

II. DATA COLLECTION

1. LITERATURE REVIEW

The Safety Information Exchange Needs Assessment literature review examined existing CVISN planning documents, ITS technologies and implementation literature, and literature regarding POE issues. This review aids in the final assessment of the Nogales POE commercial vehicle processing procedures and equipment in order to recommend automated system components that will improve information sharing and expedite operations for cross border traffic.

Information was gathered and documented from a variety of sources. Upon review, each piece of literature is categorized in the literature database (Appendix B - Literature Database) as either CVISN, ITS, or Port-of-Entry literature. The database includes:

- Title and date.
- Significant Findings.
- Lessons Learned.
- Institutional Issues.
- Operational Issues.
- Summary.

This section of the report includes:

1. Methodology for article selection.
2. A description of the database.
3. Significant findings from each category of literature.
4. Conclusions.

1.1 Methodology

In order to properly research the data needed for this literature review, an extensive Internet search was performed. Several sources of information were researched, including, but not limited to:

- American Trucking Association (including the American Trucking Associations Foundation).
- ADOT.
- California Department of Transportation.
- John Hopkins University (Applied Physics Laboratory).
- San Diego Association of Governments (SANDAG).
- U.S. Customs Service (now under Department of Homeland Security).

- U.S. Department of Agriculture.
- U.S. Department of Transportation (USDOT).
 - Federal Highway Administration (FHWA)
 - Federal Motor Carrier Safety Administration
 - Federal Transit Administration (FTA)
- U.S. Food and Drug Administration (FDA)
- University of Kentucky Transportation Center
- University of Oregon Transportation Center

Utilization of our own resources, including professional contacts and previous work (California Statewide Goods Movement ITS Action Plan), provided adequate data to review for selecting literature. Discussions/meetings with subcontractors were also held to further our research. After a thorough review of our sources, the literature to be reviewed was selected (listed in Tables 2, 3 and 4 in subsequent sections) and sorted according to the previously mentioned categories.

Discussions with stakeholders from ADOT also provided direction on possible sources of existing literature. Specifically, the FHWA's CVISN initiative, ADOT's EPIC phases 1 and 2, and federal Performance and Registration Systems Management (PRISM) program documents were obtained for review.

Within the database, a scale is included as to the relevance of the literature in several categories. The symbols provided display the amount of relevance of the article to the following categories:

- CVISN
- ITS
- Customs
- State
- Federal
- International

Relevance is rated 0-4, as described in Table 1.

Table 1 – Relevance Rating

Relevance Rating	Degree of Relevance
0	No Relevance
1	Slightly Relevant
2	Partly Relevant
3	Mostly Relevant
4	Fully Relevant

1.2 CVISN Literature

The CVISN literature reviewed uncovered some key concepts that deserve to be noted (a list of the articles used for this section is provided in Table 2). The safety element of CVISN is a prevailing theme throughout this literature, specifically promoting highway safety. It is also noted that carrier outreach and participation in electronic screening is vital to the success of any new technology program. Carrier outreach should begin at the early stages of development in order to receive the best level of support during the project.

There are many electronic screening technologies mentioned in this literature, including, but not limited to:

- Dedicated Short Range Communications (DSRC).
- Weigh-in-Motion (WIM).
- Automatic Vehicle Classification (AVC).
- Vehicle Tracking Loops.
- Variable Message Signs (VMS).
- Safety and Fitness Electronic Record (SAFER) Data Mailbox (SDM).
- Electronic Data Interface (EDI).
- License Plate Recognition (LPR).

Many of these technologies are being utilized at the Nogales POE, and others are in the planning stages. These and other technologies are beneficial to the POE because they create a more thorough and efficient operation. Implementing additional technologies, as well as shared technologies between the many state and federal agencies at the POE, can aid in the safety, security, and efficiency of processing the information of the commercial motor carrier traffic.

Table 2 – CVISN Literature

Article	Date
CVISN Guide To Electronic Screening (USDOT)	March 2002
Arizona CVISN Top Level Design Description (ADOT)	August 2002
What Have We Learned About Intelligent Transportation Systems: Chapter 6 – What Have We Learned About ITS for Commercial Vehicle Operations? Status, Challenges, and Benefits of CVISN Level 1 Deployment (Battelle)	December 2000
Evaluation of the Commercial Vehicle Information Systems and Networks (CVISN) Deployment Initiative (Battelle for USDOT ITS Joint Program Office)	March 2002
Memorandum of Understanding between The Arizona Department of Transportation (ADOT) and The Arizona Department of Public Safety (DPS) The United States Customs Service (USCS) The United States Department of Agriculture (USDA) The United States Department of Transportation (USDOT) – Federal Motor Carrier Safety Administration (FMCSA) The United States General Services Administration (USGSA) Expedited Processing at International Crossings (EPIC) Phase 2 Commercial Vehicle Operations/Traffic Management System Nogales, Arizona Port-of-Entry - Mariposa Federal and State Complexes (ADOT)	August 2002
CVISN - Executive Summary Model Deployment Initiative (MDI) Summary Evaluation Plan (Battelle for USDOT)	July 1998

1.3 Intelligent Transportation Systems (ITS)

The majority of articles for this literature review were oriented towards ITS. Many of those articles (listed in Table 3) are evaluations, assessments, or field operational tests (FOT) of certain systems or specific border crossings in the United States.

Integrating a new system or technology into existing ones was a prevalent theme in several of the articles. Travel time and fuel consumption are two other common themes. New and/or improved technologies in electronic screening and/or trucks equipped with transponders were significant in many of the evaluations. There are many technologies in the marketplace, and they are changing and improving, frequently leading to many challenges that arise when determining which technology is best for any given border. Some of the challenges mentioned in these articles include:

- Funding constraints.
- Dealing with multi-agencies (each having a different focus or need).
- When a site does install a new technology, the agency (ies) do not use that new system or do not utilize all of its capabilities.
- Which technology to use.
- Standards for use.

Table 3 – ITS Literature

Article	Date
Intelligent Transportation Systems at International Borders – A Cross-Cutting Study (U.S.FHWA/Federal Transit Administration)	April 2001
ITS Sheet 6: ITS Puts Freight Information Ahead of Freight Movement (FHWA-OP-01-013)	2001
Ambassador Bridge Border Crossing System (ABBSCS) Field Operational Test (Booz Allen Hamilton)	May 2000
General Accounting Office Customs Service Modernization Management Improvements Needed on High-Risk Automated Commercial Environment Project (U S. GAO)	May 2002
Arizona PRISM Implementation Project Plan (ADOT)	April 2000
<i>DRAFT VERSION D.2</i> Commercial Vehicle Information Systems and Networks (CVISN), International Border Clearance (IBC) and National ITS Architecture Alignment (John Hopkins University for FMCSA)	December 2001
International Border Electronic Clearance (IBEX) Test and Evaluation Strategy (U.S. Federal Highway Administration)	February 1996
Advantage I-75 Mainline Automated Clearance System (MACS) (USDOT/Iowa State University)	August 1998
Oregon Green Light CVO Evaluation Final Report (Transportation Research Institute, Oregon State University)	April 2001
International Border Electronic Clearance - IBEX, Evaluation Report (Booz Allen Hamilton)	July 1998
Coutts / Sweetgrass Automated Border Crossing Phase I (State of Montana DOT and U.S. FHWA)	March 1999
EPIC Expedited Processing at International Crossings - Evaluation Final Report (Western Highway Institute and SAIC)	September 1998
A Guide to Developing a Regional ITS/CVO Coordination Plan (U.S. Federal Highway Administration)	August 1997
Expedited Processing and International Crossing (EPIC) Test & Evaluation Strategy (U.S. Federal Highway Administration)	February 1996
Electronic Cargo Seals: Context, Technologies, and Marketplace (Michael Wolfe, North River Consulting Group)	July 2002
Final Report Assessment of Automated Data Collection Technologies for Calculation of Commercial Motor Vehicles Border Crossing Travel Time Delay (Battelle for Federal Highway Administration)	April 2002
Statewide ITS Architecture Development A Case Study - Arizona's Rural Statewide ITS Architecture (FHWA, FTA)	September 1999

1.4 Port-of-Entry

The final category of articles (Table 4) focuses on literature regarding POEs. While many of the articles in the previous two categories mention specific POEs, there is more focus on CVISN or ITS information in this category of articles. There were not many sources for POE operations. Many of the articles can be cross-referenced for the purpose of this literature review.

The POE articles concentrate on more efficient and effective processing for trucks that come into the United States. The articles are concerned with integrating state-of-the-art information systems that identify, weigh, classify, and provide instruction to commercial vehicles prior to entering the ports.

Table 4 – Port-of-Entry Literature

Article	Date
Marketing Winter Vegetables from Mexico (USDA)	April 1998
2001 Assessment of Truck Travel Time & Delay at 7 International Ports-of-Entry - Report Summaries (FHWA) Measurement of Commercial Motor Vehicle Travel Time and Delay at U.S. International Border Stations (FHWA) http://www.ops.fhwa.dot.gov/freight/pmeasure/index.htm	2001
Port-of-Entry Advanced Sorting System (PASS) Operational Test Final Report (US FHWA and Oregon DOT)	December 1998

1.5 Conclusion

An overview of the current resources available, focusing on ITS technologies, existing CVISN planning and implementation literature, and POE issues has been presented in the previous sections. However, new technologies are always being developed and existing technologies are being improved. Government programs at the state and federal levels are also under review and new directions may be considered for ITS/CVO technologies.

Major topic areas of concern for the Nogales POE include the following:

1. Participation by the motor carrier community is essential to achieve long-term success. Carrier outreach should begin in the early stages of development in order to build support for any program. Providing an incentive to the carrier could help in establishing their participation and their support.
2. How much funding is required to complete the project? A thorough knowledge of all funding options and sources will assist in a successful CVISN project. Questions to answer in this process can include:
 - Where will the funding be obtained?
 - How will operations and maintenance costs be funded?
 - What type of procurement should be used for each product?
 - What can be done to expedite procurements?
3. The application of electronic screening will be affected by many constraints. Site limitations, availability of support staff and funding are a few of the possible constraints. Each POE has a unique design, Nogales included, because of:

- State policy and practices.
 - Traffic flow, volume and number of lanes.
 - Availability site space.
 - Legacy systems characteristics.
 - Existing proprietary solutions.
 - Resources available for making changes.
4. The North American Free Trade Area (NAFTA) presents many issues, including:
 - Formalization of a federal-state presence at border crossings.
 - Adoption of specific port improvement recommendations.
 - Collaboration between state and federal inspection authorities in the sharing of resources and the joint assignment of port inspection.
 5. Wireless communication capabilities for the project is another area of concern. In the *Arizona CVISN Top Level Design Description*, it is noted that Arizona does not have wireless communication in place for real-time inquiries or immediate upload of inspections to the Safety and Fitness Electronic Record - Data Mailbox (SDM) from the roadside. This type of wireless capability could be beneficial to Arizona's CVISN program.
 6. CVISN can produce substantial cost savings for states and motor carriers, improve the efficiency and fairness of commercial vehicle operations, and most importantly save lives. CVISN must be deployed nationwide for these results to happen.
 7. CVISN safety information exchange and electronic screening technologies can result in significant safety benefits, but only if these technologies are widely deployed, fully integrated, and combined with innovative enforcement and outreach strategies.
 8. Information management is not unique to the border environment, and receives regular attention in most ITS and COV forums. The primary issue here stems from the concern on the part of the carrier community regarding the collection, use, and protection of information not specifically required by law, and liability regarding inaccurate data.
 9. Electronic screening will reduce travel time and fuel consumption for trucks participating in these programs, or transponder-equipped trucks. Electronic screening has the potential to decrease the occurrence of unobserved bypasses resulting from full queues and increase the percentage of trucks being screened for safety and compliance.
 10. Use of "smart cards" to confirm the identity of the driver using a sorted thumbprint and to provide information about the seal on the cargo being transported will allow for a higher level of efficiency and security of the freight as it is shipped from its origin to its destination. Using electronic container seals (e-seals) to monitor the security of containerized freight across international borders can help to automate clearance and credentialing of commercial vehicles through ports and terminals. Electronic seals have the potential to improve both freight transportation security and productivity. Previous trials of electronic seals have been successful in decreasing congestion and operating costs by providing information that allows freight movement organizations to identify and avoid transportation bottlenecks.

With these issues in mind, Arizona's POE at Nogales has the potential to be a model port utilizing a sophisticated CVISN system. There is a high volume of commercial traffic making use of the Nogales port, causing congestion and delays in the processing of motor carriers through the various agencies. A more thorough and efficient automated procedure for processing the carrier's information will be needed to eliminate any further delays.

It should be noted that homeland security is one other issue that was explored. With the developments of September 11, 2001, homeland security has become a priority for all border sites across the county. Homeland security is such an evolving and developing issue that it was difficult to find substantial literary documents to review. Several news stories from various sources were researched and examined, however, none were focused specifically on border concerns and ITS to have made them relevant to this literature review. At this time CBP (Spell out) is in the process of deployment or have future plans for installment in the near future along the U.S./Mexico border technology tools such as:

- **Free and Secure Trade program (FAST)** – FAST provides expedited processing for participants that qualify under the stringent terms of the program. The program also requires the foreign manufacturer to use high security seals properly placed in the approved manner when crossing the border. ADOT is in the process of merging the ITS EPIC2 project with the FAST program.
- **Secure Electronic Network for Travelers Rapid Inspection (SENTRI)** – SENTRI establishes a dedicated commuter lane system and an automated system that allows motorists at selected southern land border ports to enter the United States.
- **Automated Commercial Environment (ACE)** – ACE is an Internet-based portal designed to provide easy-to-use access to consolidated border processing information.

2. STAKEHOLDER INTERVIEWS

Various federal and state motor carrier safety information systems have been available to the Nogales POE, but are neither installed nor being used at the Nogales commercial POE. This impedes the ability for all commercial vehicle safety inspectors to capture, communicate, and collect data pertinent to vehicles and the drivers they are examining. The inability of truck inspectors to have immediate access to required records may lead to potential accidents or allow problem drivers to operate commercial vehicles.

The lack of timely vehicle and driver information at the Nogales inspection facility will have an impact on its ability to operate at its full potential. This can affect the ability of both state and federal motor carrier inspectors to maintain required truck and operator safety standards.

In the process of determining the best plan of action for the Nogales POE, the key stakeholders must be interviewed/surveyed to obtain their perspectives on how the operations and safety at the Nogales inspection facility might be improved via CVISN and ITS related technologies.

Among the more significant lessons learned—not only through the border systems FOTs (Field Operational Test), but across the spectrum with regard to ITS/CVO—has been that technology implementation alone does not guarantee success. Because most ITS/CVO implementations have

depended, and will continue to depend, on voluntary participation on the part of carriers and on the support of the enforcement community, care must be exercised in selecting technology and process solutions. To be considered a viable, long-term approach, any such solution must take into consideration the needs and desires of the user community.

This is particularly true in the border-crossing environment, where location-specific demographic characteristics of the user population are extremely important in identifying deployable solutions. For example, solutions that work well at locations like the Ambassador Bridge outside Detroit, Michigan, where the movement of auto parts and completed automobiles between various manufacturing facilities are accomplished in a closed-loop, may not work well at locations like Nogales, where seasonal produce shipments via small local carriers constitute a significant portion of the traffic. Further, concerns regarding the safety of non-U.S. vehicles are much more pronounced along the southern border than in the states that border Canada, where random selection of vehicles for inspection is severely limited.

These issues underscore the importance of understanding the operational and institutional constraints and requirements at each specific border site. The best source for this information is the body of stakeholders that routinely engage in activities at a specific crossing. For this study, we have interfaced directly with representatives from key stakeholder groups, relying on existing relationships to capture the location-specific needs and expectations of each.

Interviews with staff members at both the state and federal levels are the basis for this portion of the assessment. Key interviewees included:

- U.S. federal government entities.
- Arizona state government entities.
- Mexican federal government entities.
- Customs brokers.

Interviews with these stakeholders provided the perspectives of those personnel involved with the port operations and those in direct contact to shape the final assessment findings and recommendations.

Included in this section of the report is the methodology and significant findings gathered from the interviews. The details of the survey instrument and detailed interview summaries are included in Appendix C - Survey Questions, and Appendix D - Interview Summaries, respectively.

2.1 Methodology

This section describes the process of identifying the interview population, developing the interview guides, conducting the interviews, and deriving the findings.

In order to properly evaluate and address the needs of the Nogales POE in terms of an operations and safety information exchange system under the umbrella of CVISN and ITS related technologies, an extensive list of key public and private stakeholders was developed with the assistance of the TAC. Those identified stakeholders have an interest in the policies, procedures, and operations that take place at the port.

Working closely with the TAC, it was determined that the interviewee list should be limited in scope and involve only the principals of those groups and individuals with a direct connection to the port. The following (Table 1) is a list of those who were contacted for interviews.

Table 5 - Principal Stakeholders

Agency	Name	Title
U.S. Federal Motor Carrier Safety Administration	Eric Ice	Division Administrator
U.S. Federal Motor Carrier Safety Administration	Max LeBleu	Safety Program Manager
U.S. Federal Motor Carrier Safety Administration	Alan D. Vitcavage	Federal Program Specialist
U.S. Federal Motor Carrier Safety Administration	Paul De La Ossa	Border Supervisor
U.S. Federal Highway Administration	Ed Stillings	Field Coordinator
Bureau Customs and Border Protection (formerly U.S. Customs Services)	John O' Reilly	Assistant Director
Bureau Customs and Border Protection (formerly U.S. Customs Services)	Celia De La Ossa	Chief Inspector, Cargo
U.S. Department of Agriculture	Manny Trujillo	Nogales Port Director
U.S. Food and Drug Administration	Adrian Garcia	Nogales Port Director
U.S. General Services Administration	Ron Sandlin	Property Manager
Secretaría de Comunicaciones y Transportes (Mexico)	Teodoro Echeverria Ortiz	Deputy Administrator for the State of Sonora
Mexican Customs Services	Rudolfo Torres	
Confederacion de Asociaciones Agricolas del Estado de Sinaloa (CAADES)	Evangelos Demetrius	
Arizona Department of Transportation – Motor Vehicle Division	George N. Bays	Coordinator, Special Border Projects
Arizona Department of Transportation – Motor Vehicle Division	Doug Holler (Richard S. Saspe – retired-interviewed prior to retirement)	Lieutenant
Arizona Department of Transportation – Transportation Planning	Dale Buskirk	Director of Transportation Planning, Policy and Programming

Agency	Name	Title
Arizona Department of Transportation – Traffic Operations Center	Manny Agah	Manager
Arizona Department of Transportation	Dave Phillips – resigned after interview was completed	CVISN/PRISM Program Manager
Arizona Department of Public Safety	Ursulla Miller	CVISN Liaison
Arizona Department of Public Safety	Rob Cahoon	Administrative Sergeant Criminal Justice Support Division
Arizona Department of Agriculture	Cindy Dahn	Field Operations Manager
Arizona Department of Environmental Quality	Edna Mendoza	Hazardous Waste Coordinator
Arizona Motor Transport Association	Karen Rasmussen	President
Arizona Department of Transportation – Motor Vehicle Division	Kathleen Morley	Assistant Deputy Director – Motor Carrier and Tax Services
Pacific Brokerage	J.B Hanson	Supervisor
Michael I. Capin Brokerage	Michael Capin	Supervisor

CVISN – Commercial Vehicle Information Systems and Networks

PRISM – Performance and Registration Information Systems Management

Interviews were not completed for all those listed in Table 5. Reasons for not obtaining an interview ranged from the stakeholder not having time in their schedule, to not responding to our requests for interviews for reasons unknown to us. In addition, there were individuals that were receptive to the ideas of evaluating the specific needs in terms of an operations and safety information exchange system under the umbrella of CVISN and ITS technologies. In these specific circumstances, a survey was sent via e-mail, however the survey was not returned or completed after this initial contact. The agencies that were not able to complete the interview process include:

- Arizona Department of Agriculture.
- Arizona Motor Transport Association.
- Arizona Motor Carrier Association.
- U.S. General Services Administration.
- Secretaría de Comunicaciones y Transportes (Mexico).
- Mexican Customs Services.
- Confederacion de Asociaciones Agricolas del Estado de Sinaloa (CAADES).

The survey instruments were designed to elicit thoughtful and constructive observations on the responsibilities and realities of the Nogales port. In developing the questions, the main goal was to obtain the perspective of stakeholders about how operations and safety (including security) might be improved at the Nogales POE via CVISN and ITS related technologies.

Several themes were created to encompass all of the relevant information that could potentially be taken from each interview. Those themes include:

- Familiarity with CVISN/ITS/CVO initiatives.
- Understanding the stakeholders operation/business focus and the connection with the Nogales POE.
- Historical observations of changes at Nogales POE and any impact to the stakeholder operations.
- Key areas of concern as it revolves around operation at the Nogales POE.
- Changes/enhancements necessary or desired for Nogales POE.
- Additional concerns, suggestions, or recommendations for the Nogales POE.

Interviews were envisioned to obtain the perspective from both public and private stakeholders. While a standard list of questions was created, those questions were tailored to each specific interview based on who and what organization/entity was being interviewed. However, the themes remained consistent throughout the interview process. Appendix C - Survey Questions, contains the survey instrument used for the interviews.

Consistency was also guaranteed by conducting each interview with one of two interviewers:

- Taso Zografos.
- Walter Gonzales.

Upon reviewing each interview, we found common themes among the responses given. The problem statement, the interviewee population, and the interview findings indicated an internal perspective for this portion of the project. Each member of the population has a common goal of having the system work as effectively and efficiently as possible, taking into account border safety and security. This perspective includes the following viewpoints:

- How staff members perceive their knowledge of CVISN/ITS/CVO initiatives.
- Their understanding of their operation and its connection with the Nogales POE.
- How to effectively and efficiently operate the Nogales POE.

Transcripts of all 17 interviews are contained in Appendix C - Survey Questions.

2.2 Findings And Recommendations

This section presents a summary of CBP's mission, and the principal interview findings and recommendations derived from the interview process.

While each POE within CBP is not the same, they do share the same mission statement and goals. As stated in the CBP website, "It is the goal of CBP to provide the American public with greater security and facilitate the flow of legitimate people and goods across the United States border. As its primary mission, CBP will focus on preventing terrorists and terrorist weapons from entering the country."

Specific to the POE, the same website states, “Ports of Entry are responsible for all daily operational aspects of the Customs Service. Ports of Entry are responsible for maintaining a focus on trade compliance (imports/cargo), passenger operations, outbound operations (exports) and anti-smuggling/canine.”

A summary of Customs’ mission indicates that safety and security are the main focus and they are taking an active role in ensuring safety and security. Our interviews have yielded responses that support this goal. Other issues in regard to the operation of the port included:

- Technological advances.
- Truck congestion.
- Land use.
- Electronic sharing of information.
- Homeland security.
- Traffic management.
- Redundancy in systems.
- Size of the facility.
- Pre-sorting of carriers.
- Utilizing one consistent “system.”
- Processing cargo.

These concerns deal mainly with the internal structure and functioning of the Nogales POE. Categorizing these issues would place them in categories similar to the following:

- Safety.
- Security.
- ITS.
- Leadership.
- Facility management.
- Operations efficiency.

While there are several areas that were brought to our attention as needing improvement, there were also many areas that are seen as the port’s strengths. The following are some quotes from the interviews illustrating areas of perceived strength.

- Commercial traffic management:
 - “The trucks come into the United States and go through a quick inspection immediately after crossing.”
 - “Trucks are either directed to the Superbooths or to the inspection compound. The inspector at the Superbooth reviews their paperwork. The papers are bar-coded for a quick scan of their information.”
 - “The compound has been completely redesigned and reconfigured. The compound is now much faster and more efficient.”
 - Customs currently has a queuing management system in place that allows an automated means to determine traffic queuing time. This is currently in the passenger vehicle area and they hope to implement it in the cargo operations.

- Operations efficiency:
 - “The U.S. Customs Service is always trying to find ways to improve their operations and systems at the port...”
 - “The port is more adaptable to changing conditions than most ports, testing new ideas, policies, approaches, and procedures.”
 - “Nogales is much faster and more efficient at processing trucks than other ports. The trucks are able to pass through faster than they did five years ago.”

- ITS:
 - “There has been a large amount of new technology coming into the compound in the last five -six years, most of it coming in on the inspection side of the operations.”
 - “(The Federal Motor Carrier Safety Administration is required to) check every license before entering the country, using a PDA (personal digital assistant) and (front line inspectors) have a PDA to determine if the carrier should be tagged to be inspected.”

In addition to those high points, there are also areas where suggestions for change were given. Below, we describe the findings and subsequent stakeholder recommendations for each topic of concern.

2.2.1 Land Use/Traffic Management

Historical observations have shown that over the past five to 10 years, there has been an increase in the number of trucks coming across the border. This leads to the issue of land use planning, or the lack thereof, at the Nogales Port. One of the shortcomings is that there are several hills and valleys that make it difficult to expand the facility. The physical constraints at the port have created additional challenges to implementing the new technology.

The increase in the number of trucks has created a need for an additional lane or lanes for the commercial portion of the border crossing. It was noted that utilizing the space at Nogales should be better planned as it related to moving trucks through the compound. The topic of relocating the passenger processing area west of its current location, and allowing that space to be used for commercial operations, was also brought to our attention. However, it specifically noted that this modification is only in the discussion stage.

2.2.2 Electronic Sharing of Information

Most, if not all, interviews brought out the topic of sharing information electronically between agencies involved in port operations. Electronic sharing of information would expedite port operation by creating one common database where all data is stored and accessed by all agencies involved at the port. The obstacle is how to keep confidential information out of the hands of those agencies that do not need access to it. In other words, how can relevant information about the trucks, the carriers, the drivers, and the cargo be shared between agencies without revealing certain information that certain agencies do not need to view? The requesting agency would like to have the ability to extract specific data from a common database without viewing all of the data that is being stored. There appears to be networks and technologies that are currently

available, but the question is how to bring them together to make it work effectively and efficiently for Nogales. Technological improvements at the port are a major issue for most agencies. One interview summed it up as follows, “Technology should be the major area of concern. All of the agencies that currently have operations at the port should find a way to work together on the same system.”

2.2.3 Size of the Facility/Operations

As previously mentioned, land use is an area of concern brought to light in several interviews. The layout of the land that the compound sits on has created impediment to expanding the size of the port. However, lack of space has led to other noted shortcomings in the size of the facility. There is a need for examination space for the cargo being carried into the United States. There is a specific need for more space to examine trucks carrying hazardous materials and waste. Another interview noted that the size of Nogales’ port, the largest in Arizona, could be a shortcoming to the state since other border crossings in the Southwest are two to three times larger and have a lower number of trucks coming across their borders.

The size of the facility leads to the level of effectiveness of its operations. One interview noted that in order to accommodate the high volume of trucks coming through during the peak season, there should be a consideration to extend the hours of operation. This could be done in place of constructing a new lane that may not be completely utilized during the off-peak period. Overall, the agencies that are currently working at the port needs to be coordinated to allow them to effectively and efficiently utilize one consistent system that will be implemented to allow those agencies to operate at their highest potential. This is best summed up in the following interview response: “A consensus needs to be put in place with all the different players that are in place at the Nogales port. Everyone needs to get together to define the objectives of the port and note who is doing what activity, how they are carrying out those activities, and what is their primary focus. The port currently has too much overlapping of processes and procedures.”

2.2.4 Homeland Security

The subject of Homeland security has become a pressing issue with recent events. This was not specifically addressed in the survey instrument. However, the topic was brought to our attention by several of the stakeholders. Now that the U.S. Customs Service is under the purview of the U.S. Department of Homeland Security, stakeholders have a heightened awareness of border safety. There have been changes in focus for some agencies. Attention is now being directed to anti-terrorism at our nation’s borders. Homeland security will be considered during the remaining tasks, as outlined for this assessment. Specifically, the technologies inventory and the implementation plan will address this issue in more detail.

2.3 Conclusion

Through these findings and recommendations, stakeholders are looking for leadership, responsiveness, collaboration, and relationship building from their respective agencies as well as those who are working in direct relation with the port’s operations. Improving these aspects of Nogales POE operations, will improve the overall performance of the port and its staff.

3. INVENTORY OF CVISN/ITS SERVICE APPLICATIONS

The purpose of Task 4, Safety Information Exchange Needs Assessment, is to provide an inventory of existing and emerging ITS technologies that could support and help improve operations at the Nogales, Arizona, commercial vehicle POE. This includes assessing the port's commercial vehicle processing procedures and equipment in order to recommend system components that will help improve information sharing and expedite operations for cross-border commercial traffic.

3.1 Methodology

Operations procedures at the Nogales POE were studied and documented in order to identify potential areas of improvement. This research involved a number of visits to the port compound, as well as interviews with key personnel from the various agencies represented there, including:

- ADOT.
- Arizona Motor Vehicle Division (MVD).
- Arizona Department of Public Safety
- Arizona Department of Environmental Quality (ADEQ).
- U.S. Customs Service, recently moved under the Bureau of Customs and Border Protection (BCP).
- United States Department of Agriculture (USDA), now under the direction of CBP.
- U.S. Federal Highway Administration (FHWA).
- U.S. Federal Motor Carrier Safety Administration (FMCSA).
- U.S. Food and Drug Administration (FDA).

In addition, the Booz Allen team reviewed the port's existing plans for upcoming technology improvements in order to uncover any gaps and identify specific technologies or products.

Operations At The Nogales POE

The Nogales POE is located at the Mariposa Road border crossing on State Route 189 about 65 miles south of Tucson, Arizona, and is the primary crossing point for northbound commercial vehicles leaving the Mexican state of Sonora. According to research conducted under the Nogales CyberPort Project, the wide variety of commodities passing through the port include agricultural products (fresh fruits, vegetables and nuts), portland cement, industrial chemicals, optical and photographic equipment, machinery, and motor vehicle equipment. Among these, the primary imports in terms of volume are agricultural products (34%) and portland cement (18%). The great majority of these imports are destined for Arizona (71.6%), with a significant portion bound for California (16.4%)².

Typical daily hours of operation at the port are 6 a.m. to 10 p.m., during which as many as 1200 commercial vehicles may cross the border. However, since fresh agricultural products make up a large portion of the imports through Nogales, the port experiences a seasonal peak between October and June, during which hours are extended to accommodate as many as 1500 vehicles per day.

² *Nogales CyberPort Project: Alternative Trade Flow Projections and CyberPort Concept Models.* Wilbur Smith Associates, December 2002. Pages 4-9

The U.S. inspection compound for northbound commercial vehicles is roughly 50 yards past (i.e., north of) the U.S.-Mexico border. See Figure 1. Northbound commercial vehicles cross the border in one of four dedicated lanes that are separated from non-commercial traffic. The four lanes merge into two inspection lanes. Commercial vehicles are first stopped at a traffic signal where the driver and the cab door are digitally photographed. A record of the incoming vehicle is created in the port's information system and the picture is included in the record for easier identification. Each vehicle is then allowed to proceed forward and is weighed while traveling at low speed using Weigh-in-Motion (WIM) technology. Shortly after being weighed, the vehicle approaches the first inspection point, the Drug Screening Area (DSA), where it stops to be inspected by CBP agents. The CBP agents perform a visual inspection of the vehicle, sometimes utilizing trained dogs to detect illegal contraband. Vehicles then proceed to the next inspection stage where they will enter the "Superbooth." A License Plate Recognition (LPR) camera captures the vehicle's license plate number as it enters the Superbooth. The Superbooth enclosure contains officers from Arizona's Motor Vehicle Division (MVD) as well as CBP and FMCSA agents. At this point, the driver and vehicle are checked for proper licensing, credentials, and insurance. Each agency has its own separate computer terminal on which to enter, obtain, and verify information. Since some of the truck drivers cross the border frequently and are trusted by the agents, the inspection process can stop here so that the vehicle can go on its way. This is referred to as "Rapid Enforcement." The Nogales POE reports that approximately 60% of commercial vehicles enter the country through Rapid Enforcement.

Any vehicle that has been referred for further inspection is directed by a Variable Message Sign (VMS) to enter the compound and proceed to either the vehicle inspection area or the cargo inspection area. If a vehicle is referred for both inspections, the cargo inspection takes precedence.

During cargo inspections, vehicles are entirely unpacked in order to view the contents. This is both a space- and time-consuming exercise. Since so much of the imports through Nogales are agricultural in nature, the cargo inspection area is staffed with agents from the FDA, the CBP and the USDA Animal and Plant Health Inspection Service.

Vehicle inspections, conducted by the FMCSA, check the vehicles for general safety and road-worthiness.

Once these inspections are complete, and the vehicle is approved, it is free to exit the compound and proceed into the United States.

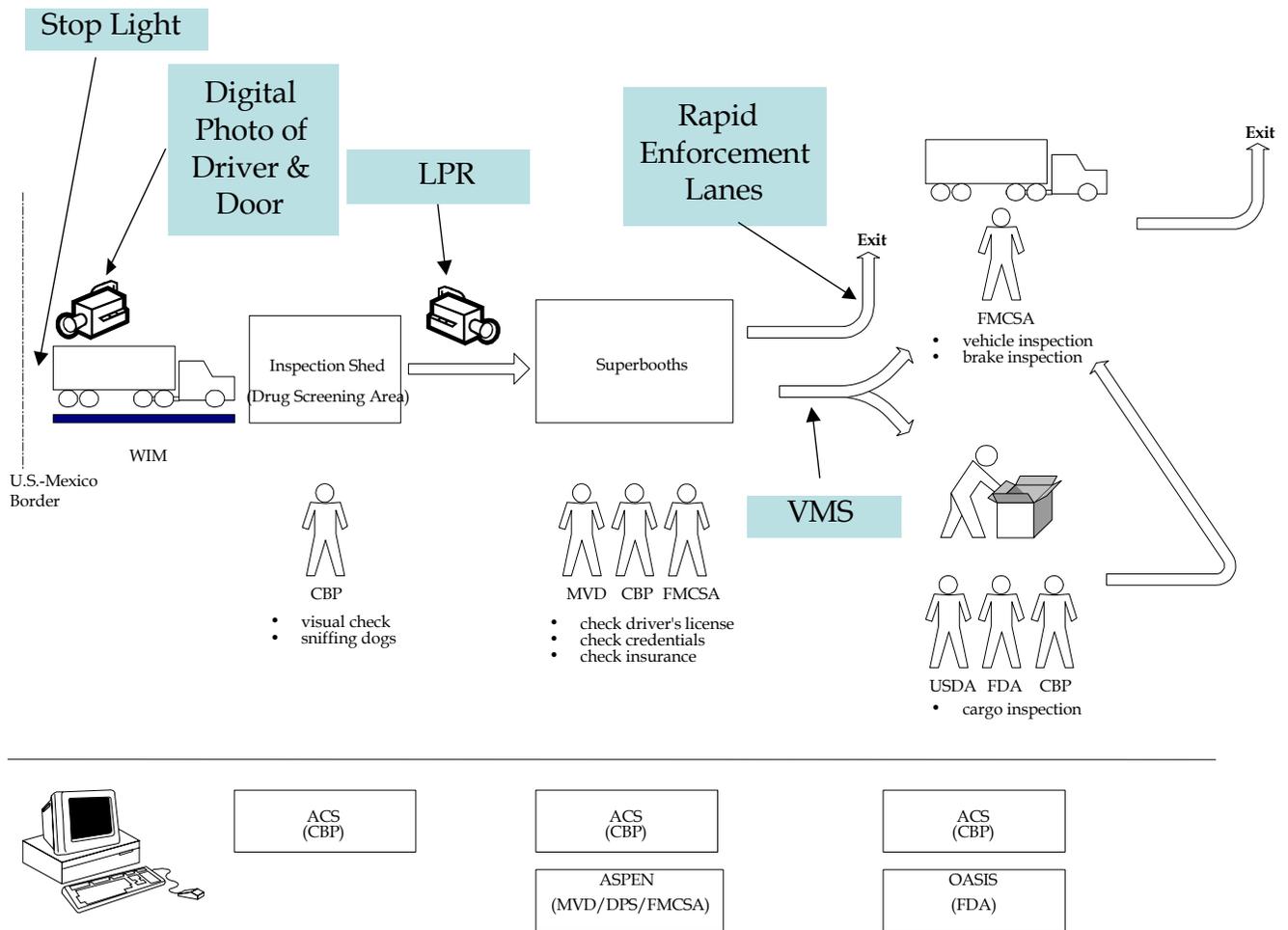


Figure 1 – Process at the Nogales, AZ International Commercial Vehicle Port-of-Entry

3.2 Technology Listing By Category

The analysis of the port's operation, and its plans for upcoming technology improvements, directed our search for technologies, products and vendors. Technology areas focused on include:

- Vehicle to Roadside Communications/Electronic Data Interface (EDI).
- Local Area Networks (LANs).
- Local software applications/hardware platforms.
- Weigh-in-Motion (WIM).
- Variable message signs (VMS).
- License Plate Recognition (LPR).
- Electronic cargo seals (e-seals).

Many of these technologies are being utilized at the Nogales port and others are in the planning stages. These and other technologies are beneficial to the port by creating a more thorough and efficient operation. Implementing additional technologies as well as sharing technologies among the many state and federal agencies involved on the compound can aid in the safety, security, and efficiency of processing the information of the commercial motor carrier traffic.

A sampling of products and vendors, by category, is provided in Appendix E - Vendors And Product Sheets. Note that this is only a representative sample, and there are possibly dozens of other vendors available. The following text provides a short synopsis of the products and vendors found during our search.

3.2.1 Vehicle to Roadside Communications/Electronic Data Interface (EDI)

Vehicle to Roadside Communications and EDI enables the exchange of data between the vehicle and the surrounding infrastructure. In a commercial vehicle application, this data might include items such as:

- Identity of the driver.
- Origin, destination of the cargo.
- Contents of cargo.
- Diagnostic information about the vehicle.

There are a number of technologies that could be used to achieve vehicle to roadside communications, but the most popular in the commercial vehicle environment are radio frequency (RF) transponders. Examples of commercial systems and vendors that provide RF transponders include:

- E-Zpass.
- PrePass.
- TeleNexus.
- TransCore's SmartWatch framework and Amtech tags.

E-Zpass

E-Zpass' transponders, initially used specifically for electronic toll collection, now also provide functionality for prescreening commercial vehicles at state POEs. This helps eliminate the need for multiple transponders. E-Zpass is primarily marketed in the mid-Atlantic region and the Northeast. Figure 2 below is a depiction of the multi-jurisdictional corridors that support the E-ZPass system.



Figure 2 – E-ZPass Multi-Jurisdictional Corridor Network

(Note: Filled-in circles with letters represent service center operations)

PrePass

The PrePass service, which uses RF transponders, is already in use in many parts of the country, including Arizona. The map below shows current PrePass deployment sites. PrePass provides commercial vehicle prescreening at state POEs. Figure 3 below depicts the network of the PrePass system as it is deployed to date.

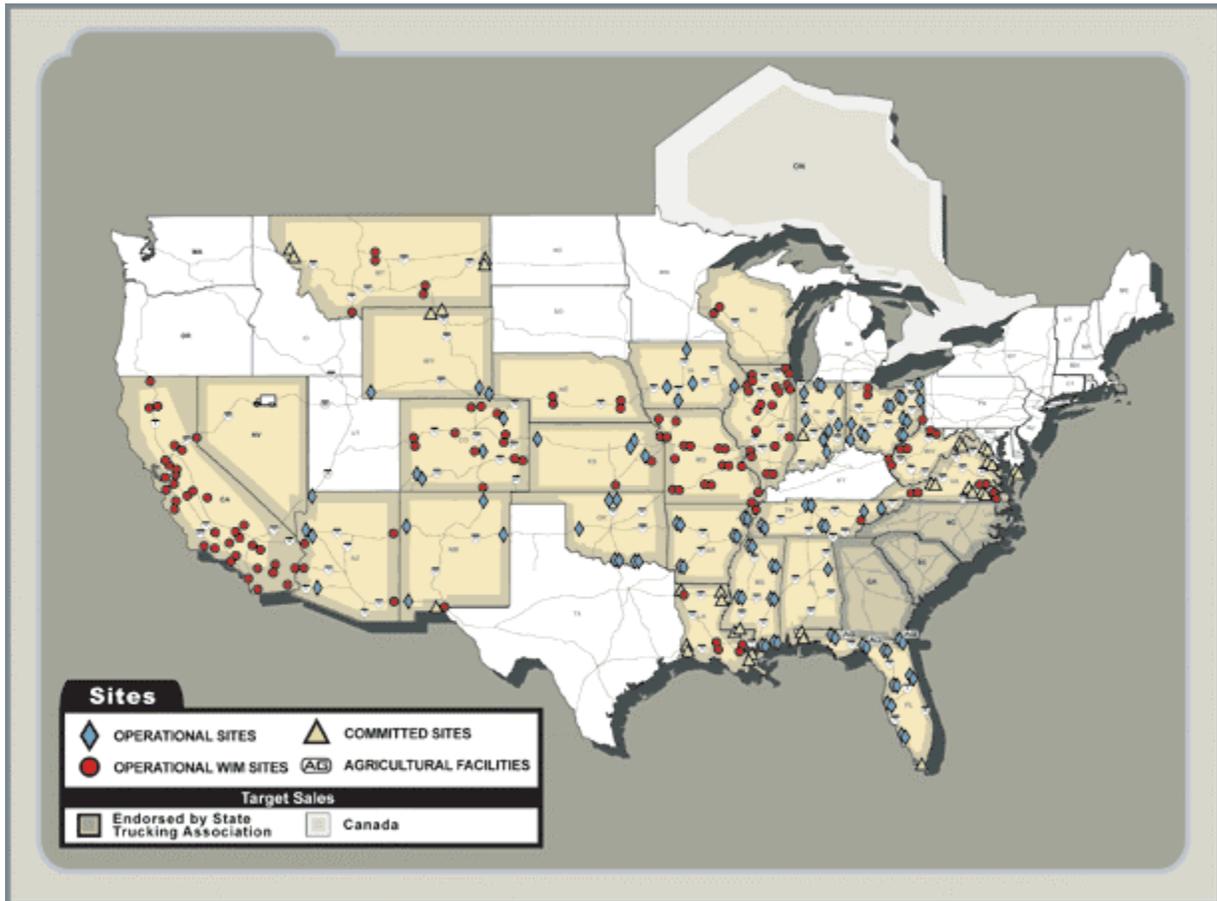


Figure 3 – Prepass Network

TeleNexus

TeleNexus is a maker of Automatic Vehicle Identification (AVI) tags for toll collection and vehicle tracking. One unique security feature is that the tag is deactivated when removed from the vehicle's windshield.

TransCore/Amtech

TransCore provides perhaps the most complete offering of products and services for commercial vehicle port operations. TransCore markets Amtech transponders as well as “eGo” adhesive

sticker tags. The eGo tags are read/write-capable and can hold 128 bytes of information. Please refer to the TransCore information sheets in Appendix E - Vendors And Product Sheets for more information. Figure 4 below depicts several options of transponders for vehicles.



Figure 4 – Sample Transponder Types

3.2.2 Local Area Networks (LANs)

Conventional wireline networks are beginning to give way to the use of wireless networking technologies. Wireless LAN (WLAN) technologies offer reduced installation and operations costs through the elimination of conduit and cabling; however, interference and security can be a concern. The leading WLAN technologies are:

- Bluetooth.
- Wireless Fidelity, or WiFi.
- Ultrawideband, or UWB.

Bluetooth

Bluetooth is a relatively new wireless networking standard that enables a wide range of devices to communicate and exchange data. For example, Bluetooth can be used to wirelessly and seamlessly exchange data between a desktop workstation and a cell phone or PDA.

Bluetooth works in the 2.4 GHz ISM (International Standard Modulation) band using spread spectrum frequency hopping for tight security and high immunity from interference. It has an operating range of up to about 10 meters, so it is best suited for interconnecting items in close proximity. There are possibly hundreds of companies that sell products that utilize or support the use of Bluetooth.

WiFi

WiFi, short for Wireless Fidelity, is another wireless networking standard that relies on the Institute of Electrical and Electronics Engineers (IEEE) 802.11a and 802.11b specifications. The 802.11b specification utilizes the 2.4 GHz band to wirelessly transmit data at approximately 11 Mbps over an indoor distance of up to several hundred feet or an outdoor distance of up to tens of miles. The 802.11a specification uses the 5 GHz band to transmit data at 54 Mbps at typically

shorter distances. The actual transmission distance for either standard depends on impediments, materials, and line of sight.

Because of its range and data transmission rates, WiFi would seem better suited for WLAN applications; however, there have been several reported incidents of hackers “eavesdropping” on WiFi radio transmissions. In most cases, this is because the user has failed to activate WiFi’s built-in security features.

The 802.11b specification includes “Shared Key” authentication and Wired Equivalent Privacy (WEP) encryption. Most products offer these security measures, but surveys indicate that nearly 70% of today’s WiFi users fail to activate them at the time of installation.

UWB

UWB, or ultrawideband, is an emerging technology based on the IEEE 802.15 specification. This high-bandwidth technology is envisioned for connecting personal computers (PCs) to home electronics and appliances, and, as such, should not directly compete with technologies based on the 802.11 specifications. UWB is not expected to be available commercially until late 2004 or into 2005.

3.2.4 Local Software Applications/Hardware Platforms

UNIX-based systems have historically been preferred over PC-based systems for mission-critical services because of their greater reliability. However, recent improvements in PC operating systems (namely Windows 2000 and Windows XP) have made them significantly more reliable, and now a more cost-efficient alternative. The typical Sun or HP UNIX-based workstation can cost from \$8,000 to \$20,000, compared to a \$1000-\$3000 Windows-based PC.

3.2.5 Weigh-in-Motion (WIM)

WIM scales enable a truck to be weighed while still moving; ideally at highway speed. A number of newer, portable WIM devices are currently on the market and are described in the Appendix E - Vendors And Product Sheets.

3.2.6 Variable Message Signs (VMS)

VMS, sometimes also referred to as Dynamic Message Signs (DMS), have been in production for nearly 30 years. A couple important considerations of a VMS are brightness and resistance to glare, especially when used in bright or sunny locations. Another important consideration is compliance with the National Transportation Communications for ITS Protocol (NTCIP) interoperability standard. Only NTCIP-compliant systems can be purchased with federal ITS funds.

3.2.7 License Plate Recognition (LPR)

LPR has had mixed success in the commercial vehicle environment for various reasons, including:

- Nonstandard (i.e., unpredictable) placement of license plates on trailers.
- Muddy or otherwise dirty plates.
- Bent or damaged plates.

However, a number of vendors were identified, including one that alternatively scans container ISO (International Organization for Standardization) numbers or other identification numbers that are printed on the vehicle.

3.2.8 Electronic Cargo Seals (e-seals)

E-seals come in a wide variety of configurations. The simplest e-seals indicate whether a locking pin or tie cable has been removed during transit, possibly indicating that the container or trailer had been opened. More sophisticated sentry systems log the date, time, and latitude/longitude position of the vehicle each time the trailer or container is opened, and can even notify someone in real-time via a cellular phone link. Examples of these various e-seals are provided in the Appendix E - Vendors And Product Sheets.