DEVELOPING A FRAMEWORK FOR COLLECTING AND SHARING DATA AND INFORMATION

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and
TBWG Travel and Trade Data Subcommittee

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16. Abstract

This document analyzes the current situation along the U.S. – Canada border relating to data collection and sharing amongst the members of the Transportation Border Working Group (TBWG). Through interviews, the project team identified specific stakeholder needs relating to transportation related data along the U.S. – Canada border, and developed a conceptual framework that could be employed to make data collection and dissemination more efficient for the members of the TBWG.

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TABLE OF CONTENTS

Page

List of Acronyms vi
1. Project Background and Objectives 1
2. Current State Analysis 3
   U.S.-Canada Border Crossing Environment 3
   Data Sources 11
3. Stakeholder Interviews 22
   Current Data Uses 23
   Current Data Collection Efforts, Data Sharing, and Planned Data Collection Efforts 26
   Data Needs 31
4. Insights Gained from Stakeholder Interviews 35
5. Gap Identification 37
   Existing State 37
   To-be State 43
   Gap Analysis 44
6. Conceptual Framework 47
Appendix – Stakeholders Contacted 50
References 51

LIST OF FIGURES

Page
Figure 1. Map. Major U.S.-Canada ports of entry. 5
Figure 2. Map. Major Canada-U.S. truck crossings. 7
Figure 3. Flowchart. Screening process for commercial vehicles at U.S.-Canada border crossing stations. 10
Figure 4. Flowchart. Screening process for passenger vehicles at U.S.-Canada border crossing stations. 10
Figure 5. Flowchart. ACE data flow plan. 12
Figure 6. Graphic. Conceptual framework diagram. 49

LIST OF TABLES

Page
Table 1. Major U.S.-Canada ports of entry and available services..... 4
Table 2. U.S.-Canada truck traffic by port of entry. 6
Table 3. Interviewee list..... 23
Table 4. Current data uses..... 24
Table 5. Current and planned data collection and sharing..... 27
Table 6. Data needs..... 32
Table 7. Stakeholder category groupings..... 38
Table 8. Data use matrix. 40
Table 9. Data-sharing practices by interviewed stakeholders..... 42
Table 10. State comparison by area of interest to TBWG. 46

LIST OF ACRONYMS

Acronym	Full Name	Acronym	Full Name
ACE	Automated Commercial Environment	ITDS	International Trade Data System
ADT	Average Daily Traffic	MARAD	Maritime Administration
APHIS	Animal and Plant Health Inspection Service	MDOT	Michigan Department of Transportation
ATRI	American Transportation Research Institute	MOT	Ministry of Transportation
BIFA	Border Information Flow Architecture	NAFTA	North American Free Trade Agreement
BTS	Bureau of Transportation Statistics	NATS	North American Transportation Statistics
CBP	Customs and Border Protection	NCFRP	National Cooperative Freight Research Program
CBSA	Canada Border Services Agency	NHTSA	National Highway Traffic Safety Administration
CCMPO	Chittenden County Metropolitan Planning Organization	NRS	National Roadside Survey
CFS	Commodity Flow Survey	O-D	Origin - Destination
CVO	Commercial Vehicle Operations	OGD	Other Governmental Departments
CVS	Commercial Vehicle Survey	PBOA	Public Border Operators Association
DHS	Department of Homeland Security	PGA	Participating Government Agencies
DOT	Department of Transportation	POE	Port of Entry
EBTC	Eastern Border Transportation Coalition	RFID	Radio Frequency Identification
FAF	Freight Analysis Framework	RITA	Research and Innovative Technology Administration
FAST	Free and Secure Trade	SCTG	Standard Classification of Transported Goods
FHWA	Federal Highway Administration	SEMCOG	Southeastern Michigan Council of Governments
FMCSA	Federal Motor Carrier Safety Administration	STB	Surface Transportation Board
FSIS	Food Safety Inspection Service	TBWG	Transportation Border Working Group
FTZB	Foreign Trade Zone Board	TGT	Turnpike Global Technologies
FWS	Fish and Wildlife Service	TRB	Transportation Research Board
GPS	Global Positioning System	TSA	Transportation Security Administration
ICE	Immigration and Customs Enforcement	USDOT	U.S. Department of Transportation
IFDS	International Freight Data System	WIM	Weigh-In-Motion
IMTC	International Mobility and Trade Corridor	WSDOT	Washington State Department of Transportation
ITC	International Trade Commission		

1. PROJECT BACKGROUND AND OBJECTIVES

Established in 2001, the Transportation Border Working Group (TBWG) is composed of U.S. and Canadian federal transportation agencies, federal border agencies, state/provincial transportation agencies, field border agencies, regional transportation agencies, infrastructure builders and maintainers, and other border operating or management agencies. One of TBWG's objectives is to coordinate transportation planning, policy implementation, and technology deployment in order to enhance border infrastructure and operations. Information and data are an important element to plan border transportation infrastructure, particularly at the binational level, where federal, state, and provincial stakeholders interact on a constant basis.

Border system changes and initiatives, greater reliance on technology, security requirements, trade facilitation requirements, and the need for multi-agency cooperation to improve border and transportation infrastructure all present opportunities for data sharing among governmental and private agencies that operate at or near the border. The ever-changing border environment offers a unique opportunity for transportation and border agencies to develop a framework that describes the way in which agencies collect, access, share, and use data from both traditional and less familiar sources.

The TBWG Border Trade and Traffic Data Subcommittee (BTTDCS) has been charged with coordinating border trade, traffic, and corridor data products among TBWG partners. In 2003, this subcommittee organized a data workshop that identified four main areas in which to concentrate data collection efforts. Recently BTTDCS invited several agencies and other stakeholders to present data collection experiences, which reaffirmed its initial assessment that the four main areas of concern for the subcommittee are:

Data collection efforts encompassing all four areas of interest to TBWG take place in some form at nearly all international crossings on the U.S.-Canada border. These data present an opportunity to better inform transportation planning and operations decisions. Large amounts of data are currently being collected at international border crossings by various public and private stakeholders; however, there have been limited efforts to standardize these data and/or disseminate them to all of the stakeholders involved in the border crossing process.

The ultimate goal of this project is to develop a conceptual framework that can guide how key agencies within TBWG collect and share information. To meet this goal, a two-step approach was designed by the project team. The first step was to conduct an analysis of the data sources that are currently in use by members of TBWG, and to identify the gaps in the available data. The second step in this effort was to design a framework that would account for the data gaps identified in the first step of the research so that members of TBWG can use the framework for future data collection and sharing activities.

This draft report summarizes the project team's initial findings and includes the following sections:

- Chapter 1, “Project Background and Objectives,” provides a general overview of the project and its goals.
- Chapter 2, “Current State Analysis,” illustrates the U.S.-Canada border crossing environment as well as sources of transportation data that are currently available to stakeholders involved in the border crossing process.
- Chapter 3, “Stakeholder Interviews,” summarizes the results of the stakeholder interviews that were conducted by the project team during this endeavor.
- Chapter 4, “Insights Gained from Stakeholder Interviews,” discusses common themes found during the interview process.
- Chapter 5, “Gap Identification,” compares the findings from the current state analysis to the stakeholder interviews to identify what types of data should be incorporated into the proposed framework.
- Chapter 6, “Conceptual Framework,” builds off each previous section to lay the foundation for a framework that could be used to guide data collection and sharing efforts by members of TBWG in the future.
- The appendix lists the stakeholders contacted during this project.

2. CURRENT STATE ANALYSIS

This chapter describes what is currently taking place at ports of entry along the U.S.-Canada border. This chapter is divided into two main sections. The first section provides an overview of the U.S.-Canada border crossing environment. The second section discusses some of the transportation-related data sources that are currently available to stakeholders who participate in the border crossing process along the United States' northern border. The report's goal is not to describe every data collection effort undertaken; this would be prohibitively time consuming and of little value. Rather, the goal is to identify the main sources of data, the main sources of data used by stakeholders, and the diversity of data available in terms of collection techniques and data elements. To do so, this report provides examples of all types of data collection efforts and includes a description of the collection method, data elements, and data quality.

U.S.-CANADA BORDER CROSSING ENVIRONMENT

U.S.-Canada Land Border Ports of Entry

While the U.S.-Canada border has many ports of entry, a small number are considered major ports with:

- Tools available to monitor wait time.
- NEXUS[(1)] service.
- Free and Secure Trade (FAST)[(2)]service.

NEXUS is the expedited crossing program for passenger vehicles that cross the border frequently, and FAST is the expedited crossing program for goods movement. NEXUS and FAST crossers can either be offered a dedicated lane for crossing or can be serviced in multiple-use lanes.

Twenty-eight crossings provide at least one of these three services. Three of these locations are dedicated to passenger travel only, while the rest serve both commercial and passenger vehicles. In 2008, 12 million trucks, 55 million cars, and 432,000 other vehicles – for a total of 67.4 million vehicles – flowed across U.S.-Canada border crossings. The fact remains that even this simple statistic describing the directional flow of vehicles that is collected in each country is challenging to compile, given the various contrasting sources and binational authority to release a common two-way statistic. Table 1 summarizes the border crossings by service provided:

- "Y" indicates yes; that service is offered and that vehicle type is able to cross at the port of entry.
- "N" indicates no; that service is not offered or that vehicle type is not able to cross at the port of entry.
- "na" indicates that the available data did not clarify whether the service was offered.

Table 1. Major U.S.-Canada ports of entry and available services.

	United States								Canada					
				Commercial Vehicles			Pass Vehicles		Commercial Vehicles		Pass Vehicles			
Port Name	Port Code	City	State	Standard	FAST Lane	FAST	Standard	NEXUS	Standard	FAST	Standard	NEXUS	City	Prov.
Boundary Bay	3017	Point Roberts	WA	na	na	N	na	Y	Y	N	Y	Y	Delta	BC
Douglas (Peace Arch)	3004	Blaine	WA	N	N	N	Y	Y	N	N	Y	Y	Surrey	BC
Pacific Highway	3004	Blaine	WA	Y	Y	Y	Y	Y	Y	Y	Y	Y	Surrey	BC
Huntingdon	3009	Sumas	WA	Y	N	N	Y	N	Y	N	Y	N	Huntingdon	BC
Osoyoos-Oroville	3019	Oroville	WA	na	na	Y	na	na	Y	Y	Y	N	Osoyoos	BC
Coutts	3310	Sweet Grass	MT	Y	N	Y	Y	N	Y	Y	Y	Y	Coutts	AB
North Portal	3403	Portal	ND	na	na	Y	na	na	Y	Y	Y	N	North Portal	SK
Emerson	3401	Pembina	ND	Y	N	Y	Y	N	Y	Y	Y	Y	Emerson	MB
Fort Frances Bridge	3604	International Falls	MN	Y	na	Y	Y	na	Y	Y	Y	Y	Fort Frances	ON
Sault Ste. Marie	3803	Sault Ste. Marie	MI	Y	N	Y	Y	N	Y	Y	Y	Y	Sault Ste. Marie	ON
Blue Water Bridge	3802	Port Huron	MI	Y	Y	Y	Y	Y	Y	Y	Y	Y	Sarnia	ON
Detroit-Windsor Tunnel	3801	Detroit	MI	Y	N	Y	Y	Y	Y	Y	Y	Y	Windsor	ON
Ambassador Bridge	3801	Detroit	MI	Y	Y	Y	Y	Y	Y	Y	Y	Y	Windsor	ON
Peace Bridge	901	Buffalo	NY	Y	N	Y	Y	Y	Y	Y	Y	Y	Fort Erie	ON
Whirlpool Bridge	901	Buffalo/Niagara Falls	NY	N	N	N	N	Y	N	N	N	Y	Niagara Falls	ON
Queenston-Lewiston Bridge	901	Lewiston	NY	Y	N	Y	Y	N	Y	Y	Y	N	Queenston	ON
Rainbow Bridge	901	Niagara Falls	NY	N	N	N	Y	Y	N	N	Y	Y	Niagara Falls	ON
Thousand Island Bridge	708	Alexandria Bay	NY	Y	N	Y	Y	N	Y	Y	Y	N	Lansdowne	ON
Prescott-Ogdensburg	701	Ogdensburg Bridge	NY	na	na	Y	na	na	Y	Y	Y	N	Prescott	ON
Cornwall/International Bridge	704	Rooseveltown	NY	na	na	Y	na	na	Y	Y	Y	N	Cornwall	ON
St-Bernard-de-Lacolle	712	Champlain	NY	Y	Y	Y	Y	Y	Y	Y	Y	Y	Lacolle	QC
St. Armand / Philipsburg	212	Highgate Springs	VT	Y	N	Y	Y	N	Y	Y	Y	Y	St. Armand	QC
Rock Island	209	Derby Line	VT	Y	N	Y	Y	N	Y	Y	Y	N	Stanstead	QC
Stanhope-Norton	211	Norton	VT	Y	N	N	Y	N	Y	n	Y	N	Stanhope	QC
Armstrong-Jackman	104	Jackman	ME	Y	N	N	Y	N	Y	N	Y	N	Armstrong/Megantic	QC
Woodstock Road	106	Houlton	ME	Y	N	Y	Y	Y	Y	Y	Y	Y	Belleville	NB
St. Stephen/Milltown	115	Calais	ME	Y	N	N	Y	N	na	N	Y	N	St. Stephen	NB
St. Stephen/Ferry Point	115	Calais	ME	Y	N	Y	Y	N	Y	Y	Y	N	St. Stephen	NB

Figure 1 illustrates the locations of major U.S.-Canada border crossings. The numbers correspond to the port codes indicated in table 1. The locations of interest are highlighted in the boxes. These locations can be cross-referenced with table 1 to identify available services.

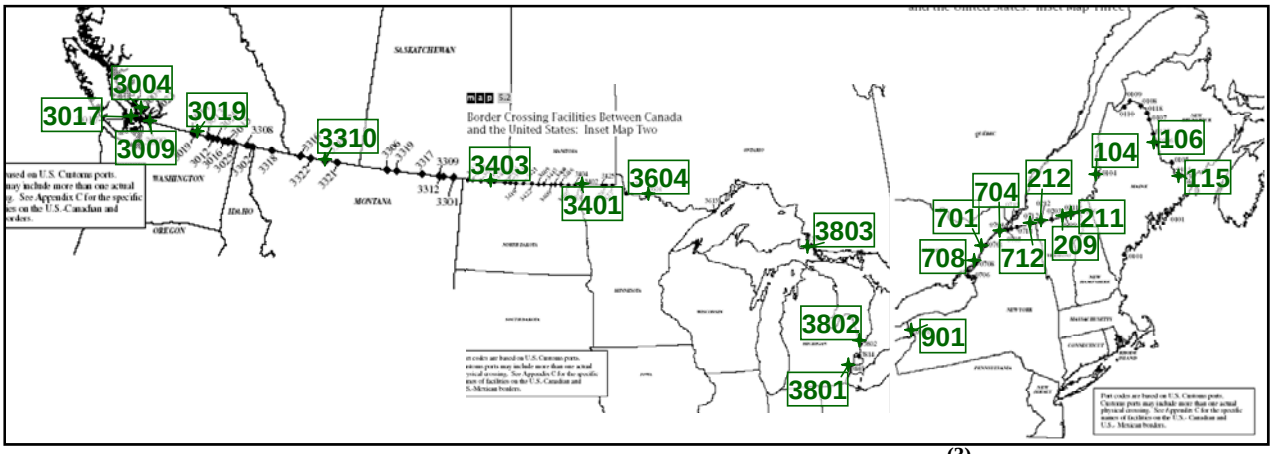

Figure 1. Map. Major U.S.-Canada ports of entry[3].

Table 2 shows U.S.-Canada truck traffic entering the United States; it presents data from 2007, the most recent year available from the Bureau of Transportation Statistics, and only includes trucks entering the United States. The ports in table 1 reflect 92 percent of the northern border two-way truck volume. More than 50 percent of the total truck traffic is concentrated in three ports of entry, between Michigan, New York, and Ontario. Detroit-Windsor is the busiest port of entry and handled 2.98 million two-way trucks in 2008. The second largest are the ports between Buffalo, New York, and the Niagara region in Ontario, which carried 2.08 million two-way trucks in 2008. Michigan carried the largest number of two-way trucks of any state on the U.S.-Canada border, representing 44 percent of the total. New York carries the next largest volume, with 22 percent of the two-way total. Washington carries the third largest volume, with 12 percent of the total two-way truck traffic on the northern border.[4]

Table 2. U.S.-Canada truck traffic by port of entry.

	United States			Canada		2007 Trucks Entering U.S.	
Port Name	**Port Code**	**City**	**State**	**City**	**Prov.**	**Volume**	**% of Northern Border Total**
Boundary Bay	3017	Point Roberts	WA	Delta	BC	18,344	0.3%
Douglas (Peace Arch)	3004	Blaine	WA	Surrey	BC	438,001	6.7%
Pacific Highway	3004	Blaine	WA	Surrey	BC		
Huntingdon	3009	Sumas	WA	Huntingdon	BC	135,678	2.1%
Osoyoos-Oroville	3019	Oroville	WA	Osoyoos	BC	44,618	0.7%
Coutts	3310	Sweet Grass	MT	Coutts	AB	137,042	2.1%
North Portal	3403	Portal	ND	North Portal	SK	72,144	1.1%
Emerson	3401	Pembina	ND	Emerson	MB	228,455	3.5%
Fort Frances Bridge	3604	International Falls	MN	Fort Frances	ON	22,623	0.3%
Sault Ste. Marie	3803	Sault Ste. Marie	MI	Sault Ste. Marie	ON	55,858	0.9%
Blue Water Bridge	3802	Port Huron	MI	Sarnia	ON	770,282	11.8%
Detroit-Windsor Tunnel	3801	Detroit	MI	Windsor	ON	1,773,465	27.1%
Ambassador Bridge	3801	Detroit	MI	Windsor	ON		
Peace Bridge	901	Buffalo	NY	Fort Erie	ON	1,088,438	16.6%
Whirlpool Bridge	901	Buffalo/Niagara Falls	NY	Niagara Falls	ON		
Queenston-Lewiston Bridge	901	Lewiston	NY	Queenston	ON		
Rainbow Bridge	901	Niagara Falls	NY	Niagara Falls	ON		
Thousand Island Bridge	708	Alexandria Bay	NY	Lansdowne	ON	209,080	3.2%
Prescott-Ogdensburg	701	Ogdensburg Bridge	NY	Prescott	ON	52,809	0.8%
Cornwall/International Bridge	704	Rooseveltown	NY	Cornwall	ON	41,218	0.6%
St-Bernard-de-Lacolle	712	Champlain	NY	Lacolle	QC	387,033	5.9%
St-Armand/Philipsburg	212	Highgate Springs	VT	St. Armand	QC	124,086	1.9%
Rock Island	209	Derby Line	VT	Stanstead	QC	125,545	1.9%
Stanhope-Norton	211	Norton	VT	Stanhope	QC	19,931	0.3%
Armstrong-Jackman	104	Jackman	ME	Armstrong/Megantic	QC	106,964	1.6%
Woodstock Road	106	Houlton	ME	Belleville	NB	96,947	1.5%
St. Stephen/Milltown	115	Calais	ME	St. Stephen	NB	99,685	1.5%
St. Stephen/Ferry Point	115	Calais	ME	St. Stephen	NB		

Note: Aldergrove-Lynden and Thunder Bay-Grand Portage are not included in table 1 or figure 1, but are in figure 2 because they represent only about 1.5 percent of all cross-border truck traffic.

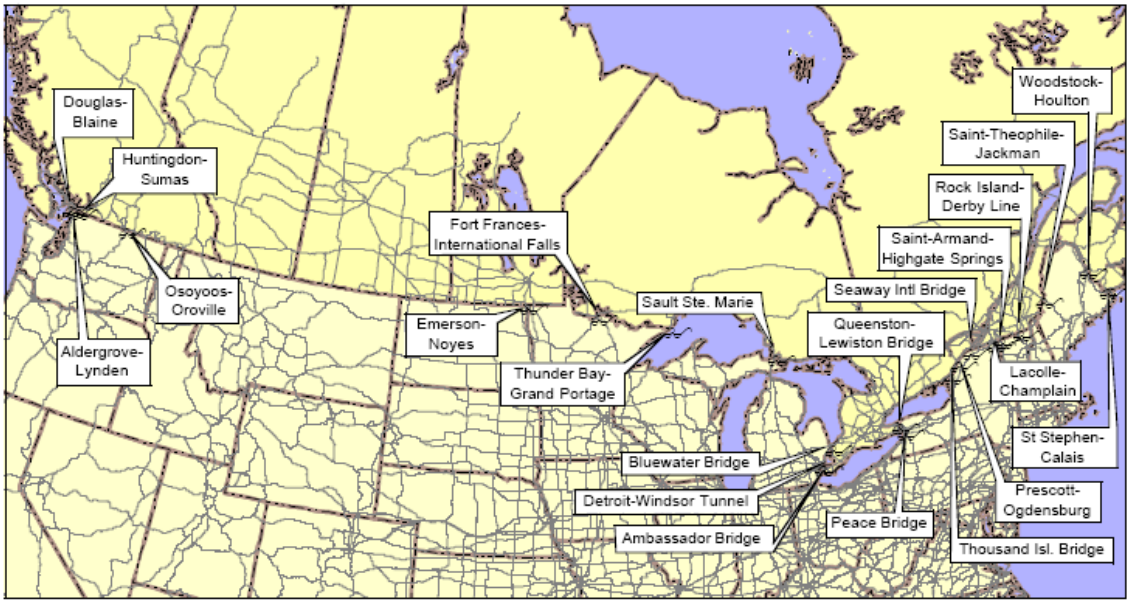

Figure 2. Map. Major Canada-U.S. truck crossings[5].

Stakeholders in the U.S.-Canada Border Crossing Environment

Many individuals and organizations are involved in the movement of goods and people across the border. Departments in both countries are responsible for ensuring safety and security on the border and within the country, and ensuring adequate capacity at the border and on the roadways approaching the border. Stakeholders on both sides of the U.S.-Canada border include federal, state, and local governments and agencies; shippers and carriers; bridge authorities; and the traveling public.

Bridge and Tunnel Operators

The operation of bridges and tunnels along the U.S.-Canada border is administered by diverse agencies including Blue Water Bridge U.S. and Blue Water Bridge Canada, the Buffalo and Port Erie Public Bridge Authority, the Detroit International Bridge Company, Detroit Windsor Tunnel LLC, the Ogdensburg Bridge Port Authority, the International Bridge Administration, the Niagara Falls Bridge Commission, the Seaway International Bridge, the Thousand Island Bridge Authority, and the Public Bridge Operators Association (PBOA). Although many agencies are involved in the management of international bridges along the U.S.-Canada border, there is a relatively high degree of collaboration among these stakeholders to ensure efficient border operations. TBWG includes various bridge operators as its members, which is just one illustration of these collaboration efforts. The Federal Ministry of Transport (Transport Canada) is the department responsible for legislative management and reporting for international bridges/tunnels. The department has developed new bridge and tunnel regulations.

State Departments of Transportation and Provincial Ministries of Transportation

These organizations develop and maintain the infrastructure approaching the border, both northbound and southbound. Examples include the Washington State Department of Transportation and the British Columbia Ministry of Transportation.

Freight Carriers

Freight carriers, third-party logistics providers, shippers, and independent contractors all carry goods across the border, in service of a client or for themselves. These companies can be based in the United States or in Canada. Many specialize in cross-border service. A valuable aspect of data collection efforts forming part of the National Roadside Survey is the collection of vehicle license plate jurisdiction. This jurisdictional activity knowledge and ability to filter activities by jurisdiction fill many data gaps. At present, border trade activity is highly imbalanced, with 75 percent of all activity facilitated and 77 percent of all cargo value moved by Canadian carriers and shippers. Thus, U.S. data sources are not likely to contain this knowledge from U.S.-based shippers or carriers and must rely on Canadian sources to ensure 100 percent coverage.

U.S. Department of Homeland Security (DHS)

DHS is the agency responsible for homeland security on the U.S. side of the border. DHS has three primary missions: prevent terrorist attacks within the United States, reduce the United States' vulnerability to terrorism, and minimize the damage from potential attacks and natural disasters. DHS includes several agencies operating near the U.S. - Canada border, including Customs and Border Protection (CBP), the Transportation Security Administration (TSA), and Immigration and Customs Enforcement (ICE).

Public Safety Canada

Public Safety Canada is the Canadian equivalent of the U.S. Department of Homeland Security, established as a ministerial department in 2004. This agency includes the Canadian Border Service, the Royal Canadian Mounted Police, the Canadian Security Intelligence Service, and Correctional Service Canada. Their primary mission is law enforcement and intelligence functions, with a secondary priority on emergency preparedness and disaster relief.

U.S. Customs and Border Protection

CBP performs two crucial roles in facilitating trade to and from the United States: securing it from acts of terrorism, and assuring that goods arriving in the United States are legitimate and that appropriate duties and fees are paid. CBP performs a security inspection immediately after a commercial vehicle enters the United States. CBP has implemented the FAST program at most commercial border crossings and the NEXUS program with dedicated lanes at selected passenger crossings.

Canadian Border Services Agency

The Canada Border Services Agency (CBSA) ensures the security and prosperity of Canada by managing the access of people and goods to and from Canada. CBSA has also implemented the FAST program for commercial vehicles and the NEXUS program.

Other Stakeholders

Other stakeholders that are not physically present at the border and do not participate directly in the process, but collect and use information, include cities located near the border (e.g., Surrey, British Columbia), metropolitan planning organizations located near the border (e.g., the Whatcom Council of Governments), and state and provincial departments of transportation and finance/economic development trade and federal organizations (e.g., Transport Canada and the U.S. Department of Transportation [USDOT]). Both Transport Canada and USDOT are good sources of cross-border data.

There are additional, smaller organizations that are concerned about cross-border transportation, such as the International Mobility and Trade Corridor Project, which is supported by the Whatcom Council of Governments, TBWG, and the Eastern Border Transportation Coalition (EBTC). These groups include many of the stakeholders mentioned previously and meet regularly to discuss regional transportation issues. In addition, there are local and national chambers of commerce, academic researchers and consultants, and industry organizations such as the American Transportation Research Institute (ATRI).

Port of Entry Screening Process

The U.S.-Canada border crossing process is relatively streamlined. Passenger and commercial vehicles are examined separately. Both can be pulled out for secondary screening. Entering the United States also involves a radiation screening. Commercial vehicles have a longer process that can involve cargo and agriculture inspection. Figure 3 illustrates the basic crossing process for commercial vehicles, and figure 4 illustrates that for passenger vehicles.

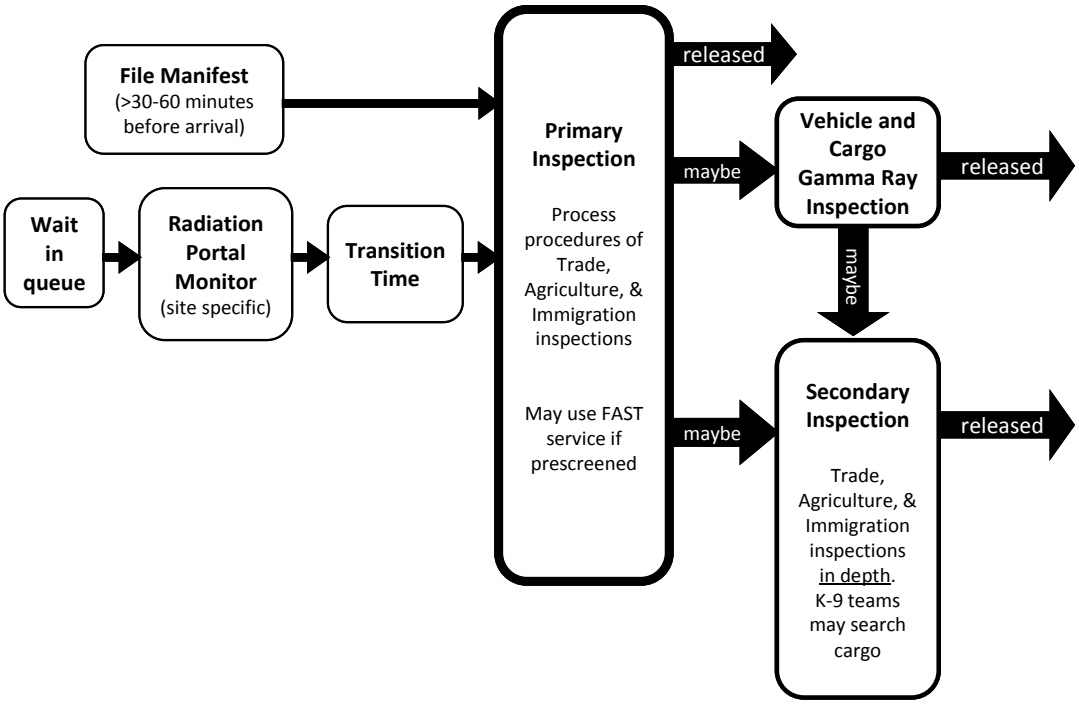

Figure 3. Flowchart. Screening process for commercial vehicles at U.S.-Canada border crossing stations.

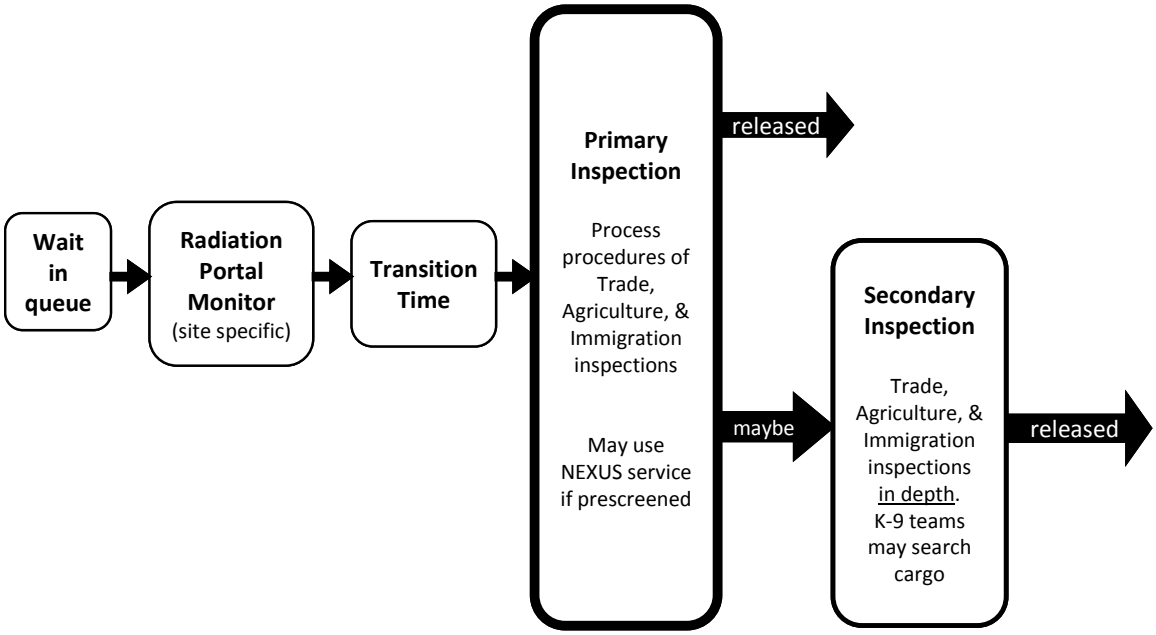

Figure 4. Flowchart. Screening process for passenger vehicles at U.S.-Canada border crossing stations.

DATA SOURCES

Existing Data Sources

Evaluations of border performance and analysis that support border infrastructure planning are based on data regarding current border operations. As previously discussed, these data can be organized into four categories:

- Traffic count/classification data.
- Origin-destination data.
- Border wait-time/congestion data.
- Enhanced trade data.

In this section, the existing availability of data, the quality of these data, and the mechanisms for data sharing are discussed.

As mentioned previously, some stakeholders collect information for their own operations and planning. This may include obtaining and analyzing existing data or independent data collection efforts. There are also several national programs on both sides of the border to collect and dissemination border data. Following is a summary of the more significant and systematic efforts currently available; these sources of information will most likely influence the data collection and sharing efforts at the border.

Other Governmental Departments (OGD) Single Window Interface

The OGD Single Window Interface is an integrated system for departments and transporters within Canada to share trade data. The system links the Canadian Border Services Agency, the Canadian Food Inspection Agency, Natural Resources Canada, and Transport Canada with importers and brokers (external users). This integrated system allows all users to access trade data and permits importers and brokers to complete transactions electronically. Instead of presenting paper packages at the office of release, importers and brokers who have gone through the required testing can send transactions with OGD requirements electronically. This system allows better communication within Canadian regulatory departments and allows them to allocate more resources to high-risk shipments. External users must be registered with CBSA to use the OGD Single Window Interface system. When fully implemented, OGD could be harmonized with the U.S. CBP's ACE/ITDS System, as both systems follow the World Customs Organization's (WCO) trade facilitation model.

Automated Commercial Environment (ACE)[(6)]

ACE is the commercial trade processing system being developed by U.S. Customs and Border Protection to facilitate trade while strengthening border security. The ACE system uses a secure data portal to connect CBP with the trade community and participating government agencies (PGA) by providing a single, centralized, online access point for communications and information related to cargo shipments. Through the portal it is possible to manage accounts, perform periodic payment, and enter the information for the electronic truck manifests (e-

manifest). The e-manifest capabilities are now fully operational at the northern and southern borders, detailing shipment, conveyance, and carrier information.

The International Trade Data System (ITDS) is a program that is ensuring interagency participation in ACE. Through ITDS efforts, ACE will provide a "single window" for collecting and sharing trade data with agencies that are responsible for ensuring the compliance of imported and exported cargo with U.S. laws. There are 45 PGAs in ITDS, and nearly 500 end users from 27 PGAs have access to the ACE portal.

Deployed in phases, ACE will be expanded to provide cargo-processing capabilities across all modes of transportation and will replace existing systems with a single, multimodal manifest system for land, air, rail, and sea cargo. Future releases will result in further automation of entry summary processing and enhanced account management features.

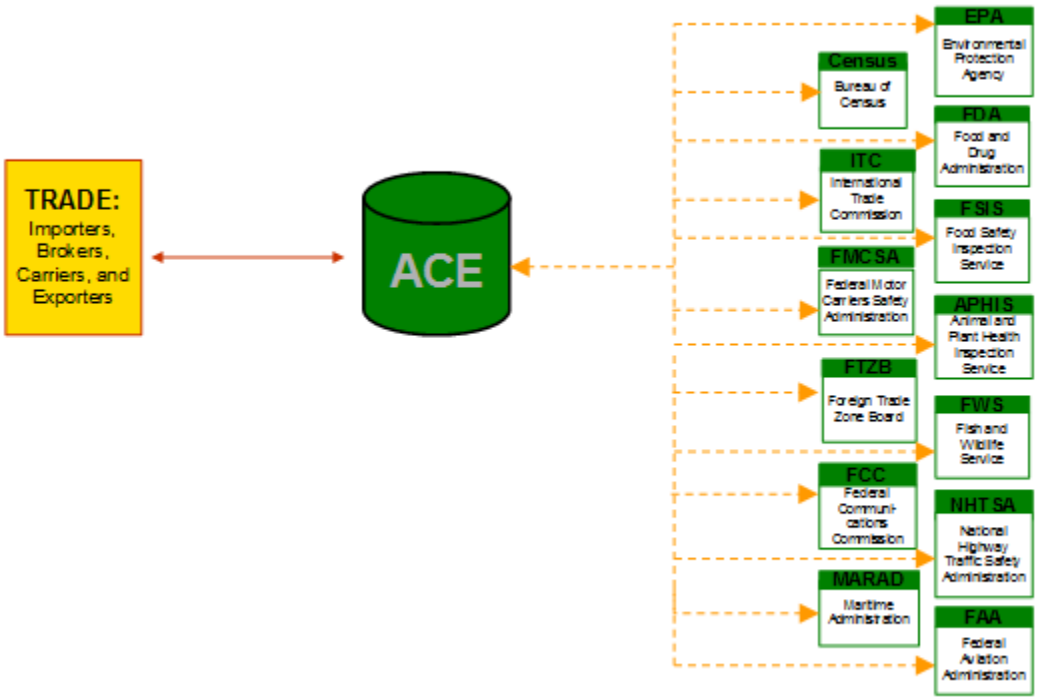

Figure 5. Flowchart. ACE data flow plan.

International Freight Data System (IFDS): Seven USDOT agencies will obtain data collected by CBP through a system-to-system interface between ACE and USDOT's planned International Freight Data System. The Research and Innovative Technology Administration (RITA) is the primary agency engaged in creating and managing IFDS.

Bureau of Transportation Statistics (BTS): BTS performs research and prepares statistics and reports on the volume and geography of international trade on the United States' transportation systems.

BTS currently receives import and export summary data from the Bureau of the Census on a monthly basis and border crossing data from CBP on a periodic basis. BTS plans to use transaction data downloaded from ACE into IFDS, including entry/entry summary reports from importers, manifest reports from carriers, and name and address information for carriers from ACE carrier account files. This information can be sorted by the location where the shipment was loaded on the conveyance that arrives in the United States, port of arrival, location of consignee, and conveyance.

Federal Highway Administration (FHWA): FHWA conducts research on international commodity flows and related freight transportation activities, and develops analytical tools (including freight models) to measure the transportation system and examine the relationship between freight transportation improvements and the U.S. economy.

FHWA will access entry/entry summary and manifest data through the USDOT International Freight Data System to analyze cargo and conveyance movements in order to better allocate resources among states.

Federal Motor Carrier Safety Administration (FMCSA): FMCSA will access data through IFDS to analyze the flow of international truck freight across the United States, in order to improve staffing and related enforcement activities at U.S. borders and inform the allocation of Federal resources to state motor carrier safety partners.

FMCSA will access entry/entry summary and manifest data through the USDOT International Freight Data System to analyze cargo and conveyance movements and to better allocate resources among states.

FMCSA will also have a direct interface with ACE for screening trucks entering the United States. FMCSA enforces safety standards for commercial motor vehicles entering the United States. Under the ITDS program, FMCSA will receive information about commercial motor vehicles and drivers reported in manifest declarations that are electronically submitted to CBP by carriers or their agents in advance of cargo arriving at the border. FMCSA will use this advance information to identify vehicle and driver safety compliance issues and determine whether an inspection is required. The FMCSA screening results will also be transmitted, via ACE, to carriers to provide an opportunity to correct problems before arrival at the border. Vehicle and driver inspections may be performed by either FMCSA inspectors or by state authorities.

When an electronic truck manifest is validated by CBP, information related to the commercial motor vehicle and driver entering the United States will automatically be transmitted via a secure virtual private network connection over the Internet to the FMCSA system, Query Central. Query Central will use the data to verify the operating authority, insurance, commercial driver license, hazardous materials endorsement, and carrier safety score. The screening results will be transmitted back to CBP and the carriers or their agents within approximately eight seconds of manifest submission. Under the ITDS program, FMCSA and CBP are developing an interface between the FMCSA data system, Query Central, and ACE to allow the prescreening of commercial motor carriers and their drivers and equipment prior to their arrival at U.S. border ports of entry. FMCSA will receive information about commercial motor carriers, vehicles, and drivers reported in manifest declarations that are electronically submitted by carriers or their

agents in advance of cargo arriving at the border. FMCSA will use this advance information to identify potential vehicle and driver safety compliance issues and determine whether an inspection is required. The FMCSA screening results will be transmitted, via ACE, back to the carriers or their agents to provide the carrier an opportunity to correct problems before arrival at the border. Vehicle and driver inspections may be performed by either FMCSA inspectors or by state authorities.

The interface between CBP and FMCSA is currently being tested with actual carrier data. The purpose of this test is to analyze the volume of screening issues and system screening performance. Over the next two years, various functions will be phased in. The first phase, which was targeted for deployment nationwide in September 2007, includes FMCSA screening of manifest information as well as notification to carriers or their agents of FMCSA-related issues. FMCSA will develop an enforcement strategy to address safety compliance issues identified by this data exchange. With the second phase, FMCSA-related manifest issues will display a warning for CBP officers to refer the vehicle in question to an FMCSA inspection facility located outside the CBP compound. The third phase will be deployed at ports where FMCSA is operating within the CBP compound and will require FMCSA issues to be closed prior to the vehicle exiting the port. With the deployment of the fourth and final phase, critical FMCSA issues will result in CBP rejection of the manifest.

Canadian National Roadside Survey

The Canadian National Roadside Survey (NRS) is collected roughly every five years. While the provinces of Ontario and Quebec rely on roadside surveys to develop their understanding of truck activities and are likely to continue, the future of a federally coordinated effort is currently in doubt. In the surveys completed in 1995, 1999, and 2005 to 2007, a sample of trucks was surveyed at permanent weigh stations, truck inspection stations, truck rest areas, and special truck trip generators including intermodal terminals, airports, and major manufacturers.

The latest survey performed from 2005 to 2007 was undertaken at approximately 200 directional sites throughout Canada but was unevenly sampled between jurisdictions. This unique and extensive survey effort collected truck characteristics related to vehicle, carrier, trip, commodity, and driver. Detailed information about origin-destination and routing of loaded and empty trips with detailed axle weights and commodity descriptions is a trademark of the intercept survey.

From a transportation modeling perspective, the NRS expansion methodology provides an undisputable representation of hourly truck volumes and characteristics at the 200 strategically located intercept points. This methodology provides stakeholders the ability to confidently model activity at key control points on our strategic infrastructure and activities at international border crossing facilities by travel direction for the entire cordon.

In addition to the intercept survey, a considerable effort of vehicle classification using automated traffic recorders and weigh-in-motion technologies was undertaken, collecting a minimum of two weeks of continuous hourly classification data plus three hours of manual classification for validation purposes.

While the primary focus of the survey has been to collect information about travel within Canada and its provinces, recent efforts (1999 and 2005 to 2007) have focused more on cross-border travel patterns. The data for 1999 and 2005 to 2007 are openly available but must be individually requested. At the time of publication of this document, negotiations for a data-sharing agreement between Transport Canada and FHWA have stalled. Unfortunately, without the agreement, the data cannot be shared, not even for planning efforts of significant binational infrastructure projects connecting the two countries.

Commodity Flow Survey (CFS)

CFS, a joint effort between the U.S. Census Bureau and the Bureau of Transportation Statistics, produces data on the movement of goods in the United States. The 2007 CFS is a component of the Census Bureau's Economic Census. Commodity surveys were conducted from 1963 to 1983; however, the current form of the CFS, developed in 1993, was improved in methodology, sample size, and scope.

The CFS records shipment data from manufacturing, mining, wholesale, and select retail and service establishments. These shipment data are used to estimate origin-destination patterns by commodity type, mode, shipment size, and value for freight transportation. CFS shipment data are also used to assess demand on existing transportation systems and assist with critical investments in future transportation facilities and services.

Commodities, as reported in the CFS, can be defined as goods and products that an establishment produces, sells, or distributes. According to the CFS, a shipment "is a single movement of goods, commodities, or products from an establishment to a single customer or to another establishment owned or operated by the same company as the originating establishment (e.g., a warehouse, distribution center, or retail or wholesale outlet)."

The CFS collects the following data for each shipment:

- Shipment identification number.
- Date on which the shipment was made.
- Value.
- Weight.
- Standard Classification of Transported Goods (SCTG) code.
- Description of the commodity, or the commodity that makes up the greatest percentage of the shipment's weight.
- Domestic destination or port of exit.
- Mode(s) of transportation.
- Whether the shipment was an export or hazardous material.
- Mode of export.
- Destination city and country for exports.
- United Nations/North American (UN/NA) code for hazardous material.

The CFS reports shipment value, tons, ton-miles, and average miles per shipment by:

- Transportation mode.
- Shipment distance.
- Shipment weight.
- SCTG code.
- SCTG code and transportation mode.
- SCTG code and shipment distance.
- SCTG code and shipment weight for shipment distance groups.

Elements of the CFS are used by BTS, TRANSEARCH, FHWA's Freight Analysis Framework (FAF), and the Surface Transportation Board's (STB's) Carload Waybill Sample. Raw data from the CFS can be viewed from the U.S. Bureau of the Census's website; however, the complete results from the most recent CFS (conducted in 2007) will not be available until December 2009. In relation to international trade, the CFS reports the value and weight of exports leaving the United States, which in turn are used by the agencies mentioned above to report more detailed data.

Statistics Canada

Statistics Canada is the official Canadian federal government agency responsible for producing statistics of importance to Canada. Statistics Canada is responsible for collecting and disseminating statistics in order to "help Canadians better understand their country – its population, resources, economy, society and culture."[(7)] This agency is established by legislation, and acts on the behalf of Canada and each of its provinces. The goal of the agency is to provide public- and private-sector entities with insights into current levels of social, census, and economic statistics. Data collected by Statistics Canada help these entities make informed decisions.

Statistics Canada is responsible for conducting a census every five years and administers over 350 surveys related to all aspects of Canadian life. Statistics Canada develops transportation-related databases based on these data collection efforts targeting air, rail, road, and marine transportation providers and users. Surveys of these stakeholders are conducted on a monthly or annual basis. Survey data are oftentimes bolstered by administrative data sources. The resultant databases also include significant data on passenger traffic. Examples of data collected for each mode include freight origin-destination, tonnage, commodities hauled, and transportation provider revenues and expenses. Based on these results, Statistics Canada produces a large number of reports. In regards to international trade, interested parties can search and view a wide variety of import and export data based on commodity type, mode of transport, and many other variables. These data are accessible for a minimal fee through Statistics Canada's website.

Transborder Freight Data

The North American Transborder Freight Database is developed on a monthly basis by BTS under a contract with the U.S. Bureau of the Census. The Census Bureau provides BTS with detailed reports of U.S. international trade statistics collected as part of its Foreign Trade Statistics Program. Using the census reports, BTS develops tables of U.S. import and export trade flows with Canada and Mexico, including shipment characteristics by commodity type and surface modes of transportation.

Development of the Transborder Surface Freight Database was initiated in 1993. The objective was to study the impacts on U.S. surface trade flows with Canada and Mexico as a result of the North American Free Trade Agreement (NAFTA) signed by the United States, Canada, and Mexico in December 1993 and enacted January 1, 1994.

The North American Transborder Freight Database, available since April 1993, contains freight flow data by commodity type and by mode of transportation (rail, truck, pipeline, air, vessel, and other) for U.S. exports to and imports from Canada and Mexico. The database includes two sets of tables; one is commodity based, and the other provides geographic detail. The purpose of the database is to provide transportation information on North American trade flows that could be used for trade corridor studies, transportation infrastructure planning, marketing and logistics plans, and other purposes. It allows users to analyze movement of merchandise by all land modes, waterborne vessels, and air carriers. Statistics Canada has a similar product named Merchandise Trade; the value of goods reported since 2004 may be inaccurate, but the tonnage measures remain robust and precise.

Border Information Flow Architecture (BIFA)

While BIFA contains no data, it does provide a data framework. Some of the elements of BIFA could be used as a guideline to developing a data warehouse. The components of BIFA are listed below.

- Services: BIFA includes the following ITS services that support border operations and management of the transportation system surrounding the border:
  - Archive data management.
  - Border inspection.
  - Commercial vehicle operations (CVO).
  - Electronic payment.
  - Emergency management.
  - Incident management.
  - Maintenance management.
  - Traffic management.
  - Traveler information.
- Stakeholders: BIFA describes applicable stakeholders along with their roles and responsibilities for each ITS service.
- Inventory: This component describes the systems operated by stakeholders that support, or may support, interfaces that cross stakeholder boundaries.
- Needs and services: This component identifies the needs that drove development of BIFA and identifies the services the architecture provides. As in the ITS Architecture, BIFA uses market packages that represent slices of the architecture that address specific services.
- Interfaces and information exchanges: This component covers the interfaces, information flows, and key diagrammatic outputs of the architecture. Interfaces illustrate interconnects or information flows.

FHWA GPS Data Collection

FHWA is sponsoring a project to collect information at freight-significant corridors and five U.S.-Canada border crossings ports. FHWA is working with ATRI, which is in turn working closely with its telecommunications industry partners and participating motor carriers. ATRI collects information and develops performance measures such as average travel rate, corridor demand, time-of-day analysis, and reliability along critical freight corridors throughout the United States.

Border Wait-Time Monitoring (Truck GPS and Bluetooth)

Transport Canada Ontario Region has worked in partnership with Turnpike Global Technologies (TGT) and its more than 50 client carriers to develop a method for estimating border wait (crossing) times for commercial vehicle traffic based upon custom-configured, interval data derived from the trip/tractor logs generated by TGT's onboard, vehicle-tracking, and data-logging technology. TGT's data-logging system has been programmed to record vehicle movement, stop time, and delays, both within the crossing plaza and throughout predefined perimeter zones. With base station readers located at each respective crossing, the corresponding wait-time, or crossing-time, interval can be transmitted, processed, and then posted within minutes to a fully integrated web portal[(8)] or otherwise stored for subsequent time series and trend analysis. In just over three years, approximately 260,000 Canada- and U.S.-bound crossing observations have been recorded at southern Ontario's five major border crossings (i.e., Ambassador, Bluewater, Detroit/Windsor, Peace, and Queenston/Lewiston). More recently, EBTC sponsored the installation of readers at two additional crossings (Champlain-Lacolle and Stanstead-Derby Line).

This partnership effort to exploit global positioning system (GPS) data logs to estimate commercial vehicle wait times at U.S.-Canada border crossings has afforded a collateral opportunity to assess the viability of utilizing Bluetooth technology as a technically viable, cost-effective interval measurement tool, or wait-time metric, for passenger traffic at U.S., Canada, and Mexico border crossings. TGT's proprietary RouteTracker utilizes Bluetooth technology to minimize communication costs typically associated with a built-in modem and frequent transmission of large volumes of GPS and engine diagnostic data. All Bluetooth devices (e.g., cell phones, personal digital assistants, hands-free sets, and in-dash units), when in "on" mode, continuously emit a unique Bluetooth identification (ID) signal that is hard-wired into each device. Bluetooth-enabled readers, or data-access points, operating in discovery mode then read, record, and assign a time stamp to every unique ID that comes within its specified (10-20 meter) range. This Bluetooth functionality has been ably demonstrated to date at the Detroit/Windsor Tunnel where readers located at entry and exit points for both Canada- and U.S.-bound traffic have recorded transit time intervals for 150,000 (approximately 2.7 percent of total annual traffic volumes) largely noncommercial/passenger vehicles over the past 30 months. The unique Bluetooth ID is merely the serial number, or product ID, issued by the manufacturer. It is devoid of any personal data and offers no connectivity beyond those data access points that might be set in place to estimate passenger crossing and/or queuing times at any particular border crossing. In many technical respects, Bluetooth is similar to a radio frequency identification (RFID) proximity application, yet it requires very little purpose-built infrastructure, and there is no corresponding need to equip a user population. The possibility that Bluetooth could

complement, if not rival, RFID proximity applications, bringing further empirical evidence to bear on the dynamic of wait-time performance metrics, etc., merits further attention. Additional field tests and deployments already underway, or planned, for border crossings, as well as highway corridor and other modal applications, are indicative of the buoyant interest that is emerging in response to Bluetooth's potential as a viable performance metric.

U.S. Customs and Border Protection and Canada Border Services Agency

Information available from U.S. Customs and Border Protection and the Canada Border Services Agency regarding port of entry (POE) operations is often contradictory because much of the available information is out of date or of limited availability. The Canadian Border Services Agency website[9] provides information regarding each port of entry, listing availability of commercial and traveler services as well as FAST and NEXUS services. This website also provides some information regarding U.S. operations.

The U.S. Customs and Border Protection website[10] also provides information regarding each border crossing. However, this website is focused more on providing information about CBP personnel rather than providing information to travelers about available services. Determining what services are provided at each port of entry for travelers to the United States is difficult. For many of the ports listed in table 1, exact service provisions are unclear.

Information regarding POE services is also available from the two border service agencies' wait-time websites[11]. These websites only provide information for the busiest border crossings but do indicate provision of commercial and passenger services. The CBP website also indicates availability of dedicated lanes for preferred services (FAST and NEXUS). Other sources of information regarding POE services are various reports from CBP regarding FAST service[12].

Summary of Existing Data Sources by Category

Traffic Count/Classification Data

Traffic count data and classification data are available from the Bureau of Transportation Statistics, Statistics Canada, State departments of transportation (DOTs), provincial ministries of transportation (MOTs), and border operators and their associations (e.g., PBOA covering New York and Michigan crossings). Some of these sources provide traffic count data online. Others require an individual request. The classification data are available from BTS online but generally require an individual request to obtain them from other sources. The North American Transportation Statistics Database (NATS) also has volume data available by mode[13]. It is summarized by direction of flow (both directions are available) and provides annual summaries.

Both traffic count and vehicle classification data are automatically recorded from loop detectors, weigh-in-motion scales, and administrative records on an ongoing basis. Supplemental counts are also conducted during short, periodic intervals.

Traffic count data are most widely available. Some of the count data are published in hourly increments and are frequently available directionally. These data are relatively easy to collect and share, especially from loop detectors, which are designed to output the data in a useable form. However, even this most basic function is not well coordinated across all crossings, states,

and provinces. Instead, each organization collects data to meet its particular mandate. A lack of uniform technology, a failure to standardize classification schemes, and a patchwork of data collectors provide aggregate information that is not calibrated into one source and shared equally.

The BTS website[14] has the most comprehensive data, including detailed classification data, but will only provide monthly summaries of volumes by mode and only provides information regarding vehicles entering the United States. The Statistics Canada website provides monthly data[15] by port of entry for vehicles entering Canada but charges a fee for the data. Statistics Canada can provide classification in terms of automobiles, trucks, or other vehicles. Transport Canada includes information about vehicles entering both the United States and Canada, but the data are provided yearly and are outdated[16]. The NATS data show a strong imbalance in travel to Canada versus travel to the United States. The individual states and provinces generally provide detailed count data, but the data are distributed through each state's website[17]. Minimal information is available from provincial sources with the greatest crossing activity where the two countries are connected by bridges and tunnels. While some classification data gathered at the state/province level are continuously collected and readily available, much is collected with short-term count stations, and the data are usually available only by request. At Ontario's crossings, where 58 percent of the U.S - Canada traffic crosses, the province is not involved in conducting traffic classification counts.

Origin-Destination Data

Commercial vehicle origin-destination information has been successfully collected as part of the Transport Canada NRS in 1999 and 2005 to 2007. The Eastern Border Transportation Coalition sponsored a report in 2002[18] that provides detailed origin-destination data but was a singular evaluation and utilizes data from the 1999 NRS. By design, the latest 2005 to 2007 survey captures a statistically robust sample of the total crossing traffic over the course of multiple years and with many weeks of continuous surveying in an effort to profile an average week based on those values. The International Mobility and Trade Corridor Project in Washington State has periodically received manifest data from the port manager at Pacific Highway in order to capture origin-destination data, but this is not made widely available. Infrequent passenger origin-destination surveys are conducted at border crossings with analysis and aggregated data available from the participating states/provinces and border operator.

Another source of origin-destination data is the U.S. Commodity Flow Survey. The U.S. Commodity Flow Survey is conducted every five years. The survey documents a large sample of shipments and records the zip code of the origin and destination, five-digit SCTG code, weight, value, and modes of transport as well as information on whether the shipment is containerized, a hazardous material, or an export. The results of the survey are distributed by BTS and are aggregated at the national, state, and metropolitan level.

Similar to the U.S. Commodity Flow Survey, the Statistics Canada Trucking Commodity Origin and Destination Survey is a broad survey of freight carriers in Canada. The survey describes trucking company businesses by their region of service, profitability, expenses, and general type of commodity moved. The information is gathered and reported quarterly. Commodity origin-destination information is available upon request, and a fee may be involved.

Border Wait-Time/Congestion Data

U.S. Customs and Border Protection[19] and the Canada Border Service Agency[20] both publish real-time wait information, differentiated by commercial and passenger vehicles for the major ports of entry. Information regarding wait time is not available for the other border crossings. The largest POEs have dedicated information available from their local DOT/MOT as well as from miscellaneous border agencies[21]. These sites show wait times, congestion, or feeds from web cameras.

The wait-time and congestion information is generally collected on an ongoing basis. None of the wait-time or congestion websites indicate the source of their data. A variety of methods are likely used to collect the data including loop sensor information and visual inspection. Some wait-time information is known to be gathered from driver interviews ("How long have you been waiting?"), and some may be gathered from camera observations.

These data are updated regularly, with most updated at least hourly, and are available for most travelers given the concentration of travelers at the major ports of entry. The data are generally presented in easy-to-use formats and are widely linked between northbound and southbound information.

However, most of these data are only available in real time – Washington DOT and British Columbia MOT provide archived data[22]. Few sites indicate any archiving or availability of historic data. Because the sources are unknown, the methodology and comparability cannot be examined. Additionally, without knowing typical times, travelers cannot easily use this information to change their routing or timing.

Enhanced Trade Data

Enhanced trade data refers to commodity flow data and detailed operational data. Detailed operational data are generally only available from small periodic samples based on individual interviews of shippers or drivers. For example, the Washington State DOT conducts a statewide survey of shippers every three years. The best commodity flow data are from the BTS Transborder Freight Data,[23] which collects electronic manifest data from the United States and Canada. The same sources provide information about trade movement. Statistics Canada provides information about commodity imports by province[24]. The Eastern Border Transportation Coalition 2002 provides detailed flow data but has the same limitations as mentioned above.

The BTS data are available by month, by state and province, by commodity, by value, and by port. However, the number of cross classifications is limited – commodity data by port of entry has only been available since 2007. The Statistics Canada information is summarized by month and province, and is only available for imports.

3. STAKEHOLDER INTERVIEWS

As mentioned previously, many different stakeholders involved in the border crossing process at the U.S.-Canada border collect, share, and use transportation data for a variety of purposes. To gain a better understanding of the uses of freight-related data, along with the data needs of these stakeholders, a questionnaire was designed by the project team and distributed to members of TBWG. This questionnaire served as an interview guide that enabled the project team to collect current data uses, current data collection efforts and data sharing, planned data collection efforts, and data needs from each stakeholder interviewed.

This chapter presents a summary of the interviews that were conducted by the project team. Each section in this chapter is composed of two main components:

- A matrix illustrating each responding agency and their uses, collection and sharing efforts, planned collection efforts, and needs for freight-related data by each of the four main areas of interest to TBWG.
- Summaries of the key points made by each responding agency.

It is important to note that the responses of each interviewee may not precisely represent the current data uses, data collection efforts, and data needs of each respective organization. For example, an interviewee may work for a department/division of an organization that uses one form of data (e.g., truck traffic counts), while other departments/divisions within the same organization use different forms of data (e.g., passenger vehicle counts). Each individual, along with his or her organization, division (if applicable), and position (if applicable), that was interviewed as part of this project is listed in table 3.

Table 3. Interviewee list.

Interviewee	Organization	Division/Department (If Applicable)	Position (If Applicable)
Jesse Gwilliams	Michigan Department of Transportation	N/A	Transportation Planner
Elizabeth Stratton	Washington (State) Department of Transportation	Freight Policy	Project Manager
Chris Hoff	Transport Canada	Pacific Region	Project Manager
Pierre Tremblay	Ministere des Transports du Quebec	Transportation Systems Modeling	Chief
Hugh Conroy	Whatcom Council of Governments	International Mobility & Trade Corridor Project	Project Manager
Tony Shallow	Transport Canada	Ontario Region	Senior Economist
Trevor Brydon	Southeast Michigan Council of Governments (SEMCOG)	Transportation	Planner
Crystal Jones & Travis Black	FHWA	Freight Management & Operations	Transportation Specialist
Rob Tardif	Ontario Ministry of Transportation	Transportation Planning	Team Leader
Stan Korosec	Blue Water Bridge Canada	Operations	Vice President
Steve Beningo**	BTS	RITA	International Transportation Specialist
Michael Sprung**	FHWA	Freight Management & Operations	FAF Coordinator
George St. Clair	U.S. Customs and Border Protection	Office of Field Operations	Senior Consultant Supporting Western Hemisphere Travel Initiative
Costa Pappis	Vermont Agency of Transportation	Policy and Planning	Planning Coordinator
Bob Leore	Transport Canada	Headquarters	Chief, Surface and Marine Statistics

** These two interviews were conducted as part of this project; however, the results of these interviews vary slightly from the ones conducted with other stakeholders because these two individuals work for agencies/divisions that are only responsible for collecting and disseminating transportation data.

CURRENT DATA USES

The objective of this section is to identify the current uses of border transportation data by the various agencies interviewed for each of the four areas of interest to TBWG.

Table 4 shows the response matrix for the “current data uses” portion of the questionnaire.

Table 4. Current data uses.

Agency	Department (If Applicable)	Traffic Count/ Classification Data	Origin-Destination Data Collection	Border Wait Time/ Congestion	Enhanced Trade Data
Michigan DOT		X	X	X	X
Washington DOT	Freight Policy	X	X	X	X
Transport Canada	Pacific Region	X	X	X	X
Ministere des Transports du Quebec	Transportation Systems Modeling	X	X	X	X
Whatcom Council of Governments		X	X		
Transport Canada	Ontario Region			X	X
SEMCOG		X	X		
FHWA	Freight Management and Operations	X	X	X	X
Ontario Ministry of Transportation	Policy and Planning	X	X	X	X
Blue Water Bridge Canada	Operations	X			
U.S. Customs and Border Protection	Office of Field Operations	X	X	X	X
Vermont Agency of Transportation	Policy and Planning	X	X		
Transport Canada	Headquarters	X	X	X	X

Key Points Gathered from Each Interview Relating to Data Uses

The Michigan Department of Transportation (MDOT) uses collected information for travel demand modeling, project planning, documentation of existing delays, and various other purposes. The data are used to help decision makers decide where to spend their money on infrastructure improvements and for benchmarking purposes, performance monitoring, and reporting to local stakeholders and legislatures.

The Washington Department of Transportation (WSDOT) uses information from BTS, the International Mobility and Trade Corridor (IMTC) Project, and other sources to understand basic trade flows and freight movements throughout the state of Washington. This allows WSDOT to prioritize infrastructure improvements and use the information for planning purposes. Origin-

destination (O-D) information is also used to analyze what freight is being delivered within the state and what freight is passing through. Information is also used by WSDOT to monitor the success of policies/programs like the FAST program.

Transport Canada (Pacific Region) uses information collected from various sources to report on trends in trade traffic and explain variations in trade traffic trends, as well as to identify opportunities for improvements within the border-related infrastructure and operating system. Traffic count and class data allow Transport Canada to monitor levels of activity at each border crossing, to obtain what types of commodities are crossing the border in both directions, and to validate traffic models. O-D data are primarily used to justify funding for improvements at specific border crossings. Wait-time and congestion data are used to monitor delay, assess the benefits of policies/programs such as FAST, identify factors that contribute to delay, and contribute to the Advanced Traveler Information System (ATIS), which in theory will optimize passenger car delay. Enhanced trade data are used to inform the efficiency of programs such as FAST.

The Ministere des Transports du Quebec, as a provincial transportation department, uses data relating to all four areas of interest to TBWG for planning and transportation studies across the Quebec territory. These studies use data to inform policy and infrastructure improvement decisions, as well as forecast future trade and vehicle flows on a local, urban, regional, and/or national scale.

The Whatcom Council of Governments uses traffic count and O-D data primarily for traffic management and improvement projects and for cost-benefit analysis. By using these types of data, the Whatcom Council of Governments hopes to answer questions such as: Why is FAST not used? Would another lane provide a significant benefit at a border crossing? Who/where are the decision makers? How disaggregate is the universe of the decision makers? By both asking and answering these types of questions, the Whatcom Council of Governments hopes to initiate reality-based discussions relating to border crossing issues and convince stakeholders to unite when lobbying for resources.

Transport Canada (Ontario Region) uses border wait-time and enhanced trade data mainly for identifying and addressing congestion issues. By using border crossing time data, Transport Canada can measure intervals throughout the border crossing process and use them for performance measures. Also, these types of analyses allow Transport Canada to assess the feasibility of a new border crossing.

SEMCOG has access to data relating to all four areas of interest to TBWG; however, SEMCOG primarily uses traffic count and O-D data for regional transportation planning purposes. Specifically, SEMCOG is interested in finding out what part of the local economy is tied into the border crossing of passenger vehicles (in both directions). SEMCOG would like to expand this study to include commercial freight.

FHWA's Office of Freight Management and Operations uses data relating to all four areas of interest to TBWG; however, the agency indicated that it is most interested in using data pertaining to border wait times and congestion. By using border wait-time and congestion data, FHWA hopes to get a total view of the crossing times for freight throughout the border crossing

environment in the United States. This information is used to allocate funds where the greatest needs exist.

The Ontario Ministry of Transportation uses all data relating to all four areas of interest to TBWG for communications, decision making, infrastructure expansion, and support of its investments. Also, the Ontario Ministry of Transportation uses data for planning and modeling purposes.

Blue Water Bridge Canada primarily utilizes traffic count and classification data for accounting and planning purposes. By using count and classification data, the bridge operator can get a better sense of when the peak travel times are, and exactly how many passenger vehicles and commercial vehicles are crossing the border at a given time.

U.S. Customs and Border Protection uses data relating to all four areas of interest to TBWG for reporting to both Congress and the general public. For traffic count data, CBP collects both commercial vehicle and passenger vehicle data. These data are reported monthly on a national level; however, in the future it will be reported by POE and time of day. CBP also collects O-D data relating to commercial vehicles but does not collect this type of data for passenger vehicles. Border wait-time data are recorded at major ports; however, the technology used for recording these data varies from port to port. These wait times are posted on CBP's website that tracks border wait times. Enhanced trade data are collected at an aggregate level. These data are proprietary, so there is no way that they can be released at a detailed, disaggregate level.

The Vermont Agency of Transportation primarily uses data relating to two of the four areas of interest to TBWG: traffic count/classification data and O-D data. These data are used for project planning, traffic impacts analyses, inputs into a travel demand model, corridor planning, and regional planning through EBTC and TBWG. This information allows the Vermont Agency of Transportation to estimate the impacts of proposed projects or developments, calculate the impacts of rerouting traffic for construction/maintenance purposes, monitor shifts in travel patterns, and project future traffic in the region.

Transport Canada (Headquarters) uses data relating to all four areas of interest to TBWG to make and support investment decisions, as well as for planning and policy-making purposes. These data allow Transport Canada to monitor the structure of freight and passenger flows to gain a better understanding of who is crossing, what is crossing, when it is crossing, where it is crossing, and why it is crossing.

CURRENT DATA COLLECTION EFFORTS, DATA SHARING, AND PLANNED DATA COLLECTION EFFORTS

This section of the report provides information on data that are currently being collected, data sharing, and data that will be collected in the future by each agency that was interviewed. These factors are separated into each of the four areas of interest to TBWG relating to transportation border data.

Table 5 shows the response matrix for the "current data collection and sharing" portion of the questionnaire. In this matrix, a "✓" indicates that the corresponding organization currently

collects data on the specific area of interest to TBWG, a "*" indicates that the agency plans on collecting the type of data, and an "X" means that the organization both collects and plans on collecting the specific type of data.

Table 5. Current and planned data collection and sharing.

Agency	Department (If Given)	Traffic Count/ Classification Data	Origin-Destination Data Collection	Border Wait Time/ Congestion	Enhanced Trade Data
Michigan DOT		X	*	✓	✓
Washington DOT	Freight Policy	*	*		X
Transport Canada	Pacific Region	X	X	X	X
Ministere des Transports du Quebec	Transportation Systems Modeling	X	X	X	
Whatcom Council of Governments					✓
Transport Canada	Ontario Region			X	
SEMCOG					
FHWA	Freight Management and Operations			X	
Ontario Ministry of Transportation	Policy and Planning	✓	✓	✓	✓
Blue Water Bridge Canada	Operations	X		✓	
U.S. Customs and Border Protection	Office of Field Operations	X	✓	X	X
Vermont Agency of Transportation	Policy and Planning	X	X	X	
Transport Canada	Headquarters	✓	✓	X	

Key Points Gathered from Each Interview Relating to Current Data Collection Efforts, Data Sharing, and Planned Data Collection Efforts

In the Michigan Department of Transportation, traffic count data are collected at each of the international bridges in Michigan on a consistent basis. MDOT has also coordinated a delay study at the Blue Water Bridge that used Bluetooth technology to collect border crossing times. This study covered both commercial and passenger vehicles. MDOT shares most of its data with various public and private stakeholders. However, there are some existing rules/guidelines for sharing proprietary data. MDOT has plans to gather its own O-D information in the near future. As part of this study, St. Claire County will attempt to quantify the economic impact of freight moving through the county. These types of data collection efforts are rather infrequent; the last O-D study was conducted 10-15 years ago.

The Washington Department of Transportation collects enhanced trade data as a way to understand issues associated with cross-border trade, and to compare against data collected by various other agencies. To collect these data, WSDOT conducts one-on-one interviews with carriers. These interviews are conducted every three years. Currently, border wait times and their variability are the biggest area of concern among carriers in northwest Washington. WSDOT publishes the results of the survey in a report when the study is completed. All publications are stored in what WSDOT refers to as a data warehouse. WSDOT plans to continue traffic counts in the foreseeable future. Also, WSDOT is coordinating a commodity flow with the National Cooperative Freight Research Program (NCFRP), in which the first step is developing the methodology for data collection. Additionally, WSDOT is developing a survey with the goal of estimating the economic impact of delay in the Puget Sound region.

Transport Canada (Pacific Region) collects data relating to all four areas of interest to TBWG. Traffic count and classification data, as well as border wait-time data, are collected through the Border Operations Survey, which is conducted every three years. Data are collected for both northbound and southbound commercial freight as part of this study. Also, the Dangerous Goods and Truck Classification Survey, which is conducted every five years, counts dangerous goods crossing the border in both directions at three lower mainland commercial crossings. For O-D and enhanced trade data, the National Roadside Survey has been collected every five years, with the latest version published in 2006. Transport Canada is willing to share the data they collect with any interested party. Transport Canada plans to collect classification, O-D, commodity, and border operations (including inspection time) data at three lower mainland commercial crossings in both directions. They expect these data to be available at the Transportation Research Board (TRB) in 2010.

The Ministere des Transports du Quebec collects traffic count data on a continuous basis across the entire province, including areas near the border crossings. It also participates in the Roadside Trucking Survey. There is an ongoing project with EBTC and Turnpike Global Technologies to monitor border travel times as well. Counts and truck O-D data are usually shared with their partners, which include Transport Canada and the Ontario Ministry of Transportation. This organization has a continuous effort to collect traffic count data, which include weight control with weigh-in-motion systems. Also, commercial freight O-D surveys are done in a 5-10 year cycle. Along with these two efforts, the Ministere des Transports du Quebec has an ongoing project that collects border wait times at several crossings in the province.

The Whatcom Council of Governments conducts a CVO Evaluations Study every three years to analyze commercial vehicle operations at the Pacific Highway port of entry. This study provides detailed wait times and service times through surveys. The primary geographical focus of this study is Blaine, Washington. The Whatcom Council of Governments is currently planning to participate in a data collection effort during the summer of 2009 (probably July). This would be a week-long, detailed operations survey at Blaine, Lynden, and Sumas. Surveyors would take detailed time measurements of border operations for the week, capturing wait time, lane choice, primary booth time, and secondary inspection time. This will be done in conjunction with a manifest sampling so that connections can be drawn between commodity and operations.

Transport Canada (Ontario Region) is currently collecting travel times at five international border crossings: Ambassador Bridge, Blue Water Bridge, Detroit-Windsor Tunnel, Peace Bridge, and Queenston-Lewiston Bridge. Data collection is being performed for commercial vehicles in both travel directions using GPS technology, and Bluetooth technology has been tested for this effort by TGT. The information collected is shared with some users through a password-required web system. Information that is disseminated to authorized users includes time series data by crossing, direction, and time of day. Transport Canada has no plans to collect additional data in the near future, but is planning to "mine" the information and load the information to web servers with the goal of developing a "data warehouse." Transport Canada is also analyzing the possibility of expanding the effort beyond the border to a corridor level, similar to FHWA's efforts in the United States. In addition to this work, Transport Canada Ontario Region has formed a university consortium consisting of the Michigan Technical Research Institute, Ohio State University, and the University of Arizona. This consortium has been estimating wait times at the Blue Water Bridge based on GPS technology with the help of General Motors' third-party logistics providers.

SEMCOG used to collect survey data; however, state and federal data provided to them are sufficient for its use. Data are shared with SEMCOG from state and federal agencies, the National Roadside Survey, and Global Insight. The data shared with SEMCOG are used primarily for forecasting purposes. SEMCOG has no planned data collection efforts in the near future.

FHWA is concentrating its efforts on collecting border crossing times in both directions at five northern border crossings using GPS technology. GPS data are purchased from ATRI. Results of this study will most likely be available in the summer of 2009. FHWA shares the results of its studies on its website in report form. Some data are also available through FHWA's website as long as there are no nondisclosure agreements in place. The emphasis for future data collection efforts will be placed on finding a standardized way to collect border crossing times for both passenger and commercial vehicles. Also, weigh-in-motion (WIM) data are available, but no one uses it at this point. FHWA also expects that data collected by the ITDS will enhance the FAF to make the data more precise.

The Ontario Ministry of Transportation (MTO) collects data relating to all four areas of interest to TBWG. In general, traffic classification data collection efforts do not focus on border crossings, given that they are beyond provincial jurisdiction. The one exception is the Pigeon River crossing where MTO owns and maintains the bridge crossing. MTO must rely on the patchwork of traffic classification from border operators and fragmented federal sources and

attempt to harmonize these data. MTO collects truck O-D data through roadside driver intercept surveys as required, generally every five years. Ontario's truck survey is named the Ontario Commercial Vehicle Survey (CVS). The latest effort between 2005 and 2007 involved 104 survey sites where approximately 100,000 surveys were collected describing internal and external trip tour activities. The survey process involves collecting a balanced inbound/outbound sample of truck trips proportional to the hourly and day-of-the-week traffic volumes. Passenger roadside intercept surveys are conducted at international borders as required, again collecting inbound and outbound traffic. MTO relies on the efforts performed by Transport Canada Ontario Region to gain access to truck border wait times. Advancements in technology facilitated by Bluetooth technology (for both commercial vehicles and passenger vehicles) has the potential to expand vehicle detection and O-D data collection between two or more fixed points where the technology has been installed. In terms of enhanced trade data, MTO relies heavily on its own CVS to understand the complex border crossing activities and travel characteristics. The CVS is a true transportation database with coverage of all empty and loaded vehicles (no load factors required for conversion) with average daily metrics of trips, tonnage, and commodity value. The CVS is collected as a component of Transport Canada's National Roadside Survey. Currently, disaggregate data are collected at the federal level in Canada and aggregated in order to report on national transportation trends. Disaggregate data are not shared with state/provincial and municipal levels by the federal government due to reasons associated with confidentiality. MTO plans to investigate the potential uses of the Statistics Canada's Trucking Commodity Origin Destination Survey (TCOD) as a source for enhanced trade data. Federal coordination of future NRSs remains uncertain. Given the wide adoption of Statistics Canada merchandise trade tonnage and commodity value data, this organization has had a high degree of interest in the data collection program. The Ontario Ministry of Transportation foresees the use of GPS data as a way to compare and validate routing information collected through its CVS and National Roadside Survey.

Blue Water Bridge Canada collects traffic count and classification data hourly, monthly, and yearly. Vehicles are classified by their number of axles. Both count and classification data are collected at the toll booths on the bridge. The bridge also attempts to collect wait times at the crossing; however, the data are not continuously and uniformly collected. Results of the count and classification data are published on a monthly basis and are available to all interested parties. The Blue Water Bridge will continue to collect count and classification data since this information is the most valuable to the bridge operator. Currently, the bridge has no plans to collect O-D, border wait-time, or enhanced trade data.

U.S. Customs and Border Protection collects data relating to all four areas of interest to TBWG on an ongoing basis at all POEs. For passenger vehicle traffic count data, there is no standardized method for collecting this type of data as of yet. ACE is used to collect information for commercial vehicle shipments and yields data relating to all four areas of interest to TBWG. ACE will continue to be the main source of data for commercial shipments in the foreseeable future. Because CBP collects data that deal with security issues, disaggregate data are not shared on a regular basis. It is possible to gain access to CBP data if the entity requesting the data goes through the proper channels to do so.

The Vermont Agency of Transportation currently collecting data relating to three of the four areas of interest to TBWG, including traffic count, O-D, and border wait-time data. Traffic

count/classification data are the only type of data collected on an ongoing basis by the agency (every two years). O-D data are currently being collected in a partnership with the MPO as a method to update travel demand models, and border wait-time data are collected as part of an EBTC project to determine the wait times at the border crossing in Derby, Vermont. Any data collected by this agency will be shared with Vermont state agencies, regional planning commissions, and neighboring state DOTs (through EBTC and TBWG) upon request.

Transport Canada (Headquarters) currently collects data in support of the National Roadside Survey related to three of the four areas of interest to TBWG. O-D and traffic count data are collected at all principle border crossings by Transport Canada. O-D data are collected on an ad hoc basis, while traffic count data are continuously collected. Along with administering surveys for O-D data, Transport Canada uses side-firing radar units and weigh-in-motion sensors to collect traffic count data. Border wait-time data are collected using GPS receivers on a select sample of trucks. These data are collected for both northbound and southbound traffic. Border wait-time data were mentioned by Transport Canada as a planned data collection effort since this area of interest to TBWG will be concentrated on by this agency in the near future. These data are used for internal purposes; however, Transport Canada will share the data it collects with any interested party upon request whenever possible.

DATA NEEDS

Table 6 shows the response matrix for the “data needs” portion of the questionnaire.

Table 6. Data needs.

Agency	Department (If Given)	Traffic Count/ Classification Data	Origin-Destination Data Collection	Border Wait Time/ Congestion	Enhanced Trade Data
Michigan DOT		X	X	X	X
Washington DOT	Freight Policy	X	X		X
Transport Canada	Pacific Region	X	X	X	X
Ministere des Transports du Quebec	Transportation Systems Modeling	X	X	X	X
Whatcom Council of Governments		X	X		X
Transport Canada	Ontario Region				
SEMCOG					
FHWA	Freight Management and Operations	X	X	X	X
Ontario Ministry of Transportation	Policy and Planning	X	X	X	X
Blue Water Bridge Canada	Operations		X		X
U.S. Customs and Border Protection	Office of Field Operations				
Vermont Agency of Transportation	Policy and Planning			X	
Transport Canada	Headquarters	X	X	X	X

Key Points Gathered from Each Interview Relating to Data Needs

The Michigan Department of Transportation expressed a need for continuously updated data. Also, consistent definitions for transportation-related data would be beneficial for this agency (i.e., What is a commercial vehicle? What is "border wait time?"). A historic database for border crossing times was the final data identified by MDOT.

The Washington Department of Transportation would like to see traffic counts in both directions at the border, as well as more accurate information on the commodities that are crossing the border and more detailed information on origins and destinations. Also, the agency is interested

in finding the level(s) of performance that private industry desires in a border crossing environment.

Transport Canada (Pacific Region) is interested in converting tonnage data to the number of commercial vehicles, and obtaining more detailed information for empties and bobtails (specifically for two-way trips). Transport Canada would also like to see more information on two-way trips in general, as well as some sort of formal reporting on the number of booths open (FAST and non-FAST). This type of information, specifically O-D data for two-way trips, would allow them to better understand border operations.

The Ministere des Transports du Quebec expressed a need for more accurate count/classification and O-D data, as well as a full-scale commodity flow survey (shipper based) similar to the one that exists in the United States. The agency is hoping for better trade data (with correct geography of flows) through enhancements that are currently being made to electronic data systems by both customs agencies.

The Whatcom Council of Governments is interested in obtaining data relating to cost of border crossing trips, specifically pertaining to the cost level needed to see modal shifts. The agency also would like to see more use of WIM data so loaded and empty containers could be counted in each direction at the border. The Whatcom Council of Governments also stated that data relating to commodities and exchange rates would be beneficial.

Transport Canada (Ontario Region) currently has no plans to collect additional information in the near future. Transport Canada will develop new applications with the border wait-time information. Efforts are currently underway to further field-test the viability of utilizing Bluetooth technology as an interval measurement tool or wait-time metric for passenger traffic at border crossings on the U.S.-Canada and U.S.-Mexico border.

SEMCOG would like to see the National Roadside Survey continued. SEMCOG is also interested in using GPS to identify factors that lead to routing decisions by carriers. The agency has requested information collected by FHWA in similar studies to investigate the possibility of obtaining GPS data from carriers in the Detroit area.

Because FHWA collects, shares, and disseminates data relating to all four areas of interest to TBWG, it is primarily concerned with increasing the accuracy of the data collected, shared, and disseminated. No specific data needs were expressed by FHWA in the interview.

The Ontario Ministry of Transportation has a need to participate in all four areas of interest to TBWG. MTO is at risk in the area of collection of traffic classification data, given that it relies heavily on the activities, methods, and standards of others who have jurisdiction over these facilities. The Ontario Ministry of Transportation expressed a desire to put agreements in place that would allow the sharing of disaggregate data collected at the federal level in Canada with state/provincial and municipal-level agencies. There is a strong interest in the promotion and support for dedicated and programmed passenger and commercial transportation activity based data collection efforts. MTO accepts that the NRS is not perfect, but the type of data collected (where they are collected) serves many uses and advances the agency's ability to implement border-related infrastructure investments of national significance. The agency is hoping that

systems like ITDS are implemented on both sides of the border and that transportation data can be shared, with jurisdictions and all agencies making investments in trade corridors.

Blue Water Bridge Canada expressed a need for continuous, accurate, real-time or near real-time O-D data as well as a standardized definition of border wait times and collection efforts. Specifically, the agency is interested in the factors that go into the decision-making process for crossing the border at a given location. While more accurate and continuous O-D and border wait-time data for commercial vehicles are a priority, having this type of information for passenger vehicles would be beneficial as well.

Because CBP collects large amounts of data for both commercial vehicles and passenger vehicles on a consistent basis and maintains its own database, the agency has no real data needs at this point. The main challenge CBP faces is keeping up with technology that can be used to collect border crossing data. Rapid advancements in technology like GPS and RFID are changing the way that border crossing data are collected.

The Vermont Agency of Transportation has a need for improved border wait-time/congestion data so that it can gain a better understanding of the methods and technologies used for route tracking.

Transport Canada (Headquarters) cited a need pertaining to all four areas of interest to TBWG. In particular, Transport Canada needs detailed, comparable, and accurate data on two-way traffic flows at all major border crossings. Also, Transport Canada would like to see more accurate economical data on North American freight flows encompassing O-D, commodity, and vehicle type. Transport Canada understands that this work must be done in concert with U.S. authorities. Another data need mentioned by Transport Canada was related to more complete border wait-time data. Currently, border wait-time data used by this agency are based on a small sample of trucks; therefore, a more complete description of border wait times could be obtained by expanding the scope of the current border wait-time collection effort. The final data need indicated by Transport Canada involved improving international trade data. Transport Canada would like to see more detailed information on commodity flows and tracking movements, mode by mode, to their ultimate destination. They would like the data broken down by physical transport flows and not on the basis of customs transactions. Transport Canada would like to see more coordination between national governments and among local governmental agencies as a way to resolve data collection/comparability issues currently being experienced, and as a way to address the data needs listed previously in this section.

4. INSIGHTS GAINED FROM STAKEHOLDER INTERVIEWS

The Bureau of Transportation Statistics, Statistics Canada, state DOTs, and provincial MOTs provide traffic count data at ports of entry. While BTS and Statistics Canada provide the data online, others require an individual request. The North American Transportation Statistics Database also has volume data available by mode[25]. These data are automatically recorded from loop detectors, weigh-in-motion stations, or administrative records and stored in a database that is accessible online. The use of systems to automatically record and transfer data means that it is consistently available, and the research team recommends this method for continuing to provide up-to-date information.

Origin-destination information is not widely available. Currently, surveys or intentional manifest samples must be performed to collect this information. Those that collect the information do not disseminate it widely. With the movement to electronic manifests filed through ACE/ITDS and OGCD Single Window Interface, a process similar to that currently used with loop detector data (automatic collection, formatting, and online dissemination) could be employed to make this information automatically available. The research team recommends this be pursued.

U.S. Customs and Border Protection[26] and the Canada Border Service Agency[27] both publish real-time wait information, differentiated by commercial and passenger vehicles for the major ports of entry. The wait-time and congestion information is generally collected on an ongoing basis by existing sensors but is not archived. The research team recommends this information be collected, processed, automatically archived, and made available via the same mechanism as vehicle volume and origin-destination data.

Commodity flow and detailed operational data are generally only available from small periodic samples based on individual interviews of shippers or drivers. This collection mechanism does not lend itself to consistent collection and dissemination. However, ACE/ITDS and OGCD Single Window Interface archives do include commodity information for all border crossing vehicles.

The research team recommends that future data collection and dissemination be developed off the ACE/ITDS and OGCD Single Window Interface systems, which require information on each border crossing vehicle. Additional data from consistent, systematic sensors such as loop detectors can augment the data available from these sources and should be made available online.

After conducting interviews with various stakeholders involved in the border crossing process along the U.S.-Canada border, the research team found that certain themes were present in each section of the interview:

- For current data uses:
  - Nearly all of the organizations interviewed used transportation-related data for planning purposes.

  - The most common example given of “planning purposes” was for allocating funds, specifically for transportation infrastructure improvements.
  - Tracking the success of transportation-related policies/programs was another popular reason for using transportation-related data. Both the FAST program and NEXUS program were mentioned by several stakeholders during this portion of the interview.
- For data collection, data sharing, and planned data collection efforts:
- For data needs:
  - The most common data need given during this portion of the interview related to data accuracy. Several stakeholders used the example of border wait-time data. There are multiple sources for border wait-time data available, and often the border wait-time data disseminated by these sources vary greatly.
  - Multiple stakeholders also pointed out a clear need for real-time or near real-time data as well.
  - Stakeholders on both sides of the border would like to see the National Roadside Survey continued.
  - Several stakeholders expressed a need for data that sheds light on why/how carriers make routing decisions. These stakeholders indicated that a larger, more accurate sample of O-D data sources may be the answer to this problem.
  - Standardized definitions and methodologies for collecting data relating to all four areas of interest to TBWG were pointed out by multiple stakeholders as a clear data need of their organization.

It is clear that certain elements of transportation-related data are important to many stakeholders at varying levels of the border crossing process at the U.S.-Canada border. These elements are expressed in the themes listed above. Subsequent chapters of this report will address these themes and identify other gaps in the data that currently exist in order to achieve the ultimate goal of this project: to develop a conceptual framework that can guide how key agencies within TBWG collect and share information.

5. GAP IDENTIFICATION

This chapter summarizes the "existing state" of the border data collection environment resulting from the analysis that took place during initial phases of this project. Building off the interviews conducted with stakeholders in previous tasks, this chapter also describes the "to-be state," or ideal conditions for transportation data collection and dissemination in the U.S.-Canada border crossing environment. These two "states" are later compared to one another to identify gaps that exist between them. The results of identifying these existing gaps will illustrate data needs that are not being fulfilled by current or planned data collection efforts along the U.S.-Canada border. These gaps will serve as input for the "conceptual framework" that will include a plan to reduce or eliminate the gaps, and that will describe specific actions that stakeholders can take to improve data collection and sharing in the U.S.-Canada border crossing environment.

EXISTING STATE

Public stakeholders involved in the border crossing process for both passenger vehicles and commercial vehicles can be classified into three basic categories: Federal, State/Provincial, and local. Local stakeholders include both public agencies and private-sector entities, like bridge operators. Each of the stakeholders interviewed as part of this project fall into one of these three categories. Each stakeholder interviewed as part of this project, along with their category grouping, can be found in table 7[*]. These stakeholder categories are further broken down by the country that they operate in.

[*] The complete list of stakeholders that were contacted is presented in the appendix. This table presents the stakeholders that responded to the survey and/or provided information to the research team.

Table 7. Stakeholder category groupings.

U.S. Federal	Federal Highway Administration
	Customs and Border Protection
	Bureau of Transportation Statistics
U.S. State	Michigan Department of Transportation
	Washington Department of Transportation
	Vermont Agency of Transportation
Canadian Federal	Canada Border Services Agency
	Transport Canada (Headquarters)
	Statistics Canada
Canadian Provincial	Transport Canada (Pacific Region)
	Transport Canada (Ontario Region)
	Ministere des Transportes du Quebec
	Ontario Ministry of Transportation
U.S./Canadian Local	Whatcom Council of Governments
	Southeast Michigan Council of Governments
	Blue Water Bridge Canada

After conducting stakeholder interviews during task 1, certain patterns emerged as to how each of these stakeholder groups use transportation-related data. The most common answers given as to how these agencies use data include:

- Modeling.
- Planning.
- Allocating funds.
- Reporting to other agencies.
- Performance monitoring.
- Forecasting.

In order to illustrate how each interviewed stakeholder uses data in relation to the four areas of interest to TBWG, the project team developed a data use matrix, which can be found in table 8.

It is important to note that most of these stakeholders are large organizations with many different departments/divisions that have many different functions. These departments and divisions may only be responsible for collecting and/or analyzing specific types of data. Therefore, the answers given by each interviewed stakeholder do not completely reflect how the entire organization may collect/analyze transportation-related data.

Table 8. Data use matrix.

Stakeholder Category	Stakeholder	Data Use: Modeling	Planning	Fund Allocation (Infrastructure Improvements)	Reporting	Performance Monitoring	Forecasting
U.S. Federal	FHWA	▨▨ ▨▨	▨▨ ▨▨	▨▨ ▨▨	▨▨ ▨▨	▨▨ ▨▨	▨▨ ▨▨
	CBP				▨▨ ▨▨		
	BTS				▨▨ ▨▨	▨▨ □□	
U.S. State	MDOT	▨□ □□	▨▨ ▨□	▨▨ ▨□	▨▨ ▨□	▨□ □□	▨▨ □□
	WSDOT		▨▨ ▨▨	▨▨ ▨▨		▨▨ ▨▨	
	Vermont Agency of Transportation	▨▨ □□	▨▨ □□	▨▨ □□	▨▨ □□	▨▨ □□	▨▨ □□
Canadian Federal	CBSA				▨▨ ▨▨		
	Transport Canada (Headquarters)	▨▨ ▨▨	▨▨ ▨▨	▨▨ ▨▨	▨▨ ▨▨	▨▨ ▨▨	▨▨ ▨▨
	Statistics Canada	▨▨ ▨▨	▨▨ ▨▨	▨▨ ▨▨	▨▨ ▨▨	▨▨ ▨▨	▨▨ ▨▨
Canadian Provincial	Transport Canada (Pacific Region)			□□ ▨▨		□□ ▨▨	
	Transport Canada (Ontario Region)				▨▨ ▨▨	▨▨ □□	
	Ministere des Transportes du Quebec		▨▨ ▨▨	▨▨ ▨▨		▨▨ ▨▨	▨▨ ▨▨
	Ontario Ministry of Transportation		▨▨ ▨▨	▨▨ ▨▨	▨▨ ▨▨		▨▨ ▨▨
U.S./Canadian Local	Whatcom Council of Governments				▨▨ ▨□	▨▨ □□	
	SEMCOG		▨▨ □□			▨▨ □□	
	Blue Water Bridge Canada		▨□ □□	▨□ □□	▨□ □□	▨□ □□	

▨□ □□ = Traffic Count/Classification Data

□▨ □□ = Origin-Destination Data

□□ ▨□ = Border Wait-Time Data

□□ □▨ = Enhanced Trade Data

Border transportation data users can be classified into three categories. The first category is of information "producers." These are stakeholders whose mission is to analyze and disseminate

transportation information, and includes the Bureau of Transportation Statistics and Statistics Canada.

The second category includes those stakeholders that produce information for their own operation, which may not necessarily include sharing the information that is collected with others. Two agencies at the federal level fall into this category, U.S. Customs and Border Protection and its Canadian counterpart, the Canada Border Service Agency.

The third category of stakeholders includes those that require transportation data to carry out their mission and to produce information on a constant basis for specific projects. These stakeholders share the information with others and with the general public within their jurisdiction; however, the production and dissemination of transportation data are not part of their primary mission. State and provincial departments of transportation, metropolitan planning organizations, and private-sector crossing operators fall into this category.

As the matrix illustrates, "performance monitoring" was the most popular answer given by the interviewed stakeholders as to how they use their transportation-related data. "Fund allocation" and "planning" were the next most widely given use for transportation-related data.

Traffic count data are the most widely used type of transportation-related data since they are the easiest type of data to collect out of the four areas of interest to TBWG.

Along with using transportation-related data, many of the stakeholders involved in the border crossing process collect and share their own data with other public and private stakeholders. To document the data-sharing practices of the stakeholders interviewed as part of this study, the project team developed table 9, which lists whether each stakeholder's data are available to the public, whether they share their data upon request, and the types of stakeholders that are authorized to request transportation-related data from the organization.

Table 9. Data-sharing practices by interviewed stakeholders.

		Data Available to Public?		Data Available upon Request?		Stakeholders Authorized to Request Data
		Y	N	Y	N	
U.S. Federal	FHWA	✓		N/A		
	CBP		✓	✓		CBP grants access to data on a case-by-case basis
	BTS	✓		✓		
U.S. State	MDOT	✓		✓		Access to nonpublic and nonproprietary data granted on case-by-case basis
	WSDOT	✓		✓		All interested parties
	Vermont Agency of Transportation			✓		FHWA, CCMPO, regional planning commissions, neighboring state DOTs (through EBTC and TBWG)
Canadian Federal	CBSA	N/A		N/A		
	Transport Canada (Headquarters)	✓		N/A		
	Statistics Canada	✓		N/A		
Canadian Provincial	Transport Canada (Ontario Region)	✓		N/A		
	Transport Canada (Pacific Region)	✓		N/A		
	Ministere des Transportes du Quebec		✓	✓		Transport Canada, Ontario Ministry of Transportation
	Ontario Ministry of Transportation		✓	✓		Transport Canada, Ministere des Transportes du Quebec
U.S./Canadian Local	Whatcom Council of Governments	N/A		N/A		
	SEMCOG			✓		All interested parties
	Blue Water Bridge Canada	✓		N/A		

Note: CBSA did not provide information on their data-sharing practices.

All of the interviewed stakeholders share the data they collect by either making the data public information or allowing authorized users to look at it. The challenge for many stakeholders involved in the border crossing process who use transportation-related data is twofold:

- Sorting through all of the available data to find information that is relevant for their particular interests or needs.
- Finding data in the format that can be of use to them.

For example, a stakeholder may have access to data that show the aggregate weight of shipments crossing the border at a specific port of entry, but that stakeholder would really prefer to have the number of trucks crossing the border at that port of entry. These two challenges are often the

result of a stakeholder not having the resources to actively search for new sources of data. Lack of resources could be attributable to staffing levels (not enough people/time to perform this function), or the fact that acquiring new data sources is not a primary job function of the employees at a given organization.

TO-BE STATE

The description of the "to-be state" is organized by each of the four data categories that were defined by TBWG. The "to-be state" can be defined as the ideal condition for data collection and dissemination in the U.S.-Canada border environment. Factors contributing to the description of the ideal condition(s) were taken from the stakeholder interviews that were conducted in the initial tasks of this project. The feasibility of collecting "ideal" data was also taken into account by the project team during this portion of the research initiative. Each area of interest as identified by TBWG, along with a brief description of the "to-be state" described by interviewed stakeholders, are presented below.

Traffic Count/Classification Data

The ideal scenario for traffic counts includes information on vehicle crossings by vehicle type, in both directions (northbound and southbound)[*]. Vehicle type information should be captured using a standard classification for passenger as well as commercial vehicles. The most well-known classification scheme is the one employed by FHWA with 13 vehicle categories. However, in the border crossing environment, the user may not always be interested in producing results using the FHWA 13-category vehicle classification. In many cases, four simple categories that are most commonly used in this environment may suffice to meet user needs. These categories include[(28)]:

- Passenger vehicles (cars and light pick-ups).
- Single-unit trucks.
- Single combination trucks (tractor-trailer).
- Multi-trailer trucks.

Vehicle volume information counts should be available on a daily basis (average daily traffic [ADT]). ADT is defined as the estimated total traffic volume passing a point or on a road segment during a given time period (from one day to one year), divided by the number of days in that time period. Volume data are usually collected using standard road tubes or permanently installed inductive loops connected to an electronic counter. The information collected with these mechanisms can be summarized at whatever interval is needed. At the border, it would be preferable to obtain information with hourly distribution.

Origin-Destination (O-D) Data Collection

O-D data collection efforts are commonly used for transportation planning purposes. The ideal scenario includes information on the location of the origin and destination of every cross-border

[*] Northbound means trips from the United States to Canada, and southbound means trips from Canada to the United States.

trip. The location of the trip has to include geographic information disaggregated to the lowest level possible. This could allow locating the origin and destination of each trip within predefined geographic zones. Information on the trip purpose and vehicle type (commercial and passenger vehicles) is an important element of the O-D data collection efforts. Information on the "true" origin and/or destination of the trip is also important, particularly for commercial vehicle trips. Some current origin and destination information can be flawed (information pulled from importation/exportation documents) because the information that is collected from these sources can be based on the address of the importer, exporter, or customs broker and not the physical location of the trip beginning or end points ("true" origin and destination).

Border Wait Time/Congestion

Measurement of border crossing time information has become an important element to calculate border wait time and other performance measures of cross-border traffic. The ideal border crossing time information includes data on border crossings by time of day in both directions (northbound and southbound). Information should be available in near real time, and the data should be in a format in which they could be archived for trend analysis. Associated information that complements the border crossing time includes data on the particular operation characteristics of the border crossing, such as weather, security level, and number of inspection booths in operation.

Enhanced Trade Data Collection

Ideal enhanced trade data include information on commodity movement across the U.S.-Canada border with information on mode of transport as well as origin and destination. True origin-destination and transshipment information would also be an important attribute for this type of data collection effort. Enhanced trade data in the border context should also include transshipment information, which in some regions of the border is a large proportion of freight trips. Transshipments are defined as shipments from a third country through Canada to the United States or from the United States to a third country through Canada. Commodity classification detail is important for the "enhanced trade data collection" elements because the detail in which the information is collected has to be uniform between both neighboring countries. Other important elements of enhanced trade data include the value of the shipment and the sensitivity of the goods being transported (i.e., perishable versus nonperishable).

GAP ANALYSIS

A preliminary analysis comparing the existing state (current situation) with the to-be state (ideal situation) revealed that the gaps between the two situations could be broken down into two basic categories.

Gap 1 – Data Availability Gap

This type of gap occurs whenever a stakeholder has a need for a certain type of border crossing transportation-related data but the data are unavailable to them. Data can be considered unavailable when the data do not actually exist because they are not currently being collected by anyone, or the data exist but the stakeholder that requires them does not have access to them. Having no access to data typically occurs when the stakeholder knows that the data exist and

knows the source of the data, but does not have authorization from the owner of the data for their use.

Gap 2 – Data Detail Gap

This gap occurs when there is a discrepancy between the type of data a stakeholder requires and the type of data that the stakeholder has access to. This discrepancy can arise in reference to the level of detail of the collected data (aggregate versus disaggregate), and the time frame in which the data are collected (periodically versus continuously) and/or disseminated (historical versus real time).

Table 10 illustrates the four different areas of interest to TBWG, and summarizes the characteristics of the "existing state" and the "to-be state" for each area of interest. Additionally, the differences between these two "states" are represented for each area of interest in the "existing gaps" column.

Table 10. State comparison by area of interest to TBWG.

Existing State	To-Be State	Existing Gaps
Traffic Count/Classification Data Traffic counts/classification information is available with different levels of detail and not in both directions at all border crossings.	Traffic counts by direction at each crossing with vehicle classification by time of day.	Information is not available for all border crossings. The level of detail – classification and time of day – is inconsistent and in some cases is not provided in both travel directions.
O-D Data Collection Origin-destination data are infrequently collected for both commercial and passenger vehicles. Definition of O-D is inconsistent. Data are collected on a project-by-project basis.	True location of O-D, trip purpose, and information for commercial and passenger vehicles.	Availability of the O-D information is poor because efforts are performed on as-needed basis. Level of detail is inconsistent in terms of spatial resolution and definition of true O-D.
Border Wait Time/Congestion Crossing time measurements are inconsistent across border crossings. Measurements are being made in one direction only, and some crossings do not have crossing time measurement systems.	Every border crossing should have a bidirectional border crossing system disseminating information to users on a near real-time basis.	Not available for all border crossings and in both directions. Inconsistent border and wait-time definitions.
Enhanced Trade Data Collection Limitations in terms of true O-D and lack of transshipment information. In some cases data available in only one direction of travel.	True O-D location, mode of transport, and value and weight of shipments and transshipment data.	Bidirectional information with true O-D not available. Limited transshipment information requires combining various sources.

6. CONCEPTUAL FRAMEWORK

In order to develop the data framework, the initial task was to prioritize data needs followed by the development of a specific plan to reduce or eliminate the gaps that were identified through the comparison of the existing state and the to-be state.

Based on the analysis of data needs and uses, the two key data categories that are important to TBWG stakeholders are the traffic count/classification data and border wait-time/congestion data elements. The other two categories, O-D data and enhanced trade data collection, are elements that are used for specific planning projects, and the information contained in these categories varies widely depending on the ultimate use of the information. For example, microscopic modeling efforts within a binational urban area would require a great level of granularity in the O-D information, compared to a regional corridor analysis.

The research team proposes to develop a data framework or plan for the two data categories that are the most important for TBWG stakeholders. The basic concept of the framework includes the development of a metadata information system. Metadata are information about data or datasets, and are a key element to sharing information successfully. The framework includes a data warehouse system that would allow TBWG members to have access to those data elements of interest in an organized and systematic way. The metadata will provide definitions of data elements to be archived in the data warehouse.

A data warehouse is defined as a subject-oriented, integrated, nonvolatile, and time-variant collection of granular data[29]. Data are gathered into the data warehouse from a variety of sources and merged into a coherent whole. Data are obtained from multiple and disparate sources, filtered, aggregated, summarized, and fed into the data warehouse. Building a data warehouse is an iterative process and evolves constantly as user requirements, volume of data, and business process change over time[30].

The framework will serve as a guide to collect and share information in a consistent manner. The guide includes several activities that are required to develop the data warehouse, including:

1. Identify border crossing locations. The information that will be incorporated into the data warehouse will be based on each border crossing location. TBWG would need to decide which international crossing will become part of the initial phase of the proposed system. The border crossing would need to be indentified and its particular basic characteristics documented, to include name, number of lanes per direction, hours of operation, and special programs offered (FAST, NEXUS, etc.).
2. Identify data elements. Specific data elements that will form part of the data warehouse for each category will need to be identified. The initial phase of the data warehouse should have at least the following data elements:
   - Traffic count/classification data:
     - Border location ID.
     - Direction of travel (northbound or southbound).
     - Traffic volume (vehicles) by vehicle type.

    - Time period.
- Border wait time/congestion:
    - Border location ID.
    - Direction of travel (northbound or southbound).
    - Crossing times (minutes) of commercial and passenger vehicles.
    - Time period.
    - Number of inspection lanes open.

3. Identify data sources. Some agencies are already collecting information on the two types of data categories. However, as mentioned earlier, there are inconsistencies on the way data are captured and shared. During this task, TBWG members should identify those stakeholders that are willing to participate in the program and share the information to feed into the data warehouse.
4. Define business processes. Once the data are fed into the data warehouse, they are processed to turn data into information. During this part of the implementation, TBWG will need to define specific reporting requirements that will serve to define required business processes. The database designer will work with TBWG to agree upon the final metadata and data elements to be archived in the data warehouse. Business processes include procedures to convert data into information by cleaning, aggregating, creating queries, etc.
5. Implementation. During this phase of the process, the user interface will be designed as well as the level of spatial and temporal aggregation that is needed.

The proposed concept is depicted in figure 6.

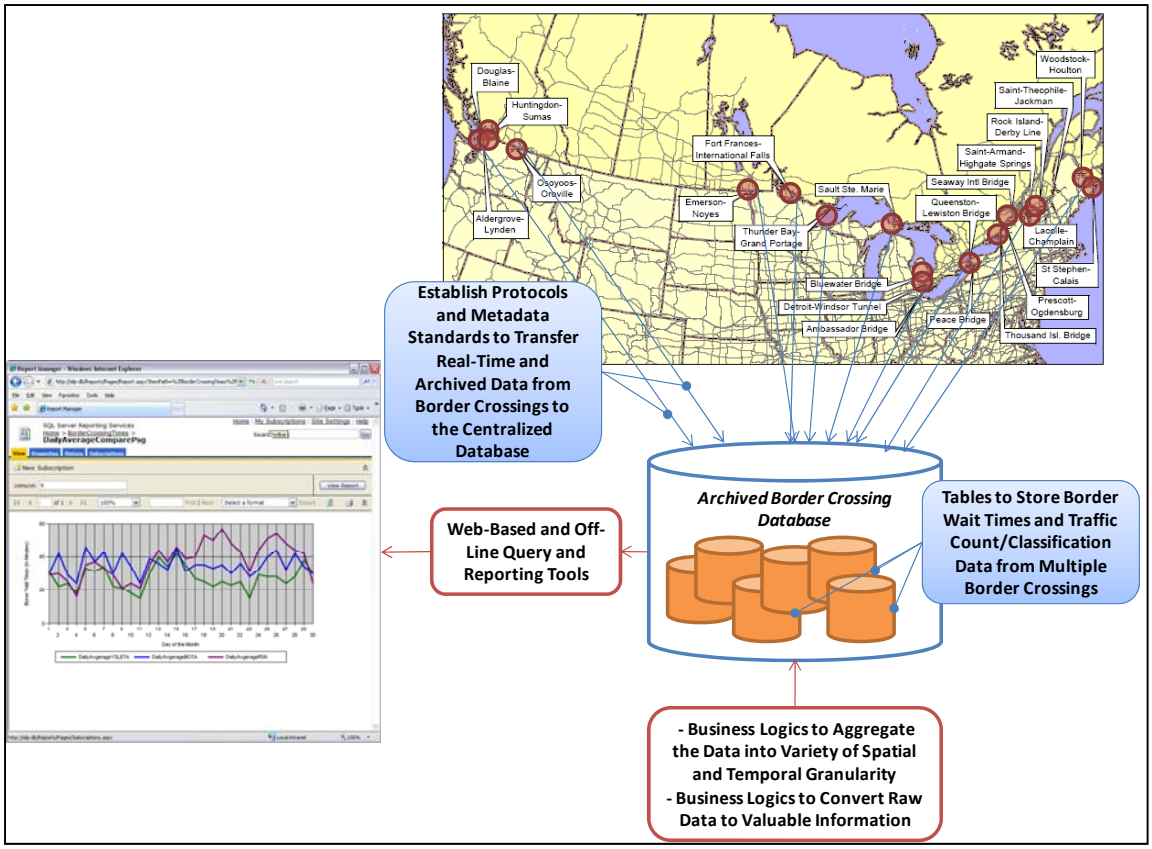

Figure 6. Graphic. Conceptual framework diagram.

APPENDIX – STAKEHOLDERS CONTACTED

Name	Organization
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Jack Olson	North Dakota Department of Transportation
Susi Derrah	New Brunswick Department of Transportation
John Reed	New York Department of Transportation
Nate Erlbaum	New York Department of Transportation
Teir Abbott-Hill	OGD Single Window Interface
Rob Tardif	Ontario Ministry of Transportation
Trevor Brydon	SEMCOG
Alex Bourgeau	SEMCOG
Gordon Baldwin	Statistics Canada
Bob Leore	Transport Canada
Brian Plant	Transport Canada
Chris Hoff	Transport Canada
Louis-Paul Tardif	Transport Canada
Richard Laferriere	Transport Canada
Tony Shallow	Transport Canada
Pierre Tremblay	Transports Quebec
Costa Pappis	Vermont Agency of Transportation
Karen Songhurst	Vermont Agency of Transportation
Elizabeth Stratton	WSDOT
Hugh Conroy	Whatcom Council of Governments

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