Abbotsford-Sumas Border Improvement Project

Final Report

A joint, binational planning effort coordinated through the International Mobility & Trade Corridor Project

January, 2003

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Enclosure Memo

Abbotsford, B.C.
Report from the B.C. Ministry of Transportation

Sumas, WA
Report from Perteet Engineering, Inc.

BRITISH COLUMBIA

ABBOTSFORD – SUMAS BORDER IMPROVEMENT PROJECT

Ministry of Transportation and Highways

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EXECUTIVE SUMMARY

The Huntingdon/Sumas Border Improvement project was undertaken through the International Mobility and Trade Corridors Projects. This study focuses on addressing problems on the Canadian side of the border, and was coordinated with a similar study on the US side of the border.

One of the first tasks undertaken was a review of the most relevant reports, studies, and data acquisition exercises that have been recently completed regarding the commodity flow, commercial vehicle traffic and traffic operations at the Huntingdon/Sumas border crossing. A notable report was the Lower Mainland Border Crossing Commercial and Passenger Vehicle Forecast, TSI Consultants (November 2001), which provided commodity flow data, existing AADT traffic volumes and annual growth rates for both commercial vehicle and passenger vehicle traffic. Southbound passenger vehicle traffic is projected to grow at an annual rate of 1.3% and commercial vehicle traffic is projected to grow at an annual rate of 5.4% from 2001 to 2011 at the Huntingdon/Sumas border crossing.

After reviewing the available data, additional data was acquired as part of this study to analyze the existing performance and identify deficiencies at the Huntingdon/Sumas border crossing, and included the following:

- On November 7, 2001 and February 26, 2002 personnel from the Ministry of Transportation gathered truck queuing and delay data for the Highway 11 southbound commercial vehicle traffic.
- Hourly truck volumes were derived from data acquired from US Customs, which provided hourly data for a two-week period beginning May 13, 2001 and ending May 26, 2001.
- A topographic survey was completed of the Canadian side of the border crossing by personnel from the BC Ministry of Transportation.
- The Ministry of Transportation and the U.S. Consultant (Perteet Engineering Inc) conducted joint stakeholder interviews on May 30th, 2002. The interviews included discussions with the following stakeholders: US Customs, US Immigration and Naturalization Services, Customs Brokers, Canada Customs and Revenue Agency, and representatives from Sumas and the trucking industry. Representatives from City of Abbotsford and Huntingdon Duty Free Store were not interviewed but they were included in project team meetings, and their concerns and interests were communicated through these meetings.

A major cause of southbound border traffic congestion and delay was found to be commercial vehicles parking along Highway 11 immediately north of the border.

The drivers are required to park their trucks and walk to the customs brokerage offices to complete their paperwork prior to entering the US. There is presently room to park approximately 13 tractor semi-trailors along Highway 11 from the border to the intersection of Highway 11 and 4th Avenue. The available parking is not adequate and interferes with passenger vehicle access to the border. On occasion parked commercial vehicles have blocked all southbound traffic to the border resulting in large queues and delays.

Another significant cause of border congestion is queuing and delay at the single US Customs truck booth. Queuing at the US truck booth sometimes extends across the border, interfering with the ingress and egress of traffic to the Huntingdon Duty Free store. The larger queues lessen the available parking space for customs brokers, thus compounding the deficiency of inadequate customs brokers parking.

The large queues and delays are very disruptive to the traffic operations north of the border. The large queues extend in excess of 1.6 kilometres and the delays often exceed 30 minutes. The commercial vehicles in the queues prevent passenger vehicles from accessing the border and interfere with the traffic operation of the local residents in Huntingdon. The commercial vehicles also interfere with the ingress and egress of traffic from the Huntingdon Duty Free store. Safety is also a concern since frustrated drivers have been observed driving in an unsafe manner to bypass the long queue. Vehicles have been observed driving in the opposing lane of traffic or on the narrow shoulders along Highway 11. Some drivers have tried to jump the queue by using the local street network to gain access to Highway 11 closer to the border.

The data acquired from US Customs was analyzed to determine the 30th highest hourly truck volume for 2000, which is the latest year that provided hourly truck volumes for the entire year. The 30th highest hourly volume of the year was used as the design hourly volume (DHV) and this value was found to be 44 trucks/hr. The 2000 DHV was then projected forward to determine the DHV for future design years. The parking requirements were then calculated for the DHV based on the observed parking demand when MoT personnel acquired the queuing and delay data. The analysis indicates that a total of 19 commercial vehicle parking stalls are required by 2006, and will have to be increased to 32 by 2021.

The commercial vehicle queuing at the US Customs truck booth was also examined. The queuing analysis indicates that on average a single US Customs booth is adequate for the current truck volumes and processing times at US Customs. However, the queues would continue to grow as the truck volumes increase and by 2006 there would be an average of 7 commercial vehicles in the queue. A second truck booth should be provided by 2006 to lessen the queues and delays at US Customs.

Approximately 18 possible improvement options were investigated and screened prior to detail analysis. A number of improvement options were considered too costly, or not practical at this border crossing. Two low cost improvement options that clearly provided advantages to the project, which were small in scope and did not preclude other options were recommended for implementation. An additional five improvement options were carried forward for detailed analysis. They were evaluated based on the following criteria:

- Cost
- Traffic Impact
- Environmental Impact
- Geotechnical Issues
- Land Use Impact
- Property Impact
- Social/Community Impact
- Ease of Implementation

The detailed analysis resulted in the following recommendations for immediate implementation to improve southbound traffic operations:

1. Provide a commercial vehicle staging area with access from 4th Avenue as shown in Figure 6a.

This improvement option addresses the two main causes of southbound queuing, delay and congestion: (1) this improvement provides customs brokerage parking, and (2) this improvment provides additional queuing to the US Customs truck booth. The traffic operations would improve for both the southbound commercial vehicle traffic and passenger vehicle traffic. The ingress and egress to and from the Huntingdon Duty Free Store and the traffic operations for the residents living in Huntingdon area would also improve.

The cost to construct the truck staging area shown in Figure 6a was originally estimated to be $2.8 million (Canadian), an updated Class "C" Conceptual Plan has estimated the cost to be $3.5 million (Canadian) , which is higher than originally planned. The scope of the work could be reduced, or some of the work could be deferred to a later date, while still providing most of the benefits. The expected parking demand is for 23 parking stalls by 2011, and 32 parking stalls by 2021. Right-of-way could be secured at this time for the 34 parking stalls as shown in Figure 6a, but construction could be limited to 23 parking stalls to lessen the initial capital expenditure. The commercial vehicle yearly growth rates and resulting parking demands are subject to high uncertainty, and the additional parking stalls would only be constructed once the traffic volumes increase.

2. Increase Proportion of Pre-cleared Trucks

It is recommended that utilization of BRASS, or a similar system to pre-clear commercial vehicles that eliminates the need to visit a customs broker, should be maximized to improve efficiencies. It will still be necessary to provide a truck staging area for southbound truck traffic since many of the trucks crossing the border would not qualify for BRASS, or any other similar method of pre-clearance.

3. Improve Paint Markings and Signing

It is recommended that the signing and paint markings at the border be improved to current standards. This would provide minor improvements to safety and traffic operations

The detailed analysis also provided long-term recommendations to improve the traffic operations at the border: The long-term recommendations would enhance the effectiveness of the near-term improvements already discussed, and help prevent traffic problems as the traffic volumes increase in the future. The long-term recommendations consist of the following:

1. Provide a Second US Customs Truck Booth

A second US Customs truck booth would significantly shorten the southbound queuing to the truck booth and lessen the delay for commercial vehicles to cross the border. By 2011 a second US Customs truck booth would be required otherwise very large queues and delays would develop on a regular basis.

2. Establish a Commercial Processing Center

A commercial processing center will lessen the demand for the number of parking stalls in the truck staging area. It is recommended that after construction of the truck staging area shown in Figure 6a, planning begin on establishing a commercial processing center next to the truck staging area.

3. Implement Commercial Vehicle Operations (CVO) Improvements

CVO improvements for the southbound commercial vehicle traffic could provide long-term benefits. The technology is in the developmental and testing phases for the Pacific Border crossing and the Huntingdon/Sumas border crossing is presently not suitable for this technology. As the technology improves the use of CVO improvements should be re-evaluated. CVO improvements could reduce the delay, queue lengths and congestion by improving the efficiencies at the border. However, not all of the trucks would use the CVO technology, and the truck staging area shown in Figure 6a would still be required even if the technology is ready for widespread implementation.

1 INTRODUCTION

1.1 Project Objectives

The objectives of the Abbotsford – Sumas Border Improvement project are to address the operation and safety problems on both the north and south sides of the border. While each objective outlined below will be examined independently, there are critical relationships that must be recognized linking each objective to the operation of the border facilities on both sides of the border. The goal of this project is to identify and evaluate options that address the following objectives:

- Achieve measurable improvement to current traffic and safety problems.
- Reduce parking on the roadway.
- Mitigate hazardous conditions associated with the railway grade crossings
- Reduce conflicts between local and through traffic.
- Reduce the impacts of cross-border traffic on adjacent businesses.
- Maintain access to residential areas east of Highway 11.
- Accommodate commercial traffic generated within the Sumas industrial area.
- Complement improvements planned by WSDOT to SR9 south of Sumas as well as improvements made and planned to be made to Highway 11.
- Optimize the kind and amount of truck processing and inspection that must occur at the border, through appropriate use of off-site inspection, pre-arrival processing, and similar operational improvements.
- Consider both the short-term (5-year) and long-term (20-year) traffic scenarios.
- Meet with the approval of all agencies involved.

The project will also consider the following stakeholder objectives:

City of Abbotsford
- Provide free and clear access to the residential area in Huntingdon.
- Maintain good commercial access to benefit the trucking industry.

Canada Customs and Revenue Agency
- Address community problems and concerns.
- Undertake a cooperative approach to developing solutions.

Customs Brokerage
- Create a paperless environment.
- Eliminate the need for truck drivers to enter the office.
- Develop ITS technology associated with freight movement.

Photo 1a – Huntingdon/Sumas border crossing.
Southward view of passenger vehicle inspection booths.

Photo 1b – Huntingdon/Sumas border crossing.
Southward view of commercial vehicle inspection booth.

1.2 Study Background

The Huntingdon/Sumas border crossing is one of four crossings between Whatcom County, WA and British Columbia which make up the Cascade Gateway. A rapid increase in commercial traffic at the border has led to problems of congestion southbound. On the Canadian side of the border, operations are constrained by the need to ensure access to the adjacent residential area and to accommodate operations by the railways. Due to the growing traffic and congestion concerns, it has become imperative to identify the short and long-term transportation and operational needs of the Huntingdon/Sumas border crossing and develop an implementation strategy for the necessary improvements.

The Abbotsford – Sumas Border Improvement project was undertaken through the International Mobility and Trade Corridors Projects. This study focuses on addressing problems on the Canadian side of the border, and has been coordinated with a similar study on the U.S. side of the border.

The study focuses on addressing the following southbound problems:

- Parked trucks often block access to booths for both automobiles and other trucks.
- Traffic backs up to Vye Road on occasion blocking access to side roads that serve the Huntingdon neighborhood.
- Traffic regularly backs up past the Duty Free shop, thus interfering with ingress and egress to the shop.
- Tractors not licensed to operate in Canada haul loads across the border and dump trailers for pick-up by Canadian operated tractors.
- Tractors make U-turns on 5th Avenue leading to complaints by Abbotsford residents.
- Passenger vehicles cut into the line by driving through the Duty Free parking lot.

Photo 1c – Northward view of queuing on Highway 11 southbound.

Photo 1d – Commercial vehicles blocking
access to Huntingdon Duty Free Store.

1.3 Study Area

The study area will encompass the Huntingdon/Sumas border crossing. The northern study limit will be Farmer Road at the north edge of the Huntingdon neighborhood within the City of Abbotsford, and the southern limit will be the border crossing. Due to the bi-national nature of this project, the Ministry has worked closely with the U.S. consultant, Perteet Engineering Inc., addressing the operation and safety issues in the study area which extends southwards into the City of Sumas.

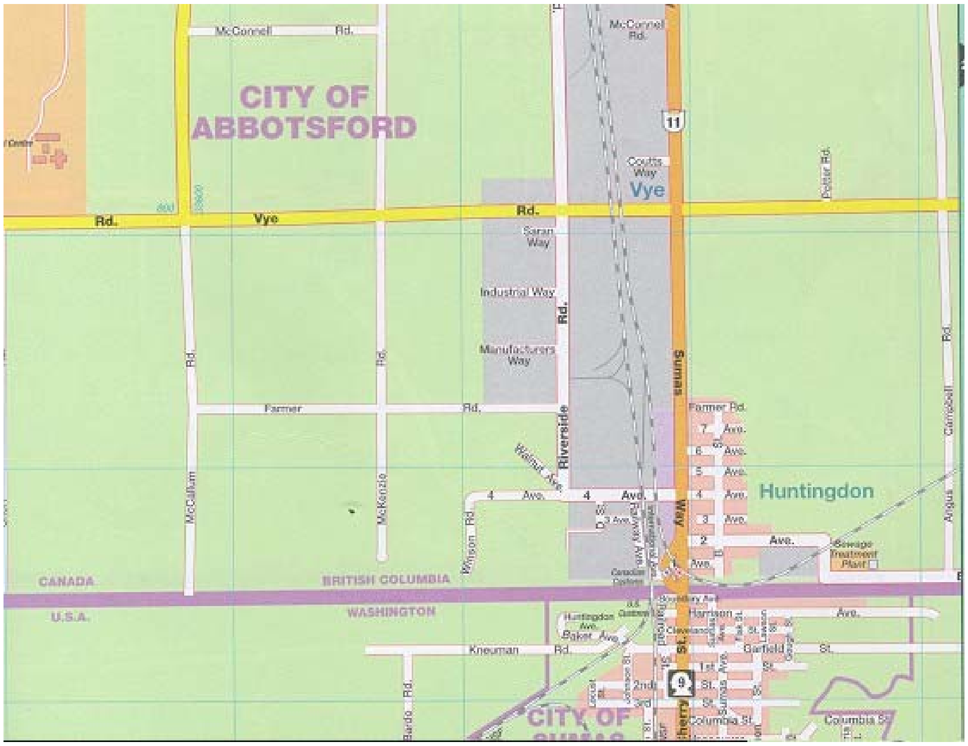


Photo 1e – Study area.

1.4 Scope of Work

The scope of the planning and preliminary design study is as follows:

- Assembly and review of information on traffic in the study area including traffic volumes, vehicle delays, queue lengths, pedestrian volumes, etc.
- Identification of significant commercial traffic generators and interviews with major users of commercial border services.
- Review of border crossing agencies' operations and plans affecting their current and future operations.
- Preparation of short term (2006) and long term (2021) traffic forecasts for the study area.
- Identification of current and anticipated infrastructure, operational and regulatory constraints to safe and efficient traffic flow in the study area.
- Identification and screening of potential improvements to alleviate these constraints. This should include examination of the potential for use of Intelligent Transportation Systems (ITS) technology.
- Performance of a Multiple Account Evaluation on shortlisted projects. This will include preliminary layout requirements, geotechnical issues,

environmental and First Nations issues, right of way issues, cost estimates and impacts to the road network and adjacent businesses and residences.
- Recommendations for improvements based on the Multiple Account Evaluations, and implementation plans for project timing and phasing.

1.5 Project Organization

A steering committee has overseen all aspects of the planning and preliminary design study. The steering committee is comprised of representatives from:

- Washington State Department of Transportation
- B.C. Ministry of Transportation
- Transport Canada
- Whatcom Council of Governments

The Abbotsford – Sumas Border Improvement project team, comprised of representatives from the following organizations, has reviewed all deliverables and provide input throughout the project:

- B.C. Ministry of Transportation
- Canada Customs and Revenue Agency
- City of Abbotsford
- City of Sumas
- Huntingdon Duty Free
- Transport Canada
- U.S. Customs Service
- Whatcom Council of Governments

The B.C. Ministry of Transportation was responsible for the technical aspects on the Canadian side. Perteet Engineering Inc. was responsible for the technical aspects on the U.S. side.

2 TASK 1 – DATA COLLECTION AND DATA NEEDS ANALYSIS

The following gives an overview of the most relevant reports, studies, and data acquisition exercises that have been recently completed regarding the commodity flow, commercial vehicle traffic and traffic operations at Huntingdon/Sumas border crossing.

2.1 Reports

2.1.1 Highway 11 – Huntingdon Border Crossing Improvements, BC, Ministry of Transportation (October 2000)

The purpose of this document was to obtain funding for design, property acquisition, and construction of improvements to the Huntingdon border crossing. A brief description of the project area, signing, and traffic was provided, as well as reference was made to work done by others.

The "problem definition" section of the document discusses many of the issues that are relevant to this current study including the following:

- During busy periods southbound queues at the border crossing restrict access to the duty-free shop north of the border, and to local streets in the Huntingdon area.
- Commercial traffic is identified as of particular concern. Truck traffic and the truck queue lengths have grown substantially since the implementation of the Free Trade Agreement in 1993, and the growth in truck traffic is anticipated to continue.
- Commercial vehicle parking is recognized as a problem. Parking is required while drivers process their paper work at the customs brokerages. This document states that many of the commercial vehicles are LTL (Less than Truck Load) but this will have to be confirmed by the current study. A high percentage of LTL vehicles may be problematic since it generally takes longer to process their paper work at the customs brokerages.
- A problem exists with the geometrics of southbound approach to the border due to an S-turn, railway crossing, and limited sight distance.

Four alternatives were proposed by this document to address the concerns raised in the problem definition section:

- ❑ Alternative #1 – Reassign the westernmost passenger vehicle queuing lane, located immediately north of the international border, as a truck staging/parking lane.

- Alternative # 2 – Add an additional southbound lane from midway between 2nd St. and 3rd St. to the Southern Rail Crossing.
- Alternative #3 – Add an additional southbound lane on Highway 11 from 4th St. to the Southern Rail Crossing.
- Alternative # 4 – Re-route all commercial truck traffic destined to the US one block west from 4th St., and southerly along a new road to be constructed. The road would access a staging/parking area where trucks could park while their paperwork is processed at the Customs Brokerages.

This document went on to analyze the four alternatives and perform a risk assessment of each alternative. However, recent events of September 11, 2001, have changed the border crossing such that the analysis and risk assessment are not relevant to the existing conditions.

Alternative #1 is no longer a viable alternative since concrete barrier has been placed to prohibit commercial vehicles from parking in the vehicle queuing lanes. Commercial vehicles were on occasion parking in the passenger vehicle queuing lanes when there was no parking along the truck queuing lanes. The addition of the concrete barrier has resulted in the removal of some commercial vehicle parking and increasing the commercial vehicle queuing and parking on Highway 11.

Alternative #2 is no longer a viable option since the completion of the work undertaken by the Ministry of Transportation in late 2001 is similar to Alternative #3. Recent changes to the border crossing inspection and procedures at the US Customs, as well as the concrete barrier that was placed, have resulted in substantially longer queues on Highway 11. On occasion stopped commercial vehicles have completely blocked access to the border and the Duty Free Store. This has made it necessary to undertake minor improvements and to increase the mobility for southbound traffic.

Minor widening has been made to Highway 11 at the S-turn, and paint markings were changed to provide two southbound lanes from 4th Avenue, as was proposed in Alternative #3. Signing has to be installed to direct commercial vehicles to use the shoulder lane and passenger cars will use the centre lane. Commercial vehicles that require the services of Custom Brokers are able to stop in the shoulder lane. Pre-cleared or empty commercial vehicles have to use the passenger vehicle lane to drive around stopped trucks, but this may still be problematic when there is excessive queuing.

As mentioned in the MoT October document, the additional southbound lane on Highway 11 provides parking for approximately 10 semi-trailers or 5 B-trains. The October document had estimated $1,100,000 to provide the second south bound lane, but this work was completed for approximately $100,000. Originally the scope of work was to include widening on Highway 11, but much of the work was changed to modifying the paint markings only.

The risk assessment of Alternative #3 indicated that truck volume growth would still cause traffic disruptions within 5 to 10 years. A commissionaire was suggested to direct trucks to available parking spots since it would not be readily apparent to the drivers when the parking spots will be open.

Alternative #4 was the recommended solution in the MoT October document, although it did have the highest cost. A new road from 4th Avenue would lead to a staging/parking area for approximately 10-15 semi-trailers or 5 – 8 B-trains. The staging area would discharge the commercial vehicles into the border facility directly at the truck waiting area in front of the Duty Free Store. This alternative offered greatly improved access to the border for both commercial and passenger vehicles, while improving access to the Duty Free Store and the local community. Property acquisition would be required from the Duty Free Store, but they would also benefit from improved access for their customers.

Alternative #4, or a variation of this alternative, is still a viable option for improving the operations at the border crossing and warrants further investigation by this study.

2.1.2 Lower Mainland Border Crossing Commercial and Passenger Vehicle Forcast, TSI Consultants (November 2001)

The purpose of the TSI report was to develop estimates of commercial and passenger vehicle demand at the identified Lower Mainland border crossings for the horizon years of 2006 and 2011. This study used the International Mobility and Trade Corridor (IMTC) project database on the commercial and passenger vehicle movements at the Canada/US border crossings. The IMTC database was augmented with US Census commodity-flow data to enable forecasting of commercial and passenger vehicle volumes. This study involved the five crossings on the Canada/US border in the Lower Mainland:

- Peace Arch/Blaine (Highway 99);
- Pacific Highway/Blaine (Highway 15);
- Aldergrove/Lynden (Highway 13);
- Huntingdon/Sumas (Highway 11); and
- Point Roberts

This summary of the TSI report deals with the information relevant to the Huntingdon/Sumas border crossing.

Chapter 2 of the TSI report examined the current conditions and provides a detailed description of the total commercial vehicle demand and the types of commodities that are transported. The commercial vehicle movement at the border crossings was aggregated into 11 groups, and they are listed in Table 2a.

Table 2a – Commodity Group Aggregations

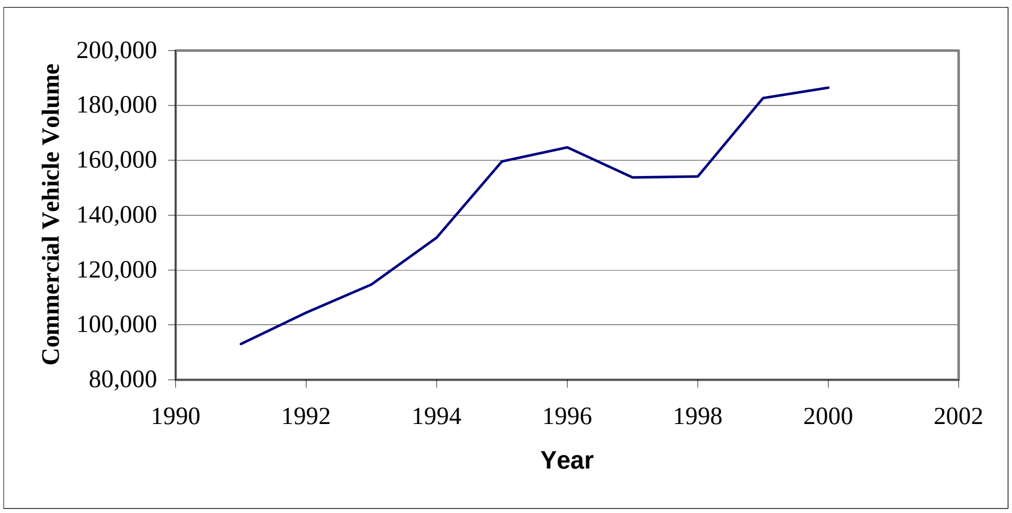
1	Farm Products
2	Food and kindred products
3	Bulk minerals, clay, stone, chemicals and allied products
4	Wood and wood products
5	Pulp, paper and allied products
6	Miscellaneous manufacturing products
7	Metal products
8	Machinery
9	Miscellaneous shipments
10	Unknown commodity
11	Empty

The total commercial vehicles processed by Huntingdon/Sumas border crossing is shown in Table 2b. Approximately 15% of the Lower Mainland commercial vehicle traffic crosses at the Huntingdon/Sumas border Crossing.

Table 2b – Huntingdon/Sumas Border Crossing

Year	Total Commercial Vehicle Volume*
1991	93,000
1992	104,500
1993	114,700
1994	131,900
1995	159,600
1996	164,700
1997	153,800
1998	154,100
1999	182,600
2000	186,500

Figure 2b – Huntingdon/Sumas Border Crossing



Typical summer weekday commercial vehicle demand experienced at the Huntingdon/Sumas border crossing during the year 2000 is shown in Table 2c.

Table 2c – Huntingdon/Sumas Border Crossing
Peak Summer Weekday Commercial Vehicle Volume

	SB	NB	Total
Summer (August, 2000)	450	210	660
Winter (November, 2000)	430	170	600

The TSI report also presents data regarding the content of the commercial traffic, by direction, for both the summer and winter seasons. Although other time periods were presented in the TSI report, only the Average Annual Daily Traffic

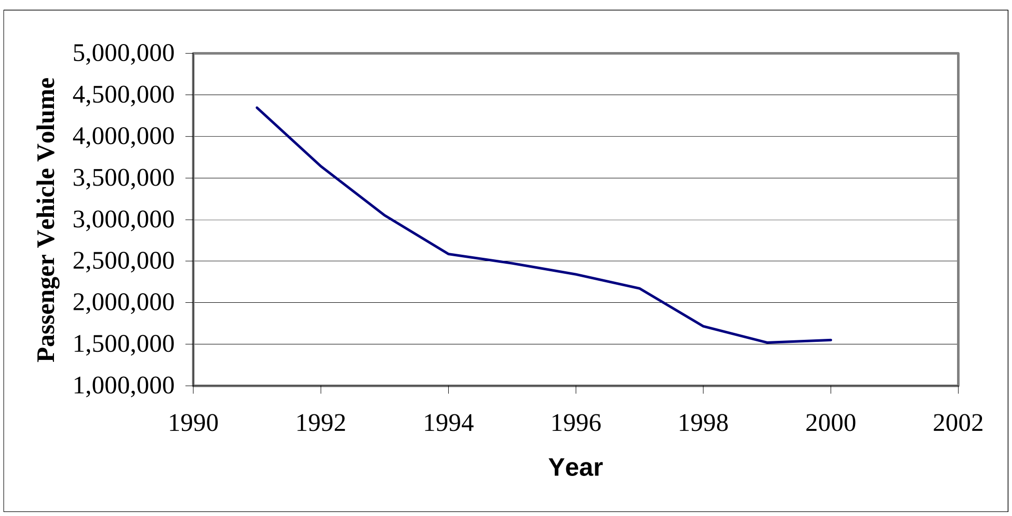
(AADT) and the Summer Weekday Daily Traffic are reproduced in this study. The AADT gives an indication of the commercial traffic patterns throughout the year while the Summer Weekday Daily Traffic provides the commercial traffic composition during the peak period.

Passenger vehicle volumes at the Huntingdon/Sumas border crossing have declined from a peak in 1991. The decline is largely attributed to the devaluation of the Canadian dollar. Table 2d shows the passenger vehicle volume at the Huntingdon/Sumas border crossing from 1991 to 2000. The Huntingdon/Sumas border crossing carries approximately 17% of the total passenger vehicle demand of the five Lower Mainland border crossings.

Table 2d – Huntingdon/Sumas Border Crossing

Year	Passenger Vehicle Volume
1991	4,347,200
1992	3,640,600
1993	3,050,100
1994	2,585,600
1995	2,474,600
1996	2,341,400
1997	2,170,400
1998	1,716,800
1999	1,518,100
2000	1,550,800

Figure 2d – Huntingdon/Sumas Border Crossing



Chapter 3 of the TSI report provides forecasts of commercial vehicle volumes for the horizon years of 2006 and 2011. The commercial vehicle volume forecasts are based on forecasts of commodity flow over the border in both directions. It is important to note that the commodity flow over the border is dependent on many factors, such as: governmental policies, relative pricing, trade agreements, shifting markets, etc. and are therefore subject to risk and uncertainties.

The TSI report provides the forecast annual growth rates for the flow of commodities for the Canada/US Lower Mainland border crossings. From the predicted increase in commodity traffic, commercial vehicle volumes were forecast for the 2006 and 2011 horizon years and these are provided in Table 2e and Table 2f.

Table 2e - Huntingdon/Sumas Border Crossing
2006 and 2011 AADT Forecast

Direction	Commercial Vehicle Volume			Annual Growth Rate		
	2000	2006	2011	00-06	06-11	00-11
NB	150	210	260	5.7%	4.2%	5.0%
SB	350	510	640	6.3%	4.6%	5.5%
Total	500	720	900	6.1%	4.5%	5.4%

Table 2f - Huntingdon/Sumas Border Crossing
2006 and 2011 Peak Summer Weekday Forecast

Direction	Commercial Vehicle Volume			Annual Growth Rate		
	2000	2006	2011	00-06	06-11	00-11
NB	210	290	360	6.0%	4.4%	5.3%
SB	450	650	810	6.1%	4.5%	5.4%
Total	660	940	1170	6.1%	4.5%	5.4%

Chapter 4 of the TSI report provides information regarding passenger vehicle volumes forecasts at the Canada/US border crossings. Passenger vehicle demand has diminished since 1991, but appears to have stabilized during the 1998 to 2000 time period. The TSI report assumed that the value of the Canadian dollar would not change significantly relative to the US dollar, and this would maintain the current stable demand. However, a significant change in the relative value of the currencies can significantly vary the cross border passenger vehicle demand; therefore, the forecast volumes are subject to high uncertainty. Table 2g provides the forecast passenger vehicle volume at the Huntingdon/Sumas border crossing.

Table 2g – Huntingdon/Sumas Border Crossing
2006 and 2011 Annual Passenger Vehicle Trips

Direction	Passenger Vehicle Volume			Annual Growth Rate		
	2000	2006	2011	00-06	06-11	00-11
NB	732,300	782,000	864,800	1.1%	2.0%	1.5%
SB	818,500	867,800	946,700	1.0%	1.8%	1.3%
Total	1,550,800	1,643,000	1,804,300	1.0%	1.9%	1.4%

The peak volume daily passenger vehicle trips occur on the weekend days, and Table 2h provides a summary of the forecast volumes.

Table 2h - Huntingdon/Sumas Border Crossing
2006 and 2011 Peak Daily Passenger Vehicle Trips

Direction	2000	2006	2011
NB	3,190	3,410	3,810
SB	3,350	3,760	4,090
Total	6,760	7,170	7,890

Useful information is also provided in the Additional Information section of the TSI report. An origin destination matrix is provided for the Huntingdon/Sumas border crossing. The TSI matrix is revised in this report to provide separate southbound and northbound origin destination matrices for the Huntingdon/Sumas border crossing. The combined totals exceed 100% due to significant figures.

Table 2I - Huntingdon/Sumas Border Crossing
Origin – Destination (southbound)

O/D	Whatcom	Puget Sound	Rest USA	West USA	Total
Alberta		2%			2%
Alaska		2%			2%
West LM	8%				8%
East LM	25%	19%	5%	3%	52%
Rest BC	5%		3%	6%	14%
Total	38%	23%	8%	9%	78%

Table 2j - Huntingdon/Sumas Border Crossing
Origin – Destination (northbound)

O/D	Alberta	West LM	East LM	Rest BC	Total
Whatcom		1%	7%	1%	9%
Puget Sound			3%	1%	4%
East WA			1%		1%
West WA					0%
Rest USA					
West USA		1%	2%	1%	4%
Total	0%	2%	13%	3%	18%

2.1.3 Pacific Highway Washington-British Columbia Border Crossing, TSI Consultants (October 2001)

The purpose of the TSI survey was to identify and quantify systematically the various segments of the delay and travel time experienced by commercial vehicles crossing the international border at Pacific Highway. Although the survey data is not pertinent, the methodologies to acquire and analyze the data may be relevant to the data acquisition that will have to be done for the Abbotsford - Sumas border improvement project.

The survey of the southbound and northbound commercial traffic was divided into three phases:

Phase1:	Study Initiation and Training
Phase 2A:	Data Collection – Southbound Traffic
Phase 2B:	Data Collection – Northbound Traffic
Phase 3:	Data Processing and Documentation

The delay was recorded with the use of mobile computing devices, commonly referred to as personal digital assistants (PDA).

The *delay* was defined as the elapsed travel time experienced by a commercial vehicle from the time the vehicle enters into a queue on the approaching roadway to the time when the vehicle is cleared to proceed at the customs kiosk. The total delay is made up of travel delay caused by roadway congestion, time expended for processing brokerage papers, and inspection and clearance time experienced at the customs kiosk.

The total southbound delay was segregated into the following segments;

Delay Segment 1: This segment applies to vehicles not requiring to stop and was measured as the elapsed time from when a vehicle first joins the queue (the point where a vehicle experienced significant slowdown or stoppage) to when the vehicle enters the kiosks at U.S. Customs.

Delay Segment 2-A: Segments 2-A, 2-B, and 2-C describes the delays experienced by vehicles requiring to stop to process paperwork. Segment 2-A is measured as the elapsed time from the start of the queue to stopping at a parking location.

Delay Segment 2-B: This segment is measured as the elapsed time a commercial vehicle remains parked while processing customs brokerage papers.

Delay Segment 2-C: This segment measured the elapsed time from when a commercial vehicle left its parking spot to when it arrived at the U.S. Customs kiosks.

Delay Segment 3: This is the time taken for a commercial vehicle to clear U.S. Customs at the kiosk.

A total of five surveyors and a supervisor were used to gather the delay data, and to record the extent of the queue on the Pacific Highway. One surveyor was stationed at the start of the queue, two at the parking locations and two at the U.S. Customs kiosks.

The entire front license plate was recorded at all of the survey stations. For vehicles with multiple license plates, the local license plate or the license plate nearest to the surveyor was recorded. Synchronized time stamps were automatically recorded in each of the PDA when the license plate data was entered. In addition to the license plate data, the following data was also collected;

- Vehicle classification data was collected at the first station as the vehicle entered the queue. The classification codes were consistent with those used in the IMTC Cross Border Trade and Travel Survey.
- Length of Queue.
- Occupancy of the available parking stalls.

Hourly volumes and vehicle arrival rates were calculated from the survey data.

The permanent count stations on the approach highways were used to estimate the peak periods to conduct the survey. The southbound survey was conducted on Wednesday, March 28th 2001 and Monday, April 2nd 2001 from 0630h to 1700h.

The southbound delay summary is provided in the TSI survey but it is not relevant to the project. The average time spent parked while processing customs brokerage papers may be of relevance, and it was found to be 20.2 minutes.

2.1.4 Summary of Findings, 1999 Lower Mainland Truck Freight Study, Translink Strategic Planning Department (July 2000)

The Lower Mainland Truck Freight Study investigated the trucking movements in the geographic area bounded by the US border to the south, the Straight of Georgia to the west, the Coast Range mountains to the north of the Fraser Valley, and the town of Hope to the east.

The Lower Mainland Truck Freight Study was divided into three main components, which are discussed below:

1. Origin/Destination Surveys

Surveys of three types of truck trips were conducted:

- Internal Trips – truck trips originating and terminating at points within the Lower Mainland. The internal trip survey does not provide relevant data regarding truck movements at the Huntingdon/Sumas border crossing.
- External Trips – truck trips originating or terminating at points outside of the Lower Mainland. The survey also included trips originating outside of the Lower Mainland and passing through the study area.
- Special Generator Trips – truck trips originating or terminating at discrete truck traffic generators, such as port terminals, the airports, and inter-modal rail facilities.

The study area was divided into eleven sub-areas. The sub-area bordering the Huntingdon/Sumas border crossing was designated Valley South. Much of the origin-destination information acquired dealt with trucking trips between the sub-areas and is not pertinent to the Huntingdon/Sumas border crossing.

Section 2.4 of the Lower Mainland Truck Freight Study deals with External Gateways and provides relevant information regarding the Huntingdon/Sumas border crossing.

The report states that approximately 500 trucks cross the Huntingdon/Sumas border crossing in each direction each day, for a combined total of 1,000 two-way trips per day. Approximately 52% of the trucks entering Canada are destined to Abbotsford and Chilliwack. Other major destinations are Mission and Pitt Meadows/Maple Ridge, which are served by the Highway 11 crossing of the Fraser River at Mission. The survey results also indicates that approximately 21% of the trucks entering the study area from the

Huntingdon/Sumas border crossing leave the study area through the eastern gateways heading to the BC interior. The ultimate destinations of the through trips are the BC interior, Alaska or the rest of Canada. The destinations of truck trips using the Huntingdon/Sumas border crossing are given in Table 2k.

Table 2k – Destinations of Trucks Entering the Lower Mainland Via Huntingdon/Sumas Border Crossing

Sub-Area	Destinations
Fraser Valley South	52%
Eastern Externals	21%
Fraser Valley North	15%
Pitt Meadows/Maple Ridge	12%
Burnaby/New Westminster/NE Sector	0%
Richmond	0%
North Delta/North Surrey	0%
South Delta	0%
Vancouver	0%
The Langleys	0%
Vancouver/Gulf Islands	0%
White Rock/South Surrey	0%
North Shore	0%
Highway 99 North	0%
Total	100%

2. Vehicle Volumes and Classification Survey

A major vehicle classification count program was completed at 75 locations throughout the study area during November 1999. Vehicles were classified into 10 different categories including light and heavy trucks.

Many of the count stations follow boundaries and are grouped together into screenlines. The object was to count all of the movements crossing the screenlines to get a representation of the truck movements in the Lower Mainland. One such screenline gathered the truck data at the following Canada/US border crossings:

- Highway 15 (Pacific Border Crossing);
- Highway 13 (Aldergrove Border Crossing);
- Highway 11 (Huntingdon/Sumas Border Crossing)

During the period 1985 to 1996, daily and PM peak hour total traffic volumes across this screenline grew by approximately 4% per year. From 1996 to 1999, daily traffic growth decreased by 7% per year. It is important to note that this decrease is attributed to a decline in passenger vehicles. The number of truck movements through the screenline has been increasing dramatically. The total truck volume at the three US border crossings has increased approximately 92% between 1991 and 1999, or 9% per year. Approximately 26% of the traffic at this screenline is made up of trucks, of which 16% are light trucks and 84% are heavy trucks.

3. Truck Demand Forecasting Model

A computer model that is able to forecast the truck demand was developed using the surveys and vehicle classification counts. No forecast truck data is provided for the Huntingdon/Sumas border crossing in the Summary of Findings in the Lower Mainland Truck Freight Study.

Although the computer model is a valuable planning tool at the macroscopic level in projecting truck traffic, it may not be suitable for predicting truck volumes at the Huntingdon/Sumas border crossing for the following reasons:

- The truck traffic at the borders is highly variable.
- The amount of truck crossing the borders is influenced by trade agreements and import duties.
- ITS improvements may improve commercial vehicle border processing efficiencies.
- The truck traffic will have to be further subdivided into empty trucks, pre-cleared trucks, and trucks requiring the services of Customs Brokers, in order to estimate the delay and the truck staging/parking requirements.
- The amount of time required for drivers using the services of the Customs Brokers will have to estimated.
- The amount of trucks using the Huntingdon/Sumas border crossing is somewhat dependent on the delay experienced by truck drivers at the other border crossings.

2.1.5 Draft Report, British Columbia Lower Mainland Trade Corridor Border Projects, Transport Canada Pacific Region (September 2001)

The purpose of the Trade Corridor Border Projects Report describes the border crossing network in the Vancouver Lower Mainland area of British Columbia and provides an overview of current operational issues and infrastructure requirements.

The background section stated that general travel demand over the border has fluctuated, but commercial vehicle traffic has continued to grow at a rapid pace. This has resulted in increased traffic congestion and delay for automobiles, buses and commercial truck traffic.

Commercial vehicle traffic has increased at the Huntingdon/Sumas border crossing, which has resulted in Highway capacity problems at the border. During 2000 the Huntingdon/Sumas border crossing processed 1.55 million passenger vehicles and over 186,000 commercial vehicles. The commercial vehicle volume at the Huntingdon/Sumas border crossing is projected to increase by 59% from 2000 to 2010.

The following partners and stakeholders have been identified for the Highway 11 Trade Corridor: BC Ministry of Transportation, District of Abbotsford, Canada Customs and Revenue Agency and Transport Canada, Washington State Dept. of Transportation, City of Sumas, IMTC, US Customs.

The appendices provide valuable data regarding passenger and commercial vehicle volumes at the Huntingdon/Sumas border crossing.

Table 2l – Huntingdon/Sumas Border Crossing Passenger Vehicle Volumes

Year	Southbound	Northbound	Total
1991	2,270,722	2,076,512	4,347,234
1992	1,984,521	1,656,119	3,640,640
1993	1,596,774	1,453,310	3,050,084
1994	1,337,680	1,247,947	2,585,627
1995	1,279,530	1,195,093	2,474,623
1996	1,218,390	1,123,014	2,341,404
1997	1,123,716	1,046,673	2,170,389
1998	882,145	834,749	1,716,894
1999	786,532	731,593	1,518,125
2000	818,539	732,263	1,550,802

Figure 2l – Huntingdon/Sumas Border Crossing Passenger Vehicle Volumes

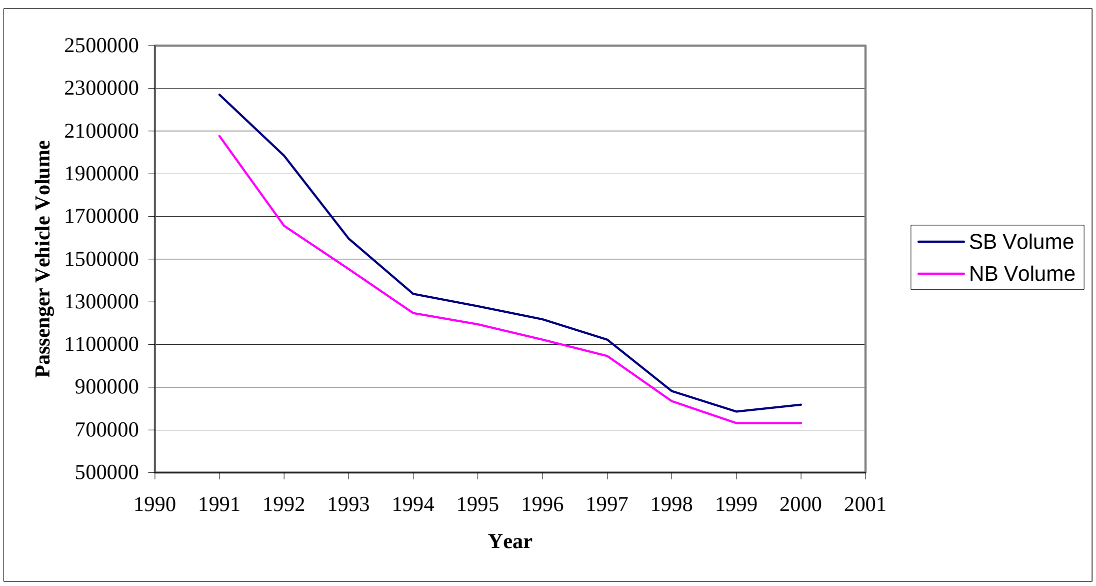
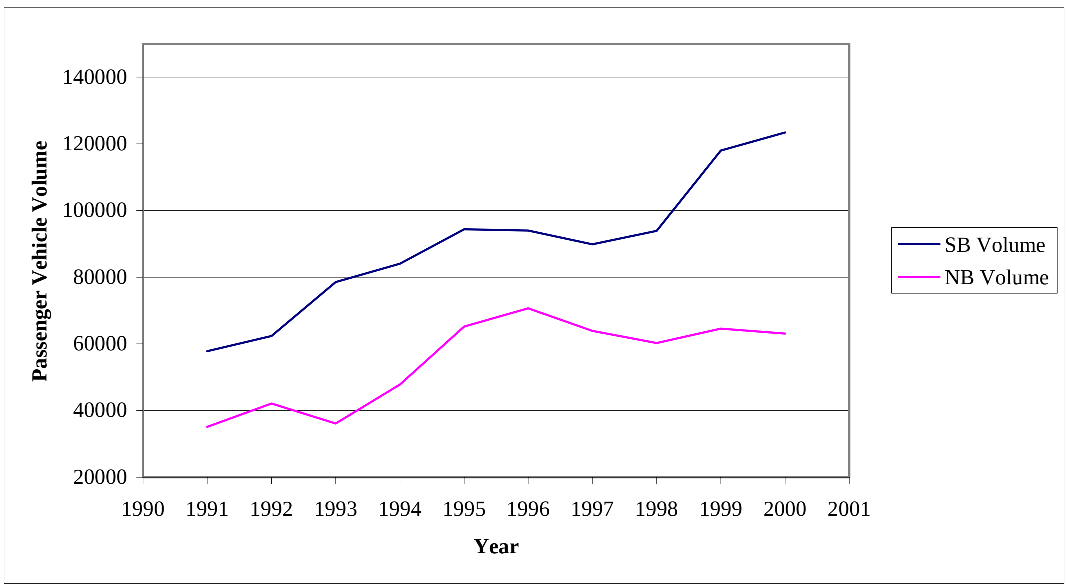


Table 2m – Huntingdon/Sumas Border Crossing
Commercial Vehicle Volumes

Year	Southbound	Northbound	Total
1991	57,838	35,156	92,994
1992	62,343	42,152	104,495
1993	78,550	36,075	114,625
1994	84,059	47,842	131,901
1995	94,412	65,206	159,618
1996	94,008	70,664	164,672
1997	89,863	63,919	153,782
1998	93,915	60,210	154,125
1999	117,974	64,558	182,532
2000	123,420	63,093	186,513

Figure 2m – Huntingdon/Sumas Border Crossing
Commercial Vehicle Volumes



2.1.6 British Columbia Lower Mainland Trade Corridor Border Projects Request for SHIP Funding Approval in Principle (Draft Report November 2001)

The report describes the border-crossing network in the Vancouver Lower Mainland area and provides an overview of the current operational issues that are impacting trade along the NAFTA corridors and the proposed projects aimed at improving cross-border mobility. Approval in Principle for funding from Canada's Strategic Highway Infrastructure Program (SHIP) is requested for the projects presented in the report.

The background information and the historical and projected growth of the passenger vehicle and commercial vehicle volumes are the same as presented in the references previously reviewed.

The current bi-national planning study of the Huntingdon/Sumas border crossing is discussed in the report. The report states that the result of the bi-national planning study will likely recommend improvements to both sides of the border, including design and construction of a truck staging area to reduce congestion on the Canadian side of the border.

The following details are also provided in the report regarding the Highway 11 Truck Staging Project:

- Annual total traffic at this border crossing in 2000 was 1,737,315 vehicles of which 186,513 were commercial vehicles.
- The Huntingdon border crossing on Highway 11 is the most easterly of the four crossings in the Lower Mainland of BC. Highway 11 connects with State Route 546 in Sumas Washington. SR 546 in turn connects with SR 539 north of Lynden and subsequently to Interstate 5 north of Bellingham.
- A bi-national planning study is under way (this study), as is preliminary design for a commercial vehicle staging area and the widening of Highway 11 from 4th Avenue to just north of where the Southern Railway tracks cross Highway 11.
- Commercial vehicles intending to cross from Canada into the United States are required to complete all brokerage paper work prior to crossing the border. As a result of this practice, drivers park their trucks on Highway 11, which often impedes other traffic and creates large queues and delays to both commercial vehicles and general traffic.
- Recent changes instituted by US Customs has exacerbated the commercial vehicle parking problem on Highway 11. On occasion parked commercial vehicles have completely blocked access to the border. Minor construction was completed to lessen this problem. This work did not completely solve the current problem, which will worsen as the numbers of commercial vehicles continues to increase.
- It is anticipated that a commercial vehicle staging area will provide immediate relief to current congestion for both commercial and passenger vehicles.
- This project is seen to improve safety. A high level environmental review indicated that there will likely be no major environmental impacts.
- No public private partnerships are apparent at this time.

2.1.7 IMTC International Mobility and Trade Corridor Project 2001 Resource Manual (February 2001)

The IMTC Project is a United States and Canadian coalition of businesses and government entities formed to jointly identify and pursue improvements to cross-border mobility in the Cascade Gateway.

The shared goal is improved mobility to better facilitate trade, transportation, and tourism with innovative improvements to infrastructure, operations, and technology.

The IMTC Resource Manual provides additional information regarding the IMTC resources, participants and projects. Background information is provided describing the increased pressures on the border crossings.

The IMTC Resource Manual provides the annual passenger vehicle and commercial vehicle crossings at the Huntingdon/Sumas border crossing, which are already documented in this report. Monthly passenger vehicle and commercial vehicle crossings are also presented for 2000 in the following exhibits:

Table 2n – Huntingdon/Sumas Border Crossing
Monthly Commercial Vehicle Volumes (2000)

Year	Southbound	Northbound	Total
Jan	9,451	3,785	13,236
Feb	9,271	5,917	15,188
Mar	10,981	4,623	15,604
Apr	9,836	4,841	14,677
May	10,769	6,049	16,818
Jun	10,984	7,494	18,478
Jul	10,862	5,920	16,782
Aug	11,229	3,870	15,099
Sep	10,616	6,446	17,062
Oct	11,085	4,838	15,923
Nov	10,112	5,092	15,204
Dec	8,224	4,218	12,442

Table 2o – Huntingdon/Sumas Border Crossing
Monthly Passenger Vehicle Volumes (2000)

Year	Southbound	Northbound	Total
Jan	52,635	48,110	100,745
Feb	57,990	52,587	110,577
Mar	60,830	57,434	118,264

Apr	62,924	59,794	122,718
May	67,838	63,135	130,973
Jun	72,371	67,457	139,828
Jul	93,270	79,458	172,728
Aug	95,187	80,350	175,537
Sep	78,144	65,533	143,677
Oct	68,511	59,133	127,644
Nov	55,158	49,545	104,703
Dec	53,681	49,727	103,408

2.1.8 Business Case Evaluation – Highway 11 Commercial Vehicle Staging Area, Hamilton Associates and UMA (April 2002)

A business case was developed for a southbound commercial vehicle staging area at the Huntingdon/Sumas border crossing. The business case was submitted by the BC Ministry of Transportation to Transport Canada for consideration of federal funding.

The submission included a Multiple Account Evaluation which considered the following: financial account, customer service account, financial summary and benefit-cost analysis, economic development and social/community account.

In addition to a benefit-cost analysis, the submission addressed the following cirteria established by Transport Canada:

- Optimized use of existing facilities.
- Long-term self-sufficient operation without further reliance on federal financial support.
- A well-concieved and integrated project.
- How the project or techniques may be applied to other potential sites.

The business case concluded the following: "An evaluation of the truck staging area on Highway 11 indicates a positive net present value of 4.1 million dollars (based on a discount rate of 8 percent), indicating that anticipated benefits exceed the expected costs. A gross benefit-cost ratio of 3.9 is anticipated based on reduced user costs (in terms of time, accident costs, and vehicle operating costs) and the expected costs of construction and maintenance (less anticipated salvage value). Similarly attractive net present values and benefit-costs are anticipated using a discount rate of 6 or 10 percent. Reduced delays form by far the largest component of the anticipated benefit. Economic development benefits have been calculated on the basis of anticipated benefits, show economic impacts of $3.6 million and employment impacts of 30 person-years.

2.2 Data Needs Analysis

The reports and studies that have been completed provide a good description of the current and anticipated growth in commodity flow and commercial vehicle traffic at the Huntingdon/Sumas border crossing. The data that has been acquired will be used to estimate the commercial vehicle volumes for the analysis of the 2006 (short-term) and 2021 (long-term) improvement options.

The report and studies also provide a reasonably good description of the current operational problems at the Huntingdon/Sumas border crossing. However, additional information is required to fully document the operational problems at the border crossing, to generate a complete list of possible remedial proposals, and to properly evaluate proposed options. It is recommended that additional data collection activities include:

- Interview with the following stakeholders:
  - U.S. Customs
  - U.S. Immigration and Naturalization Service
  - Canadian Customs
  - City of Abbotsford
  - Customs brokerage operators
  - Duty Free store operators
  - Local Railway
  - British Columbia Trucking Association
  - Possibly additional stakeholders on the US side of the border
- Interview with IMTC members to generate ideas and evaluate the efficiencies to be gained by ITS initiatives.
- License plate survey of southbound commercial vehicles, with corresponding time stamps. This will track all commercial vehicles, in space and time, through the entire border crossing process. The license plate survey will provide the following necessary data:
  - Truck traffic arrival pattern during the hour and day.
  - Queue Lengths
  - Document the total delay when crossing the border.
  - Distribution of empty/pre-cleared trucks (trucks not requiring to stop) and trucks that are stopping (vehicle inspection and/or trucks requiring the services of customs brokers).
  - Document the length of time that trucks are stopped. This will be used to evaluate the requirement for a truck staging area.
  - Processing time of the trucks at the US Customs border kiosks.
- Document all additional operational problems. Additional operational problems may involve of the following:

- Signing and Pavment Markings.
- Access problems (duty free store, local businesses, and local street network).
- Pedestrian movements.
- Lighting

- Complete topographic survey for preliminary layout and design of improvement options, including options for a truck staging area. The topographic survey will also assist in assessing the current operational problems, for example operational problems arising from improper paint markings.

3 TASK 2 – DATA AND MAPPING ACQUISITION

The following gives an overview of the additional data that has been acquired to analyze the existing performance and identify deficiencies at the Huntingdon/Sumas border crossing.

3.1 Ministry of Transportation November 7, 2001 Field Data Acquisition

On November 7th four personnel from the Ministry of Transportation gathered truck queuing and delay data at the Huntingdon border crossing. During the field visit the following observations were made:

- The queuing and delay at the border crossing is very sporadic. At 12:30 PM there was virtually no queue. Soon afterwards a queue developed to 6th Avenue in approximately 10 minutes. The queue developed quickly resulting from commercial vehicles stopping between the railway crossing and Second Avenue. The stopped commercial vehicles blocked all access to the border including passenger vehicles. Canadian and US customs officials stated that this is a common occurrence with queues often extending to Vye Road, which is 1.6 kilometres north of the border.
- The queue on Highway 11 varied in length, but generally extended from 5th Avenue to 7th Avenue. At 12:45 PM the queue shortened from 5th Avenue to 2nd Avenue in approximately two minutes, and soon afterwards there was no queue on Highway 11. There were still two trucks parked in front of the Duty Free Store. The queue dissipated quickly once the trucks blocking access to the border crossing had left.
- Even when truck parking spaces are available in front of the Duty Free Shop, truck drivers may still park their trucks further back in the queue and block traffic to the border crossing, since they have no way of knowing when parking is available closer to the border. At the time of this survey, there was only one southbound lane from the railway crossing to Vye Road, therefore when a truck stopped in the single lane section it blocked access to the border for all vehicles.

- The queue on Highway 11 created major disruptions for the border and local traffic. Vehicles were observed driving on the gravel shoulder or in the opposite lane to the first available cross street. The local street network was then used to provide access closer to the border. A city bus was observed driving in the opposite lane to 6th Avenue. Vehicles were seen performing U-turns on Highway 11. Tractor semi-trailers were seen turning onto Highway 11 from 4th Avenue. The Canadian custom officials stated that both trucks and cars attempt to jump the queue by using the local road network to access Highway 11 closer to the border.

- It was apparent that the truck arrivals to the border are random and highly variable. The number of trucks using the Huntingdon border crossing is also dependent on the delay at other border crossings. The US Custom Officials have said that truck drivers discuss the delay at the various border crossings, and commercial vehicle traffic at the Huntingdon Border crossing has increased since the delay at the Pacific border crossing has worsened.

- The US Customs have placed concrete roadside barrier, on the US side of the border, to prevent commercial traffic from accessing the commercial vehicle inspection booths from the passenger vehicle approach lanes. The passenger vehicle approach lanes were also used to provide truck parking for Custom Brokers. The removal of this commercial vehicle parking has contributed to development of large queues. The US Customs Official stated that there are two reasons for placing the roadside barrier:

    1. To prevent commercial vehicles from interfering with passenger vehicles on their approach to the border.
    2. To increase security at the border by preventing commercial vehicles from directly accessing the border from the passenger vehicle approach lanes.

- The US Customs Official have suggested adding an additional approach lane for commercial traffic on the Canadian side of the border, by removing an approach lane for passenger vehicle traffic. This would require the relocation of raised channelization and high mast lighting. The Canadian Custom Officials did not think this was a good idea, since they believed all of the existing passenger vehicle approach lanes are required.

Photo 3a – Concrete roadside barrier at
U.S. Customs following September 11.

3.2 US Customs Inspection Data, Daily Staff Versus Workload (Sunday May 13, 2001 to Saturday May 26, 2001)

The U.S. Customs office has provided hourly truck inspection workload data from May 13th 2001 to May 19th 2001. This data was used to estimate the southbound hourly distribution of weekend and weekday truck traffic at the border crossing.

Included in the truck totals were railcars from trains crossing the border. Therefore unusual spikes in the hourly truck volumes were removed from the data and the average of the two hourly volumes before and after the spikes were used. Table 3a provides the hourly truck volume data.

Table 3a - US Customs Inspection Data
Hourly Truck Volumes - Sunday May 13, 2001 to Saturday May 26, 2001

Hour	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
0:00	2	6	6	9	6	5	1
1:00	1	3	5	5	5	4	1
2:00	1	5	7	6	9	9	1
3:00	2	6	7	6	6	6	2
4:00	1	4	9	8	10	10	1
5:00	2	9	16	21	20	15	4
6:00	3	14	15	18	24	15	4
7:00	4	21	14	24	24	21	3
8:00	4	23	25	23	24	22	8
9:00	5	23	32	31	33	28	5
10:00	8	16	31	31	27	30	8
11:00	10	20	26	32	33	26	10
12:00	9	15	21	22	27	26	7
13:00	7	16	29	30	23	28	6
14:00	8	16	21	38	27	23	5
15:00	9	15	35	28	31	24	3
16:00	7	23	28	24	18	14	5
17:00	6	12	32	34	31	12	13
18:00	9	11	21	13	26	8	13
19:00	7	22	16	12	11	7	1
20:00	5	9	12	11	17	7	3
21:00	8	6	11	10	7	5	2
22:00	7	4	9	8	12	5	1
23:00	3	4	4	4	4	1	1
Totals	128	303	432	448	455	351	108

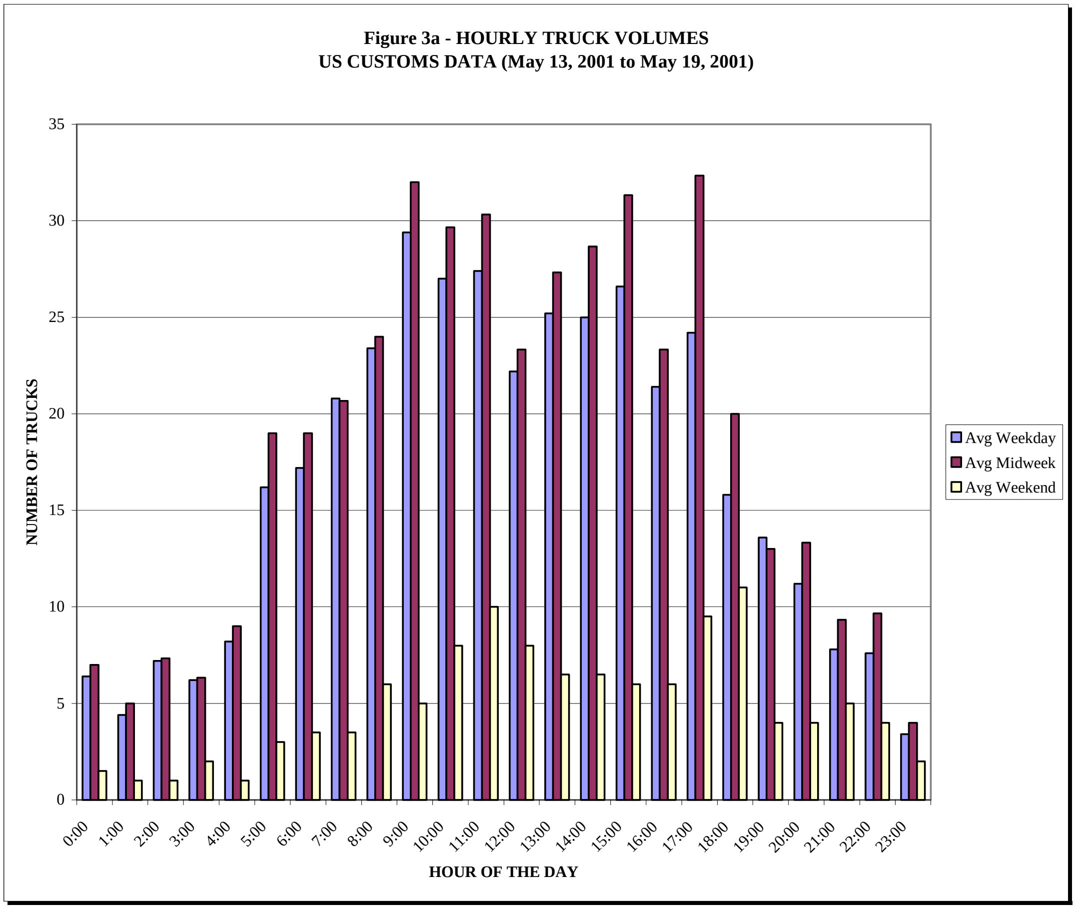


Figure 3a graphically shows the average hourly truck distribution during the week (Mon to Fri), midweek (Tue to Thu), and weekend (Sat and Sun). The graph indicates that the midweek truck volumes are slightly higher than the weekday average volumes, and significantly higher than the weekend truck volumes. The graph also shows that the peak truck volumes occur during the morning and afternoon (9:00 AM to 12:00 PM and 3:00 PM to 6:00 PM).

3.3 Truck Statistics for Port of Sumas WA (1997-2001)

The US Customs office has provided daily truck volumes entering the US through the Huntingdon/Sumas border crossing from January 1st, 1997 to April 30th, 2001. This data was used to analyze the characteristics and changes to the truck traffic volumes over various time periods. The daily totals clearly show that the truck traffic volume is higher during the weekdays and lower on the weekends. The data also shows the weekly and monthly distribution of truck traffic over the year, and provides the yearly truck traffic totals.

The truck data was later used to estimate the Design Hourly Volume, and project the Design Hourly Volume into the future to the design horizon years.

3.4 Topographic Site Survey of Canadian side of the Border (Completed January 2002)

The survey section of the BC Ministry of Transportation completed a topographic site survey of the Canadian side of the Huntingdon/Sumas border crossing. The north-south survey limits are from 4th Avenue to the Canada/US border. The east-west survey limits are from Highway 11 to West Railroad Street. The survey was limited to the areas that will likely be considered for a truck staging area, or other infrastructure improvements. The survey was completed prior to the delivery of Task 1 due to the limited time constraint to complete this project.

The survey provides the following information:

- Digital Terrain Model of the survey limits. This model will be used to estimate quantities for various infrastructure improvement options.
- AutoCAD drawing showing the following detail:
    - Legal description and lot boundaries.
    - Approximate location of underground utilities
    - Surface Detail – buildings, poles, lamp standards etc.
    - Roads – edge of pavement, gravel shoulder.
    - Existing signing and pavment markings.
    - Surface Drainage – ditching, culverts.
    - Limits of trees, shrubs.
    - Railway.

The site survey will help with the generation of realistic infrastructure improvement options, and with the evaluation of the options taken forward to preliminary design and costing. The site survey will also assist in presenting different options to the project team and stakeholders.

3.5 Ministry of Transportation February 26, 2002 Field Data Acquisition

On November 7th four personnel from the Ministry of Transportation gathered truck queuing and delay data for the Highway 11 southbound commercial vehicle traffic at the Sumas/Huntingdon border crossing. This is the first data acquired since the November 2001 widening of Highway 11 through the southbound "S" curve. During the field visit the following observations were made:

- The recent changes to Highway 11 have provided minor improvements to the mobility of southbound traffic on Highway 11. As long as the commercial vehicles remain in the curb lane and the queuing does not extend beyond the start of two southbound lanes, passenger vehicle traffic is able to drive around queued commercial vehicle traffic.

- The commercial vehicle traffic congestion is still severe and queuing often extends beyond the start of the two southbound lanes, into the single lane sections on Highway 11. This results in the excessive delay and queuing since all southbound traffic is blocked. This was observed once during the morning and conversation with Canada Customs officials have confirmed that excessive queuing to Vye Road or beyond is still prevalent. Under these conditions, the traffic operation at the border deteriorates rapidly, and the observations made during the November 7th field visit still apply.
- Commercial vehicles are no longer parking next to the raised channelization separating the commercial vehicle and passenger vehicle approach lanes. Instead commercial vehicles are parking in the curb lane and immediately in front of the raised channelization as shown in Photo 3b. This leaves a narrow space, between the parked commercial vehicles, for trucks to pass through when they are heading to the US Customs inspection booth. On occasion the space provided has not been adequate and access to the border is blocked for all commercial vehicles until the parked vehicle leaves. There are also times when extra wide loads arrive at the border that can not proceed, and must wait for the parked trucks to leave.

Photo 3b – Commercial vehicles parked at U.S. Customs.

3.6 Stakeholder Interviews - Conducted on May 8, 2002

The formal stakeholder interviews were conducted on May 8, 2002. An interview team comprised of Peter De Bolt and Gina Patenteau, Perteet Engineering Inc. (US consultant) and Ian Miki, BC Ministry of Transportation, conducted interviews with the following stakeholders:

- US Customs
- US Immigration and Naturalization Services
- Cherry Street Business Owner
- Aggregates West, a Sumas based US trucking company
- IKO, a Canadian owned and Sumas based business
- Residents of Sumas
- Bosch Customs Brokers (US)
- Livingston International (Canadian brokers)
- Canada Customs

The interview questions were prepared beforehand and used as a guide for conducting the interviews. In all cases, a discussion developed rather than a formal question and answer process. The questions focussed on issues and details which were not uncovered in the previous task.

The detailed interview minutes are attached as an attachment.

Additional stakeholder interviews will be required with the local railway company and respective trucking associations as the project progresses.

3.7 Overview of U.S. Customs Import Processes

The U.S. Customs Laws requires completed import documentation prior to goods entering the country.
Regular carriers travelling southbound through U.S. Customs have an interest in minimizing the customs clearance process. In most cases, the necessary paperwork is advanced to the brokerages prior to arrival at U.S. Customs.

The following is a brief description of the variety of clearance processes available for commercial carriers to clear U.S. Customs:

PAPS – This refers to the Pre-Arrival Processing System. Unfortunately, this system has not been operating efficiently, therefore usage is low. A pilot project for remote location filing is apprently in place. The results of the pilot project have not been released. Conversely, Canada Customs uses PARS (Pre-Arrival Release System). Approximately 90% of carriers are enrolled in the program. If

PARS fails, the documentation has to be re-done resulting in a 5 minutes to 2 hour delay.

BRASS – If a company delivers the same commodity on a repetitive basis, the company may apply for BRASS. In BRASS, if a company has the same commodity, applies and passes through the port 24 times without mishap, U.S. Customs can authorize the company to come through the border without going to see a broker. A set of numbers is issued to the company and they can drive up to the inspection booth and clear their freight.

Line Release – Carriers provide basic information upon arrival at the inspection booth. Line Release is not applicable to freight which is of interest to other federal jurisdictions (ex. U.S. Food and Drug Administration).

Formal Entry - Carriers seeking to enter shipments valued at greater than $2,000 U.S. are required to post a surety bond to ensure payment of duties and compliance with other Customs requirements. A formal, consumption entry also requires the following documents: 1) a bill of lading (or other evidence of the consignee's right to make the entry on behalf of the importer), 2) a commercial invoice indicating value and description of the goods, 3) an entry manifest (Customs Form 7533 or 3461), and 4) packing lists and whatever other documents needed to determine admissibility of the goods.

Informal Entry – Carriers and individuals with non-risk shipments (ex. wood chips, gravels) valued at $2,000 U.S. or less may use an informal entry process and generally avoid the need to use a brokerage service. Informal entries do not require the posting of a bond. The Customs inspector rather than the importer makes determinations of the goods classification. The inspector completes the needed Customs forms. And liquidation (final assessment and payment of duties) is handled on the spot.

The link to the web based document that covers the basic import entry process is: http://www.customs/treas.gov/impoexpo/import.htm.

3.8 Overview of Intelligent Transportation System (ITS) Technology

The intent of this section is to decipher and summarize the ITS acronyms.

The overall long term objective of ITS is to expedite the movement of goods and people across the border and ensuring security on both sides of the border. Meeting the objective from a commercial vehicle aspect would involve convincing all stakes holders including shippers, carriers and brokers to move from a paper work/bar code process to a paperless/electronic process. The following ITS initiatives and concepts are currently under implementation or in the planning/development stage for future implementation at various Lower Mainland border crossings.

NEXUS
The Nexus program is designed to simplify border corssings for pre-approved, low risk travellers. It is a joint program implemented by the Canada Customs and Revenue Agency, Citizenship and Immigration Canada, U.S. Customs Service and the U.S. Immigration and Naturalization Service. Nexus lanes at the Pacific Highway/Blaine, and Douglas/Blaine border crossings will be open in late June 2002.

Participants in the Nexus program will be approved by both Canada and the U.S. as low-risk, pre-approved travellers, enjoying a simplified entry process while travelling back and forth across the Canada/U.S. border.

Nexus pass holders use dedicated lanes at both border crossings and are not regularly subject to the usual customs and immigration questioning. License plate readers will be incorporated for northbound vehicles. Until Canada has an analogous reader system, southbound vehicles will be identified by radio-frequency cards.

More information is available on the following website: http://www.getnexus.com.

ATIS
ATIS is the Advanced Traveler Information System currently under development that will disseminate delay times at the border crossings. Traffic flow data approaching the border will be collected by detector loops buried within the roadway. The border delay will be computed using the traffic data and service rate data from the inspection booths. Cameras will also be used to monitor the traffic flow. Public information will be transmitted to Variable Message Signs (VMS) and will also be provided over the internet and by automated voice messaging via the telephone. The delay information is currently directed towards passenger vehicles, however, future plans may look into providing information that may interest commercial vehicles.

Wait Time Initiative
Work is currently underway to develop, design and implement a fully automated wait time system to monitor and report on commercial and traveler's' wait times at border locations. A fully automated monitoring system is planned to properly manage border service standards and traffic delays and to enhance security. Preliminary plans are for two or three field cameras and three monitors to be provided at each site. Two cameras will provide a complete view of traffic congestion while a third camera will enable customs staff to zoom in to car passengers or licence plates for security reasons. Phase 1 will involve wait time monitoring of commercial and traveler traffic volumes at the Pacific Highway

border crossing and not the remaining four border crossings in the Lower Mainland.

CVO
CVO refers to the Commercial Vehicle Operation project. Phase 1 currently involves select, northbound, U.S. commercial vehicles. Commercial vehicles leaving the Port of Seattle with in-bond cargo would be detected by a Automated Vehicle Identification (AVI) transponder readers. The data relating to the vehicle and cargo would be stored digitally. During the northward journey, AVIs at weigh scales and at the Canadian border would detect the commercial vehicle. Once the vehicle reaches the border, the inspector would have access to the information on the vehicle's journey. US Customs is informed when the truck crosses the border and has left the continental United States.

Phase 2 currently involves installing Weigh-In-Motion (WIM) detectors at the Port Mann weigh scale and the Pacific Highway border crossing. The detectors are intended to track the journey of select commercial vehicles travelling southbound into the U.S. and to also expedite the weigh scale process by electronically determining if vehicle characteristics meet or exceed the weigh scale criteria. The truck driver is informed in his cab whether his truck is cleared to proceed or must stop.

Phase 3 includes plans to involve the Vancouver International Airport, a source for U.S. bound cargo.

Commercial vehicles equipped with transponders and participating in the CVO project, will not have to use the services of Customs Brokers, but will head directly to the Customs inspection booth. This will lessen the demand for parking at the commercial vehicle staging area.

E-seals
E-seals involve identifying the cargo using digital technology. The cargo may be stored in a special container containing digital information or may be labelled with a bar code type of sticker. A pilot program in the U.S. is currently underway.

Pre-clear Commercial Vehicle Drivers
A possible future program initiative is complementing the cargo and vehicle arrival information with driver information. Background checks would be completed on commercial vehicle drivers. Ultimately the goal is to electronically identify the cargo, truck, and the driver. Security and cross border mobility would be improved. The demand for a truck staging area would be lessened. However, a smaller truck staging area would still be required since not all of the commercial vehicles would be pre-cleared

4 TASK 3 – ANALYZE EXISTING PERFORMANCE AND IDENTIFY DEFICIENCIES

Task 3 involved the completion of a detailed operational analysis of the Huntingdon/Sumas border crossing. A detailed analysis was necessary to assess and quantify existing traffic and border operational problems and the potential problems arising from increased traffic and congestion. The available data is supplemented with field observations and interviews with stakeholders. A brief discussion is also provided of the recent changes that were made to Highway 11 to mitigate the operational problems immediately north of the border crossing.

4.1 Recent Changes to Highway 11

Recent changes were made to Highway 11 to improve the approach to the border crossing and mitigate the queuing and delay experienced by the commercial vehicles and general-purpose traffic. The queuing and delay at the border crossing had worsened as a result of changes made since September 11th to address security concerns. Vehicle inspections were increased and concrete roadside barrier was placed on the US side of the border, which prevented commercial vehicles from accessing a parking area on the Canadian side of the border. Commercial vehicles were no longer able to park next to the general-purpose lanes adjacent to the raised channelization. This area was not intended to provide parking for commercial vehicles, but it was used to park up to 2 tractor semi-trailers. The only remaining parking was adjacent to the commercial vehicle lane between the border and the “S” curves on Highway 11, which could provide parking for up to 5 tractor semi-trailers.

Photo 4a – Concrete roadside barrier at
U.S. Customs following September 11.

The remaining commercial vehicle parking was not adequate, and commercial vehicles were parking further back on Highway 11. Commercial vehicles were also parking in the single lane sections on Highway 11, which blocked all access to the border, including access for the general-purpose traffic. The traffic operations at the border crossing had deteriorated and the queuing and delay had become excessive. Canadian and US Customs officials stated that the queues often extended to Vye Road, which is 1.6 kilometres north of the border, and the delays often exceeded 30 minutes. The owner of the Huntingdon Duty Free Store indicated that his business was suffering due to the increased congestion, delay and driver frustration. Even when truck parking spaces were available in front of the Duty Free store, truck drivers were parking further back in the queue and blocking traffic to the border crossing, since they had no way of knowing that parking was available closer to the border.

During November 2001, low cost improvements were designed and constructed that provided for two lanes southbound on Highway 11, starting at the 4th Avenue intersection. The scope of the work consisted of the following:

- Reconfigure the raised island where Highway 11 splits at 2nd Avenue.
- Change the lane markings by narrowing the northbound lane and provide two southbound lanes from 4th Avenue to the “S” curve.

- Widen Highway 11 through the "S" curves to provide two lanes southbound, tying into the start of the existing two lanes southbound.

The objective of the improvements was to provide a second southbound lane to enable general-purpose traffic to drive around a stopped commercial vehicle in the curb lane. The second southbound lane can now provide parking for up to an additional 8 tractor semi-trailers between 4th Avenue and the railway crossing.

The queuing and delay on Highway 11 has subsequently been reduced; however, border traffic operational problems still persist. As commercial vehicle traffic volumes increase the effectiveness of the improvements will diminish, and border traffic operational problems will become more prevalent and severe.

4.2 Existing Deficiencies

Even with the recent improvements to Highway 11, the commercial vehicle parking along Highway 11 is still inadequate. Commercial vehicle drivers are not given positive guidance to a parking area, but are left on their own to find what space is available. Trucks are currently parking in the Highway 11 approach lanes, disrupting the flow of traffic and forcing vehicles to drive around the stopped trucks. There is still a risk of parked commercial vehicles blocking access to the border.

Discussions with the Canadian Customs and Huntingdon Duty Free Store personnel have confirmed that excessive queuing and delay still persists subsequent to the recent improvements to Highway 11. Commercial vehicle queuing in the curb lane has extended beyond 4th Avenue and into the single lane section of Highway 11. Commercial vehicles parked for the customs brokerages have blocked the two southbound lanes on Highway 11, south of the 4th Avenue intersection. On occasion commercial vehicles have tried to pass a parked commercial vehicle in the curb lane, only to become trapped in the centre general purpose lane, and consequently block passenger vehicle access to the border. Subsequent to the recent improvements, the southbound queuing on Highway 11 has extended to Vye Road, over 1.6 kilometres to the north of the border, and the delays have been excessive, over 45 minutes.

Trucks parking in front of the Duty Free Store have disrupted this business. Commercial vehicles have blocked access to the Duty Free Store and customers entering and egressing from the store must cross the path of the commercial vehicles.

Photo 4b – Commercial vehicles blocking
access to Huntingdon Duty Free Store.

Long queues on Highway 11 have created major disruptions to local traffic. Local vehicle traffic has been known to drive on the gravel shoulder or in the opposite lane to the first available cross street in order to get by the end of a queue. Vehicles have tried to jump the queue by using the local street network to gain access to Highway 11 closer to the border crossing.

Presently a total of 15 parking stalls are required to provide parking for commercial vehicles that are utilizing the services of Customs Brokerages (based on 30th highest hourly volume, and 85% probability that a truck will find a parking stall). A maximum of only 10 tractor semi-trailers can now be parked along Highway 11. The methodology used in determining the parking requirements is presented in Task 4 of this report, under the heading of Estimate Future Demand and Analyze Future Performance.

The safety of truck drivers walking to their Customs Brokers should be improved. Truck drivers park their trucks wherever they find an available spot, and end up walking along the narrow lanes of Highway 11. They also end up crossing Highway 11 at many different locations. No sidewalk is provided along Highway 11 and there are no painted crosswalks.

The Ministry of Transportation District Manager has noted that a small number of northbound trucks cross the border and parks their trailers on the side streets of the Huntingdon residential community. The American truck driver returns to the US side of the border and a Canadian truck driver picks up the trailer and continues northward.

Large commercial vehicles have been seen turning at the intersection of Highway 11 and 4th Avenue. Trucks are forced to cross over into the opposing lane and/or drive onto the gravel shoulder in order to complete the turn. The intersection should be widened to give trucks additional width to make their turning maneuvers, and quadrant islands should also be provided at the intersection. The Highway 11 lane widths through this intersection and south to the railway crossing are substandard and should be widened.

The signing for the southbound traffic in advance of the border crossing is not adequate. Additional signing is required where the two southbound lanes begin on Highway 11. The queue often extends beyond the existing border signing and the reduced speed zones before the border. The existing signing at the border is likely substandard, and the reflectivity, text size, and messaging should be reviewed.

The turbulent traffic patterns on the southbound approach to the border crossing jeopardize the security of the Canadian and American federal facilities at the border. The approach to the border is not orderly, with passenger vehicles, commercial vehicles, buses and recreational vehicles all intermingling. This makes it difficult to identify security threats or to deal with an incident if one occurs. There are presently no cameras to monitor approaching traffic. Intelligent Transportation Systems initiatives that improve security, such as electronic identification of drivers, commercial vehicles, or the cargo, are presently not being utilized.

Long queues and excessive delay is detrimental to the environment. Both commercial and passenger vehicles are spending long periods of time idling on Highway 11 as they slowly progress through the queue. Air quality is compromised from the exhaust of the idling vehicles. Water quality is also detrimentally affected. Contaminated water from idling vehicles or pavement runoff currently flows into storm sewers without oil/water separation or removal of other contaminants. The harmful affects to the environment are further exacerbated by the delay to local traffic caused by the queuing at the border.

Highway 11 passes close to residential properties in the Huntingdon community. Traffic noise pollution can be heard in the residential areas. Most notable is the braking noise of the large commercial vehicles.

A summary of the border traffic operational problems north of the Canadian US border is presented in Table 4a. A qualitative assessment of the severity of the problem is also presented based on the following criteria:

Low Severity:	🚗	Minor delay or queuing for passenger vehicles or commercial vehicles. Access to the local community or nearby businesses is unaffected. Border security and safety is not compromised.
Medium Severity:	🚗 🚗 🚗	Passenger vehicles and/or commercial vehicles experience delay and queuing, but the delay and queuing is not excessive. Access to the local community or nearby businesses is hindered but not impeded. Border security and safety may be jeopardized.
High Severity:	🚗 🚗 🚗 🚗 🚗	Passenger vehicles and/or commercial vehicles commonly experience excessive delay and queuing, to Vye Road and beyond. Access to the local community or nearby businesses may be blocked for some time. Safety is compromised and border security is at risk.

Table 4a – Huntingdon Sumas Border Crossing
Border Traffic Operational Problems – Canadian Side

Deficiency	Severity	Operational Problems
Insufficient Customs Brokerage Parking.	🚗 🚗 🚗 🚗 🚗	• Occasional disruption/blockage of all southbound traffic. • Long delays and long queues, often beyond Vye Road. • Ingress and egress to Huntingdon Duty Free is often blocked. • Occasional disruption/blockage of local access to Huntingdon neighbourhood. • Border security is compromised. • Safety is compromised. • Commercial and passenger vehicles try to queue jump using the local road network.
Single US Customs Truck Inspection Booth.	🚗 🚗 🚗 🚗	• Occasional queuing and delay at US Customs truck inspection booth. • This deficiency is compounded with inadequate customs brokerage parking. • May disrupt ingress and egress to Huntingdon Duty Free. • Border security is compromised. • Safety is compromised.
No commercial vehicle trailer drop off	🚗	• Commercial vehicles drop trailers north of the border for pick-up by local drivers. • Commercial vehicles use the Huntingdon local street network for this purpose. • Safety on the local streets is compromised. • Local street access is compromised.
Positive guidance is lacking or could be improved.	🚗 🚗	• Paint markings are non-existent or faded. • Signing is old and should be improved (text size, reflectivity, etc.). • Variable Message Signs are currently not used. • Queuing on Highway 11 often extends beyond the signing. • Directional signing to customs brokerage is non-existent. • Safety is compromised. • Mobility is compromised.
Vehicles must ingress or egress the Huntingdon Duty Free by crossing the commercial vehicle lanes.	🚗 🚗 🚗	• Ingress and egress to the Huntingdon Duty Free store is often blocked by commercial vehicles. • Safety is compromised. • Drivers may decide not to shop at the Duty Free store.
Commercial vehicle drivers are unable to determine if parking is available closer to the border.	🚗 🚗	• Commercial vehicles sometimes park further back in the queue, even when parking is available closer to the border. • This results in increased delay and queuing.
Commercial vehicle drivers are not provided with real-time border information.	🚗 🚗	• Congestion and the resulting queuing and delay is increased since drivers are not provided advance warning that congestion is less at a different border crossing.
Commercial vehicles turn onto Highway 11 at the 4th Ave. intersection.	🚗	• Adequate width for the large turning sweeps required by commercial vehicles is not provided. • Safety is compromised.
Custom brokers are not situated close to where commercial vehicles currently park.	🚗 🚗 🚗	• The travel time results in longer parking times for commercial vehicles. • This results in increased queuing and delay. • Safety is compromised. • No sidewalks and crosswalks for truck drivers walking to customs brokers.

From the previous discussions and Table 4a it becomes apparent that much of the traffic operational problems for southbound traffic heading to the border arise from the congestion, delay and queuing caused by the commercial vehicles. The delay experienced by commercial vehicles is made up of two main components: delay caused by commercial vehicles stopping to use the services of Custom Brokers, and delay caused by commercial vehicle processing and inspection at US Customs. A more detailed quantitative analysis of the queuing and delay is presented below.

4.3 Analysis of Customs Brokerage Parking Delay

The current parking demand was calculated using the truck data provided by US Customs and the traffic data gathered in the field on February 26th, 2002. Approximately 50% of the trucks arriving at the border were observed stopping and utilizing the services of Custom Brokers. Approximately 46% of the trucks were non-LTL, requiring the services of only one Custom Broker, and stopping for an average of 18 minutes. Approximately 45 of the trucks were LTL, requiring the services of multiple Custom Brokers and stopping for approximately 45 minutes.

Section 5.1 of this report provides a daily peak hour chart and describes the methodology used in calculating the daily peak hour volumes. A Design Hourly Volume of 44 trucks/hr was used for the analysis of the Customs Brokerage Parking. The Design Hourly Volume corresponds to the 30th highest hourly volume of the year and the 90th percentile hourly volume of the year. A high percentile volume was used as the Design Hourly Volume since the consequence of a truck not finding a parking spot may severely disrupt the traffic operations at the border.

The parking demand was calculated using multiple channel queue theory and the methodology is described in Section 5.2 of this report. The results of the queuing analysis for 2000 are as follows:

- 11 parking stalls should be provided for non-LTL trucks.
- 4 parking stalls should be provided for LTL trucks.
- The total number of parking stalls required, using the 2000 traffic data, is 15.

4.4 Analysis of US Customs Inspection Delay

On occasion a queue develops at the US Customs commercial vehicle inspection booth. The US Customs typically have one inspection booth in operation and it takes approximately 1 minute to process a commercial vehicle. A single US Customs inspection booth can service approximately 60 trucks/hour.

The consequence of a truck arriving at the US inspection booth and having to wait a short period of time would not severely impact the traffic operations at the border crossing. Therefore the 50th percentile weekday daily peak hour volume was used to analyze the performance of the US Customs inspection booth. The peak hour volume for each weekday was ranked in descending order and the 50th percentile was found to be 37 trucks/hour.

Queuing analysis of the US Customs inspection operation indicates that a single booth generally provides adequate service using 2000 traffic data. The queuing analysis is based on a random arrival, random service, single-channel system. The results of the queuing analysis are as follows:

- The probability that when a truck arrives at the US Customs inspection it will not encounter any trucks is 38%.
- On average there will be 1 truck waiting to be served.
- On average there will be 1.6 trucks in the system (waiting to be served and being served).
- On average a truck will take 2.6 minutes to pass through the US Customs inspection, which consists of 1.6 minutes of waiting and 1 minute at the inspection booth.

It is important to note that there is presently very little room for queuing to the US Customs inspection booth without impacting on the available parking on Highway 11. If there are more than two or three tractor semi-trailers at the booth and in the queue, the trucks trying to leave their parking spot north of the border may find it difficult to enter the line-up for the US Customs inspection booth. This will lead to increased congestion north of the border, and may increase the queuing and delay caused by the parking for the Customs Brokerage.

Another important consideration is the time to process a commercial vehicle at the US Customs booth is variable and may have increased since the field data was acquired. Homeland security has become a major concern since September 11th and US Customs is spending more time inspecting both cars and trucks that are entering the US.

5 TASK 4 – ESTIMATE FUTURE DEMAND AND ANALYZE FUTURE PERFORMANCE

Task 4 involves analyzing the quantitative data and extrapolating the data to the 2006 and 2021 design years. The qualitative data is also used to further refine the results of the quantitative data.

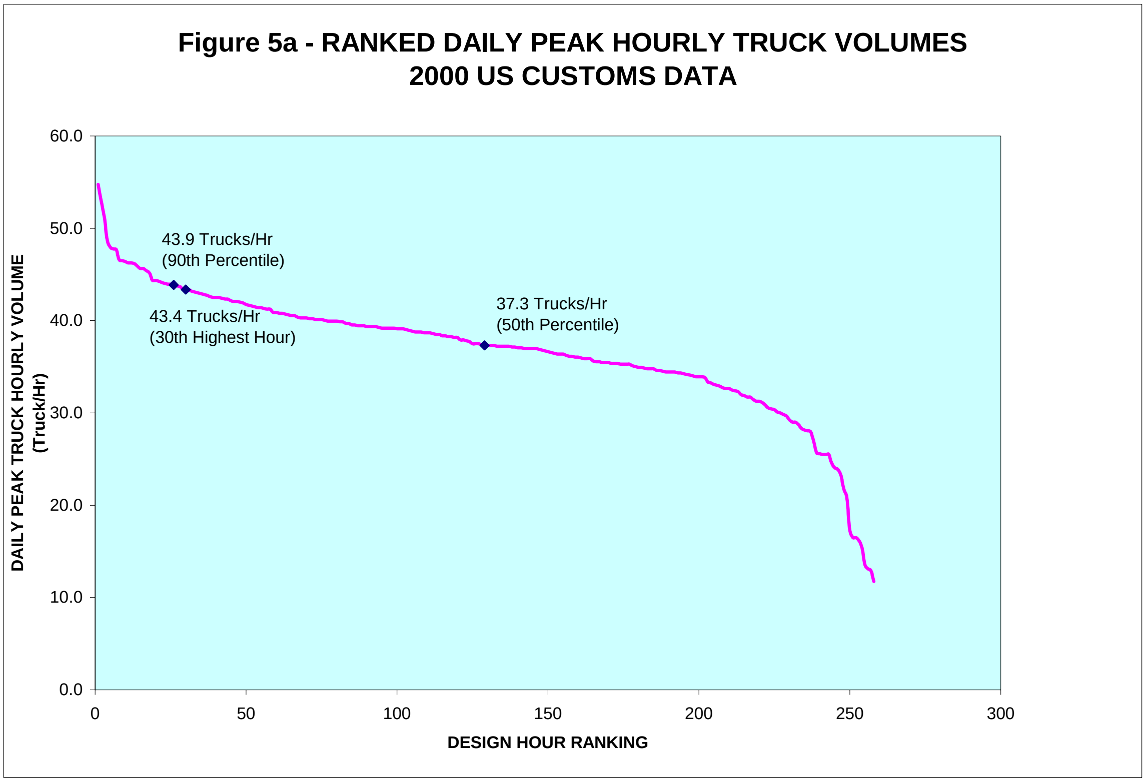
5.1 Truck Design Hourly Volume

The data clearly indicates that the truck volumes crossing the border are significantly higher during the weekdays; therefore the weekend truck volumes are not used in the analyses.

The hourly truck inspection workload data for the week of May 13th to May 26th, 2001 was used to calculate the peak hour count as a percentage of the day's total count. For example, on Friday May 25th, 2001, the peak hour was 30 trucks per hour during a daily total of 351 trucks. The peak hour count was therefore 30/351 = 8.5% of the total truck volume. During the five weekdays the peak hour count as a percentage of the daily total was found to vary from a low of 7.2% to a high of 8.5%. The average value was found to be 8.0%. The peak hour count as a percentage of the daily truck total did not vary significantly through the week and the value of 8.5% was used for design purposes. This value was used to estimate the peak hour for daily count data that was not segregated into hourly volumes.

The peak hour count as a percentage of the daily truck volume was then used to analyze the 1997 to 2001 daily truck data that was provided by US Customs. The peak hour volume was calculated for each weekday for the 2000 data, which is the most current year that has a complete set of data. For example the July 12th, 2000 daily truck volume is given as 514 trucks. The peak hour count is therefore 514 x 8.5% = 44 trucks/hour.

The peak hour for each weekday through 2000 was then listed in descending order and the results are plotted in Figure 5a. The 50th percentile peak hour was found to be 37 trucks/hr and the 90th percentile peak hour was found to be 44 trucks/hr. It is not cost effective to design for the highest hourly volume of the year, since there are unusual circumstances throughout the year that results in a few hours being significantly higher than the mean. The 30th highest hourly volume is commonly used as the Design Hourly Volume for transportation projects. The 30th highest hourly volume is greater than most of the hourly volumes throughout the year, but not excessively greater. During 2000 the 30th highest hourly volume was found to be 43 trucks/hr.



The 2000 30th highest volumes were then used to estimate the Design Hourly Volume for the short term improvement options (2006 design year) and the long term improvement options (2021 design year). Based on the Lower Mainland Border Crossing Commercial and Passenger Vehicle Forecasts (Draft Report, November 2001) prepared by TSI Consultants, the annual growth rate for the southbound commercial vehicle traffic is anticipated to be 6.3% from 2000 to 2006, and 4.6% from 2006 to 2011. The growth rate from 2006 to 2011 was also used as the growth rate from 2011 to the 2021 design year. The growth rates, percentage increases and the calculated Design Hourly Volumes are presented in Table 5a.

Exihibit ?? - Huntingdon/Sumas Border Crossing
Forecast Design Hourly Volumes - Low Growth

Time Period	Annual Growth Rate	Percentage Increase	Design Hourly Volume
2000-2006	5.3%	36.3%	60 Trucks/hr at 2006
2006-2011	3.6%	19.3%	72 Trucks/hr at 2011
2011-2021	3.6%	42.4%	102 Trucks/hr at 2021

5.2 Truck Parking Demand

The parking requirements for the 2006 and 2011 design years were calculated based on multiple channel queue theory[1]. The parking lot was treated as a series of parallel service channels, and each parking stall represents a service channel. The mean service rate for each channel is the same; therefore, the parking requirements for the "less than truck load" (LTL) and non-LTL trucks were calculated separately, and later combined to determine the total parking demand. The LTL trucks take a longer time to process their paperwork since they often require the services of more than one custom broker. The truck arrival rate was assumed to be random and independent of each other. The arrival rates used in the analysis were the Design Hourly Volumes presented in Table 5a.

The mean service rates were estimated from data collected on February 26th, 2002. The average parking time for LTL trucks was found to be 18 minutes and the average parking time for non-LTL trucks was found to be 45 minutes. Approximately 50% of the trucks arriving at the border were observed parking at the border crossing (note: same as the Pacific Border Crossing). Approximately 46% of the trucks were non-LTL trucks and approximately 4% of the trucks were LTL trucks (note: 45% and 5% respectively was used at the Pacific Border Crossing).

- A processing time of 20 minutes was used for non-LTL trucks (note: 25 minutes was used at the Pacific Border Crossing). The drivers of these trucks generally attend only one Customs brokerage office. This results in a service rate of 3.0 trucks/hr.
- A processing time of 45 minutes was used for LTL trucks (note: 60 minutes was used at the Pacific Border Crossing). The drivers of these trucks are generally required to attend multiple Customs brokerage offices. This results in a service rate of 1.33 truck/hr.

The queuing analysis was performed in the following manner: the numbers of parking stalls were increased such that there was a high probability that a truck arriving at the staging area would find a parking stall. The recommended number of parking stalls corresponds to an 85% probability that a truck will find a parking stall and not have to wait. The results of the queuing analysis are provided in Table 5b. A more detailed description of the queuing analysis is provided in Appendix 5A.

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[1] May, Adolf D., Traffic Flow Fundamentals (Prentice-hall, Englewood Cliffs, New Jersey, 1990) pp. 338-375.

Table 5b – Huntingdon/Sumas Border Crossing
Forecast Parking Demand

Design Year	Non-LTL Trucks	LTL Trucks	Total Parking
2006	14	5	19
2011	17	6	23
2021	24	8	32

5.3 Queuing at US Customs Truck Inspection Booth

The 50th percentile daily peak hour volume was used in the queuing analysis of the US Customs commercial vehicle inspection. The queuing analysis provided in Section 4.4 indicates that a single inspection booth will generally provide adequate service. The 50th percentile daily peak hour volume was projected forward to obtain the hourly volumes for the various design years. As discussed earlier, the 50th percentile daily peak hour volume was used in the analysis, since the consequence of a truck arriving at the US inspection booth, and having to wait a short period of time, would not severely impact the traffic operations at the border crossing.

Table 5c - Huntingdon/Sumas Border Crossing
Forecast 50th Percentile Daily Peak Hourly Volume

Time Period	Annual Growth Rate	Percentage Increase	50th Hourly Volume
2000-2006	6.3%	44.3%	53 Trucks/hr at 2006
2006-2011	4.6%	25.2%	67 Trucks/hr at 2011
2011-2021	4.6%	56.8%	105 Trucks/hr at 2021

The results of the queuing analysis indicates the following:

Design Year 2006

- A single inspection booth will still function adequately but the queue and delay will be significantly larger. The average number waiting to be served will grow to 6.7 trucks, and the average time that a truck will wait to be served will be 6.7 minutes.
- If two inspection booths are provided, the probability that a truck will have to wait in a queue reduces from 88% to 27%. The average number of trucks

waiting to be served would be 0.2 and the average wait to be served would be 14 seconds.

Design Year 2011

- Two US Customs inspection booths will be required to service the increased number of commercial vehicles crossing the border.
- With two inspection booths there is a 40% probability that a truck will have to wait in a queue before inspection. The average number of trucks waiting to be served would be 0.5 and the average wait to be served would be 0.45 minutes.

Design Year 2021

- Two US Customs inspection booths will function adequately, but the queue and delay will grow substantially.
- With two inspection booths there is an 82% probability that a truck will have to wait in a queue before inspection. The average number of trucks waiting to be served would be 5.7 and the average wait to be served would be 3.3 minutes.
- If three inspection booths were provided there would be a 33% probability that a truck will have to wait in a queue before inspection. The average number of trucks in the queue would be 0.5 and the average wait to be served would be 0.27 minutes.

The present configuration at the border, with the US Customs inspection booth located just south of the border and the available Customs Brokerage parking located immediately north of the border, does not allow for much queuing for US Customs without significantly impacting on the Customs Brokerage parking. If there are more than two or three semi-trailors at the US Customs booth or in the queue, the available Customs Brokerage parking will be reduced. This can quickly lead to congestion and significantly increase the delay and queuing on Highway 11. The amount of queuing that can be accommodated at the US Customs inspection booth will ultimately depend on the configuration of the commercial vehicle staging area.

5.4 Sensitivity of Parking Demand

The parking requirements are based on the most current traffic data provided by US Customs, and the forecast annual growth rate in commercial vehicle traffic prepared by TSI Consultants (Novemeber 2001). The growth rates were developed using the IMTC project database on the commercial and passenger vehicle movements at the Canada/US border crossings. The IMTC database was augmented with US Census commodity-flow data to enable forecasting of commercial and passenger vehicle volumes. The growth in commercial vehicle traffic at the Huntingdon/Sumas border crossing is subject to many factors and the growth rate may vary from the predicted value. Factors that may vary the growth rate include the following:

- The rate of economic growth in Canada and the United States, especially in the areas near the border crossing.
- Changes in trade agreements between Canada and the United States.
- Increased security and inspections at the border.
- Increased delay and congestion at other border crossings.

Factors that may vary the parking demand include the following:

- ITS initiatives that would affect how commercial vehicles are processed at the border and at Custom brokerages.
- Increased use of pre-cleared trucks.
- Changes in the commodity carried by commercial vehicles.

A high and low annual growth rate was used to examine the sensitivity of the commercial vehicle parking demand to changes in the growth rate. The high growth rate used an annual growth rate that was 1% higher than the predicted value, and the low growth rate used an annual growth rate that was 1% lower. The results of the sensitivity analysis are provided in the following two tables.

Table 5d – Huntingdon/Sumas Border Crossing
Forecast Parking Demand – High Growth Rate

Design Year	Yearly Growth Rate	Non-LTL Trucks	LTL Trucks	Total Parking
2006	7.3%	15	5	20
2011	5.6%	18	6	24
2021	5.6%	30	8	38

Table 5e – Huntingdon/Sumas Border Crossing
Forecast Parking Demand – Low Growth Rate

Design Year	Yearly Growth Rate	Non-LTL Trucks	LTL Trucks	Total Parking
2006	5.3%	14	4	18
2011	3.6%	16	5	21
2021	3.6%	21	6	27

The number of parking stalls required for commercial vehicles at the border crossing is also influenced by the time it takes to process the paperwork at the Customs Brokerages offices. Intelligent Transportation Systems/Commercial Vehicle Operations (ITS/CVO) initiatives may reduce the length of time required to process the paperwork at the Customs Brokerages offices, or decrease the percentage of commercial vehicles requiring the services of the Customs Brokerages.

Improvements gained by the implementation of ITS/CVO systems would result in less queuing and delay. For example a reduction of 25% in the number of trucks using the services of Customs Brokerages would result in the parking demand provided in Table 5f.

Table 5f – Huntingdon/Sumas Border Crossing
Forecast Parking Demand with 25% Fewer Trucks Stopping

Design Year	Yearly Growth Rate	Non-LTL Trucks	LTL Trucks	Total Parking
2006	6.3%	11	4	15
2011	4.6%	13	4	17
2021	4.6%	20	6	26

5.5 Sensitivity of Queuing at US Customs

The time to process a commercial vehicle at the US Customs Booth may have recently increased. Homeland security is a major concern and US Customs has been spending more time inspecting both cars and trucks. The queuing analysis was repeated assuming the average time it takes to process a truck at the US Customs Booth increased from 1 minute to 1.5 minutes.

The increased processing time will produce the following results:

Design Year 2006

- A single inspection booth would no longer be adequate and two inspection booth would now be required.
- With two inspection booths the probability that a truck will have to wait in the queue is 53%. The average number of trucks waiting to be served would be 1.0 and the average wait to be served would be 1.2 minutes.

Design Year 2011

- Two inspection booths would be required.
- With two inspection booths the probability that a truck will have to wait in the queue is 76%. The average number of trucks waiting to be served would be 3.9 and the average wait to be served would be 3.5 minutes.

Design Year 2021

- Two inspection booths would no longer be adequate and three inspection booths would be required.

6 TASK 5 – DEVELOPMENT AND INITIAL SCREENING OF OPTIONS

Improvement options were developed to address existing and future deficiencies, and to maintain and improve the functionality of the border crossing and the connecting roadway system.

6.1 Existing Highway 11 Southbound

Highway 11 southbound is currently 2 lanes from 4th Avenue to the railway crossing. The outside lane is currently utilized by commercial vehicles and passenger vehicles currently utilize the inside lane.

6.2 Improvement Options

Long-term and short-term improvement options were developed to allow the Project Team and stakeholders to logically work towards a preferred solution. Previous discussions and work at the Huntingdon-Sumas border crossing, and other related border crossing, have been documented. The improvement options were assembled from the following:

- Project Team Workshop, June 2002.
- Project Team Meeting Minutes, March 2001 to January 2002.
- Highway 11 – Huntingdon Border Crossing Improvements, B.C. MoTH, October 2000.
- Pacific Highway Border Crossing Study, Hamilton Associates, October 1999.

6.2.1 Extend the Second Southbound Lane

The second southbound lane begins at 4th Avenue. This lane would be extended north to accommodate the commercial vehicle queues.

<u>Advantages</u>

- This option would fit well with the long-term plans to 4-lane Highway 11. Early indications are that the work could be completed inside the current right-of-way.
- The additional queuing room for commercial vehicles will lessen the occurrence of commercial vehicles blocking passenger vehicles.

<u>Disadvantages</u>

- Drivers requiring brokerage services may have to walk long distances. Safety concerns may arise since there are no designated sidewalks along Highway 11.
- Commercial vehicle drivers may decide not to park when they are back in the queue, but will slowly make their way up the queue and continue to park near the border.

- Commercial vehicle flow will be inefficient unless commissionaires are deployed. For example, a commercial vehicle approaching the end of the queue will be unable to determine if vacancies are available upstream. A staging area will manage the storage of vehicles more effectively.

6.2.2 Provide a Commercial Vehicle Staging Area North of Duty Free Store – Access from 4th Avenue Figure 6a

All commercial vehicles would be directed off of Highway 11, onto 4th Avenue and into a new staging area north of the duty free store. A large area of vacant undeveloped land is available to accommodate up to 34 commercial vehicles. The staging area would be used by commercial vehicles requiring brokerage services. The commercial vehicles would exit the staging area along a new roadway behind the duty free store. Locating the roadway behind the duty free store would require relocation of the U.S. Customs employee parking lot. The exit road would lead directly to the existing US Customs commercial vehicle inspection booths.

The staging area may also be equipped with active signing to inform drivers of vacant parking areas ahead and to manage the inflow of vehicles.

This option would require the reconstruction of the Highway 11 and 4th Avenue intersection to accommodate the turning movements of large commercial vehicles. The ownership of the staging area and a small section of 4th Avenue would also need to be determined, as a small amount of maintenance will be required.

Advantages

- Resolves the major operational problem of commercial vehicles blocking all access to the border.
- Separates the commercial vehicles from other vehicles. The existing Highway 11 located south of 4th Avenue will only be used by general purpose vehicles and no commercial vehicles.
- Reduces congestion, delay and queuing for both commercial vehicles and passenger vehicles.
- Resolves the problem of commercial vehicles blocking ingress and egress to and from the Huntingdon Duty Free store.
- Provides room for commercial vehicle queuing to the US Customs inspection without impacting on the parking. This may defer the need to implement a second US Customs inspection booth for commercial vehicles.

- Provides for drop-off and pick-up of commercial vehicle trailers, thus removing commercial vehicles from the residential road network.
- Moves commercial vehicles further away from the Huntingdon residential community, located on the east side of Highway 11.
- Improves security through a well controlled approach to the border.
- This option provides the flexibility to work well with other potential improvements. For example the following improvements could be made in addition to providing the truck staging area: relocate Customs Brokerage or Commercial Vehicle Operation (CVO) improvements. The roadway between the truck staging area and the border will be well suited for Automated Vehicle Identification (AVI), video camera surveillance, License Plate Readers (LPR) and other Intelligent Transportation Systems (ITS) initiatives designed specifically for commercial vehicles.

<u>Disadvantages</u>

- High capital cost for the construction of the truck staging area and improvements to the 4th Avenue intersection.
- A large piece of private property will have to be purchased (this property is currently for sale).
- The truck staging area will move the Customs Brokerage parking a short distance further away from the existing brokerage offices.
- Canada Customs and Revenue Agency (CCRA) have expressed concern that the southbound commercial vehicle traffic is moved further away from their building, and new approach passes through the existing CCRA holding area for seized vehicles.

6.2.3 Provide a Commercial Vehicle Staging Area North of Duty Free Store – Access from Highway 11 Figure 6b

This option proposes a commercial vehicle staging area in the same location as the previous option; however, the access to and from the staging area has changed. Access to and from the staging area would be provided between the Huntingdon Duty Free Store and the Southern Railway Crossing on Highway 11. The Ingress to the Huntingdon Duty Free store will have to be relocated to the south to provide room for the access.

The main advantage is the reduced capital cost when compared to the previous option, since the 4th Avenue intersection would not be improved. However, many of the Advantages presented in the previous option would not be realized, and they are presented as disadvantages below.

<u>Benefits</u>

- The capital costs are less than the previous option while reducing congestion queuing and delay for both commercial and passenger vehicles.
- The border approaches for the south bound commercial vehicle traffic remains close to the CCRA building.

Disadvantages

- Commercial vehicles may still block access to or interfere with the ingress and egress of customers to and from the Huntingdon Duty Free Store.
- Possible queuing to the US Customs inspection booth may interfere with passenger vehicle operations.
- The commercial vehicle traffic approaching the border crossing remains closer to the Huntingdon residential area than in the previous option.
- The commercial vehicle traffic approaching the border would be uncontrolled and it would be more difficult to implement CVO improvements such as AVIs and LPRs.
- Security may still be compromised with passenger and commercial vehicle traffic intermingling north of the border.
- It would be difficult to prevent commercial vehicles from parking in front of the Duty Free Store, as they do now. Enforcement would have to be provided to prevent this from happening, otherwise the current disruption to the border traffic may persist.
- The existing deficiencies at the 4th Avenue intersection would not be resolved. Large commercial vehicles have been observed turning at this intersection, and there have been complaints from the public that this intersection is unsafe.

6.2.4 Provide a Commercial Vehicle Staging Area at 3rd Avenue West off Highway 11
Figure 6c

Properties to the west of Highway 11, off of 3rd Avenue, are currently for sale. Commercial vehicles requiring brokerage services would be directed into a truck staging area located to the west of Highway 11. The area is small and capable of storing up to 14 commercial vehicles. The commercial vehicles would exit directly onto Highway 11 prior to the railway crossing.

Advantages

- Resolves the major operational problem of commercial vehicles blocking all access to the border as long as the demand for Customs Brokerage parking is less than 14 stalls.
- Commercial vehicles requiring brokerage services will be removed from Highway 11.

- Reduces congestion, delay and queuing for both commercial vehicles and passenger vehicles.

Disadvantages

- High capital costs.
- Property acquisition may be problematic. More than one property owner would be affected and not all of the properties are for sale.
- Access to and from the parking stalls is not ideal. Commercial vehicles will have to back out of some of the parking stalls.
- The demand for Customs Brokerage Parking would soon exceed the 14 parking stalls that could be provided. Congestion and delay problems will reappear once the parking demand exceeds capacity.
- Commercial vehicles may still block access to or interfere with the ingress and egress of customers to and from the Huntingdon Duty Free Store.
- Possible queuing to the US Customs inspection booth may interfere with passenger vehicle operations.
- The commercial vehicle approach to the border would be uncontrolled and it would be more difficult to implement CVO improvements such as AVIs and LPRs.
- Security may still be compromised with passenger and commercial vehicle traffic intermingling north of the border.
- Enforcement may be a problem since truck drivers may decide not to park in the truck staging area but continue to park close to the border off of Highway 11 as they do now.

6.2.5 Deploy Commissionaires

Commissionaires would be deployed to manage the flow of southbound traffic under the existing laning configuration. Commissionaires can not issue parking tickets but would provide the following services:

- Ensure that commercial vehicles requiring brokerage services remain in the outside lane and keep the inside lane clear for passenger vehicles and commercial vehicles not requiring brokerage services.
- Direct commercial vehicles to vacant parking areas.
- Ensure that access to the Duty Free and other “No Stopping” areas remains clear.
- Assist drivers who are not aware of the Customs brokerage procedures or locations.

Commissionaires may also be used for the staging area in the absence of active signing. Commissionaires would direct drivers to available parking spaces in the pull-through parking areas.

Advantages

- Small improvement to the flow and management of southbound commercial vehicles.
- Ingress and egress to and from the Huntingdon Duty Free Store would be improved.

Disadvantages

- The management of commercial vehicle flow is not a direct responsibility of Canada or U.S. Customs. With budget constraints, funding for commissionaire staff may be limited.
- Life cylce costs would be high to hire and maintain commissionaire staff.
- Improvements to traffic operations would be minimal since the customs brokerage parking demand presently exceeds available parking, and it is anticipated that the demand will continue to grow.
- The queuing to the US Customs inspection booth would remain unchanged and inadequate.
- Commissionaires are unable to enforce compliance.

6.2.6 Unmanned Crossing at West Railway Street

Commercial vehicles would be directed down 4th Avenue and down West Railway Street to an unmanned crossing. The vehicles may include pre-cleared, empty or low risk loads such as trucks travelling to the IKO shingle mill located on Bob Mitchell Way. ITS transponders and gates may be used to control access across the border.

Advantages

- Reduces the volume of trucks at the inspection booths by separating trucks that require the services of a Customs broker from pre-cleared and empty trucks.
- Provides a segregated route for trucks enrolled in a future ITS/CVO system.

Disadvantages

- The security threat of an unmanned border crossing will likely eliminate this option.
- Capital costs for new roads connecting the unmanned border crossing.
- Does not address the main cause of border congestion and delay, which is attributed to the blockage of commercial and passenger vehicle traffic by stopped by commercial vehicles.

6.2.7 Second US Customs Truck Booth

Currently, only a single US Customs booth processes southbound commercial vehicles. A second commercial vehicle booth may be provided adjacent to the existing booth. A reallocation of staff or additional staff will be required to process the vehicles.

Advantages

- Doubles the existing truck processing capacity.
- Reduces delay and queuing at US Customs truck booth. The queuing at the US Customs booth has become more of a problem due to the increased time required to process a commercial vehicle as a result of increased security measures.
- The Customs Brokerage parking on Highway 11 will not be impacted by queuing at US truck inspection.
- The commercial vehicle traffic could be separated into two lanes, one lane for each booth. One lane could be for empty and low risk pre-cleared trucks, and the other lane for trucks with customs brokerage paperwork. This may improve efficiency and processing times at US Customs.

Disadvantages

- Capital costs for a new truck inspection booth.
- Additional staff is required.
- Does not address a major cause of border congestion and delay, which is attributed to the blockage of commercial and passenger vehicle traffic by commercial vehicles stopped for Customs Brokers.
- The commercial vehicle approach to the border would be uncontrolled and it would still be difficult to implement CVO improvements such as AVIs and LPRs.

- Security may still be compromised with passenger and commercial vehicle traffic intermingling north of the border.

6.2.8 Relocate Truck Inspection Booth

Relocate the truck inspection booth into the City of Sumas to increase the vehicle storage capacity. A potential location is south of the Tavern building. A commercial vehicle staging area for Customs Brokerage could also be provided south of the Canada/US border.

<u>Advantages</u>

- Providing an adequately large commercial vehicle staging area south of the border resolves the major operational problem of commercial vehicles blocking all access to the border.
- Reduces congestion, delay and queuing for both commercial vehicles and passenger vehicles.
- Provides additional room for queuing at the truck inspection booth.

<u>Disadvantages</u>

- High capital cost to relocate the US truck inspection facility and to construct a commercial vehicle truck staging area.
- Property acquisition may be required.
- This option is not compliant with the present policy of requiring Customs Brokerage paperwork to be completed prior to entering the US.
- Allowing all commercial vehicles to cross the border without any checks or restrictions further jeopardizes border security.
- The queuing to the US Customs inspection booth would remain unchanged and inadequate.

6.2.9 Off-Site Inspection Site

Commercial vehicles requiring inspection would be directed to a controlled, off-site inspection site. Vehicles could be monitored by cameras to ensure that they report to the designated area. Potential sites include vacant areas within the City of Sumas and along Bob Mitchell Way.

Advantages

- Reduces delay and queuing at US truck inspection, although the reductions may be minimal.
- Lessens the impact of the queuing at US truck inspection on the customs brokerage parking on Highway 11.

Disadvantages

- Does not address the main cause of border congestion and delay, which is attributed to the blockage of commercial and passenger vehicle traffic by commercial vehicles stopping for customs brokers.
- Property acquisition may be required.
- Existing problems with security, Huntingdon Duty Free store, and implementation of ITS initiatives are not addressed.

6.2.10 International Plaza, Joint Canada-U.S. Facility

The existing Canada Customs and U.S. Customs buildings would be combined into a single facility. Human resources may be shared. Any surplus area would be utilized as vehicle lanes or vehicle storage areas.

Advantages

- Potential for increased efficiencies.
- Potential for improved border security.
- Potential for improved border traffic operations.

Disadvantages

- Very high capital costs. Complete redesign and reconstruction of border facilities.
- Laws and policies regulating Canadian and American border operations will have to be changed. Changes would have to be made at the senior government level for this option to proceed.
- This option would take a long time to implement.

6.2.11 Increase in the Proportion of Pre-cleared Trucks

Trucks carrying pre-cleared shipments do not need the services of a customs broker and thus do not need to stop at the border.

Shippers who want to pre-clear their shipments must obtain a “line release” from U.S. Customs. Line releases are intended primarily for high volume, low risk shipments. Consequently, significant restrictions are currently placed on shippers who want a line release. For example, U.S. Customs requires that a minimum of 50 virtually identical shipments per year be shipped through a single port to qualify for a line release. The line release is then valid for only the specified shipment and port. In practice, most bulk shipments qualify for line releases.

Advantages

- Reduced demand for customs brokerage parking resulting in less congestion, delay and queuing at the border crossing.
- Inexpensive option that is already implemented.

Disadvantages

- The effectiveness of this option to reduce congestion, delay and queuing is questionable since participation is voluntary.
- Analysis indicates that border congestion and delay, which is attributed to the blockage of commercial and passenger vehicle traffic by commercial vehicles stopping for Customs Brokers, will still persist. A large percentage of commercial vehicles do not qualify for line release.
- Existing problems with security, Huntingdon Duty Free store, and implementation of ITS initiatives are not addressed.

6.2.12 Implement NEXUS

The NEXUS program, which has a focus towards passenger vehicles, will allow participants to use dedicated commuter lanes and not be regularly subject to normal customs and immigration questioning. This will help reduce congestion and delays. Participants will be provided with a NEXUS card.

Advantages

- Increased mobility for frequent border users.
- Less passenger vehicle delay and queuing at the border.
- Improved security through identification and monitoring of NEXUS participants.

Disadvantages

- Currently not planned for Huntingdon/Sumas Border Crossing.
- Capital cost for new technology.
- Does not address the main cause of passenger vehicle border delay, which is attributed to blockage of passenger vehicles stopped by commercial vehicles, and more recently commercial vehicle queuing at the US Customs inspection booth.

6.2.13 Implement Advance Traveler Information System (ATIS)

ATIS will gather and disseminate delay times at the border crossings. Public information will be transmitted to Variable Message Signs (VMS), and will also be provided over the Internet and by automated voice messaging via the telephone. The delay information is currently directed towards passenger vehicles, however, in the future information may be provided that may be of interest to commercial vehicle drivers.

<u>Advantages</u>

- Less passenger vehicle delay and queuing at the border.
- May lessen commercial vehicle delay and queuing if information is provided regarding commercial vehicle operations.

<u>Disadvantages</u>

- Capital cost for new technology.
- Does not address the main cause of passenger vehicle border delay, which is attributed to blockage of passenger vehicles stopped by commercial vehicles, and more recently commercial vehicle queuing at the US Customs inspection booth.
- At this time ATIS does not provide commercial vehicle delay.

6.2.14 Wait Time Initiative

Work is currently underway to develop, design and implement a fully automated wait time system to monitor and report on commercial and traveler's' wait times at the Pacific Highway Border Crossing. A fully automated monitoring system is planned to properly manage border service standards and traffic delays and to enhance security. Preliminary plans are for two or three field cameras and three monitors to be provided at each site. One of the cameras will enable customs staff to zoom in to car passengers or license plates for security reasons. A similar system could be developed and implemented at the Huntingdon/Sumas Border Crossing.

<u>Advantages</u>

- Improved security.
- Wait Time Initiative will complement ATIS.
- Valuable database will be established to assess and improve border operations in the future.

<u>Disadvantages</u>

- Capital cost for new technology.
- Does not address the main cause of passenger vehicle border delay, which is attributed to blockage of passenger vehicles stopped by commercial vehicles, and more recently commercial vehicle queuing at the US Customs inspection booth.

6.2.15 Implement Commercial Vehicle Operation (CVO)

Encourage commercial vehicles to be equipped with transponders. AVI would be located at select locations to read and track the commercial vehicles, and provide the data to Customs Inspection prior to their arrival. Commercial vehicles participating in the CVO project, will not have to use the services of customs brokers, but will head directly to the US Customs inspection booth. This will lessen the demand for parking at the commercial vehicle staging area.

It is anticipated that initial utilization of transponders by the trucking industry will be low, but the rate of adoption will increase as the benefit of the technology becomes better known. The utilization of transponders will eventually peak at approximately 60% of the commercial vehicles. This model is based on toll facilities around the world, which rely on onboard transponders. It usually takes approximately 10 years to achieve the maximum 60% utilization.

<u>Advantages</u>

- Improved security through identification and monitoring of commercial vehicles participating in CVO.
- Reduced delay and queuing by commercial vehicles.
- Reduced delay to passenger vehicles through less blocking of passenger vehicles by stopped commercial vehicles.

<u>Disadvantages</u>

- Capital cost for new technology.
- The new technology is still under development or only recently implemented at other border crossings.
- The level of acceptance and utilization of transponders by the trucking industry is uncertain. The shippers, carriers and the custom brokers are all required to participate in the use of the transponder technology.
- CVO transponder based options would provide long-term improvements as the technology is accepted and utilized, but the short-term queuing, delay and congestion would remain.
- A truck staging area would still be required since there would not be 100% utilization of transponder technology.

6.2.16 E-seals and Pre-Clear Commercial Vehicle Drivers

E-seals involve identifying the cargo using digital technology. A possible future program initiative is complementing the cargo and vehicle arrival information with driver information. Background checks would be completed on drivers. Ultimately the goal is to electronically identify the cargo, truck, and the driver.

Advantages

- Improved security through identification and monitoring of commercial vehicle, cargo and driver.
- Reduced delay and queuing by commercial vehicles.
- Reduced delay to passenger vehicles through less blocking of passenger vehicles by stopped commercial vehicles.

Disadvantages

- Capital cost for new technology.
- The new technology is still under development and not ready for implementation.
- Not all of the commercial vehicle drivers will be pre-cleared.
- Not all of the cargo will be E-seals.
- The utilization and acceptance of E-seals and Pre-Clearance of Drivers would be subject to the same limitations as transponders (see disadvantages for CVO).
- A truck staging area would still be required since there would not be 100% utilization.

6.2.17 Relocate Customs Brokers Closer

Relocate and consolidate brokerages to reduce the walking distance for southbound commercial vehicle drivers requiring processing.

Advantages

- Improved Safety.
- Slightly reduced delay and queuing by commercial vehicles.
- Space for Customs Brokerage offices could be provided with a new truck staging area.

Disadvantages

- Capital cost for new offices.
- It may be difficult to move offices from United States to Canada.
- It may be difficult for an American to work under Canadian rules and regulations.

6.2.18 Improve Paint Markings and Signing, Construct Sidewalk.

The current paint markings are old and faded, and the signing is old and may not be to current standards. Both could be improved. No stopping hatchmarks may be placed at the entrance to the Huntingdon Duty Free to discourage commercial vehicles from blocking the access.

Sidewalks and crosswalks should be provided along Highway 11 to improve the safety of pedestrian traffic at the border crossing. Sidewalks and crosswalks would also benefit truck drivers walking to and from the custom brokerage offices by providing positive guidance.

Advantages
- Low capital cost.
- Minor improvements to traffic operation.

Disadvantages
- Increased maintenance costs. Repainting the hatchmarks will be required on a frequent basis as the paint markings will fade.
- The congestion, delay and queuing at the border will remain unchanged without additional improvements.
- Does not address the main cause of passenger vehicle border delay, which is attributed to blockage of passenger vehicles stopped by commercial vehicles, and more recently commercial vehicle queuing at the US Customs inspection booth.

6.3 Initial Screening

Preliminary screening using high level criteria is necessary to eliminate those options that are clearly not feasible. The high level criteria are:

- Cost
- Mobility
- Security
- Practicable

The screening process generally involves a qualitative assessment of the option based on the criteria above. A more detailed evaluation of the shortlist of alternatives is presented later in this report.

6.3.1 Cost

An initial qualitative assessment of the cost of each alternative was made. Alternatives that were considered too costly, or provided little benefit while incurring significant cost were eliminated. Consideration was given to life cycle costs, which included the initial capital cost, operating cost, and periodic rehabilitation cost.

6.3.2 Traffic Mobility

A qualitative assessment of improvements to border traffic mobility was made for each of the proposed alternatives. The alternatives were assessed in relation to the mobility deficiencies identified at the border. Consideration was given to the following: congestion, delay, queuing, safety, and access to Hutingdon Duty Free. Alternatives that did not address the deficiencies, or only provided minor improvements, were subsequently eliminated.

6.3.3 Security

Public and economic security is a priority for Canada and the U.S. However, security measures must be incorporated such that they do not hinder the efficient and effective operation of the border crossing. In the following document, “The Canada-U.S. Smart Border Declaration, Action Plan for Creating a Secure and Smart Border”, one pillar of support is providing secure infrastructure. This pillar proposes infrastructure improvements and the incorporation of ITS.

6.3.4 Practicable

A qualitative assessment of the practicality of each alternative was made. Consideration was given to customer service, social/community and environmental impacts, and legislative challenges. Timing was also considered, since the alternatives must be consistent with existing plans and policy initiatives. Alternatives that were deemed not practicable were eliminated.

The results of the initial screening is presented in Table 6a. Each alternative was evaluated and either accepted or rejected for a more detailed qualitative and quantitative analysis. In addition, alternatives that clearly provided advantages to the project, which were small in scope and did not preclude other options were recommended for implementation without further analysis.

Table 6a – Huntingdon Sumas Border Crossing
Initial Screening of Improvement Options

Improvement Option	Status	Rationale
Extend Second Southbound Lane	✗ Rejected	• High cost, marginal benefits • Insufficient mobility
Commercial Vehicle Staging Area Access from 4th Ave.	✓ Accepted	• High cost, major benefits • Greatly improved mobility
Commercial Vehicle Staging Area Access from Highway 11	✓ Accepted	• High cost, major benefits • Improved mobility
Commercial Vehicle Staging Area At 3rd Ave West off Highway 11	✗ Rejected	• High cost, some benefits • Insufficient mobility
Deploy Commissionaires	✗ Rejected	• High life cycle cost • Insufficient mobility
Unmanned Crossing at West Railway Street	✗ Rejected	• High security threat • Insufficient mobility
Second US Truck Inspection Booth	✓ Accepted	• Moderate cost, marginal benefits • Improved mobility
Relocate Truck Inspection Booth	✗ Rejected	• High cost, marginal benefits • Improved mobility • Not practical - Legislation
Off-Site Inspection Site	✗ Rejected	• High cost, marginal benefits • Moderately improved mobility
International Plaza, Joint Canada-US Facility	✗ Rejected	• High cost • Not practical - Legislation
Increase Proportion of Pre-cleared Trucks	✓ Recommended [1]	• Low cost, moderate benefits • Moderately improved mobility
Utilize NEXUS Dedicated Commuter Lane	✗ Rejected [2]	• Moderate cost, marginal benefits • Insufficient mobility
Implement Advance Traveler Information system	✗ Rejected	• Moderate cost, marginal benefits • Insufficient mobility
Wait Time Initiative	✗ Rejected	• Moderate cost, marginal benefits • Insufficient mobility
Implement Commercial Vehicle Operation	✓ Accepted	• Moderate cost, marginal benefits • Improved mobility
E-seals and Pre-clear Commercial Vehicle Drivers	✗ Rejected	• Moderate cost, marginal benefits • Improved mobility
Relocate Customs Brokers	✓ Accepted	• Moderate cost, marginal benefits • Improved mobility
Improve Paint Markings and Signing	✓ Recommended [1]	• Low cost, marginal benefits • Moderately improved mobility

Notes:
1. Improvement option is recommended for implementation without further analysis.
2. The use of a NEXUS commuter lane should be reviewed when there is a demand for this service.

The initial screening has resulted in the rejection of eleven improvement options, and the acceptance of five improvement options for further evaluation. The options rejected are not carried further in this study, but should be re-evaluated in future studies. The ITS options may be recommended in the future as the technology improves and the utilization becomes more widespread.

Two improvement options are recommended for implementation without further analysis. The first recommendation is to increase the use of pre-cleared trucks and the second is to improve the paint markings and signing. These are low cost options that will improve the safety and traffic mobility without compromising the implementation of other potential options.

References

The Canada-U.S. Smart Border Declaration, Action Plan for Creating a Secure and Smart Border (2001), Ottawa.

Wait Time Initiative Business Case (2002), Customs Branch, Ottawa.

7 TASK 6 – DETAILED EVALUATION OF SHORTLISTED ALTERNATIVES

Task 6 involves both a qualitative and quantitative evaluation of the five improvement options carried forward from the initial screening of all of the options. The objective of the detailed evaluation is to assess the improvement options against a list of criteria. After the detailed evaluation, the task 7 report will provide recommendations regarding short-term and long-term improvements.

The criteria that are used for the detailed evaluation of the recommended options are as follows:

- Cost – Both capital cost and operations/maintenance costs are evaluated (All figures will be in Canadian Dollars unless otherwise noted).
- Traffic Impact – The improvement options are evaluated on how they improve safety, reduce queue lengths, delay, and congestion, and on how overall traffic mobility is improved at the border.
- Environmental Impact – An assessment of the impacts on drainage, watercourses, vegetation and other elements of the natural environment is made.
- Geotechnical Issues – The significant geotechnical issues and constraints that may preclude development of the option are examined.
- Land Use Impact – A qualitative assessment is made on how well the improvement options fit with the current land use.
- Property Impact – The property impacts and the amount of new right-of-way is discussed for each option.
- Social/Community Impact – A qualitative assessment of the social/community impact of the improvement options is made, including public acceptance of the improvement option.
- Ease of Implementation – Will the improvement option require multi-agency coordination and agreement, or could operational changes made by a public agency limit the effectiveness of the improvement option?

7.1 Provide a Commercial Vehicle Staging Area North of the Duty Free Store – Access from 4th Avenue Figure 6a

All commercial vehicles would be directed off of Highway 11, onto 4th Avenue, and into a new staging area north of the duty free store. Commercial vehicles requiring brokerage services would stop in the truck staging parking stalls. The commercial vehicles would exit the staging area along a new roadway behind the duty free store.

Cost:

A Class "C" cost for this improvement option is estimated to be $3.5 million. The operation/maintenance costs would be minimal. The truck staging area would be illuminated and an upgraded railway crossing of 4th Avenue with flashing lights and movable gates would be required.

Traffic Impact:

This option would provide substantial improvements to border traffic mobility. Trucks parking on Highway 11 are a primary cause of southbound border delay and congestion. On occasion parked trucks have blocked all southbound access to the border crossing. It is estimated that 32 parking stalls will be required in 2021 for customs brokerage parking. This option has the capacity to provide 34 parking stalls.

Another cause of southbound congestion and delay is queuing at the US Customs truck booth. The queuing analysis indicates that the average truck queues will continue to grow as truck traffic is expected to increase. Homeland security is a major concern and US Customs has recently begun spending more time inspecting commercial vehicles crossing the border. Queuing at the US border will continue to grow, and this option provides a significant amount of queuing space before commercial vehicles would impact on the general-purpose traffic heading to the border, or the local traffic in the area.

Two lanes would be provided from the southern end of the truck staging area to the Canada/US border crossing. Each lane would cover a distance of 180 metres and a total of 14 large tractor-semitrailors (24 metres long) could be queued in this area. The truck staging area extends another 240 m towards 4th Avenue and another 10 large tractor-semitrailors could queue in this area without blocking access to the parking stalls. In summary, a total of 24 large tractor-semitrailors could be queued to the US truck inspection booth without negatively impacting the 4th Avenue or Highway 11 traffic, and still enable access to the truck parking stalls.

Delay would be reduced for both the commercial vehicle traffic and the general-purpose traffic. On occasion there have been large delays, sometimes exceeding 45 minutes, when access to the border has been stopped by parked commercial vehicles. The ample number of parking stalls in the truck staging area will eliminate these large delays.

Southbound traffic on Highway 11 often interferes with the mobility of the residents in the Huntingdon community, including city buses. This improvement option would greatly lessen the southbound queues on Highway 11, thus improving access for the local residents. Commercial vehicles have on occasion dropped off their trailors for pick-up by another carrier on the local streets in the

Huntingdon community. The truck staging area would allow drop-off and pick-up of the trailors without negatively impacting the local community.

Safety would also be improved since the large queues presently result in risk taking. Frustrated drivers have been observed driving on narrow shoulders, or in the opposing lane of traffic to access the local roads. Large commercial vehicles have been observed turning at the 4th Avenue and Highway 11 intersection. The poor geometrics of this intersection have resulted in trucks driving over the curb and encroaching into the opposing lanes as they make their turn. Numerous complaints have been made to the MoT district office as vehicle collisions have been narrowly avoided. This option proposes to improve this intersection by providing proper channelization and lane widths for the turning movements of the commercial vehicles.

The owner of the Huntingdon Duty Free Store favours this option for a truck staging area since it would improve the traffic operations for his business. Commercial vehicles presently parking and queuing at the border interfere with the ingress and egress of his customers. By relocating the commercial vehicle access to the west side of the duty free store, customers off of Highway 11 would be provided direct access to the store.

CCRA have expressed concern that this option moves the southbound commercial vehicle traffic further away from their building and through their parking area for seized cars. These concerns may be mitigated possibly with closed circuit television cameras so the CCRA staff can still monitor the commercial vehicles from their building. There may be surplus land on Highway 11, infront of the Huntingdon Duty Free Store, that may be used to park seized vehicles. Another issue that needs to be resolved during detailed design is how will commercial vehicles, which are refused entry into Canada, going to be directed back to the US.

Environmental Impact:

There are no watercourses located within the property identified as the potential truck staging area. A consultant was hired to undertake a preliminary environmental investigation of the subject property. The preliminary fisheries and wildlife report indicated that there are no significant issues that would preclude development of the property as a truck staging area. A small amount of compensation may be required for loss of trees, which is estimated to cost $20,000. The environmental compensation cost is already included in the cost estimate.

The subject property was investigated for contaminants originating from the nearby railways. No significant amounts of contaminants were found.

Geotechnical Issues:

A MoT geotechnical engineer undertook a site visit and has provided preliminary comments. There are no significant geotechnical issues that would preclude development of a truck staging area. The groundwater is near the surface, which will limit sub-excavation and may make construction more difficult. The soils in the area are generally soft silts and sands, and it is expected that there would be approximately 150 mm of primary settlement. Preloading of the truck staging area will likely be required to speed up the settlement prior to paving. Either a flexible or rigid pavement option could be used for the pavement structure. The flexible pavement option was used for the cost estimate since this option results in the lower capital cost.

Land Use Impact:

This option for a truck staging area would fit well with the existing land use of the surrounding area. The property identified for the truck staging area is bordered by railways on the west side, the Huntingdon Duty Free store on the south side, and small commercial businesses adjacent to Highway 11 and 4th Avenue on the east and north sides. The subject property is presently zoned industrial and the City of Abbotsford has indicated that the present zoning allows the property to be used as a truck staging area.

Property Impact:

This option for a truck staging area would require a substantial amount of right-of-way. The owner of the Huntingdon Duty Free Store also owns the land identified for the truck staging area, and a portion of the this property near 4th Avenue is currently for sale. The owner has seen Figure 6a and has expressed an interest in selling the subject property to advance this option to design and construction.

A small amount of property would also be required at the Highway 11 and 4th Avenue intersection. Most of the property in this area is currently owned by the MoT, with the exception of the northwest quadrant of the intersection, which is privately owned.

Social/Community Impact:

A public open house presentation of the improvement options has not been made to the residents of the Huntingdon community. This task will likely be completed by a consultant as part of a detail design assignment. The public meeting will be made early in the design assignment, before the project moves to the design drawing stage. The City of Abbotsford has indicated their strong preference for the option presented in Figure 6a, and support construction of this option at the earliest possible date.

It is expected there would be strong public acceptance of this option. This option moves the commercial vehicle traffic further to the west, away from the Huntingdon residential community. There would be less noise and air pollution for the people living in the Huntingdon community. The local residents would also welcome the improved traffic operations at the border, which improve their access to and from the Huntingdon community.

Ease of Implementation:

This option would be fairly easy to implement since almost all of the work is situated entirely on the Canadian side of the border, and requires the coordination and approvals of Canadian public agencies. Changes on the US side of the border would be minimal.

Operational changes at US Customs could still negatively impact the traffic operations at the border even if this option is constructed. However, the impacts to the southbound traffic and the residents of Huntingdon would still be less than if no improvements were made as a result of the increased storage provided for commercial vehicles.

The benefits resulting from the construction of this option could be improved upon by the implementation of other options, and this option does not eliminate other options from consideration.

7.2 Provide a Commercial Vehicle Staging Area North of the Duty Free Store – Access from Highway 11 Figure 6b

Commercial vehicles having to stop and use the services of customs brokers would be directed to a truck staging area north of the Huntingdon Duty Free Store. Access to the truck staging area would be provided by a right-in and right-out off of Highway 11. Access to the border for both the commercial vehicle traffic and the general-purpose traffic would remain largely unchanged.

Cost:

A Class "C" cost for this improvement option is estimated to be $2.1 million. The operation/maintenance costs would be minimal. The truck staging area would be illuminated, which would require a small budget for operational/maintenance costs.

Traffic Impact:

A primary cause of southbound border delay and congestion is caused by trucks parking to use customs brokers. It is estimated that 32 parking stalls will be required in 2021 for customs brokerage parking. This option has the capacity to provide 28 parking stalls. Although parking will be provided in the proposed truck staging area, nothing will prevent commercial vehicles from parking on Highway 11, infront of the Huntingdon Duty Free store, as they do now.

This option does not provide any additional queuing space for southbound commercial vehicles. Queuing at the US Customs truck inspection booth will continue to grow as truck volumes are projected to increase and as processing times increase to perform inspections.

Queuing could be provided for two lanes of trucks from the proposed right-in/right-out off of Highway 11 to the US border. Approximately 11 large tractor-semitrailors could be lined up in this queue. However, trucks may still park in this area as the drivers use the services of customs brokers so the amount of queuing space could be significantly reduced. Additional queuing space is available from the right-in/right-out off of Highway 11, north to the 4th Avenue intersection, in the Highway southbound shoulder lane. This distance is approximately 200 metres, which could provide storage for 8 large tractor-semitrailors. However, any commercial vehicle queuing on Highway 11 will lessen the available queuing space for general-purpose traffic and negatively impact on the local traffic.

This improvement option would lessen the southbound queues on Highway 11 by providing customs brokerage parking. This would provide marginal improvements to the traffic in the Huntingdon community. The local residents would still encounter traffic disruptions, since queuing to the US Customs inspection booth will still extend down Highway 11.

Commercial vehicles have on occasion dropped their trailors for pick-up by another carrier on the local streets in the Huntingdon community. This truck staging area would allow drop-off and pick-up of the trailors in the parking area without negatively impacting the local community.

Safety would be marginally improved since the large queues presently result in risk taking. Frustrated drivers have been observed driving on narrow shoulders, or in the opposing lane of traffic to access the local side roads, would be reduced. However, this option does not improve the 4th Avenue and Highway 11 intersection, where commercial vehicles have been observed turning onto Highway 11. The poor geometrics of this intersection have resulted in trucks driving over the curb and encroaching into the opposing lanes as they make their turn. Numerous complaints have been made to the MoT district office as vehicle collisions have been narrowly avoided.

Access to and from the Huntingdon Duty Free Store would be marginally improved since congestion on Highway 11 in front of the store would be reduced. However, commercial vehicle queuing would still extend to the Huntingdon Duty Free Store and interfere with the ingress and egress of the store’s customers.

CCRA may prefer this option since they have expressed concern that the Figure 6a option moves the southbound commercial vehicle traffic further away from their building and through their parking area for seized cars.

Environmental Impact:

Same as the Figure 6a option. Please refer to the previous discussion.

Geotechnical Issues:

Same as the Figure 6a option. Please refer to the previous discussion.

Land Use Impact:

Same as the Figure 6a option. Please refer to the previous discussion.

Property Impact:

This option for a truck staging area would require a substantial amount of right-of-way, which is owned by the owner of the Huntingdon Duty Free Store. The subject property is presently for sale, but the owner of the Huntingdon Duty Free Store favours the option presented in Figure 6a and property acquisition may be more difficult.

This option would not improve the Highway 11 and 4th Avenue intersection, therefore, no additional property acquisitions will be required.

Social/Community Impact:

The City of Abbotsford has indicated their strong preference for the option presented in Figure 6a and they are not as supportive of this improvement option.

It is expected that this improvement option would still receive public acceptance since the local residents would welcome the improved traffic operations at the border, and the marginal improvements to the traffic operations in the Huntingdon community. However, the traffic improvements are not as significant as the option presented in Figure 6a, and the commercial vehicle traffic would still travel on Highway 11 near the Huntingdon residential community. The noise and air pollution would remain largely unchanged.

Ease of Implementation:

This option would be easy to implement since all of the work is situated entirely on the Canadian side of the border and only requires the coordination and approvals of Canadian public agencies.

Operational changes at the US border facilities could still negatively impact the traffic operations at the border even if this option was to be constructed. The queuing for southbound traffic remains on Highway 11 and would only be marginally improved by the moving the customs brokerage parking to the new facility. Longer processing times at the US border facilities could easily use up the available queuing space, and long delays and queues on Highway 11 could still persist. The effectiveness of this improvement option is dependent on a good level-of-service at the US border facilities, much more so than the option presented in Figure 6a.

The benefits resulting from the construction of this option could be improved upon by the implementation of other options; This option does not eliminate other options from consideration.

7.3 Second US Customs Truck Booth

Currently, only a single US Customs booth processes southbound commercial vehicles. A second commercial vehicle booth may be provided adjacent to the existing booth. This improvement option could be constructed as a stand-alone improvement or in conjunction with a new truck staging area north of the Canada/US border.

Cost:

The approximate capital cost to construct a second southbound commercial vehicle booth is estimated to be $0.4 million to $0.6 million (US dollars). This figure was taken from the cost estimate prepared by Perteet Engineering to construct a second northbound commercial booth.

The annual operational and maintenance costs would be significant since additional staffing would be required from US Customs. A staff of two would likely be required with annual salaries and benefits costing approximately $150,000 (US dollars) per year.

Traffic Impact:

A second southbound US Customs truck booth would alleviate a lot of border congestion and delay resulting from commercial vehicles parking north of the border to process paperwork at the customs brokerage offices. Long queues and delays caused by parked trucks would still persist.

A second US Customs truck booth would significantly shorten the southbound queuing. As discussed previously, queuing to the US Customs truck booth is expected to grow as truck volumes increase, and US Customs has recently begun spending more time inspecting commercial vehicles to improve homeland security. The analysis in Task 4, Section 5.3 shows that a second US Customs truck booth would significantly lessen the average queue lengths and delay (in 2006 the average queues and delay would decrease from 6.7 trucks and 6.7 minutes to 0.2 trucks and 14 seconds). By 2011 a second US Customs truck booth is required otherwise the single truck booth would be over-saturated, and very large queues and delays would develop on a regular basis. It is important to note that the queuing analysis completed in Task 4, may underestimate the queuing at the US Customs truck booth since the average processing times may have increased.

The second US Customs truck booth would only provide minor short-term improvements to the traffic operations and mobility of the local residents in the Huntington community and for the ingress and egress of customers to the Huntington Duty Free Store. The queuing, delays and congestion caused by drivers parking their trucks while they process paperwork at the customs brokers offices would still persist. There would be virtually no safety improvements by implementing this option.

Environmental Impact:

It may be possible to construct a second US Customs truck booth within the present built-up area adjacent to the US facility. Even if some road widening were required, the environmental impacts would likely be minor, and not impact on any significant watercourse.

Geotechnical Issues:

Given that the present facility would only be expanded, there should be no significant geotechnical issues.

Land Use Impact:

The second US Customs truck booth would be located close the existing booth, away from the residential area of Sumas. The scope of the infrastructure improvements would be relatively small and fit well with the current land use in the area.

Property Impact:

It may be possible to fit the scope of the infrastructure improvements within the existing right-of-way, or only a small amount of new right-of-way may be required.

Social/Community Impact:

It is expected that this improvement option would receive public acceptance from the local residents in the Huntingdon area, since local residents would welcome all measures that would improve traffic operations at the border. The noise and air pollution for the local residents would marginally decrease as a result of less queuing and delay. As volumes increase and the need for increased capacity at US Customs increases, the social/community benefits of this option would also increase.

Ease of Implementation:

Since a second US Customs truck booth would require coordination and approvals by US government agencies, from a Canadian perspective, this improvement option may be difficult to implement. The effectiveness of a second US Customs truck booth is also dependent on the staffing levels provided, which are again controlled by a US government agency.

The benefits of a second US Customs truck booth would be greatly improved with the construction of a truck staging area as presented in Figure 6a or 6b. The truck staging area resolves the traffic problems resulting from the tucks parking along Highway 11, and as long as the second truck booth remains properly staffed, the second truck booth resolves the traffic queuing problems at the US Customs truck booth.

7.4 Implement Commercial Vehicles Operation (CVO)

Commercial vehicles would be equipped with transponders and not have to use customs brokers. Commercial vehicles would head directly to the US Customs truck booth.

Costs:

An inbound trucking processing system is currently in the development and construction phase for a small amount of inbound trucks to the Highway 15 Pacific Border Crossing. The budget for this work is $860,000 (US).

Traffic Impact:

Presently the technology is in the development and testing phase, and it is not ready for widespread use. The only trucks that will be able to use this technology at this time are inbound trucks. These are trucks that pick up their load at specific ports and head directly to the border crossing. The customs brokerage paperwork is also handled electronically so the trucks do not have to stop at the border, but head directly to US Customs. The truck data is presently not provided electronically to US Customs. Initially only a small number of commercial vehicles will use this technology and only at the Pacific Border Crossing.

Eventually it is planned that the truck data would be transmitted ahead to custom brokerage offices and government agencies, including US Customs. The demand for a truck staging area would be reduced, as fewer commercial vehicles are required to stop. Queuing at the US Customs truck booth would also be reduced since truck data would be provided in advance of the arrival of the commercial vehicle, which should improve processing times at US Customs.

This is a long-term improvement option that may provide significant improvements to the traffic operations at the Huntingdon/Sumas border crossing, but the technology is new and not ready for implementation at this border crossing. Most of the southbound trucks crossing the border at Huntingdon originate from the Fraser Valley or further east, and not from the major ports in the Greater Vancouver area. These trucks are presently not suitable for CVO implementation.

Even if the technology was ready for implementation at the Huntingdon/Sumas border crossing, there will always be a large number of trucks that will not carry transponders. A truck staging area would still be required since these trucks would still have to stop at the border crossing to complete their customs brokerage paperwork.

Environmental/Geotechnical:

There would be virtually no environmental impacts or geotechnical concerns.

Land Use/Property Impact:

This option would not change the land use, and may not require any additional property.

Social/Community Impact:

Although not ready for implementation at this time, CVO improvements would result in improved efficiencies, which would lessen border crossing delay, queuing and congestion. This will lessen noise and air pollution.

Ease of Implementation:

Implementation of CVO improvements requires the coordination and approvals of both US and Canadian government agencies, and the acceptance and utilization of the technology by the trucking industry and customs brokerage offices. It would be very difficult to implement CVO improvements to the Huntingdon/Sumas border crossing at this time.

7.5 Relocate Customs Brokers

Customs brokerage offices could be consolidated and relocated next to the proposed truck staging area as shown in Figure 6a or 6b. Southbound commercial vehicles presently park on the Canadian side of the border, and the drivers walk to and from the existing customs brokerage offices on the US side of the border. It would take less time to complete the paperwork if the customs brokerage offices were located close to where the commercial vehicles are required to stop.

A variation of this improvement option discussed at project team meetings proposed establishing a commercial processing centre next to the proposed truck staging area. The commercial processing centre would not be staffed, but would provide a direct telephone and fax connection to the existing customs brokerage offices. Drivers would fax their paperwork to the customs brokerage offices for processing, without leaving the truck staging area.

Costs:

The capital cost to provide a commercial processing centre would be relatively small, approximately $100,000. Although the centre would not be staffed, operating and maintenance costs may still be significant. The commercial processing centre would have to be serviced on a regular basis and vandalism may be a problem. Security cameras may be required.

The capital cost to relocate a customs brokerage office would be much higher. The operating and maintenance costs would also be much higher since additional staff members are required unless the existing offices are closed and relocated.

Traffic Impact:

This option would improve efficiencies and lessen the demand for commercial vehicle parking since it would not take as long to process the customs brokerage paperwork. The amount of time saved would be the time required to walk from the truck staging area to the present location of the customs brokerage offices and back to the truck (approximately 5 to 10 minutes). The truck staging area would still be required, but the improved efficiencies would lessen the number of parking stalls required.

Without a truck staging area this improvement option would be ineffective and the existing traffic problems would persist.

This improvement option would not provide any improvements to delay and queuing at the US Customs truck booth.

Safety would be improved since cross border pedestrian traffic would be reduced. Drivers would not have cross the border to travel to the customs brokerage offices.

Environmental Impact, Geotechnical Impact, Land Use Impact and Property Impact:

The relocated customs brokerage offices could be located in nearby existing buildings, and the commercial vehicle centre could be located in the proposed truck staging area. Consequently, this improvement option would have very little environmental, geotechnical, land use and property impacts.

Social/Community Impact:

It is expected that the public would accept this improvement option or remain neutral. The improved efficiencies would provide a small reduction in the noise and air pollution.

Ease of Implementation:

It may be very difficult to relocate customs brokerage offices from the US to the Canadian side of the border. This would involve approval from government agencies on both sides of the border. It may be difficult to obtain approval for staff to continue to live in the US and work in Canada, and the custom brokerage companies may not want to relocate their offices.

A commercial processing centre may have greater acceptance by the customs brokerage companies since their offices would remain at their present location. However, the customs brokerage offices must still change how they provide their services. Coordination and approvals are still required from government agencies on both sides of the border.

This option would improve the efficiencies for southbound commercial traffic, but would be virtually ineffective in relieving traffic delay, queuing and congestion as a stand-alone improvement.

8 TASK 7 – RECOMMENDED IMPROVEMENTS AND PHASING PLAN

Task 7 gives the recommended short-term and long-term improvement options. The support documentation for the improvements is provided in the preceding task reports. The timing and phasing of the short-term and long-term improvement options are discussed below.

Budgetary constraints may limit the scope of the improvement options. A brief discussion is also provided on reducing the scope of the improvement option while still providing most of the benefits.

8.1 Recommended Short-term Improvements

8.1.1 Commercial Vehicle Staging Area, Access from 4th Avenue Figure 6a

The primary short-term recommendation is for immediate detailed design and construction of the commercial vehicle staging area, with the southbound commercial vehicle access from 4th Avenue, as shown in Figure 6a. This is the only option that would provide immediate relief for the two main causes of southbound queuing, delay and congestion: (1) this option addresses the need for customs brokerage parking, and (2) this option provides additional queuing to the US Customs truck booth. The traffic operations would improve for both the southbound commercial vehicle traffic and general-purpose traffic. The traffic operations for the Huntingdon Duty Free Store and for the residents living in the Huntingdon residential area would also improve.

The City of Abottsford and the owner of the Huntingdon Duty Free Store have both expressed their preference to advance this improvement option, and it is anticipated that local public acceptance would be greatest for this improvement option.

Although increased delay at US Customs could still negatively impact on the southbound traffic operations, the construction of this improvement option would mitigate any disruptions at US Customs. Coordination and approvals of Canadian public agencies would be necessary, but approvals from US public agencies would not be required.

The $3.5 million (Canadian dollars) cost is higher than originally planned for a truck staging area. The scope of the work could be reduced, or some of the work could be deferred to a later date, while still providing most of the benefits.

The expected parking demand is for 23 parking stalls by 2011, and 32 parking stalls by 2021. Right-of-way could be secured at this time for the 34 parking stalls as shown in Figure 6a, but construction could be limited to 23 parking stalls to lessen the initial capital expenditure. The commercial vehicle yearly growth rates and parking demand are subject to a high degree of uncertainty, and the additional parking stalls would only be constructed when they are required.

8.1.2 Increase Proportion of Pre-cleared Trucks

Increasing the proportion of pre-cleared trucks will reduce the demand for customs brokers parking. The current BRASS system enables companies that routinely cross the border to obtain authorization to go directly to US Customs when crossing the border. The drivers are not required to go to the customs brokers offices to clear their cargo. It is recommended that utilization of BRASS, or a similar system, should be maximized to improve efficiencies.

It will still be necessary to provide a truck staging area for southbound traffic since many of the trucks crossing the border do not qualify for BRASS. However, companies that qualify should be identified and encouraged to apply for BRASS. The current requirements for BRASS may be reduced to enable more companies to participate in this program, but this is subject to the approval of the US regulatory agencies.

8.1.3 Improve Paint Markings and Signing

It is recommended that the signing and paint markings at the border be improved to current standards. This would provide minor improvements to safety and traffic operations. The truck staging area presented in Figure 6a would still be required.

8.2 Recommended Long-term Improvements

8.2.1 Second US Customs Truck Booth

A second US Customs truck booth would significantly shorten the southbound queuing to the truck booth and lessen the delay for commercial vehicles to cross the border. By 2011 a second US Customs truck booth is required otherwise very large queues and delays would develop on a regular basis. It is recommended that construction of a second US Customs truck booth be undertaken near 2006, and no later than 2011. The traffic queues and delays at the single US Customs booth should be monitored on a regular basis to determine when best to proceed with the second truck booth.

The construction of a second US Customs truck booth will still require a truck staging area for customs brokers parking.

8.2.2 Establish a Commercial Processing Center

A commercial processing center will lessen the demand for the number of parking stalls in the truck staging area. The time necessary for drivers to obtain the services of a custom broker would be reduced, since they would not have to walk to the brokerage offices on the US side of the border. It is recommended that after construction of the truck staging area shown in Figure 6a, planning begin on establishing a commercial processing center next to the truck staging area.

8.2.3 Commercial Vehicle Operations (CVO)

Implementing CVO improvements for the southbound commercial vehicle traffic could have long-term benefits. The technology is in the developmental and testing phases and is not ready for widespread use. As the technology improves the use of CVO improvements should be re-evaluated. CVO improvements would reduce the delay, queue lengths and congestion by improving the efficiencies at the border, but not all of the trucks would use the CVO technology, and the truck staging area shown in Figure 6a would still be required.

APPENDIX A
QUEUING ANALYSIS FOR TRUCK PARKING

Exhibit A1 - Huntingdon/Sumas Border Crossing
Queuing Analysis of Parking Demand for 2000

20 Minute Parking Demand

Arrival Rate **AR** (Tr/hr)	Service Rate **SR** (Tr/hr)	Utilisation **U=AR/SR**	No. of Service Channes **c**	No. of Trucks in System **n**	Formula **U^n/n!**	Formula **sum (U^n/n!)**	Probability of No Trucks **p0**	Probability of all servers full queue empty **pc**	Probability Truck will Wait **P(busy)**
20	3	6.7	1	0	1	1			
20	3	6.7	2	1	7	8			
20	3	6.7	3	2	22	30			
20	3	6.7	4	3	49	79			
20	3	6.7	5	4	82	162			
20	3	6.7	6	5	110	271			
20	3	6.7	7	6	122	393			
20	3	6.7	8	7	116	509			
20	3	6.7	9	8	97	606	0.11%	8.12%	31.33%
20	3	6.7	10	9	72	678	0.12%	5.82%	17.46%
20	**3**	**6.7**	**11**	**10**	**48**	**726**	**0.13%**	**3.62%**	**9.20%**
20	3	6.7	12	11	29	755	0.13%	2.03%	4.58%
20	3	6.7	13	12	16	771	0.13%	1.05%	2.15%
20	3	6.7	14	13	8	779	0.13%	0.50%	0.95%
20	3	6.7	15	14	4	783	0.13%	0.22%	0.40%
20	3	6.7	16	15	2	785	0.13%	0.09%	0.16%
20	3	6.7	17	16	1	785	0.13%	0.04%	0.06%
20	3	6.7	18	17	0	786	0.13%	0.01%	0.02%
20	3	6.7	19	18	0	786	0.13%	0.00%	0.01%
20	3	6.7	20	19	0	786	0.13%	0.00%	0.00%

Notes:	44 Trucks/hr	Design Hourly Volume for 2000
	20 Trucks/Hr	20min Parking Demand (46% of DHV)
	2 Trucks/Hr	45min Parking Demand (4% of DHV)

Exhibit A2 - Huntingdon/Sumas Border Crossing
Queuing Analysis of Parking Demand for 2000

45 Minute Parking Demand

Arrival Rate **AR** (Tr/hr)	Service Rate **SR** (Tr/hr)	Utilisation **U=AR/SR**	No. of Service Channes **c**	No. of Trucks in System **n**	Formula **U^n/n!**	Formula **sum (U^n/n!)**	Probability of No Trucks **p0**	Probability of all servers full queue empty **pc**	Probability Truck w ill Wait **P(busy)**
2	1.33	1.5	1	0	1	1			
2	1.33	1.5	2	1	2	3			
2	1.33	1.5	3	2	1	4	21.05%	11.84%	23.68%
2	**1.33**	**1.5**	**4**	**3**	**1**	**4**	**22.10%**	**4.66%**	**7.46%**
2	1.33	1.5	5	4	0	4	22.28%	1.41%	2.01%
2	1.33	1.5	6	5	0	4	22.31%	0.35%	0.47%
2	1.33	1.5	7	6	0	4	22.31%	0.08%	0.10%
2	1.33	1.5	8	7	0	4	22.31%	0.01%	0.02%
2	1.33	1.5	9	8	0	4	22.31%	0.00%	0.00%
2	1.33	1.5	10	9	0	4	22.31%	0.00%	0.00%

Notes:	44 Trucks/hr	Design Hourly Volume for 2000
	20 Trucks/Hr	20min Parking Demand (46% of DHV)
	2 Trucks/Hr	45min Parking Demand (4% of DHV)

Exhibit A3 - Huntingdon/Sumas Border Crossing
Queuing Analysis of Parking Demand for 2006

20 Minute Parking Demand

Arrival Rate **AR** (Tr/hr)	Service Rate **SR** (Tr/hr)	Utilisation **U=AR/SR**	No. of Service Channes **c**	No. of Trucks in System **n**	Formula **U^n/n!**	Formula **sum (U^n/n!)**	Probability of No Trucks **p0**	Probability of all servers full queue empty **pc**	Probability Truck w ill Wait **P(busy)**
29	3	9.7	1	0	1	1			
29	3	9.7	2	1	10	11			
29	3	9.7	3	2	47	57			
29	3	9.7	4	3	151	208			
29	3	9.7	5	4	364	572			
29	3	9.7	6	5	703	1275			
29	3	9.7	7	6	1133	2408			
29	3	9.7	8	7	1565	3973			
29	3	9.7	9	8	1891	5864			
29	3	9.7	10	9	2031	7895			
29	3	9.7	11	10	1963	9859			
29	3	9.7	12	11	1725	11584			
29	3	9.7	13	12	1390	12974			
29	**3**	**9.7**	**14**	**13**	**1034**	**14008**	**0.01%**	**4.37%**	**14.13%**
29	3	9.7	15	14	714	14721	0.01%	2.87%	8.08%
29	3	9.7	16	15	460	15181	0.01%	1.75%	4.42%
29	3	9.7	17	16	278	15459	0.01%	1.00%	2.31%
29	3	9.7	18	17	158	15617	0.01%	0.54%	1.16%
29	3	9.7	19	18	85	15702	0.01%	0.27%	0.56%
29	3	9.7	20	19	43	15745	0.01%	0.13%	0.26%

Notes:	63 Trucks/hr	Design Hourly Volume for 2006
	29 Trucks/Hr	20min Parking Demand (46% of DHV)
	3 Trucks/Hr	45min Parking Demand (4% of DHV)

Exhibit A4 - Huntingdon/Sumas Border Crossing
Queuing Analysis of Parking Demand for 2006

45 Minute Parking Demand

Arrival Rate **AR** (Tr/hr)	Service Rate **SR** (Tr/hr)	Utilisation **U=AR/SR**	No. of Service Channes **c**	No. of Trucks in System **n**	Formula **U^n/n!**	Formula **sum (U^n/n!)**	Probability of No Trucks **p0**	Probability of all servers full queue empty **pc**	Probability Truck will Wait **P(busy)**
3	1.33	2.25	1	0	1	1			
3	1.33	2.25	2	1	2	3			
3	1.33	2.25	3	2	3	6			
3	1.33	2.25	4	3	2	8	9.88%	10.55%	24.12%
3	**1.33**	**2.25**	**5**	**4**	**1**	**9**	**10.39%**	**4.99%**	**9.08%**
3	1.33	2.25	6	5	0	9	10.51%	1.89%	3.03%
3	1.33	2.25	7	6	0	9	10.53%	0.61%	0.90%
3	1.33	2.25	8	7	0	9	10.54%	0.17%	0.24%
3	1.33	2.25	9	8	0	9	10.54%	0.04%	0.06%
3	1.33	2.25	10	9	0	9	10.54%	0.01%	0.01%

Notes:	63 Trucks/hr	Design Hourly Volume for 2006
	29 Trucks/Hr	20min Parking Demand (46% of DHV)
	3 Trucks/Hr	45min Parking Demand (4% of DHV)

Exhibit A5 - Huntingdon/Sumas Border Crossing
Queuing Analysis of Parking Demand for 2011

20 Minute Parking Demand

Arrival Rate **AR** (Tr/hr)	Service Rate **SR** (Tr/hr)	Utilisation **U=AR/SR**	No. of Service Channes **c**	No. of Trucks in System **n**	Formula **U^n/n!**	Formula **sum (U^n/n!)**	Probability of No Trucks **p0**	Probability of all servers full queue empty **pc**	Probability Truck w ill Wait **P(busy)**
36	3	12	1	0	1	1			
36	3	12	2	1	12	13			
36	3	12	3	2	72	85			
36	3	12	4	3	288	373			
36	3	12	5	4	864	1237			
36	3	12	6	5	2074	3311			
36	3	12	7	6	4147	7458			
36	3	12	8	7	7109	14567			
36	3	12	9	8	10664	25232			
36	3	12	10	9	14219	39450			
36	3	12	11	10	17063	56513			
36	3	12	12	11	18614	75127			
36	3	12	13	12	18614	93741			
36	3	12	14	13	17182	110923			
36	3	12	15	14	14728	125651			
36	3	12	16	15	11782	137433	0.00%	5.11%	20.46%
36	**3**	**12**	**17**	**16**	**8837**	**146269**	**0.00%**	**3.72%**	**12.66%**
36	3	12	18	17	6238	152507	0.00%	2.52%	7.56%
36	3	12	19	18	4158	156665	0.00%	1.60%	4.35%
36	3	12	20	19	2626	159291	0.00%	0.97%	2.41%

Notes:	79 Trucks/hr	Design Hourly Volume for 2011
	36 Trucks/Hr	20min Parking Demand (46% of DHV)
	3 Trucks/Hr	45min Parking Demand (4% of DHV)

Exhibit A6 - Huntingdon/Sumas Border Crossing
Queuing Analysis of Parking Demand for 2011

45 Minute Parking Demand

Arrival Rate **AR** (Tr/hr)	Service Rate **SR** (Tr/hr)	Utilisation **U=AR/SR**	No. of Service Channes **c**	No. of Trucks in System **n**	Formula **U^n/n!**	Formula **sum (U^n/n!)**	Probability of No Trucks **p0**	Probability of all servers full queue empty **pc**	Probability Truck w ill Wait **P(busy)**
3	1.33	2.25	1	0	1	1			
3	1.33	2.25	2	1	2	3			
3	1.33	2.25	3	2	3	6			
3	1.33	2.25	4	3	2	8			
3	1.33	2.25	5	4	1	9	10.39%	4.99%	9.08%
3	**1.33**	**2.25**	**6**	**5**	**0**	**9**	**10.51%**	**1.89%**	**3.03%**
3	1.33	2.25	7	6	0	9	10.53%	0.61%	0.90%
3	1.33	2.25	8	7	0	9	10.54%	0.17%	0.24%
3	1.33	2.25	9	8	0	9	10.54%	0.04%	0.06%
3	1.33	2.25	10	9	0	9	10.54%	0.01%	0.01%
3	1.33	2.25	11	10	0	9	10.54%	0.00%	0.00%
3	1.33	2.25	12	11	0	9	10.54%	0.00%	0.00%

Notes:	79 Trucks/hr	Design Hourly Volume for 2011
	36 Trucks/Hr	20min Parking Demand (46% of DHV)
	3 Trucks/Hr	45min Parking Demand (4% of DHV)

Exhibit A7 - Huntingdon/Sumas Border Crossing
Queuing Analysis of Parking Demand for 2021
20 Minute Parking Demand

Arrival Rate **AR** (Tr/hr)	Service Rate **SR** (Tr/hr)	Utilisation **U=AR/SR**	No. of Service Channes **c**	No. of Trucks in System **n**	Formula **U^n/n!**	Formula **sum (U^n/n!)**	Probability of No Trucks **p0**	Probability of all servers full queue empty **pc**	Probability Truck will Wait **P(busy)**
58	3	19.3	1	0	1.000E+00	1.000E+00			
58	3	19.3	2	1	1.933E+01	2.033E+01			
58	3	19.3	3	2	1.869E+02	2.072E+02			
58	3	19.3	4	3	1.204E+03	1.412E+03			
58	3	19.3	5	4	5.821E+03	7.233E+03			
58	3	19.3	6	5	2.251E+04	2.974E+04			
58	3	19.3	7	6	7.253E+04	1.023E+05			
58	3	19.3	8	7	2.003E+05	3.026E+05			
58	3	19.3	9	8	4.841E+05	7.867E+05			
58	3	19.3	10	9	1.040E+06	1.827E+06			
58	3	19.3	11	10	2.011E+06	3.837E+06			
58	3	19.3	12	11	3.534E+06	7.371E+06			
58	3	19.3	13	12	5.693E+06	1.306E+07			
58	3	19.3	14	13	8.467E+06	2.153E+07			
58	3	19.3	15	14	1.169E+07	3.322E+07			
58	3	19.3	16	15	1.507E+07	4.829E+07			
58	3	19.3	17	16	1.821E+07	6.650E+07			
58	3	19.3	18	17	2.071E+07	8.721E+07			
58	3	19.3	19	18	2.224E+07	1.095E+08			
58	3	19.3	20	19	2.263E+07	1.321E+08			
58	3	19.3	21	20	2.188E+07	1.540E+08			
58	3	19.3	22	21	2.014E+07	1.741E+08			
58	3	19.3	23	22	1.770E+07	1.918E+08			
58	**3**	**19.3**	**24**	**23**	**1.488E+07**	**2.067E+08**	**0.00%**	**4.47%**	**22.97%**
58	3	19.3	25	24	1.199E+07	2.187E+08	0.00%	3.57%	15.75%
58	3	19.3	26	25	9.269E+06	2.279E+08	0.00%	2.70%	10.55%
58	3	19.3	27	26	6.892E+06	2.348E+08	0.00%	1.96%	6.89%
58	3	19.3	28	27	4.935E+06	2.398E+08	0.00%	1.36%	4.39%
58	3	19.3	29	28	3.408E+06	2.432E+08	0.00%	0.91%	2.73%
58	3	19.3	30	29	2.272E+06	2.454E+08	0.00%	0.59%	1.65%
58	3	19.3	31	30	1.464E+06	2.469E+08	0.00%	0.37%	0.97%
58	3	19.3	32	31	9.130E+05	2.478E+08	0.00%	0.22%	0.56%
58	3	19.3	33	32	5.516E+05	2.484E+08	0.00%	0.13%	0.31%
58	3	19.3	34	33	3.232E+05	2.487E+08	0.00%	0.07%	0.17%
58	3	19.3	35	34	1.838E+05	2.489E+08	0.00%	0.04%	0.09%
58	3	19.3	36	35	1.015E+05	2.490E+08	0.00%	0.02%	0.05%

Notes:	125 Trucks/hr	Design Hourly Volume for 2021
	58 Trucks/Hr	20min Parking Demand (46% of DHV)
	5 Trucks/Hr	45min Parking Demand (4% of DHV)

Exhibit A8 - Huntingdon/Sumas Border Crossing
Queuing Analysis of Parking Demand for 2021

45 Minute Parking Demand

Arrival Rate **AR** (Tr/hr)	Service Rate **SR** (Tr/hr)	Utilisation **U=AR/SR**	No. of Service Channes **c**	No. of Trucks in System **n**	Formula **U^n/n!**	Formula **sum (U^n/n!)**	Probability of No Trucks **p0**	Probability of all servers full queue empty **pc**	Probability Truck w ill Wait **P(busy)**
5	1.33	3.75	1	0	1	1			
5	1.33	3.75	2	1	4	5			
5	1.33	3.75	3	2	7	12			
5	1.33	3.75	4	3	9	21			
5	1.33	3.75	5	4	8	29			
5	1.33	3.75	6	5	6	35			
5	1.33	3.75	7	6	4	39	2.31%	4.78%	10.29%
5	**1.33**	**3.75**	**8**	**7**	**2**	**41**	**2.34%**	**2.27%**	**4.27%**
5	1.33	3.75	9	8	1	42	2.35%	0.95%	1.63%
5	1.33	3.75	10	9	0	42	2.35%	0.36%	0.57%
5	1.33	3.75	11	10	0	42	2.35%	0.12%	0.18%
5	1.33	3.75	12	11	0	42	2.35%	0.04%	0.06%
5	1.33	3.75	13	12	0	43	2.35%	0.01%	0.02%
5	1.33	3.75	14	13	0	43	2.35%	0.00%	0.00%

Notes:	125 Trucks/hr	Design Hourly Volume for 2021
	58 Trucks/Hr	20min Parking Demand (46% of DHV)
	5 Trucks/Hr	45min Parking Demand (4% of DHV)

APPENDIX B
QUEUING ANALYSIS AT U.S. CUSTOMS TRUCK BOOTH

Exhibit B1 - Huntingdon/Sumas Border Crossing
Queuing Analysis of US Customs Inspection
Present Day Data

Arrival Rate **AR** (Tr/hr)	Service Rate **SR** (Tr/hr)	Utilisation **U=AR/SR**	No. of Service Channes **c**	No. of Trucks in System **n**	Formula **U^n/n!**	Formula **sum (U^n/n!)**	Probability of No Trucks **p0**	Probability of all servers full queue empty **pc**	Probability Truck will Wait **P(busy)**	Mean No. Waiting to be Served **Lq**	Mean Time in System (Waiting & Service) **Ws (min)**	Mean Time Waiting to b Served **Wq (min)**
37	60	0.6	1	0	1	1	38.33%	23.64%	61.67%	1.0	2.6	1.61
37	60	0.6	2	1	1	2	52.87%	10.05%	14.53%	0.1	1.1	0.11
37	60	0.6	3	2	0	2	53.88%	2.11%	2.65%	0.0	1.0	0.01
37	60	0.6	4	3	0	2	53.97%	0.33%	0.38%	0.0	1.0	0.00
37	60	0.6	5	4	0	2	53.97%	0.04%	0.05%	0.0	1.0	0.00

Exhibit B2 - Huntingdon/Sumas Border Crossing
Queuing Analysis of US Customs Inspection
2006 Design Year

Arrival Rate **AR** (Tr/hr)	Service Rate **SR** (Tr/hr)	Utilisation **U=AR/SR**	No. of Service Channes **c**	No. of Trucks in System **n**	Formula **U^n/n!**	Formula **sum (U^n/n!)**	Probability of No Trucks **p0**	Probability of all servers full queue empty **pc**	Probability Truck will Wait **P(busy)**	Mean No. Waiting to be Served **Lq**	Mean Time in System (Waiting & Service) **Ws (min)**	Mean Time Waiting to b Served **Wq (min)**
53	60	0.9	1	0	1	1	11.67%	10.31%	88.33%	6.7	8.6	7.57
53	60	0.9	2	1	1	2	38.73%	15.11%	27.06%	0.2	1.2	0.24
53	60	0.9	3	2	0	2	41.05%	4.72%	6.68%	0.0	1.0	0.03
53	60	0.9	4	3	0	2	41.31%	1.05%	1.34%	0.0	1.0	0.00
53	60	0.9	5	4	0	2	41.34%	0.19%	0.23%	0.0	1.0	0.00

Exhibit B3 - Huntingdon/Sumas Border Crossing
Queuing Analysis of US Customs Inspection
2011 Design Year

Arrival Rate **AR** (Tr/hr)	Service Rate **SR** (Tr/hr)	Utilisation **U=AR/SR**	No. of Service Channes **c**	No. of Trucks in System **n**	Formula **U^n/n!**	Formula **sum (U^n/n!)**	Probability of No Trucks **p0**	Probability of all servers full queue empty **pc**	Probability Truck will Wait **P(busy)**	Mean No. Waiting to be Served **Lq**	Mean Time in System (Waiting & Service) **Ws (min)**	Mean Time Waiting to b Served **Wq (min)**
67	60	1.1	1	0	1	1						
67	60	1.1	2	1	1	2	28.34%	17.67%	40.01%	0.5	1.5	0.45
67	60	1.1	3	2	1	3	32.16%	7.46%	11.89%	0.1	1.1	0.06
67	60	1.1	4	3	0	3	32.66%	2.12%	2.94%	0.0	1.0	0.01
67	60	1.1	5	4	0	3	32.73%	0.47%	0.61%	0.0	1.0	0.00

Exhibit B4 - Huntingdon/Sumas Border Crossing
Queuing Analysis of US Customs Inspection
2021 Design Year

Arrival Rate **AR** (Tr/hr)	Service Rate **SR** (Tr/hr)	Utilisation **U=AR/SR**	No. of Service Channes **c**	No. of Trucks in System **n**	Formula **U^n/n!**	Formula **sum (U^n/n!)**	Probability of No Trucks **p0**	Probability of all servers full queue empty **pc**	Probability Truck will Wait **P(busy)**	Mean No. Waiting to be Served **Lq**	Mean Time in System (Waiting & Service) **Ws (min)**	Mean Time Waiting to b Served **Wq min**
105	60	1.8	1	0	1	1						
105	60	1.8	2	1	2	3	6.67%	10.21%	81.67%	5.7	4.3	3.27
105	60	1.8	3	2	2	4	15.56%	13.90%	33.37%	0.5	1.3	0.27
105	60	1.8	4	3	1	5	17.04%	6.66%	11.84%	0.1	1.1	0.05
105	60	1.8	5	4	0	6	17.31%	2.37%	3.64%	0.0	1.0	0.01

Exhibit B5 - Huntingdon/Sumas Border Crossing
Queuing Analysis of US Customs Inspection - 50% Increase in Inspection Times
Present Day Data

Arrival Rate **AR** (Tr/hr)	Service Rate **SR** (Tr/hr)	Utilisation **U=AR/SR**	No. of Service Channes **c**	No. of Trucks in System **n**	Formula **U^n/n!**	Formula **sum (U^n/n!)**	Probability of No Trucks **p0**	Probability of all servers full queue empty **pc**	Probability Truck will Wait **P(busy)**	Mean No. Waiting to be Served **Lq**	Mean Time in System (Waiting & Service) **Ws (min)**	Mean Time Waiting to b Served **Wq (min)**
37	40	0.9	1	0	1	1	7.50%	6.94%	92.50%	11.4	20.0	18.50
37	40	0.9	2	1	1	2	36.75%	15.72%	29.25%	0.3	1.9	0.41
37	40	0.9	3	2	0	2	39.32%	5.19%	7.50%	0.0	1.6	0.05
37	40	0.9	4	3	0	2	39.61%	1.21%	1.57%	0.0	1.5	0.01
37	40	0.9	5	4	0	3	39.65%	0.22%	0.27%	0.0	1.5	0.00

Exhibit B6 - Huntingdon/Sumas Border Crossing
Queuing Analysis of US Customs Inspection - 50% Increase in Inspection Times
2006 Design Year

Arrival Rate **AR** (Tr/hr)	Service Rate **SR** (Tr/hr)	Utilisation **U=AR/SR**	No. of Service Channes **c**	No. of Trucks in System **n**	Formula **U^n/n!**	Formula **sum (U^n/n!)**	Probability of No Trucks **p0**	Probability of all servers full queue empty **pc**	Probability Truck will Wait **P(busy)**	Mean No. Waiting to be Served **Lq**	Mean Time in System (Waiting & Service) **Ws (min)**	Mean Time Waiting to b Served **Wq (min)**
53	40	1.3	1	0	1	1						
53	40	1.3	2	1	1	2	20.30%	17.82%	52.80%	1.0	2.7	1.17
53	40	1.3	3	2	1	3	25.66%	9.95%	17.82%	0.1	1.7	0.16
53	40	1.3	4	3	0	4	26.44%	3.40%	5.08%	0.0	1.5	0.03
53	40	1.3	5	4	0	4	26.56%	0.90%	1.23%	0.0	1.5	0.01

Exhibit B7 - Huntingdon/Sumas Border Crossing
Queuing Analysis of US Customs Inspection - 50% Increase in Inspection Times
2011 Design Year

Arrival Rate **AR** (Tr/hr)	Service Rate **SR** (Tr/hr)	Utilisation **U=AR/SR**	No. of Service Channes **c**	No. of Trucks in System **n**	Formula **U^n/n!**	Formula **sum (U^n/n!)**	Probability of No Trucks **p0**	Probability of all servers full queue empty **pc**	Probability Truck will Wait **P(busy)**	Mean No. Waiting to be Served **Lq**	Mean Time in System (Waiting & Service) **Ws (min)**	Mean Time Waiting to b Served **Wq (min)**
67	40	1.7	1	0	1	1						
67	40	1.7	2	1	2	3	8.84%	12.41%	76.34%	3.9	5.0	3.52
67	40	1.7	3	2	1	4	17.09%	13.39%	30.31%	0.4	1.8	0.34
67	40	1.7	4	3	1	5	18.43%	6.05%	10.40%	0.1	1.6	0.07
67	40	1.7	5	4	0	5	18.68%	2.05%	3.09%	0.0	1.5	0.01

Exhibit B8 - Huntingdon/Sumas Border Crossing
Queuing Analysis of US Customs Inspection - 50% Increase in Inspection Times
2021 Design Year

Arrival Rate **AR** (Tr/hr)	Service Rate **SR** (Tr/hr)	Utilisation **U=AR/SR**	No. of Service Channes **c**	No. of Trucks in System **n**	Formula **U^n/n!**	Formula **sum (U^n/n!)**	Probability of No Trucks **p0**	Probability of all servers full queue empty **pc**	Probability Truck will Wait **P(busy)**	Mean No. Waiting to be Served **Lq**	Mean Time in System (Waiting & Service) **Ws (min)**	Mean Time Waiting to b Served **Wq min**
105	40	2.6	1	0	1	1						
105	40	2.6	2	1	3	4						
105	40	2.6	3	2	3	7	3.21%	9.67%	77.33%	5.4	4.6	3.09
105	40	2.6	4	3	3	10	6.31%	12.49%	36.33%	0.7	1.9	0.40
105	40	2.6	5	4	2	12	7.02%	7.29%	15.34%	0.2	1.6	0.10

Abbotsford-Sumas Border Improvement Project

Project Summary Technical Memorandum

Perteet Engineering, Inc.
Civil, Transportation and Surveying

Perteet Engineering, Inc.

Whatcom COUNCIL OF GOVERNMENTS

TO: Melissa Miller, Project Coordinator, Whatcom Council of Governments

FROM: Peter De Boldt, P.E., Project Manager, Perteet Engineering

DATE: November 21, 2002

RE: Summary Technical Memorandum
Abbotsford-Sumas Border Improvement Study (PEI No. 22009)

Introduction

The purpose of this memorandum is to summarize the work efforts of the Abbotsford-Sumas Border Crossing Improvement Project's northbound traffic evaluation of issues and possible solutions. This phase of the project was conducted in conjunction with a similar effort performed by the British Columbia Ministry of Transportation for southbound traffic at the border.

A Project Team consisting of the following individuals who provided valuable background information, technical direction, and product review oversaw the project.

- David Davidson – City of Sumas
- Melissa Miller – Whatcom Council of Governments
- Gordon Rogers – Whatcom Council of Governments
- Hugh Conroy - Whatcom Council of Governments
- Ian Miki – B.C. Ministry of Transportation
- Todd Harrison - Washington Department of Transportation
- D. Wayne Gordon - City of Abbotsford
- Ken Peck - U.S. Customs Service
- Trevor Davidson - Canada Customs & Revenue Agency
- Philip Davies - Transport Canada
- Garry Dickinson – Huntingdon Duty Free
- Maurizio Ponzini – B.C. Ministry of Transportation

The work was broken into work elements that produced a series of Technical Memoranda. These Technical Memoranda allowed the Project Team to review work products as the project progressed and to provide comments and input at critical stages of project development. Following is a summary of the different Technical Memoranda that were produced for the project:

- **Technical Memorandum 1 – Data Collection, Review and Needs Analysis.** This identified and summarized the different reports and studies that had already been conducted that related to the Abbotsford-Sumas border crossing. It also identified additional data needs necessary for this study.
- **Technical Memorandum 2 – Data Collection Summary.** A summary of the traffic counts, border crossing processing times collected for this study, and the on-site interviews performed.
- **Technical Memorandum 3 – Existing/Future Traffic Demand and Performance.** A determination and evaluation of existing (2001), 2006, and 2021 traffic demand and performance was conducted.
- **Technical Memorandum 4 – Design Charette Summary.** To help identify issues, and possible solutions to those issues for northbound traffic, a Design Charette was held in Sumas in May, 2002. This Memorandum summarized the results of that Design Charette, and helped shape the development of concepts to resolve issues of concern to the community.
- **Technical Memorandum 5 – Near- and Long-Term Improvement Concepts.** A variety of both near and long-term concepts were developed, along with their potential range of cost in this Technical Memorandum.
- **Technical Memorandum 6 – Concept Screening and Identification of Recommended Concepts.** This Technical Memorandum summarized results of screening the different concepts developed in Technical Memorandum 5, and provided recommendations on preferred concepts.

Each of the Technical Memoranda cited above are compiled and included as chapters in the following pages. They provide more detailed background on the project, and represent a basis upon which future actions can be built.

Recommendations

Based on the project work, one Near-Term Concept (NTC) and one Long-Term Concept (LTC) have been chosen as recommended concepts. With respect to Near-Term Concepts, the recommendation is to pursue NTC 1: Increased Border Staffing as the preferred concept. The increased staffing would consist of three new Full Time Employees (FTE's) in order to operate one additional booth. It is a unique solution due to the fact that it directly addresses the border queuing issues of both passenger and commercial vehicles, while reducing wait times for those crossing the border. It does assume that Canada Customs would have the flexibility of using the additional FTE's in either the commercial or passenger booths depending on demand. This concept meets almost all of the "Community/Stakeholder Impact" criteria identified in Technical Memorandum 6, has a low capital cost, and no right-of-way acquisition.

One drawback to NTC 1 is that it is dependent on the ability of the federal Canadian Government to fund the positions. NTC 1 would require Canada Customs to hire additional staff to occupy additional booths on a yearly basis. This solution may or may not be considered a long term solution due to the fact that there may not be any guarantee that Canada Customs would be able to staff the booths consistently in future years.

With respect to Long-Term Concepts, a combination of LTC 2 (Additional Passenger Car Queuing Space) and LTC 3 (Second Northbound Commercial Vehicle Booth) is recommended. The combination of these concepts would directly solve problems associated with both passenger and commercial vehicles. Together, LTC 2 and LTC 3 satisfy the majority of the "Community/Stakeholder Impacts" criteria cited in Technical Memorandum 6, and they have a relatively low capital cost. They also would have a relatively low amount of right-of-way purchase and environmental impact.

It is further recommended that if NTC 1 cannot be implemented, consideration be given to an accelerated schedule to implement the additional passenger car queuing space of LTC 2. Of all the other concepts considered, this concept would help address what currently appears to be the greatest community concern of vehicle queuing impacting other activities in downtown Sumas. If funding were made available, this concept could probably be operational within 1-1/2 to 2 years.

In closing, we are reminded that there are a wide variety of stakeholders impacted by the Abbotsford – Sumas border crossing. The recommended concepts for northbound traffic were chosen by trying to answer the questions of:

- How can each of the stakeholder's needs be met?
- How can concepts be implemented within a reasonable cost?
- How can concepts be implemented with minimal negative impact to the overall community of Sumas?

The recommended concepts, NTC 1 or a combination of LTC 2 and LTC 3, address problems associated with both passenger vehicles and commercial vehicles. These concepts are approximately mid-range in total cost (both capital and operational/maintenance), and satisfy most all of the criteria associated with the local community and stakeholders.

COUNCIL OF GOVERNMENTS

Abbotsford-Sumas Border Improvement Project

Technical Memorandum 1

Data Collection, Review and Needs Analysis

Perteet Engineering, Inc.
Civil, Transportation and Surveying

TO: Melissa Miller, Project Coordinator, Whatcom Council of Governments

FROM: Peter De Boldt, P.E., Project Manager, Perteet Engineering

DATE: REVISED August 12, 2002

RE: Data Collection, Review and Needs Analysis - Technical Memorandum 1
Abbotsford-Sumas Border Improvement Study (PEI No. 22009)

1 INTRODUCTION

The purpose of this memorandum is to summarize existing data collected regarding the Sumas-Huntingdon border crossing and to summarize the potential need for new data to be collected. The focus of this documentation effort is for northbound traffic (i.e. from the United State into Canada). A companion data collection and data needs analysis was conducted by the BC Ministry of Transportation for southbound traffic. Only information from that companion document particularly relevant to northbound traffic is repeated here.

The following gives an overview of the most relevant reports, studies, and data acquisition exercises that have been recently completed regarding the automobile traffic, commercial vehicle traffic and traffic operations at the Sumas/Huntingdon border crossing. Each relevant data set is documented separately in the following pages.

1.1 IMTC Cross-Border Trade and Travel Study Final Report (September 2001)

The objective of this report by Cambridge Systematics was to document trade and travel patterns at the U.S./Canada border crossings in Whatcom County. The Study implied that there was the opportunity to divert some traffic from the more heavily traveled border crossings in Whatcom County to Sumas to alleviate congestion at those other crossings.

An interesting piece of information was a table that identified shopping trips to Canada by U.S. residents. Significant portions of U.S. shoppers to Canada go to Abbotsford as documented in Table 1-1.

Table 1-1 – Shopping Trips to Canada (U.S. Residents)

Major Destination City	Summer Trips	Percentage	Fall Trips	Percentage
Abbotsford	308	25.5	424	24.5
Vancouver	202	16.7	541	31.3
Surrey	196	16.3	163	9.4
Richmond	158	13.1	157	9.1
White Rock	140	11.6	131	7.6
Langley	80	6.6	148	8.5
Aldergrove	N/A	--	114	6.6
Other	122	10.1	53	3.1
Total	**1,206**	**100.0**	**1,731**	**100.0**

Following are a few more “factoids” that were gleaned from the study:

- Northbound auto traffic at Sumas was found to peak in the afternoon just like most other crossings in Whatcom County. Truck traffic volumes were cited as generally constant throughout the mid-day. Figure 1-1 illustrates the time-of-day traffic patterns.

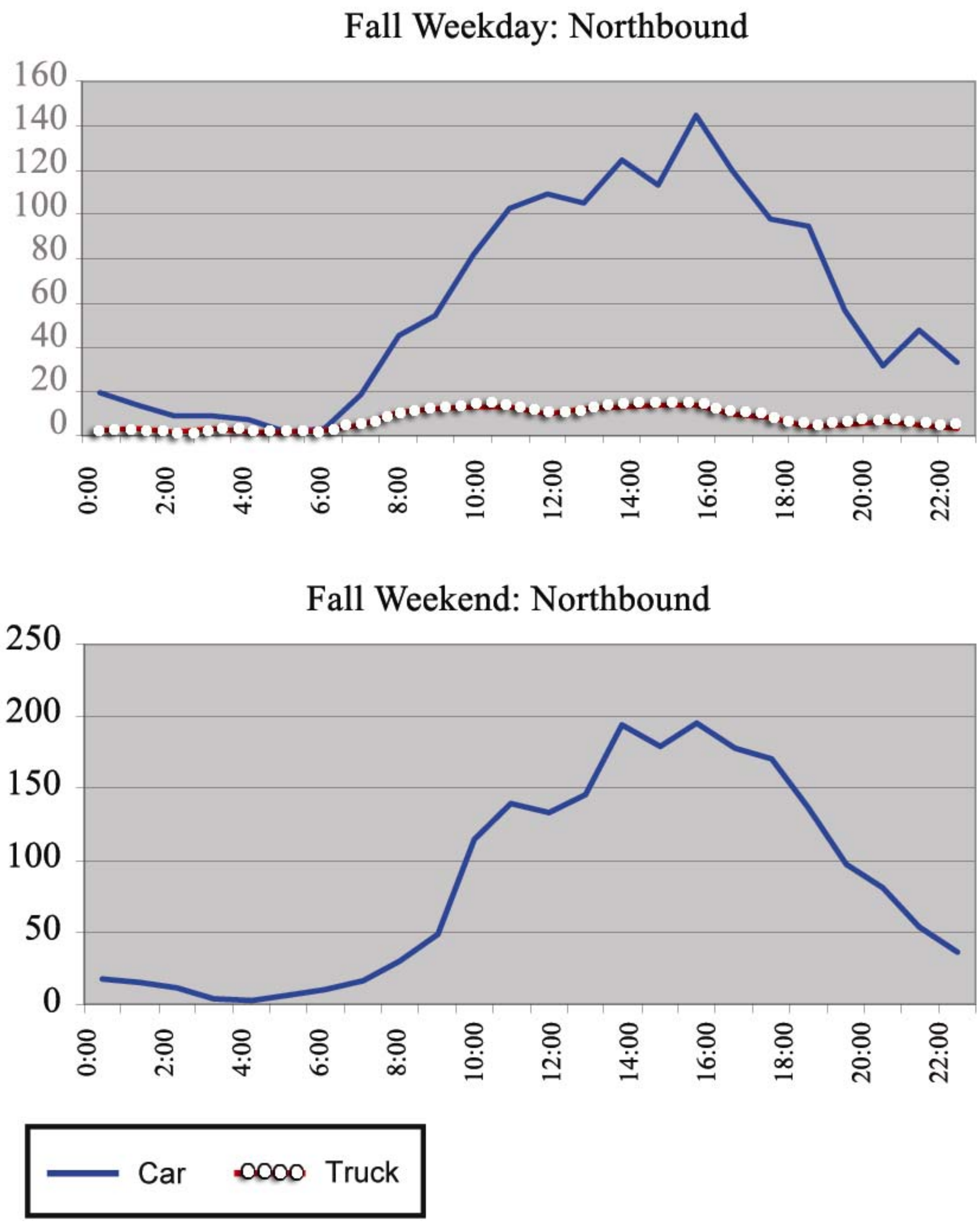


Figure 1-1 - Sumas/Huntingdon Border Crossing Time-of-Day Traffic Patterns

- Truck trips using the Sumas/Huntingdon crossing tended to have local origins and destinations in the Eastern Lower BC Mainland and Whatcom County. This is illustrated in Figure 1-2.

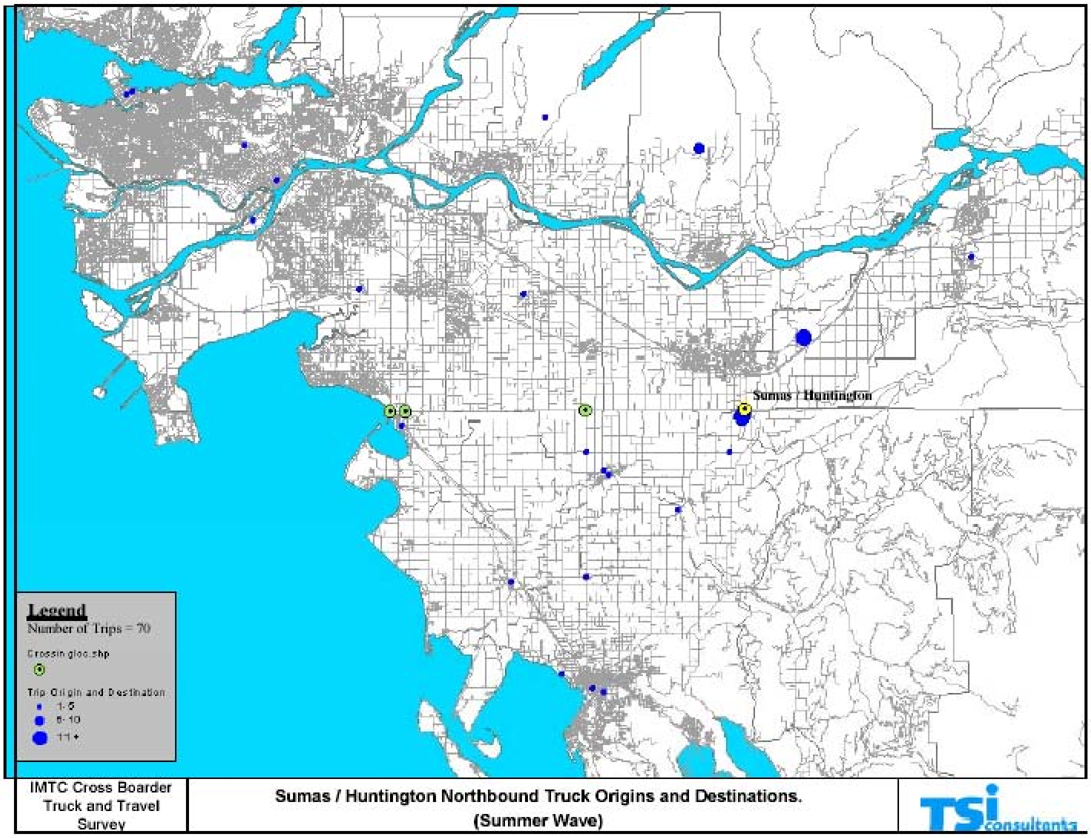


Figure 1-2 - Sumas/Huntingdon Border Crossing Northbound Truck Origins and Destinations

- The vast majority of both automobile and truck traffic (over 95%) using the Sumas/Huntingdon crossing were doing so because they considered it to be the "Fastest/Most Direct Route".
- Interestingly, the study concluded that trucks utilizing the Sumas/Huntingdon border crossing were unlikely to divert to an alternative because of the overall origin-destination patterns.
- HOV trips at the Sumas/Huntingdon crossing are relatively high when compared to the other Whatcom County crossings.
- Sumas was found to have a large percentage of repetitive truck trips. The majority of the repetitive trips occur between Whatcom County and the East Lower Mainland, and the Puget Sound and the East Lower Mainland. During the fall months, Sumas also has a significant percentage of repetitive trips made by trucks with an origin or destination outside the study area.

1.2 BC Lower Mainland Truck Inspection Site Analysis (July and September 2001)

The objective of this report by TSI and IBI Group was to assist in the development of a Truck Inspection Site Business Plan for the Lower Mainland south of the Fraser River. An EMME/2 Travel Demand Forecasting Model was developed to forecast the quantity of light and heavy truck trips, the origins and destinations of these truck trips, and the most likely route taken between these origins and destinations. The focus was to identify truck inspection sites, so the majority of the report focused on facilities north of the border. However, there was some information regarding external gateway forecasts in Chapter 3 for the Sumas/Huntingdon crossing. This information is summarized in Table 1-2. The projected ADT volumes show a volume based solely on demographics as well as a volume for the combination of demographics and a growth factor. This growth factor takes into account the trends within industry regarding containerization of goods.

Table 1-2 - Sumas/Huntingdon Border Crossing ADT Commercial Vehicle Volumes

Crossing	1999	2021 (based upon demographics	Annual Growth Rate	2021 (based upon demographics and factor)	Annual Growth Rate
Sumas/Huntingdon	1,000	1,500	2.2%	2,400	4.2%

1.3 British Columbia Lower Mainland Trade Corridor Border Projects (September, 2001)

The purpose of this Transport Canada report was to describe the border-crossing network in the Vancouver Lower Mainland area of British Columbia and provide an overview of current operational issues that are impacting trade. The focus of the report was on those issues and infrastructure requirements that are affecting trade. Relevant information for the northbound Sumas/Huntingdon crossing included documentation of both passenger vehicle and truck vehicle volumes. These are summarized in Table 1-3 below.

Table 1-3 - Sumas/Huntingdon Border Crossing Northbound Vehicle Volumes*

Year	Auto	Truck
1991	2,076,512	35,156
1992	1,656,119	42,152
1993	1,453,310	36,075
1994	1,247,947	47,842
1995	1,195,093	65,206
1996	1,123,014	70,664
1997	1,046,673	63,919
1998	834,749	60,210
1999	731,593	64,558
2000	732,263	63,093

**Note that other data sources have slightly different vehicle volume values (i.e. the 2002 International Mobility & Trade Corridor Project Resource Manual identified the northbound auto vehicle volume at the Sumas/Huntingdon crossing to be 733,163 rather than the 732,263 shown above.*

1.4 City of Sumas Border Crossing Traffic Study (1991)

This study by Kittelson and Associates evaluated traffic conditions in Sumas at a time when traffic volumes were significantly higher than they are today. The study documented an extreme peak of 1,113 automobiles and 10 trucks in the queue. An estimated 21,397 lane-feet of storage was necessary to accommodate this extreme queue. On a typical peak day, a queue of over 1,000 vehicles could develop requiring 10,150 lane-feet of storage. On an average day, queues did not typically exceed 300 vehicles that required 5,790 lane-feet of storage.

A majority of the trips heading northbound consisted of Canadian automobiles returning to Canada after short-duration (less than 24 hours) shopping trips to the City of Sumas.

The report evaluated a range of possible improvement alternatives to address the queue problems that existed. The Conclusions and Recommendations section of the report summarized the following six alternatives as being the most seriously considered:

- Removing parking on Cherry Street and re-striping to 2 northbound lanes and 1 southbound lane.
- Providing a truck-only access on Garfield Street and Sumas Avenue from Cherry Street to new truck crossing.
- Designating Sumas Avenue from Front Street to the border as SR 9.
- Designating Sumas Avenue from Front Street to the border as a truck route.

- Using the Port of Bellingham's private street as SR 9 and reconfiguring the United States Customs exit plaza – RCCE facility entry plaza to control potential conflicts.
- Providing a one-way system for SR 9 using Cherry Street northbound and Railroad Street southbound.
- Construction of queue storage area in the industrial land to the west of the City of Sumas CBD and metering vehicles from that queuing area into a controlled access roadway leading to the border.
- Provide an Eastern Bypass of the City of Sumas. Several subalternatives were suggested, but all use the existing Rock Road and Conchman Road right-of-way to Jones Road. From that point all used new and existing but unopened right-of-way's to reach the boarder crossing at Cherry Street.

Final recommendation of the study was that an Eastern Bypass should be implemented, even though it would have the greatest capital cost. The benefits cited were as follows:

- It was the only alternative that could handle the maximum queue.
- It could provide a unique opportunity for an existing traffic service facility (duty-free shop, Customs Export Control facility).
- It reserved land for a new border crossing locations if that unlikely circumstance were to occur.

1.5 2001 Border Reviews: Assessment of 7 International Border Crossings (Presentation on February 26, 2002)

This review was conducted by Robert E.L. Davis for the Federal Highway Adminstration (FHWA). Seven different border crossings between the U.S., Canada, and Mexico were evaluated. Three of the border crossings were on the U.S./Mexican border, and four were on the U.S./Canadian border. Following is the location of each crossing:

Mexican Border

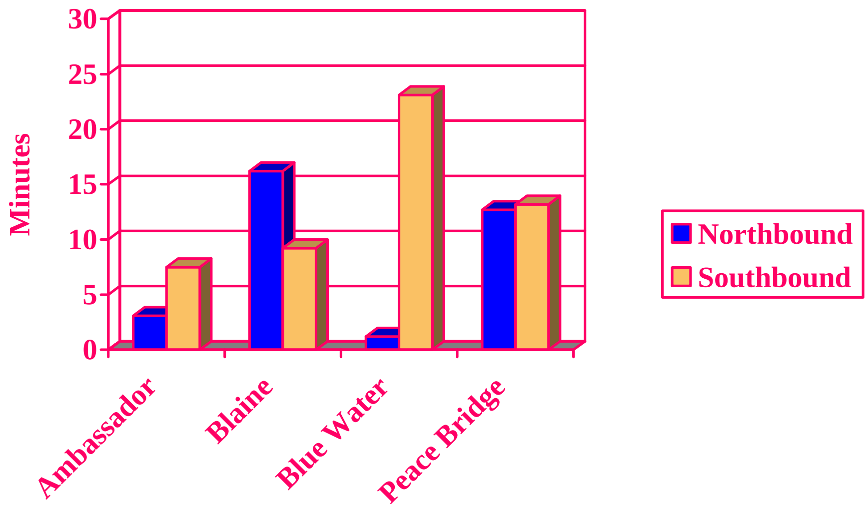
- Otay Mesa, California
- Zaragosa Bridge, El Paso, Texas
- Laredo, Texas (Bridge 4)

Canadian Border

- Ambassador Bridge, Detroit, Michigan
- Blue Water Bridge, Port Huron, Michigan
- Blaine, Washington
- Peace Bridge, Buffalo, New York

The following Table 1-4 illustrates average crossing times for northbound traffic at the Canadian border crossings:

Table 1-4 – Average Crossing Times for Canadian Border Crossings



Delay times for each site are included below in Table 1-5:

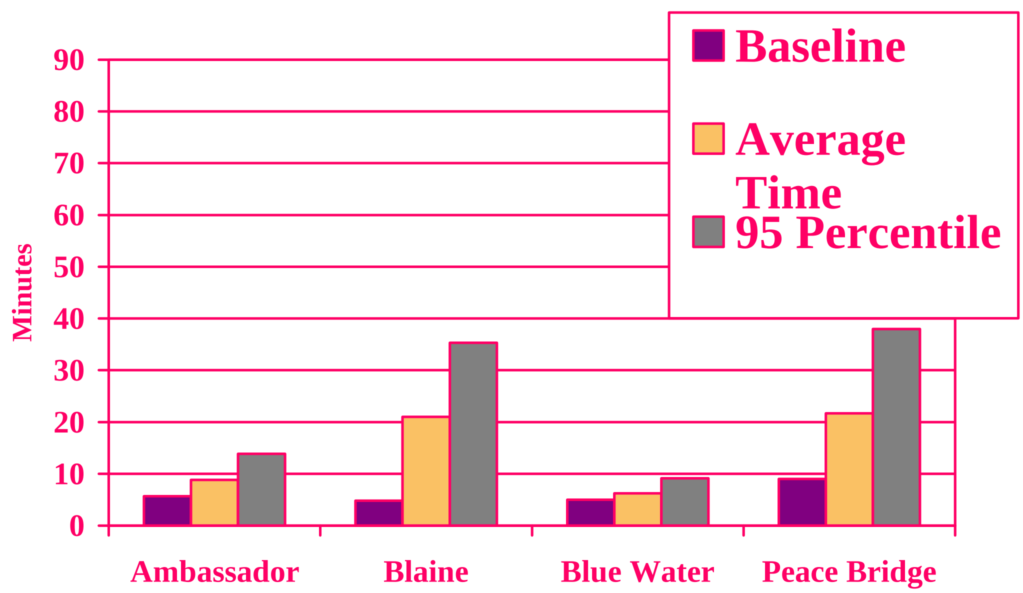


Table 1-5 – Delay Times for Canadian Border Crossings

This information is presented to illustrate the wide variance of crossing times at different locations. Specific data regarding volumes was not provided in the report.

1.6 Lower Mainland Border Crossing Commercial and Passenger Vehicle Forecasts, Prepared by TSI Consultants (February 2002)

The purpose of the TSI report was to describe existing commercial and passenger vehicle demand at the identified Lower BC Mainland border crossings, and to develop estimates of future demand for the horizon years of 2006 and 2011. This study used the International Mobility and Trade Corridor (IMTC) project database on the commercial and passenger vehicle movements at the Canada/US border crossings. The IMTC database was augmented with US Census commodity-flow data to enable forecasting of commercial and passenger vehicle volumes. This study involved the five crossings on the Canada/US border in the Lower BC Mainland:

- Peace Arch/Blaine (Highway 99);
- Pacific Highway/Blaine (Highway 15);
- Aldergrove/Lynden (Highway 13);
- Sumas/Huntingdon (Highway 11); and
- Point Roberts

It also provided an estimate of potential commercial vehicle diversion to Aldergrove Crossing if it were made a fully functional commercial vehicle crossing. This summary of the TSI report deals with the information relevant to the Sumas/Huntingdon border crossing. Salient conclusions from the study were:

- Commercial vehicle demand for the northbound Sumas/Huntingdon crossing grew at a rate of approximately 5% per year between 1991 and 2000.
- The peak demand for commercial vehicles is during a summer weekday.
- Approximately 31% of all northbound trucks are empty. Ninety percent of these trips have an origin and destination within Whatcom/Puget Sound and the Lower BC Mainland. The study concluded that an expedited clearance system for empty trucks that may potentially include techniques such as ITS and/or an "empty truck lane" warrants consideration.
- Based upon commodity-based forecasts, commercial vehicle demand is expected to continue to grow by over 5% per year toward the horizon year of 2011.
- If the Aldergrove Crossing were enhanced to become a fully functional commercial vehicle crossing and no significant improvements were made at other crossings, the demand at Aldergrove Crossing can be expected to increase due to diversion from other crossings.
- Passenger vehicle demand has decreased by over 40% since 1991. This was commonly attributed to the devaluation of the Canadian dollar relative to the U.S. dollar.
- Passenger vehicle demand is expected to increase at an annual rate of approximately 1.5%.

The total commercial vehicles (both northbound and southbound) processed by the Sumas/Huntingdon border crossing are shown in Table 1-6. Approximately 15% of the Lower BC Mainland commercial vehicle traffic crosses at the Sumas/Huntingdon border Crossing.

Table 1-6 - Sumas/Huntingdon Border Crossing

Year	Total Commercial Vehicle Volume
1991	93,000
1992	104,500
1993	114,700
1994	131,900
1995	159,600
1996	164,700
1997	153,800
1998	154,100
1999	182,600
2000	186,500

Typical summer weekday commercial vehicle demand experienced at the Sumas/Huntingdon border crossing during the year 2000 is shown in Table 1-7.

Table 1-7 - Sumas/Huntingdon Border Crossing
Peak Summer Weekday Commercial Vehicle Volume

	SB	NB	Total
Summer (August, 2000)	450	210	660
Winter (November, 2000)	430	170	600

The report noted that the Sumas/Huntingdon Border Crossing had a strong orientation for local trips that have an origin or destination in the Eastern Lower BC Mainland or Whatcom County. Over 60% of the trips have an origin in the Eastern Lower BC Mainland or Whatcom County. Over 50% have a destination in the same two sub-areas.

The TSI report also presents data regarding the content of the commercial traffic, by direction, for both the summer and winter seasons. Although other time periods were presented in the TSI report, only the Average Annual Daily Traffic (AADT) and the Summer Weekday Daily Traffic are reproduced in this study. The AADT gives an indication of the commercial traffic patterns throughout the year while the Summer Weekday Daily Traffic provides the commercial traffic composition during the peak period.

Passenger vehicle volumes at the Sumas/Huntingdon border crossing have declined from a peak in 1991. The decline is largely attributed to the devaluation of the Canadian dollar. Table 1-8 shows the passenger vehicle volume at the Sumas/Huntingdon border crossing from 1991 to 2000. The Sumas/Huntingdon border crossing carries approximately 17% of the total passenger vehicle demand of the five Lower Mainland border crossings.

Table 1-8 - Sumas/Huntingdon Border Crossing

Year	Passenger Vehicle Volume
1991	4,347,200
1992	3,640,600
1993	3,050,100
1994	2,585,600
1995	2,474,600
1996	2,341,400
1997	2,170,400
1998	1,716,800
1999	1,518,100
2000	1,550,800

Chapter 3 of the TSI report provides forecast of commercial vehicle volumes for the horizon years of 2006 and 2011. The commercial vehicle volume forecasts are based on forecasts of commodity flow over the border in both directions. It is important to note that the commodity flow over the border is dependent on many factors, such as: governmental policies, relative pricing, trade agreements, shifting markets, etc. and are therefore subject to risk and uncertainties.

The TSI report provides the forecast annual growth rates for the flow of commodities for the Canada/US Lower Mainland border crossings. From the predicted increase in commodity traffic, commercial vehicle volumes were forecast for the 2006 and 2011 horizon years and these are provided in Table 1-9 and Table 1-10.

Table 1-9 - Sumas/Huntingdon Border Crossing
2006 and 2011 AADT Forecast

	Commercial Vehicle Volume			Annual Growth Rate		
Direction	2000	2006	2011	00-06	06-11	00-11
NB	150	210	260	5.7%	4.2%	5.0%
SB	350	510	640	6.3%	4.6%	5.5%
Total	500	720	900	6.1%	4.5%	5.4%

Table 1-10 - Sumas/Huntingdon Border Crossing
2006 and 2011 Peak Summer Weekday Forecast

	Commercial Vehicle Volume			Annual Growth Rate		
Direction	**2000**	**2006**	**2011**	**00-06**	**06-11**	**00-11**
NB	210	290	360	6.0%	4.4%	5.3%
SB	450	650	810	6.1%	4.5%	5.4%
Total	660	940	1170	6.1%	4.5%	5.4%

Chapter 4 of the TSI report provides information regarding passenger vehicle volumes forecasts at the Canada/US border crossings. Passenger vehicle demand has diminished since 1991, but appears to have stabilized during the 1998 to 2000 time period. The TSI report assumed that the value of the Canadian dollar would not change significantly relative to the US dollar, and this would maintain the current stable demand. However, a significant change in the relative value of the currencies can significantly vary the cross border passenger vehicle demand; therefore, the forecast volumes are subject to high uncertainty. Table 1-11 provides the forecast passenger vehicle volume at the Sumas/Huntingdon border crossing.

Table 1-11 - Sumas/Huntingdon Border Crossing
2006 and 2011 Annual Passenger Vehicle Trips

	Passenger Vehicle Volume			Annual Growth Rate		
Direction	**2000**	**2006**	**2011**	**00-06**	**06-11**	**00-11**
NB	732,300	782,000	864,800	1.1%	2.0%	1.5%
SB	818,500	867,800	946,700	1.0%	1.8%	1.3%
Total	1,550,800	1,643,000	1,804,300	1.0%	1.9%	1.4%

The peak volume daily passenger vehicle trips occur on the weekend days, and Table 1-12 provides a summary of the forecast volumes.

Table 1-12 - Sumas/Huntingdon Border Crossing
2006 and 2011 Peak Daily Passenger Vehicle Trips

Direction	2000	2006	2011
NB	3,190	3,410	3,810
SB	3,350	3,760	4,090
Total	6,760	7,170	7,890

Chapter 5 of the TSI report evaluated commercial vehicle volumes based on potential diversion of commercial traffic from the Sumas/Huntingdon and Pacific crossings to the Aldergrove crossing. Table 1-13 documents the volumes anticipated for Sumas/Huntingdon if the Aldergrove Crossing were upgraded to be a functional commercial vehicle crossing and no significant improvements were made at the other crossings.

- "Base" = current volumes
- "Low" = resulting traffic volumes if "low" volumes of commercial traffic were diverted to Aldergrove
- "High" = resulting traffice volumes if "high" volumes of commercial traffic were diverted to Aldergrove

Table 1-13 - Sumas/Huntingdon Border Crossing
Commercial Vehicle Volumes with Aldergrove Diversion

Year	Estimate Range	Commercial Vehicle Volumes
2000	Base	660
2000	Low	530
2000	High	400
2006	Base	940
2006	Low	750
2006	High	560
2011	Base	1170
2011	Low	940
2011	High	710

1.7 Survey Summary Report, IMTC Commercial Vehicle Delay Survey Pacific Highway Washington-British Columbia Border Crossing Prepared by TSI Consultants (October 2001)

The purpose of the TSI survey was to identify and quantify systematically the various segments of the delay and travel time experienced by commercial vehicles crossing the international border at Pacific Highway. Although the survey data is not directly pertinent to the Sumas/Huntingdon crossing, the methodologies to acquire and analysis the data may be relevant to the data acquisition that will have to be done for the Sumas/Huntingdon border project.

The survey of the southbound and northbound commercial traffic was divided into three phases:

Phase1:	Study Initiation and Training
Phase 2A:	Data Collection – Southbound Traffic
Phase 2B:	Data Collection – Northbound Traffic
Phase 3:	Data Processing and Documentation

The delay was recorded with the use of mobile computing devices, commonly referred to as personal digital assistants (PDA).

The *delay* was defined as the elapsed travel time experienced by a commercial vehicle from the time the vehicle enters into a queue on the approaching roadway to the time when the vehicle is cleared to proceed at the customs kiosk. The total delay is made up of travel delay caused by roadway congestion, time expended for processing brokerage papers, and inspection and clearance time experienced at the customs kiosk.

The total southbound delay was segregated into the following segments:

Delay Segment 1: This segment applies to vehicles not requiring to stop and was measured as the elapsed time from when a vehicle first joins the queue (the point where a vehicle experienced significant slowdown or stoppage) to when the vehicle enters the kiosks at U.S. Customs.

Delay Segment 2-A: Segments 2-A, 2-B, and 2-C describes the delays experienced by vehicles requiring to stop to process paperwork. Segment 2-A is measured as the elapsed time from the start of the queue to stopping at a parking location.

Delay Segment 2-B: This segment is measured as the elapsed time a commercial vehicle remains parked while processing customs brokerage papers.

Delay Segment 2-C: This segment measured the elapsed time from when a commercial vehicle left its parking spot to when it arrived at the U.S. Customs kiosks.

Delay Segment 3: This is the time taken for a commercial vehicle to clear U.S. Customs at the kiosk.

A total of five surveyors and a supervisor were used to gather the delay data, and to record the extent of the queue on the Pacific Highway. One surveyor was stationed at the start of the queue, two at the parking locations and two at the U.S. Customs kiosks.

The entire front license plate was recorded at all of the survey stations. For vehicles with multiple license plates, the local license plate or the license plate nearest to the surveyor was recorded. Synchronized time stamps were automatically recorded in each of the PDA when the license plate data was entered. In addition to the license plate data, the following data was also collected:

- Vehicle classification data was collected at the first station as the vehicle entered the queue. The classification codes were consistent with those used in the IMTC Cross Border Trade and Travel Survey.
- Length of Queue.
- Occupancy of the available parking stalls.

Hourly volumes and vehicle arrival rates were calculated from the survey data.

The permanent count stations on the approach highways were used to estimate the peak periods to conduct the survey. The southbound survey was conducted on Wednesday, March 28th 2001 and Monday, April 2nd 2001 from 0630h to 1700h.

The southbound delay summary is provided in the TSI survey but it is not relevant to the Sumas/Huntingdon project. The average time spent parked while processing customs brokerage papers may be of relevance, and it was found to be 20.2 minutes.

1.8 Summary of Findings, 1999 Lower Mainland Truck Freight Study Translink Strategic Planning Department (July 2000)

The Lower Mainland Truck Freight Study investigated the trucking movements in the geographic area bounded by the US border to the south, the Straight of Georgia to the west, the Coast Range mountains to the north of the Fraser Valley, and the town of Hope to the east.

The Lower Mainland Truck Freight Study was divided into three main components, which are discussed below:

1. Origin/Destination Surveys

Surveys of three types of truck trips were conducted:

- Internal Trips – truck trips originating and terminating at points within the Lower Mainland. The internal trip survey does not provide relevant data regarding truck movements at the Sumas/Huntingdon border crossing.
- External Trips – truck trips originating or terminating at points outside of the Lower Mainland. The survey also included trips originating outside of the Lower Mainland and passing through the study area.
- Special Generator Trips – truck trips originating or terminating at discrete truck traffic generators, such as port terminals, the airports, and inter-modal rail facilities.

The study area was divided into eleven sub-areas. The sub-area bordering the Sumas/Huntingdon border crossing was designated Valley South. Much of the origin-destination information acquired dealt with trucking trips between the sub-areas and is not pertinent to the Sumas/Huntingdon border crossing.

Section 2.4 of the Lower Mainland Truck Freight Study deals with External Gateways and provides relevant information regarding the Sumas/Huntingdon border crossing.

The report states that approximately 500 trucks cross the Sumas/Huntingdon border crossing in each direction each day, for a combined total of 1,000 two-way trips per day. Approximately 52% of the trucks entering Canada are destined to Abbotsford and Chilliwack. Other major destinations are Mission and Pitt Meadows/Maple Ridge, which are served by the Highway 11 crossing of the Fraser River at Mission. The survey results also indicate that approximately 21% of the trucks entering the study area from the Sumas/Huntingdon border crossing leave the study area through the eastern gateways heading to the BC interior. The ultimate destinations of the through trips are the BC interior, Alaska or the rest of Canada. The destinations of truck trips using the Sumas/Huntingdon border crossing are given in Table 1-14.

Table 1-14 – Destinations of Trucks Entering the Lower Mainland Via Sumas/Huntingdon Border Crossing

Sub-Area	Destinations
Fraser Valley South	52%
Eastern Externals	21%
Fraser Valley North	15%
Pitt Meadows/Maple Ridge	12%
Burnaby/New Westminster/NE Sector	0%
Richmond	0%
North Delta/North Surrey	0%
South Delta	0%
Vancouver	0%
The Langleys	0%
Vancouver/Gulf Islands	0%
White Rock/South Surrey	0%
North Shore	0%
Highway 99 North	0%
Total	100%

2. Vehicle Volumes and Classification Survey

A major vehicle classification count program was completed at 75 locations throughout the study area during November 1999. Vehicles were classified into 10 different categories including light and heavy trucks.

Many of the count stations follow boundaries and are grouped together into screenlines. The object was to count all of the movements crossing the screenlines to get a representation of the truck movements in the Lower Mainland. One such screenline gathered the truck data at the following Canada/US border crossings:

- Highway 15 (Pacific Border Crossing);
- Highway 13 (Aldergrove Border Crossing);
- Highway 11 (Sumas/Huntingdon Border Crossing)

During the period 1985 to 1996, daily and PM peak hour total traffic volumes across this screenline grew by approximately 4% per year. From 1996 to 1999, daily traffic growth decreased by 7% per year. It is important to note that this decrease is attributed to a decline in passenger vehicles. The number of truck movements through the screenline has been increasing dramatically. The total truck volume at the three US border crossings has increased approximately 92% between 1991 and 1999, or 9% per year. Approximately 26% of the traffic at this screenline is made up of trucks, of which 16% are light trucks and 84% are heavy trucks.

1.9 IMTC International Mobility and Trade Corridor Project 2002 Resource Manual (March 2002)

The IMTC Project is a United States and Canadian coalition of businesses and government entities formed to jointly identify and pursue improvements to cross-border mobility in the Cascade Gateway.

The shared goal is improved mobility to better facilitate trade, transportation, and tourism with innovative improvements to infrastructure, operations, and technology.

The IMTC Resource Manual provides additional information regarding the IMTC resources, participants and projects. Background information is provided describing the increased pressures on the border crossings.

The IMTC Resource Manual provides the annual passenger vehicle and commercial vehicle crossings at the Sumas/Huntingdon border crossing, which are already documented in this report. Monthly passenger vehicle and commercial vehicle crossings are also presented for 2001 in the following Tables 1-15 and 1-16:

**Table 1-15 – Sumas/Huntingdon Border Crossing
Monthly Commercial Vehicle Volumes (2001)**

Year	Southbound	Northbound	Total
Jan	9,279	3,891	13,170
Feb	9,088	6,963	16,051
Mar	10,939	7,546	18,485
Apr	11,631	4,901	16,532
May	11,022	6,698	17,720
Jun	11,386	6,084	17,470
Jul	11,570	6,315	17,885
Aug	12,662	6,173	18,835
Sep	12,301	5,969	18,270
Oct	13,370	4,592	17,962
Nov	10,817	3,865	14,682
Dec	9,583	5,529	15,112
Total	133,648	68,526	202,174

**Table 1-16 – Sumas/Huntingdon Border Crossing
Monthly Passenger Vehicle Volumes (2001)**

Year	Southbound	Northbound	Total
Jan	53,948	51,017	104,965
Feb	51,550	49,255	100,805
Mar	58,764	56,465	115,229
Apr	61,845	58,854	120,699
May	67,903	62,369	130,272
Jun	70,810	64,868	135,678
Jul	83,290	77,720	161,010
Aug	91,801	79,665	171,466
Sep	61,986	45,897	107,883
Oct	51,620	34,373	85,993
Nov	42,102	33,258	75,360
Dec	44,142	38,587	82,729
Total	739,761	652,328	1,392,089

1.10 Data Needs Analysis

The reports and studies that have been completed provide a good description of the current and anticipated growth in commodity flow and commercial vehicle traffic at the Sumas/Huntingdon border crossing. The data that has been acquired will be used to estimate the commercial vehicle volumes for the analysis of the 2006 (short-term) and 2021 (long-term) improvement options.

The report and studies also provide a reasonably good description of the current operational problems at the Sumas/Huntingdon border crossing. However, additional information is required to fully document the operational problems at the border crossing, to generate a complete list of possible remedial proposals, and to properly evaluate proposed options. It is recommended that additional data collection activities include:

- Interview with the following stakeholders:
  - U.S. Customs
  - Canadian Customs
  - U.S. Immigration
  - City of Sumas
  - Customs brokerage operators
  - Duty Free store operators
  - Sumas Residents
  - Sumas Business owners along Cherry Street.
- Interview with IMTC members to generate ideas and evaluate the efficiencies to be gained by ITS initiatives.
- License plate survey of northbound commercial vehicles, with corresponding time stamps. This will track all commercial vehicles, in space and time, through the entire border crossing process. The license plate survey will provide the following necessary data:
  - Truck traffic arrival pattern during the hour and day.
  - Queue Lengths
  - Document the total delay when crossing the border.
  - Distribution of empty/pre-cleared trucks (trucks not requiring to stop) and trucks that are stopping (vehicle inspection and/or trucks requiring the services of customs brokers).
  - Document the length of time that trucks are stopped. This will be used to evaluate the requirement for a truck staging area.
  - Processing time of the trucks at the Canadian Customs border kiosks.
- Document additional operational problems. Additional operational problems may involve the following:
  - Signing and Pavement Markings.

- Access problems (local businesses, and local street network).
- Pedestrian movements.

A meeting will be held with the B.C. Ministry of Transportation to review the data needs and determine how to collect the additional data.

Whatcom
COUNCIL OF GOVERNMENTS

Abbotsford-Sumas Border Improvement Project

Technical Memorandum 2

Data Collection Summary

Perteet Engineering, Inc.
Civil, Transportation and Surveying

TO: Melissa Miller, Project Coordinator, Whatcom Council of Governments

FROM: Gina Parenteau, EIT, Design Engineer, Perteet Engineering
Peter De Boldt, P.E., Project Manager, Perteet Engineering

DATE: REVISED August 19, 2002

RE: Data Collection Summary - Technical Memorandum 2
Abbotsford-Sumas Border Improvement Study (PEI No. 22009)

Introduction

The purpose of this memorandum is to summarize new data collected regarding the Abbotsford-Sumas border crossing. Prior to collecting the new data, existing data (which consists of past studies and reports), was collected and reviewed. The past studies and reports included documentation of historical and projected traffic volumes. They did not however document much of the specific operational characteristics of the Abbotsford – Sumas border crossing. This memorandum documents new data that was collected via interviews with people involved with border crossing operations, as well as through site observation.

Existing Data

The majority of the existing studies and reports are not specific to the Abbotsford – Sumas border crossing. However, within these studies there are some vehicle volumes and volume growth rates that are specific to this crossing. The useful data that is specific to this crossing for northbound traffic is:

- Passenger vehicle volumes
- Commercial vehicle volumes
- Future passenger vehicle projections and growth rates
- Future commercial vehicle projections and growth rates

Additional Data

Need for Additional Data

In order to ultimately develop improvement options, it is necessary to understand the daily operations of Canada Customs and review the site-specific data regarding processing times and delay times as a result of those operations. Because each border crossing operates differently, it was important to get information that is specific to the Abbotsford – Sumas crossing. It is necessary to understand staffing, facilities configurations, customs broker operations and processing procedures. In order to model northbound traffic operations, it is necessary to know average times and ranges for processing times, brokerage visits and inspections. This information was collected during two site visits (April 23, 2002 and April 30, 2002). At this time, both operational and processing time data was gathered. Notes specific to both site visits are attached in Appendix A. Data collected at both site visits is attached in Appendix B.

Site Interviews

On two occasions, operational data was collected from Canada Customs. On April 23, 2002, Larry Vidito, Administrative Superintendent, of Canada Customs was interviewed. He provided operational information for both passenger vehicle operations and commercial vehicle operations. He also discussed average processing times and inspection times for passenger vehicles. Several times Larry said it is hard to give an "average" for processing and inspection times because there are so many variables that contribute to these activities.

The second opportunity to interview and collect data was on April 30, 2002. Trevor Davidson, Chief of Customs Operations, Canada Customs was interviewed. Trevor provided a tour of both the passenger and commercial vehicle facilities and explained the processing and inspection procedures for both. He gave his thoughts on processing and inspection times. He noted that it is hard to give an average for these times because each situation is different. At the primary booth there are variables which include the number of passengers in a vehicle, what type of identification they have, and how the inspector conducts the questioning, to name a few. If a passenger vehicle is sent to the inspection area, the times vary greatly because it is dependent on what they are stopping for. It may be because their identification is not in order, or the vehicle may have to actually be inspected.

Data Collection – Customs Processing Times

Statistics Canada (through the Whatcom Council of Governments) was able to provide both passenger vehicle volumes and commercial vehicle volumes for 13 months (April 2002 and prior). This data is included in Appendix C.

Based on the variance in the operations of Canada Customs and the variables related to the vehicles and drivers, it was determined that a sample of data was necessary for the modeling needs and the understanding of the project. A sample of processing times for passenger vehicles at the primary booth was taken on April 23, 2002. Data regarding processing times for commercial vehicles was collected on both April 23 and April 30, 2002. The data for both days is attached in Appendix B.

It was found that the commercial vehicle processing booth is not consistently open during the weekdays. The commercial vehicle building officially closes at 4 pm each weekday, and is closed on the weekends. When the commercial vehicle building is <u>open</u>, there is about a 50/50 chance that someone is in the processing booth. It all depends on staffing and how busy it is inside the building – daily, there is only three staff scheduled to work in the building. When the booth is closed, truckers must go inside the commercial vehicle building to get processed. After 4 pm, when the entire commercial vehicle building closes, trucks must park in the parking area just north of the border and drivers walk over and go inside the passenger vehicle building.

Following is a summary of the processing times collected:

Ave. Processing Time for Passenger Vehicles	48 seconds
Ave. Processing Time – Commercial Vehicles – processing at primary check point	42 seconds
Ave. Processing Time – Commercial Vehicles – processing inside commercial vehicle building	6 min. 57 sec.
Ave. Processing Time – Commercial Vehicles – processing inside passenger vehicle building	8 min. 0 sec.

Data Collection – Traffic Counts

Afternoon peak period turn movement traffic volumes were collected at several intersections around Sumas to gain a better understanding of current traffic patterns. These traffic counts were collected for the period between 2:00 and 4:00 p.m. to correlate with the peak period of traffic crossing the border northbound. The intersections for which data was collected are listed below.

- Halverstick Road and Bob Mitchell Way
- Garfield Street and Sumas Avenue
- Garfield Street and Cherry Street
- Front Street and Sumas Avenue
- Halverstick Street and Cherry Street

The data was collected on Tuesday, April 23rd, 2002. Traffic volumes at each of the intersections were relatively moderate. Details of the traffic counts are contained in Appendix D.

Summary

Collecting the operational and processing time data specific to the Abbotsford – Sumas crossing was critical to the success of this study. With these pieces of data, operational models can be developed for past, existing, and future operations and volumes, if necessary.

Both traffic volumes and the operations and staffing of the Canadian border crossing are directly affecting the queuing at the border. Understanding the data we have, combined with the impacts the community of Sumas and the trucking dependent businesses perceive as issues, is critical to arriving at the recommended solutions for this study.

Sumas Site Visit/Interview – 4/23/02

- Gina Parenteau, Perteet Engineering, Inc., met with Larry Vidito, Administrative Superintendent, Canada Customs. He conducted a tour of the border crossing area and discussed the processes for both cars and commercial vehicles crossing the border. He was very helpful answering any questions regarding operations. Following is a summary of what was discussed:

  PASSENGER VEHICLES
  - The checkpoint for passenger vehicles has five lanes, and has an additional lane for buses (six total lanes). It is rare that buses come through, and this lane is not held open. If a bus comes through, it stops and someone goes inside the building.
  - Normally only one car lane is open (far left lane) and <u>if they have the staff</u>, they will open a second lane if there is consistently about five vehicles waiting.
  - Very rarely do they have three car lanes open – maybe they will open up a third lane if two lanes are open and the vehicles are backing up to the stop sign (see map, this is about 460' from the checkpoint). He said this sometimes might happen if there is a U.S. holiday and people have been traveling.
  - Secondary car inspection – this has five lanes that can fit two cars in each lane or one recreational vehicle (ex: motor home).
  - He has never seen all secondary inspection spots filled. If all the spots were filled, and a car from the first checkpoint needed to be sent to inspection, they would have that car park off to the side – they would not delay vehicles in the first checkpoint because of a lack of space in the official parking area.
  - Queue lengths – in Larry's opinion, there is really no problem in the City of Sumas. A few years ago, there would be some long delays (blocks in length) for travelers due to locals who would cross the border, get gas or food, and then jump back in line. This would cause the travelers to not move because as people were cleared through the border, the locals would jump in the empty spots within the queue.
  - Peak Volume – in Larry's opinion, he thinks weekends are the busiest time, maybe between 5 to 9 p.m., especially on U.S. holidays.

  COMMERCIAL VEHICLES
  - Truck Inspection – there is one primary checkpoint lane. There are no designated parking "spots" for trucks, but there is a parking "area" just north of the border. Trucks are either cleared at the checkpoint, or they have to park and go inside the building.
  - If trucks need to visit a broker, they let the truck pass through the checkpoint and park and then the driver walks over to the broker.
  - If a truck needs to be "inspected" it is normally because their paperwork is not in order. Normally that takes an average of five minutes or so, but depending on the reason for inspection, it could range from five minutes to two hours. He really thinks it varies and doesn't think he could identify an average time.
  - There usually is not a line up of trucks prior to the checkpoint.

- Channelization and speed limits for the study area were noted and recorded on the plans.

- Approximately 2-1/2 hours was spent observing traffic at the border crossing – both passenger and commercial vehicles. Both passenger and commercial vehicle volumes were recorded as well as some of the time delays at the checkpoints. Following is a summary of the information:
  - In 54 minutes, approximately 83 passenger vehicles went through the checkpoint. It was noted that two of the vehicles timed were sent to secondary inspection and took longer to get through the checkpoint (ranging from 2:40 to 3:26). The average time at the checkpoint was 48 seconds for all vehicles, and 33 seconds excluding the vehicles that were sent to secondary inspection. On the average, 1 passenger vehicle approached the border every 52 seconds.
  - In 62 minutes, approximately 33 commercial vehicles went through the checkpoint. On the average, 1 commercial vehicle approached the border every 1 minute 53 seconds. During this time period, trucks were not being stopped at the checkpoint, but were driving past the checkpoint and parking, and the drivers were going inside to get cleared. Eleven trucks were timed from the point they stopped until they drove away. The average time they spent going inside and getting cleared was 3 minutes and 45 seconds.
- Other Notes:
  - Approaching the commercial vehicle crossing, there are two lanes for trucks (approximately 320') and a posted sign that says, "Trucks use right lane for parking – 30 minute limit". One lane eventually ends before it gets to the checkpoint, so there is only one lane that actually goes through the checkpoint.
  - Between Harrison Ave. and Garfield St., there is only one lane striped, but it is the width of two lanes, it's paved, and has a curb.
  - Brokers are within approximately 160' to 460' of the area where the trucks park.
  - The channelization for almost the entire study area is one lane in each direction, with the exception of the intersection of Cherry St. and Halverstick Rd.

Sumas Site Visit/Interview – 4/30/02

Gina Parenteau, Perteet Engineering, Inc. and Sanjeev Tandle, Perteet Engineering, Inc., met with Trevor Davidson, Chief of Customs Operations, Canada Customs. He said Canada Customs keeps a lot of the data that may be relevant to this study. He has volumes for passenger vehicles and commercial vehicles, delay times at the checkpoint for passenger vehicles, and the percentage of passenger vehicles and trucks that go to secondary inspection. He also has information on queues for passenger vehicles.

It was also found that the secondary inspection of passenger vehicles has no impact on the queue of the passenger vehicles – he said passenger vehicles would never be delayed through the first checkpoint if the secondary inspection parking area were full. Trevor said that in 30 years, he has never seen it full, and even if it did get full, they would take passenger vehicles that needed to be inspected to another parking lot or off to the side. He also said that even if secondary inspection times were used in a model, there is no "average" time, there is not a "range" that he would suggest using. Inspection times are extremely random and can range from 10 minutes to hours to days.

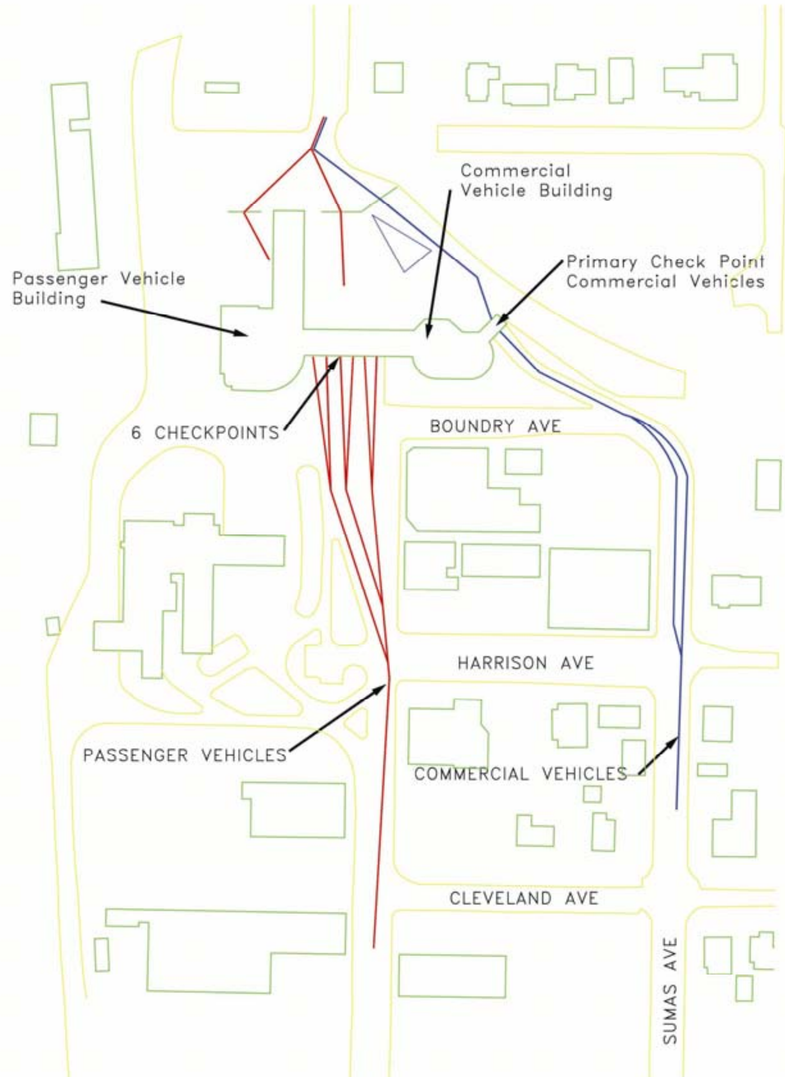
Operationally, it was also found that the commercial vehicle checkpoint is not consistently open during the weekdays. The commercial vehicle building officially closes at 4pm each weekday, and is closed on the weekends. Trucks must park in the parking area and drivers walk over and go inside the passenger vehicle building. When the commercial vehicle building is open, there is about a 50/50 chance that someone is in the checkpoint booth. It all depends on staffing and how busy it is inside the building –they only schedule three staff to work in the building.

Approximately four hours were spent collecting data regarding the delay times of commercial vehicles. The checkpoint was open for some of that time, and after it closed drivers had to go into the commercial vehicle building. After the commercial vehicle building closed (at 4 p.m.), drivers had to go to the passenger vehicle building. There is a sample of data for each scenario.

As an additional note, some Canadians who were being inspected offered some information. They said that about four years ago they remember that the lines were blocks long consistently. This was because of the value of the Canadian dollar in the U.S. and people would cross over just to shop. But now, they don't see these kinds of lines. One of the customs officers said he thinks that in the summer the queue is consistently backed up through the customs area on the weekdays, and on the weekends it backs up through the town for blocks.

Commercial Vehicles
Primary Checkpoint

Truck #	Delay (seconds)
1	34
2	20
3	41
4	45
5	40
6	33
7	130
8	102
9	36
10	25
11	22
12	47
13	2
14	51
15	41
16	9
Average	42 sec
BREAK IN DATA	
PRIMARY CHECKPOINT CLOSED	



Data collected from the Primary Checkpoint occurred on April 30, 2002, between 1:49 p.m. and 2:19 p.m.. The Primary Checkpoint is closed at approximately 2:00 p.m. daily and drivers are directed to walk inside the commercial vehicle building for clearance.

The Commercial Vehicle Building is closed at 4:00 p.m. daily, and drivers are then directed to walk to the Passenger Vehicle Building for clearance.

Additional delays occur when the driver is required to exit their vehicle and walk to alternative checkpoints.

Commercial Vehicles

Checkpoint Inside Commercial Vehicle Building

Truck #	Time In:	Time Out:	Elapsed Time	Comment
Date: 4/23/02				
1	2:37:00	2:40:00	0:03:00	
2	3:23:20	3:26:45	0:03:25	
3	3:23:38	3:28:42	0:05:04	
4	3:29:00	3:32:13	0:03:13	
5			0:03:09	Start and stop times not recorded, just a running stopwatch time
6	3:01:00	3:04:00	0:03:00	
7	3:28:00	3:31:20	0:03:20	
8	3:05:55	3:09:10	0:03:15	
9	3:09:10	3:16:10	0:07:00	
10	3:17:00	3:20:26	0:03:26	
11	3:17:33	3:20:58	0:03:25	
			0:03:45	Average Delay Time on 4/23/02
Date: 4/30/02				
1	2:53:00	3:34:30	0:41:30	vehicle had to be towed
2	2:53:50	2:57:10	0:03:20	
3	2:55:40	3:33:09	0:37:29	
4	2:56:29	3:00:58	0:04:29	
5	3:02:58	3:13:00	0:10:02	
6	3:01:22	3:06:59	0:05:37	
7	3:03:23	3:07:55	0:04:32	
8	3:03:43	3:34:05	0:30:22	
9	3:06:10	3:37:40	0:31:30	
10	3:06:38	3:10:53	0:04:15	
11	3:07:31	3:11:24	0:03:53	
12	3:11:30	3:28:46	0:17:16	
13	3:11:54	3:14:13	0:02:19	
14	3:12:15	3:16:18	0:04:03	
15	3:30:29	3:37:05	0:06:36	
16	3:30:49	3:38:45	0:07:56	
17	3:39:48	3:41:39	0:01:51	
18	3:39:48	3:43:40	0:03:52	
19	3:39:48	3:42:38	0:02:50	
20	3:40:51	3:45:03	0:04:12	
21	3:52:15	3:55:35	0:03:20	
22	3:53:45	3:57:35	0:03:50	
23	3:41:03	3:50:22	0:09:19	
24	3:44:20	3:50:37	0:06:17	
25	3:44:57	3:51:20	0:06:23	
26	3:48:23	3:53:45	0:05:22	*
27	3:50:45	3:54:27	0:03:42	
28	3:51:20	3:54:53	0:03:33	
29	3:51:20	3:53:05	0:01:45	
			0:08:13	Average delay time (excluding vehicle 1) on 4/30/02
			0:06:57	**Average Delay Time of Both Data Sets**
BREAK IN DATA COLLECTION - COMMERCIAL VEHICLE BUILDING CLOSED				

* Vehicle delay time was affected by delay of vehicle #1

Commercial Vehicles

Checkpoint Inside Passenger Vehicle Building

Truck #	Time In:	Time Out:	Elapsed Time	Comment
34	4:14:12	4:21:10	0:06:58	
36	4:20:54	5:05:04	0:44:10	
37	4:25:55	4:29:19	0:03:24	
38	4:26:56	4:30:55	0:03:59	
39	4:29:10	4:49:28	0:20:18	
40	4:28:36	4:37:59	0:09:23	matched w/Sanjeev's data
41	4:35:30	4:42:40	0:07:10	his card wouldn't work in gate
42	4:40:55	4:44:13	0:03:18	
43	4:42:40	4:47:48	0:05:08	
44	4:43:40	4:48:20	0:04:40	
45	4:52:02	5:02:31	0:10:29	card wouldn't work in gate, caused add'l delay of 7:31
46	4:52:14	5:03:21	0:11:07	**
47	4:52:14	5:03:47	0:11:33	**
48	4:56:40	5:04:23	0:07:43	**
49	4:57:44	5:13:40	0:15:56	
50	5:01:03	5:07:14	0:06:11	
51	5:05:00	5:12:34	0:07:34	
52	5:05:40	5:10:38	0:04:58	
54	5:07:25	5:11:21	0:03:56	
55	5:07:25	5:14:54	0:07:29	
56	5:07:50	5:11:58	0:04:08	
57	5:13:54	5:18:43	0:04:49	
58	5:15:38	5:21:54	0:06:16	
59	5:19:29	5:24:59	0:05:30	
60	5:20:31	5:27:41	0:07:10	
61	5:22:19	5:26:23	0:04:04	
62	5:26:00	5:28:33	0:02:33	
63	5:36:41	5:39:59	0:03:18	
64	5:37:40	5:41:30	0:03:50	
65	5:38:38	5:46:55	0:08:17	
66	5:40:43	5:47:38	0:06:55	
67	5:48:25	5:51:57	0:03:32	
			0:08:00	**Average Delay Time**

** Vehicles were affected by delay of vehicle #45

Passenger Vehicles

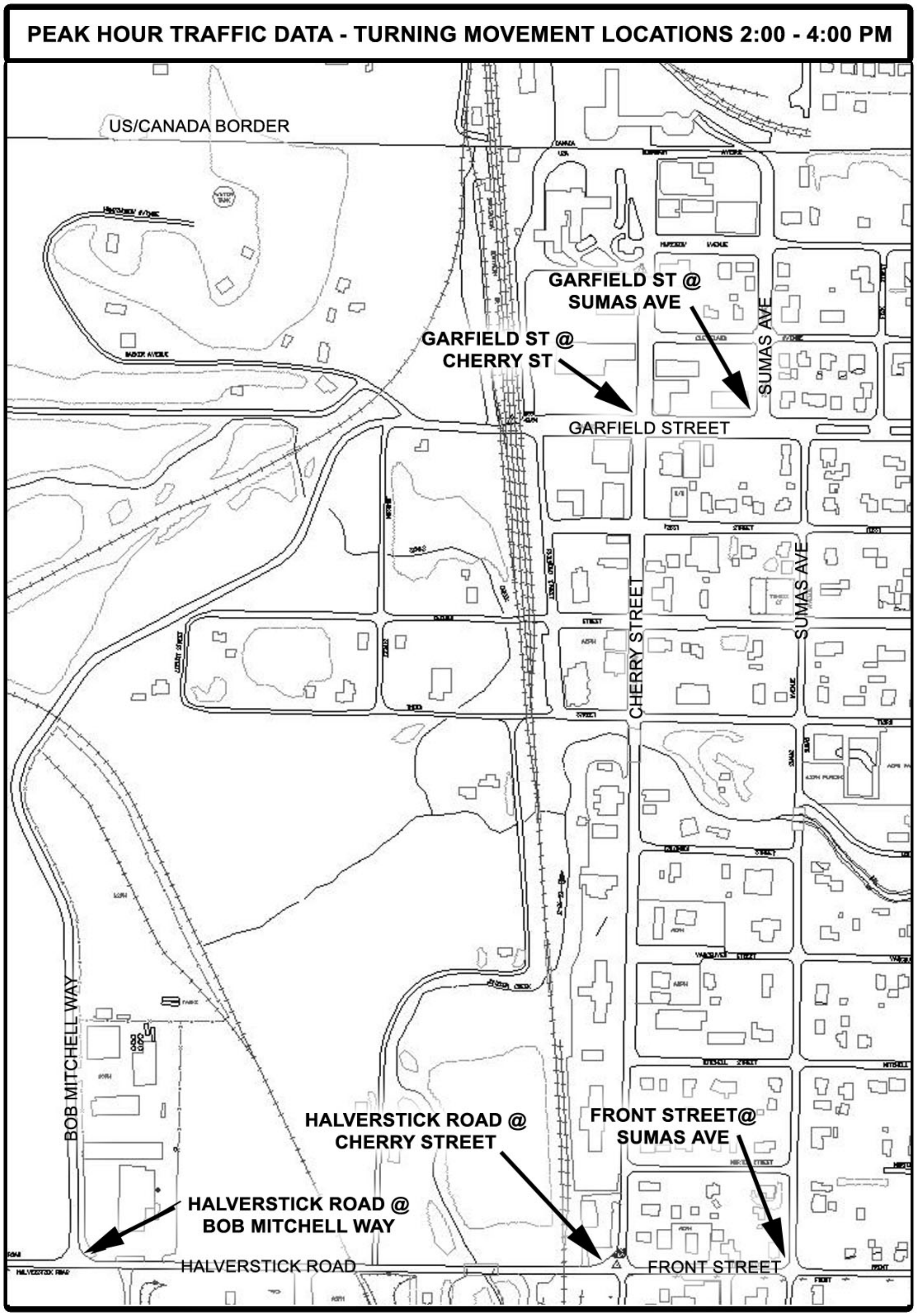
Primary Checkpoint of Passenger Vehicle Building

Truck #	Time In:	Time Out:	Elapsed Time	Comment
Date: 4/23/02				
1	1:58:00	1:58:39	0:00:39	
2	1:58:00	1:58:35	0:00:35	
3	2:00:00	2:02:40	0:02:40	delayed for secondary inspection
4	2:00:00	2:00:44	0:00:44	
5	2:00:00	2:00:15	0:00:15	
6	2:08:00	2:08:42	0:00:42	
7	2:08:00	2:08:05	0:00:05	
8	2:10:00	2:11:03	0:01:03	
9	2:10:00	2:13:26	0:03:26	delayed for secondary inspection
10	2:10:00	2:10:21	0:00:21	
11	2:10:00	2:10:49	0:00:49	
12	2:25:00	2:25:19	0:00:19	
13	2:25:00	2:25:30	0:00:30	
14	2:25:00	2:25:32	0:00:32	
15	2:25:00	2:25:08	0:00:08	
16	2:39:00	2:39:24	0:00:24	
17	2:40:00	2:40:45	0:00:45	
18	2:40:00	2:40:22	0:00:22	
19	2:40:00	2:40:31	0:00:31	
20	2:47:00	2:48:14	0:01:14	
			0:00:48	**Average Delay Time**

Abbotsford-Sumas Border Crossing Study
PEI #22009
Monthly Vehicle Volumes
Data received from Statistics Canada

Month	Total Passenger Vehicles	Total Commercial Vehicles	Total Volume
April 01	58,854	4,901	63,755
May 01	62,369	6,698	69,067
June 01	64,868	6,084	70,952
July 01	77,720	6,315	84,035
Aug.01	79,665	6,173	85,838
Sept. 01	45,897	5,969	51,866
Oct.01	34,373	4,592	38,965
Nov.01	33,258	3,865	37,123
Dec.01	38,587	5,529	44,116
Jan.02	35,902	5,302	41,204
Feb.02	38,580	4,535	43,115
March 02	42,359	8,162	50,521
April 02	44,856	8,784	53,640
Av. Monthly	50,561	5,916	56,477
12 Month Volume *(5/01 thru 4/02)*	598,434	72,008	670,442

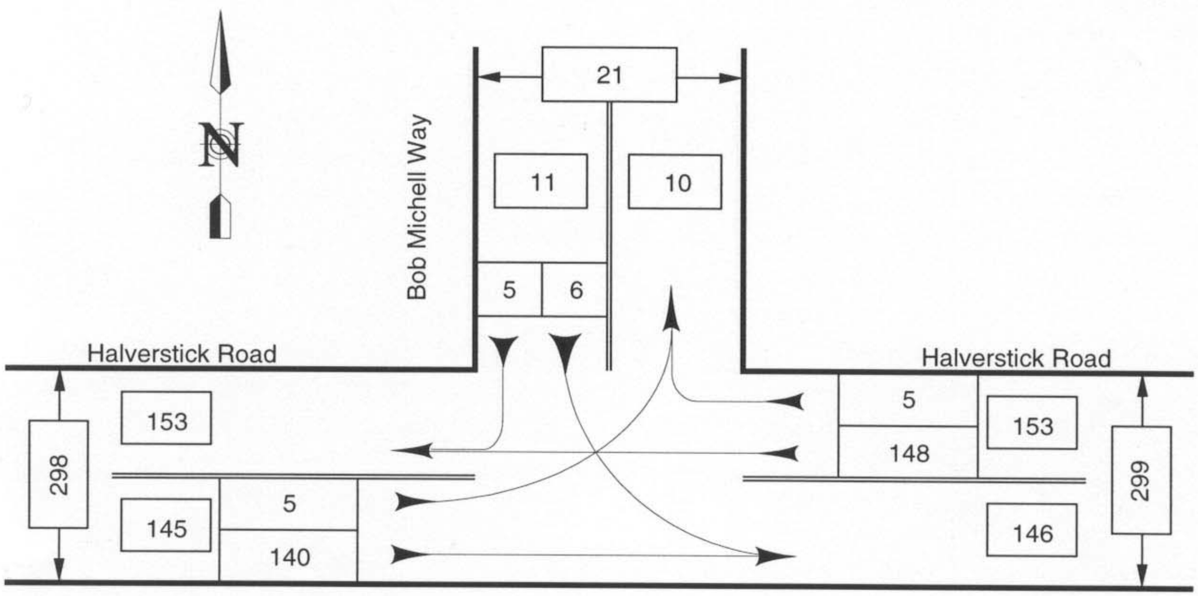
Appendix D


PEAK HOUR TRAFFIC DATA - TURNING MOVEMENT LOCATIONS 2:00 - 4:00 PM
US/CANADA BORDER
GARFIELD ST @ SUMAS AVE
GARFIELD ST @ CHERRY ST
SUMAS AVE
GARFIELD STREET
CHERRY STREET
SUMAS AVE
BOB MITCHELL WAY
HALVERSTICK ROAD @ CHERRY STREET
FRONT STREET@ SUMAS AVE
HALVERSTICK ROAD @ BOB MITCHELL WAY
HALVERSTICK ROAD
FRONT STREET

TRAFFIC DATA GATHERING

TURNING MOVEMENTS DIAGRAM

2:00 - 4:00 PM PEAK HOUR: 2:45 PM TO 3:45 PM



INTERSECTION PEAK HOUR VOLUME	
IN	309
OUT	309

	HV	PHF
SB	9%	0.69
NB	#N/A	#N/A
WB	18%	0.83
EB	19%	0.76
INTRS.	18%	0.90

HV = Heavy Vehicles
PHF = Peak Hour Factor

Halverstick Road @ Bob Mitchell Way

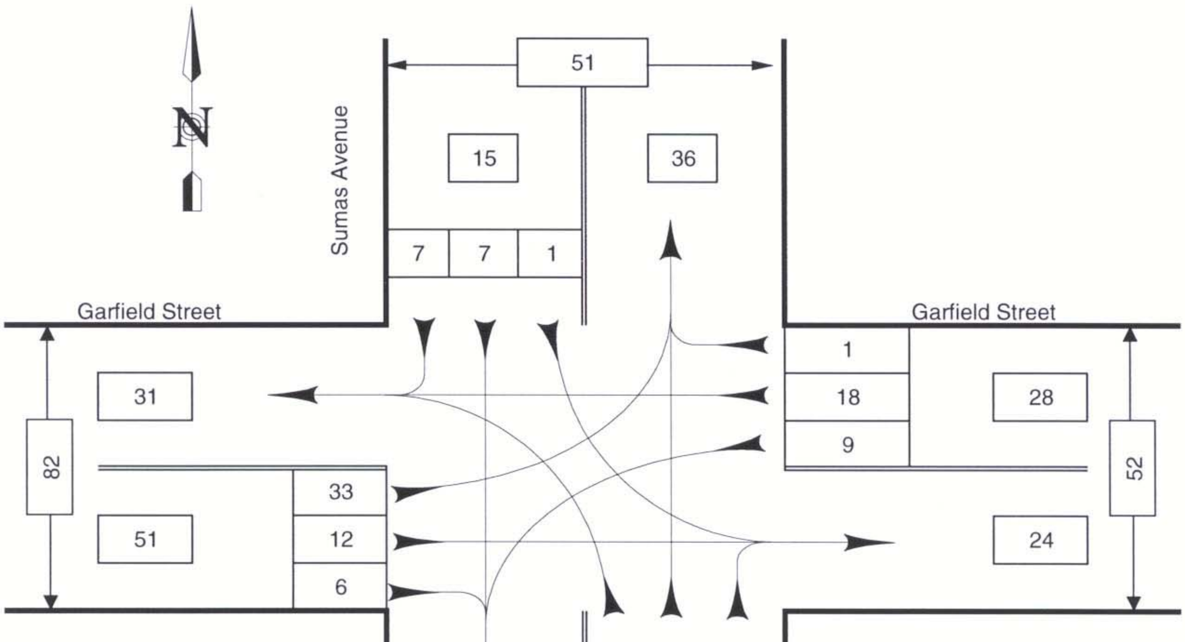
Sumas, WA

COUNTED BY:	AS	DATE OF COUNT:	Tue. 4/23/02
REDUCED BY:	CN	TIME OF COUNT:	2:00 - 4:00 PM
DATE OF REDUCTION:	Wed. 4/24/02	WEATHER:	Sunny

TRAFFIC DATA GATHERING

TURNING MOVEMENTS DIAGRAM

2:00 - 4:00 PM PEAK HOUR: 2:45 PM TO 3:45 PM



INTERSECTION PEAK HOUR VOLUME	
IN	113
OUT	113

	HV	PHF
SB	27%	0.63
NB	0%	0.79
WB	11%	0.78
EB	57%	0.91
INTRS.	32%	0.91

HV = Heavy Vehicles
PHF = Peak Hour Factor

Garfield Street @ Sumas Avenue

Sumas, WA

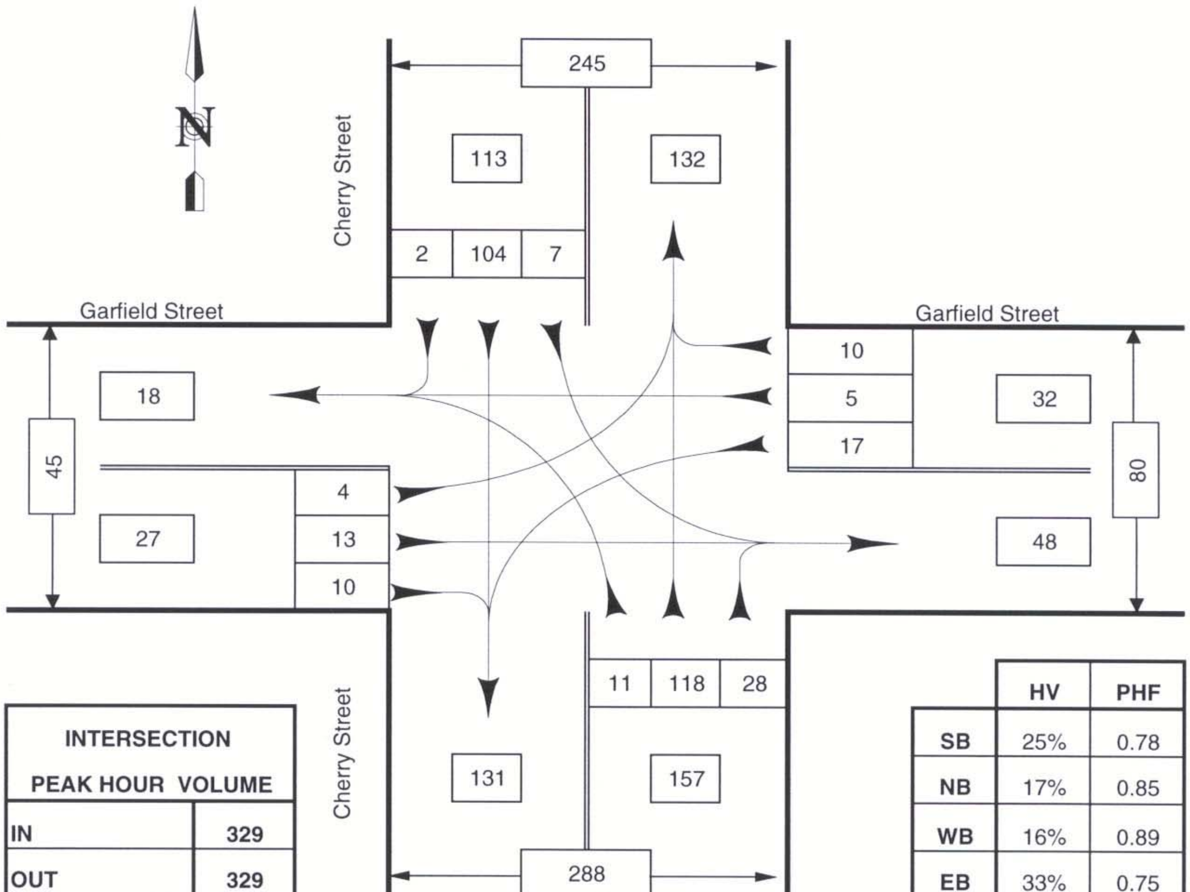
COUNTED BY: JT
REDUCED BY: CN
DATE: Wed. 4/24/02

DATE OF COUNT: Tue. 4/23/02
TIME OF COUNT: 2:00 - 4:00 PM
WEATHER: Sunny

TRAFFIC DATA GATHERING

TURNING MOVEMENTS DIAGRAM

2:00 - 4:00 PM PEAK HOUR: 2:45 PM TO 3:45 PM



INTERSECTION PEAK HOUR VOLUME	
IN	329
OUT	329

	HV	PHF
SB	25%	0.78
NB	17%	0.85
WB	16%	0.89
EB	33%	0.75
INTRS.	21%	0.96

HV = Heavy Vehicles
PHF = Peak Hour Factor

Garfield Street @ Cherry Street

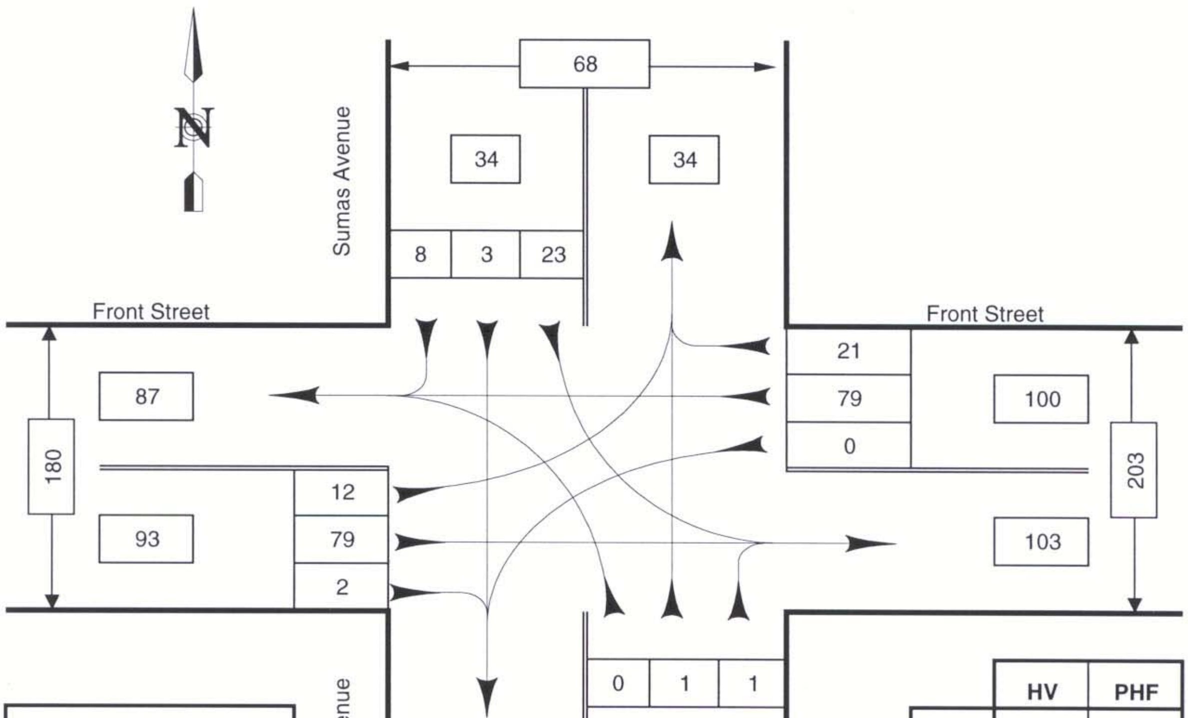
Sumas, WA

COUNTED BY:	CN	DATE OF COUNT:	Tue. 4/23/02
REDUCED BY:	CN	TIME OF COUNT:	2:00 - 4:00 PM
DATE:	Wed. 4/24/02	WEATHER:	Sunny

DTG TRAFFIC DATA GATHERING

TURNING MOVEMENTS DIAGRAM

2:00 - 4:00 PM PEAK HOUR: 2:45 PM TO 3:45 PM



INTERSECTION PEAK HOUR VOLUME	
IN	229
OUT	229

	HV	PHF
SB	0%	0.71
NB	50%	0.25
WB	11%	0.81
EB	9%	0.78
INTRS.	9%	0.88

HV = Heavy Vehicles
PHF = Peak Hour Factor

Front Street @ Sumas Avenue

Sumas, WA

COUNTED BY: TP

REDUCED BY: CN

DATE: Wed. 4/24/02

DATE OF COUNT: Tue. 4/23/02

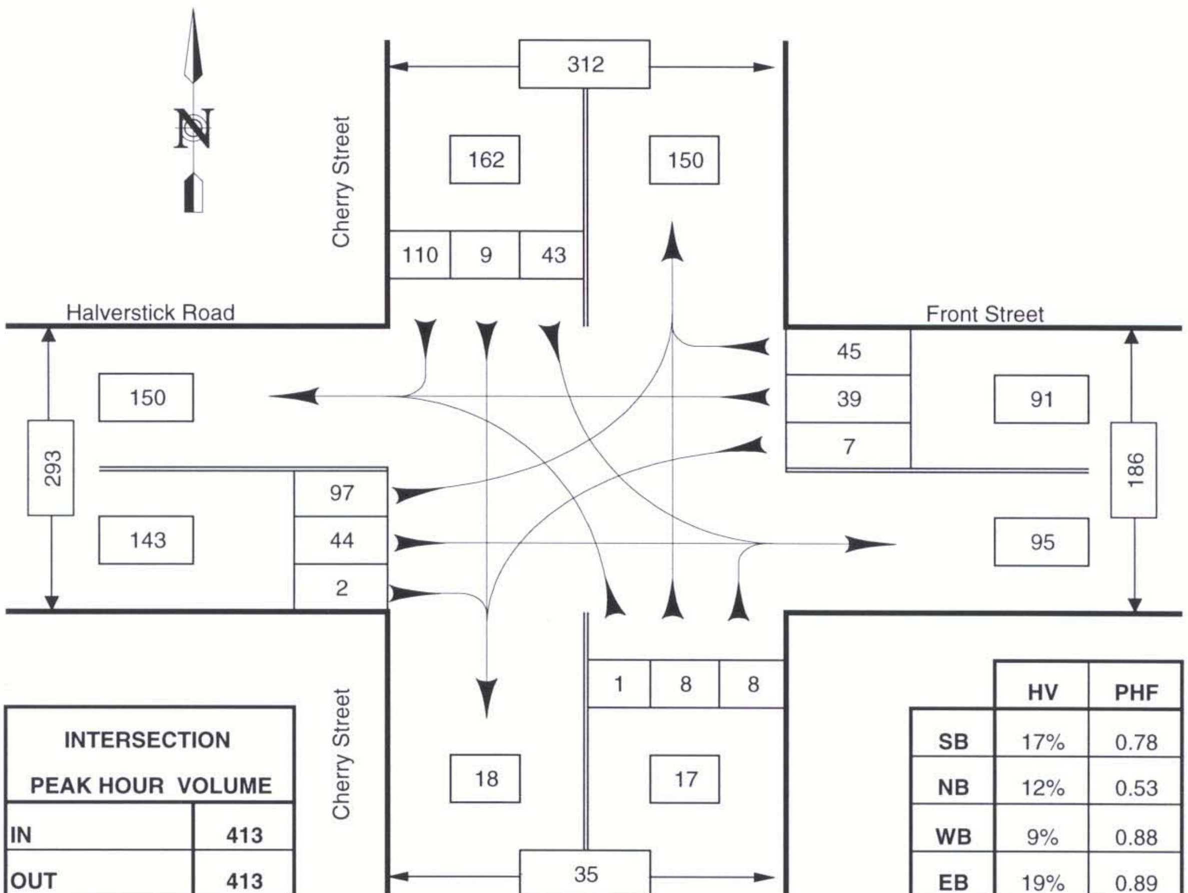
TIME OF COUNT: 2:00 - 4:00 PM

WEATHER: Sunny

TRAFFIC DATA GATHERING

TURNING MOVEMENTS DIAGRAM

2:00 - 4:00 PM PEAK HOUR: 2:30 PM TO 3:30 PM



INTERSECTION PEAK HOUR VOLUME	
IN	413
OUT	413

	HV	PHF
SB	17%	0.78
NB	12%	0.53
WB	9%	0.88
EB	19%	0.89
INTRS.	15%	0.91

HV = Heavy Vehicles
PHF = Peak Hour Factor

Halverstick Road @ Cherry Street

Sumas, WA

COUNTED BY:	LH	DATE OF COUNT:	Tue. 4/23/02
REDUCED BY:	CN	TIME OF COUNT:	2:00 - 4:00 PM
DATE:	Wed. 4/24/02	WEATHER:	Sunny

COUNCIL OF GOVERNMENTS

Abbotsford-Sumas Border Improvement Project

Technical Memorandum 3

Existing/Future Traffic Demand and Performance

Perteet Engineering, Inc.
Civil, Transportation and Surveying

TO: Melissa Miller, Project Coordinator, Whatcom Council of Governments

FROM: Gina Parenteau, EIT, Design Engineer, Perteet Engineering
Peter De Boldt, P.E., Project Manager, Perteet Engineering

DATE: REVISED September 17, 2002

RE: Existing/Future Traffic Demand and Performance - Technical Memorandum 3
Abbotsford-Sumas Border Improvement Study (PEI No. 22009)

Introduction

The purpose of this memorandum is to document existing northbound traffic operations, and anticipated future traffic operation conditions for the northbound border crossing at Sumas in 2006 and 2021. Traffic volume information and processing times documented in Technical Memorandums 1 and 2 serve as a basis for the analysis.

Operational Analysis Methodology

A variety of analysis tools were considered to evaluate both existing and future condition traffic operations at the border. The focus of the operational analysis was the potential queuing of vehicles as they approach Canada Customs. These queues can disrupt other activities in downtown Sumas. Because individual processing times for vehicles crossing the border can vary greatly, and traffic volumes themselves have significant fluctuations, it is difficult to identify a precise volume of vehicles in the queue at any particular time. Several traffic operations analysis tools were considered to assist in the operational analysis. One such analysis tool was a computer program entitled VISSIM. This is a computer program typically used to simulate traffic operations on a transportation network that includes both controlled and uncontrolled intersections. We found it that it could not adequately simulate the effects of the variability associated with the processing times at the border crossing, and therefore it was not used.

Another very promising tool that was considered was a computer simulation program entitled WESTA (an acronym for Weigh Station). This is a program developed by Mitretek Systems under contract to the FHWA to simulate facilities such as Truck Weigh Stations, Toll Booths, Safety Inspection Stations, and Customs Stations at Border Crossings. Initial research indicated that it was the perfect tool to evaluate operations at the border crossing. In theory, it considered the specific geometry of the border crossing and the variable arrival times for vehicles to in order to predict queues. It could also theoretically help in assessing impacts any proposed changes would have on those queues. In the process of trying to use the program, we found that it was not yet fully operational. We did receive considerable assistance from Mitretek in trying to get the simulation model to properly function, but were ultimately unsuccessful.

We resorted to a method of determining potential queues by calculating how many vehicles arrive at the border during a specified time period, how many could be processed during that time period, and then determining the difference between the arrival volumes and the processing volumes to establish anticipated queues. This approach does not account for the rather considerable variability that can occur within the analysis period, but does provide a reasonable overall assessment of the extent of potential queues. Several different traffic arrival rates were considered. These consisted of a “peak” period as well as an “average” period. The concept of evaluating the peak period was to identify the extent of the queue that might be generated for a time of heavy traffic volume at the border. The average period was evaluated to gauge a more “typical” queue. By evaluating the two different periods a better understanding of the sensitivity of the queue that might be generated was achieved. An important question for the Project Team to consider will be which queue, or percentage of the queue, can or should facilities be designed to accommodate.

The peak period traffic volume was determined by evaluating Statistics Canada monthly data to find the month with the highest total volume (August for passenger cars, and March for commercial vehicles). Canada Customs daily records were then used to ascertain the highest daily traffic within those months. Neither data source recorded volumes on an hourly basis so a twenty-four hour traffic count data collected by the Washington State Department of Transportation (WSDOT) in August 2000 for northbound Cherry Street (south of Garfield Street) was used to ascertain the peak hour percentage of daily traffic, as well as the percentage of daily traffic for the next three consecutive hours. These percentages were than applied to the peak daily record to ascertain both the peak hour traffic volume at the border, and the traffic volumes for the next three consecutive hours. These volumes were then used to compute both the peak hour queue, and the queue that might develop if processing time during a period of up to four hours could not keep up with demand.

The goal of looking at the “average” traffic period was to determine what type of queues might develop on a common basis during the late afternoon peak hours. The “average” daily traffic was determined by distributing the annual 2001 Statistics Canada traffic volumes equally over 365 days. Unlike many roadways, total traffic volumes at the border crossing tends to peak on the weekends, and is slightly lower on the weekdays (the opposite of most roadways). By distributing the annual traffic volume over 365 days, the intent was to develop a queue analysis somewhere in between a typical weekday and typical weekend day. The same process used to determine peak period traffic volumes was conducted to determine the highest “average” hourly traffic volumes for northbound traffic at the border, as well as the volumes that would be expected over the next three consecutive hours over the course of a day.

In order to determine the queues that might result from the varying traffic volume conditions, anticipated processing times for each vehicle were necessary. Data required to determine these processing times was collected on April 23 and 30 of 2002, and is documented in

Technical Memorandum 2. Following is a summary of the processing times calculated for both passenger vehicles and commercial vehicles:

Ave. Processing Time for Passenger Vehicles	48 seconds
Ave. Processing Time – Commercial Vehicles – processing at primary check point	42 seconds
Ave. Processing Time – Commercial Vehicles – processing inside commercial vehicle building	6 min. 57 sec.
Ave. Processing Time – Commercial Vehicles – processing inside passenger vehicle building	8 min. 0 sec.

Existing Conditions (2001)

Based on information from Statistics Canada and Canada Customs records, the peak daily and associated hourly volumes for northbound traffic at the Huntingdon border crossing were selected as follows:

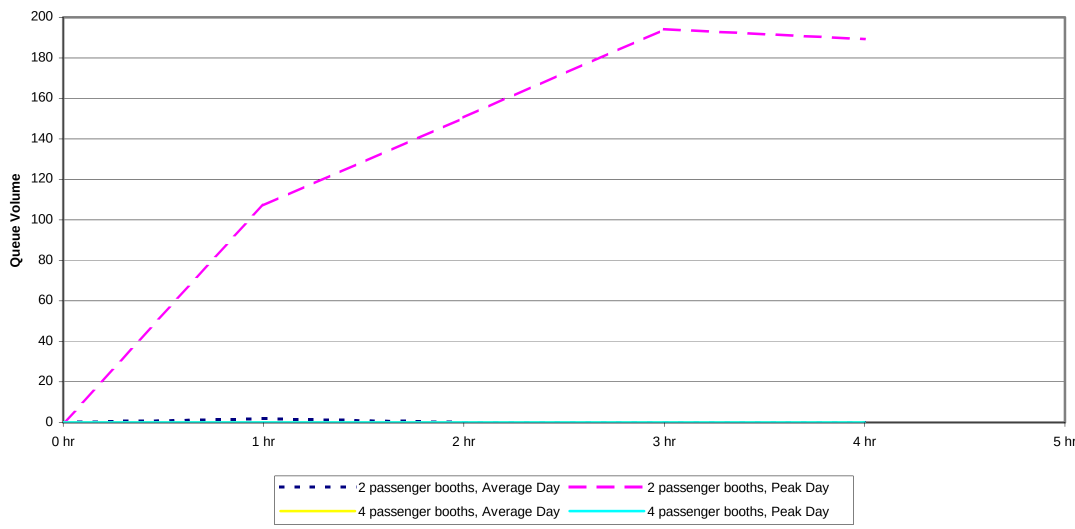
Period	Passenger Vehicles	Commercial Vehicles
Peak Daily	3,024	394
Peak Hourly	257	33
"Average" Daily	1,787	188
"Average" Hourly	152	16

A variety of different conditions affect how many vehicles might be in a queue at the border. An important variable considered in our analysis was the number of Customs booths that might be open. For the commercial vehicles, an important variable is whether the primary booth is open, or if truckers must exit their vehicle and go inside a building. An example of the results of one analysis for how many vehicles would be in the queue after one hour is documented below. Details of all analysis are included in Appendix A.

Condition	Number of Passenger Cars in Queue (assumes 2 booths open)	Number of Commercial Vehicles in Queue (assumes primary booth open)	Number of Commercial Vehicles in Queue (assumes primary booth closed, commercial building open)
"Peak" Daily Traffic	107	0	25
"Average" Daily Traffic	2	0	7

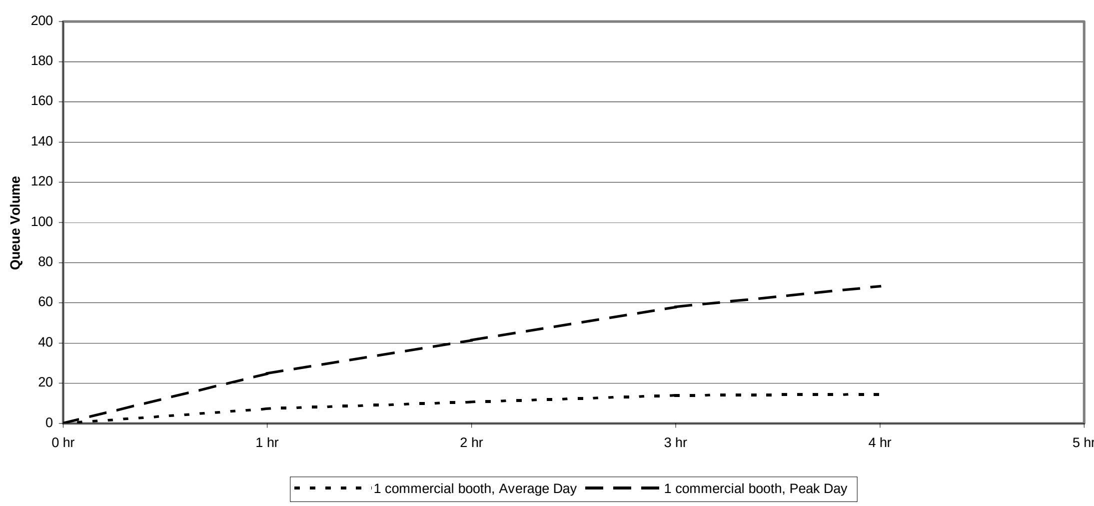
The following charts identify the number of vehicles that would be in the border queue for a variety of differing conditions.

2001 - Passenger Vehicle Queue Volume



For passenger cars, queues that impact the Sumas street system only develop under "peak" conditions when only two Customs booths are open. If Customs is able to keep four booths open, the data available indicates that no significant queues develop.

2001 - Commercial Vehicle Queue Volume
(Assumes primary booth is closed, truckers entering commercial vehicle building)



For commercial vehicles, no significant queues develop as long as the primary booth is open. Queues can begin to develop when the primary booth is closed, and truckers must exit their vehicles and enter the Canada Customs building.

Future Conditions (2006)

Canada Customs daily records for 2001 were extrapolated to 2006 by using a 5.7% per year truck volume growth rate and a 1.1% per year passenger car volume growth rate as documented in the *Final Report, Lower Mainland Border Crossing Commercial and Passenger Vehicle Forecasts – February 2002* by Transport Canada. The peak daily and associated hourly volumes for the 2006 northbound traffic at the Huntingdon border crossing were as follows:

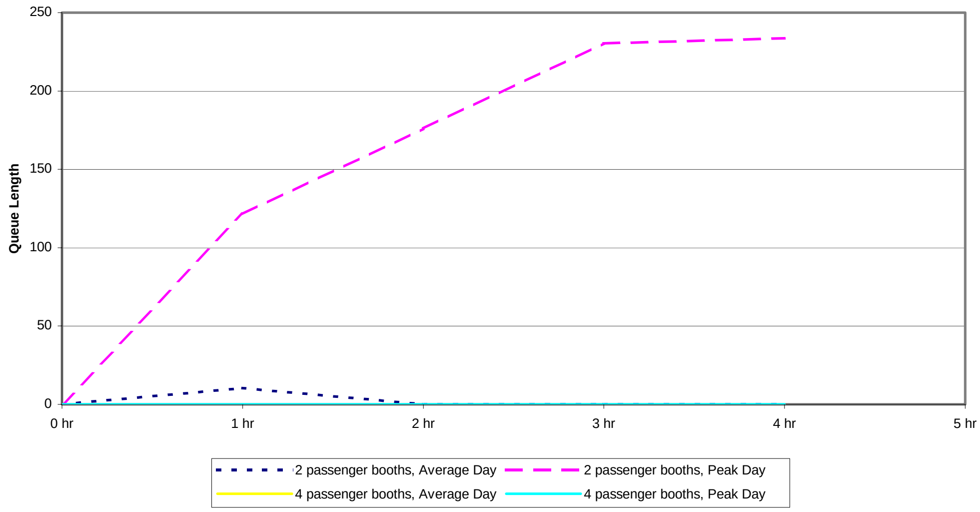
Period	Passenger Vehicles	Commercial Vehicles
Peak Daily	3,194	520
Peak Hourly	271	44
"Average" Daily	1,887	248
"Average" Hourly	160	21

A variety of different conditions affect how many vehicles might be in a queue at the border. An important variable considered in our analysis was the number of Customs booths that might be open. For the commercial vehicles, an important variable is whether the primary booth is open, or if truckers must exit their vehicle and go inside a building. An example of the results of one analysis for how many vehicles would be in the queue after one hour is documented below. Note that the truck queues are beginning to significantly grow if the primary booth is closed. Details of all analysis are included in Appendix A.

Condition	Number of Passenger Cars in Queue (assumes 2 booths open)	Number of Commercial Vehicles in Queue (assumes primary booth open)	Number of Commercial Vehicles in Queue (assumes primary booth closed, commercial building open)
"Peak" Daily Traffic	121	0	36
"Average" Daily Traffic	10	0	12

The following charts identify the number of vehicles that would be in the border queue for a variety of differing conditions.

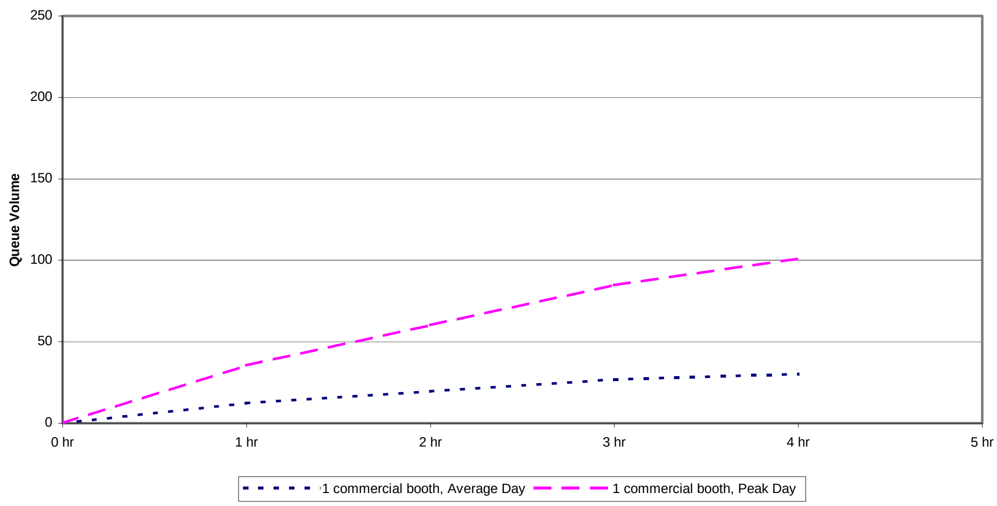
2006 - Passenger Vehicle Queue Volume



For passenger vehicles, queues that impact the Sumas street system only develop under "peak" conditions when two Customs booths are open. If Customs is able to keep four booths open, the data available indicates that no significant queues develop.

2006 - Commercial Vehicle Queue Volume

(Assumes primary booth is closed, truckers entering commercial vehicle building)



For commercial vehicles, no significant queues develop as long as the primary booth is open. Queues can begin to develop when the primary booth is closed, and truckers must exit their vehicles and enter the Canada Customs building. These queues can become quite significant with over 100 vehicles theoretically in the queue during peak periods by 2006.

Future Conditions (2021)

Canada Customs daily records for 2001 were extrapolated to 2021 by using the growth rates in the following table as documented in the *Final Report, Lower Mainland Border Crossing Commercial and Passenger Vehicle Forecasts – February 2002* by Transport Canada.

Growth Period	Annual Passenger Vehicle Growth	Annual Commercial Vehicle Growth
2001-2006	1.1%	5.7%
2006-2011	2.0%	4.2%
2011-2021*	2.0%	4.2%

* A specific growth rate for the years 2011 to 2021 was not included in the report cited above, therefore the growth rate from 2006-2011 was used for 2011 to 2021.

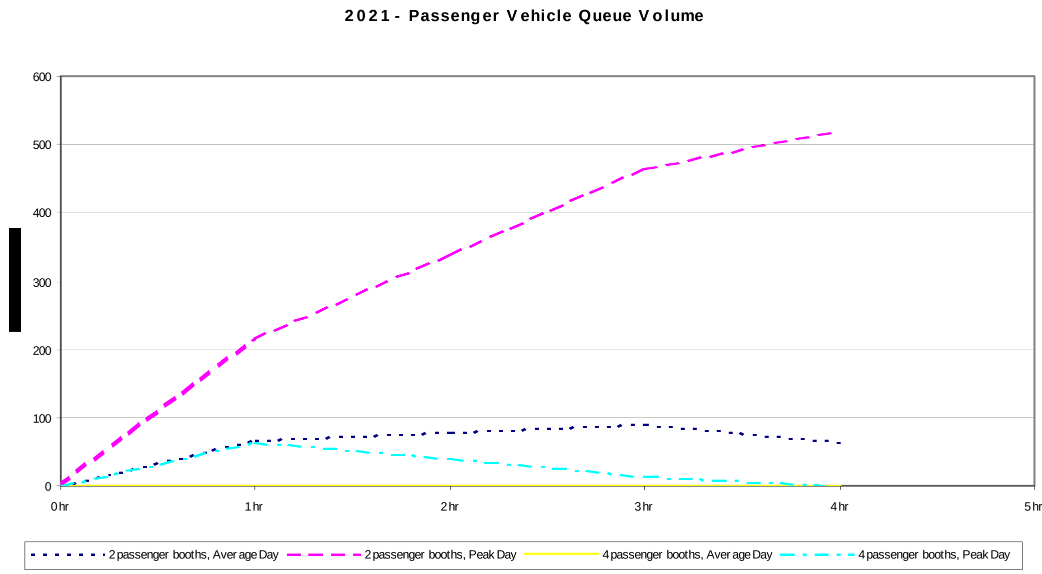
The peak daily and associated hourly volumes for 2021 northbound traffic at the Huntingdon border crossing were as follows:

Period	Passenger Vehicles	Commercial Vehicles
Peak Daily	4,229	964
Peak Hourly	365	82
“Average” Daily	2,540	460
“Average” Hourly	216	39

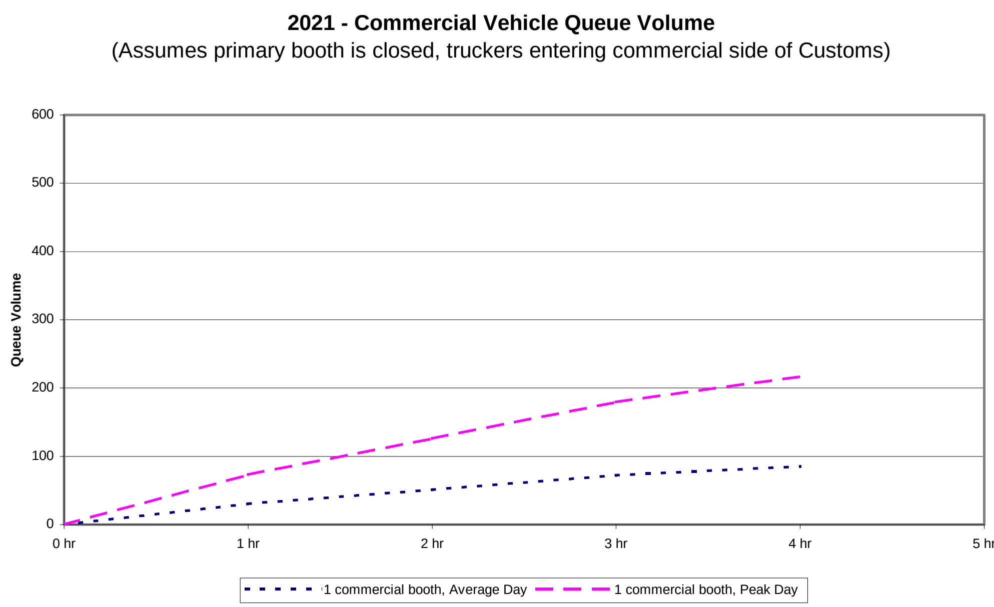
A variety of different conditions affect how many vehicles might be in a queue at the border. An important variable considered in our analysis was the number of Customs booths that might be open. For the commercial vehicles, an important variable is whether the primary booth is open, or if truckers must exit their vehicle and go inside a building. An example of the results of one analysis for how many vehicles would be in the queue after one hour is documented below. Note that quite a few passenger vehicles are caught in the queue with two booths open, and the same is true for commercial vehicles when their primary booth is closed. Details of all analysis are included in Appendix A.

Condition	Number of Passenger Cars in Queue (assumes 2 booths open)	Number of Commercial Vehicles in Queue (assumes primary booth open)	Number of Commercial Vehicles in Queue (assumes primary booth closed, commercial building open)
“Peak” Daily Traffic	215	0	73
“Average” Daily Traffic	66	0	30

The following charts identify the number of vehicles that would be in the border queue for a variety of differing conditions.



For passenger vehicles, queues that impact the Sumas street system develop under both "average" and "peak" conditions when two Customs booths are open. If Customs is able to keep four booths open, the data available indicates that about 65 vehicles would be in the queue during the peak period. This is enough vehicles to impact the Cherry Street and Sumas Avenue intersection. The period of impact is anticipated to last about one hour.



For commercial vehicles, no significant queues develop as long as the primary booth is open. Queues can begin to develop when the primary booth is closed, and truckers must exit their vehicles and enter the Canada Customs building.

Summary

The queues at the border are highly variable. There are a wide range of variables that affect the length queues. The principal elements are: traffic volumes, the number of booths open, and the processing time per vehicle. Of these factors, it appears that operating the maximum number of booths can have the strongest positive effect on minimizing the queues northbound.

As an example, if the primary commercial booth were kept open past its current closing time of about 2:00 p.m. until about 6:00 p.m., little or no queues would develop due to truck activities. This would be true until 2021. A major contributing factor is that trucks continue to process through the Custom’s booth at a rate of approximately one every 42 seconds, implying that empties continue to represent a significant portion of truck traffic.

In order to keep passenger vehicle queues minimized, it is important to have four Customs booths open during peak periods. If only two are open, queues would consist of over 230 vehicles during the peak four hour period by 2006, and over 520 vehicles by 2021 during the peak four hour period (during our site visits on week days in April of 2002, Customs had at one to two booths open).

If because of operating budget constraints Canada Customs is not able to operate enough booths, alternative means of creating enough pavement to accommodate the anticipated queues should be considered. The participants of the design charette held in May of 2002 identified several concepts to address this issue. These will be evaluated in Technical Memorandum 5.

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Find queue lengths based on specified design years and varying lane scenarios

Find queues for the following years:
Year 2001
Year 2006
Year 2021

For each year find a queue length for :
Average day = based on total annual volumes from Statistics Canada
Peak volume day = high volume day pulled from actual daily records of Canada Customs informal data or Statistics Canada data

Annual Vehicle Volumes - Northbound Traffic

Source: Statistics Canada

	Passenger Vehicles	Commercial Vehicles	
Year 2001	652,328	68,526	Vehicles/Year
	1,787	188	Average Vehicles/Day (vehicles per yr./365 days)
	152	16	Peak Hour - Hour 1 (8.5%)[1]
	114	12	Peak Hour - Hour 2 (6.4%)[1]
	114	12	Peak Hour - Hour 3(6.4%)[1]
	86	9	Peak Hour - Hour 4(4.8%)[1]

[1]*Peak Hour distribution per WSDOT Traffic Counts 7/13/00*

Peak Volume Day - Northbound Traffic

Source: Canada Customs daily records
Passenger = weekend, summer 2001[a]
Commercial = weekday, spring 2001[a]
[a]*This month was selected due to the fact that it is the highest volume month*

	Passenger Vehicles	Commercial Vehicles	
Year 2001	3,024	394	Vehicles/Day
	257	33	Peak Hour - Hour 1 (8.5%)[1]
	194	25	Peak Hour - Hour 2 (6.4%)[1]
	194	25	Peak Hour - Hour 3(6.4%)[1]
	145	19	Peak Hour - Hour 4(4.8%)[1]

[1]*Peak Hour distribution per WSDOT Traffic Counts 7/13/00*

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Vehicle Growth Forecasts - Northbound Traffic

Source: Final Report, Lower Mainland Border Crossing Commercial & Passenger Vehicle Forecasts - February 2002, Transport Canada

Truck Growth - Northbound

Year 2000 to 2006 5.7%

Year 2006 to 2011 4.2%

Passenger Vehicle Growth - Northbound

Year 2000 to 2006 1.1%

Year 2006 to 2011 2.0%

	PASSENGER Vehicles Per Day			**COMMERCIAL Vehicles Per Day**		
Year	Growth	Av. Day	Peak Day	Growth	Av. Day	Peak Day
2001		1,787	3,024		188	394
2002	1.1%	1,807	3,057	5.7%	199	416
2003	1.1%	1,827	3,091	5.7%	210	440
2004	1.1%	1,847	3,125	5.7%	222	465
2005	1.1%	1,867	3,159	5.7%	235	492
2006	1.1%	1,887	3,194	5.7%	248	520
2007	2.0%	1,925	3,258	4.2%	258	542
2008	2.0%	1,964	3,323	4.2%	269	564
2009	2.0%	2,003	3,390	4.2%	281	588
2010	2.0%	2,043	3,457	4.2%	292	613
2011	2.0%	2,084	3,526	4.2%	305	639
2012	2.0%	2,126	3,597	4.2%	317	665
2013	2.0%	2,168	3,669	4.2%	331	693
2014	2.0%	2,211	3,742	4.2%	345	722
2015	2.0%	2,256	3,817	4.2%	359	753
2016	2.0%	2,301	3,893	4.2%	374	784
2017	2.0%	2,347	3,971	4.2%	390	817
2018	2.0%	2,394	4,051	4.2%	406	852
2019	2.0%	2,442	4,132	4.2%	423	887
2020	2.0%	2,490	4,214	4.2%	441	925
2021	2.0%	2,540	4,299	4.2%	460	964

Note: there were no projected growth rates for 2012 to 2021, therefore the growth rate after 2011 was assumed to be the same as 2006 thru 2011

Average Processing Times

Average processing times are based on Data Collection on 4/23/02 and 4/30/02 done by Perteet (see attached)

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Year 2001, Average Day

Commercial A = 1st Checkpoint is OPEN

Commercial B = 1st Checkpoint is CLOSED, Comm. Vehicle Bldg. OPEN

Commercial C = 1st Checkpoint is CLOSED, Comm. Vehicle Bldg. CLOSED, Pass. Vehicle Bldg. OPEN

	Passenger Vehicles	Commercial Vehicles	
Year 2001	652,328	68,526	Vehicles/Year
	1,787	188	Average Vehicles/Day
	152	16	Peak Hour - Hour 1 (8.5%)[1]
	114	12	Peak Hour - Hour 2 (6.4%)[1]
	114	12	Peak Hour - Hour 3(6.4%)[1]
	86	9	Peak Hour - Hour 4(4.8%)[1]

[1]*Peak Hour distribution per WSDOT Traffic Counts 7/13/00*

Passenger	Comm. A	Comm. B	Comm. C	
48	42	417	480	av. Processing time at checkpoint (seconds)
0.80	0.70	6.95	8.00	av. Processing time at checkpoint (minutes)
75	86	9	8	# vehicles processed per hour per lane
HOUR 1				
152	16	16	16	Hour 1 - vehicles/hr
77	0	7	8	# of vehicles in queue after **1 hour** for **one lane**
2	0	0	1	# of vehicles in queue after **1 hour** for **two lanes**
0				# of vehicles in queue after **1 hour** for **three lanes**
0				# of vehicles in queue after **1 hour** for **four lanes**
HOUR 2				
114	12	12	12	Hour 2 - vehicles/hr
116	0	11	13	# of vehicles in queue after **2 hours** for **one lane**
0	0	0	0	# of vehicles in queue after **2 hours** for **two lanes**
0				# of vehicles in queue after **2 hours** for **three lanes**
0				# of vehicles in queue after **2 hours** for **four lanes**
HOUR 3				
114	12	12	12	Hour 3 - vehicles/hr
156	0	14	17	# of vehicles in queue after **3 hours** for **one lane**
0	0	0	0	# of vehicles in queue after **3 hours** for **two lanes**
0				# of vehicles in queue after **3 hours** for **three lanes**
0				# of vehicles in queue after **3 hours** for **four lanes**
HOUR 4				
86	9	9	9	Hour 4 - vehicles/hr
166	0	14	19	# of vehicles in queue after **4 hours** for **one lane**
0	0	0	0	# of vehicles in queue after **4 hours** for **two lanes**
0				# of vehicles in queue after **4 hours** for **three lanes**
0				# of vehicles in queue after **4 hours** for **four lanes**

NOTE: Queue lengths were determined by identifying the difference between the number of vehicles arriving per hour, and the number of vehicles that could be processed each hour.

NOTE: All volume numbers rounded to nearest whole number

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Year 2001, Peak Day

Commercial A = 1st Checkpoint is OPEN

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Commercial C = 1st Checkpoint is CLOSED, Comm. Vehicle Bldg. CLOSED, Pass. Vehicle Bldg. OPEN

	Passenger Vehicles	Commercial Vehicles	
Year 2001			
	3,024	394	Vehicles/Day
	257	33	Peak Hour - Hour 1 (8.5%)[1]
	194	25	Peak Hour - Hour 2 (6.4%)[1]
	194	25	Peak Hour - Hour 3(6.4%)[1]
	145	19	Peak Hour - Hour 4(4.8%)[1]

[1]Peak Hour distribution per WSDOT Traffic Counts 7/13/00

Passenger	Comm. A	Comm. B	Comm. C	
48	42	417	480	av. Processing time at checkpoint (seconds)
0.80	0.70	6.95	8.00	av. Processing time at checkpoint (minutes)
75	86	9	8	# vehicles processed per hour per lane
HOUR 1				
257	33	33	33	Hour 1 - vehicles/hr
182	0	25	26	# of vehicles in queue after **1 hour** for **one lane**
107	0	16	18	# of vehicles in queue after **1 hour** for **two lanes**
32				# of vehicles in queue after **1 hour** for **three lanes**
0				# of vehicles in queue after **1 hour** for **four lanes**
HOUR 2				
194	25	25	25	Hour 2 - vehicles/hr
301	0	41	44	# of vehicles in queue after **2 hours** for **one lane**
151	0	24	29	# of vehicles in queue after **2 hours** for **two lanes**
1				# of vehicles in queue after **2 hours** for **three lanes**
0				# of vehicles in queue after **2 hours** for **four lanes**
HOUR 3				
194	25	25	25	Hour 3 - vehicles/hr
419	0	58	61	# of vehicles in queue after **3 hours** for **one lane**
194	0	32	39	# of vehicles in queue after **3 hours** for **two lanes**
0				# of vehicles in queue after **3 hours** for **three lanes**
0				# of vehicles in queue after **3 hours** for **four lanes**
HOUR 4				
145	19	19	19	Hour 4 - vehicles/hr
489	0	68	73	# of vehicles in queue after **4 hours** for **one lane**
189	0	34	43	# of vehicles in queue after **4 hours** for **two lanes**
0				# of vehicles in queue after **4 hours** for **three lanes**
0				# of vehicles in queue after **4 hours** for **four lanes**

NOTE: Queue lengths were determined by identifying the difference between the number of vehicles arriving per hour, and the number of vehicles that could be processed each hour.

NOTE: All volume numbers rounded to nearest whole number

ABBOTSFORD-SUMAS BORDER IMPROVEMENTS			
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Year 2006, Average Day

Commercial A = 1st Checkpoint is OPEN

Commercial B = 1st Checkpoint is CLOSED, Comm. Vehicle Bldg. OPEN

Commercial C = 1st Checkpoint is CLOSED, Comm. Vehicle Bldg. CLOSED, Pass. Vehicle Bldg. OPEN

	Passenger Vehicles	Commercial Vehicles	
Year 2006			
	1,887	248	Average Vehicles/Day
	160	21	Peak Hour - Hour 1 (8.5%)[1]
	121	16	Peak Hour - Hour 2 (6.4%)[1]
	121	16	Peak Hour - Hour 3(6.4%)[1]
	91	12	Peak Hour - Hour 4(4.8%)[1]

[1]Peak Hour distribution per WSDOT Traffic Counts 7/13/00

Passenger	Comm. A	Comm. B	Comm. C	
48	42	417	480	av. Processing time at checkpoint (seconds)
0.80	0.70	6.95	8.00	av. Processing time at checkpoint (minutes)
75	86	9	8	# vehicles processed per hour per lane
HOUR 1				
160	21	21	21	Hour 1 - vehicles/hr
85	0	12	14	# of vehicles in queue after **1 hour** for **one lane**
10	0	4	6	# of vehicles in queue after **1 hour** for **two lanes**
0				# of vehicles in queue after **1 hour** for **three lanes**
0				# of vehicles in queue after **1 hour** for **four lanes**
HOUR 2				
121	16	16	16	Hour 2 - vehicles/hr
131	0	20	22	# of vehicles in queue after **2 hours** for **one lane**
0	0	2	7	# of vehicles in queue after **2 hours** for **two lanes**
0				# of vehicles in queue after **2 hours** for **three lanes**
0				# of vehicles in queue after **2 hours** for **four lanes**
HOUR 3				
121	16	16	16	Hour 3 - vehicles/hr
177	0	27	30	# of vehicles in queue after **3 hours** for **one lane**
0	0	1	8	# of vehicles in queue after **3 hours** for **two lanes**
0				# of vehicles in queue after **3 hours** for **three lanes**
0				# of vehicles in queue after **3 hours** for **four lanes**
HOUR 4				
91	12	12	12	Hour 4 - vehicles/hr
193	0	30	35	# of vehicles in queue after **4 hours** for **one lane**
0	0	0	5	# of vehicles in queue after **4 hours** for **two lanes**
0				# of vehicles in queue after **4 hours** for **three lanes**
0				# of vehicles in queue after **4 hours** for **four lanes**

NOTE: Queue lengths were determined by identifying the difference between the number of vehicles arriving per hour, and the number of vehicles that could be processed each hour.

NOTE: All volume numbers rounded to nearest whole number

ABBOTSFORD-SUMAS BORDER IMPROVEMENTS			
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Year 2006, Peak Day

Commercial A = 1st Checkpoint is OPEN

Commercial B = 1st Checkpoint is CLOSED, Comm. Vehicle Bldg. OPEN

Commercial C = 1st Checkpoint is CLOSED, Comm. Vehicle Bldg. CLOSED, Pass. Vehicle Bldg. OPEN

	Passenger Vehicles	Commercial Vehicles	
Year 2006			
	3,194	520	Vehicles/Day
	271	44	Peak Hour - Hour 1 (8.5%)[1]
	204	33	Peak Hour - Hour 2 (6.4%)[1]
	204	33	Peak Hour - Hour 3(6.4%)[1]
	153	25	Peak Hour - Hour 4(4.8%)[1]

[1]Peak Hour distribution per WSDOT Traffic Counts 7/13/00

Passenger	Comm. A	Comm. B	Comm. C	
48	42	417	480	av. Processing time at checkpoint (seconds)
0.80	0.70	6.95	8.00	av. Processing time at checkpoint (minutes)
75	86	9	8	# vehicles processed per hour per lane
HOUR 1				
271	44	44	44	Hour 1 - vehicles/hr
196	0	36	37	# of vehicles in queue after **1 hour** for **one lane**
121	0	27	29	# of vehicles in queue after **1 hour** for **two lanes**
46				# of vehicles in queue after **1 hour** for **three lanes**
0				# of vehicles in queue after **1 hour** for **four lanes**
HOUR 2				
204	33	33	33	Hour 2 - vehicles/hr
326	0	60	62	# of vehicles in queue after **2 hours** for **one lane**
176	0	43	47	# of vehicles in queue after **2 hours** for **two lanes**
26				# of vehicles in queue after **2 hours** for **three lanes**
0				# of vehicles in queue after **2 hours** for **four lanes**
HOUR 3				
204	33	33	33	Hour 3 - vehicles/hr
455	0	85	88	# of vehicles in queue after **3 hours** for **one lane**
230	0	59	66	# of vehicles in queue after **3 hours** for **two lanes**
5				# of vehicles in queue after **3 hours** for **three lanes**
0				# of vehicles in queue after **3 hours** for **four lanes**
HOUR 4				
153	25	25	25	Hour 4 - vehicles/hr
534	0	101	106	# of vehicles in queue after **4 hours** for **one lane**
234	0	67	76	# of vehicles in queue after **4 hours** for **two lanes**
0				# of vehicles in queue after **4 hours** for **three lanes**
0				# of vehicles in queue after **4 hours** for **four lanes**

NOTE: Queue lengths were determined by identifying the difference between the number of vehicles arriving per hour, and the number of vehicles that could be processed each hour.

NOTE: All volume numbers rounded to nearest whole number

ABBOTSFORD-SUMAS BORDER IMPROVEMENTS			
Project: 22009		Calc. By: GP	Date: 7/15/2002
Subject: Queue Lengths		Chkd. By: PGD	Date: 7/16/2002
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Year 2021, Average Day

Commercial A = 1st Checkpoint is OPEN

Commercial B = 1st Checkpoint is CLOSED, Comm. Vehicle Bldg. OPEN

Commercial C = 1st Checkpoint is CLOSED, Comm. Vehicle Bldg. CLOSED, Pass. Vehicle Bldg. OPEN

	Passenger Vehicles	Commercial Vehicles	
Year 2021			
	2,540	460	Average Vehicles/Day
	216	39	Peak Hour - Hour 1 (8.5%)[1]
	163	29	Peak Hour - Hour 2 (6.4%)[1]
	163	29	Peak Hour - Hour 3(6.4%)[1]
	122	22	Peak Hour - Hour 4(4.8%)[1]

[1]*Peak Hour distribution per WSDOT Traffic Counts 7/13/00*

Passenger	Comm. A	Comm. B	Comm. C	
48	42	417	480	av. Processing time at checkpoint (seconds)
0.80	0.70	6.95	8.00	av. Processing time at checkpoint (minutes)
75	86	9	8	# vehicles processed per hour per lane
HOUR 1				
216	39	39	39	Hour 1 - vehicles/hr
141	0	30	32	# of vehicles in queue after **1 hour** for **one lane**
66	0	22	24	# of vehicles in queue after **1 hour** for **two lanes**
0				# of vehicles in queue after **1 hour** for **three lanes**
0				# of vehicles in queue after **1 hour** for **four lanes**
HOUR 2				
163	29	29	29	Hour 2 - vehicles/hr
229	0	51	54	# of vehicles in queue after **2 hours** for **one lane**
79	0	34	39	# of vehicles in queue after **2 hours** for **two lanes**
0				# of vehicles in queue after **2 hours** for **three lanes**
0				# of vehicles in queue after **2 hours** for **four lanes**
HOUR 3				
163	29	29	29	Hour 3 - vehicles/hr
316	0	72	75	# of vehicles in queue after **3 hours** for **one lane**
91	0	46	53	# of vehicles in queue after **3 hours** for **two lanes**
0				# of vehicles in queue after **3 hours** for **three lanes**
0				# of vehicles in queue after **3 hours** for **four lanes**
HOUR 4				
122	22	22	22	Hour 4 - vehicles/hr
363	0	85	90	# of vehicles in queue after **4 hours** for **one lane**
63	0	51	60	# of vehicles in queue after **4 hours** for **two lanes**
0				# of vehicles in queue after **4 hours** for **three lanes**
0				# of vehicles in queue after **4 hours** for **four lanes**

NOTE: Queue lengths were determined by identifying the difference between the number of vehicles arriving per hour, and the number of vehicles that could be processed each hour.

NOTE: All volume numbers rounded to nearest whole number

ABBOTSFORD-SUMAS BORDER IMPROVEMENTS

Project: 22009		Calc. By: GP	Date: 7/15/2002
Subject: Queue Lengths		Chkd. By: PGD	Date: 7/16/2002
		Page 8	of 8

Year 2021, Peak Day

Commercial A = 1st Checkpoint is OPEN

Commercial B = 1st Checkpoint is CLOSED, Comm. Vehicle Bldg. OPEN

Commercial C = 1st Checkpoint is CLOSED, Comm. Vehicle Bldg. CLOSED, Pass. Vehicle Bldg. OPEN

	Passenger Vehicles	Commercial Vehicles	
Year 2021			
	4,299	964	Vehicles/Day
	365	82	Peak Hour - Hour 1 (8.5%)[1]
	275	62	Peak Hour - Hour 2 (6.4%)[1]
	275	62	Peak Hour - Hour 3(6.4%)[1]
	206	46	Peak Hour - Hour 4(4.8%)[1]

[1]*Peak Hour distribution per WSDOT Traffic Counts 7/13/00*

Passenger	Comm. A	Comm. B	Comm. C	
48	42	417	480	av. Processing time at checkpoint (seconds)
0.80	0.70	6.95	8.00	av. Processing time at checkpoint (minutes)
75	86	9	8	# vehicles processed per hour per lane
HOUR 1				
365	82	82	82	Hour 1 - vehicles/hr
290	0	73	74	# of vehicles in queue after **1 hour** for **one lane**
215	0	65	67	# of vehicles in queue after **1 hour** for **two lanes**
140				# of vehicles in queue after **1 hour** for **three lanes**
65				# of vehicles in queue after **1 hour** for **four lanes**
HOUR 2				
275	62	62	62	Hour 2 - vehicles/hr
491	0	126	129	# of vehicles in queue after **2 hours** for **one lane**
341	0	109	114	# of vehicles in queue after **2 hours** for **two lanes**
191				# of vehicles in queue after **2 hours** for **three lanes**
41				# of vehicles in queue after **2 hours** for **four lanes**
HOUR 3				
275	62	62	62	Hour 3 - vehicles/hr
691	0	179	183	# of vehicles in queue after **3 hours** for **one lane**
466	0	153	160	# of vehicles in queue after **3 hours** for **two lanes**
241				# of vehicles in queue after **3 hours** for **three lanes**
16				# of vehicles in queue after **3 hours** for **four lanes**
HOUR 4				
206	46	46	46	Hour 4 - vehicles/hr
822	0	217	221	# of vehicles in queue after **4 hours** for **one lane**
522	0	182	191	# of vehicles in queue after **4 hours** for **two lanes**
222				# of vehicles in queue after **4 hours** for **three lanes**
0				# of vehicles in queue after **4 hours** for **four lanes**

NOTE: Queue lengths were determined by identifying the difference between the number of vehicles arriving per hour, and the number of vehicles that could be processed each hour.

NOTE: All volume numbers rounded to nearest whole number

WHATCOM COUNCIL OF GOVERNMENTS

Abbotsford-Sumas Border Improvement Project

Technical Memorandum 4

Design Charette Summary

Perteet Engineering, Inc.
Civil, Transportation and Surveying

TO: Melissa Miller, Project Coordinator, Whatcom Council of Governments

FROM: Gina Parenteau, EIT, Design Engineer, Perteet Engineering
Peter De Boldt, P.E., Project Manager, Perteet Engineering

DATE: May 17, 2002

RE: Design Charette Summary
Abbotsford-Sumas Border Improvement Study (PEI No. 22009)

Introduction

The purpose of the Design Charette held on May 14, 2002 was to identify what local members of the community perceive to be the past, current and future issues caused by the border crossing and determine what they see as possible solutions to these issues. The focus of this Design Charette was issues that occur south of the border. Members of the local community who have been most impacted by the current border operations were invited by the City of Sumas. Approximately 58 people from the local community were invited and 23 attended.

The attendees were given a brief overview of the purpose of the Design Charette and given some statistical information on traffic volumes, both past and present. Ian Miki, from the BC Ministry of Transportation, gave a brief update of the issues and status of studies north of the border. The attendees were distributed into smaller groups of 4-7 people per table, along with a facilitator from Perteet Engineering, the Whatcom Council of Governments, or the City of Sumas. Each group was given approximately half an hour to identify what they perceive the issues to be as a result of the border crossing. Once issues were identified at each table, a representative of each table reported the issues they identified. The next step was to give each group about an hour to discuss possible solutions to the identified issues. At the end of the hour, each table reported what they visualized as possible solutions.

Summary of Issues

Based on the specific issues the groups identified, five key issues have been determined. These issues are perceived to have a negative impact on the residents and businesses of Sumas, as well as trucking dependent businesses that cross the border regularly.

1. How trucks access Canada Customs – need to re-route to avoid Cherry Street
2. Lack of queuing areas
3. Difficulty/inconvenience in accessing Customs Brokers
4. Trucks dropping trailers around town
5. Occasional passenger vehicle queue lengths impacting cross-street intersections and local businesses

Summary of Solutions

After each group presented their specific solutions, it was noted that there are six general areas where improvements or changes could be made that would solve various problems.

1. Create parking area for trucks
2. Create queuing area for trucks
3. Construct a new truck route
4. Re-route trucks
5. Adequate staffing and creating a second truck booth at Canada Customs
6. Locate US Brokers on the Canadian side and Canadian Brokers on the US side of the Border

Below is a more detailed listing of the specific issues and solutions that each group developed. These are offered as "verbatim" as possible to capture the extent of the issues discussed.

Specific Identified Issues:

- Pedestrian traffic safety south of the border – there are a lot of pedestrians who need to visit the brokers before they can pass through the US Customs, and there are currently no marked crosswalks to cross Cherry Street.
- When there is a queue on Cherry Street, trucks block business driveways and storefronts
- Inadequate operations of Canadian Customs inspection facility – there is inadequate staffing to process the commercial and passenger vehicles.
- Potential re-routing of SR9 and resulting traffic volumes.
- Lack of parking space available for RV's prior to the border - RV's stop prior to the border crossing so that their passengers can make sure they have all their paperwork in order, meet with other members of their group, etc. They currently stop on the roadside.
- Trucks dropping trailers around town – trucks drop trailers wherever they can find an empty spot in various lots around town. Some of the identified lots are the Legion parking lot and the empty gas station lots.
  The possible reasons identified why truckers drop their loads are:
  - They drop their load and then drive the tractor somewhere to spend the night
  - They drop their load and another tractor picks it up later
- Experienced border-crossers divert to side streets to avoid queues
- There is no designated lane, northbound, for trucks that do not need to visit brokers (which includes PARS trucks and empty trucks). As a result, these trucks end up waiting in the queue when they could be through the border crossing in less than a minute.
- There are no queue areas for both passenger and commercial vehicles, except for right near the crossing, and these are inadequate for high volume queues
- Noise – trucks keep running in the area near the crossing, which is disturbing to the nearby residents.

- If a queue area is constructed near the truck crossing, there will be a "huge" amount of noise.
- The routes to reach the border for passenger and commercial vehicles should be separated.
- There is no clearly defined truck route until you reach Garfield.
- Sometimes trucks divert from Cherry Street into the residential area if there is a queue
- There are some damaged curb radii due to trucks.
- On the current streets where trucks queue, there is limited sight distance and truckers can't tell if the trucks in front of them are parked and they are able to go around and cross the border, or if they actually need to wait.
- Bob Mitchell Way is being blocked by southbound truck traffic using businesses along Bob Mitchell Way.
- There is not adequate space for outbound trucks to stop if they need to be inspected.
- The outbound inspection process impact on residents.
- Lack of enforcement on parking restrictions.
- Traffic queues block east-west through traffic.
- Truck traffic needs to be re-routed off of Cherry Street and out of residential areas.
- Rail crossings/switching can be inconvenient.

Specific Suggested Solutions

- Provide parking area for trucks near the brokers.
- Turn Sumas Ave. from the border to Garfield into a one way to proved more lanes so one can be designated as a "thru lane" (meaning, truckers that don't have to visit brokers or trucks that are empty).
- Re-zone the blocks from between Cherry and Sumas and from the border to Garfield.
- Post signs that tell trucks what to do/processes in regards to where to park etc. when visiting brokers or making other stops
- Re-route trucks from Cherry Street, using Bob Mitchell Way.
- Locate US Brokers on the Canadian side and Canadian Brokers on the US side of the Border.
- Create more booths for trucks and designate one as a "thru lane" (meaning, truckers that don't have to visit brokers or trucks that are empty).
- Create a "full service" parking area for trucks.
- Move the truck route <u>west</u> of town – probably Bob Mitchell Way.
- Develop a way for trucks to submit paperwork to and from brokers while they are waiting in the queue – maybe electronically.
- Create holding lanes for vehicles.
- Turn the land at Starving Sams into a truck parking area and then enforce the parking laws within the City.
- Buy out the three homes along Sumas Ave. by customs and put a parking and inspection area there and have Canada Customs put in a second truck booth.
- Increase staffing at Canada Customs.

- Construct an entirely new truck route thru the Johnson creek area east of Bob Mitchell Way, route to Garfield. Turn the Legion and its parking lot into an inspection and parking area (this would be used by both southbound and northbound trucks).
- Construct a new truck route which brings trucks to the west side of the railroad tracks near the border, and construct a truck border crossing on the west side of the railroad tracks, leaving the passenger vehicle route along Cherry Street.

Abbotsford-Sumas Border Improvement Project

Technical Memorandum 5

Near- and Long-Term Improvement Concepts

Perteet Engineering, Inc.
Civil, Transportation and Surveying

TO: Melissa Miller, Project Coordinator, Whatcom Council of Governments

FROM: Dan Hansen, P.E., Lead Engineer, Perteet Engineering
Peter De Boldt, P.E., Project Manager, Perteet Engineering

DATE: REVISED – November 26, 2002

RE: Near- and Long-Term Improvement Concepts - Technical Memorandum 5
Abbotsford-Sumas Border Improvement Study (PEI No. 22009)

Introduction

The northbound movement of traffic across the U.S.-Canadian border at Sumas has been a concern of local residents and users of the border crossing for many years. Some of the problems that have been identified include significant delays and long queues at the border.

The purpose of this technical memorandum is to summarize possible near- and long-term improvement concepts that would improve the northbound flow of traffic at the Sumas/Huntingdon border crossing. For discussion purposes, these concepts have been divided into “Near-Term Improvements” and “Long-Term Improvements”. The “Near-Term Improvements” are intended to cover concepts that could be implemented almost immediately at minimal cost, while the “Long-Term Improvements” may require a greater capital cost, changes that would involve multiple agency approvals, or have a wide impact on the community.

Many of the concepts outlined in this technical memorandum were developed through a project design charette held on May 14, 2002. Business owners and residents of the communities of Sumas, Huntingdon, and Abbotsford attended this design charette. Additional participants included representatives from the Cities of Sumas and Abbotsford, the Washington State Department of Transportation, the B.C. Ministry of Transportation, and the Whatcom Council of Governments.

A proposed screening process, which is the next step of the project, is described at the conclusion of this memorandum. This approach will be discussed with the Project Team and, once a final evaluation approach is agreed upon, it will be used to select those concepts to be examined in greater detail.

Near-Term Improvements

Near-Term Concept (NTC) 1: Increased Border Staffing

The existing and future traffic demand and performance analysis conducted as part of Technical Memorandum 3 indicated that additional staffing at the Canada Customs booths could eliminate northbound queuing of both passenger vehicles and commercial vehicles in the near term, and nearly eliminate it through the year 2021. For passenger vehicles, queues develop more frequently due to the limited staff availability of Canada Customs. Under existing conditions, when only two of the six booths are open during peak hours, queues of over 100 cars develop, resulting in vehicles queuing beyond the intersection of Cherry Street and Third Street. Opening a third booth would reduce this queue significantly, while opening a fourth booth would eliminate the queue altogether.

Currently, northbound commercial traffic rarely creates significant queues when staff occupies the commercial vehicle booth. Because the commercial vehicle booth often closes between 2:00 and 3:00 pm due to staffing restrictions, processing times for the commercial vehicles significantly increases when truckers must exit their vehicles to enter the Canada Customs building. If funding could be procured to ensure that Canada Customs staff occupies the existing northbound commercial booth until 5:00 pm, it would be instrumental in preventing queues from forming.

Near-Term Concept (NTC) 2: Bob Mitchell Way Truck Route

Near-Term Concept 2 focuses on separating commercial vehicle traffic from the passenger vehicle traffic and providing a commercial vehicle parking area to help minimize queues. Under the assumption that U.S. Customs may start doing more northbound (outbound) commercial vehicle inspections, or that Canada Customs would be unable to acquire funding to staff the primary commercial booth, a commercial vehicle parking area could be created just south of the border. This concept uses Bob Mitchell Way from Halverstick Road (SR 9) to the intersection of Railroad Street and Garfield Street to provide the principal commercial vehicle route to and from the border. The route would then continue east on Garfield Street, thence north on Sumas Avenue to the existing Commercial Vehicle Crossing. This concept would take advantage of existing roadways, thereby not requiring any additional roadway construction. The route and parking area are illustrated on Figure 1.

There are two options for the commercial vehicle parking area near the border: NTC 2A and NTC 2B, which are illustrated on Figures 1A and 1B. Both concepts would be located along Sumas Avenue between Cleveland Avenue and the border. NTC 2A is designed as a parking lot, where trucks could conduct independent arrival and departure. NTC 2B is designed as a holding area to be managed with a first-in first-out principal.

For NTC 2A, parking area ingress would be provided from existing Cleveland Avenue and egress would be at the northwest corner of the parking area about 275 feet from the existing Commercial Vehicle Crossing.   To accommodate the parking area, it is estimated that six residential parcels would need to be acquired, including the removal of three residential structures along Sumas Avenue, as suggested at the design charette.

The parking area of NTC 2A would allow flexibility for trucks to conduct independent arrival and departure in order to conduct business at a customs broker or other activity within Sumas. It would not be an efficient use of space if the goal were to hold and manage truck queuing. A total of 12 trucks, based on WSDOT's Typical Truck Storage detail, could be accommodated in the parking lot for this concept. The preliminary opinion of cost to design and construct this concept is $3 million to $4 million. This opinion of cost includes preliminary engineering, right-of-way and construction.

Near Term Concept 2B would be the most efficient use of space for queuing purposes and is designed to stack trucks in a configuration similar to a ferry terminal, as is shown on Figure 1B. This approach would follow a first-in, first-out principal, and assumes that truckers would not be getting out of their vehicles to use services in Sumas or Huntingdon. This parking concept would provide space for about 20 double-trailer commercial vehicles. The preliminary opinion of cost to design and construct this concept is $4.2 million to $5.6 million. This opinion of cost includes preliminary engineering, right-of-way and construction.

ADVANTAGES:

Rerouting of Commercial Vehicle Traffic: This concept would relocate commercial traffic off Cherry Street to a route west of town, leaving the passenger vehicle route on Cherry Street.

Commercial Vehicle Queuing: The parking in this concept would provide some of the space that may be required by a future increase in outbound inspections of commercial vehicles. Based on the Queue Length Analysis included in Technical Memorandum 3, in 2006, a peak day, peak period queue of nearly 90 trucks could develop after four hours if all northbound vehicles were to be subjected to outbound inspection (it should be noted that at this time it is not clear just how many outbound trucks would be subjected to inspection, but it is unlikely that all would fall in this category).   On an average day in 2006, a total of approximately 17 trucks could be in the queue after four hours if all northbound trucks were to be x-rayed. If x-ray inspection is implemented, Near-Term Concept 2B would be the best option because of the storage capacity provided. If x-ray inspection is not implemented, Near-Term Concept 2A, illustrated in Figure 1A, may be desirable because of the flexibility it would provide for truck arrival and departure.

Commercial Vehicle Parking: The area surrounding the parking facility could be modified to create a "full service" parking area for trucks, as suggested at the design charette. For example, additional services could include restaurants, laundry, and sundries provided by private parties.

Public Acceptance: It is expected that the public would be accepting of this concept. It would address re-routing commercial vehicle traffic off Cherry Street and would provide truck parking downtown, which was expressed as being desirable at the design charette.

Cost: The cost of constructing this concept is considered to be relatively low. The proposed new truck route would be on an existing roadway, thereby requiring minimal cost to implement. The greatest share of cost is attributed to the parking area construction and land acquisition.

Effectiveness: This concept would effectively route commercial vehicles out of the city for a good portion of the truck route.

DISADVANTAGES:

Property Impacts: The parking area would require parcel acquisition as well as removal of structures. Cleveland Avenue east of Sumas Avenue may need modifications to accommodate the commercial vehicle ingress into the parking area.

Effectiveness: The effectiveness of NTC 2 is compromised by routing commercial vehicles for the last 1,700 feet through city streets (Garfield Street and Sumas Avenue) in order to reach the commercial vehicle crossing. The parking areas would be marginally effective in providing for long-term parking demands for commercial vehicles.

Near-Term Concept (NTC) 3: Truck Parking at the American Legion Hall Site

Near-Term Concept 3 would provide commercial vehicle parking at the American Legion Hall Site and is divided into two parts: NTC 3A and NTC 3B, illustrated in Figure 2A and Figure 2B. This concept would also utilize a new commercial vehicle lane and an additional commercial vehicle border-crossing booth, which are both described in Long Term Concept (LTC) 3. This concept has been divided into two parts in the event that if one part is deemed unnecessary, the other part could be constructed independently. This concept would require turning Sumas Avenue into a one-way street from Harrison Avenue to the border.

The parking area and access paths of NTC 3A would require about 22,580 square feet of pavement and provide two parking stalls, based on WSDOT's Typical Truck Storage detail. Ingress to NTC 3A would occur on Sumas Avenue. This parking area would necessitate the acquisition of the American Legion Hall and Legion parking lot along with one building near a warehouse storage area, south of the Canada Customs structure. Total opinion of cost for this Concept is $1.5 million to $1.9 million. This opinion of cost includes preliminary engineering, right-of-way and construction.

NTC 3B would require about 34,030 square feet and provide up to six stalls for parking commercial vehicles with double trailers. One double trailer vehicle could fit in each of the six lanes, each about 100 lineal feet, and utilize a signal system to allow individual trucks to proceed to the border crossing in turn. In order for this concept to provide parking, two entrances would be used. The first entrance would be on Sumas Avenue and the second on Harrison Avenue. This concept would require the acquisition and removal of one residential structure and one business structure. The opinion of cost is $1.7 million to $2.2 million. This opinion of cost includes preliminary engineering, right-of-way and construction.

ADVANTAGES:

Commercial Vehicle Queuing: Both NTC 3A and 3B could provide some of the space that may be required by future increases in outbound inspections of commercial vehicles. However, NTC 3B would provide more space by accommodating up to six double-trailer commercial vehicles.

Cost: The cost of Concept NTC 3A and 3B is considered to be relatively low with minimal new paved areas and some acquisitions.

Property Impacts: Encroachment into existing developed parcels would include the American Legion Hall and its parking area bordering Sumas Avenue, as repeatedly suggested at the design charette. NTC 2A would also require the acquisition and removal of one structure located northwest of the Legion Hall.

Environmental: The quantity of new impervious area would have minimal impact on the existing storm sewer system if it is possible to tie the new storm sewer pipe and system into the existing without upgrading any of the existing storm system.

DISADVANTAGES:

Rerouting of Commercial Vehicle Traffic: NTC 3A and 3B would not re-route commercial vehicle traffic.

Commercial Vehicle Queuing: The two stalls of the NTC 3B parking area would provide little space for future queuing demands.

Commercial Vehicle Parking: NTC 3B would have negligible impact on the deficiency of commercial vehicle parking in the area.

Public Acceptance: It is expected that the public would not be accepting of this concept as it does little to address the concerns of commercial vehicle traffic and parking that were raised at the design charette.

Effectiveness: NTC 3's effectiveness is marginal in solving the commercial vehicle queuing and parking issues. The second lane of NTC 3A would be only effective if a new booth were to be fully staffed by Canada Customs. NTC 3B would not effectively address the need for commercial vehicle parking due to the few parking spaces it would provide.

Longevity: The solutions that NTC 3 would provide are short term. If the second lane were to be fully operational, it is expected that this concept would satisfy demand through 2006. This demand is outlined in Perteet Engineering's Technical Memorandum 3.

Flexibility: NTC 3 would only focus on commercial vehicles at the border. It would not address the issues and concerns of commercial vehicle traffic and parking on the city streets and the conflicts that occur with the amalgamation of commercial and passenger vehicles on the same streets.

Long-Term Improvements

Long-Term Concept (LTC) 1: Johnson Creek Truck Route

Long-Term Concept 1 would be comprised of new roadway and commercial vehicle parking area, illustrated in Figure 3. The proposed route would be 32-feet wide, including two 12-foot lanes and two 4-foot shoulders. It is intended to meet long-term commercial vehicle demands, and could be used for both northbound and southbound traffic. It would require a joint effort on the part of both the U.S. and Canada to develop the roadway network for a functional solution. The concept would re-route commercial traffic out of the downtown core of Sumas. The concept has been divided into 3 sections: LTC 1A, LTC 1B, and LTC 1C. This division recognizes that the concept could be effectively developed in phases, as funding becomes available. The division would also allow for a simple method of updating the opinion of cost in the event that the commercial vehicle route's connections to the existing roadways are changed. These sections are illustrated in Figures 3 and 3A.

LTC 1A would construct the segment from Bob Mitchell Way to the U.S.-Canada Border. A majority of undeveloped land would be used on the U.S. side of the border, with the relocation of one business required on the Canadian side, near the truck border crossing. Ideally, incorporated in this segment would be the following items:

- A new commercial vehicle building for both U.S. and Canada Customs operations (a very rough estimate is that each would occupy about 25,000 square feet, similar to the existing Canada Customs commercial vehicle building).
- A secure parking lot that would allow truckers to meet with Customs brokers.
- An upgrade of Railroad Avenue north of the border to 4th Avenue in Huntingdon to accommodate the commercial vehicle traffic (this cost is not included in the current opinion of cost due to the fact that it is on the Canadian side of the border).

Section LTC 1B would construct the segment from Halverstick Road to Bob Mitchell Way. Total length of this segment would be approximately 2,645 lineal feet. It would include about 275 lineal feet of bridge structure over a tributary of Johnson Creek. This portion of the truck route would be situated on a majority of undeveloped land. However, at the south end of the roadway the removal of one residential structure would be necessary.

LTC 1C would link the new State Route 9 alignment proposed by WSDOT to Concept 1B at Halverstick Road. The length of LTC 1C would be 1,185 lineal feet, including 850 lineal feet of bridge structure. During the development of this concept, Perteet Engineering determined that the proximity of Johnson Creek to the existing railroad tracks at the south end of the truck route warranted the use of a single structure to cross over both the creek and the railroad tracks. However, if this concept were to be pursued, confirmation of the grade crossing of the railroad tracks would need to be investigated more thoroughly. This concept would acquire mostly undeveloped land with the exception of one parcel north of Halverstick Road (SR 9). This parcel would need to be acquired and the residential structure removed in order to avoid Johnson Creek, while still maintaining proximity to Johnson Street at the north end of the route. This would allow the west edges of the existing and new roadways to coincide.

A preliminary opinion of cost to develop this concept is as follows:

- LTC 1A - $1.5 million to $2.1 million
- LTC 1B - $7.4 million to $9.9 million
- LTC 1C - $5.2 million to $6.9 million

This opinion of cost was developed using 2002 values and includes preliminary and final engineering, right-of-way and construction.

ADVANTAGES:

Re-routing of Commercial Vehicle Traffic: LTC 1A, 1B, and 1C would re-route truck traffic to the west of town and leave the passenger vehicle route along Cherry Street. This would eliminate all commercial vehicle traffic from the downtown core. This concept would also allow for the construction of a second commercial vehicle lane at the border that could be used for all commercial vehicle traffic or used exclusively by those not required to visit brokers.

Commercial Vehicle Queuing: The 12 truck stalls of LTC 1B's parking area and its travel lanes to Garfield Street would provide for current demand and future demand for an average day through at least the year 2006, if U.S. Customs were to conduct outbound inspections of commercial vehicles. It would offer the flexibility to meet 2021 average day demands with expansion of the parking area to 26 stalls, and the staffing of a second northbound commercial vehicle booth. This concept would not have a sufficient number of stalls to accommodate a peak day, peak period truck demand if all commercial vehicles were to be subjected to outbound inspection (although not known for sure at this time, it is unlikely that this situation would occur).

Commercial Vehicle Parking: The parking area could also be modified to create a full service parking area for trucks, as suggested at the design charette. LTC 1A would provide the largest parking area of all the parking concepts.

Public Acceptance: It is expected that the public would be accepting of this concept, as it would address the concerns regarding commercial vehicle traffic and parking that were raised at the design charette.

Property Impacts: LTC 1A, 1B, and 1C would require minimal encroachment into existing developed parcels with the exception of two residential buildings. The parking area would not require any removal of structures. Right-of-way for this concept should be relatively simple to acquire.

Effectiveness: This concept is expected to be highly effective in routing commercial vehicles to the border and avoiding the use of city streets. LTC 1A would provide an ample amount of open space for the efficient ingress, parking, and egress of commercial vehicles.

Longevity: It is anticipated that implementation of the three concepts of the Johnson Creek Truck Route concept would meet existing and commercial vehicle demands well into the future. This concept would also meet the anticipated queuing demands for an average day created by the proposed commercial vehicle x-ray inspections to the year 2006, as forecasted in Technical Memorandum 3. With some modifications, the Johnson Creek Truck Route could accommodate most, if not all, of the outbound inspection queues forecasted into the year 2021.

Flexibility: The concept could be constructed in phases, beginning with LTC 1A, then proceeding to LTC 1B, and concluding with LTC 1C in order to accommodate funding constraints. If desired, the Johnson Creek Truck Route could also be used by passenger vehicle traffic as a north-south connector. This would alleviate some of the congestion that could occur as passenger and commercial vehicles maneuver at the business areas on Bob Mitchell Way. Passenger vehicular traffic could be directed off the truck route and onto Bob Mitchell Way in order to access the existing passenger vehicle facility on Cherry Street.

DISADVANTAGES:

Cost: LTC 1 is one of the most costly concepts presented in this Technical Memorandum. This is due to several factors including the amount of land that would need to be acquired along with construction of new roadway, bridge structures, a large parking area, and a commercial vehicle border crossing structure.

Environmental: The placement of LTC 1's new impervious material, in what appears to be existing wetlands, could possibly have negative impacts on the environment. This concept would require bridges to cross Johnson Creek at two separate places.

Long-Term Concept (LTC) 2: Additional Passenger Vehicle Holding Area on Cherry Street

If additional staffing for the passenger vehicle portion of the Canada Customs facility is not possible, an additional holding area north of Cleveland Avenue could be constructed and utilized, illustrated in Figure 4. This holding area is one element of Long-Term Concept (LTC) 2 and would create six northbound holding lanes on Cherry Street. The 15-foot wide lanes would support a total queue length of 3,260 lineal feet and branch off to the west near the intersection of Cherry Street and Cleveland Avenue. These lanes could accommodate up to 130 passenger vehicles, assuming an average vehicle length of 25 feet. The existing edge of pavement on the east side of Cherry Street would remain the edge, with the additional lanes added to the west side. These holding lanes would provide a place for passenger vehicles to queue as they are waiting to cross the border. The vehicles would stop 165 feet from the Canada Customs building and proceed individually to a customs booth as they become available. A signal system could be installed to facilitate the efficient processing of the vehicles.

The second element of LTC 2 is the diverting of the southbound lanes entering the United States from their existing location after passing through the United States Customs. These southbound lanes would merge into Cherry Street about 150 feet north of Garfield Street, which is about 275 feet south of their existing point of mergence.

The increase of northbound lanes and divergence of southbound lanes would generate approximately 12,600 square feet of new impervious area. This concept would require the removal of one business on the west side of Cherry Street near the U.S. Customs facility and at least a partial acquisition of a business parcel at the southwest corner of Cherry Street and Garfield Avenue. This concept is illustrated in Figures 4 and 4A. A preliminary opinion of cost to design and construct this concept is $2.8 million to $3.7 million. This opinion of cost includes preliminary and final engineering, right-of-way and construction costs.

ADVANTAGES:

Passenger Vehicle Queuing: LTC 2 would provide ample space for passenger vehicles to queue while waiting to cross the border. This could possibly alleviate congestion and conflict between passenger and commercial vehicles using the same roads to get to their respective border crossing areas.

Cost: The cost of constructing LTC 2 is considered to be relatively low. The proposed paved area for both southbound and northbound lanes would not be substantial, but would require substantial traffic control.

Longevity: It is anticipated that implementation of LTC 2 would satisfy passenger vehicle demand at the border well into the future. Assuming a passenger vehicle length of 25 feet, the holding lanes could feasibly hold about 130 vehicles.

Environmental: The quantity of new impervious area would have minimal impact on the existing storm sewer system.

DISADVANTAGES:

Re-routing of Commercial Vehicle Traffic: LTC 2 would not have any provision for re-routing commercial vehicle traffic.

Commercial Vehicle Parking: This concept would not have any provision for commercial vehicle parking.

Public Acceptance: It is expected that the public would not be accepting of this concept as it would not address the concerns of re-routing commercial vehicle traffic and the provision of commercial vehicle parking that were raised at the design charette.

Property Impacts: The improvements of LTC 2 would require the acquisition and removal of at least one and possibly two businesses. This is mostly attributed to the divergence of the southbound lanes. However, it may be possible to avoid these acquisitions if the southbound lanes were diverted to Railroad Street instead of Cherry Street, along with some modification to the northbound holding lane pattern.

Flexibility: LTC 2 would directly address the needs of passenger vehicles only. The issues and concerns of commercial vehicle traffic and parking would not be directly addressed. By queuing passenger vehicles in their designated area, conflict between passenger and commercial vehicles on the city streets may be decreased.

Long Term Concept (LTC) 3: Second Northbound Commercial Booth

Long Term Concept 3 would add a second Canada Customs northbound lane and an additional booth for commercial vehicles, illustrated in Figure 5. According to the data presented in Technical Memorandum 3, this second lane and booth could significantly decrease queue lengths for an average day in the years 2001 and 2006. The 20-foot commercial vehicle lane of LTC 3 would veer off Sumas Avenue near Boundary Avenue and continue 235 feet to the new booth. This additional lane would require the acquisition of 8,250 square feet of right-of-way and the removal of one structure on the Canadian side of the border. The new lane would consist of about 6,925 square feet of new impervious area with no other widening required. The new commercial vehicle booth would be placed adjacent to the existing booth. A preliminary opinion of cost to design and construct this concept is $0.7 million to $1.0 million. This opinion of cost includes preliminary engineering, right-of-way and construction costs.

ADVANTAGES:

Commercial Vehicle Queuing: Concept LTC 3 would provide almost 235 feet of queuing length for the commercial vehicle border crossing. Assuming a maximum commercial vehicle length of 80 feet, this would accommodate about three commercial vehicles.

Cost: The cost of Concept LTC 3 is considered to be relatively low due to minimal new paved areas and acquisitions.

Property Impacts: The new lane would require minimal land acquisition. However, one small structure on the Canadian side of the border would need to be removed.

Environmental: The quantity of new impervious area would have minimal impact on the existing storm sewer system.

DISADVANTAGES:

Re-routing of Commercial Vehicle Traffic: LTC 3 would not relocate the commercial vehicle traffic.

Public Acceptance: It is expected that the public would not be accepting of this concept, as it would not address the concerns of commercial vehicle traffic routing and parking that were raised at the design charette.

Flexibility: The effectiveness of this concept would be marginal in solving the commercial vehicle queuing and parking issues in the City of Sumas. The second lane of LTC 3 would only be effective if Canada Customs would be able to keep the new booth fully staffed. This concept is assumed to maximize efficiency when combined with either NTC 3A or NTC 3B due to the provision of parking by these concepts.

Long Term Concept (LTC) 4: Truck Routing via Coachman Road

Long Term Concept 4 is similar to that detailed in the Kittleson Report of 1991. LTC 4 would utilize mostly existing roads with the exception of the construction of one new road, illustrated in Figure 6. The truck route would redirect commercial vehicle traffic to the east side of the city of Sumas. The route would start on Halverstick Road (SR9) using Front Street, Coachman Road, Jones Road, a new road would be constructed to Harrison Avenue, and Harrison Avenue. A parking area on Harrison Avenue near the existing Canada Customs and Commercial Vehicle Crossing would also be constructed. The proposed truck route would be 32 feet wide, including two-12 foot lanes and two-4 foot shoulders. Six-foot sidewalks would be constructed along Harrison Avenue and the new road, as these roadways are assumed to be the only two that require a provision for pedestrians. The parking of LTC 4 is illustrated in detail in Figure 6A.

Long Term Concept 4 would require approximately 14,725 lineal feet of roadway widening and about 650 lineal feet of new roadway construction. The new roadway would allow the commercial vehicle traffic to access Harrison Avenue, along with the parking and border crossing from Jones Road, without utilizing the downtown streets of Sumas. The approximate 103,500 square feet of parking area would have 16 commercial vehicle stalls, using WSDOT’s Typical Truck Storage detail. The parking area and roadways of LTC 4 would require the acquisition of almost eight acres of land and the removal of three residences and one business. A preliminary opinion of cost to design and construct this concept is $13.2 million to $17.6 million. This opinion of cost includes preliminary engineering, right-of-way and construction costs.

ADVANTAGES:

Re-routing of Commercial Vehicle Traffic: This concept would relocate commercial vehicle traffic from the downtown streets of Sumas to a route east of town, leaving passenger vehicle traffic unchanged.

Commercial Vehicle Queuing: The 16 stalls could accommodate 16 double trailer commercial vehicles.

Commercial Vehicle Parking: The area adjacent to the parking facility could be modified to create a "full service" parking area for trucks, as suggested at the design charette. Services could include restaurants, laundry, and sundries offered by private parties.

Public Acceptance: It is expected that the public would be accepting of the concept, as it would address concerns about commercial vehicle traffic re-routing and parking that were raised at the design charette.

Effectiveness: LTC 4 would route commercial vehicles to the south and east of the city of Sumas. However, 1,700 feet of the truck route would be on Harrison Avenue from east of Larson Street to Sumas Avenue. The parking area would provide parking for up to 16 double-trailer commercial vehicles.

Longevity: It is anticipated that implementation of the Conchman Road Truck Route would meet the commercial vehicle roadway demands well into the future.

DISADVANTAGES:

Cost: LTC 4 is one of the more expensive concepts. This is due to several factors including the amount of land acquisition, building removal, a large parking area, and length of roadway required.

Property Impacts: The parking area of this concept would require encroachment into existing developed parcels and the removal of five residential structures. The roadway would require the acquisition of right of way along the entire 15,000 lineal feet for construction.

Environmental: LTC 4's additional impervious material area would have intrinsic negative impacts on the environment.

Proposed Screening Process (Next Steps)

The next step of the project will include a detailed screening process of the near- and long-term improvement concepts identified above, as well as any others that the Project Team considers appropriate. The goal of this screening process is to evaluate and select the best concepts for additional evaluation. The screening elements are expected to include:

- Traffic Impacts – Identify the traffic congestion relief benefit of a concept.
- Environmental Issues – A qualitative assessment of impacts the concept might have on wetlands, streams, or other elements of the natural environment.
- Capital Cost - This element would focus on the costs of implementation, both capital and operational. Anticipated operational cost information will be solicited from the Project Team.
- Land Use Impacts – Qualitative assessment of items such as noise impacts and compatibility of the proposed concept with existing or proposed land uses.
- Flexibility – How easy would it be to reconfigure the concept to accommodate changed conditions.

- Right-of-way /Property Impacts – How much right-of-way would be required for the proposed concept as well as impacts on existing land uses (i.e. residential or business displacement and noise).
- Public Acceptance – Based on input received from the Design Charette, and feedback from the Project Team, assess potential public acceptance of the concept.
- Ease of Implementation – Identify the concepts that will require multi-agency coordination and agreement or potential community impacts that would make implementation difficult.
- Longevity – How long would the proposed concept meet demand.

The Consultant will prepare an initial matrix comparing the different improvement options. The Project Team would then be asked to review the matrix and supporting documentation prior to the next Project Team meeting and to provide comments. These comments would then be distributed to all members to consider prior to a meeting where final "rankings" would be assigned.

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Abbotsford-Sumas Border Improvement Project

Technical Memorandum 6

Concept Screening and Identification of Recommended Concepts

Perteet Engineering, Inc.
Civil, Transportation and Surveying

Perteet Engineering, Inc.

Whatcom COUNCIL OF GOVERNMENTS

TO: Melissa Miller, Project Coordinator, Whatcom Council of Governments

FROM: Peter De Boldt, P.E., Project Manager, Perteet Engineering
Gina Parenteau, E.I.T., Design Engineer, Perteet Engineering

DATE: Revised - November 26, 2002

RE: Concept Screening and Identification of Recommended Concepts - Technical Memorandum 6
Abbotsford-Sumas Border Improvement Study (PEI No. 22009)

Introduction

The purpose of this memorandum is to evaluate the seven proposed concepts outlined in Technical Memorandum 5 and select some of the concepts as recommended solutions to the problems created by the Abbotsford-Sumas border crossing and related activities. The selection of the recommended concepts is the result of a screening process that evaluates each of the seven proposed concepts.

The screening process utilizes two different methodologies. The first consists of an analysis of how many of the different "problems" (identified in Technical Memorandum 4) a specific concept would resolve. The “Problems Solved” Evaluation represents essentially a "yes" or "no" assessment of whether a specific concept would resolve the identified problems associated with the Abbotsford-Sumas border crossing.

The second methodology of the screening process evaluates each concept based on a set of evaluation criteria developed to identify the impacts the concepts would have on the local community and other stakeholders. The “Community/Stakeholder Impacts” Evaluation includes a mixture of qualitative elements utilizing a "good", "fair", or "poor" rating in addition to some quantitative elements, such as cost.

The last segment of this memorandum identifies a recommended Near-Term Concept and a Long-Term Concept as preferred solutions to the problems created by the border crossing and related activities.

Identification of Problems and Solutions

In order to identify the problems generated by the border crossing and generate some potential solutions, a Design Charette was held on May 14, 2002. Local members of the community and other stakeholders identified what they perceived to be the past, current, and future issues caused by the border crossing and discussed what they saw as possible solutions. The focus of the Design Charette was on issues that occur south of the border. Technical Memorandum 4 provides the details of the Design Charette. As a result of the Design Charette, the following problems and solutions were identified:

GENERAL PROBLEMS	GENERAL SOLUTIONS
❑ Routing of truck traffic along Cherry Street ❑ Lack of queuing areas for commercial vehicles ❑ Lack of queuing areas for passenger vehicles ❑ Difficulty/inconvenience in accessing Customs Brokers ❑ Trucks dropping trailers in parking lots or parking tractors and trailers around the City of Sumas ❑ Occasional vehicle queue lengths impacting cross-street intersections and local businesses	❑ Create parking areas for trucks ❑ Create queuing areas for trucks ❑ Create queuing areas for cars ❑ Construct a new truck route ❑ Re-route trucks off of Cherry Street ❑ Adequate staffing of customs booths and creating a second commercial vehicle booth at Canada Customs ❑ Locate U.S. Brokers on the Canadian side and Canadian Brokers on the U.S. side of the border

Based on the general solutions identified at the Design Charette, Perteet Engineering has developed seven concepts as possible specific solutions to the problems created by the border crossing and related activities of northbound traffic. For discussion purposes, these concepts were divided into "Near-Term Concepts (NTC)" and "Long-Term Concepts (LTC)". The "Near-Term Concepts" were intended to cover concepts that could be implemented almost immediately at minimal cost, while the "Long-Term Concepts" may require a greater capital cost, changes that would involve multiple agency approvals, or have a wider impact on the community. Some of the concepts have sub alternatives, resulting in an "A" or "B" version. The concepts are outlined in detail in Technical Memorandum 5.

The specific solutions are:

- Near-Term Concept 1 (NTC 1): Increased Border Staffing
- Near-Term Concept 2A (NTC 2A): Bob Mitchell Way Truck Route with Parking Area east of Sumas Avenue
- Near-Term Concept 2B (NTC 2B): Bob Mitchell Way Truck Route with Queuing Area east of Sumas Avenue
- Near-Term Concept 3A (NTC 3A): Truck Parking at the American Legion Hall Site (could have access via either Cherry Street, or Bob Mitchell Way)
- Near-Term Concept 3B (NTC 3B): Truck Queuing at the American Legion Hall Site (could have access via either Cherry Street, or Bob Mitchell Way)
- Long-Term Concept 1 (LTC 1): Johnson Creek Truck Route
- Long-Term Concept 2 (LTC 2): Additional Passenger Vehicle Holding
- Long-Term Concept 3 (LTC 3): Second Northbound Commercial Booth
- Long-Term Concept 4 (LTC 4): Truck Routing via Conchman Road

Screening Process

The goal of the screening process was to qualitatively assess which of the issues each concept addresses and to identify how well each concept meets, or does not meet, criteria which would be important to the local community and other stakeholders.

The selected screening process utilizes two different methodologies. The first consists of an analysis of how many of the different problems a specific concept would resolve and is labeled the “Problems Solved” Evaluation. It is essentially a "yes" or "no" assessment of whether a specific concept would resolve a particular problem at the Abbotsford-Sumas border crossing. This is an important step to help identify which type of traffic (passenger or commercial) the concept is addressing and whether or not as a result of the concept the traffic issues would be addressed.

The second methodology used in the screening process is labeled the “Community/Stakeholder Impacts” Evaluation. Each concept was evaluated on the basis of how it would address issues important to the local community and other stakeholders. This assessment process includes a mixture of qualitative elements utilizing a "good", "fair", or "poor" rating in addition to some quantitative elements, such as costs. The purpose of this step is to identify the areas where some concepts may be more desirable than others.

Identifying a screening process that would rank the concepts and result in determining the “best” option was difficult. This is largely due to the fact that the each of the problems and solutions are specific to either passenger vehicles or commercial vehicles. Each concept does not solve <u>every</u> problem identified. Concepts generally directly solve one or more of the problems specifically. Because of this, each of concepts cannot be evaluated as a comparison against the others to determine the "best" recommended concept and a qualitative approach is used instead.

Evaluation of Concepts

"Problems Solved" Evaluation

The "Problems Solved" Evaluation is summarized in Table 6-1 and illustrates the results of how well each concept would address the general problems that the community and the stakeholders identified for traffic heading northbound to the border crossing. The problems cited by the community and stakeholders, and summarized below, are in some cases somewhat similar (such as Rows 3 and 6 in the table below). In that circumstance, it could be argued that providing queuing space for passenger cars would solve passenger vehicle queues from impacting cross-street intersections and businesses. There are subtle differences however, and therefore each of the problems raised by the community and stakeholders was included in the table. If the proposed concept addresses the problem, it received a check in the table below.

Table 6-1 – "Problems Solved" Evaluation

Problem	NTC 1	NTC 2A	NTC 2B	NTC 3A	NTC 3B	LTC 1	LTC 2	LTC 3	LTC 4
Routing of truck traffic along Cherry St.	☐	☑	☑	☐	☐	☑	☐	☐	☑
Lack of queuing areas for commercial vehicles	☑	☐	☑	☐	☑	☑	☐	☑	☑
Lack of queuing areas for passenger vehicles	☑	☐	☐	☐	☐	☐	☑	☐	☐
Difficulty/inconvenience in accessing customs brokers	☐	☑	☐	☑	☐	☑	☐	☐	☑
Trucks dropping trailers in parking lots or parking tractors and trailers around the City of Sumas	☐	☑	☐	☑	☐	☑	☐	☐	☑
Occasional vehicle queue lengths impacting cross-street intersections and local businesses (Reduced because of queue storage or vehicle rerouting)	☑	☐	☑	☐	☑	☑	☑	☑	☑
NUMBER OF PROBLEMS SOLVED	**3**	**3**	**3**	**2**	**2**	**5**	**2**	**2**	**5**

Five of the seven concepts would directly solve the problems related to commercial vehicle traffic. NTC 2A, NTC 2B, LTC 1 and LTC 4 would all address the issue of the designated truck route being along Cherry Street. Each of these concepts also creates some kind of a holding area for trucks, however these concepts may differ in the respect that the area may be designated as either parking for trucks or a queuing storage area. NTC 1 and LTC 3 solve commercial vehicle queuing problems with the cooperation of Canada Customs. The issue of trucks parking throughout the city is solved with NTC 2A, NTC 3A, LTC 1 and LTC4. Providing parking areas for trucks in NTC 2A, NTC 3A, LTC 1, and LTC 4 would allow trucks to visit customs brokers or perform other activities without adding too queues or disrupting citizens within the city.

NTC 1 and LTC 2 would directly address passenger vehicle queuing issues. The NTC 2B, NTC 3B, LTC 1, LTC 3, and LTC 4 all indirectly help solve the problem of vehicle queuing impacting cross-street intersection and local businesses. They do this either by minimizing the number of commercial vehicles that might be mixed into the passenger vehicle queue or by opening up the current commercial vehicle booth for use by passenger vehicles.

"Community/Stakeholder Impacts" Evaluation

The "Community/Stakeholder Impacts" Evaluation consists of 11 criteria used to evaluate each concept. This evaluation is summarized in Table 6-2. In developing the criteria, it was important to consider what types of impacts the implementation of a concept would have and who would be affected by the decision to implement a concept. It was important to realize that individual citizens, businesses, and government agencies, as well as the natural environment would be affected by the choice to implement any one of the concepts. Therefore the criteria selected were identified as areas that would be important to both the local community and other stakeholders. The criteria consists of the following:

1. **Relief of Traffic Congestion -** Each of the problems result in traffic congestion within the city, either directly or indirectly. Would the concept relieve the traffic congestion created by the border crossing and related activities?
2. **Decreased Wait Times to Cross Border –** Most of the problems identified either directly or indirectly affect the wait times of vehicles trying to cross the border when queues develop. When queues do develop, would the concept decrease the average wait times of vehicles?
3. **Minimal Natural Environmental Impacts -** Some of the concepts would create new impervious surfaces or would be located in agricultural or undeveloped areas. Would the concept have a minimal amount of negative impact on wetlands, streams, or other elements of the natural environment?
4. **Compatibility with Land Use –** Some of the concepts would require displacement of homes, businesses, or land that has agricultural use. The location of the concept might also be such that a disruptive environment would be created near residences. Would the concept have a minimal amount of negative effect or minimal change to the current zoned areas?
5. **Flexibility to Change –** Future traffic volumes are projected estimates and are not an exact prediction of future conditions. If there were increases in volumes over what is currently projected or surrounding conditions changed, it might make the concept

ineffective in handling traffic volumes. Would it be easy to reconfigure the concept after it was constructed or implemented in order to accommodate the changes?

6. **Public Acceptance –** Members of the local community and other stakeholders identified problems and solutions that were generally specific to their role in the community or their use of the border crossing. Would most all those involved positively accept the concept?
7. **Agency Coordination –** The number of agencies that would have to be involved in the agreement and implementation of each concept varies greatly and would be one determining factor in the time it would take to implement the concept. Some of the concepts would require cooperation from the federal Canadian government, which adds another level of complexity and uncertainty in the ability to implement the concept. Would it be one or multiple agencies coordinating the implementation of the concept?
8. **Longevity –** Traffic volumes are projected to increase in the future for both passenger and commercial vehicles. This study looks at current conditions, year 2006 conditions and through the year 2021. Would the proposed concept meet the projected demands through the year 2021?
9. **Right-of-Way –** How much right-of-way would be required for purchase for the proposed concept?
10. **Operational and Maintenance Costs –** How much would it cost per year to operate and maintain the concept?
11. **Capital Cost –** What would be the range in cost to implement the concept?

The evaluation criteria outlined above are either qualitative or quantitative, with the majority of the criteria being qualitative. The qualitative criterion uses a rating system of Good, Fair, or Poor to evaluate the concepts as to how well they meet the criteria. In conducting the evaluations, the following working definitions of the ratings are:

Good – fully meets the evaluation criteria

Fair – at least partially meets the evaluation criteria

Poor – doesn't meet the evaluation criteria most or all of the time

Following is Table 6-2 – "Community/Stakeholder Impacts" Evaluation.

Table 6-2 – "Community/Stakeholder Impacts" Evaluation

Criteria	NTC 1 - Increased Border Staffing	NTC 2A – East side of Sumas Ave Parking Area	NTC 2B – East side of Sumas Ave Queuing Area	NTC 3A - Truck Parking at the Legion Hall Site	NTC 3B - Truck Queuing at the Legion Hall Site	LTC 1 - Johnson Creek Truck Route	LTC 2 - Additional Passenger Vehicle Holding	LTC 3 - Second Northbound Commercial Booth	LTC 4 - Truck Routing via Conchman Road
Relief of Traffic Congestion	**Good** – Queue lengths would decrease	**Fair** – Truck queues not mixed with pass. queues would create less congestion on Cherry	**Fair** – Truck queues not mixed with pass. queues creates less congestion on Cherry Holding area reduces queue on streets	**Poor**- Would not effect congestion	**Poor** – Holding area would not make a significant decrease in queue length on streets	**Fair** – Truck queuing would be removed from the city, passenger car traffic is not effected	**Fair** – Passenger queue lengths would be removed from the streets, truck queuing is not affected	**Fair** – Would eliminate queue lengths for commercial vehicles, passenger car traffic is not affected	**Fair** – Truck queuing would be removed from the city, passenger car traffic is not effected
Decreased Wait Times to Cross the Border	**Good** – Wait times would be reduced	**Poor** – Would not effect wait times	**Poor** – Would not effect wait times	**Poor** – Would not effect wait times	**Poor** – Would not effect wait times	**Fair** – Would reduce wait times for trucks, but no change for cars	**Poor** – Would not effect wait times	**Fair** – Would reduce wait times for trucks, but no change for cars	**Poor** – Would not effect wait times
Minimal Natural Environmental Impacts	**Good** – No changes	**Fair** – Additional impervious surface, with no other impacts expected	**Fair** – Additional impervious surface, with no other impacts expected	**Fair** – Additional impervious surface with no other impacts expected	**Fair** – Additional impervious surface with no other impacts expected	**Poor** – Significant amount of new impervious surface and may displace natural wetland areas	**Good** –Very minimal additional new impervious surface	**Good** – Minimal new impervious surface with no other impacts expected	**Poor** – Significant amount of new impervious surface and may displace natural wetland areas
Compatibility with Land Use	**Good** – No changes	**Poor** – Require acquisition of existing residential units	**Poor** – Require acquisition of existing residential units.	**Fair** – Require acquisition of the Legion Hall and parking lot	**Fair** – Require acquisition of the Legion Hall and parking lot	**Fair** – Require acquisition of existing residence and business	**Fair** – Require acquisition of two buildings	**Good** – No residences or businesses displaced	**Poor** – Require acquisition of existing residential units and some purchase of shoulder ROW
Flexibility to Change	**Good** – Additional staffing could be added with increased volumes	**Poor** – Once constructed, capacity becomes fixed without expansion options	**Poor** – Once constructed, capacity becomes fixed without expansion options	**Poor** – Once constructed, capacity becomes fixed without expansion options	**Poor** – Once constructed, capacity becomes fixed without expansion options	**Good** –In an area not limited by exist'g land use restrictions & accommodates large truck volumes	**Poor** – Once constructed, capacity becomes fixed without expansion options	**Good** – Through staffing, the concept could respond to changing truck patterns	**Fair** – Could accommodate large truck volumes.
Public Acceptance	**Good** – Would eliminate queues with no changes to existing land uses	**Fair** – Would create holding area close to residential neighborhood.	**Fair** – Would create holding area close to residential neighborhood.	**Fair** – Would create holding area close to residential neighborhood and displace Legion Hall	**Fair** – Would create holding area close to residential neighborhood and displace Legion Hall	**Fair** – Would meet all of the "Problems Solved" criteria, but is a costly option	**Good** – Minimal impact on the city and would significantly decrease queue length on streets	**Good** – Minimal land use impact and decreased queue length	**Fair** – Would remove traffic from the city, however long route and displaced residences
Agency Coordination	**Poor** – Would require continued funding by Canadian federal government	**Fair** – Would require coordination only between the City and possibly WSDOT	**Fair** – Would require coordination only between the City and possibly WSDOT	**Good** – Would require City coordination only	**Good** – Would require City coordination only	**Poor** – Would require multiple agency coordination, including Canada	**Fair** – Would require multiple agency coordination, includ'g US Customs	**Poor** – Would require multiple agency coordination, including Canada	**Poor** - Would require maximum number of agency coordination
Longevity (design year based on average conditions, peak hour)	Year 2021	Year 2001	Year 2001	Year 2001	Year 2001	Year 2021	Year 2006	Year 2021	Year 2006
Right-of-Way	0 sf	6500 sf and 4 Residences	13,000 sf and 6 Residences	17,400 sf and 1 Business	17,000 sf and 1 Business	277,000 sf and 1 Business/1 Residence	4000 sf and 2 Businesses	8300 sf	252,600 sf and 6 Residences
Operational and Maintenance Costs	$96,000/yr (requires 3 FTE to operate 1 booth)	Not calculated.	Not calculated	Not calculated	Not calculated	$96,000/yr (requires 3 FTE to operate 1 booth) – Assumed that existing comm. booth is closed.	Not calculated	$192,000/yr (requires 6 FTE to operate both existing booth plus new booth)	Not calculated
Capital Cost	$0	$2.4-3.2 M	$3.7-4.9 M	$1.0-1.3 M	$1.1-1.4 M	$36-48 M	$2.3-$3.1 M	$0.4-0.6 M	$13.2-17.6M

Recommendations

Based on the two evaluation methods, one Near-Term Concept and one Long-Term Concept have been chosen as recommended concepts. With respect to Near-Term Concepts, the evaluation methods resulted in a recommendation of NTC 1: Increased Border Staffing as the preferred concept. NTC 1 would solve a high number of problems with respect to the other NTC's. It is a unique solution due to the fact that it directly addresses some of the issues of both passenger and commercial vehicles (assuming that Canada Customs would have the flexibility of using the additional FTE's in either the commercial or passenger booths depending on demand). NTC 1 meets almost all of the "Community/Stakeholder Impact" criteria, has a low capital cost, and no right-of-way acquisition.

One drawback to NTC 1 is that it is dependent on the cooperation of the federal Canadian Government. NTC 1 would require Canada Customs to hire additional staff to occupy additional booths on a yearly basis. This solution may or may not be considered a long term solution due to the fact that there may not be any guarantee that Canada Customs would be able to staff the booths consistently in future years.

With respect to Long-Term Concepts, a combination of LTC 2 (Additional Passenger Car Queuing) and LTC 3 (Second Northbound Commercial Vehicle Booth) is recommended based on both evaluation methods. The combination of these concepts would directly solve problems associated with both passenger and commercial vehicles. Together, LTC 2 and LTC 3 satisfy the majority of the "Community/Stakeholder Impacts" criteria and they have a relatively low capital cost. They also would have a relatively low amount of right-of-way purchase and environmental impact.

It is further recommended that if NTC 1 cannot be implemented, consideration be given to an accelerated schedule to implement LTC 2. Of all the other concepts considered, this concept would help address what currently appears to be the greatest community concern of vehicle queuing impacting other activities in downtown Sumas. If funding were made available, this concept could probably be operational within 1-1/2 to 2 years.

Although LTC 1 addresses all of the problems either directly or indirectly, the "Community/Stakeholder" Impacts Evaluation methodology implies the concept would be hard to implement due to the multiple agencies involved, the potential for a notable amount of negative environmental impacts, and the relatively high capital cost with respect to other concepts.

It is noted that none of the recommended concepts solve the problems identified by some of the stakeholders that are associated with a lack of parking area for trucks. This problem could be addressed through private parties constructing a parking area with services for truckers, which has been repeatedly suggested during interviews and at the design charette.

In closing, we are reminded that there are a wide variety of stakeholders impacted by the Abbotsford – Sumas border crossing. The recommended concepts were chosen by trying to answer the questions of:

- How can each of the stakeholder's needs be met?
- How can concepts be implemented within a reasonable cost?
- How can concepts be implemented with minimal negative impact to the overall community of Sumas?

The recommended concepts, NTC 1 or a combination of LTC 2 and LTC 3, address problems associated with both passenger vehicles and commercial vehicles. These concepts are approximately mid-range in total cost (both capital and operational/maintenance), and satisfy most all of the criteria associated with the local community and stakeholders.

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NEAR TERM CONCEPT 2A & 2B

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FIGURE 1

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NEAR TERM PARKING CONCEPT 2A

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FIGURE 1A

ABBOTSFORD SUMAS BORDER CROSSING IMPROVEMENTS
NEAR TERM PARKING CONCEPT 2B

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FIGURE 1B

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NEAR TERM CONCEPT 3A & 3B

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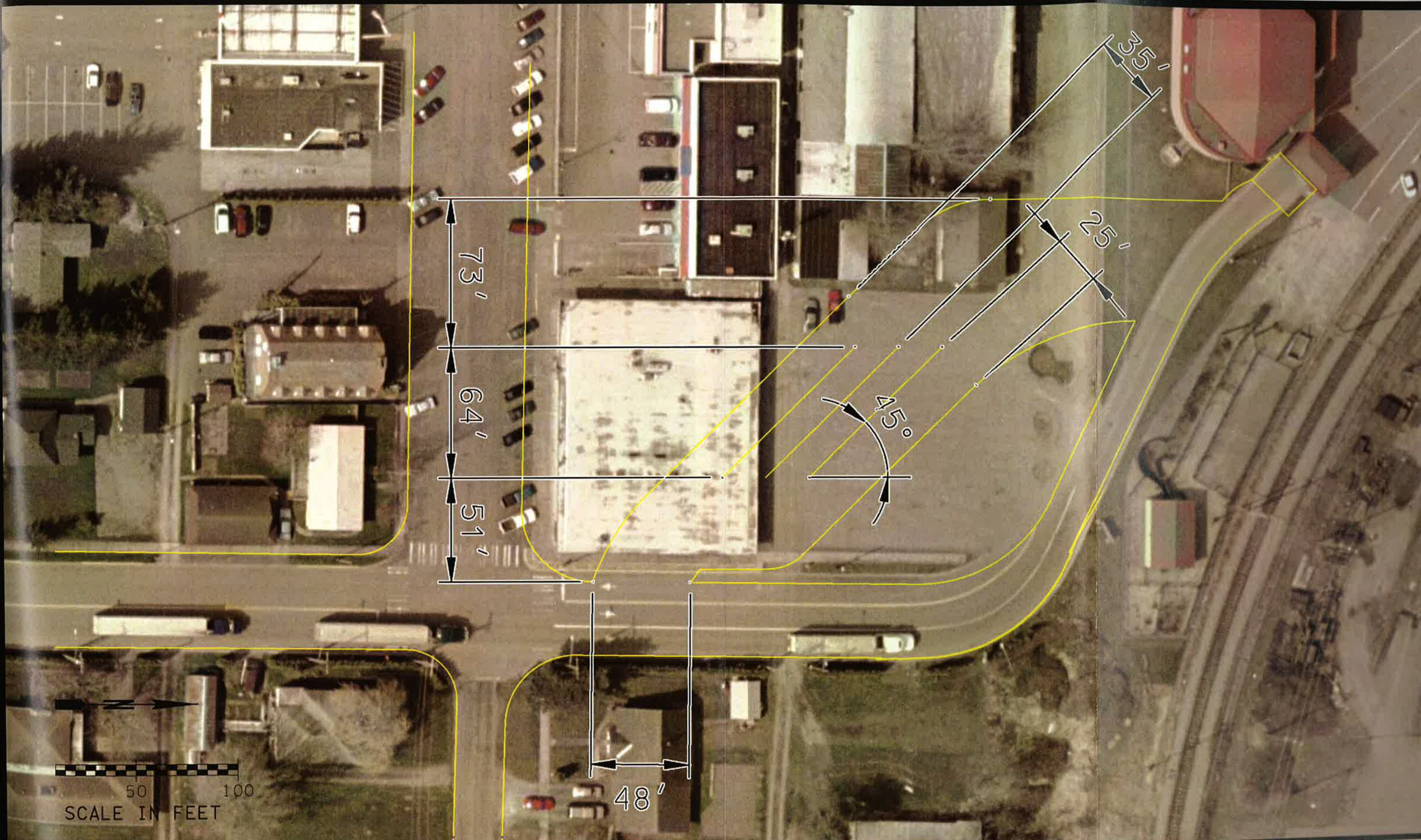
FIGURE 2



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ABBOTSFORD SUMAS BORDER CROSSING IMPROVEMENTS
NEAR TERM PARKING CONCEPT 3A

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FIGURE 2A

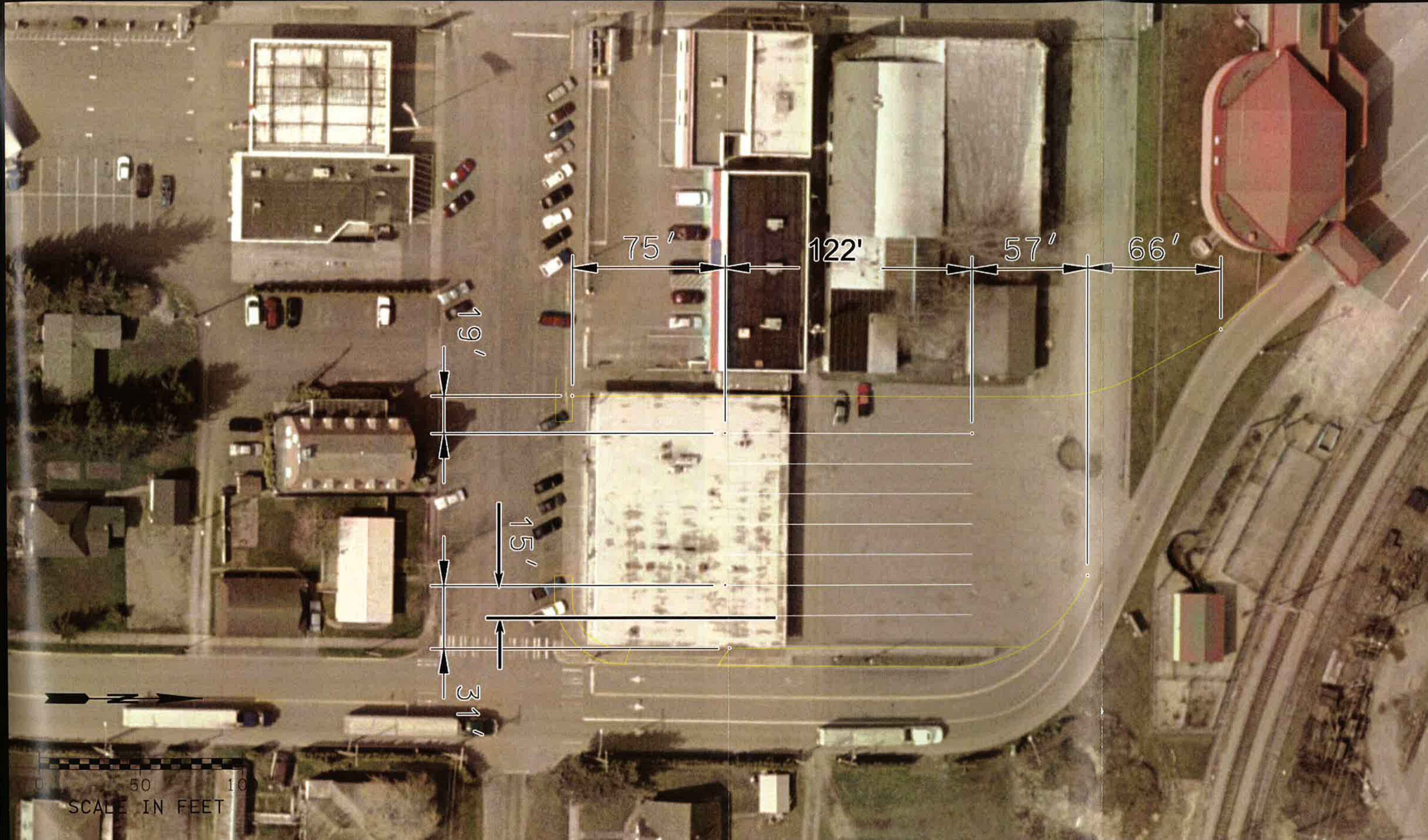

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FIGURE 2B

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LONG TERM CONCEPT 1

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FIGURE 3

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LONG TERM PARKING CONCEPT I

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FIGURE
3A

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ABBOTSFORD SUMAS BORDER CROSSING IMPROVEMENTS
LONG TERM CONCEPT 2

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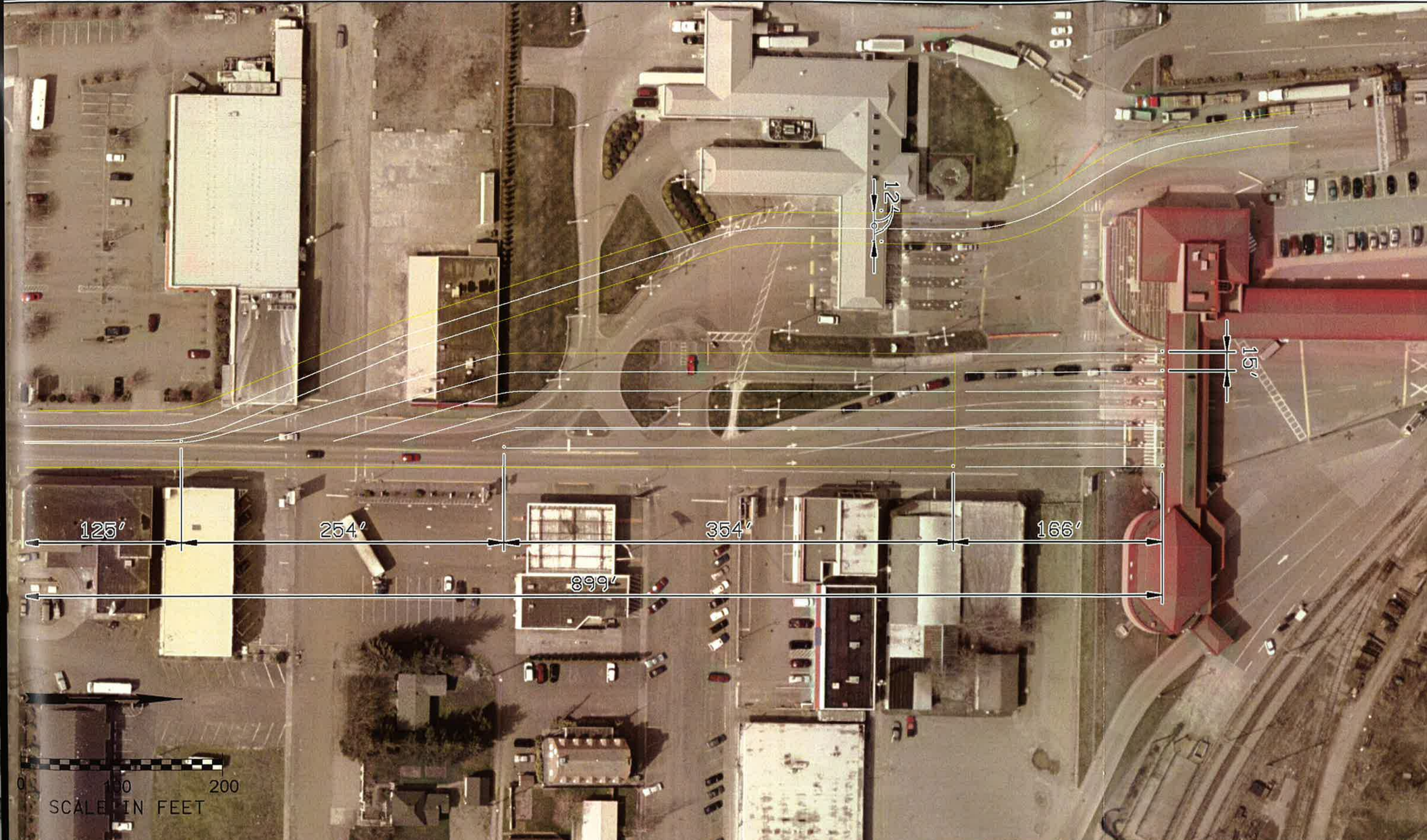
FIGURE 4



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LONG TERM PARKING CONCEPT 2

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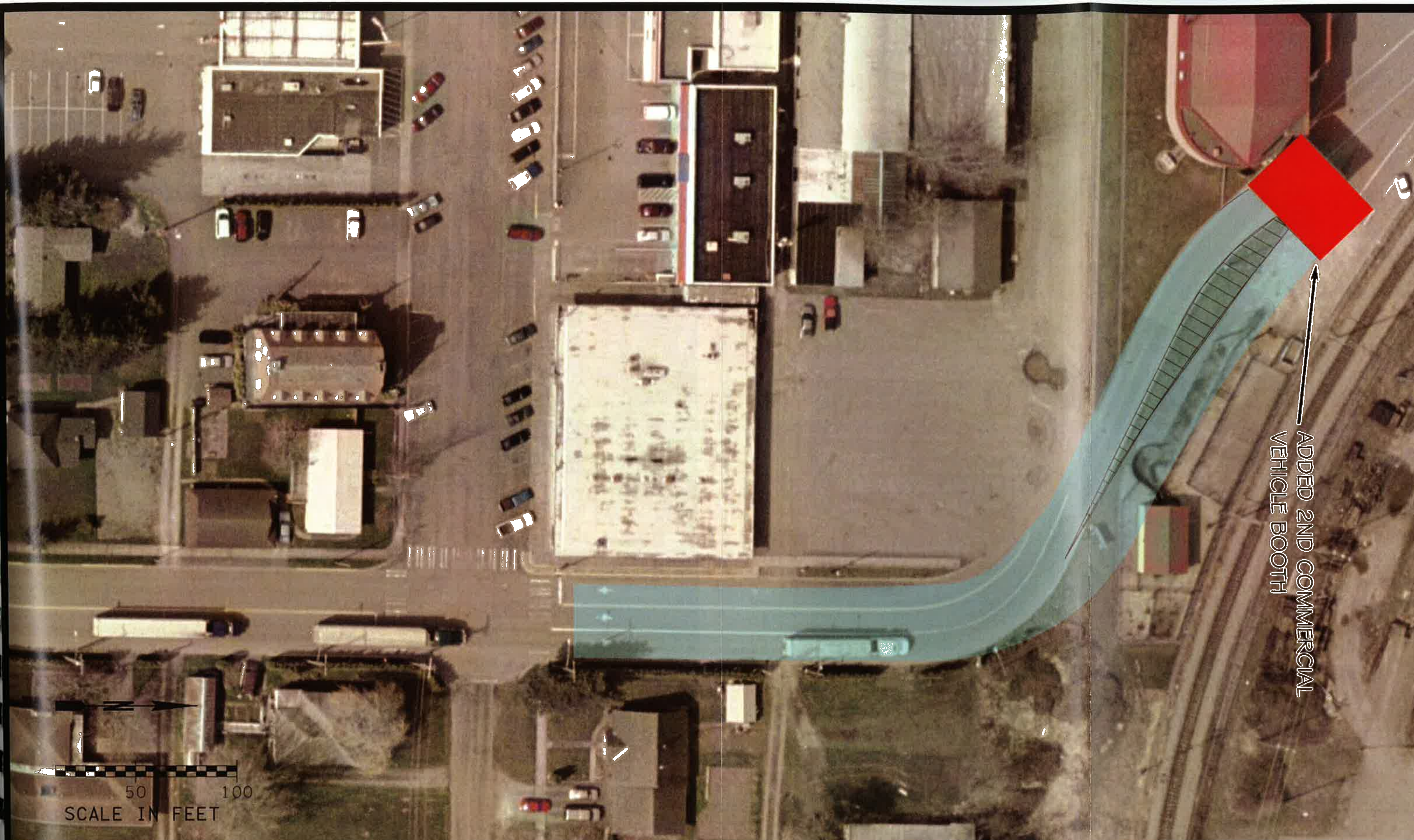
FIGURE 4A



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ABBOTSFORD SUMAS BORDER CROSSING IMPROVEMENTS
LONG TERM CONCEPT 3

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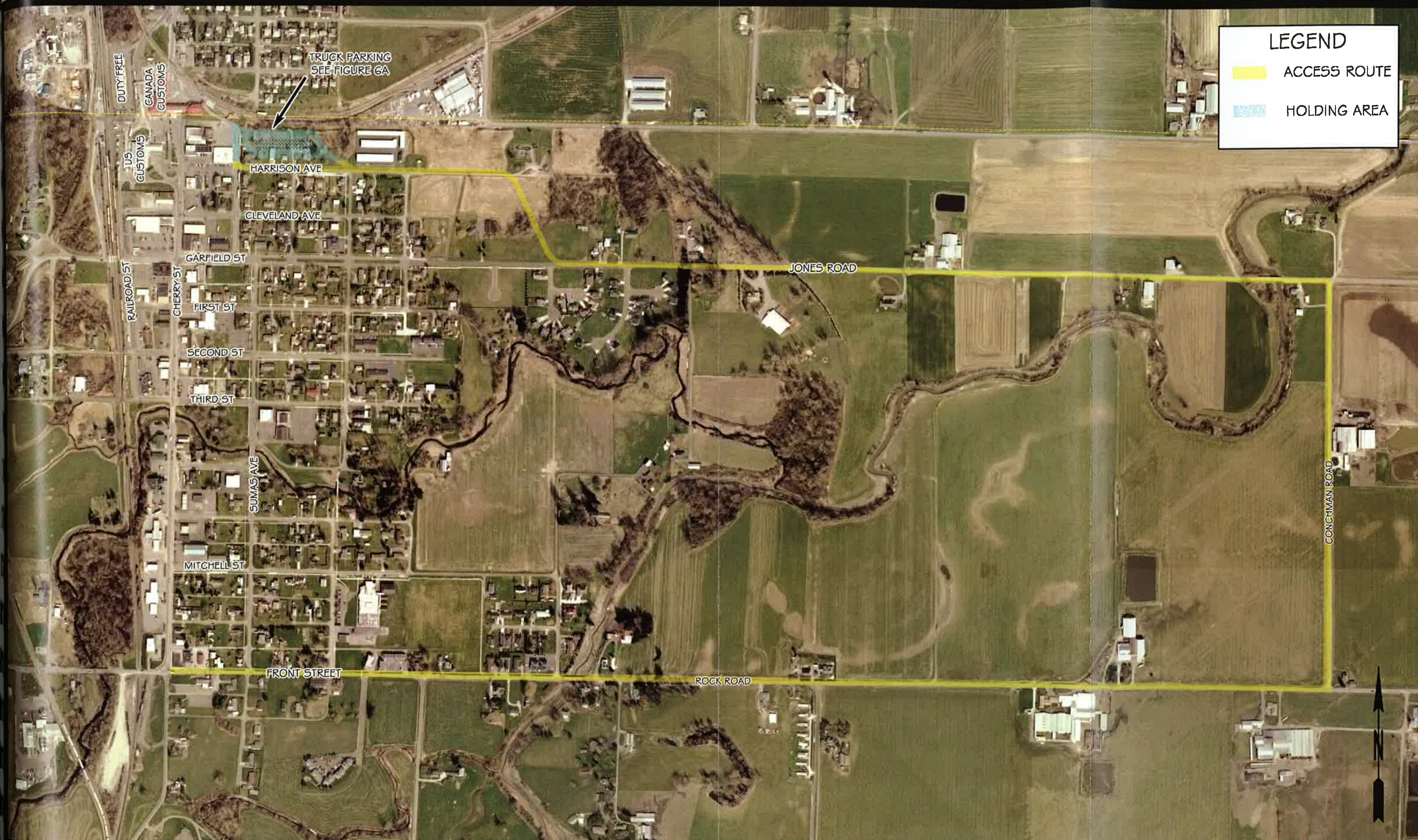
FIGURE
5



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ABBOTSFORD SUMAS BORDER CROSSING IMPROVEMENTS
LONG TERM CONCEPT 4

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FIGURE 6

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ABBOTSFORD SUMAS BORDER CROSSING IMPROVEMENTS
LONG TERM PARKING CONCEPT 4

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FIGURE 6A