	205200	47700	258259
	22	-250	-85	473200	208100	48400	249448
	23	-250	-81	479800	211000	49100	240890
	24	-250	-78	486300	213900	49700	232520
	25	-250	-74	492900	216800	50400	224460
Salvage Value	25	-1700000	-502015				
	NPV at Year 0 $		$1,969,462				$8,644,605

** Assume an Increase of 2% per year to account for traffic volume growth

Benefit-Cost Ratio: 4.4

Discount Rate: 5.0%

Table C-14 - Benefit / Cost Analysis for Option 3 - Interchange

		Costs		***Benefits***			
	Year	Construction cost and Annual Maintanance	Costs in Year 0 $	User Travel Cost Savings**	User Travel time Savings**	Annual Collision Cost Reduction**	Benefit in Year 0 $
	0	5815000	5815000				0
	1	10400	9905	672800	478600	144900	1234571
	2	10400	9433	686000	488000	147800	1198912
	3	10400	8984	699200	497400	150600	1163762
	4	10400	8556	712400	506700	153500	1129241
	5	10400	8149	725600	516100	156300	1095370
	6	10400	7761	738800	525500	159200	1062238
	7	10400	7391	751900	534900	162000	1029635
	8	10400	7039	765100	544300	164800	997797
	9	10400	6704	778300	553700	167700	966720
	10	10400	6385	791500	563000	170500	936218
	11	10400	6081	804700	572400	173400	906545
	12	10400	5791	817900	581800	176200	877520
	13	10400	5515	831100	591200	179000	849204
	14	10400	5253	844300	600600	181900	821645
	15	210400	101206	857500	610000	184700	794736
	16	10400	4764	870700	619300	187600	768528
	17	10400	4537	883900	628700	190400	743013
	18	10400	4321	897100	638100	193300	718227
	19	10400	4116	910200	647500	196100	694038
	20	10400	3920	923400	656900	198900	670562
	21	10400	3733	936600	666300	201800	647783
	22	10400	3555	949800	675600	204600	625585
	23	10400	3386	963000	685000	207500	604098
	24	10400	3225	976200	694400	210300	583207
	25	10400	3071	989400	703800	213200	562965
Salvage Value	25	-4900000	-1446984				
	NPV at Year 0 $		$4,610,797				$21,682,120

** Assume an Increase of 2% per year to account for traffic volume growth

Benefit-Cost Ratio: 4.7

Appendix D

Stakeholder Contact List

Stakeholder Contacts

Agency	Contact Persons	Phone Numbers
Municipality of West Hants	Dwight Bennett, CAO	798-8391
Municipality of the County of Kings	Brian Smith, CAO	690-6131
Town of Hantsport	Jeff Lawrence, CAO	684-3210
Glooscap First Nation	Janis Walker	684-9788
Annapolis Valley Regional School Board	Murray Goulden	538-4642
Canada Post	Hantsport Post Office	684-9127
EMO Kings County	Mike Ennis	690-6117
Emergency Health Service	Earl Russell	678-3686
Wolfville Fire Protection Service	Chief Tim MacLeod	542-3342; 670-3342 (cell)
Hantsport Fire Protection Service	Chief Philip Scott	684-9449 (H); 684-3324 (W); 670-1582 (cell)
RCMP New Minas	S/Sgt Wendell Ackerson	679-5555
Anstrum Fruit and Vegetables Limited	Ervin and Lynda Andres	Hantsport
Others	Sonya Wood	684-9541
	Stephen West	542-4187
	David Morse, MLA (letter)	681-1257
	Dick Rawlins (letter)	684-9855