International Mobility & Trade Corridor Project

Pacific Highway Port-of-Entry Commercial
Vehicle Operations Survey
Final Report
June 2007

Halcrow Consulting Inc

Prepared for:
Whatcom Council of Governments

International Mobility & Trade Corridor Project

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Pacific Highway Port-of-Entry Commercial Vehicle Border Operations Survey

Final Report

Contents Amendment Record

This report has been issued and amended as follows:

Issue	Revision	Description	Date	Approved by

Contents

1 Introduction

1.1 Background

1.1.1 Using the forum of the International Mobility and Trade Corridor (IMTC), the Whatcom Council of Governments (WCOG) retained Halcrow Consultants Inc. (HCI) to undertake a border operations survey in June 2006 to collect data to evaluate the current commercial vehicle operations at the Pacific Highway border crossing. The objective was to collect data to compare the border conditions to those observed during a similar border operations survey conducted by USDOT in 2002. This would enable evaluation of the effectiveness of various initiatives that have been completed since that 2002. The data collection would also be used as part of further technical analysis of the border operations to be undertaken at a later time and provide a new baseline condition for future monitoring.

1.1.2 The survey design and data collected was conducted in consultation with the study sponsors WCOG, Transport Canada and Western Washington University to ensure that the final survey database would be suitable for their purposes including operational modelling. Liaison was made with both the U.S. and Canada customs officials to receive clearance to place surveyors in the inspection facilities and ensure that operational concerns were addressed.

1.2 Structure of Report

1.2.1 Following this introductory chapter, Chapter 2 describes the survey design and the data collected at each stage. Chapter 3 presents the analysis undertaken using the collected data and qualitative observations made during the survey period that were not explicitly collected in the survey process. Chapter 4 documents the structure of the final database created to hold the survey data.

1.3 Acknowledgements

1.3.1 Halcrow would like to thank the customs officials from both sides of the border for their courtesy and support in completing this survey.

2 Survey Design

2.1 Overview

2.1.1 A primary objective of this data collection effort was to track commercial vehicle movements and travel time at key decision points on the approach to the primary inspection booths, and the observe processing time at primary inspection booths. Consistent with the original 2002 border operations survey the survey period for the full survey was 8:00 AM to 5:00 PM over 4 days in June. In addition, survey scope was either expanded or modified to include:

a) *Extended Hours:* It was understood that southbound commercial vehicle volume was relatively strong before 8:00 AM; conversely the northbound volumes tended to remain busy past 5 PM. To this end, an extended hours 'arrival only' survey tracked the arrival of commercial vehicles outside the general survey hours.

b) *Limited Survey:* Delays due to the construction in the northbound direction were sufficient to alter travel patterns that detailed data such as total traffic, arrival rate and queue was not considered representative. As a result, the final two northbound survey days were modified to a 'limited survey' that only focused on primary inspection time. The primary inspection booths and exit to the secondary inspection lot were surveyed in the same manner as the full survey. This was considered reasonable as operations have not changed since 2002, so the only variable that could lead to a change in queue or travel time would be primary inspection time. Hence, the limited northbound survey was supposed to cover only the booth, with freed up resources observing class/time at the southbound booths.

c) Booth Only: The modified northbound survey freed up resources and enabled one surveyor to collect additional booth service information in the southbound direction during the final two days.

2.1.2 Exhibit 2.1 shows the survey schedule for the southbound and northbound direction. The survey method is described in the following sections.

Exhibit 2.1 Survey Schedule

Dir	Date	Survey Type			
		Full	Limited	Extended Hours	Booth Only
Southbound	June 05 2006	8am - 5pm		5am - 8am	
	June 06 2006	8am - 5pm		5am - 8am	
	June 07 2006	8am - 5pm		5am - 8am	
	June 08 2006	8am - 5pm		5am - 8am	
	June 21 2006				8am - 5pm
	June 22 2006				8am - 5pm
Northbound	June 19 2006	8am - 5pm		5pm - 8pm	
	June 20 2006	8am - 5pm		5pm - 8pm	
	June 21 2006		8am - 5pm	5pm - 8pm	
	June 22 2006		8am - 5pm	5pm - 8pm	

2.2 Data Collection

2.2.1 Data was collected using handheld personal digital assistants (PDAs) running customized data collection software to allow efficient entry of license plates with synchronized timestamps to reduce data entry errors and the effort required to clean the data in post processing. Data was downloaded to a laptop from the PDAs twice each survey day to reduce exposure to data loss from a PDA failure. The end-of-day download was compared record-to-record to the midday download to check the integrity of the data; the end-of-day copy was then marked as the master copy. The PDA clocks were resynchronized at the beginning of each day to reduce clock skew in the collected data.

2.2.2 Each control point captured at least the truck license plate number and a timestamp when the observation was made. Due to the level of activity at some control points the full license plate was not captured, at these locations the first four digits were the collection standard, with the full plate if possible. This was particularly necessary at the roving queue positions and the stop-bar surveyor in the southbound direction. The booth surveyors always collected the full license plate number and were used as the control source as the data quality was very high.

2.2.3 For trucks where multiple license plates were present, a series of rules were used to ensure that each surveyor collected the same plate number. These rules, by order of precedence are as follows:

a) British Columbia license number;

b) Washington State license number;

c) If multiple plates grouped in centre, left-topmost in the group;

d) If grouped to the left, left-topmost in the group.

2.2.4 The vehicle classification was captured by the booth survey and the extended-hours survey and classified as follows:

a) Personal (cars, vans, etc. carrying commercial goods must proceed through the commercial vehicle inspections, used passenger vehicles being exported to the US for resale);

b) Light (two axle trucks);

c) Single-unit (trucks with multiple rear axles, non-articulated);

d) Truck-Trailer (Light or single-unit towing a trailer);

e) Tractor (Semi tractor, no trailer);

f) Tractor-Trailer (Semi tractor with trailer);

g) Tractor-Container (Semi tractor with shipping container on flatbed).

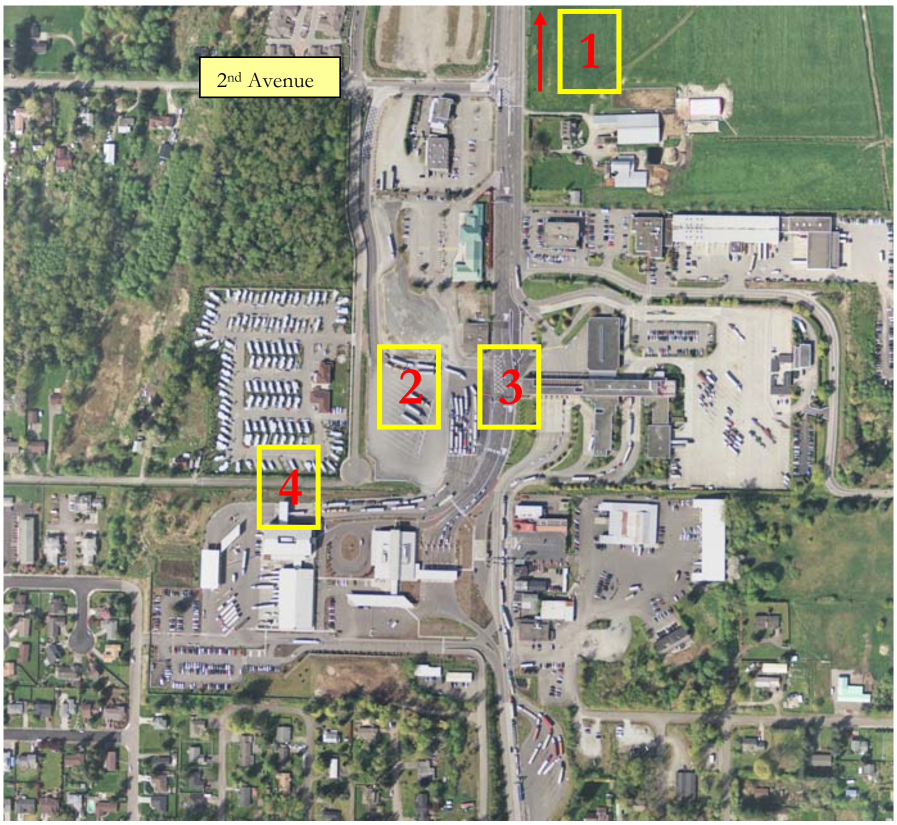
2.2.5 Queue length observations made by the roving surveyors used a series of landmarks to survey queue position. These landmarks were spaced approximately every 90-100m. The queue position was marked based on where the front bumper of the vehicle was when the vehicle stopped for the first time upon entering the queue.

2.3 Southbound Survey

2.3.1 The southbound survey was conducted on June 5-8, 2006. The southbound survey collected data at four control points to characterize the delay between these segments. Exhibit 2.2

shows the locations of the southbound survey control points. Southbound commercial vehicles approach border crossing along Highway 15. FAST approved vehicles proceed directly to the leftmost primary inspection booth while non–FAST trucks must turn at 2nd Avenue into a queuing area. This queuing area also contains a parking area for drivers who need to leave their vehicles to complete further paperwork before proceeding to the primary inspection booths. A six-lane queuing area releases trucks into the final approach to the primary inspection booths. Each lane is controlled by an individual traffic signal to release individual trucks from each lane.

Exhibit 2.2 Southbound Control Points



2.3.2 Control point 1 was a roving queue surveyor on the west side of Highway 15. The surveyor followed the queue between 2nd Ave and 8th Ave but would not follow further if the queue extended past 8th Ave. This represents a maximum observable queue distance of 1200m from 2nd Avenue, or approximately 1600-1700m from the primary inspection booths. When there was no observable queue at 2nd Ave the surveyor marked the time of the truck entering the system when passing 2nd Ave. The license plate and current queue length of each arriving truck was collected with a timestamp for their arrival. A flag was set to mark if the truck was headed for the FAST lane and bypassed the queuing. This led to some vehicles being collected that were instead headed for the brokerages to the East of Highway 15, but this was a small component of the traffic.

2.3.3 Control point 2 was a fixed position surveyor in the parking area before the border booths. The surveyor collected the license plate of each truck as it entered and left the parking area with a timestamp to determine the amount of time spent parked. A truck was considered to have left the parking area when it left the marked parking stalls even if the current queue did not allow it to completely leave the parking area as it had effectively rejoined the traffic stream. The zero queue point was marked as the stop bar for the traffic signal at 2nd Avenue. A queue of -1 was entered if the truck passed the signal without needing to stop. In 2002, the staging areas only had one queuing lane for trucks to re-enter the queue before proceeding to the primary inspection booths.

2.3.4 Control point 3 was a fixed position surveyor at the signal controlled stop bar which releases the queued trucks into the final booth approach lanes. The license plate, lane of entry and time passing the stop bar was recorded. The purpose of this point was to observe the pattern of release from each of the six queuing lanes which may be useful in further technical analysis. Lanes were assigned a number from 1-7. Lane 1 was the lane closest to the parking area numbered sequentially to lane 7 which was the CBSA access lane for trucks turned away from the Canadian border that were required to return to the states.

2.3.5 Control point 4 was the primary inspection booths themselves. Three timestamps were collected for each arriving truck: time passing the radiation portal monitor, time arriving at the booth and the time pulling away from the booth. The license plate, truck configuration and a flag as to whether or not the truck was directed into the VACIS secondary screening area were collected. This control point had the most time for the surveyors to enter data and was used as a control in the final dataset when reconciling license plate numbers. Each booth had a dedicated surveyor observing it for the entire survey day. The southbound FAST inspection booth opened at 8:00 AM on all four of the survey days, and remained open until the end of the southbound survey time period.

2.3.6 As all surveyors began at 8am, some partial trips were recorded during the beginning of the day representing trucks already queued when the survey began. These trips have had entry times filled in based on the prevailing delay experienced by the first trucks for which a full trip record is created on each survey day.

2.3.7 Resources from the northbound survey were re-allocated to a 'booth only' survey that captured primary inspection time at control point 4. This involved a single surveyor capturing timestamps for all trucks entering the booths. Because the VACIS area was located at a further distance from the booths, the surveyors were generally unable to observe whether or not trucks exiting from the primary inspection booths were delayed due to the backups at the VACIS area. For this limited 'booth only' survey time passing the RPM and license plate were not collected, only truck configuration, time arriving at the primary inspection booth, time leaving the primary inspection booth and whether or not the truck was directed to the VACIS area. The extended hours control point was operated in a very similar manner to control point one with the exception that instead of license plate data being collected, the truck configuration was collected. There were no other active surveyors during the 'extended hours' or 'booth only', so license plate data was not useful for linking.

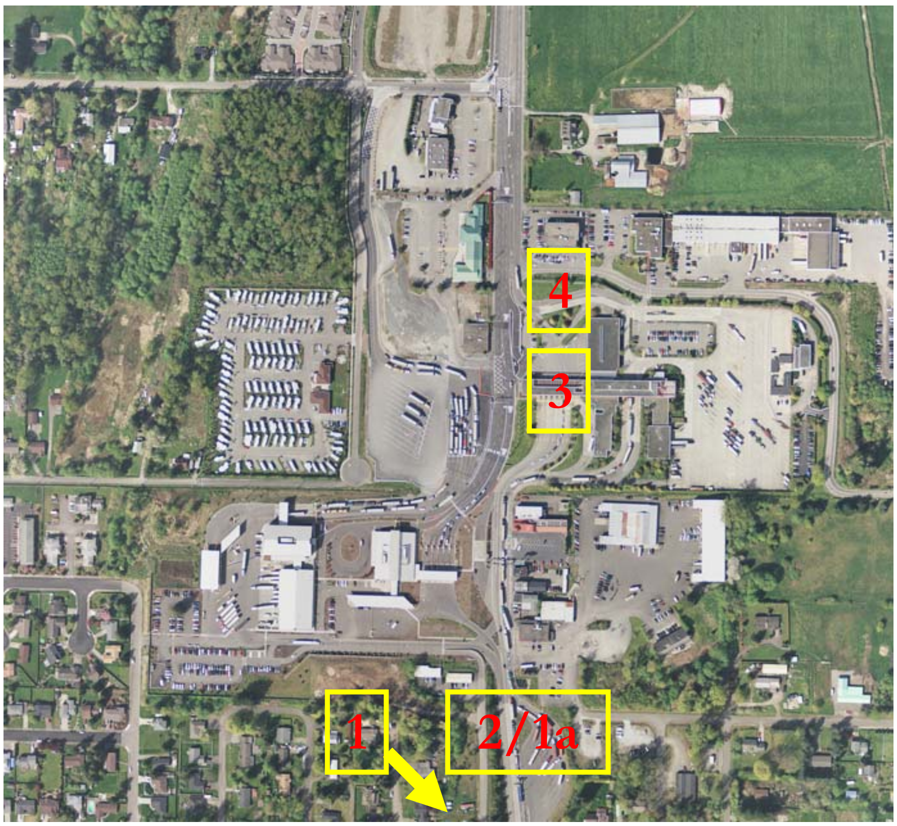
2.3.8 Due to heavy rain, two PDA failures occurred during the week of undertaking the southbound survey which resulted in approximately 25 minutes of lost data from a customs booth survey position on June 6 and 20 minutes of lost data from the stop bar survey position on June 8.

2.4 Northbound Survey

2.4.1 The northbound survey was conducted on June 19-22, 2006. Construction activities related to the widening of SR543 and border crossing improvements were undergoing during the survey period. At the end, it was agreed to proceed with the northbound survey but with a view towards daily monitoring of its usefulness and flexibility to reassign resources to undertake additional southbound surveys. It was also understood that the northbound truck operations have not been changed since the 2002 survey, and the most useful data was the monitoring of primary inspection processing time. After two days of attempting the full survey, it was decided to modify the northbound survey to the 'limited format', and reallocate resources to the southbound booth-only surveys.

2.4.2 The northbound survey collected data at four control points to characterize the delay between these segments. Exhibit 2.3 shows the location of the northbound control points.

Exhibit 2.3 Northbound Control Points



2.4.3 Control point 1 was a queue surveyor on the East side of SR543 at D Street or H Street. The construction along this stretch made it impossible to have a roving surveyor. This position was modified to survey all vehicle entering the system that were of type light, single-unit and any of the tractor-based varieties. Only arrival time was collected, as it was not possible to follow the queue through the construction area.

2.4.4 Because of no appreciable queuing due to the low truck volumes and flagging activity, a modified control point 1a was created during the final two days to free a surveyor for additional SB observation. Control point 1a was a fixed position surveyor that observed all entering commercial vehicles on SR543 or exiting the pullout area East of SR543. Queuing data was not collected as the downstream flagging crews only released enough vehicles for the available space and as such a queue was not allowed to build. This control point served as the entry time for vehicles to the system for the final two days of the survey.

2.4.5 Control point 2 was a fixed position surveyor in the pullout area on the east side of SR543 before the border booths. The surveyor collected the license plate of each truck as it entered and left the parking area with a timestamp to determine the amount of time spent parked. A truck was considered to have left the parking area when it left the marked parking stalls even if the current queue did not allow it to completely leave the parking area as it had effectively rejoined the traffic stream. This position was eliminated on the final two days of the survey and the surveyor reassigned to the SB direction.

2.4.6 Control point 3 was the customs booths themselves. Two timestamps were collected for each arriving truck: time arriving at the booth and the time pulling away from the booth. The northbound direction was not equipped with a radiation portal monitor. The license plate and truck configuration were collected. This control point had the most time for the surveyors to enter data and was used as a control in the final dataset when reconciling license plate numbers. Each booth had a dedicated surveyor observing it for the entire survey day.

2.4.7 Control point 4 was the exit of the CBSA truck parking area. License plate and time passing the automated gantry system were collected. This time represents the exit time for those vehicles where additional paperwork or secondary inspection was required. In the 2002 study, vehicles which exceeded the mean stay in the northbound holding area by more than one standard deviation were removed from the data set before undertaking analysis. It was anticipated that the drivers of those vehicles could be using the opportunity to rest and/or visit eating/entertainment establishments in the area.

2.4.8 The extended hours control point was operated for all survey days at control point 1a which captured all commercial and non-commercial vehicles because of sufficiently low traffic volume. Arrival time and vehicle classification were collected. No queue data was collected as the flagging crews ensured no queue was allowed to build at this part of the border system. All vehicles passing the control point 1a were collected during the extended survey.

2.4.9 There was no PDA failures occurred during the week of conducting the northbound survey.

2.4.10 As the arrival pattern of the vehicles was artificially constrained by the flagging activity, the arrival data has not been linked into the northbound survey master table. The extended-hours survey data has been included separately for the additional vehicle composition data captured at this collection point. The vehicle volume during the extended-hours survey was low enough that all vehicles, including those approaching the passenger vehicle booths, were collected. Passenger cars that did not pass through the commercial vehicle customs will only appear in the extended hours survey table (5pm to 8pm) in which only time and vehicle type information were recorded.

2.5 Additional Data

2.5.1 The manifest data submitted by the truck drivers to cross the border southbound was entered into a database by WCOG with a summary of the stated truck origin/destination, commodity type and day of entry. This database has been linked into the delay database by filling the unique identifier from the manifest database into the best-match record from the delay survey. The two databases have been kept separate for distribution purposes as the manifest database contains potentially sensitive information.

3 Survey Analysis

3.1 Survey Observations

3.1.1 Key observations for the survey are listed in the following:

Southbound Survey

a) In all, 2292 truck trip records were recorded during the 4 day southbound survey, for an average of approximately 570 vehicles per day during the survey period. This represents a decrease of approximately 23 percent relative to the 2002 survey during the survey period, and is larger than the total annual observed decrease of 13% between 2002 and 2005 (IMTC)[1]. This may be in part related to diversion to time periods outside the survey period; or a decrease in a particular export that typically uses daytime hours e.g. used vehicles which are required to pass through commercial vehicle inspection; or a diversion to other crossings due to northbound construction. All trucks are included in the totals, as observed at the booth, even if they were not matched.

b) The FAST lane did not show very high utilization during some days. An initial morning rush was observed that in anticipation of the FAST lane opening at 8:00 AM. After this initial backlog cleared, many gaps were observed in the booth service. During some time periods the FAST booth had a utilization of ~60-70%. The general purpose booths were essentially 100% utilized during the survey periods.

c) June 6, 2006 is believed not to represent average border conditions. Due to an international incident in IRAQ, the security level was increased and a high proportion of traffic directed to the VACIS, and the FAST lane being open to all traffic. While the booth inspection times were not significantly different, delays introduced from vehicles queuing back from the VACIS caused vehicles to be blocked from entering the booth, lowering the processing rate. The FAST lane was open to general truck traffic during the entire day.

d) The average time observed for a light vehicle to travel from the radiation portal monitors to the primary inspection booth was 15-20 seconds. Heavy vehicles averaged between 20-30 seconds. Some tractor-trailer and tractor-container vehicles took 35-45 seconds due to the weight of the load being carried. For the purposes of determining capacity and border operations, this is additional to primary inspection time.

e) Spot counts throughout the survey period show that the holding capacity of the approach from the radiation portal monitor towards the six-lane stop bar is 6-8 vehicles per lane. The capacity of the six-lane staging area from the stop bar to the parking area is 22-25 vehicles. The additional capacity from the parking area towards 2nd avenue is 9-11 vehicles. Excluding the FAST lane which queues separately, this represents a queue capacity of 43-52 vehicles from the customs booths towards 2nd Ave. The automated signal controlling the right turn from Highway 15 onto 2nd Ave works very effectively at preventing spillback of the queue onto 2nd Ave.

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[1] Total annual southbound commercial vehicles at Pacific Highway decreased from 406,700 in 2002 to 354,300 in 2005, or approximately 13%, IMTC Resource Manual, based upon US Customs and Border Protection Data

Northbound Survey

f) Border staff and construction flagging crews noted that commercial vehicle volumes were low. Some commercial vehicle operators noted that many brokers were diverting their vehicles to the Sumas border crossing due to the construction. There was no appreciable queuing to measure during the first few days due to the low volumes and flagging activity.

g) As a result of this construction activity, care should be taken when using and interpreting the northbound data including totals, vehicle composition etc. as even proportionate numbers may not be representative. The most useful data from the northbound survey relates to primary inspection times.

3.2 Southbound Survey Characteristics

3.2.1 During the survey period (8am-5pm) 500-600 trucks were processed on each survey day. The first three days of the survey were closer to 600 vehicles while the last three days were closer to 500. This represents a decrease of approximately 150 to 200 veh/survey period from the 2002 survey and potential reasons for this decline were discussed in Section 3.1.1.

3.2.2 The distribution of vehicle types by survey day is presented in Exhibit 3.1. The proportion of tractor-trailer vehicles observed in 2002 was 55% with passenger vehicles comprising 17% of the total. The 2006 survey shows an increase in the proportion on southbound tractor-trailer vehicles, with a distinct decrease in the proportion of passenger vehicles. This may be in large part related to a decrease in used passenger vehicles exported to the US from Canada, as these vehicles pass individually through the commercial vehicle booth.

Exhibit 3.1 Southbound Vehicle Distribution

Date		Passenger Vehicles	Light Truck	Single Truck	Truck / Trailer	Tractor	Tractor / Trailer	Tractor / Container	Total Vehicles	24-hr Truck Count
6/5/2006	(Mon)	4%	9%	2%	3%	2%	66%	13%	586	1,235
6/6/2006*	(Tue)	6%	7%	3%	2%	1%	71%	11%	599	1,220
6/7/2006	(Wed)	7%	9%	3%	1%	2%	75%	4%	586	1,240
6/8/2006	(Thur)	7%	12%	2%	1%	1%	71%	6%	521	1,190
6/21/2006	(Wed)	7%	12%	0%	2%	1%	70%	8%	485	
6/22/2006	(Thur)	8%	13%	0%	1%	2%	67%	8%	519	
	Total	*6%*	*10%*	*2%*	*2%*	*1%*	*70%*	*8%*	*3,296*	*4,885*

*The FAST lane was open to general truck traffic during the entire day

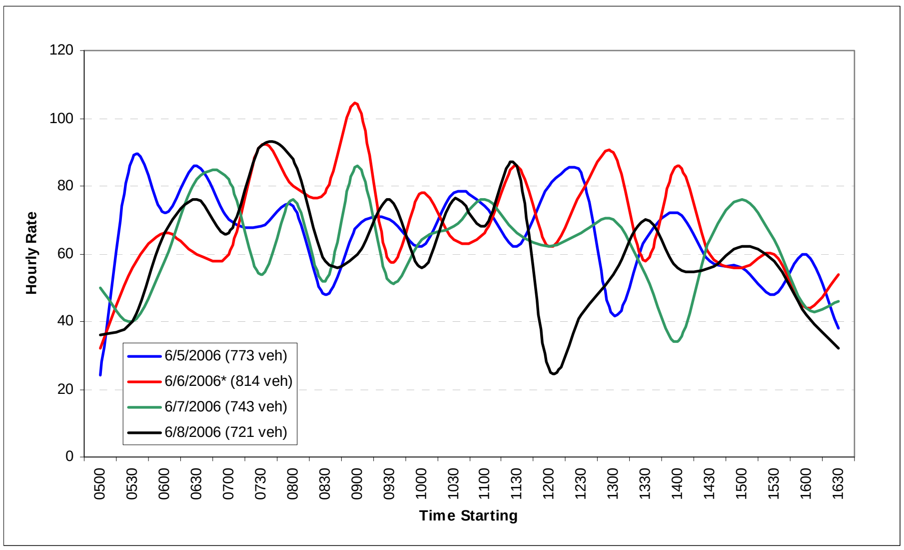
3.2.3 Container traffic made up a larger proportion of the vehicle traffic on June 5-6 (Monday, Tuesday) and a generally lower proportion on the other survey days (Wednesdays, Thursdays). The heavy vehicle percentage averaged 8% over the survey days, where this is consistent with the 2002 survey. The proportion of tractors with no trailer (bobcats) was approximately 1.5% during the survey period.

3.2.4 The field 'empty or loaded' trucks were not observed in the 2006 survey. In 2002, empty vehicles were inspected at primary inspection e.g. they pulled forward and an inspector checked empty trailers. This is no longer practiced, and there is no easily observable method to identify empty trucks.

3.2.5 Exhibit 3.2 shows the hourly arrival rate profile for total southbound commercial vehicles, including the extended hours survey data. The roving queue surveyor observed the arrival rate. June 8 had an unexplained drop in midday arrivals, possibly due to a upstream incident. This may have also contributed to the lower volume observed that day. A corresponding drop in observed queue length can be seen during this time period in Exhibit 3.3.

3.2.6 The average arrival rate is approximately 65 commercial vehicles per hour. A review of Exhibit 3.2 shows that this varies by hour, and that the variation by hour is not consistent from day to day. The arrival rate is an important contributor to travel time and delay, and demonstrates the volatility of conditions from day to day. Although not shown here, when separated from non-Fast traffic, the FAST lane arrival rate also does not show a 'typical' or 'average' daily profile.

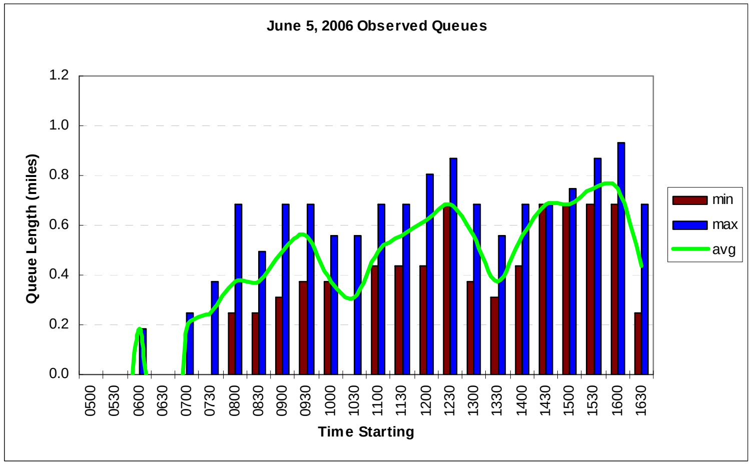
Exhibit 3.2 Southbound Hourly Arrival Rate (Total vehicles per hour)

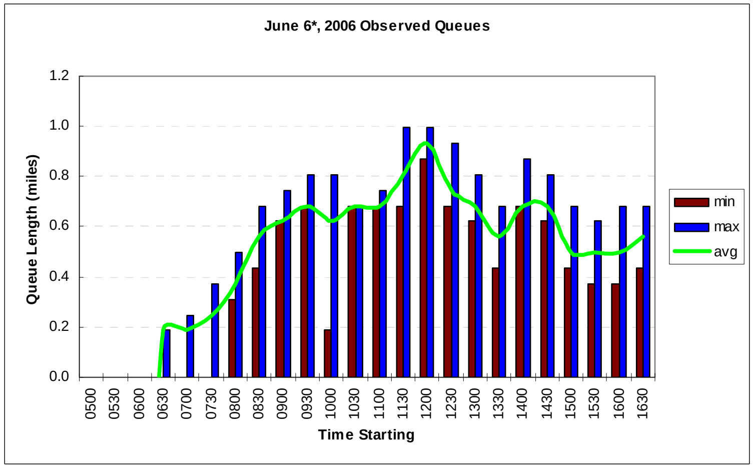


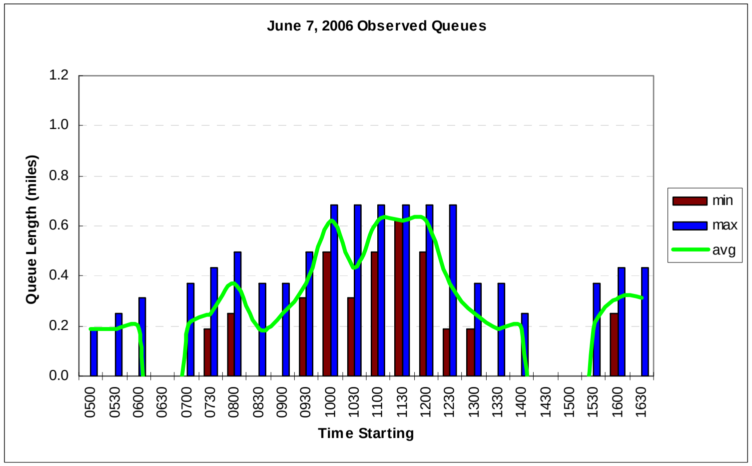
*The FAST lane was open to general truck traffic during the entire day

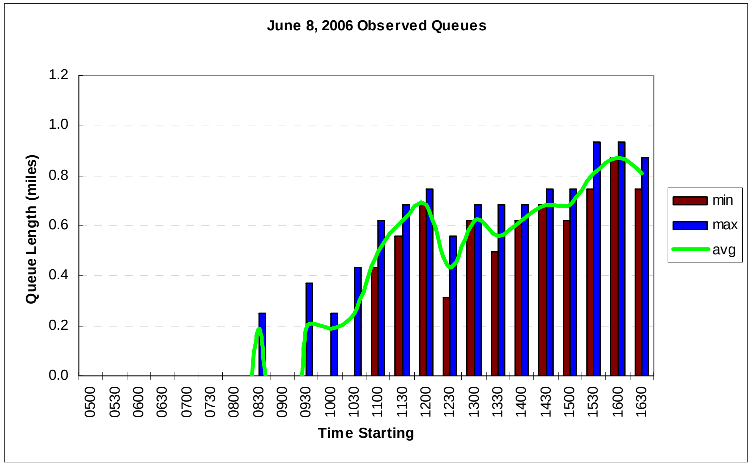
3.2.7 Exhibit 3.3 shows the observed queue profiles along Highway 15 during the survey period. The extended-hours survey has been added to these plots to extend the time period from 5am – 5pm on each survey day. The maximum, minimum and average queues are shown to illustrate the variation in queuing that was observed. Each station increment represents 90-100m of queue length. The queue length varied quite drastically with differences of 200-300 metres possible within a 5 minute period during periods of rapid queue clearance. This is believed to be driven by the signal at 2nd Avenue pulsing platoons of vehicles into the holding area.

Exhibit 3.3 Observed Queues During the Survey Period (non-FAST)







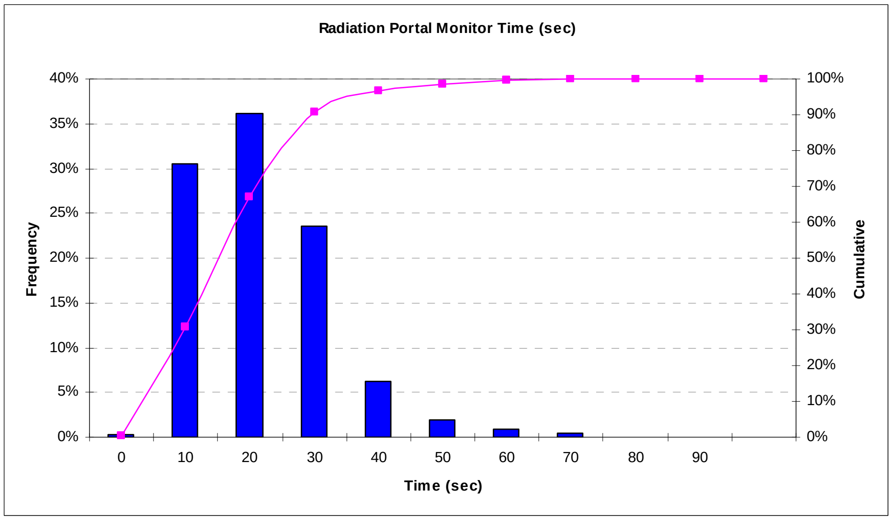


*The FAST lane was open to general truck traffic during the entire day (June 06)

3.2.8 In 2002, trucks stopped directly behind the truck in the inspection booth and proceeded to primary inspection when the preceding inspection was complete. Since 2002, a Radiation Portal Monitor (RPM) was introduced, where trucks are now required to stop approximately 20 to 30 feet further back. This serves to increase the transition time for commercial vehicles at the primary inspection booth and reduces the overall capacity.

3.2.9 Exhibit 3.4 presents a histogram of the 'transition time', or the time required to proceed from the RPM to the primary inspection booth, over the 4-day survey. Records were eliminated from the analysis if their RPM time exceeded the mean RPM time by more than one standard deviation. The RPM time for over 90 percent of trucks ranges from 10 to 30 seconds per vehicle, depending upon load, truck type etc.

Exhibit 3.4 Transition Time (seconds per vehicle)



3.2.10 Average booth processing time (with transition time reported separately) is presented in Exhibit 3.5. Exhibit 3.5 also shows the 2002 average daily primary inspection times. Exhibit 3.6 illustrates the booth processing time using a frequency distribution chart. The number of FAST vehicles and non-FAST vehicles over the four survey days are also shown in Exhibit 3.6. Booth interviews that took longer than six minutes were excluded from this calculation as they were an exceptional case. Of note:

a) In 2006, the average processing time for a non-FAST vehicle was, on average, 120 seconds per vehicle, with daily averages varying between 114 and 129 seconds per vehicle.

b) Booth processing time in the FAST booth ranged from an average of 69 to 114 seconds per vehicle, with an overall average of 86 seconds. Again, this must consider that not all trucks using the FAST booth were FAST approved at the time of the survey (FAST had recently been introduced and allowances were made for non-FAST vehicles 'accidentally' using the FAST lane at that time).

c) The average FAST primary inspection time was approximately 30 seconds per vehicle faster than non-FAST booths, or 28%.

3.2.11 **The 2006 FAST and the non-FAST booth processing times were materially longer than the 2002 average of 57 seconds per vehicle. In other words, the 2006 FAST processing time is almost 30 seconds per vehicle, or close to 50% longer than 2002. The non-FAST rates have effectively doubled since 2002.**

3.2.12

3.2.13 Exhibit 3.6 compares the average booth processing time for years 2002 and 2006. In 2002 less than 3% of booth interviews took longer than 2 minutes; in 2006, approximately 36% of booth interviews lasted longer than 2 minutes with 3% of booth interviews taking over 6 minutes

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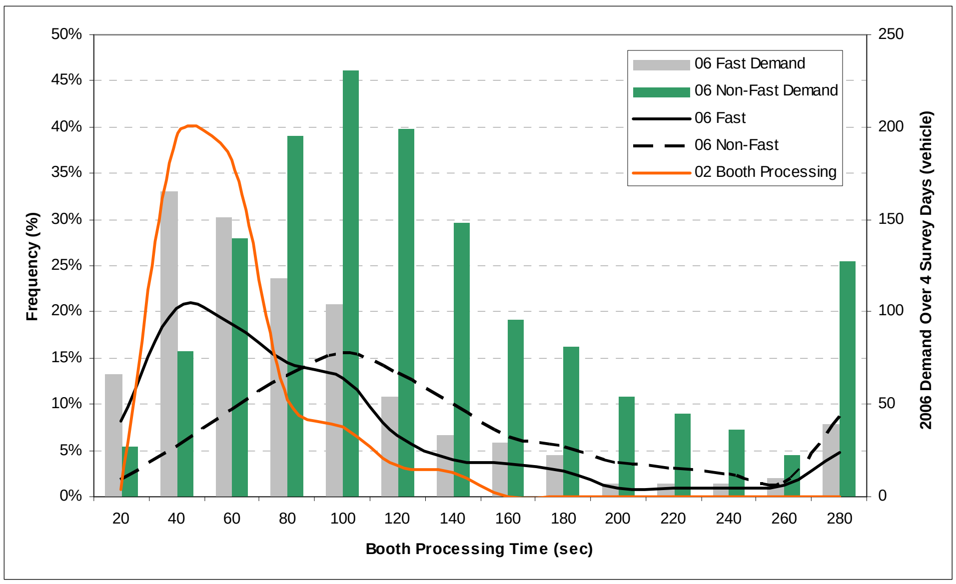
3.2.14 The booth processing time in 2006 will further be increased if the RPM time is added to the booth processing time, an increase of approximately 20 sec per vehicle (a transition time would then need to be added to the total 2002 time as well).

Exhibit 3.5 Average Southbound Booth Processing Time (seconds)

Date		2006				2002
		Booth			Transition Time	Booth
		FAST	Non-FAST	Blended		
6/5/2006	(Mon)	90	129	114	17	66
6/6/2006*	(Tue)	72	115	99	18	63
6/7/2006	(Wed)	69	114	100	17	51
6/8/2006	(Thur)	83	121	108	16	49
6/21/2006	(Wed)	114	122	120		
6/22/2006	(Thur)	94	122	112		
	Average	86	120	108	17	57

*The FAST lane was open to general truck traffic during the entire day

Exhibit 3.6 Southbound Average Booth Processing Time (2002 vs. 2006)



3.2.15 The schematic drawing of travel path for three types of truck users is shown in Exhibit 3.7. Exhibit 3.8 and Exhibit 3.9 present histograms of booth processing time for the FAST and non-FAST booths. The advantages of the FAST booth are apparent in the greater concentration of interview times in the 30 – 50 second range.

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Exhibit 3.7 Schematic Drawing of Travel Path for Three Types of Truck Users

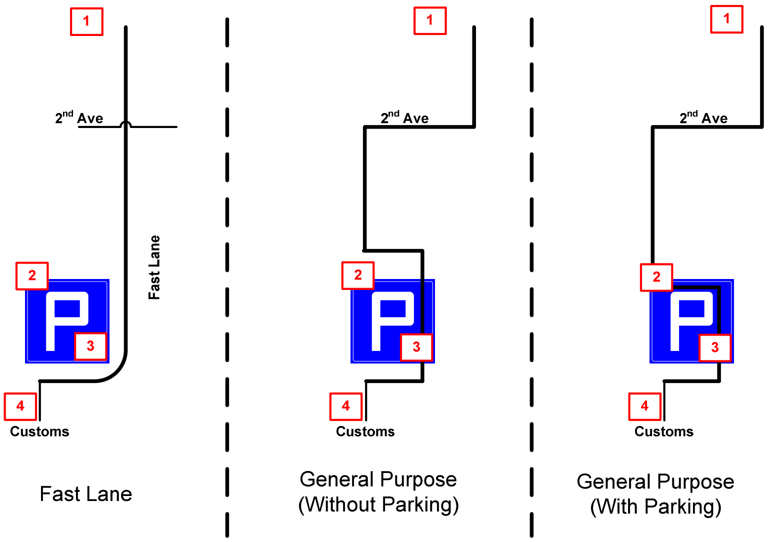


Exhibit 3.8 FAST Booth Processing Time Histogram

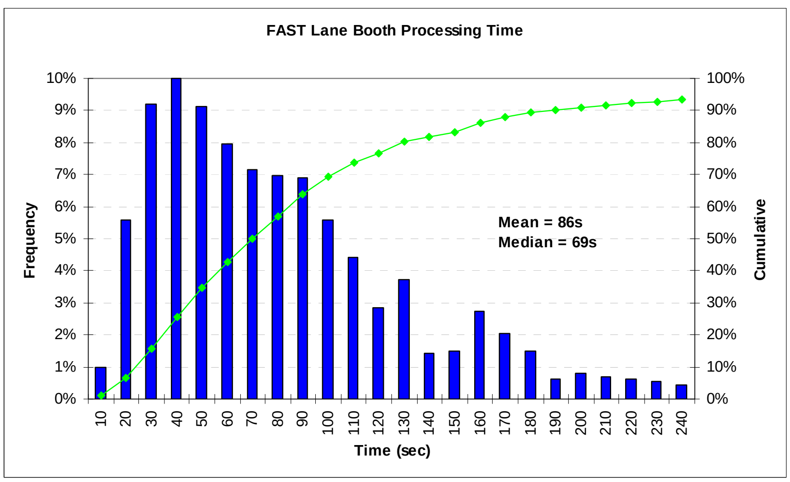
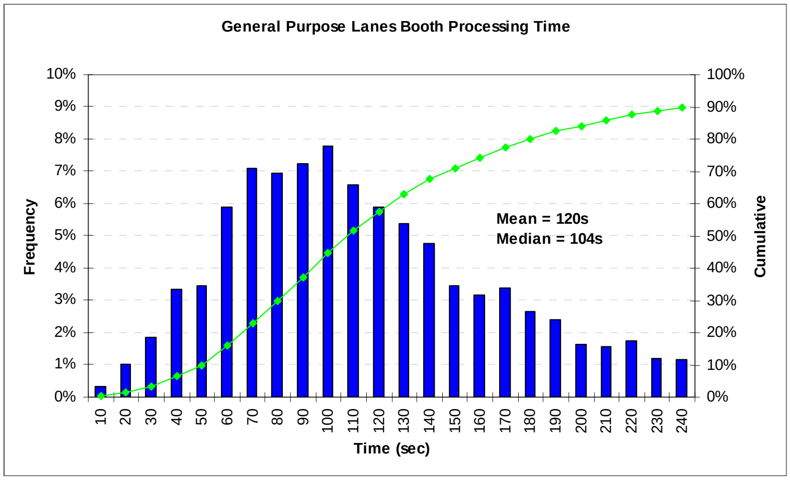


Exhibit 3.9 Non-FAST Booth Processing Time Histogram



3.2.16 Exhibit 3.10 presents a histogram of the time spent in the southbound parking area. Half of the trucks that park here stay for fewer than 20 minutes. The majority of trucks spent less than 1 hour parked here. During the survey period, only two trucks were observed parking for more than 2 hours. Overall, there were only approximately 5 percent of trucks parked in the southbound parking area as opposed to 45 percent in 2002, where this is likely related to the requirement for e-manifests.

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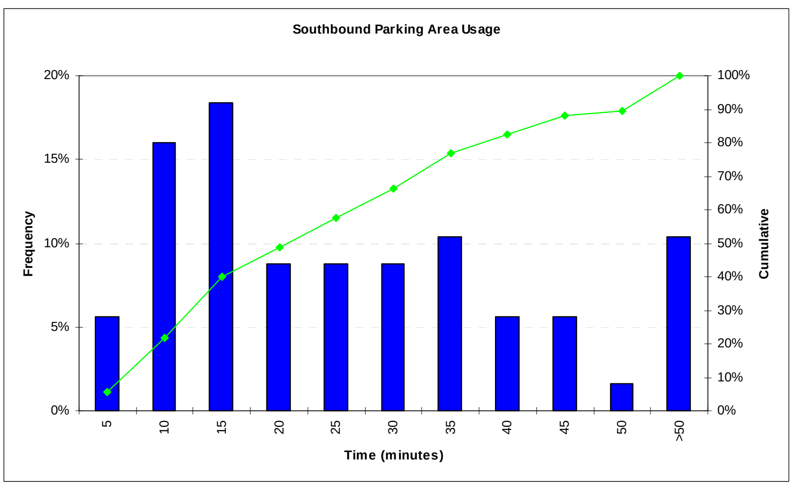
Exhibit 3.10 Parking Area Delay Histogram



3.2.17 Exhibits 3.11, 3.12 and 3.13 show the system travel time for vehicles which do not park in the parking area by the time of day they entered the system and by daily average. The average travel time for a FAST vehicle is between 16-45 minutes. The 6/6/2006 results are higher as the FAST booth was open to non-FAST traffic, and the back-ups created from a high number of VACIS inspections. On average, a non-FAST vehicle takes over 90 minutes to make the

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crossing with an average travel time of greater than two hours observed during some times of the day.

3.2.18 Observed travel times from 2002 are also presented in Exhibit 3.12. The empty/pre-cleared column from 2002 represents vehicles that proceeded directly to the booth in 2002 as they were empty of had faxed pre-clearance information in advance of their arrival at the primary inspection booth. Non-precleared vehicles refer to those that required additional paperwork at the border, usually via a personal visit to customs brokers. This involved a different traffic stream, including a number of options for parking that did not include the existing parking area.

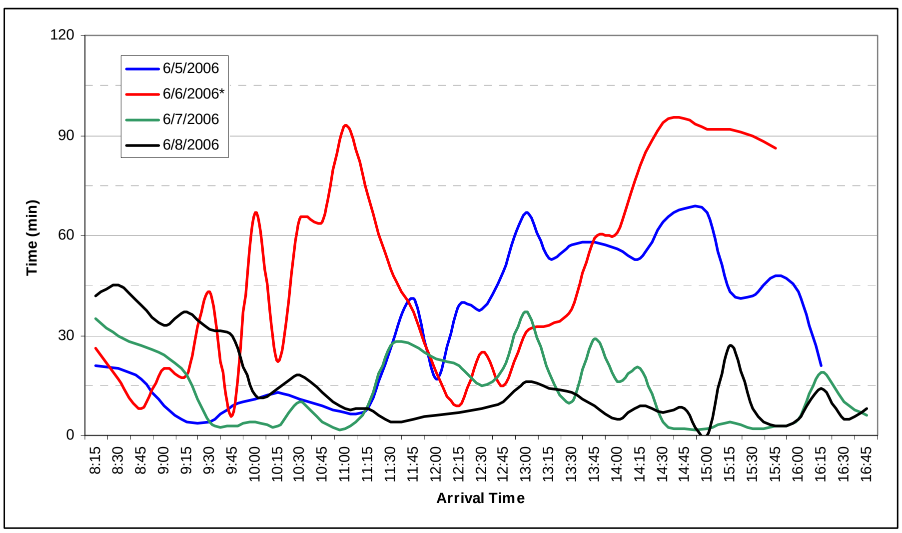
3.2.19 In 2002, the average travel time for the empty or pre-cleared trucks was approximately 32 minutes and the average travel time for non-precleared trucks was recorded as 50 minutes in 2002. In general, southbound average travel time in 2006 does not show significant reduction from 2002, where this is primarily related to increases primary inspection processing times.

Exhibit 3.11 Southbound Average Daily System Travel Time (Hours)

Year 2006			Year 2002		
Date	Booth		Date	Empty or Precleared	Non-precleared
	FAST	General			
6/5/2006 (Mon)	0.53	1.51	6/10/2002 (Mon)	0.85	1.17
6/6/2006* (Tue)	0.76	1.61	6/11/2002 (Tue)	0.68	0.93
6/7/2006 (Wed)	0.27	1.13	6/12/2002 (Wed)	0.37	0.63
6/8/2006 (Thur)	0.26	1.35	6/13/2002 (Thur)	0.25	0.58
Average	0.46	1.40	**Average**	0.53	0.83

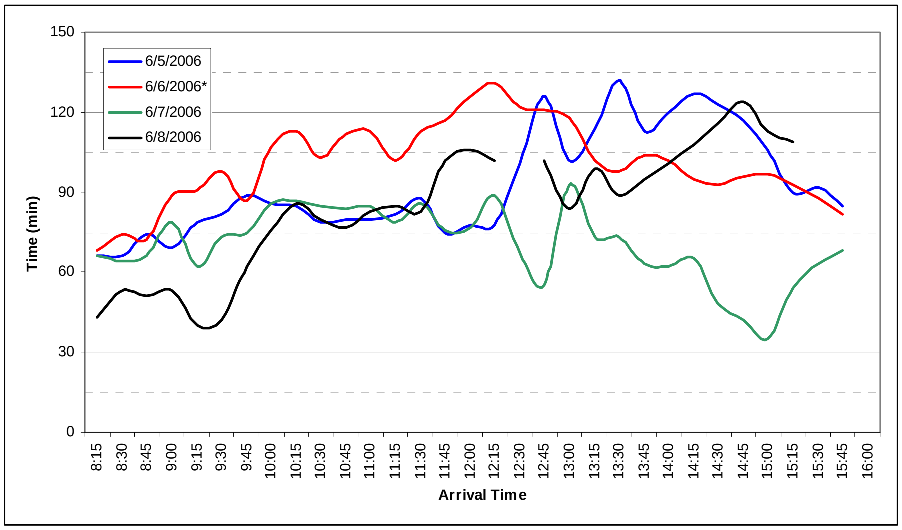
*The FAST lane was open to general truck traffic during the entire day

Exhibit 3.12 Southbound FAST Lane Travel Time



*The FAST lane was open to general truck traffic during the entire day

Exhibit 3.13 Southbound Non-FAST Lanes Travel Time



*The FAST lane was open to general truck traffic during the entire day

3.3 Northbound Survey Characteristics

3.3.1 Because of the construction and flagging activities, data collected for the northbound survey do not represent typical commercial vehicle operation conditions. Some commercial vehicles were diverted to other border crossings such as the Sumas border crossing. As a result, data collected in 2006 may not be comparable to 2002. For example, commercial vehicles diverted to other crossing may have skewed the distribution of vehicle distribution.

3.3.2 The effect of the construction on the northbound vehicle composition is not known and all northbound data should be used with caution.

3.3.3 Exhibit 3.14 presents the distribution northbound vehicles by type. The proportion of light and heavy vehicles is not materially different than that observed in 2002. The proportion of tractors carrying containers rather than a trailer is slightly higher than in 2002, but the proportion the total remains the same.

Exhibit 3.14 Northbound Vehicle Distribution

Date	Passenger Vehicles	Light Truck	Single Truck	Truck / Trailer	Tractor	Tractor / Trailer	Tractor / Container	Total Vehicles
6/19/2006 (Mon)	9%	6%	3%	3%	1%	63%	14%	567
6/20/2006 (Tue)	11%	9%	1%	1%	1%	67%	10%	629
6/21/2006 (Wed)	11%	10%	0%	3%	1%	67%	8%	673
6/22/2006 (Thur)	10%	10%	2%	5%	1%	64%	9%	670
Total	*10%*	*9%*	*1%*	*3%*	*1%*	*65%*	*10%*	*2,539*

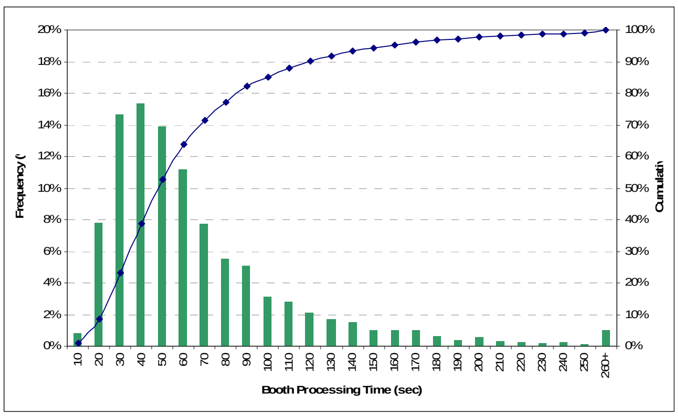
3.3.4 Exhibit 3.15 presents the average booth service time characteristics, and this is illustrated in a histogram in Exhibit 3.16. The 2002 average daily primary inspection times is also shown in the exhibit. The northbound booth interview time is relatively consistent at just over 1 minute. This shows an approximate increase of 25% over the 2002 primary inspection time.

3.3.5 The only way to assess the impact of this increase in primary inspection processing time is through a modelling effort similar to that undertaken in 2002. In summary, this included calibration of separate northbound and southbound models, development of 'representative days' that accounted for day to day variation and the series of factors that contribute to the volatility of border operations, and subsequent scenario testing.

Exhibit 3.15 Northbound Average Primary Inspection Time (seconds)

Date	2006	2002
	Booth	Booth
6/19/2006 (Mon)	68	45
6/20/2006 (Tue)	62	43
6/21/2006 (Wed)	63	54
6/22/2006 (Thur)	61	54
Overall	63	49

Exhibit 3.16 Histogram of Northbound Average Primary Inspection Time



3.3.6 Exhibit 3.17 presents the proportion of vehicles flagged as empty by the customs inspectors. The proportion of empty trucks has decreased to 24% from the 35% observed in 2002.

Exhibit 3.17 Northbound Empty Truck Percentage

Date	Total	Empty	% Empty
6/19/2006 (Mon)	567	154	27%
6/20/2006 (Tue)	629	132	21%
6/21/2006 (Wed)	673	158	23%
6/22/2006 (Thur)	670	155	23%
Overall	2,539	599	24%

3.3.7 Approximately 17% of northbound vehicles required additional processing in the customs inspection area.

4 Database Documentation

4.1 Southbound Database Structure

4.1.1 Exhibit 4.1 shows the structure of the master table for the southbound survey. This table contains the full trip records created by linking all of the individual control point survey tables. A placeholder value of 1/1/06 (outside the survey period) has been entered where the trip did not pass that control point. For example, trucks approaching the FAST booth only proceeded via the dedicated FAST lane; they bypassed the parking area where control points 2 and 3 were located. As a result, a placeholder value of 1/1/06 was entered at control points 2 and 3 for trucks approaching the FAST booth. All trips have an assigned time for control point 1 (entry to the system) and the booth observations (timerpm, timebth and timeout). The unique id from the manifest data has been filled into each record based on a license plate match.

Exhibit 4.1 Southbound Master Table Structure

Field	Type	Description
id	integer	unique key for each record
stn	integer	numbering away from customs building 4 = FAST lane, 6 = outside lane
date	date	survey day
time1	datetime	time observed entering system
time2in	datetime	time entering parking area (1/1/06 if not observed)
time2out	datetime	time exiting parking area (1/1/06 if not observed)
time3	datetime	time passing 6-lane stop bar (1/1/06 if not observed)
timerpm	datetime	time pasing RPM sensor
timebth	datetime	time arriving at customs booth
timeout	datetime	time leaving customs booth
mplate	char	license plate
typefinal	integer	numeric code of vehicle type (see type table)
manifestid	integer	number of matching record in the manifest table (tracking number)

4.1.2 Exhibit 4.2 shows the structure of the combined arrival table created by adding the extended-hours survey control point to the control point 1 table. This table has been included to allow additional analysis of the raw arrival profiles for vehicles entering the border system which may be of interest in further operational modelling.

Exhibit 4.2 Southbound Arrival Database

Field	Type	Description
id	integer	unique key for each record
time	datetime	day and time of observation
queue	integer	observed queue
fast	integer	1 = possible FAST, bypassed queue; 2 = entered queue

4.1.3 Exhibit 4.3 shows the structure of the extended days booth survey table. This table has been included to allow a larger set of observed booth operations to be analyzed in ongoing operational modelling.

Exhibit 4.3 Southbound Extended Days Booth Survey Database

Field	Type	Description
id	integer	unique key for each record
timein	datetime	time arriving at customs booth
timeout	datetime	time leaving customs booth
stn	integer	numbering away from customs building 4 = FAST lane, 6 = outside lane
typefinal	integer	numeric code of vehicle type (see type table)
outcode	integer	2 = exited system, 3 = exited to VACIS inspection area

4.2 Northbound Database Structure

4.2.1 Exhibit 4.4 shows the structure of the master table for the northbound survey. This table contains the full trip records created by linking all of the individual control point survey tables. Due to flagging activity, entry time to the system proved unreliable and was not included in the final table. For the first two days of the survey where there was a dedicated surveyor at control point 2, these times have been linked into the master table.

Exhibit 4.4 Northbound Master Table Structure

Field	Type	Description
id	integer	unique key for each record
stn	integer	3 = centre lane, 4 = customs building side (East) lane
date	date	survey day
time2in	datetime	time entering pulloff area (1/1/06 if not observed)
time2out	datetime	time exiting pulloff area (1/1/06 if not observed)
timebth	datetime	time arriving at customs booth
timeout	datetime	time leaving customs booth
timepark	datetime	time leaving customs parking/inspection area
mplate	char	license plate
typecode	integer	numeric code of vehicle type (see type table)

4.2.2 Exhibit 4.5 shows the structure of the northbound extended-hours survey point. The volume of traffic passing the extended-hours surveyor was sufficiently low that all vehicles passing the control point, including non-commercial vehicles approaching the passenger vehicle booths, were able to capture with vehicle classification.

Exhibit 4.5 Northbound Extended Hours Table Structure

Field	Type	Description
id	integer	unique key for each record
time	datetime	time passing control point 1a
typefinal	integer	numeric code of vehicle type (see type table)