

EFFICIENCY AND EFFECTIVENESS OF WEIGH STATION MANAGEMENT IN WASHINGTON STATE

Final Report

prepared for

Washington State Joint Transportation Committee

prepared by

Cambridge Systematics, Inc.

with

BGM Consulting, LLC.

January 7, 2016

final report

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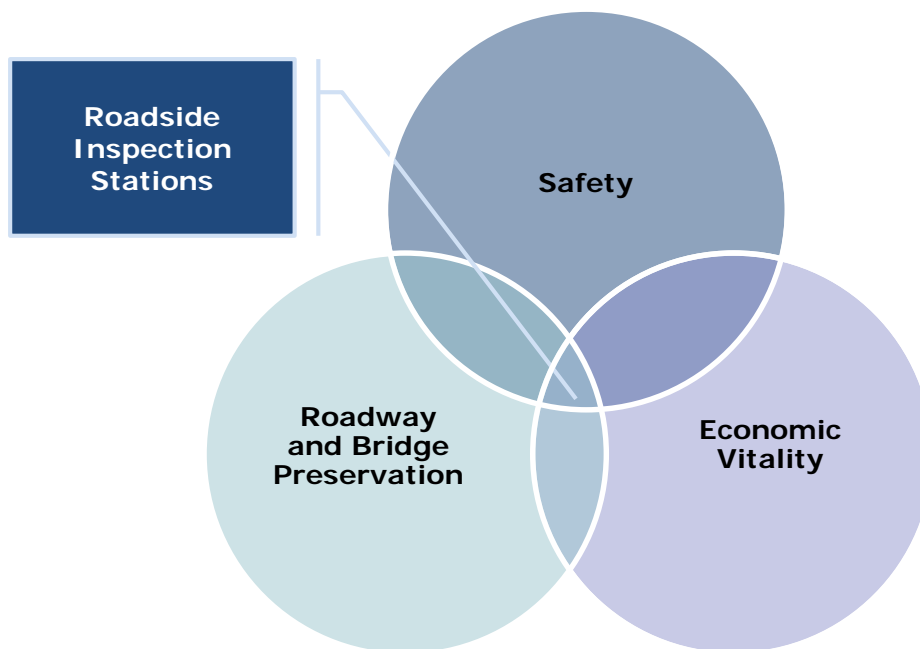
Executive Summary

Introduction

About the Study

The Washington State Joint Transportation Committee hired Cambridge Systematics to undertake a study to examine the effectiveness and efficiency of the Washington State inspection station (or “weigh station”) system. Ensuring the safety of commercial and passenger vehicles, preserving the State’s highway infrastructure, and supporting economic vitality through maintaining mobility for freight are three key priorities of the State of Washington. The Washington State Patrol (WSP) and Washington State Department of Transportation (WSDOT) share similar goals and missions that support these overarching goals. Roadside inspections and inspection stations are the nexus of where these priorities come together. Figure ES.1 shows where the inspection station system fits in the context of WSP and WSDOT goals.

Figure ES.1 Washington State Inspection Station Goals



The 2010 closure of the Federal Way southbound inspection station, 2011 closure of the Everett southbound inspection station, and potential impacts of numerous DOT projects on other inspection sites created concern about the lack of a strategic approach to the management of the system. The Washington State Joint Transportation Committee (JTC) established four main goals for the study:

- Provide educational material for use by Members and staff of the Legislature and the public about the planning, placement, and operations of the system of weigh stations in Washington;
- Evaluate the system's efficiency in managing its capital assets and operations;
- Evaluate the system's effectiveness at achieving outcomes relating to road preservation and traffic safety, while balancing the state goal of freight mobility; and
- Make recommendations regarding a more strategic approach to managing the system.

To address the above goals, the study team gathered and synthesized data, undertook technical analyses, examined best practices, and interviewed those directly responsible for the inspection station system and relevant stakeholders. Draft technical reports were submitted to JTC with data gleaned from the above steps, and a draft of the findings and recommendations was presented at the Joint Transportation Committee meeting on November 17, 2015. This Executive Summary serves as an accompanying document to the *Efficiency and effectiveness of Weigh Station Management in Washington State Final Report*, which contains additional details from the study. Both documents incorporate feedback received from JTC at that meeting and from previous comments and suggestions received on the draft technical reports.

Overview of Inspection Stations

Inspection stations, also referred to as "weigh stations" in Washington State, are locations where commercial vehicle enforcement activities such as weighing vehicles and safety inspections occur. Historically, these sites focused on weight inspections. However, recent emphasis on driver and vehicle safety at both the state and Federal level has expanded the role of these sites beyond weight enforcement alone. For this reason, the term "inspection stations" or "inspection sites" more accurately depicts current practices. Some inspection stations are also called "Ports of Entry," and serve as gateways into a state for interstate or international traffic.

Inspection operations in the U.S. typically utilize one or more of three basic configurations: 1) fixed inspection stations, 2) virtual inspection stations, or 3) mobile roadside enforcement. Fixed inspection stations and mobile roadside enforcement are currently in use in Washington State; virtual inspection stations are currently under consideration at two locations. The primary purpose of all three configurations is to enforce truck weight regulations in order to protect infrastructure from excessive wear and tear caused by overweight trucks. Depending on the state, they are also used to screen trucks for safety, credentials, and logbook violations as well as to issue permits, collect registration and fuel taxes, and conduct other activities associated with commercial vehicles.

Inspection stations often result in interaction between a State's Department of Transportation, and State Patrol or other enforcement agency. Typically, inspection stations are staffed with sworn officers of State Patrol, but some states allow other types of personnel to perform inspection functions. In Washington, inspection stations serve both weight and safety

inspection purposes, and are staffed with a mixture of specially trained commercial vehicle officers from the Washington State Patrol and Washington State Patrol Troopers.

The vast majority of states, including Washington, currently support *electronic screening*, at some or all inspection locations.¹ Electronic screening is the automated screening of vehicles to distinguish between known or likely safe and legal vehicles and potential violators *before* they stop at an inspection facility. The intent of electronic screening is to allow safe and legal trucks to bypass the station while enforcement resources are focused on higher-risk carriers and vehicles. Mainline weigh-in-motion (WIM), which measures a truck's weight on the main roadway at highway speeds, is frequently used as part of an electronic screening system.



Example Electronic Screening Infrastructure

Source: Cambridge Systematics

Types of Inspection Stations

There are three main types of inspection sites nationwide: fixed, virtual, and mobile. These categories are described below.

Fixed Inspection Stations

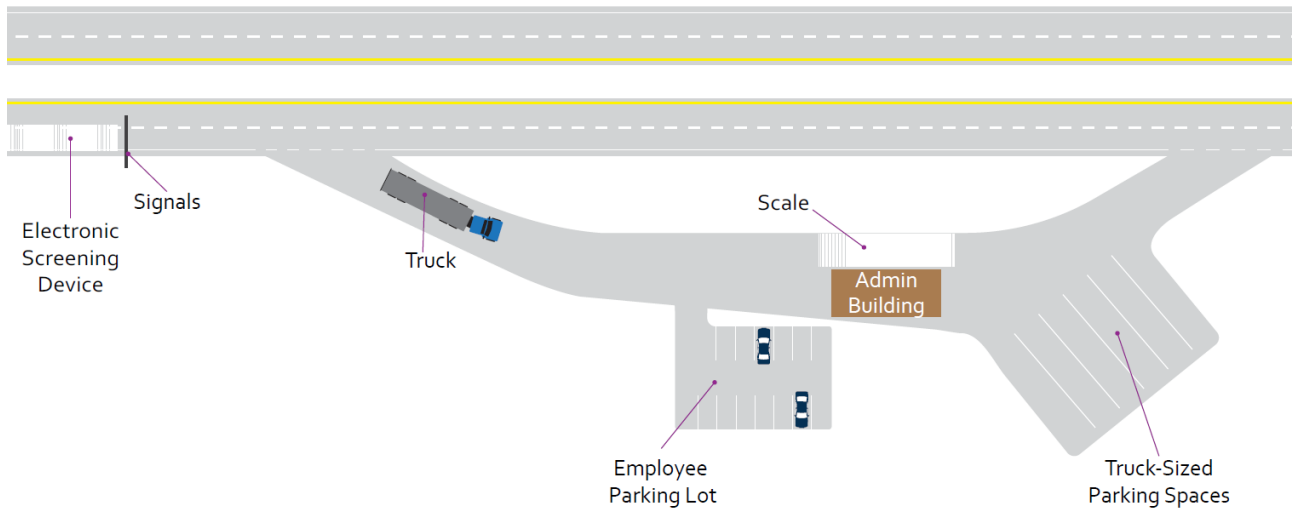
Fixed inspection stations are the most common setup currently in use in the U.S. Most fixed inspection stations include a pull-off ramp from the main roadway and a combination of fixed infrastructure, such as a static scale, and an administration building or scale house. Sites may or may not incorporate electronic screening. Washington has 52 fixed inspection sites. Figure ES.2 shows an example layout of a fixed inspection station.

The vast majority of fixed sites in the U.S. are located on the right side of the highway right-of-way. Some states, including Florida and Idaho, have also sited fixed stations in the center median of a divided highway. Inspection stations located in a median allow trucks to enter one station from two directions of travel on the same segment of roadway. This approach can be an efficient and effective means of truck evaluation and enforcement by staff, and offers potentially significant cost savings during construction and operation of the site. These types of sites can be effective in strategically situated, non-Interstate locations with moderate traffic volumes. However, siting and placement of this type of inspection station configuration can be challenging, as safety considerations dictate the need for certain configurations of traffic lanes

¹ Washington State utilizes an electronic screening system call NORPASS. For further information, see the Washington State Department of Transportation Commercial Vehicle Information Systems Network web site at: <http://www.wsdot.wa.gov/CommercialVehicle/CVISN/apply.htm>.

and median space. Examining locations in Washington for the possible placement of a median site should be considered during development of the joint statewide inspection state plan (Recommendation 8).²

Figure ES.2 Example Fixed Inspection Station

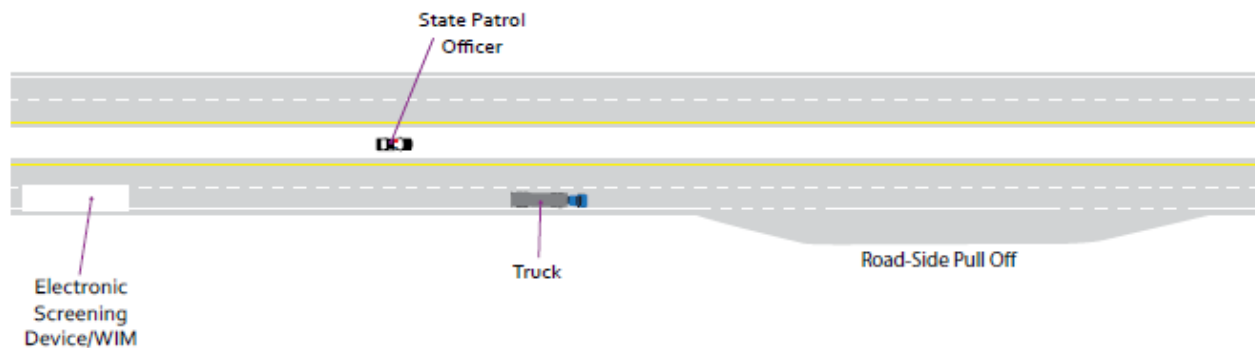


Virtual Inspection Stations

An alternative to a fixed inspection station is a virtual inspection site. Although these sites are built at a “fixed” location, they lack the physical infrastructure found at fixed sites and are based on the concept of electronic screening using integrated software systems to capture information about vehicles as they travel down the mainline. Virtual sites can have the option of stationing a mobile officer to undertake inspection or enforcement activities; when an officer is present then the station operates similar to a fixed site. However, a virtual station has the advantage that it still collects data even when an officer is not on-site. Washington does not have any virtual inspection stations. Figure ES.3 shows an example layout of a virtual inspection station with an officer present.

² A more detailed evaluation of median siting can be found in the Final Report for this study.

Figure ES.3 Example Virtual Inspection Station
With Officer Present



Mobile Roadside Enforcement

Mobile enforcement, which is used in Washington, consists of enforcement activities that do not take place at fixed stations. This type of enforcement can be combined with virtual inspection stations in order to provide citation capabilities without the cost of building and maintaining a full fixed site.

States' mobile enforcement programs usually encompass temporary roadside locations (e.g., rest areas, modified shoulders, abandoned inspection stations), roving patrols, or both. During mobile enforcement details, commercial vehicles are stopped and weighed on portable scales and may be subject to a safety inspection. Note that in some states, probable cause is required to stop a vehicle. Washington State does not have this requirement – State Troopers can stop a vehicle for any reason.



Portable Scales in use on U.S. 23 in Floyd County, KY

Source: <http://migration.kentucky.gov/Newsroom/kve/010506.htm>.

Federal Programs Supporting Inspection Stations

The Federal Motor Carrier Safety Administration (FMCSA) and Federal Highway Administration (FHWA) are the two agencies within the U.S. Department of Transportation (U.S. DOT) that have programs related to inspection stations.

The Federal Motor Carrier Safety Administration (FMCSA)'s mission is to prevent commercial motor vehicle-related fatalities and injuries. Commercial Vehicle Information Systems and

Networks (CVISN)³ and Motor Carrier Safety Assistance Program (MCSAP) grant programs are FMCSA funded, state-administered programs that provide financial assistance to states to implement projects, systems, and activities that improve commercial motor vehicle safety thereby reducing the number and severity of accidents and hazardous materials incidents involving commercial motor vehicles.

The FHWA Federal-aid Highway Program (FAHP) supports state highway systems by providing financial and technical assistance for the construction, maintenance and operations of the Nation's 3.9 million-mile highway network, including activities related to inspection stations.

³ Under the Fixing America's Surface Transportation Act (FAST) of 2015, the CVISN program will be considered as part of the Motor Carrier Safety Assistance Program.

Washington's Inspection Station System

Infrastructure

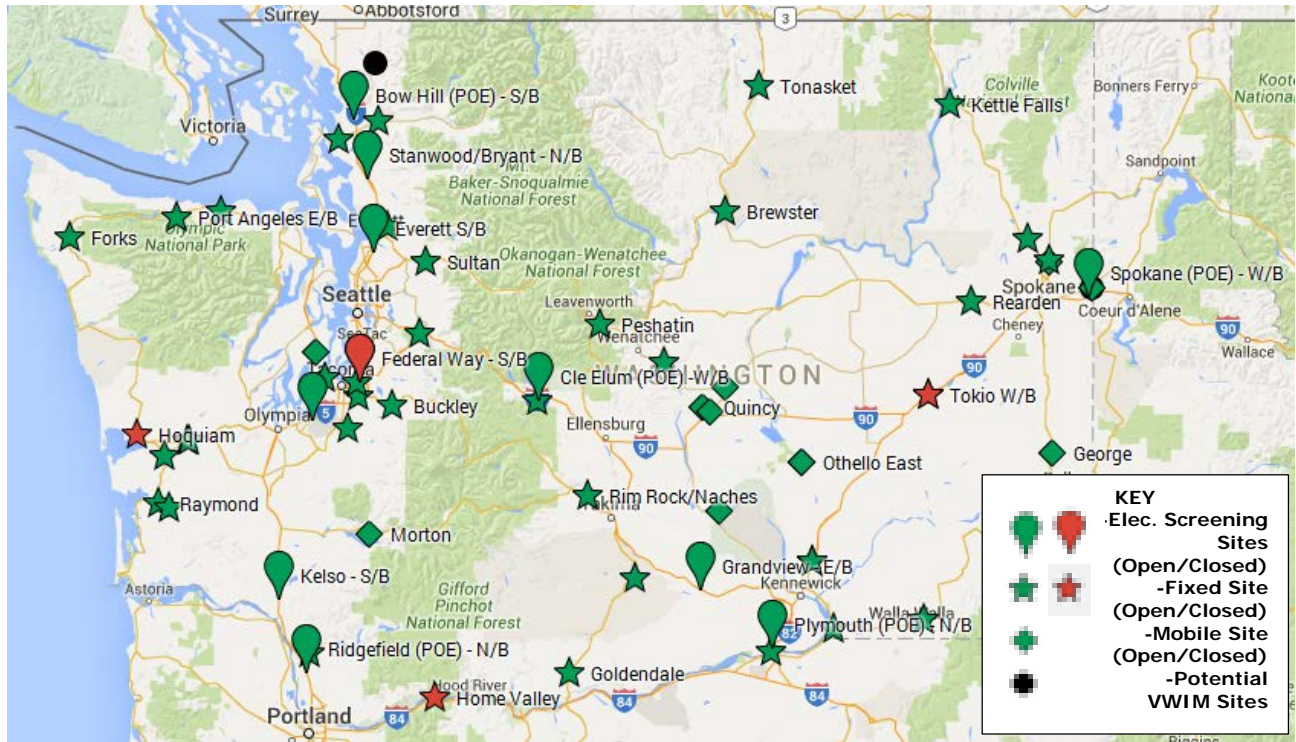
Washington's inspection station network contains a total of 63 sites. Fifty-two of the sites are fixed locations and 11 are mobile enforcement locations that are commonly used by the Washington State Patrol. The State does not currently operate any virtual inspection stations. Further classification based on Washington State specific infrastructure results in three groups of sites (2 fixed, 1 mobile):

- **Electronic Screening (Fixed) Sites** – The first group, with the highest level of functionality when fully operational, are the 12 locations that are fixed sites equipped with electronic screening technology through the CVISN program, including mainline WIM, automated license plate readers, the software to automatically run safety screening checks, and at Fort Lewis a brake inspection system that measure the heat produced when trucks brake to determine if brakes are functioning properly. These sites are also commonly referred to as “CVISN-equipped sites”
- **Fixed Sites** – The second group of sites are 40 fixed inspection stations with a fixed scale for weighing commercial vehicles. Five of these sites are “plug and run” facilities, which are sites with permanent scales that do not have scale buildings or software/computers installed, requiring the use of Patrol cars as mobile “offices” with laptops by enforcement personnel when using the site. The remaining 35 sites in this category have an administration building used to run the site when open, and varying amounts of other physical infrastructure at the site, including truck parking. These sites lack any electronic screening capabilities.
- **Mobile Sites** – The third set of sites are mobile enforcement locations. This includes 11 locations where WSDOT has either slightly widened the road to specifically accommodate mobile weight/safety checks by WSP or where WSP uses infrastructure built for other purposes (such as a rest area for motorists) to conduct commercial vehicle operations.⁴

⁴ The WSP also operates mobile enforcement units in every county who utilize the roadside, parking lots, or other unimproved locations to enforce rules and regulations. Because the locations for this type of enforcement are random, they are not included in list of 63 sites in Washington State.

Figure ES.4 shows the Washington State inspection station system.⁵ Four sites are currently closed. In addition to Federal Way S/B, sites at Home Valley, Hoquiam, and Tokio W/B are currently inoperable due to scale certification being out of date.⁶

Figure ES.4 Washington State Inspection Station System



Source: Washington State Patrol, WSDOT, Cambridge Systematics.

Operations

The Washington State Patrol is responsible for commercial vehicle enforcement in the State. The approximately 130 personnel that conduct enforcement are divided between Washington State Troopers who have full police authority but focus their activities on commercial vehicles, and Commercial Vehicle Enforcement Officers (CVEO) whose authority is limited to commercial vehicle issues. In 2014, these enforcement personnel conducted nearly 82,000 inspections, including physically weighing approximately 57,000 vehicles, and found more than 113,000

⁵ Figure 2.1 is a static versions of an electronic map that was developed as part of this study. The electronic map is available as a web-based google maps platform, and is expected to be maintained by the interagency working group identified in Recommendation 1. Further information can be found in the Appendix to the final report.

⁶ Scales must be certified annually to confirm their accuracy. If they are not, the weights obtained from them cannot be used to issue citations. Certification is performed by the Property Management Division of the WSP, part of the Commercial Vehicle Enforcement Bureau.

weight and safety violations. Table ES.1 provides a brief summary of the Washington State Inspection System.

Table ES.1 Washington State Inspection Station System Overview

Criteria	Status (2014)
Number of Sites	52 fixed sites, 12 with WIM; 11 commonly used mobile sites
Number of Additional Scales	434 mobile scales
Personnel	169 total positions, average of 127 filled in 2014. Split between 81 Commercial Vehicle Enforcement Officers (CVEO) and 46 Troopers
Annual Site Traffic Volume	40 million trucks annually on adjacent roads
Number of Screenings (Mainline WIM)	1.9 million (2014)
Number of Inspections	82,400 (2014)
Total Annual Vehicles Weighed	57,000 (fixed scales)
Total Annual Citations	113,000 (weight and safety violations), \$1.9 million in weight fines
Permits/Credentials Issued	No Data

Source: WSDOT. Washington State Enforcement Plan (2016). Interview with Captain Mike Dahl, September 17, 2015.

Table ES.2 shows aggregated statistics for the inspection station system.⁷ The vast majority of inspection and weighing activity took place at sites with electronic screening (which are generally located at locations of higher traffic volumes), accounting for more than 82 percent of the trucks physically weighed, 60 percent of the total fines issued, 58 percent of the inspections conducted, and 53 percent of the violations discovered in 2014.⁸ Mobile enforcement also led to a high number of violations and weight fines. Mobile enforcement allows for flexible, targeted operations at known problem locations, which in part explains the high rate of violations and fines. Another possible factor is that trucks with known weight or safety issues may try to bypass the fixed sites, reducing the total number of violations that can be found at the fixed locations.

⁷ Additionally, this data could be incorporated into the development of future performance measures such as the rate of violations versus inspections at the different site categories.

⁸ Electronic screening technology is currently funded by the CVISN program, thus electronic screening equipped sites are also referred to as CVISN sites.

**Table ES.2 Washington State Aggregate Inspection System Statistics
2014**

Type of Site	Trucks Physically Weighed	Weight Fines	Number of Inspections	Number of Violations
Electronic Screening (11 open sites)	47,083	\$1,126,010	48,097	59,558
No Screening, Fixed (37 open sites)	7,002	\$184,887	7,984	10,237
Mobile (11 open sites) ^a	3,214	\$578,763	26,363	43,214
Total	57,299	\$1,889,763	82,444	113,009

Source: WSP. Note that data for Everett S/B is from 2013. Data from Federal Way S/B, Home Valley, Hoquiam, and Tokio W/B excluded due to being out of service or lack of scale certification.

Note: ^a Mobile sites also include statistics from variable sites in each county.

Agency Roles and Responsibilities

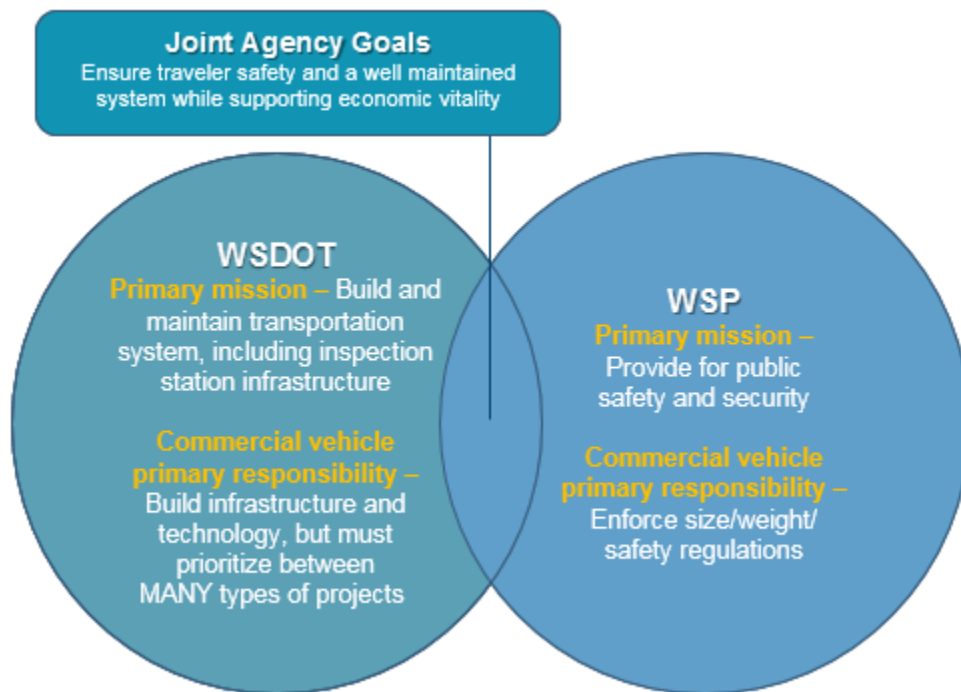
Both WSDOT and WSP are invested in the creation and efficient use of the inspection station system to ensure the safety of the motoring public and the preservation of roads and bridges in the State. The Washington Transportation Plan 2035⁹ states that, “Preservation of the capital assets of the statewide transportation network is the most critical transportation challenge facing the State.”

As in many states, in Washington responsibility for commercial vehicle inspection stations is shared between multiple agencies. Below is a description of the roles for WSDOT and WSP in roadside inspection stations, as well as the extent to which these responsibilities overlap.

A major finding of this study is that such a joint enterprise requires effective communication procedures and the current communication procedures between WSP and WSDOT, and within WSDOT, do not effectively incorporate the needs of the inspection station system. An example of this communication problem is illustrated in the Federal Way case study, summarized in the *Case Study – Federal Way* Section. Figure ES.5 summarizes the goals and responsibilities of WSDOT and WSP as related to the statewide roadside inspection station system.

⁹ Washington State DOT. Washington Transportation Plan, 2035. January 2015. On-line at: https://wtp2035.files.wordpress.com/2015/01/wtp2035_final_21-jan-2015.pdf.

Figure ES.5 Agency Responsibilities Related to Inspection Stations in Washington



Source: Cambridge Systematics.

Case Study – Federal Way

As part of this study, a case study of the Federal Way S/B inspection station was conducted to understand the causes of and lessons learned from the closure of the station in 2010.

The Federal Way S/B inspection station located on I-5 between Seattle and Tacoma was constructed in the 1960s. This inspection station has provided a location to conduct weight and safety enforcement for approximately 50 years. Since August 2010, the inspection station has been closed, creating a gap in the statewide inspection station network from the Everett southbound inspection station to the Kelso southbound inspection station – approximately 150 miles. This segment of I-5 is a major freight corridor, acting as the major north-south route through western Washington and serving important ports, airports, interconnecting highways, and thousands of freight generators and receivers. This gap in the statewide inspection station network allows commercial vehicle to operate in this area with minimal oversight.

Since the 1960s, with increasing traffic volumes, the site has been upgraded to better handle the increased weight and safety enforcement needs on Interstate 5. In 2001, a mainline weigh-in-motion (WIM) system was added to the site to help screen truck traffic and reduce the number of legal trucks that had to enter the site.

Due to rising traffic volumes (of all types) on Interstate 5, a decision was made to improve the interchange at I-5/SR 18/SR 161 near Federal Way, Washington. Also known as the Triangle Interchange Project, this work necessitated the closure of the Federal Way S/B inspection station in August 2010.¹⁰ The building of a new weigh-in-motion station to capture southbound traffic on Interstate 5 was supposed to be part of the project.¹¹ However, the site remains closed as of October 2015. The following is an evaluation of this interchange improvement and its impacts on the Federal Way S/B inspection station.¹²

Case Study Findings

- The design of the I-5, SR 18, SR 161 Triangle Project led to the closure of a major inspection station at Federal Way. The closure resulted from inadequate consideration of the effects of the interchange project to the Federal Way inspection station. A contributing factor was ineffective communication between WSDOT (responsible for infrastructure projects), and WSP (responsible for inspection station operations).
- None of the technical reports prepared by WSDOT as part of the NEPA process to understand impacts to the roadway and surrounding area adequately addressed the impacts on the Federal Way station.
- The Triangle Project created a multilane weave with commercial vehicles and passenger vehicles. The State Patrol deemed that operating the inspection station under the new configuration created a public safety hazard.
- By integrating the Federal Way inspection station into the evaluation and mitigation process in 2004 when the Interchange improvement project was conceived, it may have been possible to avoid closing the station in 2010.
- WSDOT's current \$16 to \$20 million design for a replacement Federal Way inspection station is not sufficient to meet future needs. This is due to the fact that the process for designing new facilities is based on past traffic patterns and infrastructure design; it does not adequately consider future needs or technology.

¹⁰ <http://wsdot.wa.gov/publications/fulltext/graynotebook/Mar12.pdf#page=53>.

¹¹ <http://www.Federalwaymirror.com/news/161596895.html#>.

Further details on the Federal Way case study can be found in the Final Report of this study.

Study Findings and Recommendations

Ensuring the safety of commercial and passenger vehicles, preserving the State’s highway infrastructure, and supporting economic vitality through maintaining mobility for freight are three key priorities of the State of Washington. This section presents four sets of findings and recommendations from the study to guide Washington (primarily WSDOT and WSP) towards better aligning actions and policies related to the State’s inspection station system to these key State priorities. The recommendations provide a roadmap for WSDOT and WSP to work jointly at the strategic level and includes a brief set of near-term, long-term, and ongoing implementation steps.

Four sections each present a project finding and the accompanying recommendations. These are summarized in Table ES.3.

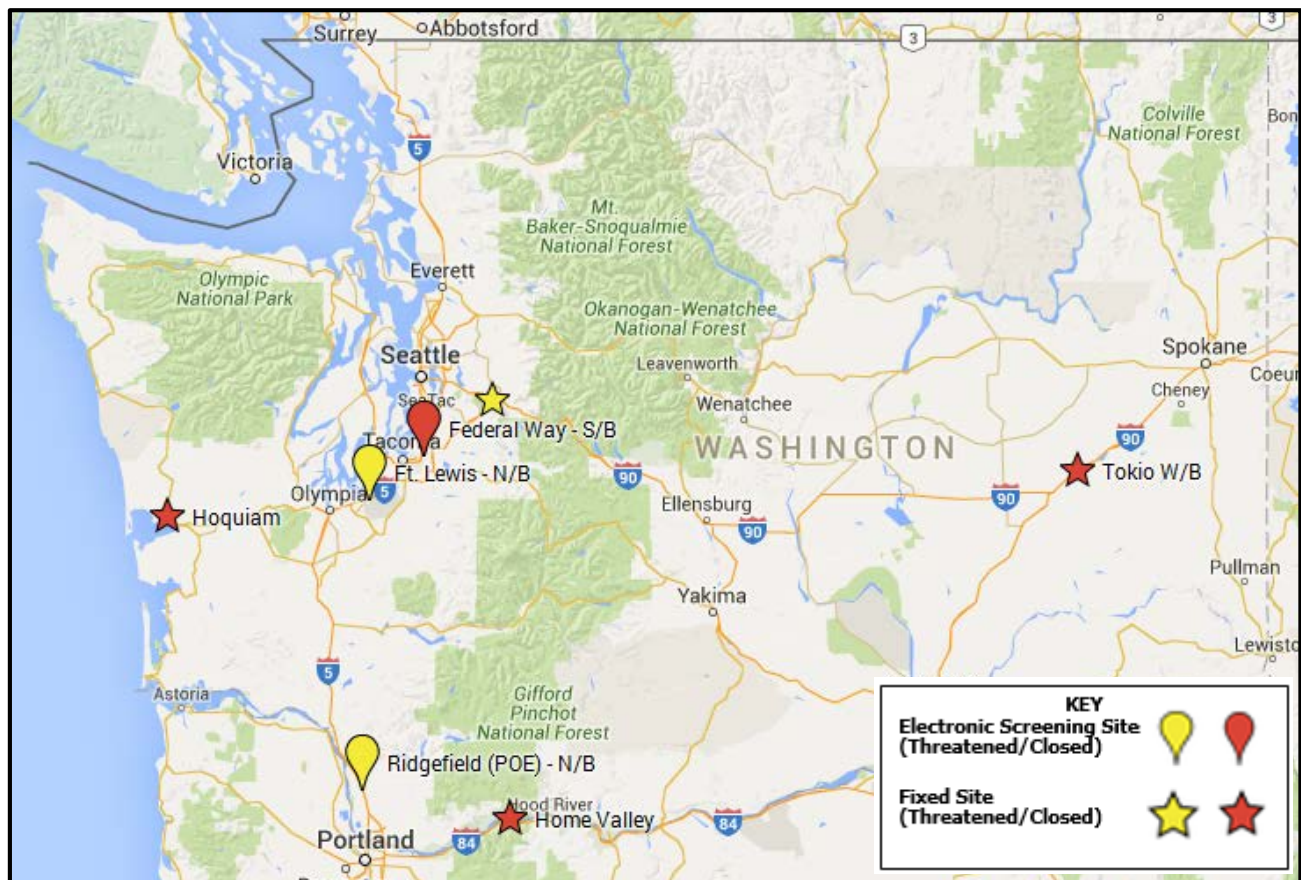
Table ES.3 Summary of Washington State Inspection System Findings and Recommendations

Finding	Recommendations
<p>Communication – The Washington State Department of Transportation (WSDOT) and Washington State Patrol (WSP) do not communicate well about inspection stations.</p>	<ul style="list-style-type: none"> • Formalize protocols for ownership and communication within and between agencies • Develop joint agency commercial vehicle-related outcomes and objectives • Revisit agencies roles and update documentation such as the Memorandum of Understanding (MOU) • Update the WSDOT Design Manual
<p>Asset Management – Inspection stations, regardless of size or technologies, should be managed like any other type of asset.</p>	<ul style="list-style-type: none"> • Create joint agency outcome-based performance measures • Apply an asset management framework to truck inspection stations • Maintain and publish a biennial needs list
<p>System Planning – The inspection station system is not adequately accounted for in WSDOT planning.</p>	<ul style="list-style-type: none"> • Develop a Joint Statewide Inspection Station System Plan
<p>Data – WSDOT and WSP have insufficient data or data-sharing arrangements to make strategic decisions regarding the inspection station system.</p>	<ul style="list-style-type: none"> • Develop a data sharing agreement between WSDOT and WSP • Collect and maintain shared data

Finding 1 – WSDOT and WSP do not communicate well about inspection stations

On a number of occasions documented through this study, it was found that a lack of effective communication between WSDOT and WSP has led to outcomes that negatively affect the ability of the State to enforce commercial vehicle regulations. For example, WSDOT has not engaged WSP effectively as part of roadway project developments that impact inspection stations, (see Figure ES.6), especially along the I-5 and I-90 corridors. Conversely, WSP does not identify enforcement needs associated with the weigh stations in a way that fits within the WSDOT project programming process, leading to inspection station capital projects not being included in the overall WSDOT capital planning process.

Figure ES.6 Closed or Potentially Threatened Inspection Stations



Source: WSDOT, WSP, Cambridge Systematics.

The following recommendations are designed to improve communication:

Recommendation 1 – Formalize protocols for ownership and communication within and between agencies

WSDOT and WSP need to formalize protocols for ownership and communication within and between agencies. An interagency working group should be developed, with leaders from each

agency that would both provide strategic guidance on matters related to inspection stations, as well as manage and oversee day-to-day activities related to inspection stations. Many of the working group's objectives could be implemented by existing staff, however additional staff may be needed to fulfill the responsibilities discussed below.

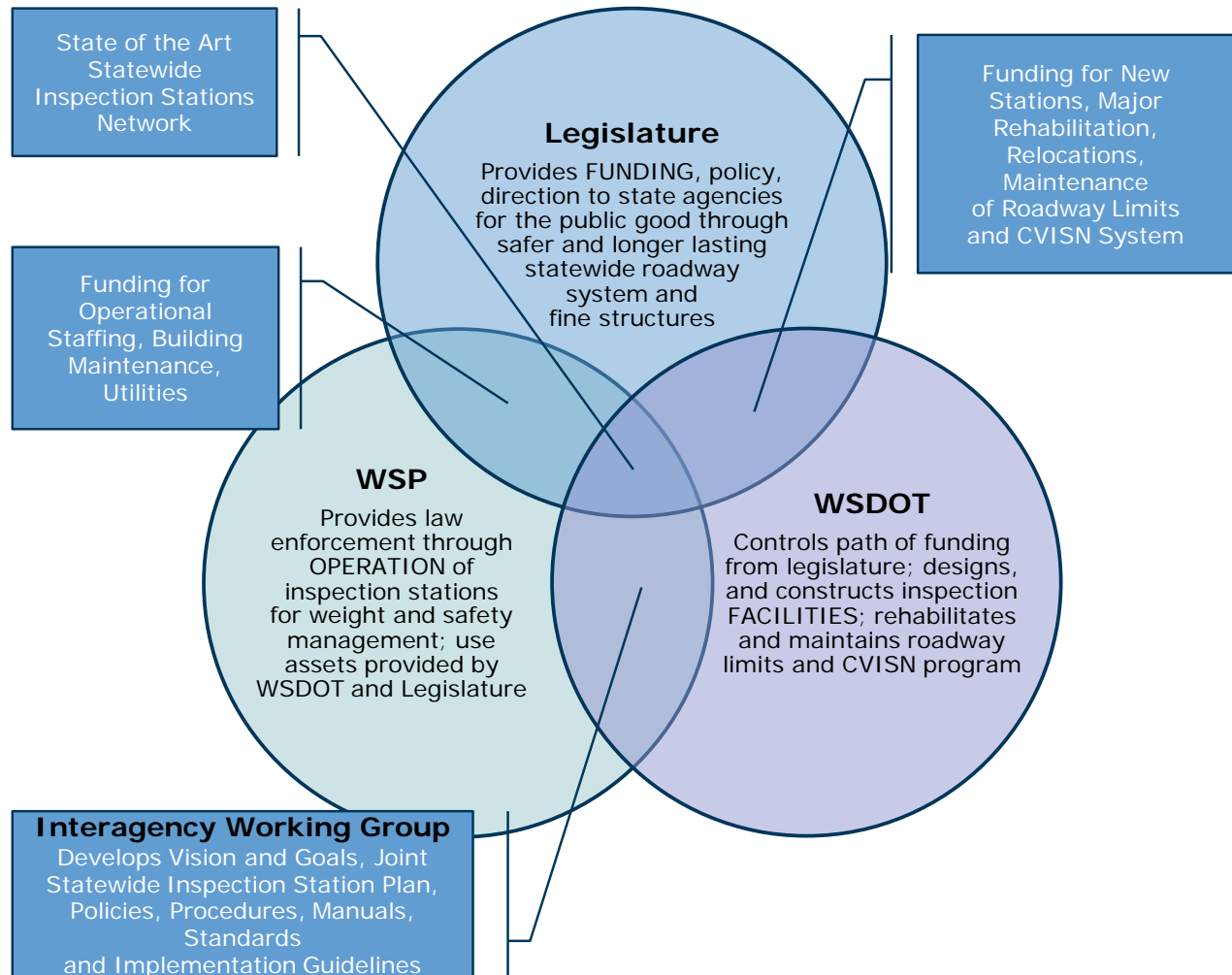
The responsibilities of the working group would encompass both ongoing activities related to inspection stations (e.g., maintenance of existing facilities) as well as new activities (e.g., joint strategic planning). Areas of emphasis would include:

- Managing and coordinating with staff in both agencies involved in data gathering related to truck enforcement (Recommendation 10);
- Designing and supervising data sharing activities between the two agencies (Recommendation 9);
- Supervising ongoing maintenance and enhancement of Washington's Commercial Vehicle Information Systems and Networks (CVISN) system (Recommendation 10);
- Owning the processes for upkeep of roadway elements and buildings within fixed sites (Recommendation 6);
- Assessing agency and industry reports of major long and short range changes to the transportation system and considering their impacts on truck enforcement (Recommendation 8);
- Integrating truck enforcement strategies into broader state government strategies for infrastructure preservation, goods movement effectiveness, and highway fatality reduction (Recommendations 6 and 8);
- Assessing statewide inspection station network infrastructure and staffing needs on a regular basis (Recommendation 8);
- Confirming and reporting outcomes of statewide inspection station network program to both agencies (Recommendations 1 and 7); and
- Working with industry to improve behavior and compliance on commercial vehicle regulations (Recommendations 2 and 5).

Executive leadership participation on strategic inspection station activities is also critical. The executives of both agencies should consider how to effectively provide strategic guidance to these truck enforcement leaders. Both WSDOT and WSP should strongly consider an organizational change that creates a central leadership staff position for commercial vehicle enforcement, which can provide leadership for and continuity to the enforcement program; essentially a division director within each agency. In WSDOT, the truck enforcement leader must be integrated into freight planning, transportation operations and technologies, major project design, performance management, capital investment analysis, determining funding priorities, and asset management decisions. In WSP, the truck enforcement leader must be integrated into information technology, patrol staff allocation, performance management, asset management, determining project funding priorities, and Federal reporting.

The Washington State Legislature may also play a role in developing a comprehensive approach to commercial vehicle enforcement, in particular directing WSDOT and WSP to take action on these recommendations, making funding decisions, and setting truck violation fines and fees. The current roles of the Legislature, WSP, and WSDOT are shown in Figure ES.7. In this scheme, the interagency working group would lead the coordination efforts between WSDOT and WSP in developing the recommendations identified below.

Figure ES.7 Washington State Inspection Station Agency Roles and Responsibilities



Source: Cambridge Systematics.

Recommendation 2 – Develop joint agency commercial vehicle-related outcomes and objectives

WSDOT and WSP will need to hold discussions to determine which outcomes are important to both agencies and to the State as a whole. “Outcomes” (as opposed to “outputs”) are what drive needs, performance and funding, and both WSP and WSDOT need to think in terms of

outcome measures when discussing truck enforcement and inspection stations, both within and between their agencies. Some of these outcomes and related measures will align with those currently tracked by WSDOT/WSP (especially in terms of safety); some will be different.

It is important that the outcomes and outcome measures related to truck enforcement and roadside inspections be developed *jointly*, and that the competing needs within or between each agency not trump those of the other during this process. Once these outcome objectives, e.g., reducing truck crashes, and related measures to track progress are developed, they should be articulated clearly by both agencies and used to determine the needs and steps required to set goals and make positive progress towards these outcomes. These jointly agreed upon outcomes will drive the development of performance measures and data, which are described in Recommendations 5 and 10, and should also be used to determine the budget recommendations and project priorities to be presented to the Washington State Legislature. Initially a third party facilitator could help WSDOT and WSP guide discussions and processes toward a complimentary approach for both agencies.

Recommendation 3 – Revisit agencies roles and update documentation

The primary source for detailing agency responsibilities regarding inspection stations in Washington State is a Memorandum of Understanding (MOU), signed by WSDOT and WSP on April 1, 2011, that detailed each agency's responsibilities regarding the day-to-day operations and long-term funding and planning for the system of inspection stations. It was very limited in its scope and did not sufficiently anticipate long-term evolution of either truck enforcement strategies or the broader transportation network. The MOU must be revisited and revised to not only serve as a strategic and financial guide for both agencies, but also as a baseline for setting the State's vision for truck enforcement. It should also establish processes for review and evolution of the MOU (as well as other documentation related to inspection stations such as the Joint Operations Policy Statement) on a periodic basis, and processes for updates of underlying reference documents on a frequent basis.

The key objectives in this revision of the MOU must be:

- Defining the expected outcomes, relevant priorities, and specific performance measures that both agencies will agree on as constituting effective truck enforcement;
- Clarifying organizational structure and defining leadership roles for managing the truck enforcement program (as per the Finding 1);
- Thoroughly defining truck enforcement activities and each agency's role in supporting these activities;
- Identifying and standardizing the process for how truck enforcement leaders interact and influence other parts of both agencies as well as other entities such as the Washington Traffic Safety Commission; and
- Setting a framework for how the two truck enforcement leaders will report to executive leadership of both agencies and recommend future MOU updates.

It is important that the MOU explicitly outline how the truck enforcement leaders are expected to report progress, system performance, challenges, and strategies to the leadership of both agencies, as well as reporting to the Legislature.

Recommendation 4 – Update the WSDOT Design Manual

WSDOT's Design Manual,¹³ most recently updated in November 2015, details policies, procedures, and methods to develop and document the design of infrastructure for the transportation network in Washington State. The final section of the manual, Chapter 1720, deals with design and placement of new weigh stations. However, the Design Manual only discusses the need for new facilities. It does not address how existing facilities should be considered in the planning or design of other highway infrastructure projects. This gap and its implications for both agencies is illustrated by the closure of the Federal Way station due to safety concerns from a highway interchange project in 2010. More stations will be potentially threatened by upcoming infrastructure projects (see Figure ES.6), such as the widening of Interstate 5 at Joint Base Lewis McChord.

The Design Manual should also be updated to include a "check" for impacts on inspection stations or commercial vehicle operations during projects such as highway design, paving, or interchanges where these impacts are most likely to occur. As an example, the following types of questions could be included in a checklist or decision tree:

- Is the project within 1 mile of an inspection station or enforcement-related technology (e.g. a Weigh-in-Motion scale or electronic screening system)?
- Will the project require rerouting of commercial vehicles, or changes to weight or length restrictions?

If the answer to either of these questions is "yes" then the project manager would be required to contact Commercial Vehicle Staff in WSDOT and WSP (this function can be served by the interagency working group described in Recommendation 1). The purpose of this dialogue is to communicate clearly that the project may have potential impacts on the inspection station system or commercial vehicle enforcement. This does not mean that a project will be required to include mitigation measures or alleviate impacts, only that communication is established between the proper channels to ensure awareness of potential impacts. This inclusion of a "check" during the planning process will help avoid a breakdown in communication, such as occurred during the I-5, SR 18, SR 161 Triangle Project as documented in the Federal Way Case Study, above. A similar checklist could also be included early in the project identification process to ensure that the appropriate parties are aware of a new project and are able to contribute to the planning process.

¹³ Washington State DOT. *Design Manual M 22-01.12*. November 2015. On-line at: <http://www.wsdot.wa.gov/publications/manuals/fulltext/M22-01/M22-01.12Complete.pdf>.

Finding 2 – Inspection stations, regardless of size or technologies, should be managed like any other type of asset

There is no Asset Management Plan currently in place for the inspection station system. This leads to a number of issues, including not having a protocol for what to do when a station or technology reaches the end of its life. WSDOT and WSP do not currently track the performance of the system in the way that is necessary to make asset management decisions.

The following recommendations are related to asset management:

Recommendation 5 – Create joint agency outcome-based performance measures

Ideal performance measures would reflect how truck enforcement strategies affect carrier and driver behavior, and how changes in that behavior affect the goals of improving infrastructure preservation, highway safety, and freight mobility. To get to those long-term measures, however, WSP and WSDOT will need to develop some intermediate measures to gain a sense of how enforcement output translates into improved preservation, safety and freight mobility outcomes. The following initial performance measures will inform the Legislature while enabling both agencies to review their underlying data and process and consider approaches for innovating additional outcome-based measures.

- Exposure of truck traffic to truck enforcement strategies.
- Carrier and driver behavior at stations.
- Infrastructure degradation change.
- Truck-related fatality change.
- Truck-related, accident-related, road delay.
- Time spent per truck delayed due to enforcement, for trucks not found in violation.
- Cost of enforcement.

These performance measures may need to change in order to reflect the outcomes and objectives formalized in Recommendation 3.

Recommendation 6 – Apply an asset management framework to truck inspection stations

WSDOT is already very familiar with the use of asset management strategies and practices. WSDOT regularly assesses many statewide assets such as bridges and pavement. The pavement asset management program at WSDOT has recently been recognized as a national leader. The program is defined as, “A coordinated set of activities, all directed toward achieving the best value possible for the available public funds in providing and operating

smooth, safe, and economical pavements.”¹⁴ Slightly modified, this statement defines the reason for implementing an asset management program for the inspection system. The Washington State Patrol is less conversant in these strategies, yet WSP adoption of asset management strategies will enable the agency to better manage the system and interact with WSDOT to make capital decisions.

There are two core questions that an asset management strategy should address:

- Why should funds be made available to the truck inspection station network, as opposed to other WSP, WSDOT, or legislative priorities?
- When funds or other resources are available to maintain, improve, or expand the truck inspection station network, what investments should be made?

An asset management framework for the inspection station system would include developing and implementing a number of recommendations found throughout this document, including:

- A common language and understanding of the system goals and priorities between the agencies (Recommendation 1)
- A detailed accounting of the assets of the system (Recommendation 6)
- Measurements of how system assets are achieving statewide goals through *outcome-based* performance measures as opposed to the output-based measures found in the annual Statewide Enforcement Plan submitted to FHWA (Recommendations 3 and 5),
- Investment needs (Recommendation 7) and priorities for a planning horizon consistent with other legislative transportation funding planning horizons (Recommendation 8), and
- A feedback loop (data) to allow for refinement based on execution of the above (Recommendation 10).

Examples of Questions to Consider in an Asset Management Strategy

Question 1 – When should stations be built? What type of station should be built? What criteria should be used to make these decisions?

Data and performance measures should be used to determine *where* new inspection stations should be located throughout the State. *Safety* and *infrastructure preservation* should be the main criteria, but others can be considered as well, such as the need for data collection. The primary consideration in type of station to be built should be the tradeoffs between safety, infrastructure preservation, and freight mobility. Depending on the needs in a particular location, one or another aspects of the station could be emphasized. Characteristics of the surrounding area, cost, and available staffing should also impact what type of station is built. In rural areas with a low volume of traffic, a station with a lot of infrastructure may not be

¹⁴ <http://www.wsdot.wa.gov/Business/MaterialsLab/Pavements/PavementManagement.htm>.

necessary, and a simple setup with static scales and an inspection area may suffice. In urban areas and on heavily used corridors, traffic management becomes a primary concern and the station should be designed to balance traffic flow with safety and weight inspection activities.

Question 2 – Once a station is built (or conceptualized), how will the agencies ensure the station is kept both functional and in good condition? What criteria determine functionality and condition? Who is responsible for each of these criteria?

Once a station is built, WSDOT and WSP have joint responsibility to keep the station in good working order. The criteria for determining whether a station is in good working order, both functionally and conditionally, will depend on the station type. For example, a CVISN-equipped station would be considered nonfunctional if its electronic screening equipment was not working, whereas a roadside pull-off does not have this technology and so it does not need to be considered.

Table ES.4 shows some example questions to determine functional or conditional deficiency at a fixed site equipped with electronic screening. WSP and WSDOT should jointly explore and expand these questions as part of the asset management process. In general, functional deficiency is caused by a lack of or nonfunctioning technology, inadequate physical layout, or life expectancy of the station infrastructure. Conditional deficiency is caused by the need for maintenance and upkeep, and other operational issues such as staffing and utilities.

Table ES.4 Example Questions to Determine Site Condition and Functionality
Washington State Inspection System

Determining Functional Deficiency	Determining Conditional Deficiency
Is the site design, ramp length, and inspection areas sufficient to process truck volumes?	What year was the administration building constructed? Is it in good physical condition?
Is the infrastructure and hardware at the right level for the station type? E.g., are the scales installed and functional? Is the electronic screening equipment installed and functional?	What year were any ancillary buildings (inspection buildings) constructed or undergo substantive maintenance work? Are they in good physical condition?
Is the technology (software, fiber optics, e-screening) sufficient to process truck volumes and in good working condition?	Are the utilities (heat, electricity, water, plumbing) sufficient and in good condition?
Is the available technology within its life expectancy and performing according to design?	Is the building properly set up for optimal work flow (Computers facing the scale, signage controls easy to reach and operational?)
Is the physical infrastructure of the station (e.g., buildings) within its life expectancy?	Is there adequate staffing to operate the site?

Using Fort Lewis as an example, the site is located on a high-volume roadway and uses electronic screening and advanced technology. However, some aspects of the technology do not perform according to design, and the ramp length leading to the site is too short for the

volume of trucks on the roadway. These aspects are functional deficiencies of the station. The administration building at Fort Lewis is in generally good condition, but has a conditional deficiency due to the fact that the station is generally staffed by a single officer, which is not sufficient given the traffic volumes at the site.

Example Applied Asset Management Matrix Framework

These two aspects – functionality and condition – can be shown on a matrix framework, illustrated by Figure ES.8. The intention of this framework is to visually identify the type of need at individual stations, and can also be used to see the system needs as a whole. Sites that fully meet the functional requirements for that location are at the top of the matrix, while sites that are unable to perform efficiently due to poor site design, insufficient technology, or other lack of infrastructure would fall to the bottom of the matrix. Similarly, sites that are maintained in good condition and operated efficiently will appear on the right of the matrix, while sites in poor condition or operated inefficiently will be at the left. For example, a site that can process current traffic volumes and has sufficient technology but has a dilapidated building and is only open one day a week due to insufficient staffing would appear in Quadrant 2. Fort Lewis, referenced above, would appear near the middle of Quadrant 4.

A fifth “quadrant” appears below the matrix indicating locations where there is an identified need for a site but a facility has not been built (SR 290 Spokane POE Bypass). Because there is no site, the functionality does not exist and the site condition is neutral. Including identified needs in the matrix helps to frame a discussion of the tradeoffs associated with investments in the system.

Two other sites are included in Figure ES.8 for illustrative purposes. WSDOT and WSP should replicate this analysis for all sites as part of an initial task to implement an asset management program. The color and shape of each symbol matches the condition (open or closed) and classification.

Examples:

- Federal Way is both functionally and conditionally deficient. The site is currently not operable due to safety concerns that arose during the construction of the I-5/SR 18/SR 161 Triangle Interchange Project. There are safety and operational concerns due to the proximity of the site entrance ramp (where trucks need to slow down to enter the facility) and the on-ramp to Interstate 5 (where vehicles need to speed up to merge with traffic), as well as the location of the WIM.
- The Spokane Port of Entry is new and the technology and infrastructure are in good working order. The site includes mainline WIM technology, dual scales, extended truck parking, a return loop for reweighings, and an inspection building for conducting safety inspections. The functionality rating is below the maximum due to the location of the site; although it is on one of the highest volume routes in the State (Interstate 90), there is a convenient bypass route available. This has led to the need to consider a virtual inspection station on SR 290 to detect trucks bypassing Spokane.

Figure ES.8 Asset Management Matrix



Source: WSDOT, WSP, Cambridge Systematics.

Recommendation 7 – Maintain and publish a biennial needs list

The framework discussed above can be used to develop a set of inspection station needs (which will also feed into the System Plan in Recommendation 8) and to prioritize which investments need to be made. We recommend that this list be updated biennially as part of the budget process, and done so jointly by both agencies, and made publically available on a web site.

In order for this approach to be effective, the responsible parties (WSP and WSDOT) need to “buy in” to the process and agree on a number of criteria for making joint decisions, including:

- Agree on definitions of functional and conditional deficiency. The concepts identified in the above table and matrix are examples; the two agencies must agree on definitions that fit their particular vision and goals for the system. These definitions need to incorporate the life expectancy of a site – for example, at some point in time, deficiencies at a station may switch from being a maintenance concern (condition) to an operational concern (functionality), leading to a shift in responsibility between the agencies.¹⁵
- Determine basic cost assumptions for moving sites between quadrants on the matrix.¹⁶
- Develop criteria for deciding when a station should be decommissioned. Determine what happens when this occurs. Does the site return to quadrant 5 (identified need but not built)?
- Agree on a process and metrics to identify the need for building a new station or changing the station type of an existing station. This also includes determining what station type is needed. A new station can be placed in the matrix in Quadrant 5.

Quadrant 5 is critical to this process. Identifying new needs increases the exposure of the industry to truck enforcement strategies, directly impacting the performance measures identified in Recommendation 5. The needs list should be developed at a level of detail that is manageable for both agencies, considers both short- and long-term needs, aligns with existing WSDOT, WSP, and the Legislative capital planning processes, and allows for prioritization of projects based on funding availability and state priorities.

¹⁵ A similar type of example is a highway interchange. At some point as traffic volumes increase, the design of the interchange is no longer adequate, regardless of the condition of the infrastructure.

¹⁶ For example, the latest State Enforcement Plan (2016) estimates that the cost of replacing the administrative/scale building (improving both condition and functionality) at Plymouth POE and building a new inspection building (improving functionality) is \$11.3 million. Installing modern scale pads (increased functionality and condition) costs approximately \$175,000 per scale.

Finding 3 – The inspection station system is not adequately accounted for in WSDOT planning

WSDOT produces a number of long-range plans that guide the development of the State's transportation modes and assets. This type of document is missing for the inspection system. There is no long-term vision, goals, or principles for the inspection station system. Stations are built or replaced on ad hoc basis, based on short-term or locally identified needs. Future system needs and use are not considered; instead planning is focused on building and rebuilding a system that is more than 50 years old.

The following recommendations are related to planning needs:

Recommendation 8 – Develop a joint statewide inspection station system plan

Along the lines of other planning documents developed by WSDOT for its other modal systems (e.g., Ferry, Aviation, Freight), this planning document would:

- Contain a vision and goals for the inspection station system;
- Identify system assets;
- Create or include performance measures; and
- Facilitate future scenario planning.

A plan for the Inspection Station System could be developed as a stand-alone plan, or it could be incorporated into existing planning efforts, such as the Freight Mobility Plan.¹⁷ The "Minnesota Statewide Commercial Vehicle Weight Compliance Strategic Program," developed by Minnesota DOT and Minnesota State Police in 2005,¹⁸ is an example of an effective, jointly developed stand-alone plan. WSDOT and WSP should be co-authors of this plan, as the plan will guide the actions of both agencies. It may be that a third party will be necessary to guide the development of the plan and ensure that each agency's needs and goals are being accounted for. Local enforcement agencies can also play a key role in providing data, identifying needs, and understanding local and long term development. Private sector involvement, especially of truckers, is also critical. For example, stakeholders may be able to identify locations in the system that unfairly target certain types of industries, creating an uneven playing field in the trucking industry.

There is also a need for the Plan to be a "living document" that is updated at a regular intervals. This requirement will foster communication between the agencies and help mitigate the impact of institutional turnover. It will also ensure that the agencies are considering new developments in the commercial vehicle enforcement field that could change how the inspection system is designed and operated. The System Plan needs to conceptualize how the commercial vehicle industry will operate 20 years in the future and determine how best to

¹⁷ On-line at: <http://www.wsdot.wa.gov/freight/freightmobilityplan.htm>.

¹⁸ On-line at: http://www.dot.state.mn.us/ofrw/PDF/cvePlan051004_1.pdf.

achieve system goals under that scenario. Planning for a system to handle current conditions will leave Washington State with an inspection system that is unable to meet future challenges. Understanding future needs will inform the asset management program by driving the inclusion of new inspection sites in Quadrant 5 of the asset management matrix.

Finding 4 – WSDOT and WSP have insufficient data or data-sharing arrangements to make strategic decisions regarding the inspection station system

Data has been compartmentalized and is not shared on a regular basis within or between WSP and WSDOT agencies. In a number of cases, data provided by the agencies during the course of this study was inaccurate or out of date. For example, records of station closures were not included in documentation provided. Station IDs and naming conventions were not reliable between agencies – for example the “Federal Way” station is listed as “SeaTac” in some documents. Furthermore, each agency currently only collects or uses partial data relating to the inspection station system, e.g., WSDOT collects truck volumes, but does not have a record of station locations.

The following recommendations are designed to improve inspection station data:

Recommendation 9 – Develop a data sharing agreement between WSDOT and WSP

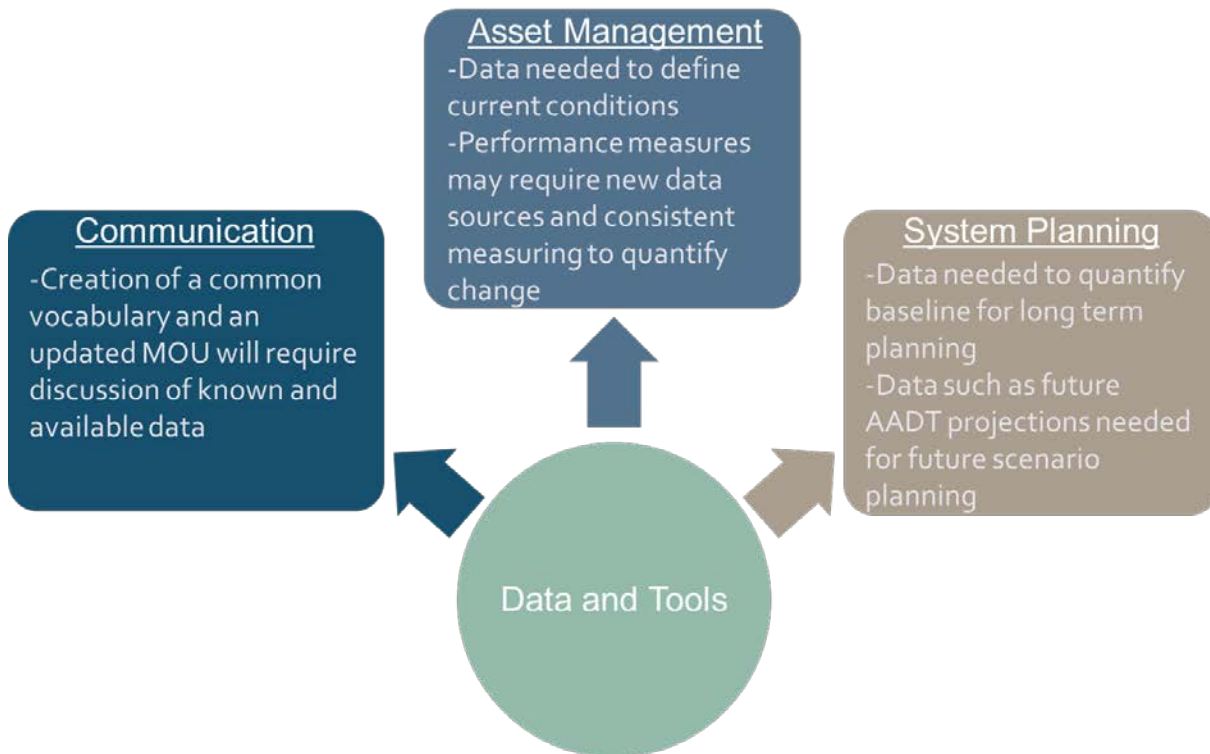
A new approach to collecting and utilizing data is an essential element to implementing each of the previous recommendations in Findings 1 through 3. As part of formalized communication procedures between WSDOT and WSP, a data sharing agreement should be developed. The agreement should address data collection, sharing, and distribution procedures. A sub-group of the interagency working group discussed in Recommendation 1 should be charged with designing and supervising data sharing activities. A summary of data needs and uses relating to the recommendations in this study are summarized in Figure ES.9.

Recommendation 10 – Collect and maintain shared data

Data from a number of sources is required to develop outcome-based performance measures, make capital programming decisions, and implement many of the recommendations described in previous sections. The data should be maintained in a single location, in a format that is easily understandable and updatable. As part of this project, an electronic map was developed that contains data from a number of sources. This map and the underlying data should be maintained by the interagency working group, and available for decision-makers in WSDOT, WSP, the Legislature, and other interested parties.

Finally, the ability to share data between inspection sites and with neighboring states is a key consideration for the future. As data sharing arrangements are formalized between WSP and WSDOT, data collection, storage, and dissemination techniques utilized by neighboring states should be examined to determine if there is a potential for future integration with Washington’s system.

Figure ES.9 Data Required to Implement Recommendations



Moving Forward

To implement the findings and recommendations of this study, a four-stage approach should be taken as summarized in Table ES.5. Each implementation step may address one or more of the above recommendations.

Through implementation with the above schedule, we anticipate the following positive outcomes for the State of Washington by the end of the 12 month period:

- Consensus between agencies as to the vision and objectives of investing in truck inspection stations;
- An accurate estimate of project backlog and long-term funding needs;
- A definition of current performance of the truck inspection system, and expected performance based on anticipated future funding;
- Initial integration of truck inspection station considerations into WSDOT project selection and design; and
- Guidance for WSP to make investment decisions between truck inspection stations and other agency initiatives.

With these outcomes in place, both WSP and WSDOT can then move forward more effectively on the longer term goals of leveraging truck inspection stations to reduce infrastructure damage, reduce truck-related fatalities, and improve freight mobility for the citizens of Washington.

Table ES.5 Recommended Implementation Approach for Washington State Inspection System Recommendations

Stage	Implementation Steps	Recommendation Addressed	Timeline
1	<ul style="list-style-type: none"> Agencies identify truck enforcement leaders (if in house) or outline approach for acquisition. Agencies form a working group to revise documentation such as the MOU. WSDOT to formulate a plan to inform WSP on WSDOT asset management practices for other assets. Identify all WSDOT projects under construction with potential impacts to truck enforcement sites. 	<ul style="list-style-type: none"> Recommendation 1 Recommendation 3 Recommendations 1 and 6 Recommendations 1, 8, and 10 	3 months
2	<ul style="list-style-type: none"> Draft revision of the MOU presented to the Legislature, with outstanding issues to be resolved. Recommendation for how the Joint Statewide Inspection Station Plan should be either incorporated into existing agency documents or developed as a standalone plan. Agency update of the electronic map developed earlier in this project. Initial estimate of current industry exposure to truck inspection stations. Draft needs inventory of new sites (Quadrant 5). Assessment checklist for Quadrants 1-4. Combined data definition for current inventory. Develop a schedule for updating the WSDOT Design Manual once the MOU is finalized, plus develop appropriate intermediate guidance to designers for the interim period. 	<ul style="list-style-type: none"> Recommendation 3 Recommendation 8 Recommendation 10 Recommendation 10 Recommendation 6 Recommendation 6 Recommendation 10 Recommendation 4 	6 months
	<ul style="list-style-type: none"> Report to the 2017 Legislature on Stages 1 and 2 deliverables. 		December 2016
3	<ul style="list-style-type: none"> Final MOU executed, and process for its annual review. Completed Joint Statewide Inspection Station System Plan, including: <ul style="list-style-type: none"> Initial presentation of all performance measures and current values; Asset management assessment of all current and needed sites; Data management implementation, including memorandum on any internal initiatives needed; and Revised schedule for open items (Design Manual changes, information technology/data initiatives, etc.). 	<ul style="list-style-type: none"> Recommendation 3 Recommendations 2, 5, 8, and 9 	12 months, then ongoing upkeep

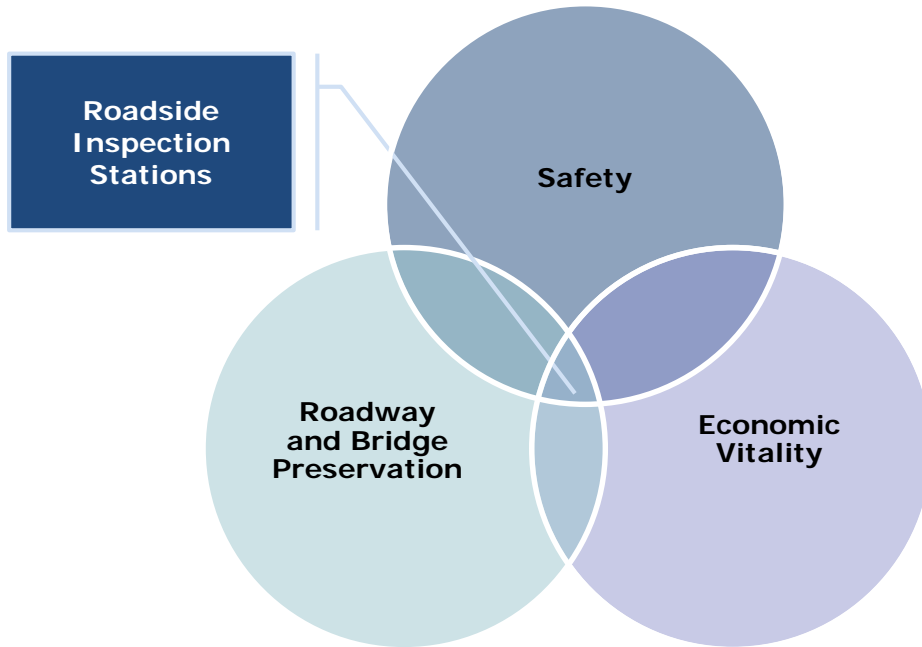
Stage	Implementation Steps	Recommendation Addressed	Timeline
	<ul style="list-style-type: none">• Report to 2018 Legislature on Stage 3 deliverables.		December 2017
4	<ul style="list-style-type: none">• Priority list of investments for consideration in the 2018 budget process for the 2019-2021 biennium.• Proposals for funding that reflect an analysis of:<ul style="list-style-type: none">– Current costs of the system (both agencies, operating and capital); and– Current revenues and avoided costs generated by the system.	<ul style="list-style-type: none">• Recommendation 7• Recommendations 8 and 10	August/September 2018

1.0 Introduction

1.1 Purpose of This Study

Each day, thousands of commercial vehicles move goods to, from, and through the State of Washington. This activity is a cornerstone of the State’s economy, and is an essential part of the supply chains that supply Washington residents. Maintaining mobility for freight, while simultaneously ensuring the safety of commercial and passenger vehicles, and preserving the State’s highway infrastructure are three key priorities of the State of Washington. The Washington State Patrol (WSP) and Washington State Department of Transportation (WSDOT) share similar goals and missions that support these overarching goals. Roadside inspections and inspection stations are the nexus of where these priorities come together. Figure 1.1 shows where the inspection station system fits in the context of WSP and WSDOT goals.

Figure 1.1 Washington State Inspection Station Goals



The purpose of the study was to examine the effectiveness and efficiency of the Washington state inspection station (or weigh station) system. The 2010 closure of the Federal Way southbound inspection station, 2011 closure of the Everett southbound inspection station, and potential impacts of numerous WSDOT projects on other inspection sites created concern about the lack of a strategic approach to the management of the system. The Washington State Legislature Joint Transportation Committee (JTC) established four goals for the study:¹⁹

- Provide educational material for use by Members and staff of the Legislature and the public about the planning, placement, and operations of the system of weigh stations in Washington;
- Evaluate the system's efficiency in managing its capital assets and operations;
- Evaluate the system's effectiveness at achieving outcomes relating to road preservation and traffic safety, while balancing the state goal of freight mobility; and
- Make recommendations regarding a more strategic approach to managing the system.

1.2 About This Report

To address the above goals, the study team gathered and synthesized data, undertook technical analyses, examined best practices, and interviewed those directly responsible for the inspection station system and relevant stakeholders. Draft technical reports were submitted to JTC with data gleaned from the above steps, and a draft of the findings and recommendations was presented to the Washington State Joint Transportation Committee on November 17, 2015. This Final Report incorporates feedback received from the JTC at that meeting and from previous comments and suggestions received on the draft technical reports. This document is organized into the following sections:

- The remainder of Section 1.0 provides a high-level overview of the types of inspection stations and weight and safety inspection stations and Federal programs;
- Section 2.0 details Washington's inspection system, including physical infrastructure, operations, enforcement activity, agency roles, and funding and programming;
- Section 3.0 highlights best practices gained from a literature review of U.S., Canadian, and global reports as well as interviews conducted with neighboring states;
- Section 4.0 presents the findings and recommendations developed as part of the study; and
- Additional technical material is provided in a series of Appendices.

¹⁹ State of Washington Joint Transportation Committee. Request for Proposals. Efficiency and Effectiveness of Weigh Station Management in Washington State. June 4, 2015.

1.3 Overview of Inspection Stations

Inspection stations, also referred to as “weigh stations” in Washington State, are locations where commercial vehicle enforcement activities such as weighing vehicles and safety inspections occur. Historically, these sites focused on weight inspections. However, recent emphasis on driver and vehicle safety at both the state and Federal level has expanded the role of these sites beyond weight enforcement alone. For this reason, the term “inspection stations” or “inspection sites” more accurately depicts current practices. Some inspection stations are also called “Ports of Entry,” which serve as gateways into a state for interstate or international traffic.



Transponder Readers (shown above) are one type of Electronic Screening

Inspection operations in the United States typically utilize one or more of three basic configurations:

1) fixed inspection stations, 2) virtual inspection stations, or 3) mobile roadside enforcement. Fixed inspection stations and mobile roadside enforcement are currently in use in Washington State; virtual inspection stations are currently under consideration at two locations. The primary purpose of all three configurations is to enforce truck weight regulations in order to protect infrastructure from excessive wear and tear caused by overweight trucks. Depending on the state, they are also used to screen trucks for safety, credentials, and logbook violations as well as issue permits, collect registration and fuel taxes, and conduct other activities associated with commercial vehicles.

The vast majority of states, including Washington, currently support *electronic screening*, at some or all inspection locations.²⁰ Electronic screening is the automated screening of vehicles to distinguish between known or likely safe and legal vehicles and potential violators *before* they stop at an inspection facility. The intent of electronic screening is to allow safe and legal trucks to bypass the station while enforcement resources are focused on higher-risk carriers and vehicles. Mainline weigh-in-motion (WIM), which measures a truck’s weight on the main roadway at highway speeds, is frequently used as part of an electronic screening system, providing real-time weight verification concurrent with automated safety and credentials verification for bypass eligibility. This approach to screening commercial traffic improves freight mobility for legal and safe carriers, saving them and their drivers time and money, and helps focus inspections on likely violators rather than the entire commercial trucking fleet.²¹ WIM can also be used as a screening tool on the entrance ramp to an inspection facility where

²⁰ Washington State utilizes an electronic screening system call NORPASS. For further information, see the Washington State Department of Transportation Commercial Vehicle Information Systems Network web site at: <http://www.wsdot.wa.gov/CommercialVehicle/CVISN/apply.htm>.

²¹ FHWA ConOps for VWS by Cambridge Systematics: http://www.camsys.com/pubs/FHWA_virtual_weigh_stn.pdf.

trucks must exit the mainline but if they pass the electronic screening do not have to stop on the static scales to be weighed. Electronic screening is also used as a key component in virtual inspection stations. In general, volume of commercial vehicles on a given roadway is one of the major considerations for the type of facility that may be needed. Lower volume sites are well served by mobile enforcement, and as truck volumes increase additional screening through virtual enforcement or fixed facilities are needed. However, the threshold for when different types of stations are employed differs by state and depends on the mission and resources of the agency.

State Departments of Transportation and law enforcement agencies often interact to conduct weight and safety inspections. Typically, inspection stations are staffed with sworn officers of State Patrol, but some states allow other State Patrol, DOT-based sworn officers²² or DOT civilian employees to perform functions at the station. In Washington, inspection stations serve both weight and safety inspection purposes, and are staffed with a mixture of specially trained commercial vehicle officers from the Washington State Patrol and Washington State Patrol Troopers.

1.3.1 Fixed Inspection Stations

Fixed inspection stations are the most common setup currently in use in the United States. Washington has 52 fixed inspection sites. Most fixed inspection stations include a pull-off ramp from the main roadway and a combination of fixed infrastructure, such as a static scale, and an administration building or scale house. Sites may or may not incorporate electronic screening. Figure 1.2 shows an example layout of a fixed inspection station, and Table 1.1 lists some of the pros and cons of fixed inspection stations.

The vast majority of fixed sites in the U.S. are located on the right side of the highway right-of-way. Some states, including Florida and Idaho, have also sited fixed stations in the center median of a divided highway. Inspection stations located in a median allow trucks to enter one station from two directions of travel on the same segment of roadway. This approach can be an efficient and effective means of truck evaluation and enforcement by staff, and offers potentially significant cost savings during construction and operation of the site. These types of sites can be effective in strategically situated, non-Interstate locations with moderate traffic volumes. However, siting and placement of this type of inspection station configuration can be challenging, as safety considerations dictate the need for certain configurations of traffic lanes and median space. Examining locations in Washington for the possible placement of a median site should be considered during development of the joint statewide inspection station system plan (Recommendation 8).²³

²² In Wisconsin, for example, the State Department of Transportation includes sworn officers who focus on commercial vehicle enforcement.

²³ A more detailed evaluation of median siting can be found in the Final Report for this study.

Figure 1.2 Example Fixed Inspection Station with Electronic Screening

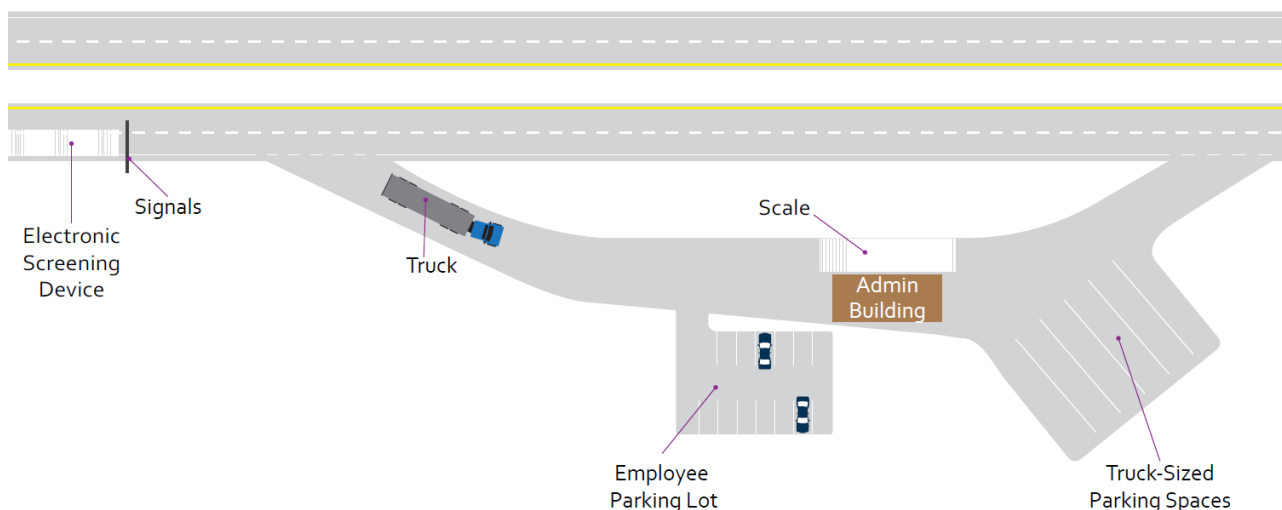


Table 1.1 Pros and Cons of Fixed Inspection Stations

Pros of Fixed Inspection Stations	Cons of Fixed Inspection Stations
Located on the side of a roadway – typically a major highway, and includes fixed infrastructure such as scales, inspection areas, and administration buildings.	Limited physical and processing capacity that can be regularly overwhelmed, resulting in commercial vehicles backing up onto the highway and requiring closure of the station so that public safety is not impacted by the lengthening queue.
Availability of several pull-in spaces allows multiple vehicles to be parked or inspected simultaneously, as staffing allows.	Limited geographic coverage due to both the fixed nature of the site and inability to deploy fixed sites in some areas (e.g., urban, mountainous) due to site constraints.
Increased safety and comfort for enforcement personnel due to presence of scale houses, extra roadside space, etc.	Limited hours of operation due to staffing and financial constraints.
	Expenses associated with the acquisition, development, operation, and maintenance of the sites.

Source: Cambridge Systematics, Inc.

1.3.2 Virtual Inspection Stations

An alternative to a fixed inspection station is a virtual inspection site. Although these sites are built at a “fixed” location, they lack the physical infrastructure found at fixed sites and are based on the concept of electronic screening using integrated software systems to capture information about vehicles as they travel down the mainline. Virtual sites can have the option of stationing a mobile officer to undertake inspection or enforcement activities; when an officer is present then the station operates similar to a fixed site. However, a virtual station has the advantage that it still collects data even when an officer is not on-site. This data can be used

to schedule enforcement activities, inform planning studies, and track potential violators for further education or enforcement through audits.

Washington does not currently operate any virtual inspection stations. Figure 1.3 shows an example layout of a virtual inspection station with an officer present, and Table 1.2 lists some of the pros and cons of virtual inspection stations.

Figure 1.3 Example Virtual Inspection Station
With Officer Present

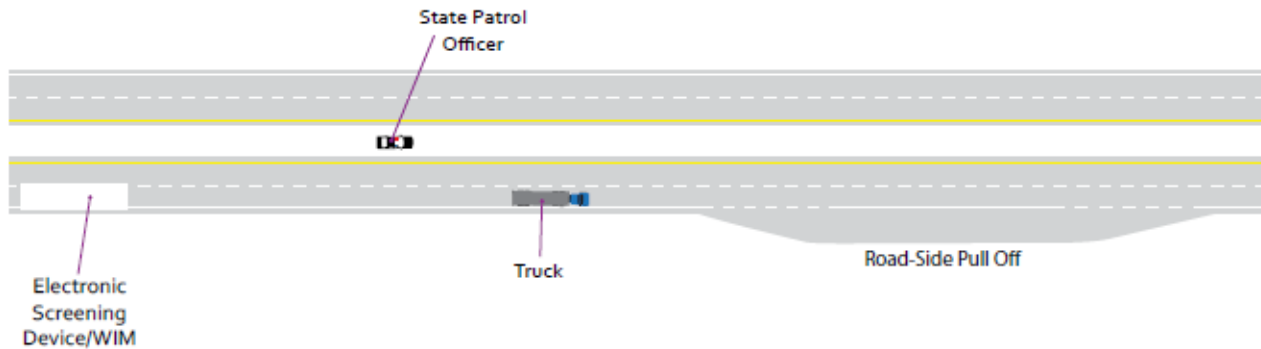


Table 1.2 Pros and Cons of Virtual Inspection Stations

Pros of Virtual Inspection Stations	Cons of Virtual Inspection Stations
Expands the geographic scope of a State's roadside enforcement program by deploying screening technology and monitoring/screening commercial vehicles on routes that bypass fixed inspection stations, secondary roadways, in urban areas, or in geographically remote locations.	Human interaction is still required for <i>enforcement</i> – VIS deployments currently require that a human issue a citation for any overweight or compliance issue that may be detected. Despite the presence of VIS technology, a State's enforcement capacity remains limited to the number of enforcement personnel that are on duty at one time in a given region.
Reduce fuel consumption by legally loaded and operating carriers caused by unnecessary delays at weigh stations.	Limited ability to detect safety concerns unless enforcement officer pulls truck over.
Reduce costs associated with new roadside enforcement assets due to the cost differential between deployment of a VIS and a fixed weigh station.	
Provides data (truck counts, weight, travel times, etc.) that can be used for planning purposes in addition to enforcement scheduling.	
Data from virtual inspection station sites also can be used during planning to effectively target enforcement resources on roadways where overweight trucks are known or are suspected to operate.	

Source: Cambridge Systematics, Inc.

1.3.3 Mobile Roadside Enforcement

Mobile enforcement, which is used in Washington, consists of enforcement activities that do not take place at fixed stations. This type of enforcement can be combined with virtual inspection stations in order to provide citation capabilities without the cost of building and maintaining a full fixed site. As a result, mobile enforcement is generally less expensive in terms of cost, but also has the potential to be less efficient for the enforcement staff.

States' mobile enforcement programs usually encompass temporary roadside locations (e.g., rest areas, modified shoulders, abandoned inspection stations), roving patrols, or both.

Washington operates roving patrols in every county, and has 11 commonly used temporary roadside locations. During mobile enforcement details, commercial vehicles are stopped and weighed on portable scales and may be subject to a safety inspection.²⁴ Note that in some states, probable cause is required to stop a vehicle. Washington State does not have this requirement – State Troopers can stop a vehicle for any reason. Table 1.3 lists the pros and cons of mobile roadside enforcement.



Portable Scales in use on U.S. 23 in Floyd County, KY.

Source: <http://migration.kentucky.gov/Newsroom/kve/010506.htm>

²⁴ Portable scales, just like scales at a fixed site, must be certified annually in order to write weight citations. 3F Certification is performed by the Property Management Division of the WSP, part of the Commercial Vehicle Enforcement Bureau.

Table 1.3 Pros and Cons of Mobile Roadside Enforcement

Pros of Mobile Roadside Enforcement	Cons of Mobile Roadside Enforcement
Expands the geographic scope of a State’s roadside enforcement program through mobile inspections on routes without fixed/virtual inspection stations, on secondary roadways, in remote areas, or on routes or near origins/destinations with a large number of overweight trucks	Human interaction is still required and the mobile inspection vehicle needs to be manned
Enforcement coverage in heavily populated urban or geographically remote locations where it may be difficult to deploy traditional/fixed enforcement operations	Safety concerns due to limited infrastructure and space
Mobile unit/trailer – no fixed infrastructure or permanent placements of screening components required	Slower operations – portable scales can typically only measure one axle at a time

Source: Cambridge Systematics.

1.4 Federal Programs Supporting Inspection Stations

The Federal Motor Carrier Safety Administration (FMCSA) and Federal Highway Administration (FHWA) are the two agencies within the U.S. Department of Transportation (USDOT) that have programs related to inspection stations. These agencies’ roles are briefly described in this section and are discussed in further detail in Section 3.1.

1.4.1 Federal Motor Carrier Safety Administration (FMCSA)

The Federal Motor Carrier Safety Administration (FMCSA)’s mission is to prevent commercial motor vehicle-related fatalities and injuries. Commercial Vehicle Information Systems and Networks (CVISN)²⁵ and Motor Carrier Safety Assistance Program (MCSAP) grant programs are FMCSA funded state-administered programs that provide financial assistance to states to implement projects, systems and activities that improve commercial motor vehicle safety thereby reducing the number and severity of accidents and hazardous materials incidents involving commercial motor vehicles. States use these Federal grants for safety programs designed to identify safety defects, driver deficiencies, and unsafe motor carrier practices, and thereby correct before they contribute to accidents. FMCSA also propagates a number of rules and regulations regarding commercial vehicles, including Hours of Service requirements, vehicle registration (U.S. DOT number), emissions standards, and driver medical requirements.

²⁵ Under the Fixing America’s Surface Transportation Act (FAST) of 2015, the CVISN program will be considered as part of the Motor Carrier Safety Assistance Program

The CVISN program is designed to: improve safety and productivity of motor carriers, commercial vehicles and their drivers; improve efficiency and effectiveness of commercial vehicle safety programs through targeted enforcement; improve commercial vehicle data sharing within states and between states and FMCSA; and reduce Federal/state and industry regulatory and administrative costs.

The goal of the MCSAP is to reduce commercial motor vehicle (CMV)-involved accidents, fatalities, and injuries through consistent, uniform, and effective CMV safety programs as described in a state's commercial vehicles safety plan.

1.4.2 Federal Highway Administration (FHWA)

The Federal Highway Administration supports State and local governments in the design, construction, and maintenance of the Nation's highway system (Federal Aid Highway Program) and various federally and tribal-owned lands (Federal Lands Highway Program).

The FHWA Federal-Aid Highway Program (FAHP)²⁶ supports State highway systems by providing financial and technical assistance for the construction, maintenance and operations of the Nation's 3.9 million-mile highway network, including the Interstate Highway System, primary highways and secondary local roads. The FHWA is charged with implementing the Federal-aid Highway Program in cooperation with the States and local government. The FHWA is heavily involved in the development of Federal size and weight regulations and their impact on states. For example, a state is subject to loss of its entire National Highway System apportionment if its laws or regulations establish weight limits for commercial motor vehicles operating on the Interstate Highway System that are either higher or lower than the Federal weight standards.²⁷ However, because Washington State had a higher weight limit (105,500 pounds) already in place when the federal standards were adopted, trucks can legally operate at the higher limit in the State.

²⁶ This program was created under MAP-21 and is reauthorized as part of the Fixing America's Surface Transportation Act (FAST) of 2015.

²⁷ See 23 U.S.C. 127(a), as implemented in 23 CFR 658.21, "Procedures for reduction of funds." and <http://ops.fhwa.dot.gov/Freight/sw/overview/index.htm>.

2.0 Washington's Inspection Station System

This section discusses Washington's inspection station system. The first section provides an overview of the inspection system using general terminology and descriptions found in the Section 2.1 overview, a brief description of enforcement activities, and a description of inspection station traffic volumes. Section 2.2 provides an overview of enforcement activities in the State, including a more detailed description of site types, personnel, and operations. Section 2.3 describes the inter- and intra-agency responsibilities of WSDOT and WSP regarding the State's inspection station system. Section 2.4 discusses funding and programming in the State. Section 2.5 provides a case study of the Federal Way inspection station, which has been closed since 2010. Comparisons between state inspection station programs are provided in Appendix C.

2.1 Overview of the Washington State Inspection Station System

2.1.1 Infrastructure

Washington's inspection station network contains a total of 63 sites. Fifty-two of the sites are fixed locations and 11 are mobile enforcement locations that are commonly used by the Washington State Patrol. The State does not currently operate any virtual inspection stations. Further classification based on Washington State specific infrastructure results in three groups of sites (2 fixed, 1 mobile):

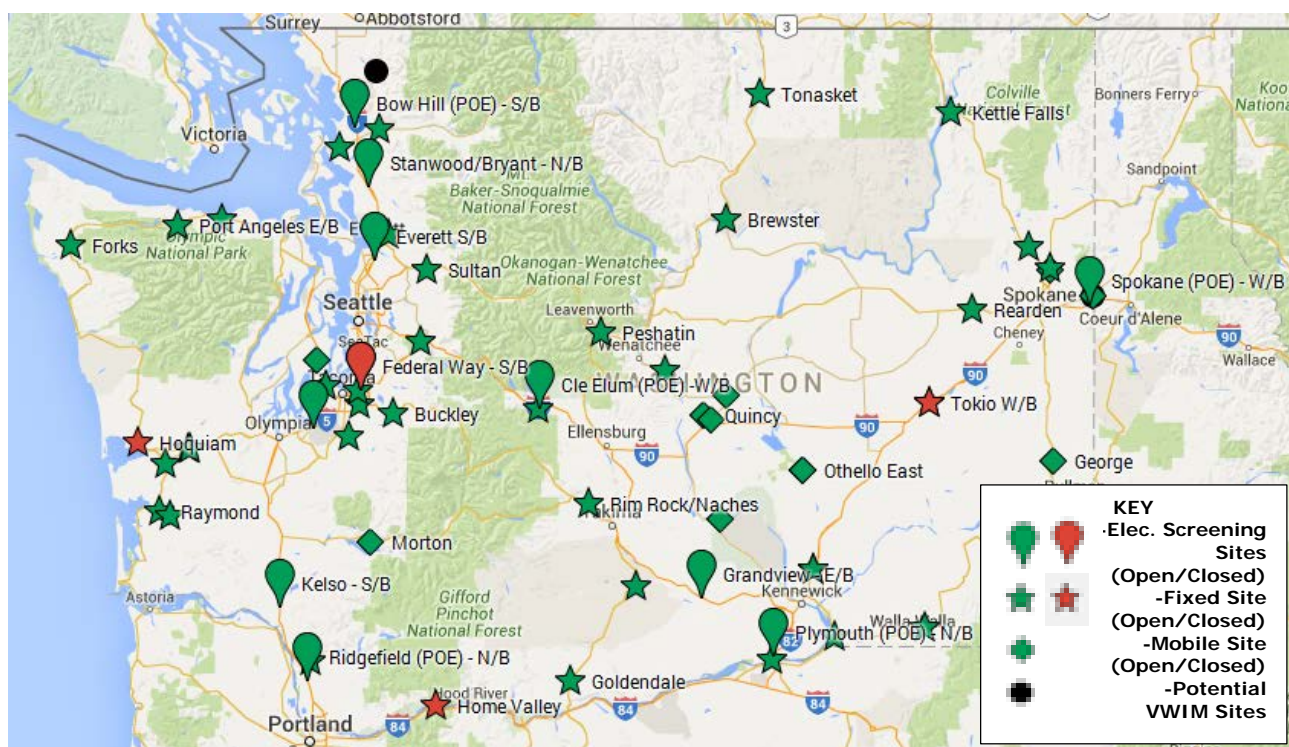
- **Electronic Screening (Fixed) Sites** – The first group, with the highest level of functionality when fully operational, are the 12 locations that are fixed sites equipped with electronic screening technology through the CVISN program, including mainline WIM, automated license plate readers, the software to automatically run safety screening checks, and at Fort Lewis²⁸ a brake inspection system that measure the heat produced when trucks brake to determine if brakes are functioning properly. These sites are also commonly referred to as “CVISN-equipped sites”
- **Fixed Sites** – The second group of sites are 40 fixed inspection stations with a fixed scale for weighing commercial vehicles. Five of these sites are “plug and run” facilities, which are sites with permanent scales that do not have scale buildings or software/computers installed, requiring the use of Patrol cars as mobile “offices” with laptops by enforcement personnel when using the site. The remaining 35 sites in this category have an administration building used to run the site when open, and varying amounts of other physical infrastructure at the site, including truck parking. These sites lack any electronic screening capabilities.
- **Mobile Sites** – The third set of sites are mobile enforcement locations. This includes 11 locations where WSDOT has either slightly widened the road to specifically accommodate mobile weight/safety checks by WSP or where WSP uses infrastructure built for other

²⁸ Fort Lewis is also referred to as Nisqually.

purposes (such as a rest area for motorists) to conduct commercial vehicle operations. In addition, WSP also stops commercial vehicles in each county at random locations, such as along the roadside or in the parking lot of a business. Stops of this nature are included in the mobile enforcement statistics collected by WSP at the county level, but the locations are not included as sites due to their infrequent and random use.²⁹

Further details about each type of inspection station described below are provided in Section 2.2. The state does not currently operate any virtual inspection stations. Figures 2.1 and 2.2 show the Washington state inspection station system.³⁰ Four sites are currently closed. In addition to Federal Way S/B, sites at Home Valley, Hoquiam, and Tokio W/B are currently inoperable due to scale certification being out of date.³¹

Figure 2.1 Washington State Inspection Station System



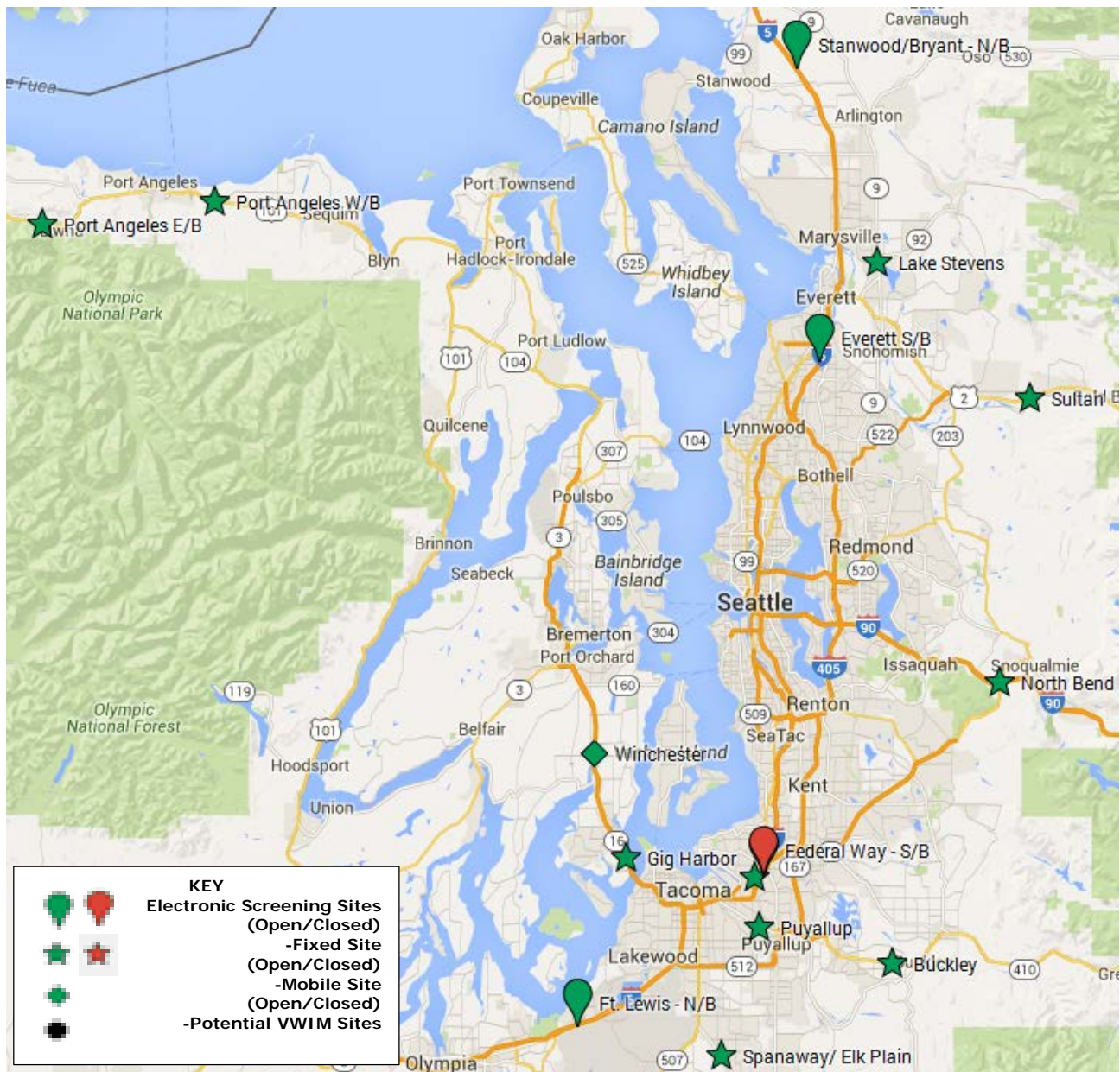
²⁹ The WSP also operates mobile enforcement units in every county who utilize the roadside, parking lots, or other unimproved locations to enforce rules and regulations. Because the locations for this type of enforcement are random, they are not included in list of 63 sites in Washington State.

³⁰ Figures 2.1 and 2.2 are static versions of an electronic map that was developed as part of this study. The electronic map is available as a web-based google maps platform. As described in Recommendation 10, this map should be maintained by the inter-agency working group. Further information can be found in Appendix A to this report.

³¹ Scales must be certified annually to confirm their accuracy. If they are not, the weights obtained from them cannot be used to issue citations. Certification is performed by the Property Management Division of the WSP, part of the Commercial Vehicle Enforcement Bureau.

Source: Washington State Patrol, WSDOT, Cambridge Systematics, Inc.

Figure 2.2 Puget Sound Area Inspection Station System



Source: Washington State Patrol, WSDOT, Cambridge Systematics, Inc.

2.1.2 Operations

The Washington State Patrol is responsible for commercial vehicle enforcement in the State. The approximately 130 personnel who conduct enforcement are divided between Washington State Troopers who have full police authority but focus their activities on commercial vehicles, and Commercial Vehicle Enforcement Officers (CVEO) whose authority is limited to commercial vehicle issues. Further details on personnel are provided in Section 2.0. In 2014, these

enforcement personnel conducted nearly 82,000 inspections, including physically weighing approximately 57,000 vehicles, and found more than 113,000 weight and safety violations.

2.1.3 Systemwide summary statistics

This section provides a statistical summary of Washington’s inspection station system.

Table 2.1 provides an overview of the inspection station system, and Table 2.2 shows aggregated statistics for the inspection station system.³² The vast majority of inspection and weighing activity took place at sites with electronic screening (which are generally located at locations of higher traffic volumes), accounting for more than 82 percent of the trucks physically weighed, 60 percent of the total fines issued, 58 percent of the inspections conducted, and 53 percent of the violations discovered in 2014.³³ Mobile enforcement also led to a high number of violations and weight fines. Mobile enforcement allows for flexible, targeted operations at known problem locations, which in part explains the high rate of violations and fines. Another possible factor is that trucks with known weight or safety issues may try to bypass the fixed sites, reducing the total number of violations that can be found at the fixed locations.

Table 2.1 Washington State Inspection Station System Overview

Criteria	Status (2014)
Number of Sites	52 fixed sites, 12 with WIM; 11 commonly used mobile sites
Number of Additional Scales	434 mobile scales
Personnel	169 total positions, average of 127 filled in 2014. Split between 81 Commercial Vehicle Enforcement Officers (CVEO) and 46 Troopers
Annual Site Traffic Volume	40 million trucks annually on adjacent roads
Number of Screenings (Mainline WIM)	1.9 million (2014)
Number of Inspections	82,400 (2014)
Total Annual Vehicles Weighed	57,000 (fixed scales)
Total Annual Citations	113,000 (weight and safety violations), \$1.9 million in weight fines
Permits/Credentials Issued	No Data

Source: WSDOT. Washington State Enforcement Plan (2016). Interview with Captain Mike Dahl, September 17, 2015.

³² Additionally, this data could be incorporated into the development of future performance measures such as the rate of violations versus inspections at the different site categories.

³³ Electronic screening technology is currently funded by the CVISN program, thus electronic screening equipped sites are also referred to as CVISN sites.

Table 2.2 Washington State Aggregate Inspection System Statistics

Type of Site	Trucks Physically Weighed	Weight Fines	Number of Inspections	Number of Violations
Electronic Screening (11 open sites)	47,083	\$1,126,010	48,097	59,558
No Screening, Fixed (37 open sites)	7,002	\$184,887	7,984	10,237
Mobile (11 open sites) ^a	3,214	\$578,763	26,363	43,214
Total	57,299	\$1,889,763	82,444	113,009

Source: WSP. Note that data for Everett S/B is from 2013. Data from Federal Way S/B, Home Valley, Hoquiam, and Tokio W/B excluded due to being out of service or lack of scale certification.

Note: ^a Mobile sites also include statistics from variable sites in each county.

Table 2.3 lists the 63 sites in the State by county and identifies the types of site, based on the above description, in each. Further details on enforcement activities at fixed sites is located in Appendix B.

As mentioned above, truck volume is one of the major determining factors in where an inspection site should be located and the type of site desired. Typically, large fixed sites with significant technological investments are placed at locations with high truck volumes in order to process the largest number of vehicles possible. There is no threshold volume at which fixed sites are necessary, this level is dependent on state traffic patterns, resources, and system goals.³⁴ In Washington locations with electronic screening typically have been established on the highway corridors with the highest truck volumes. The five locations with the top truck average annual daily traffic, or AADT, in 2014 were Federal Way N/B, Federal Way S/B, Ft. Lewis N/B, Ridgefield, and Kelso. All five are equipped with electronic screening.³⁵ Federal Way has the highest reported AADT, with more than 186,000 total vehicles passing daily. Ridgefield POE is the busiest Port of Entry³⁶ in the State due to its location on Interstate 5 and the presence of major shipping facilities in Portland, Oregon and Seattle-Tacoma, Washington. Of the 77,000 daily vehicles that pass the site, approximately 15.3 percent were trucks. For comparison, the lowest AADT near an inspection site was at Raymond on SR 6, which saw an average of 2,612 vehicles per day of which approximately 316 were trucks.

³⁴ For example, Nevada does not operate any fixed inspection sites.

³⁵ AADT is measured based on closest mainline segment (2014). Note that due to data limitations these segments are not always in the same direction of travel as the station indicated.

³⁶ Historically, Ports of Entry were locations near the state or national border where states would check permits and registrations and collect road taxes, prior to the creation of the International Fuel Tax Agreement (IFTA) which has simplified the reporting of fuel use and collection of fees for trucks operating in more than one state. However, the title today simply applies to a location on a state or national border, as many of these operations are now conducted online and not at the facilities themselves.

Table 2.3 Washington State Inspection Sites and Type by County

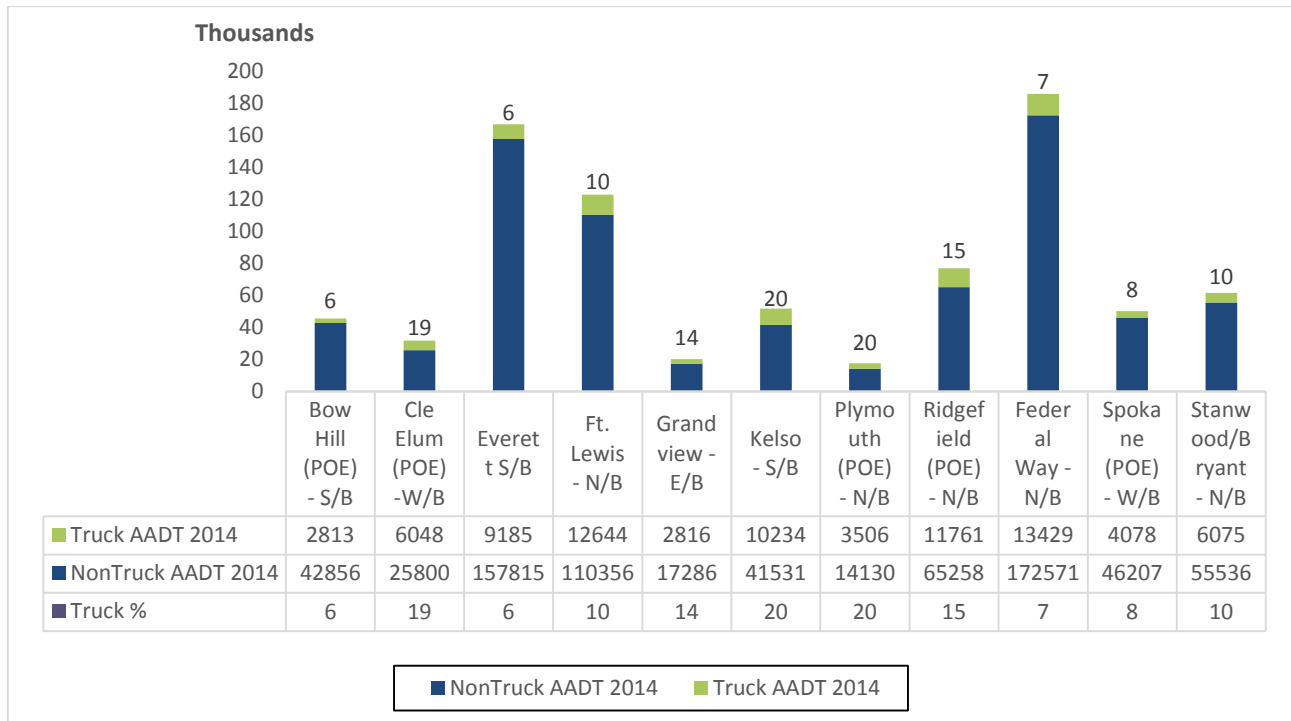
County	Number of Sites	County	Number of Sites
Adams	4 (1 Fixed, 2 Mobile, 1 closed)	Lewis	1 (1 Mobile)
Asotin	0	Lincoln	1 (1 Fixed)
Benton	4 (2 Fixed with E-Screening, 1 Fixed, 1 Roadside Pull-off)	Mason	0
Chelan	1 (1 Fixed)	Okanogan	2 (2 Fixed)
Clallam	3 (3 Fixed)	Pacific	2 (2 Fixed)
Clark	1 (1 Fixed with E-Screening)	Pend Oreille	0
Columbia	0	Pierce	6 (1 Fixed with E-Screening, 4 Fixed, 1 Mobile)
Cowlitz	2 (1 Fixed with E-Screening, 1 Fixed)	San Juan	0
Douglas	1 (1 Fixed)	Skagit	4 (2 Fixed with E-Screening, 2 Fixed)
Ferry	0	Skamania	1 (1 closed)
Franklin	2 (2 Fixed)	Snohomish	3 (1 Fixed with E-Screening, 2 Fixed)
Garfield	0	Spokane	5 (1 Fixed with E-Screening, 2 Fixed, 2 Mobile)
Grant	3 (3 Mobile)	Stevens	1 (1 Fixed)
Grays Harbor	4 (3 Fixed, 1 closed)	Thurston	0
Island	0	Wahkiakum	0
Jefferson	0	Walla Walla	2 (2 Fixed)
King	4 (1 Fixed with E-Screening, 2 Fixed, 1 closed)	Whatcom	0
Kitsap	0	Whitman	1 (1 Mobile)
Kittitas	2 (1 Fixed with E-Screening, 1 Fixed)	Yakima	2 (2 Fixed)
Klickitat	1 (1 Fixed)	Total	63 (59 operating, 4 closed)

Source: WSP, Cambridge Systematics, Inc.

Truck traffic comprises a relatively high percentage of all traffic on many key corridors in the State, thus driving the need for inspection sites that can efficiently and effectively process large volumes of trucks. For all operational fixed sites, trucks averaged 13.68 percent of the daily traffic volumes. Figure 2.3 shows current AADT and current truck AADT at the electronic screening equipped sites. Based on WSDOT projections to 2034, the AADT compound annual growth rates (the steady growth rate per year) at sites with screening varies between 1.2 percent at Grandview and 2.6 percent at Stanwood Bryant. WSDOT does not project future truck percentages, so the number of trucks passing each scale could change. However,

if truck percentages remain constant, Federal Way N/B for example could see more than 17,000 trucks pass the station each day in 2034, a more than 25 percent increase.

Figure 2.3 Washington State Mainline AADT and Truck AADT at Electronic Screening Sites, 2014



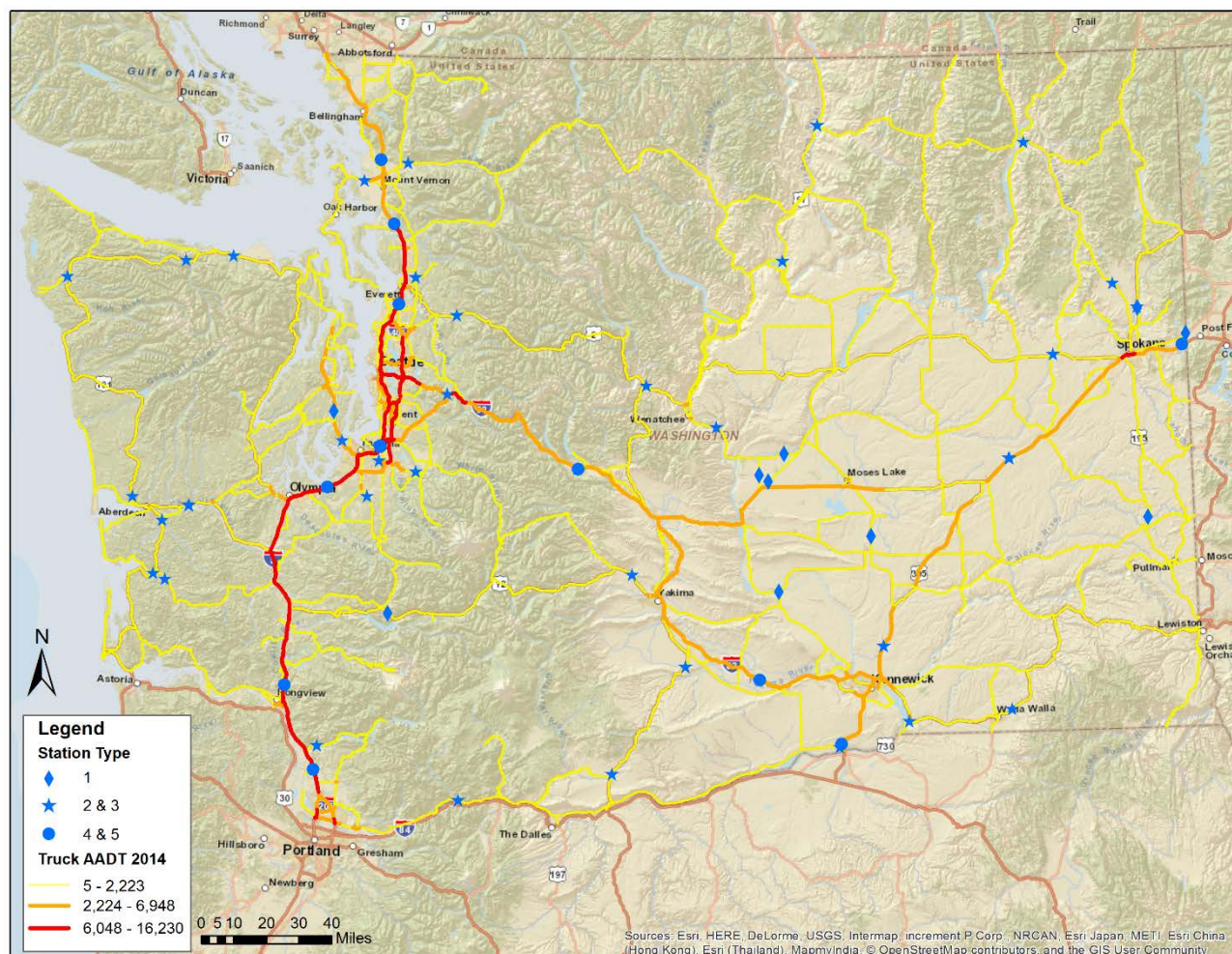
Source: WSDOT.

For nonscreening fixed sites, North Bend currently has the highest AADT followed by Cle Elum and Anacortes. Cle Elum has the highest number of trucks passing on a daily basis, though Plymouth on SR 14 has the highest truck percent of any site in the fixed system.

Approximately 40 percent of the traffic that passes Plymouth is truck, followed by Toppenish on SR 97 at 37 percent and Wallula on SR 12 at 32 percent. Further information on 2014 and projected 2034 truck traffic is presented in Appendix B.

Figure 2.4 shows a map of Washington’s truck AADT totals and station locations. The station types (1-5) referenced in the map are explained in detail in the following section of the report. Briefly, type 1 is a commonly used mobile site, and types 2-5 are different styles of fixed locations. The heaviest truck volumes in Washington’s system occur on I-5 in the Puget Sound region and south to the Oregon border. When open and functioning, there are multiple sites that cover this route. Other heavy traffic volumes occur on I-90, I-82, and U.S. 395. Coverage on these routes varies, with one noticeable gap on I-90 between I-82 and U.S. 395. Further maps and information can be derived from data provided in this study and should be incorporated into the joint statewide inspection station system plan suggested in Recommendation 8 of Section 4.0.

Figure 2.4 Washington State Truck Volume and Inspection Station Locations, 2014



Source: WSDOT, WSP, Cambridge Systematics, Inc.

2.2 Inspection Station Configuration, Technology/Infrastructure, and Personnel/Operations

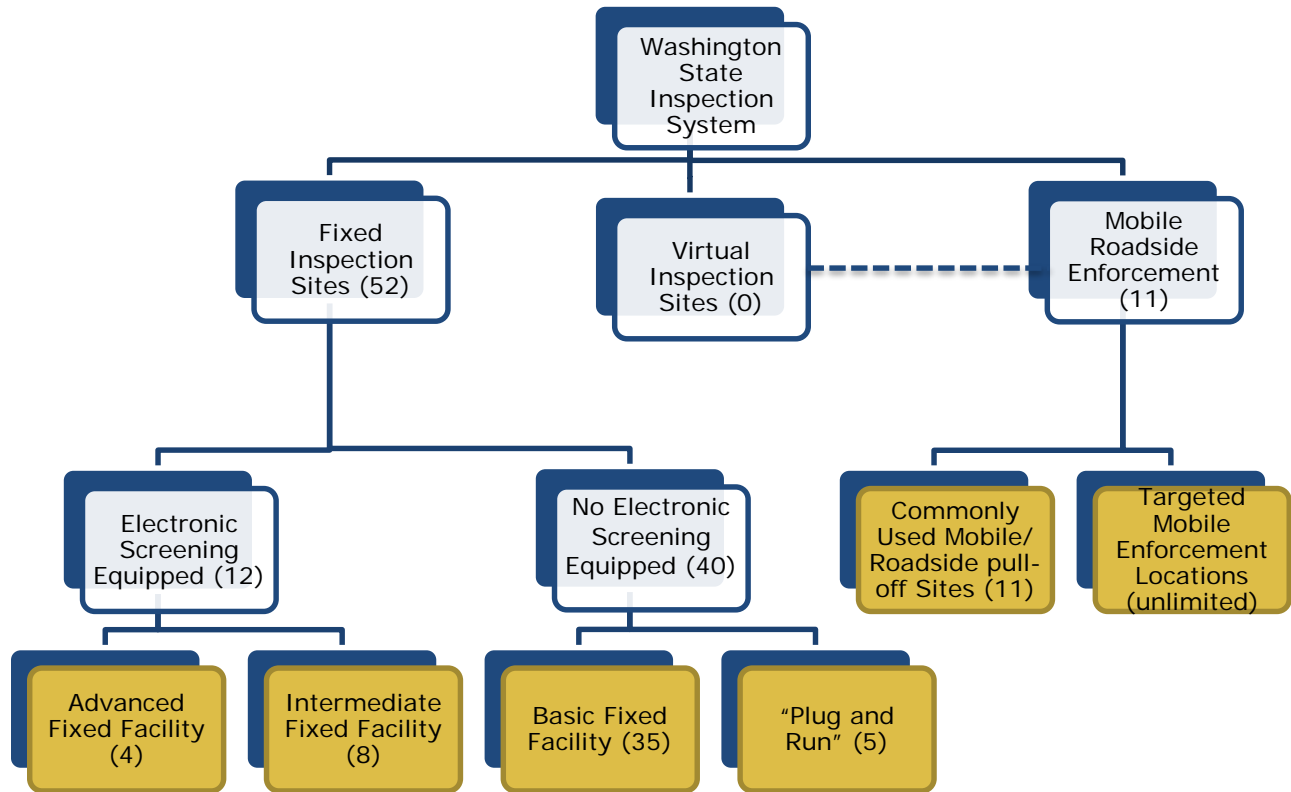
2.2.1 Washington State Inspection Station Configuration and Type

This subsection provides a high level technical overview of the types of inspection stations in Washington State, the technology and infrastructure used, and the personnel and operations in the state.

As described in Section 1.0, there are three broad configurations for inspection stations in the United States – fixed inspection stations, virtual inspection stations, and mobile roadside enforcement. Currently, Washington employs fixed inspection stations and mobile roadside enforcement, although the State is also exploring the potential for virtual inspection stations. Within these broad categories, there are a number of significant distinctions. Figure 2.5 shows

a flowchart of the State's inspection system. Highlighted boxes are specific subcategories of sites specific to Washington State. Table 2.4 provides an overview of each of these six types of sites grouped into the three configurations of mobile, fixed, and virtual sites. Each of these types of sites is described in more detail in the following subsections, including how these stations function in Washington, or showcase how the site could be incorporated into Washington's inspection system in the future.

Figure 2.5 Washington State Inspection Station Type Flow Chart



Source: WSDOT, WSP. (Numbers) indicate the number of sites in Washington in each category. Yellow shaded boxes in the flow chart are facility types that are specific to Washington State and are described in further detail below.

Table 2.4 Washington State Inspection Station Types

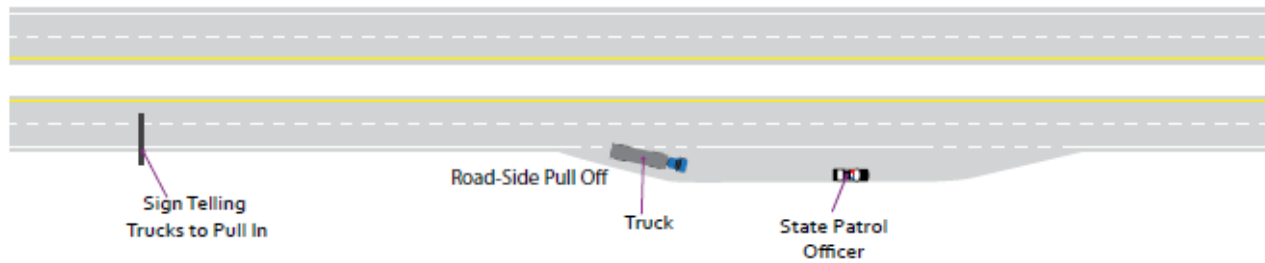
Site Configuration	Site Type	Description	Washington Example Site
Mobile Enforcement	0 – Targeted Mobile Enforcement Locations	Mobile enforcement site, does not require permanent infrastructure of any type. Random and infrequently used locations	N/A
	1 – Commonly used mobile sites/ Roadside Pull-off	Mobile enforcement site, typically with additional pavement or area for weighing and inspections but no fixed infrastructure beyond additional pavement	Vernita
Fixed Facility, no electronic screening	2 – Plug and Run	Fixed site with no scale house.	Sedro Wooley
	3 – Basic Fixed Facility	Fixed site with permanent scale house	Wallula
Fixed Facility, electronic screening	4 – Intermediate Fixed Facility	Fixed site with electronic screening	Fort Lewis N/B
	5 – Advanced Fixed facility	Fixed site with electronic screening, inspection building, extensive truck parking, truck loop, dual scales	Ridgefield POE
Virtual Facility	6 – Virtual Inspection Station	Electronic Screening only – no fixed inspection site infrastructure (scale house, fixed scale, truck parking, etc.)	Two sites under consideration

Source: WSDOT, WSP, Cambridge Systematics, Inc.

Mobile Enforcement (Site type 0-1)

Mobile enforcement, which is conducted by 10 State Patrol teams as well as local enforcement agency partners, occurs in every county in the State. These mobile enforcement units can set up anywhere they have enough space to safely pull over commercial vehicles, and can be targeted to specific industries, times of day, routes, or days of the week. For example, mobile inspection teams commonly direct trucks to rest areas or parking lots to conduct inspections. In addition, the State Patrol has identified 11 locations as commonly used mobile sites, identified here as “roadside pull-off” locations. These are locations with some type of additional space for inspection activity such as a public rest area, the parking lot of a DOT or WSP facility, or section of road with additional pavement, but lacking any fixed inspection infrastructure such as permanent scales or control booths. Figure 2.6 shows a conceptual layout for a commonly used mobile enforcement roadside pull-off site.

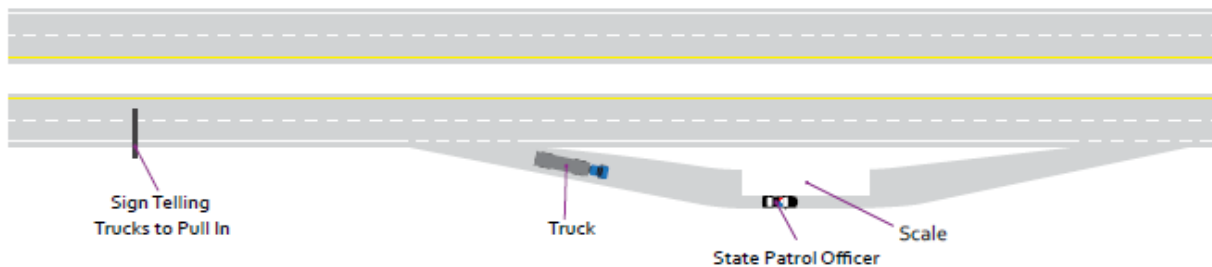
Figure 2.6 Roadside Pull-off (Type 1) Inspection Site



Fixed Facilities (Site type 2-5)

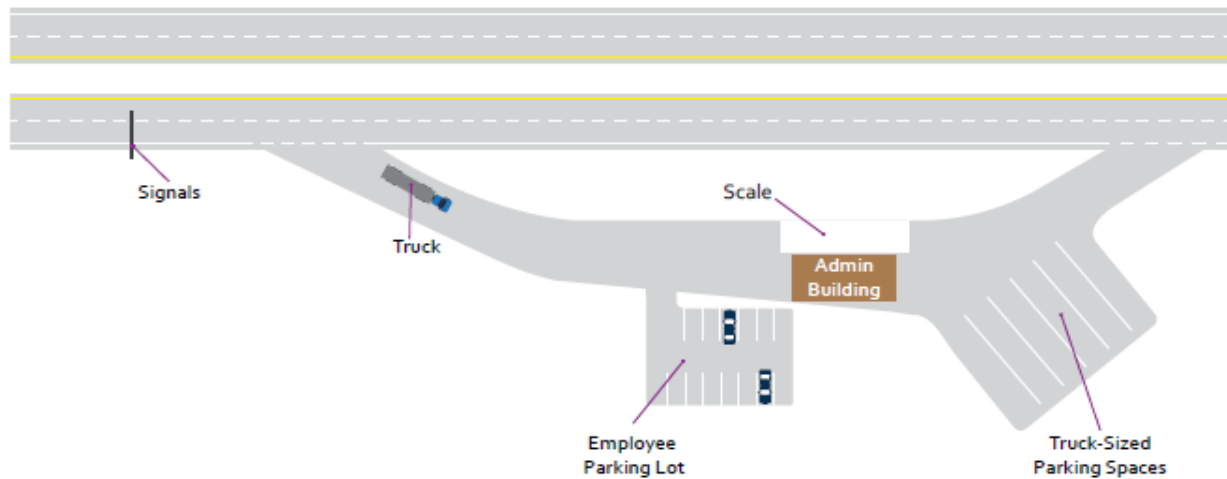
The 52 fixed sites in Washington can be divided into two categories: the 12 sites that have been upgraded with electronic screening capabilities (partially funded under the CVISN program); and the remaining 40 fixed sites that do not incorporate this technology. Of the 40 fixed sites without electronic screening technology, five (Kettle Falls, Pasco N/B, Rim Rock/Naches, Sedro Wooley, and Spring Valley) have permanent scales but lack an administration building to house the equipment necessary to run the scales and which also provide enforcement personnel with protection from the elements. These sites are also called “plug and run” sites, as enforcement personnel must use a laptop to run the scales when the site is open. This type of site is best suited for areas where the cost to build and maintain an administrative building is not justifiable, but truck volume is high enough that a fixed scale offers significant efficiencies for weighing vehicles. Figure 2.7 shows a conceptual layout of these five plug and run sites.

Figure 2.7 Plug and Run (Type 2) Inspection Site



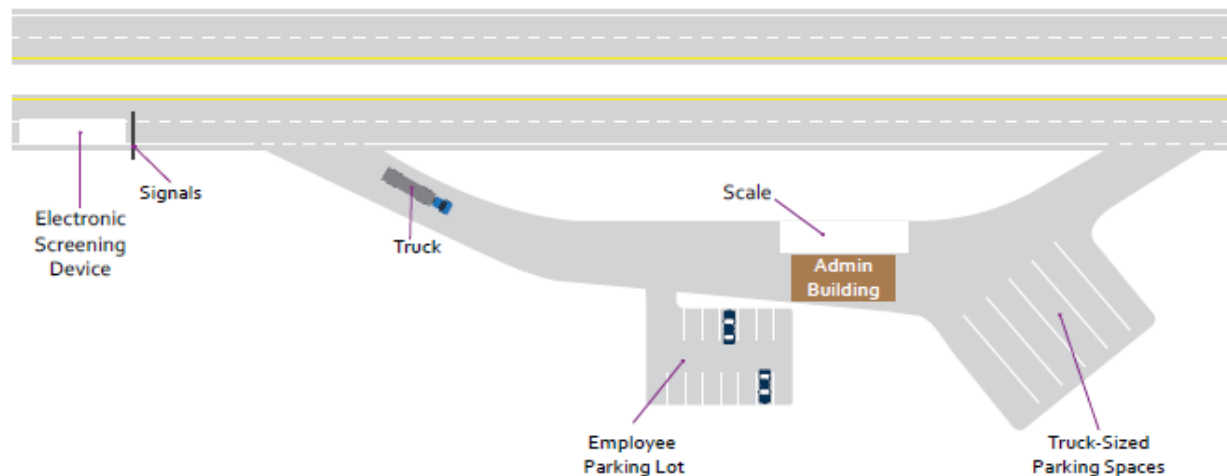
The remaining 35 fixed sites have permanent administration buildings in addition to the permanent scale. These sites may also have additional features such as parking for trucks and employees or slightly longer entrance and exit ramps, but the presence of the administration building is the defining feature. Figure 2.8 shows the conceptual layout for a basic fixed facility, which has some site infrastructure but does not incorporate electronic screening.

Figure 2.8 Basic Fixed Facility (Type 3) Inspection Site



Twelve sites in Washington include some sort of electronic screening. Of these 12 sites, 8 sites (Federal Way S/B, Federal Way N/B, Everett S/B, Fort Lewis N/B, Grandview E/B, Kelso S/B, Plymouth N/B, Stanwood/Bryant N/B) have electronic screening but lack other infrastructure upgrades at the site such as extended entrance and exit ramps or inspection buildings used to conduct vehicle safety inspections. These sites are referred to as “intermediate” fixed facilities, and a conceptual layout is shown in Figure 2.9.

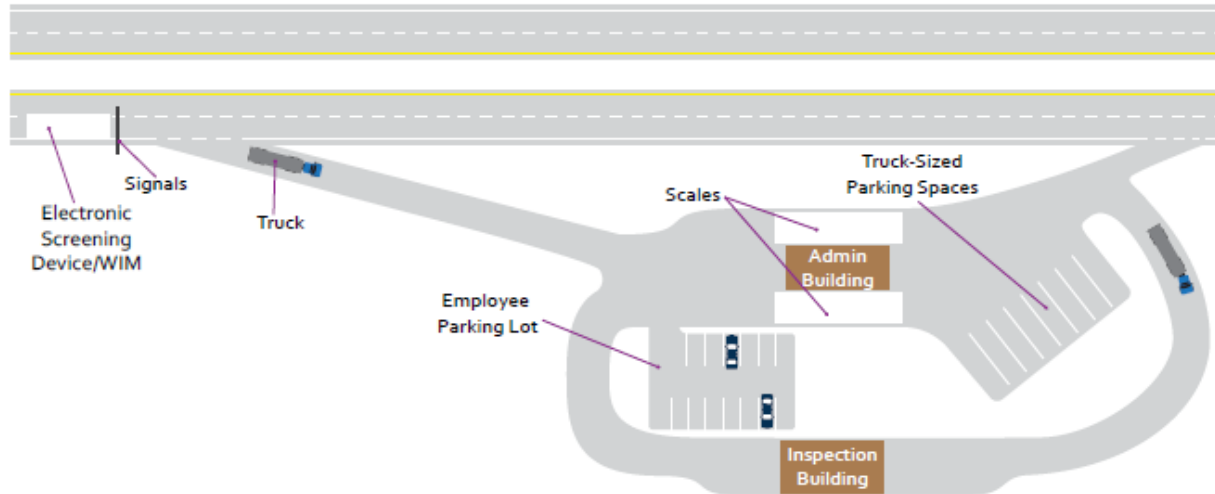
Figure 2.9 Intermediate Fixed Facility (Type 4) Inspection Site



The remaining four locations (Bow Hill, Cle Elum W/B, Ridgefield N/B, and Spokane W/B) have dual scales, extensive truck parking, covered inspection facilities, and a truck loop that trucks can take to return to the scale after undergoing an inspection or shifting/reducing their loads to comply with weigh requirements. These four sites with advanced infrastructure represent

the “top of the line” fixed facilities in Washington. Figure 2.10 shows a conceptual layout for these “advanced” fixed facility sites.

Figure 2.10 Advance Fixed Facility (Type 5) Inspection Site



The advanced and intermediate (Types 4 and 5) sites are typically found in locations with the highest truck volumes, the ability to screen out compliant vehicles and focus employee resources on trucks and drivers most likely in violation of weight and safety laws represents a significant efficiency and cost savings for the WSP. Sites without electronic screening must either pull in every vehicle for physical checks, which at sites with high volumes would quickly overwhelm inspectors and force the site to stop accepting more vehicles, or rely on officer’s judgment to decide which vehicles to further examine. The addition of inspection buildings and truck loops at Type 5 sites further enhances the ability of personnel to quickly and safely conduct weight and safety inspections on vehicles that have already been preselected for specific attention.

The four advanced fixed facilities (Bow Hill, Cle Elum W/B, Ridgefield N/B, and Spokane W/B) plus one intermediate fixed facility (Plymouth N/B) are labelled as Ports of Entry for the State of Washington. Historically, Ports of Entry were locations near the state or national border where states would check permits and registrations and collect road taxes, prior to the creation of the International Fuel Tax Agreement (IFTA), which has simplified the reporting of fuel use and collection of fees for trucks operating in more than one state. However, the title today simply applies to a location on a state or national border, as many of these operations are now conducted online and not at the facilities themselves. However, as these sites are generally located on high volume roadways with significant interstate traffic, they remain some of the busiest sites in the Washington State system. In addition, Washington’s Ports of Entry operate on a 24/7 basis, while other fixed stations typically have more limited operating hours.

Virtual Inspection Sites

Washington does not currently employ any virtual inspection stations (VIS), but is exploring placing two virtual sites to detect and deter trucks bypassing the Bow Hill and Spokane inspection stations. As described in both Sections 1.0 and 3.0, virtual sites use integrated software, including weigh-in-motion (WIM) and automatic vehicle identification (AVI) systems to capture information about vehicles, but unlike a fixed facility do not have any building, scale, or other infrastructure permanently in place. These sites can serve multiple purposes. Some states focus on “screening” and capturing information about vehicles traveling down the mainline highway, increasing the amount of data available for targeting enforcement operations, and system planning and maintenance activities.

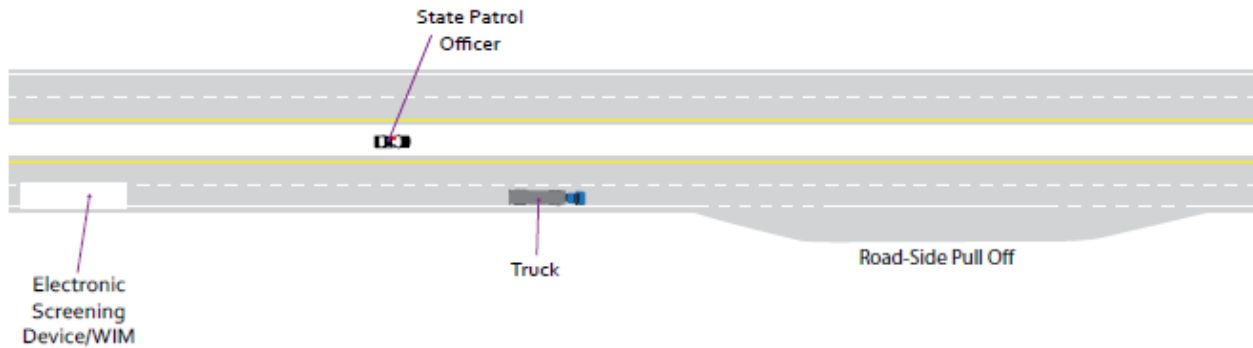
Because current WIM technology is not considered accurate enough in the United States to directly cite vehicles that are found to be overweight, some states operate mobile enforcement detachments in conjunction with virtual sites. In this setup, enforcement personnel use the VIS in a manner similar to the electronic screening equipment used in Types 4 and 5 fixed facility sites. This allows enforcement teams to identify and stop violators downstream of the VIS at a roadside pull-off or parking lot. Portable scales carried by officers are certified and so the vehicles identified by the VIS as overweight can be reweighed by officers and issued citations. An example of this setup is shown in Figure 2.11.

Even when mobile enforcement is not present, VIS sites are valuable for the traffic data that they collect, allowing for identification of vehicles and companies to target for desk enforcement activities,³⁷ or to use as information in systemwide and operational planning, both for ongoing mobile enforcement, as well as sites for future facilities. Figure 2.11 shows a typical configuration for a virtual inspection site. If a possible violation is detected, the officer would leave their position and pull the truck over at the “roadside pull-off” area downstream of the electronic screening device in order to physically inspect the vehicle and issue any needed citations.

The type of technology employed at each of these stations is discussed further in Appendix E. Appendix E also includes a visual “walkthrough” of the technology encountered during the approach to and use of the Ridgefield Port of Entry. Confirming or modifying the site classification based on the above types and understanding how and when to transition a site from one type to another are important considerations that must be discussed between the WSP and WSDOT during the development of the asset management matrix (Recommendation 6) and development of a joint statewide inspection station system plan (Recommendation 8).

³⁷ Some states such as Maryland use the truck identification features to send warning letters to violators. Although companies cannot be ticketed for prior infractions due to the lack of precision of WIM technology, these letters serve as a reminder that they are being monitored. Site audits or targeted enforcement can follow for repeat offenders.

Figure 2.11 Virtual Inspection Site (Type 6)



Source: Cambridge Systematics, Inc.

2.2.2 Personnel and Operations

The Washington State Patrol is responsible for commercial vehicle enforcement in the State. The approximately 130 personnel that conduct enforcement are divided between Washington State Troopers who have full police authority but focus their activities on commercial vehicles, and Commercial Vehicle Enforcement Officers (CVEO) whose authority is limited to commercial vehicle issues. In 2014, these enforcement personnel conducted nearly 82,000 inspections, including physically weighing approximately 57,000 vehicles, and found more than 113,000 weight and safety violations.

Personnel

Commercial vehicle enforcement staff are made up of several types of positions, including:

- **State Commercial Vehicle Troopers** – Troopers have full police authority and can perform any police function in the State but focus on commercial vehicle enforcement. They are trained to conduct inspections, weight and safety checks, and perform other commercial vehicle enforcement activities. Troopers are the only CVE personnel with authority to arrest violators engaging in criminal activities, e.g., drunk driving. Of the possible 57 Trooper positions, on average 80.6 percent (46 personnel) were filled in 2014.
- **Commercial Vehicle Enforcement Officers (CVEO)** – Like Troopers, CVEOs are trained in commercial vehicle enforcement and can conduct inspections, weight and safety checks, and perform other related functions. CVEOs cannot perform nonrelated duties, such as issuing speeding citations. A CVEO will request assistance from a Trooper in situations that require additional authority, such as criminal activity. Of the 112 possible CVEO positions, on average 72.3 percent (81 personnel) were filled in 2014.

The WSP has 66 CVEO positions specifically assigned to the Ports of Entry, whose primary function is weighing and inspecting commercial vehicles at those sites. These officers have some discretion to conduct local mobile operations to work a by-pass route or to apprehend

a vehicle that illegally by-passes an open scale. Of the 66 positions open at the Ports of Entry, approximately 66.6 percent (44 personnel) were filled in 2014.

The remaining 46 CVEO positions help to operate the remaining inspection sites throughout the State, and focus on school bus inspection, compliance review, and other commercial vehicle related activities with a small percent of their time dedicated to weight and safety enforcement.

- **City and County Law Enforcement** may also weigh vehicles, perform safety checks, perform inspections (if trained), review permits, and assist state patrol in other commercial vehicle enforcement activities. These personnel are in addition to the 169 WSP positions described above. There are approximately 46 positions in this category identified in the 2016 State Enforcement Plan (SEP).

Currently, the 169 State personnel positions are funded through a combination of Federal and State funding. As reported by the State Enforcement Plan, total yearly salaries and benefits for all enforcement personnel assigned to commercial vehicles is \$12 million. Just under half of this is funded through Federal weight-enforcement programs. Additional staff are funded through MCSAP funding or the WSP Commercial Vehicle Division. WSP notes that the operating budget currently allows for additional troopers and CVEOs; however it is difficult to fill these positions. Approximately 22 percent of commercial vehicle postings are unfilled at this time.³⁸ Further details on enforcement personnel are provided in Appendix B.

Operations

Washington's five Port of Entry facilities (Bow Hill, Cle Elum W/B, Ridgefield N/B, and Spokane W/B, Plymouth N/B) operate on a 24/7 basis. The remaining fixed site operation schedules vary depending on local traffic conditions and staff availability. The 7 non-POE fixed facility sites with electronic screening and CVISN technology are typically open from approximately 6:00 a.m. to 6:00 p.m. at least five days a week (actual days/hours vary between locations). Officers assigned to fixed inspection sites have the option of opening the site or patrolling bypass routes near the site in order to reduce the predictability of enforcement locations. Additionally, Washington State has funding through the Federal Border Enforcement Grant for two troopers who are dedicated to patrolling the border and inspecting carriers conducting international commerce.³⁹

Officers operating at a fixed roadside inspection facility perform a number of duties. Generally, in Washington, only a single officer is present at the facility; however more than one officer can operate out of a facility as staffing permits. The officer must control station traffic flow using a combination of manual signs and automatic electronic sensors and signs to direct trucks, as described in Section 2.2.2. Managing traffic flow is critical in order to reduce delay

³⁸ This is attributable both to high numbers of retirements and attrition due to an uncompetitive pay structure, as compared to similar positions at other agencies within the State. The department has reported beginning a rigorous recruitment campaign to hire new employees.

³⁹ Grant funds have been reduced from an initial funding for 4 troopers to 2 at this time.

for trucks and increases safety by avoiding backups onto the mainline. The volume of traffic flowing through a station, the procedures for managing station traffic, and the equipment available vary by location. Figure 2.12 shows examples of station signaling system controls.

Figure 2.12 Manual and Electronic Inspection Station Signaling System Controls



Source: Cambridge Systematics, Inc.

As trucks enter the station, officers observe vehicles to check for potential safety violations or overweight status. The procedure for weighing vehicles varies depending on the scale infrastructure at the site; some sites can weigh an entire vehicle at a single time, while smaller scales require an officer to weigh individual truck axles individually. Figure 2.13 shows examples of trucks being weighed on single- and multi-axle static scales.

Figure 2.13 Single-Axle (Left) and Multi-Axle (Right) Static Scales



Source: Cambridge Systematics, Inc.

If a vehicle does not exceed its legally certified weight and the inspector does not identify anything that would warrant an inspection, the vehicle is authorized to return to the mainline. A vehicle exceeding legal weight or deemed in need of further evaluation is directed to pull into a designated inspection area, and the officer either meets the driver at the truck or asks the

driver to come into the administration facility to begin the inspection process, issue a citation, or receive clarification from the driver. Some sites have enclosed inspection bays; most often in Washington inspections are conducted in an outside inspection parking area. Figure 2.14 shows examples of inside and outside inspection areas.

Figure 2.14 Inside Inspection Bay (Left) and Outside Inspection Area Parking (Right)



Source: Cambridge Systematics, Inc.

In addition to operating fixed facilities, CVE personnel operate mobile enforcement in every county in the State. Officer knowledge of a specific area or route is a key scheduling input, complemented by available traffic flow and crash data from WSDOT. Mobile units work shifting hours and locations in order to avoid predictable patterns that commercial vehicles could use to avoid oversight. Special-emphasis enforcement efforts, which typically take place over a 24-hour period, including nights and weekends are targeted to specific problem areas as needed. One example of this is a joint effort between WSDOT's Bridge Office and the WSP to identify and monitor bridges with exceptionally low weight limits.

2.3 Washington State Agency Inspection Station Roles and Responsibilities

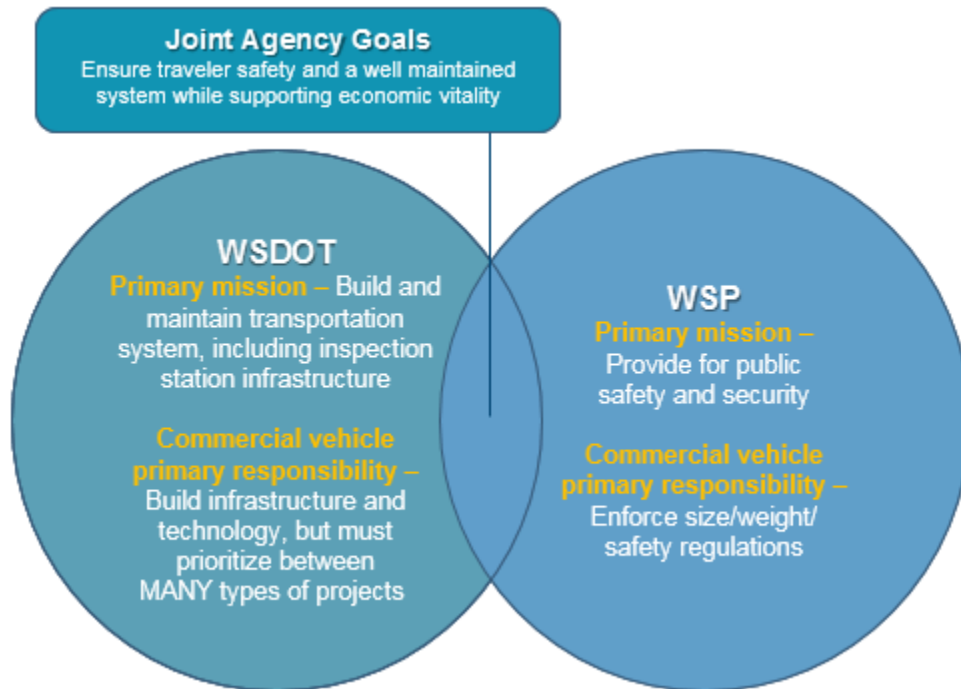
Both WSDOT and WSP are invested in the creation and efficient use of the inspection station system to ensure the safety of the motoring public and the preservation of roads and bridges in the State. The Washington Transportation Plan 2035⁴⁰ states that, "Preservation of the capital assets of the statewide transportation network is the most critical transportation challenge facing the State."

⁴⁰ Washington State DOT. Washington Transportation Plan, 2035. January 2015. Online at: https://wtp2035.files.wordpress.com/2015/01/wtp2035_final_21-jan-2015.pdf.

As in many states, in Washington responsibility for commercial vehicle inspection stations is shared between multiple agencies. Below is a description of the roles for WSDOT and WSP in roadside inspection stations, as well as the extent to which these responsibilities overlap.

A major finding of this study is that such a joint enterprise requires effective communication procedures and the current communication procedures between WSP and WSDOT, and within WSDOT, do not effectively incorporate the needs of the inspection station system. An example of this communication problem is illustrated in the Federal Way case study, summarized in Chapter 2.5, the Federal Way case study. Figure 2.15 summarizes the goals and responsibilities of WSDOT and WSP as related to the statewide inspection station system.

Figure 2.15 Agency Responsibilities Related to Inspection Stations in Washington



Source: Cambridge Systematics.

2.3.1 Washington State DOT Goals and Responsibilities related to Roadside Inspection Stations

Among WSDOT's major responsibilities is the maintenance and preservation of the State's roads and bridges. Roadside inspection stations help fulfill this responsibility by deterring commercial vehicles from operating overweight or in unsafe configurations. This priority is illustrated in WSDOT's Strategic Plan for 2014-2017, "Results WSDOT,"⁴¹ where Goal 1 for the agency is to "effectively manage system assets and multimodal investments on corridors to enhance economic vitality." One of the priority outcomes under this goal is the need for a strategic investment strategy to identify needed preservation and maintenance investments. Inspection stations evaluate trucks for overweight axles and gross weights and conduct safety inspections of commercial vehicles. Overweight trucks are a primary source of roadway pavement and bridge degradation. A single axle loaded to 40,000 pounds (twice the legal load) causes 16 times more damage than an axle loaded to 20,000 pounds. In 2006, WSDOT estimated that increasing the legal limit for dual tandem axles by 10,000 pounds would require an additional \$500 million investment in transportation infrastructure to protect against increased pavement damage.⁴² In addition, truck and operator safety violations contribute to traffic incidents that damage infrastructure and cost lives.

"WSDOT VISION- Be the best in providing a sustainable and integrated multimodal transportation system.

WSDOT MISSION- Provide and support safe, reliable and cost-effective transportation options to improve livable communities and economic vitality for people and businesses.

Table 2.5 highlights the amount of money WSDOT spends on pavement preservation and structure preservation projects in the State. An effective and efficient system of roadside inspections in the State is one part of a number of strategies necessary to minimize preservation costs and reduce impacts on the statewide system.

⁴¹ Results WSDOT. No Date?. Online at: <http://www.wsdot.wa.gov/publications/fulltext/secretary/WSDOTStrategicPlan.pdf>.

⁴² WSDOT. Legal Load Limits, Overweight Loads and Pavements and Bridges. June 2006.

Table 2.5 WSDOT Preservation Spending, 2010-2015
Millions of Dollars

	FY 2015	FY 2014	FY 2013	FY 2012	FY 2011	FY 2010
Roadway Preservation	\$133.21	\$118.1	\$121.7	\$107.9	\$167.0	\$148.1
Structures (Bridge) Preservation	\$107.8	\$95.6	\$95.3	\$84.5	\$112.8	\$100.0
Total	\$241.0	\$213.8	\$217.8	\$192.4	\$279.8	\$248.1

Source: WSDOT, 2015. Totals include overlay and rehabilitation work as part of pavement or bridge preservation. Errors due to rounding.

Goal 2 of WSDOT’s strategic plan includes a priority outcome of reducing the number of fatal and serious injuries across all modes of transportation. Strategic placement of inspection stations in segments that are prone to truck-related fatal and serious injuries could be a vital safety tool to help reach this goal. By removing unsafe drivers and trucks from the road, inspection stations can reduce the potential for crashes involving commercial motor vehicles.

Goal 5 of WSDOT’s strategic plan identifies the need to, “strengthen partnerships to increase credibility, drive priorities and inform decision-making.” Priority outcomes under this goal include the desire to increase consensus on decisions made and improve the understanding of transportation expenditures/investments and their respective outcomes. Both of these outcomes point to the need for close cooperation with other planning and regional entities in order to achieve WSDOT goals. However, the WSP is not mentioned as a partner agency or stakeholder even though their input during both planning and operations is a necessary part of the inspection system.

Finally, Goal 6 “Smart Technology” focuses on the use of technology to improve system efficiency. Acquiring data about each truck in real time is the primary objective of inspection stations and of smart technology. Automated Vehicle Identification (AVI) systems are used to gather data from different sources while a truck is traveling at highway speeds. There are currently four types of AVI systems available – transponders, License Plate Readers (LPR), U.S. DOT number readers, and cellular based geo-fencing using drivers’ smartphones. These technologies are described further in Appendix E. It is important to note that these systems focus on identifying potential safety violations, they do not measure vehicle weight (which requires a WIM system). WSDOT estimates that 40 percent of trucks in Washington have transponders, but does not estimate the percentage screened.⁴³

With the growing use of technology related to commercial vehicles in both the private and public sector, this is a key opportunity to leverage inspection system investments (specifically sites operating under CVISN funding) to aid operations, demand, and asset management of

⁴³ <http://wsdot.wa.gov/publications/fulltext/graynotebook/Mar15.pdf#page=25>.

the entire WSDOT system for all users. This use of technology reduces the number of legal and safe vehicles that enter sites for physical inspections, increasing the ability of the WSP to focus on unsafe or overweight vehicles that damage roadways or create other hazards for the general public. The more sites that employ electronic screening, the more opportunities exist for legal bypasses by trucks that are in compliance. Another example of data usage that is just beginning to be incorporated in some states is the direct sharing of data between inspection stations, allowing truck travel times to be compared to electronic logbooks to help track hours of service violations.

An ongoing challenge for WSDOT in coordinating both within their own agency and with WSP is the number of internal departments in WSDOT that are potentially involved in the inspection station system. Subagencies within WSDOT involved in the inspection station system include Strategic Assessment and Performance Analysis, Capital Program Development and Management, Multimodal Planning, Freight Systems, any of the Regional Operations groups, Construction, Development, and Intelligent Transportation Systems (ITS) Operations. The Commercial Vehicle Services Office, part of ITS Operations, has historically been the point of contact for the inspection station system as this office provides permitting and services CVISN technology support. However, this office has a limited role in highway planning, project development, and roadway preservation, and there are no formal communication channels established between this office and the WSP. Development of clearer responsibilities in terms of the inspection station system (both for WSDOT and WSP) through an interagency working group and formalization of key roles and responsibilities are recommendations described in Chapter 4.

2.3.2 Washington State Patrol Goals and Responsibilities related to Roadside Inspection Stations

The Washington State Patrol serves as the primary agency responsible for enforcing commercial vehicle laws and regulations within the State. This duty is within the larger mission of the agency to provide for the public safety and security for the State of Washington. As reported by the State Strategic Highway Safety Plan, *Target Zero*, Reducing truck-involved crashes is a Level III state priority, as truck-involved crashes led to 115 (8.2 percent) of fatalities and 341 (4.7 percent) of serious injuries from 2009-2011.⁴⁴ WSP is the primary state enforcement partner of these targets as it relates to commercial vehicles, as well as other roadway drivers.

The Washington State Patrol also has goals listed on their web site that encompass the inspection station system. Goal 1 is to “Make people safe on Washington roadways and ferries.” Goal 4 is to improve technology to enhance (among other topics) business practices, and public safety infrastructure. These two goals are similar to the WSDOT goals discussed above. A complete and efficient inspection station system can be a key component of achieving these objectives.

⁴⁴ Target Zero may be found at <http://targetzero.com/>.

WSP VISION- To be the best public safety agency in the United States

WSP MISSION- Make a difference every day, enhancing safety and security of Washington by providing the best in public safety service

A special focus on safety is found in the Washington State Patrol's 2014-2019 Strategic Plan.⁴⁵ This document identifies an Agency Priority to decrease the number of commercial-motor-vehicle-related collisions on interstate and state routes. Many of the strategies directly involve the inspection system, including:

- Target high-risk commercial motor vehicle (CMV) collision locations in the State;
- Strategic deployment of personnel at identified problem areas/times;
- Conduct drowsy/distracted driver emphasis patrols;
- Increase size, weight, and load enforcement;
- Continue deployment of Automated Infrared Roadside Screening systems; and
- Partner with WSDOT to identify high-risk carriers through the use of License Plate Readers.

Operation of the inspection system – both fixed and mobile – is a key component in carrying out the above strategies and reducing CMV-related collisions in the State. As of 2012, the five-year rolling average of CMV-involved collisions resulting in fatalities or serious injuries is declining – a positive sign that these goals are being achieved.

2.3.3 Interagency WSDOT and WSP Responsibilities and Opportunities

Together, WSDOT and WSP share responsibility for commercial vehicle weight and safety throughout the State. Essentially, WSDOT is responsible for the building and upkeep of the inspection station physical infrastructure, and WSP is responsible for operations and maintenance of the weight and safety inspection infrastructure (with the exception of CVISN equipment, which is under WSDOT authority) and for conducting inspection and enforcement activities. A Memorandum of Understanding⁴⁶ between WSDOT and WSP signed in 2011, and a Joint Operations Policy Statement⁴⁷ from 2014 are the two main documents detailing the

⁴⁵ Washington State Patrol. 2014-2019 Strategic Plan. October 2015. Online at: http://www.wsp.wa.gov/publications/reports/2014-2019_wsp_strategic_plan.pdf
http://www.wsp.wa.gov/publications/reports/2014-2019_wsp_strategic_plan.pdf.

⁴⁶ Memorandum of Understanding Related to Vehicle Weighing and Equipment Inspection Facilities on State Highways. Washington State DOT and Washington State Police. April 2011.

⁴⁷ JOPS: A Joint Operations Policy Manual. Washington State DOT, Washington State Patrol, and Washington Fire Chiefs. October 2014.

coordination and division of responsibilities for inspection stations in Washington. This dichotomy of roles is a common practice in the weight/safety inspection systems deployed in the U.S. but it does introduce potential issues. Transportation agencies are often driven by quantitative measures and focused on objects or systems – roads, bridges, and the various transportation modes. Projects tend to be well studied, defined, and address mostly predictable phenomena. Enforcement agencies more often are qualitatively and “people” focused with daily interactions with human users of the system. When working well together, the two approaches can complement the knowledge, data, and techniques employed by each.

Currently, WSDOT and WSP do not communicate well about inspection stations. An ongoing example of how current communication procedures are not effectively incorporating the needs of the inspection station system in statewide construction activities include the proposed improvements on Interstate 5 near Joint Base Lewis-McChord. The work on I-5 will likely have a significant impact on operations at the Fort Lewis inspection station. However, when WSDOT began meeting with area stakeholders in 2013, WSP was not included in the initial outreach or planning for the project.

Two other examples of the lack of communication between agencies are the closure of the Federal Way S/B weigh station as described in Case Study in Chapter 2.5, and an interchange project the Cowlitz Tribe is planning to construct near the Ridgefield Port of Entry station that threatens to undermine the use of the weigh station. These three highway projects were undertaken (or contemplated) without any consideration of the potential negative effects on the operation of three major weigh stations on I-5.

A final example of siloed and therefore ineffective inter-agency communication regarding inspection stations is discussed in the WSP State Enforcement Plan, 2016. The document indicates that WSP only recently learned about 35 WIM sites maintained by the WSDOT Traffic Data Office. This data could be very useful to the WSP for activities, including scheduling of mobile enforcement and prioritization of projects based on truck volumes; however WSP was until recently not made aware of this data.

Understanding the needs of the system and how they relate to agency responsibilities is a critical step in developing effective system level plans that can be used to identify and prioritize investments for the system in the future. Furthermore, needs for both existing and future inspection stations should be identified and recognized jointly by WSDOT and WSP using language and methodologies that are aligned with decision-making and funding processes at the two agencies. A full discussion of the lack of communication between the agencies is included in Section 4.0, Findings and Recommendations. Many of the recommendations detail the need for enhanced communication protocols between the agencies and the need for a Statewide Inspection Station Plan and an Asset Management based approach to understanding the inspection system.

2.4 Funding and Programming

Both WSDOT and WSP have responsibilities for funding the Washington State roadside inspection station system. WSDOT has primary responsibility for capital improvements; whereas WSP is responsible for maintaining and operating the sites. The State Highway System Plan⁴⁸ explains the funding and operations setup for the system as follows:

The Joint Operating Policy Statement (JOPS) between WSDOT and WSP states that WSDOT will work with WSP and provide “turn-key” weighing facilities to WSP. WSDOT will seek the funding and build the mutually agreed-upon scales. WSDOT will then turn the scales over to the WSP to maintain as outlined in the Memorandum of Understanding between the two agencies. WSP will care for the building, static scales, weigh-in-motion equipment, and pay the utilities for the building. WSDOT maintains signs, pavement, striping, outside lighting and pays to power the outside lighting.

WSDOT, as the lead agency under the CVISN program, is also responsible for providing, managing, and maintaining the CVISN program while WSP utilizes the CVISN infrastructure.⁴⁹

Investment in inspection stations have generally received less attention than other types of transportation investments in the State. The most recent State Transportation Plan (WTP 2035) does not mention weigh stations (or inspection stations).⁵⁰ The previous Washington Transportation Plan for 2007-2026 identified \$60 million for weigh station preservation as “Transportation Investments Underway.”⁵¹ However, the Washington Highway System Plan identifies a number of siting criteria that are to be used to help find suitable locations for new or relocated inspection facilities. The top criteria are daily truck volume, pavement condition, bridges and traffic safety. The last three criteria are based on estimates of the amount of damage that could be prevented by the introduction of a new inspection facility. These essential criteria are enhanced by additional considerations shown in Figure 2.16.

⁴⁸ Washington State Department of Transportation. 2007-2026 Highway System Plan. December 2007. Online at: <http://www.wsdot.wa.gov/NR/rdonlyres/B24AC1DA-8B9A-4719-B344-B083BB3F10FB/0/2007FullHSP.pdf>.

⁴⁹ JOPS, 2014.

⁵⁰ https://wtp2035.files.wordpress.com/2015/01/wtp2035_final_21-jan-2015.pdf.

⁵¹ http://www.wsdot.wa.gov/NR/rdonlyres/3D40B912-3A24-4407-ACE5-1B9FA8155CE8/0/eFinalWTP_InvestmentUnderway.pdf.

Figure 2.16 WSDOT Weigh Station Siting Criteria

Figure 31. Weigh Station Siting Criteria

Average Daily Truck Traffic	Right-of-Way Availability	Sight Distance
Forecast Average Daily Truck Traffic	Availability of Electricity	Land Use Compatability
Weigh Station Site Bypass Potential	Telephone Availability	Climate
Vehicle Inspection Violation History	Fiber Optic Cable Availability	Availability of Water/Sewage Utilities
Weigh Station Site Traffic Conflicts	Redundant Weigh Station Facilities	Proximity to WSP Offices
Accident History	Pavement Conditions	Seasonal Movements
Hazardous Materials Transported	Roadway Operating Speeds	Origin and Destination Characteristics
Potential Environmental Impacts	Topography	Highway Improvement Opportunities

Source: WSDOT Highway System Plan 2007-2026.

Table 2.6 highlights known investments in the Washington State inspection station system completed since 2007 and currently requested or programmed as part of WSDOT or WSP Capital Appropriations. About \$23 million in projects have been completed since 2007, of which \$14.5 million was provided by federal sources and \$8.7 million from state sources.

Table 2.6 Programmed and Recently Completed Washington State Inspection Station System Investments

Project	Year	Funding Amount	Funding Source	Agency Receiving Appropriation
Construction of Grandview Weigh Station	2007	\$3.7 million	WA State Capital Appropriations	WSDOT
WSDOT CVISN	2007	\$1.5 million/ \$1.5 million (Fed/ State match)	Expanded CVISN	WSDOT
Roof Replacement at Toppenish, Federal Way NB, Federal Way SB, Plymouth	2007-2009	\$50,000	WSP Capital Appropriations – State Patrol Highway Account	WSP
Replace Scales at Brady and Artic	2007-2009	\$290,000	WSP Capital Appropriations – State Patrol Highway Account	WSP
Upgrade to Scales at Gig Harbor	2011	\$168,000	WSP Capital Appropriations – State Patrol Highway Account	WSP
WSDOT CVISN	2011	\$500,000/\$500,000 (Fed/State)	Automated Infrared Roadside Screening (AIRS)	WSDOT

Project	Year	Funding Amount	Funding Source	Agency Receiving Appropriation
Spokane POE Construction	2012	\$11.4 million	100% Federal National Highway System Funds ^a	WSDOT
WSDOT CVISN	2012	\$500,000/"soft match" (Fed/State match)	CVISN Maintenance and Operations Grant	WSDOT
Upgrade to Scales at South Pasco, Deer Park, and Kelso	2013-2015	\$450,000	WSP Capital Appropriations – State Patrol Highway Account	WSP
WSDOT CVISN	FY 2014	\$500,000/\$500,000 (Fed/State match)	CVISN Maintenance and Operations. Grant (DOT designs, installs, and maintains CVISN system)	WSDOT
Everett SB Weigh Station scales, scale house, WIM, ALPR	2015	\$1.2 million (850,000 in 2013-2015, 350,000 in 2014 supplemental)	WSP Capital Appropriations – State Patrol Highway Account	WSP
Upgrade scales at Goldendale	2015-2017	\$150,000	WSP Capital Appropriations – State Patrol Highway Account	WSP
Roof Replacement at Ridgefield and Plymouth ^{41F} ⁵²	2015-2017	\$205,000	WSP Capital Appropriations – State Patrol Highway Account	WSP
Total		\$23.2 million over 10 years	\$14.5 million Federal grant/\$8.7 million State	

Source: Washington State Patrol State Enforcement Plan, 2016. Washington State Patrol Capital Appropriations for Scales From 2007-2015 (received via Email 8/18/2015). Washington State Department of Transportation. Commercial Vehicle Services, July 13 2015.

Note: ^a Email from Willy Leiste and Bill Legg, WSDOT (8/18/15).

⁵² Note that WSP is requesting funds to replace buildings at Ridgefield and Plymouth, in which case the roof replacements will not be needed. See Table 2.8.

Table 2.7 highlights anticipated funding through MCSAP for FY 2015.

Table 2.7 MCSAP Related Anticipated Funding

Project	Year	Funding Amount	Funding Source	Agency	Document Source	Notes
MCSAP related operations	2015	\$12.6 million (Federal)/ \$865,000 (State)	MCSAP Grant	WSP	2015 Commercial Vehicle Safety Plan	WSP CVEB funds 40.1 FTE using MCSAP funds.

Source: Washington State Patrol State Enforcement Plan, 2016.

Table 2.8 shows inspection station needs that have been identified by WSP in their 2016 State Enforcement Plan along with cost estimates where available. Funding sources for these needs have not yet been identified, and there may be differences in the needs identified here and those submitted to WSDOT for funding consideration. As part of the recommendations from this study, a more comprehensive process for identifying needs and funding should be undertaken. This is discussed as part of the Joint Statewide Inspection Station System Plan (Recommendation 8), Asset Management Plan (Recommendation 6), and Biennial Needs List (Recommendation 7).

Table 2.8 Washington State Patrol Identified Funding Needs

Project	Year	Funding Amount	Document Source	Notes
Replace scale and add inspection building at Plymouth POE	"Short-term" goal	SEP \$11.3 million	State Enforcement Plan, 2016.	Better electrical capacity, utilities, inspection building
Replace scale building- Ridgefield POE	"Short-term" goal	SEP \$3.8 million	State Enforcement Plan, 2016.	CVISN equipment update, utilities, electrical capacity and scale house building
Upgrade scales at Goldendale, Plymouth, Indian Valley, Everett, Federal Way N/B (west scale), Bow Hill (west scale), Port Angeles W/B, Buckley, Dryden	"Short-term" goal	SEP \$175,000 per site	State Enforcement Plan, 2016.	
New Inspection building at Rock Island	"Short-term" goal	SEP \$2 million	State Enforcement Plan, 2016.	New inspection building with office space

Project	Year	Funding Amount	Document Source	Notes
Relocate North Bend scale	"Short-term" SEP goal	TBD	State Enforcement Plan, 2016.	SR 18 and I-90 junction. Possible remodel of ramps. No sizeable station on I-90 EB between Ports and Spokane (Tokio small and rarely open)
Upgrades at Fort Lewis	"Short-term" SEP goal	TBD	State Enforcement Plan, 2016.	Utilities replacement, electrical capacity, CVISN upgrade, longer off-ramp, more parking space
Home Valley redesign	"Short-term" SEP goal	\$1.5 million	State Enforcement Plan, 2016.	Facility needs to be moved back 20 ft. and scale replaces
Upgrade 8 WIM computers	"Short-term" SEP goal	\$116,000 per site for computer and software	State Enforcement Plan, 2016.	
Replace 2 WIM computers	"Medium-term" SEP goal	\$116,000 per site for computer and software	State Enforcement Plan, 2016.	Federal Way N/B and Kelso
Installation of two VIS	"Long-term" SEP goal	TBD	State Enforcement Plan, 2016.	SR 9 in Sedro Woolley (Bypass route for Bow Hill) SR 290 in Spokane County (Bypass route for Spokane) Will include WIM/LPR
Federal Way SB relocation	"Long-term" SEP goal	TBD	State Enforcement Plan, 2016.	Not listed on priority list as the facility is adequate but inoperable due to new road configuration (WSDOT responsibility to initiate action)

Source: Washington State Patrol State Enforcement Plan, 2016.

An overview of Federal programs that can provide funding for some of the noted system repairs and updates are summarized in Table 3.1 in Section 3.1.

2.5 Case Study – Federal Way

As part of this study, a case study of the Federal Way S/B inspection station was conducted to understand the causes of and lessons learned from the closure of the station in 2010.

Findings

The major findings from the Federal Way Case Study are as follows:

- The design of the I-5, SR 18, SR 161 Triangle Project led to the closure of a major inspection station at Federal Way. The closure resulted from inadequate consideration of the effects of the interchange project to the Federal Way inspection station. A contributing factor was ineffective communication between WSDOT (responsible for infrastructure projects), and WSP (responsible for inspection station operations).
- None of the technical reports prepared by WSDOT as part of the NEPA process to understand impacts to the roadway and surrounding area adequately addressed the impacts on the Federal Way station.
- The Triangle Project created a multilane weave with commercial vehicles and passenger vehicles. The State Patrol deemed that operating the inspection station under the new configuration created a public safety hazard.
- By integrating the Federal Way inspection station into the evaluation and mitigation process in 2004 when the Interchange improvement project was conceived, it may have been possible to avoid closing the station in 2010.
- WSDOT's current \$16 to \$20 million design for a replacement Federal Way inspection station is not sufficient to meet future needs. This is due to the fact that the process for designing new facilities is based on past traffic patterns and infrastructure design; it does not adequately consider future needs or technology.

Background

The Federal Way S/B inspection station located on I-5 between Seattle and Tacoma was constructed in the 1960s. This inspection station has provided a location to conduct weight and safety enforcement for approximately 50 years. Since August 2010, the inspection station has been closed, creating a gap in the statewide inspection station network from the Everett southbound inspection station to the Kelso S/B facility – approximately 150 miles. This segment of I-5 is a major freight corridor, acting as the major North-South route through western Washington and serving important ports, airports, interconnecting highways, and thousands of freight generators and receivers. This now 5-year old gap in the statewide inspection station network allows commercial vehicle to operate in this area with minimal oversight. Figure 2.17 shows the location of the Federal Way S/B Inspection Station and the major highways in the vicinity.

Since the 1960s, with increasing traffic volumes, the site has been upgraded to better handle the increased weight and safety enforcement needs on Interstate 5. In 2001, a mainline weigh-in-motion (WIM) system was added to the site to help screen truck traffic and reduce the number of legal trucks that had to enter the site. Due to rising traffic volumes (of all types) on Interstate 5, a decision was made to improve the interchange at I-5/SR 18/SR 161

near Federal Way, Washington. Also known as the Triangle Interchange Project, this work necessitated the closure of the Federal Way S/B inspection station in August 2010.⁵³ The building of a new weigh-in-motion station to capture southbound traffic on Interstate 5 was part of the project.⁵⁴ However, the site remains closed as of October 2015. The following is an evaluation of this interchange improvement and its impacts on the Federal Way S/B inspection station.

⁵³ <http://wsdot.wa.gov/publications/fulltext/graynotebook/Mar12.pdf#page=53>.

⁵⁴ <http://www.federalwaymirrorFederalwaymirror.com/news/161596895.html#>.

Figure 2.17 Federal Way S/B Site Map



Source: WSDOT. I-5/SR 18/SR 161 Triangle Weigh Station Design Investigation. October 2015.

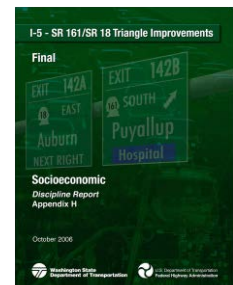
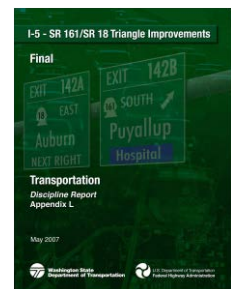
Data Gathered

The primary documents reviewed for this case study include technical reports generated during the environmental planning phase of the Triangle Interchange Project. This project was considered a Documented Categorical Exclusion (DCE) type project,⁵⁵ which does not require the full environmental review process. These types of projects typically:

- Do not induce significant impacts to planned growth or land use;
- Do not require the relocation of significant numbers of people;
- Do not have a significant impact on any natural, cultural, recreational, historic, or other resource;
- Do not involve significant air, noise, or water quality impacts;
- Do not have significant impacts on travel patterns; and
- Do not otherwise, either individually or cumulatively, have any significant environmental impacts.⁵⁶

The DCE process produced 15 discipline reports that covered a number of topics; Air Quality, Critical Areas, Cultural Resources, Natural Resources, Geotech, Hazardous Material, Land Use, Noise, Section 4f, Socioeconomics, Transportation, Visual Quality, Water Resources, and Wetland-Biology. Two of these reports could have provided an opportunity to address impacts of closing Federal Way southbound inspection station for safety of motoring public. However, neither addresses the impact the project could have on the inspection station, instead using it only as a geographic marker to delineate the areas under examination. The two documents were:

- I-5 – SR 161/SR 18 Triangle Improvements, Transportation, Discipline Report, Appendix L, Dated May 2007; and
- I-5 – SR 161/SR 18 Triangle Improvements, Socioeconomic, Discipline Report, Appendix H, Dated October 2006.



⁵⁵ The Triangle Interchange Project was considered a NEPA Chapter 24.22 Class II Project (CE) – Actions that meet descriptions contained in NEPA rules (40 CFR 1508.4, 23 CFR 771.117) and do not typically involve significant environmental impacts. Unless specifically requested by other agencies or due to either unusual circumstances or public controversy, these actions do not require an EIS or an EA.

⁵⁶ WSDOT Local Agency Guidelines M 36-63.27, Page 24-2, April 2015.

Relocation of Federal Way

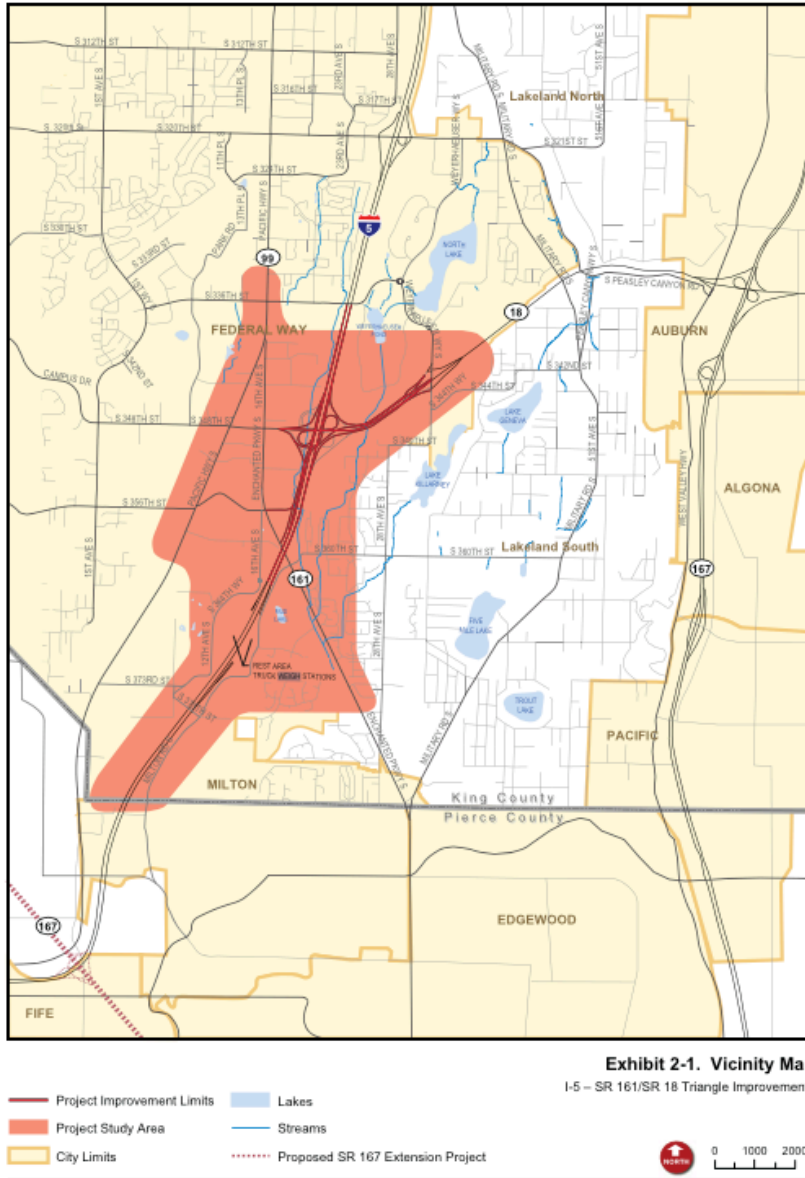
WSDOT's current \$16 to \$20 million design for a replacement Federal Way inspection station is not sufficient to meet future needs. This is due to the fact that the process for designing new facilities is based on past traffic patterns and infrastructure design; it does not adequately consider future needs or technology. *The Transportation Discipline Report* confirmed the Federal Way inspection stations were in the study area for this report. As stated above, part of a DCE is to evaluate impacts on land use and travel patterns. While the report went into great detail about land use and travel patterns on the highway system near Federal Way, including evaluation of flow rates and levels of service for various future scenarios, it did not address operations at the inspection site.

The key flaw from an inspection station operation standpoint is that building the interchange would move the merge point for one of the on-ramps closer to southbound inspection station entry ramp. Trucks slowing down to exit the mainline to the weigh station would need to cross with traffic trying to accelerate to enter I-5 southbound. This would cause a weave issue that would negatively impact entry into southbound inspection station. A weave is where traffic in two adjacent lanes is trying switch lanes in both directions (right to left and left to right) at the same time. The report shows a small change in throughput per hour for the inspection station ramp from no-build to build option for future years. A closer evaluation could have shown that the weave noted in the report is a multilane weave with commercial vehicles and passenger vehicles – creating an unsafe situation for the public and causing the closure of the Federal Way weigh station.

The Socioeconomic Discipline Report in part focused on impacts to public services, businesses, freight mobility, pedestrian, bicyclist, and transit facilities. The only reference to the inspection station in this report is in two maps showing their locations and as an end point of an auxiliary lane limit. Inspection stations were not addressed under the public services section of the report, nor were the business operations inherent in the WSP use of the site. The socioeconomic discipline report failed to address some key impacts, including:

- The ability of trucks to operate with limited size, weight, and safety oversight on an approximately 150 mile stretch of Interstate 5 from Everett inspection station to the north and the Kelso S/B facility;
- Reduction in roadway safety;
- Increase in pavement and bridge degradation and associated costs to repair;
- Reduction in revenue from WSP actions; and
- Displacement of WSP staff.

Figure 2.18 Triangle Interchange Project Study Area



Source: WSDOT. I-5/SR 18/SR 161 Triangle Weigh Station Design Investigation. October 2015.

A study released in October 2015 by WSDOT⁵⁷ examined potential solutions to this issue, including relocating the station further south, providing separate facilities to handle traffic on I-5 and SR 18, and modifying the existing station layout to better handle traffic. They identified the most desirable option as the \$16 to \$20 million project to relocate the facility south on I-5. Two locations were examined: one 800 feet south of the existing station, and one 4,600 feet south, shown in Figure 2.19. Advantages and disadvantages of these sites are shown in Table 2.9.

⁵⁷ WSDOT. I-5/SR 18/SR 161 Triangle Weigh Station Design Investigation. October 2015.

Figure 2.19 I-5/SR 18/SR 161 Triangle Weigh Station Design Investigation Federal Way Relocation Option

Option 2: Relocate the weigh station south on I-5

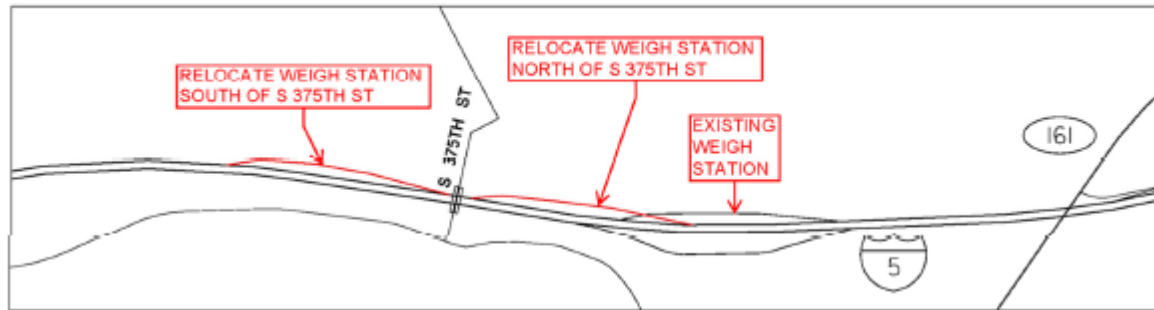


Table 2.9 Advantages and Disadvantages of Potential Federal Way Relocation Sites

	Location 1	Location 2
Advantages	<ul style="list-style-type: none"> • Addresses the issue with lack of storage for trucks entering the weigh station • Only trucks required to use the weigh station will be in the outside lane between the WB SR 18 on-ramp to SB I-5 and the weigh station • Can be constructed within existing state right-of-way 	<ul style="list-style-type: none"> • Addresses the issue with lack of storage for trucks entering the weigh station
Disadvantages	<ul style="list-style-type: none"> • Moves the weigh station closer to low density residential property • Trucks on SB I-5 can avoid the weigh station by exiting at South 320th Street or at South 348th Street 	<ul style="list-style-type: none"> • Property acquisition could be expensive, time consuming and politically sensitive • May impact wetland/stream buffers • The distance between the WB SR 18 on-ramp to SB I-5 and the exit to the weigh station is not optimal

Source: WSDOT. I-5/SR 18/SR 161 Triangle Weigh Station Design Investigation. October 2015.

An additional point of concern that is not mentioned in the WSDOT options analysis document is that all of the options evaluated reflected a new or rebuilt station that is based on the layout of the existing weigh station. The analysis did not consider alternative options, such as a virtual inspection station, or a station with a bigger footprint. The reason given for basing future impacts solely on a re-creation of the layout of the existing weigh station was a lack of design criteria to guide the implementation of a different style site. WSDOT and WSP have not at this time developed typical design criteria and standards for the inspection station network that can function as a guideline to design and build inspection stations that take into account the local environment, truck volumes, throughput capacity of stations, and technology changes.

Developing guidelines and criteria for inspection station developing is critical to ensure that the State is developing facilities that meet future needs, and are not solely based on historical or current performance. The existing Federal Way station is approximately 55 years old. It is unlikely that a 55-year-old station can safely process current truck volumes, much less the projected 80 percent increase in truck traffic by 2030. By integrating the Federal Way inspection station into the evaluation and mitigation process in 2004 when the interchange improvement project was conceived, much of this issue could have been avoided. Yet no recommendations of this nature were made as part of the report.

3.0 National, International, and State Practices

To provide a range of comparative information for Washington to understand its practices in the broader realm of commercial vehicle enforcement, a number of outreach activities were conducted and literature reviewed. Federal programs provide oversight, regulation, and funding for inspection stations – the roles and responsibilities of these agencies are described in this chapter. A number of benchmarking interviews were also conducted with peer states – a summary of findings from this process are included in this section and in the Appendix C to this report. The remaining parts of this section include:

- Section 3.1 discusses Federal programs that are tied to the operations or funding of inspection stations;
- Section 3.2 contains a literature review of U.S. and international inspection station best practices;
- Section 3.3 summarizes the information gathered from interviews with peer states;
- Section 3.4 describes information learned during a roundtable discussion with the Washington Truckers Association;
- Section 3.5 discusses potential future conditions and operations for inspection sites based on best practices and industry input; and
- Section 3.6 introduces median siting best practices and guidelines for potential future implementation in Washington.

3.1 Federal Programs Supporting Inspection Stations

The Federal Motor Carrier Safety Administration (FMCSA) and Federal Highway Administration (FHWA) are the two agencies within the U.S. Department of Transportation (U.S. DOT) that have programs related to inspection stations. These agencies' roles are discussed in more detail in Section 1.0 and briefly summarized here.

3.1.1 Federal Motor Carrier Safety Administration (FMCSA)

The Federal Motor Carrier Safety Administration (FMCSA)'s mission is to prevent commercial motor vehicle-related fatalities and injuries. Commercial Vehicle Information Systems and Networks (CVISN) and Motor Carrier Safety Assistance Program (MCSAP) grant programs are FMCSA funded, state-administered programs that provide financial assistance to states to implement projects, systems and activities that improve commercial motor vehicle safety thereby reducing the number and severity of accidents and hazardous materials incidents

involving commercial motor vehicles.⁵⁸ The Fixing America's Surface Transportation (FAST) Act, signed by President Obama in December 2015 reorganizes both programs and increases funding for MCSAP from \$313 million per year to \$334.8 million per year.⁵⁹

3.1.2 Federal Highway Administration (FHWA)

The Federal Highway Administration supports State and local governments in the design, construction, and maintenance of the Nation's highway system (Federal Aid Highway Program) and various Federally and tribal-owned lands (Federal Lands Highway Program). The FHWA Federal-Aid Highway Program (FAHP)⁶⁰ supports State highway systems by providing financial and technical assistance for the construction, maintenance and operations of the Nation's 3.9 million-mile highway network, including the Interstate Highway System, primary highways and secondary local roads.

3.1.3 Federal Funding Sources for Inspection Stations

Various Federal funding sources are available to support the deployment of inspection stations. The Federal Motor Carrier Safety Administration's CVISN and Motor Carrier Safety Assistance Program provide financial assistance to states wishing to deploy inspection stations and as a result help achieve U.S. DOT's safety and mobility goals. FHWA's FAHP provides funding, guidance and technical assistance to the State Transportation Agencies in the design, construction, and maintenance of the Nation's highway system.

3.1.4 CVISN Grant Funding

CVISN grant program (discretionary) provides Federal funding for states to deploy, operate, and maintain elements of their CVISN programs. The agency in each state that is designated as the primary agency responsible for the development, implementation, and maintenance of CVISN-related systems is eligible to apply for grant funding through grants.gov.⁶¹ In Washington, this agency is WSDOT. States are required to use 50 percent matching funds for CVISN projects. In FY 2014, Washington received \$500,000 in funding for its Expanded CVISN Program to replace 11 WIM computers. As of 2014, Washington has 5 ongoing CVISN Grants

⁵⁸ FMCSA. Commercial Vehicle Information Systems and Network (CVISN). Overview. August 20, 2015. Online at: <https://www.fmcsa.dot.gov/information-systems/cvisn/commercial-vehicle-information-systems-and-networks-cvisn>.

⁵⁹ For a more complete summary of the FAST Act's impact on MCSAP and CVISN, see the Summary of FAST Act and Update on FY 2016 Appropriation (December 11, 2015 date) at: http://www.cvsa.org/news/2015_legislative.php.

⁶⁰ This program was created under MAP-21 and is reauthorized as part of the Fixing America's Surface Transportation Act (FAST) of 2015.

⁶¹ CVISN Grant funding is authorized by Section 4126 of SAFETEA-LU (Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users) as amended by Moving Ahead for Progress in the 21st Century, Pub. L. No. 112-141, §§ 32603(c) and 32605 (2012)).

worth \$3.7 million.⁶² The categories of projects for which CVISN Grants can be utilized, either in full or in part,⁶³ is limited by category as part of the Federal CVISN authorization process.

MCSAP grant funding provides money to all states for the enforcement of commercial motor vehicle safety and hazardous materials regulations. Uniform roadside driver and vehicle safety inspections, traffic enforcement, compliance reviews, and other complementary activities are eligible under this program. The lead MCSAP agency in a State, is eligible to apply for Basic and Incentive grant funding by submitting a Commercial Vehicle Safety Plan (CVSP) to the FMCSA. In Washington, this is the State Patrol. FMCSA will reimburse each State's lead MCSAP agency 80 percent of eligible costs incurred in a fiscal year. Prior to the start of each fiscal year, FMCSA calculates the amount of Basic and Incentive Funding each State is expected to receive. This information is provided to the States and is made available on the Agency's web site. In FY 2013, the Washington State Patrol received \$3.45 million in MCSAP funding.⁶⁴

3.1.5 Federal-Aid Highway Program (FAHP)

The Federal-aid highway program is a Federally funded, State-administered program reauthorized in December 2015 by the Fixing America's Surface Transportation (FAST) Act. The FHWA provides funding, guidance and technical assistance to the State Transportation Agencies in the design, construction, and maintenance of the Nation's highway system. With few exceptions, FHWA does not provide full funding. Each funding category has an established funding ratio that defines the Federal share of the project cost. The remaining funding comes from the State or local agency. State and local funds may come from a variety of sources, including fuel taxes, toll credits, private donations, fair market value of any donated right-of-way for the project, and in some cases, may include Federal funds from another agency when permitted by that agency. Federal-aid construction projects are authorized, funds are obligated, and then the FHWA makes payments to the States for actual costs as they are incurred.

The components of an inspection station that might be eligible for funding through these Federal programs are noted in Table 3.1. This table is meant as a general overview only; many of these programs have additional eligibility requirements.

⁶² Federal Motor Carrier Safety Administration. "The Commercial Vehicle Information Systems and Networks Program, 2014." Online at: http://ntl.bts.gov/lib/55000/55000/55044/2014_CVISN_Annual_Report_Final_May_18_2015.pdf.

⁶³ Sometimes, CVISN Grant funds can be utilized for a safety-related portion of a larger project. For example, if a State decides to build a new inspection station, CVISN funding could be used for the WIM system or electronic screening, but not for the construction of a new scale house.

⁶⁴ Federal Motor Carrier Safety Administration. "Motor Carrier Safety Assistance Program Basic and Incentive Grant Fiscal Year 2013 Awards." Online at: <http://www.fmcsa.dot.gov/mcsap-basic-incentive-grant/motor-carrier-safety-assistance-program-basic-and-incentive-grant-fiscal>.

Table 3.1 Inspection Station Components Funding Sources

Inspection Station Components	CVISN Funding Eligible?	MCSAP Funding Eligible?	FHAP Funding Eligible?
WIM scales (in conjunction with safety enforcement)	Y	Y	
WIM scales (in conjunction with weight enforcement)			Y
Cameras	Y		
OCR technology (U.S. DOT- R, LPR)	Y		
System Electronics	Y		
Electronic Screening Software	Y		
Communication Networks	Y		
Roadside Inspection Computers		Y	Y
Roadside Access to Safety Information Systems		Y	Y
Automated Brake Testing Devices		Y	Y
ITS/CVO Improvements		Y	Y
Salaries of Roadside Inspectors		Y	Y

Source: Cambridge Systematics, FMCSA, FHWA.

3.2 Literature Review of National and International Practices

This section describes and examines best practices in the funding, placement, and operation of inspection stations. Understanding these issues is critical for Washington to position itself for continued leadership in the area of commercial vehicle operations and roadside inspections.

The following list identifies a number of topic areas where best practices found below regarding commercial vehicle weight and safety enforcement were considered in our analysis.

- **Identification of Locations for Investment**

- General location and sizing:
 - » Roadway segments with a high volume of trucks;
 - » Proximity to major origin and destination areas, in coordination with the statewide freight plan;
 - » Proximity to intermodal and other transfer facilities such as seaports, inland ports, major distributions centers, and major rail heads;
 - » At state and federal border crossings;
 - » In locations with seasonal distribution of goods and commodities; and

- » By identifying industries with substantially higher than typical violation rates, and placing locations on frequently used routes in those industries (in conjunction with the statewide freight plan).
- Specific physical placement:
 - » Roadway segment: straight tangent, on flat longitudinal slope or top of vertical curve;
 - » Location upstream of inspection site for mainline virtual screening to work properly; and
 - » Sufficient land for the appropriate inspection station footprint. At its largest, a site must handle all of the following: entry/exit ramps, static scales, administrative building, employee parking, truck parking, truck inspection area, truck out of service parking, and reweigh loop back to static scales.
- **Site Characteristics (fixed, virtual, mobile)**
 - Develop program level outcomes to direct development and implementation of statewide inspection station network.
 - Define baseline scenarios for inspection station types.
 - Develop technology packages, preferably vendor-independent if feasible, for key elements:
 - » Vehicle Detection on Mainline;
 - » Automated Vehicle Identification (AVI);
 - » Weigh-In-Motion (WIM);
 - » Safety screening;
 - » Credentials checking (via CVIEW or other means); and
 - » Dimension-In-Motion (DIM).
 - Ensure interoperability between AVI systems when cost-effective.
 - Develop staffing model for each site scenario based for different levels and distributions of commercial vehicle traffic.
- **Investment**
 - Develop needs based on commercial vehicle demand, previous safety issues, and (when practical) observed infrastructure damage.
 - Develop costs based on standard packages and then include site-specific implementation costs (e.g. “this location is remote and requires more communications infrastructure be brought to the area”).
 - Develop prioritization method to balance need, cost, and network coverage.

- Utilization of available matching funds programs.

For this study, best practices at the U.S. Federal level were examined, drawn mainly from the Federal Highway Administration's (FHWA) Smart Roadside Initiative (SRI) study completed in 2014. Practices for Europe and Australia are also highlighted, as well as a more detailed examination of Canadian best practices and input from the trucking industry in Washington. This information is summarized in this section and additional details are provided in the Appendix D to this document.

3.2.1 U.S. Federal Practices

The two Federal practices most closely related to roadside inspection stations that are currently being examined at the Federal level include use of technology and truck size and weight policy. These are summarized below.

Use of Technology for Roadside Enforcement

Completed in March 2014, the "Smart Roadside Initiative (SRI) Gap Analysis: State of the Practice" is the most recent national examination of inspection station operations in the United States.⁶⁵ The SRI is a U.S. DOT initiative designed to reduce the information silos between roadside Intelligent Transportation Systems (ITS) in order to increase motor carrier safety, mobility, and the operational efficiency of both carriers and public-sector agencies. The study's goals were to: 1) document currently available and emerging roadside technologies for CVO, 2) analyze the functionality being developed as part of the Smart Roadside Prototype, and 3) identify gaps where functionality is absent or insufficient to support the SRI. Focus was placed on technologies associated with three operating scenarios – mainline screening, virtual weigh (or "inspection") stations, and commercial parking systems. The document does not discuss system policy or agency interaction in any detail.

The study examined in detail 7 best practice sites from around the country and identified three major trends:

1. States are using multiple technological applications to identify commercial vehicles;
2. Technological integration at a site is critical to operational efficiency; and
3. Virtual inspection stations are increasing in popularity.

Multiple technologies are being deployed in both mainline screening operations and virtual weigh station scenarios in order to decrease the operational limitations of using technology in isolation. For example, the use of transponders paired with WIM is growing nationwide. However, this technology has the limitation that a certain type or brand of transponder may be

⁶⁵ Federal Highway Administration. FHWA-JPO-14-130. *Smart Roadside Initiative Gap Analysis: State of the Practice*. March 2014.

readable only in certain states, or require additional registrations or fees in order to work in multiple states.

Washington has an established history with transponder use, and industry interviews and state data shows that the technology continues to spread in the State. This leads to the second trend; the various technologies used at a site must be able to communicate with each other in order to reach full efficiency. A logical future outgrowth of this integration would be the ability for sites to communicate with other sites. Washington faces this issue currently. One of the main issues raised by Washington Trucking Association (WTA) members was the lack of communication between sites, which requires multiple stops if a truck encounters multiple open sites, even if the truck was already cleared at the initial site. For sites with electronic screening (Types 4 and 5), this could take the form of a truck receiving a bypass even if its weight would normally be enough to require a physical weighing because the system recognizes that the vehicle was weighed on a static scale at another site and found to be legal.

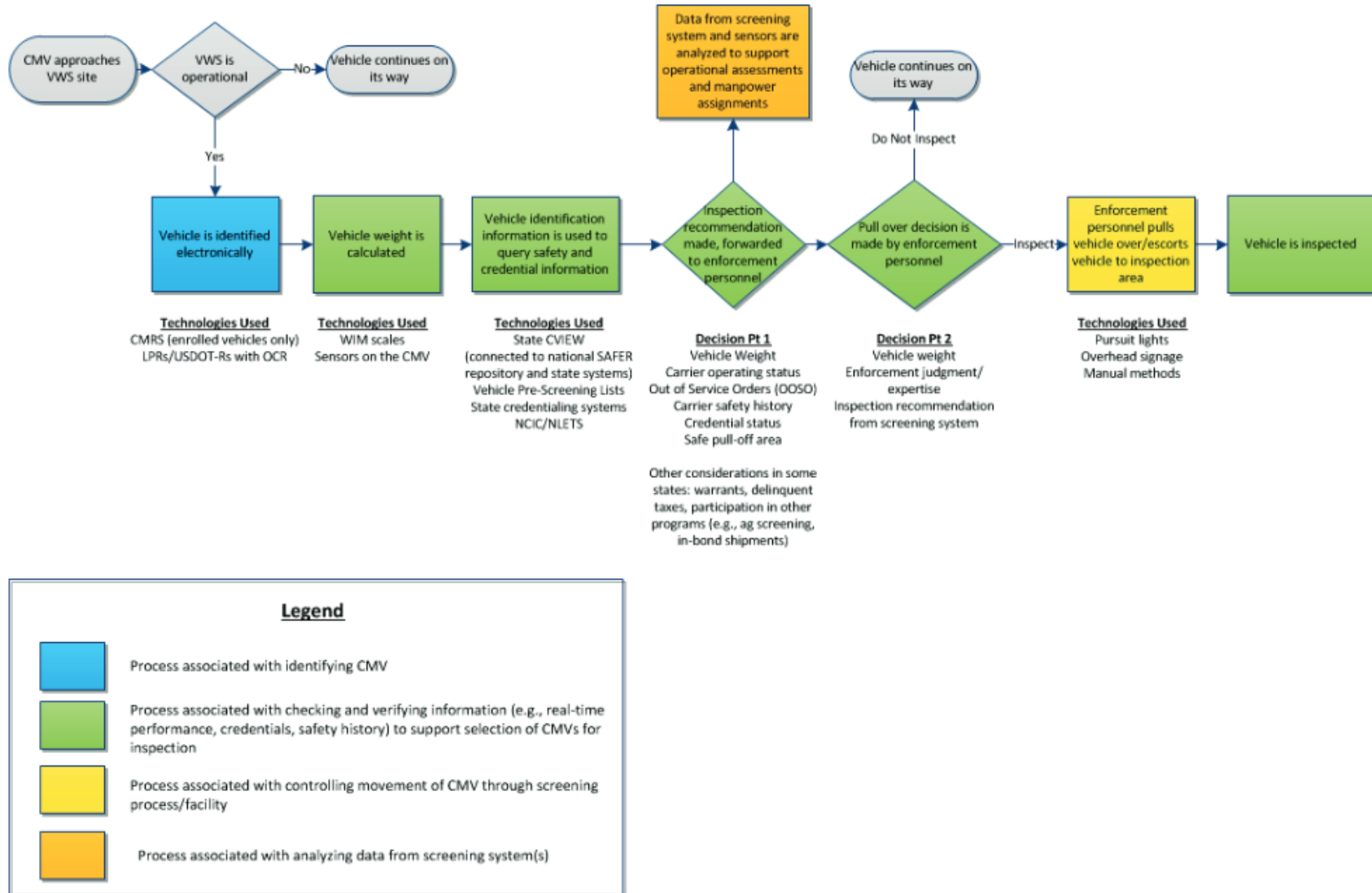
Finally, the increasing use of technology is lending itself to more virtual weigh stations that require less staffing and infrastructure costs than traditional sites while also allowing for targeted enforcement by mobile officers based on collected data. This is a trend that Washington is beginning to pursue, with planning underway for two virtual inspection sites to cover bypass routes of the Spokane and Bow Hill Ports of Entry. Figure 3.1 shows decision points and technologies employed at sites with electronic mainline screening.

Size and Weight Policy

Another recently completed study to note is the FHWA's MAP-21 Comprehensive Truck Size and Weight Limits Study,⁶⁶ which is examining the potential impacts of changing Federal commercial vehicle size and weight limits. Although this report does not directly discuss the inspection stations system, changes in Federal size and weight limits would likely impact trucking operations and could require new policy or operational goals or technological approaches in response. However, as Washington already has one of the highest weight limits in the nation (105,500 pounds; the Federal policy is 80,000 pounds), it is unlikely that size and weight policy changes will have a significant impact on Washington.

⁶⁶ Additional information and draft/final reports can be found online at: <http://ops.fhwa.dot.gov/freight/sw/map21tswstudy/index.htm>.

Figure 3.1 Technologies Used to Support Virtual Weigh Station Deployments



Source: Federal Highway Administration. FHWA-JPO-14-130. Smart Roadside Initiative Gap Analysis: State of the Practice.

3.2.2 International Practices

While the most applicable roadside inspection practices are those from the U.S., international practices can also provide insight that can help Washington understand the potential for its own system:

- The heavy reliance on data derived from WIM to drive enforcement,
- The use of virtual/mobile sites instead of fixed facilities,
- Data sharing between agencies, and
- The continued refinement of WIM technology in order to directly issue citations is a key future consideration for the State; if adopted in the United States, it would drastically reduce the need for fixed facility weight enforcement.

A brief summary of best practices in Europe, Australia, and Canada are summarized below. Further information on these international practices are described in Appendix D.

Europe

An extensive FHWA report from July 2007, "Commercial Motor Vehicle Size and Weight Enforcement in Europe,"⁶⁷ noted a number of best practices from across the European Union. Information was derived from site visits, literature reviews, and extensive interviews with industry experts and European Union members. Key conclusions and observations include:

- European countries are extensively using Weigh-in-motion (WIM) technology for preselection and use WIM technology to collect and share data, and some are experimenting with using low-speed WIM for direct enforcement (United Kingdom and Germany). For example, the Netherlands uses WIMs on roadways leading to and from the Port of Rotterdam to capture information about vehicles, which is then shared with enforcement officials to schedule operations and take preventative action with noncompliant companies, emphasizing education over enforcement.⁶⁸
- Increased use of mobile enforcement and fewer fixed sites. This trend is also occurring in some U.S. states, including Nevada and New York. Washington is in the planning stages for its first virtual inspection sites. A system of virtual inspection sites paired with targeted mobile enforcement based on data collected from the virtual sites as described in the first

⁶⁷ Federal Highway Administration Office of International Programs. *Commercial Motor Vehicle Size and Weight Enforcement in Europe*. July 2007. Online at: http://international.fhwa.dot.gov/pubs/pl07002/vsw_eu07.pdf.

⁶⁸ Federal Highway Administration Office of International Programs. *Effective Use of Weigh-in-Motion Data: The Netherlands Case Study*. October 2007. Online at: <http://permanent.access.gpo.gov/LPS105956/LPS105956/international.fhwa.dot.gov/pubs/pl07028/pl07028.pdf>.

bullet could be used in similar high freight-intensity, high-density areas with limited access points in Washington such as the Port of Tacoma or the Seattle-Tacoma Airport.

- Europe is experiencing high level of collaboration between jurisdictional levels (national and regional) and different agencies (transportation and law enforcement) for safety and weight enforcement, yet data sharing and collaboration is still a challenge between member countries, as it is between U.S. states. However, unlike the U.S., size and weight limits are largely harmonized between EU member nations.

Australia

Austrroads, an association of road transport and traffic agencies in Australia, is also focusing on the use of WIM and virtual sites for data collection and enforcement.⁶⁹ Four focus areas for Australia are asset management and pavement design, road safety and enforcement, freight management, and traffic management and network operations. A July 2014 study by the National Transport Commission of Australia⁷⁰ reveals that Australia uses a mix of police, government inspectors and outsourced private inspection groups with a wide variety of training requirements to enforce heavy vehicle requirements. However, as in Washington, the working relationship between various groups, including road transport compliance officers, Department of Transport Vehicle Inspectors, and police is key for effective enforcement.

Canada

Canadian policy and practice directly impacts the State of Washington through international trade along a shared border with the province of British Columbia. Trucks are evaluated, inspected and processed by both parties as they traverse the international border. Increases in efficiency and effectiveness are possible if the two jurisdictions and their respective agencies are able to increase cooperation and information sharing.

Canada has five primary inspection station locations near the international border with Washington State. These five inspection stations – Pacific, Nordel, Midway, Kaleden, Castlegar – are described in the Appendix D.

Use Of Technology

Canadian technology implementation is broadly similar to that in Washington. At the national border of Washington State, USA and British Columbia, Canada, an Automatic Vehicle Identification (AVI) system is used to identify trucks and gather data from trucks crossing the border with the applicable transponder system. Many trucks crossing this national border are



⁶⁹ Austrroads. AP-T171/10. Weigh-in-motion Management and Operations Manual. December 2010. Online at: <https://www.onlinepublications.austrroads.com.au/items/AP-T171-10>.

⁷⁰ National Transport Commission Australia. *Heavy Vehicle Roadworthiness Review: Phase One – Report of Current Practice*. July 2014. Online at: <https://www.nhvr.gov.au/files/heavy-vehicle-roadworthiness-report-of-current-practice.pdf>.

equipped with Weigh2GoBC⁷¹ transponders, a mainline screening system used in British Columbia that operates similarly to the NORPASS system in Washington. Washington State Department of Transportation has recently integrated the Weigh2GoBC into the Department's mainline screening system, with benefits, including faster processing and throughput at boarder crossing. One enhancement that is not yet in use in Washington State is an automatic bypass. Once a commercial vehicle has been initially checked at a Weigh2GoBC enabled station, it can be given a bypass at all subsequent inspection stations for up to the next 12 hours.⁷²

The Canadian New West Partnership Trade Agreement

On the policy level, some Canadian provinces have joined together to improve the efficiency of commerce between provinces. Specifically, the New West Partnership Trade



New West Partnership Trade Agreement
British Columbia : Alberta : Saskatchewan

Agreement (NWPTA)⁷³, a multiagency agreement allows governmental entities to function as one team to better the efficient and effective movement of goods and commerce. The NWPTA requires that government and public entities remove impediments across all economic sectors. The Agreement is comprehensive, applying to all government measures (e.g., legislation, regulations, standards, policies, procedures, guidelines, procurements, etc.) affecting trade, investment and labor mobility. Washington State could adopt the over arching direction of this concept at a State level for how agencies could communicate and help solve the needs and responsibilities they have in common.

Premium Carrier Program

Traditionally, enforcement agencies use negative reinforcement for safety and weight issues. The British Columbia Ministry of Transportation and Infrastructure (Ministry) and BC Trucking Association (BCTA) has implemented a program to reward effective self-evolutions and self-inspection. Launched in 2010, the purpose of the Premium Carrier Program is intended to enhance road safety by recognizing and rewarding those carriers who show exceptional commitment to safety and to showcase their best practices as examples for other carriers. Inclusion on the list includes benefits to carriers such as automatic assignment of the lowest random report percentage (5 percent) for Program participants registered in the Weigh2GoBC Program and free transponders for the carrier's fleet.

⁷¹ British Columbia Ministry of Transportation and Infrastructure. Additional information available online at: <http://www.weigh2gobc.ca>.

⁷² This is particularly helpful for vehicles that are at or near the weight threshold that would normally signal a truck to pull in to a site for a physical weighing. If a truck has been checked and tagged as compliant at a previous site, the system can allow the truck to bypass future sites.

⁷³ Source: New West Partnership Agreement, *for British Columbia, Alberta and Saskatchewan* <http://www.newwestpartnershiptrade.ca>.

A similar concept in Washington State could be considered to reward carriers that are at the highest level in self-policing safety and weight compliance. Potential benefits include increased effectiveness of enforcement activities to target less compliant carriers, which could lead an increase in safer trucks on highway and reduction in accidents, more efficient processing through inspection stations, and less wear and tear on roadway and station infrastructure.⁷⁴

3.3 Peer State Interviews

To gain information on current practices from neighboring and peer states on inspection station practices for this study, officials from Washington State and five additional states were interviewed. These states are Florida, Idaho, Nevada, Oregon and Tennessee. Interview questions and additional details about the responses are included in Appendix C. In general, the states were chosen to gain a measure of diversity between different practices in terms of types of operations, agency responsibilities, use of technology, staffing, infrastructure, and policy and performance measures. Findings in each of these areas are summarized below, with a more detailed discussion provided in Appendix B.

Types of Operations (Mobile versus Fixed), Strengths, and Weaknesses

Most of states interviewed use fixed facilities as their primary tool and mobile as their secondary tool for inspection of commercial vehicles statewide. All five states interviewed employ VIS, though the breadth of deployment varies. Interviews did not determine the frequency with which mobile enforcement was attached to each VIS. Only the State of Nevada, out of those interviewed, has no fixed facilities and uses a mobile only approach for their statewide inspection program. Washington State uses a full range of fixed stations, fixed stations with mainline screening, and mobile enforcement statewide.

In general, volume of commercial vehicles on a given roadway is one of the major considerations for the type of facility that may be needed. Lower volume sites are well served by mobile enforcement, and as truck volumes increase additional screening through virtual enforcement or fixed facilities are needed. However, the threshold for when different types of stations are employed differs by state and depends on the mission and resources of the agency. Regardless, all states agreed that more mainline electronic screening is needed in order to effectively operate their weigh station system.

Agency Responsibilities and Staffing

Typically each State's Department of Transportation (DOT) is charged with responsibilities of funding, planning, design, construction and maintenance of fixed and mobile facilities for commercial vehicle evaluation and inspection. WSDOT is responsible for the design and construction of inspection station facilities.

⁷⁴ Source: British Columbia, Ministry of Transportation and Infrastructure, Premium Carrier Program <http://www.th.gov.bc.ca/cvse/PremiumCarrier/index.htm>.

Each state has different approaches to how many agencies are involved in daily evaluation and inspection of commercial vehicles. Some use Department of Transportation employees as civilian inspection staff at fixed facilities and Department of Public Safety employees for both fixed and mobile inspection sites staff. All commercial vehicle evaluation and inspection at fixed stations and mobile sites in Washington is conducted by the WSP.

States use different approaches for staffing and operating sites. Some fixed facilities are open daily, around the clock, while others are operated sporadically or on an as-needed basis. Staffing decisions are made both due to the operational mission of the State as well as resource and staffing constraints. As discussed below in “Use of technology” there is a growing need for states to have either more trained and equipped staff or qualified service provider to maintain, update and repair mainline screening and virtual inspection site systems.

Use of Technology

Another common theme between states was the desire for technological solutions to expand or increase the efficiency of their inspection station systems. Table 3.2 highlights current technological practices in use in the peer reviewed states, and whether that technology is in use in Washington. Further discussion of technology needs, including data collection and maintenance is discussed in Appendix C.

Table 3.2 Technology Deployed by Peer States

Technology	Description	Used in Washington?	Notes
Weigh-in-motion (WIM)	This measures wheel weight as each truck travel over them. It also measures the distance between axles all at interstate speeds.	Y	In use at electronic-screening facilities. WSDOT also separately operates WIM for traffic counting purposes.
Automated Vehicle Identification device (AVI)	This ultimately queries a database for truck credential information.	Y	
Dimension-in-Motion device (DIM)	This either measures the height of each truck or measure height, width and length of each truck.	Y	In use at electronic-screening facilities
Classification device	This will identify which of 13 Federal classifications is each truck.	Y	
Image device	This will either read a License Plate, U.S. DOT number on side of trucks or take an overview picture of tractor.	Y	LPR- License Plate Reader
Brake check device	This measures thermal heat values from brake system of each truck.	Y	One currently in use at Fort Lewis

Technology	Description	Used in Washington?	Notes
Data linking	As truck moves from one inspection station to the next the trucks data is time stamped and moves with truck.	N	
Bypass warning	A truck that was directed to report to inspection station but chooses to remain on mainline to bypass station will have an overview picture taken and may be sent a warning in the mail. Can also monitor likely bypass routes around a fixed station for trucks trying to avoid passing the fixed site.	N	In consideration for two sites (bypass routes of Spokane and Bow Hill POE).

Source: Cambridge Systematics, Inc.

Infrastructure Siting and Functionality

Most states utilize a blend of fixed and mobile enforcement. Exact allocation and design of the system is dependent on the vision, goals, funding, and staffing available in each state. For example, Nevada utilizes an entirely mobile enforcement approach while Oregon has an expansive fixed station system, including 21 sites with electronic screening in addition to a number of sites capable of supporting mobile enforcement.

Coordination among States

States are beginning to link transportation systems and view primary corridors as shared assets or connections between the states. Some neighboring states are evaluating and discussing how they can link adjacent stations together at state borders. Oregon already allows data to be sent and received from neighboring states with during-truck trip data. This interstate during-truck trip data exchange allows enforcement personnel to check for speeding, logbook compliance and permit use, among others. As states are being ask to do more with less, this approach may spread. Some of the benefits of this approach include less right-of-way required, reductions in the number of stops for individual trucks, shared costs between states, and increased staffing efficiency.

Internal State Coordination

A successful statewide commercial vehicle evaluation and inspection system requires a number of areas of responsibility. Some of these include defining the needs of the system, strategically planning for locations, developing standards for the infrastructure, design, construction and maintenance of the system, funding, and operations. For many states, this is accomplished by multiple agencies, with each agency having their own focus of what to accomplish and limitations on how they can operate to achieve these objectives. These limitations may come from Federal codes, state statutes, department policies or memorandums of understanding between agencies.

Although housing all responsibilities for the commercial vehicle system under one agency has advantages, for many states there are at least two state agencies that share or divide up responsibilities. Typically, and in Washington State, these two agencies are a state transportation agency and law enforcement agency. However, as these agencies can have different focuses, policies, practices, protocols, and funding mechanisms, the agencies tend to function differently, which leads to challenges in maintaining an effective collaboration. For example, transportation agencies look 5, 10, or 15 years out into the future for projects to fund, and inspection station projects must compete with other modes and priorities for funding. By contrast, law enforcement agencies are responding to more real time issues, and normally focus on a shorter time horizon. Hence, an issue or need on the system is often viewed differently by law enforcement and a direct comparison between these agencies for prioritization of project needs can be difficult. Cooperation, common terms, and an understanding of joint purpose is key to be able to effectively build and manage a system.

Interviews with other states noted that there are common goals between agencies in states where dual agencies are responsible for commercial vehicle operations. For example, ensuring safety on state roadways and protecting infrastructure are common goals from multiple agencies. States with two agencies that are efficient and effective often have one point of contact and responsibility within each agency. These agency liaisons are allowed and encouraged to work throughout their own agency and directly with their counterpart. For example, the transportation agency liaison can work directly with their own work program funding, planning, standards, ITS, design, construction and maintenance departments while keeping the administrative level personnel informed. The law enforcement agency liaison can work directly with different levels of internal field operations, management and administration while keeping their administrative level copied and informed. These two people then can act as the conduit for information between both agencies while being able to fully represent all aspects of their own organization.

Policy and Performance Measures

States interviewed did not directly divulge if they had policies to guide and direct their statewide inspection station/port of entry program. Nonetheless, a common thread of discussion was on the need to answer “why” an inspection station program is needed. Fundamentally, these programs exist to be a good steward and guardian of DOT built roadway system and enhance the safety of the traveling public. Performance measures can be used to articulate the value of inspection stations to meeting these goals.

A focus on workload metrics instead of system performance measures appears to be a deficiency throughout many of the states examined, including Washington. Currently, Washington State’s Memorandum of Understanding (MOU) and Joint Operations Policy Statement (JOPS) between WSDOT and WSP do not clearly define performance measures for successful operation of the inspection station system. Workload measures, e.g. the number of vehicles weighed, are incorporated as part of the State Enforcement Plan (SEP), as per federal

requirements. WSDOT's Gray Notebook,⁷⁵ which contains quarterly performance measure reports for the entire transportation system, has one measure that counts the number of green light bypasses that transponders receive each year and the associated time and money the trucking industry saves. This need for robust performance measures is further addressed in Recommendation 5.

3.4 Industry Outreach

The study team received input from members of the Washington Trucker's Association (WTA) through a roundtable discussion and an online survey. Comments from these two sources indicated general acceptance of Washington's current inspection station system, especially sites equipped with CVISN technology. Multiple respondents indicated that they participate in the transponder system and are generally pleased with how the system works. A major source of frustration in both the roundtable and survey was the need to report to multiple weigh stations along a route due to a lack of data sharing between locations, or a lack of mainline screening technology at some locations. Additional comments and suggestions from the WTA roundtable include increasing utilization of data management systems to share data between states and facilities within Washington, upgrading scales and infrastructure at older stations and considering hills and geographic features as part of station design, increasing mobile enforcement, and increasing use of data to provide incentives for "good" carriers such as station bypass opportunities.

Additional details about the industry roundtable and survey are found in Appendix C.

3.5 The Future of Commercial Vehicle Operations

The following three sections briefly describe some of evolving trends in the commercial vehicle industry and inspection systems based on peer state and industry interviews and professional knowledge.

3.5.1 Federal Programs

As commercial vehicle infrastructure and technology largely falls under Federal funding programs, Federal transportation policy and appropriations impact State programs. The Fixing America's Surface Transportation (FAST) Act of December 2015 largely continues funding opportunities available under MAP-21, though programmatic changes will occur, such as CVISN moving under the umbrella of the MCSAP program. The FAST Act reorganizes both programs and increases funding for MCSAP from \$313 million per year to \$334.8 million per year.⁷⁶ The full implications of these programmatic changes will be seen over coming years.

⁷⁵ Online at: <http://www.wsdot.wa.gov/Accountability/GrayNotebook/navigateGNB.htm>.

⁷⁶ For a more complete summary of the FAST Act's impact on MCSAP and CVISN, see the Summary of FAST Act and Update on FY 2016 Appropriation (December 11, 2015 date) at: http://www.cvs.org/news/2015_legislative.php.

3.5.2 State Future Trends

Historically, statewide inspection systems were comprised of small independent inspection stations covering only interstate, major highways and a few rural roadways. Most early inspection stations had a small building, a small static scale, short ramps for truck queues, and possibly a computer. Trucks had CB radio for communication and paper logbooks. In the past 20 years, truck volumes have grown significantly, interstate truck hauling has increased due to the import and export of international goods, allowable size, weight, and speed limits have increased, and permitting and enforcement operations have changed. However, technology – both in-truck and on the enforcement side – has led and will continue to lead to the biggest changes.

In general, at the state level commercial vehicle inspection staffing levels are declining and agencies are being asked to do more with less staff. Meanwhile, truck volumes are continuing to rise. This disparity produces an increasing decline in the ability of commercial vehicle inspection systems to meet future needs in many states. Virtual sites, described in Section 1.0, are a tool used by many states to increase the effectiveness of their commercial vehicle enforcement operations, especially on the secondary highway systems and major bypass routes in the State. These virtual sites provide a vital tool for moderate to low truck volume roadways.

The trucking industry will continue to see an increase in technology and on-board vehicle technology in coming years. While there is not an indication that this will lead to a fundamental shift of priorities or practices in the next few years, opportunities for data integration between the industry and enforcement agencies will likely lead to increased reliance on technology for safe operations, such as automation of safety checks and/or enforcement, as data can be monitored by individual vehicles and shared as necessary with various agencies. The rate of change of technology is increasing, and will influence trucks, drivers, inspection staff and inspection systems. The following is a glimpse of how trucks, drivers, inspection staff and inspection system may operate in the next 20 years:

- On-board systems will monitor and enforce truck safety and weight. An on-board system could automatically notify the driver, fleet manager and fleet maintenance staff of issue before the truck is dispatched. If issues arise en-route, a truck could automatically notify state commercial vehicle inspection authorities of the issue. At that point, the inspection authority could contact fleet manager and driver for issue resolution. Drivers and trucks participating in this approach would be able to identify and address issues without visiting an inspection station.
- Drivers will increase their interaction with technology to help them drive more safely. Technology functions that could help drivers include driver behavior notification with automatic vehicle correction, other vehicle behavior with automatic vehicle correction, and vehicle self-diagnostic with notifications. Drivers might then be required to issue a truck pretrip plan to statewide inspection center before entering the roadway system, including

information such as route, time, truck self-diagnostic data, truck credentials, truck weight, driver credentials, driver logbook, load type, and permit type with listed conditions.

- Automatous Commercial Vehicles, or self-driving trucks could be on the roadway system within the next 20 years. There is currently a shortfall of commercial drivers in the U.S. to transport goods to meet demands. As automatous vehicle technology continues to develop it is possible for goods to be transported without human drivers. This technology will likely begin to be used in less-traveled routes on off peak hours, or in areas with significant truck congestion. As the technology develops, the vehicles may be allowed to travel more hours, and on more routes.
- Commercial vehicle inspection staff can perform many functions remotely, increasing the efficiency and effectiveness of the system. For example, commercial vehicles could be evaluated remotely from a traffic management center or statewide inspection center at headquarters. This staff could evaluate some of the commercial vehicles before they enter the roadway system through a truck pre-trip plan. Much like real time traffic congestion is mapped today, staff in the future could cull out trucks on a live map with real time traffic. Increased integration of technology will allow staff at the fixed inspection stations to focus on tasks that require more hands-on activity.
- One option being explored internationally is the ability for WIM to electronically issue citations to carriers. Although not yet allowed in the U.S., this automation would reduce the number of trucks required to enter a station and eliminate the need for staff to process citations, freeing them for other duties such as inspections, monitoring lower volume routes, or engaging in proactive interactions with companies and drivers.
- Statewide, inspection systems could have traditional inspection station with advanced mainline screening and some enforcement, with some part of the evaluation tasks sent to a statewide inspection center for processing. In part, these inspection stations and mobile site could be operated remotely. Virtual sites will become the backbone of the future statewide inspection system in some states as technology continues to improve. In the future, the primary function of a fixed inspection station may be providing safety inspection on trucks, with weight and credentialing information handled remotely.

3.5.3 Data and Technology

A number of data and technology applications will likely be available in the future. Some have been discussed above, but a more detailed view of the potentials of data integration within and between states includes the following:

- Virtual sites could gather data and evaluate both voluntary and nonvoluntary trucks that travel through each screening site, using voluntary (e.g., transponder) and nonvoluntary systems (e.g., License Plate Readers). Placement of these data gathering sites could be up stream of fixed inspection stations and mobile pull-off areas, reducing the volume of trucks that are required to report for evaluation and inspection. Thus, size of footprint for inspection station and pull-off area can be smaller, off-setting the cost of the virtual sites.

- Data can be linked between sites to provide real-time or trip-level data for individual trucks. This functionality helps inspection staff check and confirm speeding, logbooks, and permit issues. This sharing of during-truck trip data could be extended to neighboring states at border inspection stations. In the past, each inspection station functioned as an independent island from all other inspection stations within each state. Now there is an opportunity to share not only static data, but trip-level data.
- A single system architecture or data clearinghouse could be used to help collect, disseminate, and analyze the data gathered. Systems could potentially also be developed to perform functions such as automate citation issuing, similar to online systems for permitting used today. Data accuracy and reliability are required in order for the data to be used with confidence throughout the system. Additionally, an integrated systems approach is vital for efficiently supporting and updating the data and the system, and to minimize downtime.
- In the inspection stations, data should be integrated into one interface. This will increase the effectiveness of data usage, reduce fatigue of staff that are not required to look at multiple screens and dig through layers for each screen, reduce time to evaluate trucks, and allow staff to focus on potential violations that the system is not effective at finding.
- Using screening data as a management tool for operations is relatively new and is highly valuable to determine trends in truck movements. This approach allows operations to strategically place staff when and where they are needed. Demand-sensitive staffing and operations is a tool that states can use to increase the flexibility and effectiveness of their enforcement staff, and combined with virtual screening sites this can be done with less intensive infrastructure investment than in previous years.
- Another application of data is dynamic ramp queuing, which can be used at fixed stations to minimize ramp queues while increasing safety within the station and nearby roadways by reducing backups. Default thresholds for mainline screening system could be set to bring in trucks that are within some percent of the weight limit. In times of low traffic, a higher percentage of trucks can be brought in. As traffic increases, thresholds are raised to bring in only the trucks with the most probable violations. When the ramp queue is almost full, thresholds would automatically rise to their highest setting and the screening system would only bring in trucks that are well over the limit and thus almost certainly in violation.

3.6 Median Siting

Inspection stations located in a median allow trucks to enter one station from two directions of travel on the same segment of roadway. This approach can be an efficient and effective means of truck evaluation and enforcement by staff, and offers potentially significant cost savings during construction and operation of the site. However, siting and placement of this type of inspection station configuration can be challenging with several limitations. Strategic siting and placement of inspection stations are vital for operational



effectiveness and return on the investment of site infrastructure. Median sites, such as Old Town, FL on U.S. 27 pictured at right and through the rest of this section, have been successfully placed and are in use in states such as Florida and Idaho (Lewiston POE).

There are many criteria that influence the ability to site and ultimate effectiveness of a median sited inspection station. Threshold criteria should include:

- Location should have moderate to low traffic volumes – typically non-Interstate locations;
- Location needs to be strategically significant, and ideally not have high traffic volumes in both directions;
- Site should already have a median with sufficient space to locate the facility;
- Mainline should not have high occupancy vehicle lanes;
- The roadway is not projected to see a large growth in traffic requiring extra capacity or there is sufficient space to accommodate any capacity expansions without impacting the station;
- The site does not require an inspection building;
- Location should minimize the number of median openings and crossings impacted to reduce impact on emergency, law enforcement, or weather management operations; and
- Roadway has long straight segments that allow enough space for entry, exit, and merging from the higher-speed left lane of the road.

Median sites are discussed further in Appendix C. Examining locations in Washington for the possible conversion or future placement of a median site should be considered during development of the joint statewide inspection station system plan (Recommendation 8).

4.0 Study Findings and Recommendations

Ensuring the safety of commercial and passenger vehicles, preserving the State's highway infrastructure, and supporting economic vitality through maintaining mobility for freight are three key priorities of the State of Washington. The Washington State Patrol (WSP) and Washington Department of Transportation (WSDOT) share similar goals and missions that support these overarching goals, as described in Section 2.0. Roadside inspections and inspection stations are the nexus of where these priorities come together, and the statewide and operational processes for these activities have been documented as part of this report.

The purpose of the study was to examine the effectiveness and efficiency of the Washington state inspection station (or weigh station) system. As part of the study, the study team gathered and synthesized data, undertook technical analyses, examined best practices, and interviewed those directly responsible for the inspection station system and relevant stakeholders. This section presents the findings from this study, which are articulated in four sets of findings and recommendations. Following each finding is a set of recommendations, primarily aimed WSP and WSDOT, the two agencies responsible for the day-to-day operations and capital planning of the inspection station system. These recommendations were developed to provide a roadmap for WSDOT and WSP to work jointly to better define and increase the effectiveness of their roles in achieving the goals described above, as they relate to roadside inspections. The findings and recommendations are at the strategic level and designed to guide future actions of these agencies; they do not provide for specific investments in infrastructure, for example.

A draft of these findings and recommendations was presented to the Washington State Joint Transportation Committee on November 17, 2015. This document incorporates feedback received from JTC at that meeting and provides additional detail aimed at implementation of the recommendations.

This remainder of this section is broken into 5 subsections. The first four sections each present a project finding and the accompanying recommendations. These are summarized in Table 4.1.

Section 4.5 offers a brief set of directives for near- long-term, and ongoing directives for implementation.

Table 4.1 Findings and Recommendations Summary

Finding	Recommendations
<p>Communication – The Washington State Department of Transportation (WSDOT) and Washington State Patrol (WSP) do not communicate well about inspection stations.</p>	<ul style="list-style-type: none"> • Formalize protocols for ownership and communication within and between agencies • Develop joint-agency commercial vehicle-related outcomes and objectives • Revisit agencies roles and update documentation such as the Memorandum of Understanding (MOU) • Update the WSDOT Design Manual
<p>Asset Management – Inspection stations, regardless of size or technologies, should be managed like any other type of asset.</p>	<ul style="list-style-type: none"> • Create joint agency outcome-based performance measures • Apply an asset management framework to truck inspection stations • Maintain and publish a biennial needs list
<p>System Planning – The inspection station system is not adequately accounted for in WSDOT planning.</p>	<ul style="list-style-type: none"> • Develop a Joint Statewide Inspection Station System Plan
<p>Data – WSDOT and WSP have insufficient data or data-sharing arrangements to make strategic decisions regarding the inspection station system.</p>	<ul style="list-style-type: none"> • Develop a data sharing agreement between WSDOT and WSP • Collect and maintain shared data

4.1 Finding 1 – WSDOT and WSP do not communicate well about inspection stations

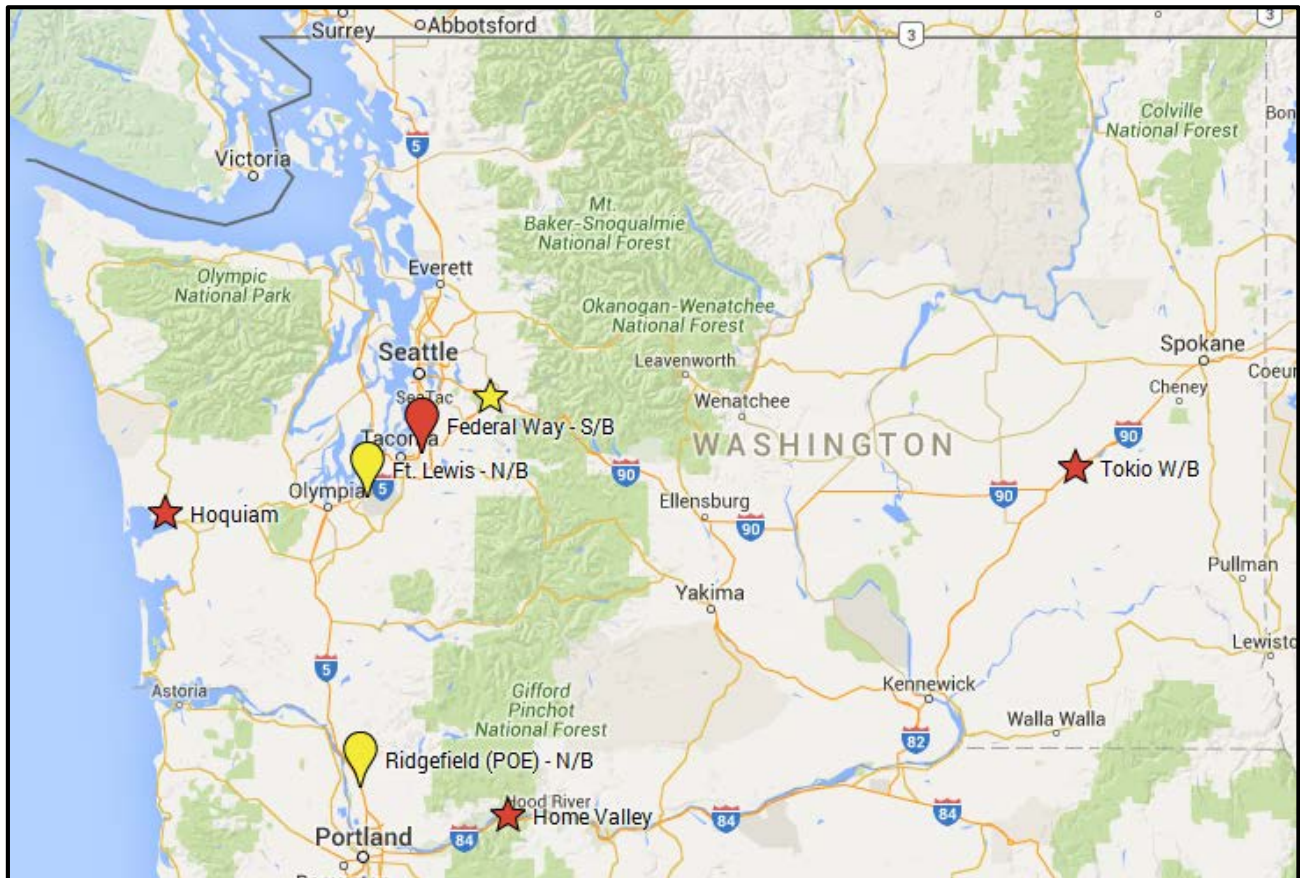
On a number of occasions documented through this study, it was found that a lack of effective communication between WSDOT and WSP has led to outcomes that negatively affect the ability of the State to enforce commercial vehicle regulations. Examples include:

- WSDOT has not engaged WSP effectively as part of roadway project developments that impact inspection stations, leading to closure or threatened closure of stations (Figure 4.1), especially along the I-5 and I-90 corridors. The Federal Way southbound station has been closed since 2010, due to safety concerns from a redesigned interchange. The needs of Federal Way southbound were not fully considered during the project development phase, as evidenced by the lack of discussion of the site in planning documents.⁷⁷ The Fort Lewis northbound and Ridgefield Port of Entry sites may be impacted by upcoming highway projects. WSP was not included in the project planning, begun in 2013, for the interchange and paving project on I-5 near Fort Lewis until September of 2015.

⁷⁷ See Chapter 2.5 for a case study of the Federal Way inspection station.

- WSP does not identify enforcement needs associated with the weigh stations in a way that fits within the WSDOT project programming process, leading to inspection station capital projects not being included in the overall WSDOT capital planning process.

Figure 4.1 Closed or Threatened Inspection Stations



Source: WSDOT, WSP, Cambridge Systematics, Inc.

4.1.1 Communication Recommendations

The following recommendations are provided to help improve communication:

1. Formalize protocols for ownership and communication within and between agencies;
2. Develop joint-agency commercial vehicle related outcomes and objectives;
3. Revisit agencies roles (Update the Memorandum of Understanding – MOU); and
4. Update the WSDOT Design Manual.

Recommendation 1 – Formalize protocols for ownership and communication within and between agencies

WSDOT and WSP need to formalize protocols for ownership and communication within and between agencies. An interagency working group should be developed, with leaders from each agency that would provide strategic guidance on matters related to inspection stations, as well as manage and oversee day-to-day activities related to inspection stations. Many of the working group's objectives could be implemented by existing staff, however additional staff may be needed to fulfil the responsibilities discussed below.

The responsibilities of the working group would encompass both ongoing activities related to inspection stations (e.g., maintenance of existing facilities) as well as new activities (e.g., joint strategic planning). Areas of emphasis would include:

- Managing and coordinating with staff in both agencies involved in data gathering related to truck enforcement (Recommendation 10);
- Designing and supervising data sharing activities between the two agencies (Recommendation 9);
- Supervising ongoing maintenance and enhancement of Washington's Commercial Vehicle Information Systems and Networks (CVISN) system (Recommendation 10);
- Owning the processes for upkeep of roadway elements and buildings within fixed sites (Recommendation 6);
- Assessing agency and industry reports of major long and short range changes to the transportation system and considering their impacts on truck enforcement (Recommendations 6 and 8);
- Integrating truck enforcement strategies into broader state government strategies for infrastructure preservation, goods movement effectiveness, and highway fatality reduction (Recommendations 6 and 8);
- Assessing statewide inspection station network infrastructure and staffing needs on a regular basis (Recommendation 8);
- Confirming and reporting outcomes of statewide inspection station network program to both agencies (Recommendations 1 and 7); and
- Working with industry to improve behavior and compliance on commercial vehicle regulations (Recommendations 2 and 5).

Many of these tasks are further defined in the following recommendations. To achieve these tasks, a common vocabulary is needed between WSDOT and WSP. This common vocabulary includes names of inspection stations, units of measure, terms used to define task, functionalities and processes. Each agency may need to compromise in some areas for the

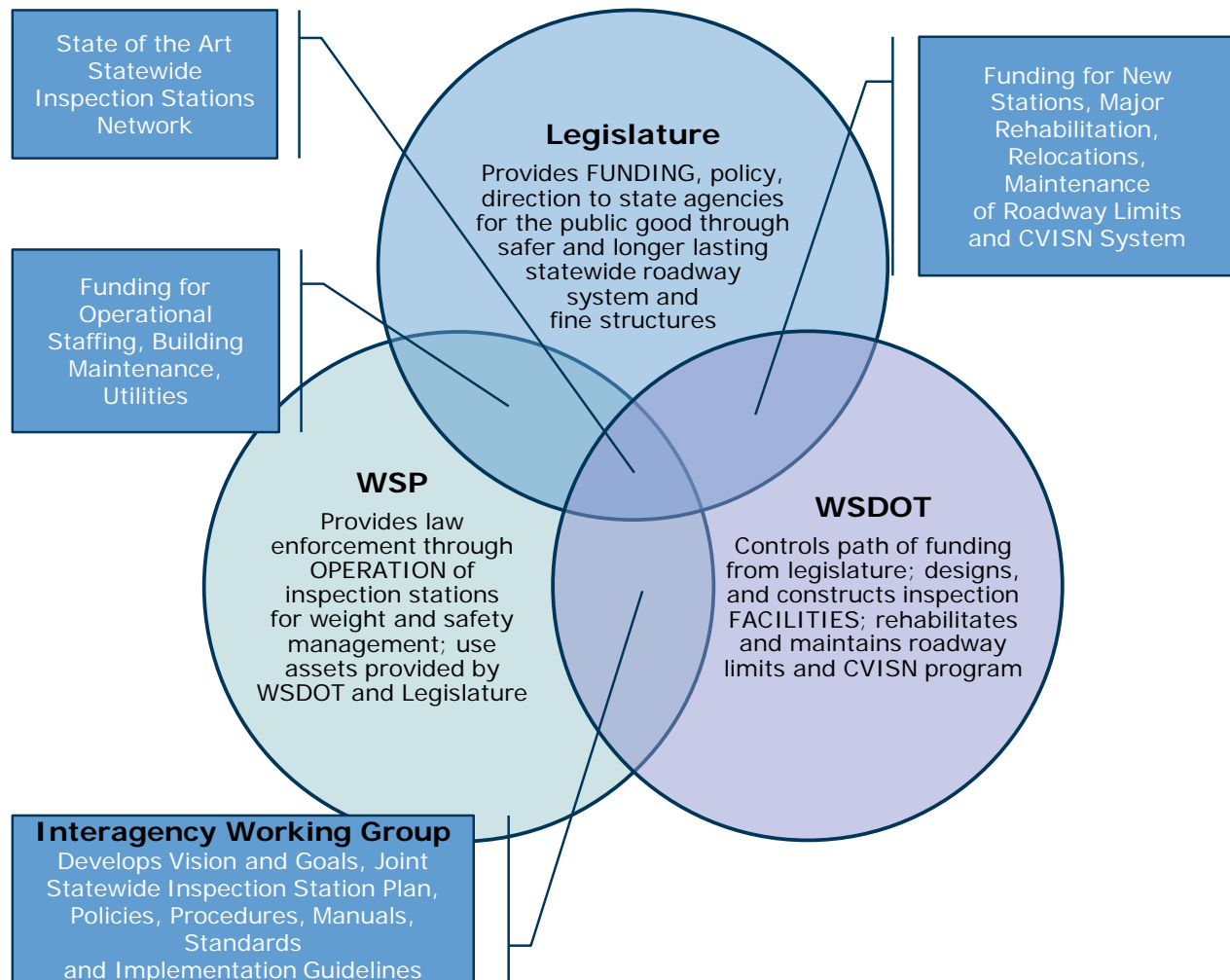
greater good of this important program. The transition period needed to achieve this common vocabulary can be short if both parties have a single common focus.

Executive leadership participation on strategic inspection station activities is also critical. The executives of both agencies should consider how to effectively provide strategic guidance to these truck enforcement leaders. The broad intersection of truck enforcement across multiple parts of both agencies dictates that executive leadership must have consistent visibility into these activities to ensure that decisions have a long-term strategic component. Both WSDOT and WSP should strongly consider an organizational change that creates a central leadership staff position for commercial vehicle enforcement, which can provide leadership for and continuity to the enforcement program; essentially a division director within each agency that will have the following responsibilities:

- **WSDOT** – The director will be integrated into freight planning, transportation operations and technologies, major project design, performance management, capital investment analysis, determining funding priorities, and asset management decisions; and
- **WSP** – The director will be integrated into information technology, patrol staff allocation, performance management, asset management, determining project funding priorities, and Federal reporting.

The Washington State Legislature may also play a role in developing a comprehensive approach to commercial vehicle enforcement, in particular directing WSDOT and WSP to take action on these recommendations making funding decisions, and setting truck violation fines and fees. The current roles of the Legislature, WSP, and WSDOT are shown in Figure 4.2. In this scheme, the interagency working group would lead the coordination efforts between WSDOT and WSP in developing the recommendations identified below.

Figure 4.2 Washington State Inspection Station Agency Roles and Responsibilities



Recommendation 2 – Develop joint-agency commercial vehicle-related outcomes and objectives

WSDOT and WSP will need to hold discussions to determine which outcomes are important to both agencies and to the State as a whole. “Outcomes” (as opposed to “outputs”) are what drive needs, performance and funding, and both WSP and WSDOT need to think in terms of outcome measures when discussing truck enforcement and inspection stations, both within and between their agencies. Some of these outcomes and related measures will align with existing goals and measures that are currently being tracked by WSDOT/WSP (especially in terms of safety); some will be different. It is important that the outcomes and outcome measures related to truck enforcement and roadside inspections be developed *jointly*, and that the competing needs within or between each agency not trump those of the other during this process. Once these outcome objectives, e.g., reducing truck crashes, and related measures to track progress are developed, they should be articulated clearly by both agencies and used to determine the needs and steps required to set goals and make positive progress towards these

outcomes. These jointly agreed upon outcomes will drive the development of performance measures and data, which are described in Recommendations 5 and 10 and should also be used to determine the budget recommendations and project priorities to be presented to the Washington State Legislature. Suggested performance measures and related outcomes are discussed in further detail under Recommendation 5.

WSDOT is a data rich agency that tracks many types of output and outcome measures, though these measures are often not aligned with the inspection station system. For example, WSDOT tracks pavement condition, but does not measure the impact of the inspection station system on maintaining pavement condition. Currently, WSP has data that is mostly output oriented and driven by reporting requirements for Federal programs. WSP will need to add outcomes of their processes to their daily activities and discussions. This may require working in conjunction with WSDOT to obtain current outcome data, and to develop processes to translate current WSP activities into an outcome base approach that aligns with WSDOT's performance and funding processes. This will allow WSP and WSDOT to better articulate the needs of the system in a way that matches the way resources are allocated in the State. Initially a third party facilitator could help WSDOT and WSP guide discussions and processes toward a complimentary approach for both agencies.

Recommendation 3 – Revisit agency roles and update documents

The primary source for detailing agency responsibilities regarding inspection stations in Washington State is a Memorandum of Understanding (MOU), signed by WSDOT and WSP on April 1, 2011, that detailed each agency's responsibilities regarding the day-to-day operations and long-term funding and planning for the system of inspection stations. It was very limited in its scope and did not sufficiently anticipate long-term evolution of either truck enforcement strategies or the broader transportation network. The MOU must be revisited and revised to not only serve as a strategic and financial guide for both agencies, but also as a baseline for setting the State's vision for truck enforcement. It should also establish processes for review and evolution of the MOU (as well as other documentation related to inspection stations such as the Joint Operations Policy Statement) on a periodic basis, and processes for updates of underlying reference documents on a frequent basis.

The key objectives in this revision of the MOU must be:

- Defining the expected outcomes, relevant priorities, and specific performance measures that both agencies will agree on as constituting effective truck enforcement;
- Clarifying organizational structure and defining leadership roles for managing the truck enforcement program (as per the Finding 1) and setting a framework for reporting to executive leadership;
- Thoroughly defining truck enforcement activities and each agency's role in supporting these activities; and

- Identifying and standardizing the process for how truck enforcement leaders interact and influence other parts of both agencies as well as other entities such as the Washington Traffic Safety Commission.

It is important that the MOU explicitly outline how the truck enforcement leaders are expected to report progress, system performance, challenges, and strategies to the leadership of both agencies, as well as reporting to the Legislature. The following sections detail specific items that should be addressed in the updated MOU.

Defining Expected Outcomes and Priorities

As described in Recommendation 2, WSDOT and WSP will need to jointly determine which outcomes are important to both agencies and to the State as a whole. Some of these outcomes will align with existing goals and processes; some may be different. The outcomes defined will drive the development of performance measures and data, which are described in Recommendations 5 and 10. Leadership from both agencies, as well as the interagency working group, should be involved in this process. Once outcomes and performance measures are determined, an asset management framework should be used to determine budget recommendations and project priorities to be presented to the Washington State Legislature. This process is described further in Recommendations 6 and 7.

Clarifying Organizational Structure

Both agencies should commit to the creation of dedicated leadership roles within their agencies for truck enforcement. The MOU should be explicit in the duties, both independent and joint, of both of these leaders. The MOU should explain where each leader fits into their agency's organizational structure, as well as identify the divisions within each agency with whom the truck enforcement leaders must interact.

The MOU should be explicit in describing the decisions the leaders are expected to make jointly, while giving the leaders the latitude to make other necessary decisions together. To the extent that the leaders are being inserted into other current agency activities as a stakeholder or committee member, these relationships must be identified.

Thoroughly Defining Truck Enforcement Activities and Agency Interactions

The current MOU has gaps between responsibilities of WSDOT and WSP. There are areas that each agency thinks is the other agency's responsibility to manage, thus the items within these gaps are not managed or implemented by anyone. For example, there is no method to define when a site is no longer functional due to changed design standards or is simply beyond its useful life-cycle. When this occurs, there is no discussion of who is responsible for the rehabilitation, replacement, or removal of the site. It is critical to identify the activities that the truck enforcement staff are responsible for either conducting or monitoring, and that the leaders are given the ability to decide how these activities are conducted within the framework of specific agency responsibility.

We recommend dividing the activities into two sets: primary activities and interactions with other agency activities. Making this explicit distinction will encourage participants to think beyond the boundaries of their own job descriptions and consider how truck enforcement interacts at a broader level with the transportation system.

Some of these activities will be wholly conducted by one agency (example: conducting Level I safety inspections), while other activities will be jointly conducted (example: determining when an enforcement location is not at an appropriate condition to effectively conduct enforcement activities). However, all topics are important for an inter-agency understanding of the type of investment needed at each location in the system. Once the MOU update is completed, both agencies should consider whether specific job descriptions must be modified to codify responsibilities with specific (sets of) employees.

Examples of the topics to be addressed in this section of the MOU would include the following (This list is not intended to be exhaustive, but instead illustrative.):

- Determining staffing allocation;
- Determining operating hours for locations (either fixed or virtual);
- Determining how an enforcement need (for people, infrastructure, and/or technology) is identified and quantified;
- Identifying the collection of relevant data to inform performance measures and outcome assessment;
- Determining the State's ongoing participation in, and funding level for, the Commercial Vehicle Information Systems and Networks (CVISN) process, as well as any subsequent Federal initiatives that may replace or augment it;
- Formalizing how WSP identified system needs are transmitted to and included in WSDOT funding considerations;
- Describing funding distribution mechanisms to make sure money is distributed to the appropriate agency or department within an agency;
- Deciding when a location, technology, or system is not meeting minimum operating standards; and
- Acquisition and evaluation activities for both physical and technological improvements.

One of the biggest flaws in the current MOU is that it does not sufficiently tie truck enforcement into broader agency objectives and activities. As a result, the role of truck enforcement staff is not always recognized within their own agencies, much less across agencies. This section of the MOU should identify the major areas where truck enforcement leaders are to engage within their agency, and the process for the leaders to request participation into other relevant processes not explicitly listed.

Examples of where truck enforcement interactions must be considered are plentiful for both agencies. The following list is intended to be illustrative and not comprehensive:

- **Information Technology** – Truck enforcement is responsible for the information technologies that comprise Washington’s implementation of the national CVISN and Smart Roadside Initiatives, including the smart roadside screening system upstream of fixed stations and future mobile sites. This smart roadside screening system allows about 75-85 percent of trucks on mainline to remain on roadway rather than pull off and enter the inspection station. The broad vision for CVISN is set through a national planning process that has evolved over the last two decades. But the tactical implementation of these initiatives within Washington requires that the approaches be congruent with overall information technology strategies of both agencies.
- **Transportation Data Development and Use**– Truck enforcement leaders should use resources currently available within Washington state government to better display critical transportation data, including the use of geographic information systems. For example, the interactive map created as part of this project and described in detail in Appendix A was based on off-the-shelf geospatial products and lists of raw location descriptions that were already available within the two agencies. The result is a useful interactive map that both agencies can use in managing and operating the system.
- **Freight Transportation and Goods Movement** – Truck enforcement will not be effective unless it is integrated into broader state agency activities around freight transportation and goods movement, conducted primarily at WSDOT. A solid statewide inspection station network is an instrumental part of long term preservation of assets and provision of safety, ongoing mobility and traffic flow (for example, by properly implementing bypass technologies), as well as short-term congestion and delay mitigation. Truck enforcement should be part of the Washington statewide freight plan, and resources may be able to be identified from broader goods movement activities that can help provide leverage for truck enforcement.
- **Long Range Planning and Project Identification** – Several of the major issues that arose prior to this study are due to the authorization of highway projects addressing congestion and freight mobility, for which truck enforcement staff were not involved in problem definition or strategy development. Similarly, the State Patrol undertakes long term strategic planning, and relevant WSDOT processes and data should be included in those planning decisions.
- **Environmental Concerns** – Truck enforcement should be included in the environmental section of transportation planning documents. A fully operating and efficient truck enforcement program can help improve environmental quality in a number of ways:
 - Trucks that are compliant with weight and safety regulations do not need to be stopped for further inspection. This reduces idling and truck delay, thus reducing the negative impact of trucks on air quality.

- Reducing the number of overweight trucks, or ensuring those trucks have paid for permits, will limit the damage done to pavement and bridges, reducing the need for repairs. This reduces both costs and the need for increased activity and resources to repair infrastructure.
- Effective enforcement may encourage overweight or oversize shipments to use alternative modes of transportation that cause less environmental damage.
- **Roadway and Facility Preservation and Maintenance** – WSDOT is responsible for roadway maintenance. Including truck enforcement during maintenance planning can yield benefits for both the inspection system and the road network. First, including the inspection system in planning will help ensure that WSP is aware of and can respond to any site closures that may be necessary. For example, if WSP are aware that a road project might necessitate the temporary closure of a site, they can plan to increase mobile enforcement in the area to help mitigate the loss of the station. Second, road work may offer an opportunity to improve enforcement infrastructure. If system planning has identified a need for additional mobile enforcement in the area, adding shoulder space to create a commonly used mobile site could be considered. If a road project occurs near a fixed site, there may be an opportunity to repair surface conditions within or on the approach and exit to the site. Finally, road work provides an opportunity to incorporate new or replace existing technology such as WIM sensors or a brake scanning system that would otherwise require additional projects and traffic interruptions.
- **Asset Management and Condition** – Section 4.2 discusses how truck enforcement is an asset class. As such, truck enforcement leaders should be aware of the assets around inspection stations, such as bridges, pavement sections, signage, etc. They should be included in the broader discussions about corridors within the State and how the assets on these corridors are operating.
- **Capital and Financial Issues** – Funding sources for truck enforcement are from two primary sources: the Federal government and highway funds appropriated by the Washington State Legislature. Each of these sources has different requirements, approaches, and vocabulary to obtain funding. Federal funding tends to be more output driven, while state funding tends to be more outcome driven. The truck enforcement leaders need to understand both agencies' broader approach to funding decisions.

It is important that the MOU explicitly outline how the truck enforcement leaders are expected to report progress, system performance, challenges, and strategy requests to the leadership of both agencies, as well as the Legislature. Given the broad nature of the above interactions, it is certain that these individuals will need assistance and guidance from the executive levels of both agencies to navigate through the difficult and varied issues that can be expected to arise. An approach that understands that the staff roles and the MOU itself are evolutionary in nature is critical to ensure that both agencies commit to maintaining an ongoing positive relationship.

Recommendation 4 – Update the WSDOT Design Manual

WSDOT's Design Manual,⁷⁸ most recently updated in November 2015, details policies, procedures, and methods to develop and document the design of infrastructure for the transportation network in Washington State. The final section of the manual, Chapter 1720, deals with design and placement of new weigh stations. According to the document, the WSP is responsible for providing to WSDOT's Program Management Office of Strategic Planning and Programming, a project definition that includes a statement of need, purpose, type of work, and general location. WSP and WSDOT are intended to cooperate to identify the specific location, and the WSDOT region is supposed to prepare a design decision estimate and submit it to Program Management. Site location decisions and design features are discussed.

However, the Design Manual only discusses the need for new facilities. It does not address how existing facilities should be considered in the planning or design of other highway infrastructure projects. This gap and its implications for both agencies is illustrated by the closure of the Federal Way station due to safety concerns from a highway interchange project in 2010. More stations will be potentially threatened by upcoming infrastructure projects, such as the widening of Interstate 5 at Joint Base Lewis McChord. WSDOT's project map shown in Figure 4.3 does not identify the Fort Lewis northbound inspection station, located just south of the Center Drive Interchange across from Eagles Pride Golf Course. Furthermore, WSP was not involved in the initial planning work for the project. Operations at this inspection station – the busiest on I-5 – will be impacted during construction that is scheduled to begin in 2017 and finish in 2023.⁷⁹

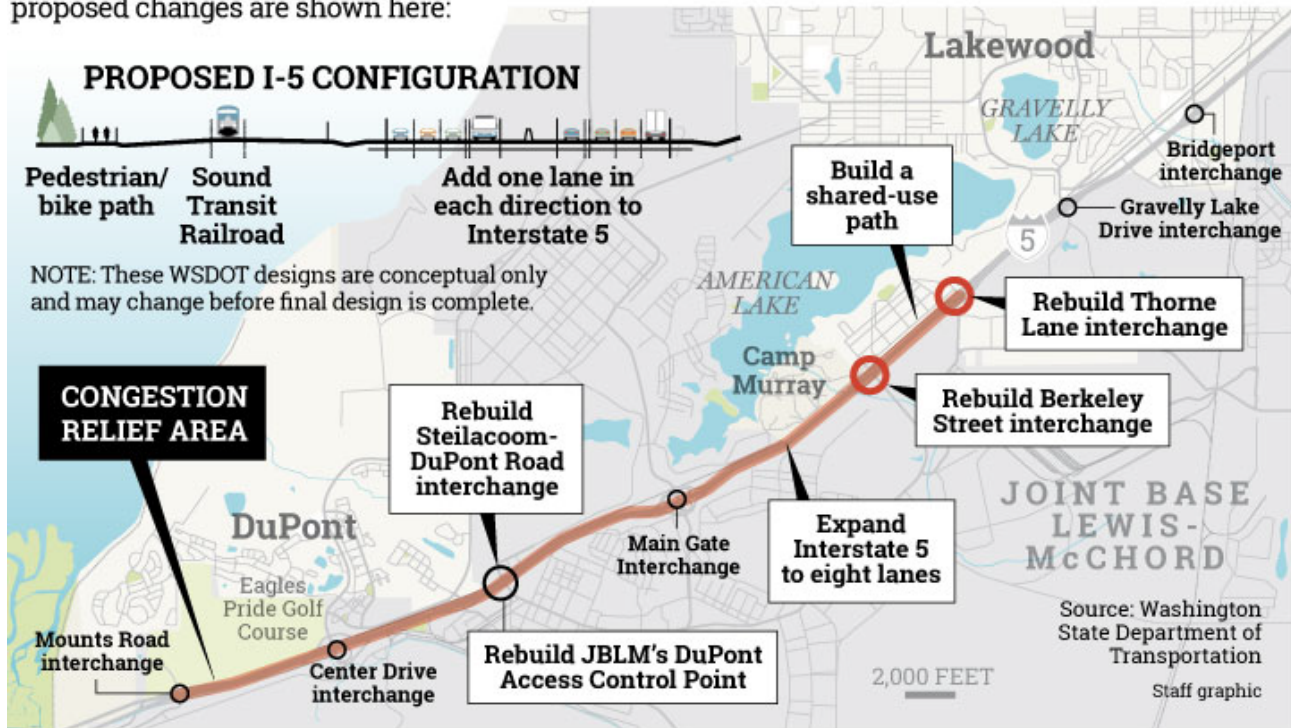
⁷⁸ Washington State DOT. *Design Manual M 22-01.12*. November 2015. Online at: <http://www.wsdot.wa.gov/publications/manuals/fulltext/M22-01/M22-01.12Complete.pdf>.

⁷⁹ Jordan Schrader. "Wider I-5 –along with years of worse congestion – coming to JBLM area." *The Olympian*. August 29, 2015. Online at: <http://www.theolympian.com/news/local/traffic/article32730147article32730147.html>.

Figure 4.3 I-5 JBLM Area Congestion Relief Project Map

New interchanges, lanes to ease congestion on busy I-5

Nearly \$500 million has been approved by the Legislature to transform a seven mile stretch of Interstate 5 running from Lakewood to DuPont. The project will add one lane in each direction, which will require the demolition of several overpasses to allow for an eight-lane interstate. Some of the proposed changes are shown here:



Source: Jordan Schrader. "Wider I-5 –along with years of worse congestion – coming to JBLM area." *The Olympian*. August 29, 2015.

The Design Manual should also be updated to include a "check" for impacts on inspection stations or commercial vehicle operations during projects such as highway design, paving, or interchanges where these impacts are most likely to occur. As an example, the following types of questions could be included in a checklist or decision tree:

- Is the project within 1 mile of an inspection station or enforcement-related technology (e.g. a Weigh-in-Motion scale or electronic screening system)?
- Will the project require rerouting of commercial vehicles, or changes to weight or length restrictions?

If the answer to either of these questions is "yes" then the project manager would be required to contact Commercial Vehicle Staff in WSDOT and WSP (this function can be served by the interagency working group described in Recommendation 1). The purpose of this dialogue is to communicate clearly that the project may have potential impacts on the inspection station system or commercial vehicle enforcement. This does not mean that a project will be required

to include mitigation measures or alleviate impacts, only that communication is established between the proper channels to ensure awareness of potential impacts. This inclusion of a “check” during the planning process will help avoid a breakdown in communication, such as occurred during the I-5, SR 18, SR 161 Triangle Project as documented in the Federal Way Case Study, above. A similar checklist could also be included early in the project identification process to ensure that the appropriate parties are aware of a new project and are able to contribute to the planning process.

4.2 Finding 2 – Inspection stations, regardless of size or technologies, should be managed like any other type of asset

There is no Asset Management Plan currently in place for the inspection station system. This leads to a number of issues, including the following:

- There is no protocol for what to do when a station or its technology reaches the end of its life;
- WSDOT has no performance measures directly involving the inspection station system; and
- WSP’s performance measures measure process, not outcomes.

4.2.1 Asset Management Recommendations

There are three interrelated recommendations addressing asset management:

1. Create performance measures shared by both agencies that are outcome based as to how truck inspection stations are affecting infrastructure, safety, and freight mobility;
2. Apply an asset management framework to truck inspection stations; and
3. As part of the biennial budget process, maintain and publish a list of backlogged truck inspection station needs, the cost to address the backlog, and the expected benefits of addressing the backlog.

Recommendation 5 – Create joint agency outcome-based performance measures

Most states have not yet implemented comprehensive commercial vehicle policies nor outcome-based performance measures for commercial vehicle activities. Many states struggle with the question of “why” a weigh station program is needed and how it fits into the overall missions of the State Patrol, DOT, and any other relevant agencies. Ideally, performance measures should be used to determine this “why” – how truck enforcement strategies affect carrier and driver behavior, and how changes in that behavior affect the goals of improving infrastructure preservation, highway safety, and freight mobility. To get to those long-term measures, however, WSP and WSDOT will need to develop some intermediate measures to gain a sense of how enforcement output translates into improved preservation, safety and freight mobility outcomes. The following initial performance measures and associated joint

agency outcomes (Recommendation 3) will inform the Legislature while enabling both agencies to review their underlying data and process and consider approaches for innovating additional outcome-based measures. These performance measures may need to change in order to reflect the outcomes and objectives formalized in Recommendation 3.

- **Exposure of truck traffic to truck enforcement strategies.** How effective is the Washington truck inspection system as a whole, including people, facilities, and technologies, at observing truck traffic and selecting appropriate candidates for additional enforcement activity? For example, if a virtual weigh station is built but the staffing is not available to sufficiently operate it during sufficient peak travel periods, was there truly a return on investment? WSDOT will need to consider approaches to measure exposure of the trucking industry to enforcement activities as part of its traffic management data, although some data is likely available from technologies already in place at some sites. A joint agency outcome tracked by this performance measure would be increased monitoring of the commercial vehicle fleet in Washington.
- **Carrier and driver behavior at stations.** The ultimate objective of a statewide inspection station network is to improve the behavior of those in the trucking industry who either choose to operate outside the law or are unaware of their actions outside the law. This performance measure looks at the change in behavior of the trucking industry over time. WSP is currently collecting some of the data needed to make this determination – violation data. Adding a measure of how often the WSP interacts with trucks, into the calculation allows both WSP and WSDOT to identify trends in how the behavior in Washington is changing over time. For example, if the number of carriers with a safety violation at Ridgefield drops in the next five years, it is important to know if it is due to an overall drop in traffic volume, or an increase in the number of inspections. The number of inspections conducted each year is the unit of exposure. A joint agency outcome based on this performance measure would be a reduction in weight and safety infractions.
- **Infrastructure degradation change.** This suggested performance measure is admittedly imprecise and confounded by automobile traffic as well as weather, bridge and pavement design, investments in maintenance and rehabilitation, and other factors. However, measuring weight enforcement violations at specific locations, will enable WSP to explain to WSDOT the mix of overweight vehicles being removed from the roadways and bridges. Then WSDOT engineers should be able to develop proxy measures for how bridge and pavement damage is slowed by WSP's enforcement actions. National research, such as the recently completed Federal Truck Size and Weight Study,⁸⁰ can help inform the mathematics needed to transform violations enforced into savings realized. A joint agency outcome of this performance measure is a reduction in pavement degradation caused by commercial vehicles.

⁸⁰ Federal Highway Administration. *Map-21 Comprehensive Truck Size and Weight Limits Study*. Online at: <http://ops.fhwa.dot.gov/freight/sw/map21tswstudy/index.htm>.

- **Truck-related fatality change.** This measure should be tied into Target Zero as at least a second level priority. Admittedly, there are many confounding factors at play, such as weather, automobile traffic, and driver choices not governed by the truck inspection station network's activities. But it is important to measure this outcome to see if specific enforcement approaches (for example, installing/using thermal brake sensors) have a disproportional effect on reducing the number of truck-related fatalities. A joint agency outcome for both this performance measure would be a reduction in truck-related incident fatalities.
- **Truck-related, accident-related, road delay.** Linking road delay to specific causes is difficult. Proxies may be needed for this performance measure, and the measure may need to be restricted to urban areas unless only full closures are tracked. Measuring the delay caused specifically by truck incidents may be difficult in the short term and this measure may start off more anecdotal in nature until efficient collection strategies are developed through research. A joint agency outcome tracked by this performance measure is an increase in truck mobility.
- **Time spent per truck delayed for trucks not found in violation.** Inefficient enforcement has a negative impact on freight mobility, especially at older fixed sites. If, for example, 140 trucks enter an inspection station, but none of them have a Level I safety inspection conducted, there is significant delay without producing any actual enforcement. Given the dual role of truck inspection stations for weight enforcement and for safety, this measure will need to be carefully setup and applied to make sure that, for the above example, trucks pulled in for weighings are not included. Note that this measure does not measure mobility impacts for trucks found in violation, as those vehicles and drivers *should* be delayed. A joint agency outcome based on this performance measure is an increase in the "hit rate" of truck inspection activities.
- **Cost of enforcement.** Finally, in order to properly measure return on investment for truck inspection station initiatives, both agencies must understand the underlying cost of the enforcement system. A joint agency outcome based on this performance measure is the amount of funding required to build, maintain, and operate the system.

Recommendation 6 – Apply an asset management framework to truck inspection stations

WSDOT is already very familiar with the use of asset management strategies and practices. WSDOT regularly assesses many statewide assets such as bridges and pavement. The pavement asset management program at WSDOT has recently been recognized as a national leader. The program is defined as, "A coordinated set of activities, all directed toward achieving the best value possible for the available public funds in providing and operating smooth, safe, and economical pavements."⁸¹ Slightly modified, this statement defines the

⁸¹ <http://www.wsdot.wa.gov/Business/MaterialsLab/Pavements/PavementManagement.htm>.

reason for implementing an asset management program for the inspection system. Similar suggestions emerged from a recent JLARC audit of WSDOT's asset condition and needs assessment for pavement and bridges.⁸² Two recommendations from the JLARC study include the need to use best practices when making bridge estimates and the need to improve stakeholder confidence in those estimates.

The Washington State Patrol is less conversant in these strategies. This is reasonable to expect, due to the different missions of the two agencies, and is consistent with observed enforcement agencies elsewhere in the United States. WSP adoption of asset management strategies for truck inspection stations, however, will enable the agency to better interact with WSDOT to make capital funding decisions.

The number of transportation improvements WSDOT can make are nearly infinite – bike lanes, HOV lanes, more durable pavement, sidewalks – all at various mileposts and at other locations on the State's network. However, since funds are limited there needs to be a way for the universe of potential investments to be brought down to a manageable number in order for the agency to conduct financial planning, prioritize investments and communicate with the Legislature and the public. The fundamental question is "do we invest in *this*, or *that*?"

In terms of commercial vehicle enforcement, the number of locations throughout the State and the strategies for enforcement are infinite. If there were no limitations on funding and personnel, or if technology was negligible in cost, a statewide commercial vehicle enforcement network could have data collection and inspection stations on every mile of the highway. However, funds and personnel are limited, and choices must be made in terms of where to place enforcement personnel and build inspection stations.

As a result, there are two core questions that an asset management strategy should address:

- Why should funds be made available to the truck inspection station network, as opposed to other WSP, WSDOT, or legislative priorities?
- When funds or other resources are available to maintain, improve, or expand the truck inspection station network, what investments should be made?

An asset management framework for the inspection station system would include developing and implementing a number of recommendations found throughout this document, including:

- A common language and understanding of the system goals and priorities (Recommendation 1);
- A detailed accounting of the assets of the system (Recommendation 6);

⁸² Mark Fleming and Eric Thomas, Joint Legislative Audit and Review Committee. "Audit on Highway and Bridge Maintenance and Preservation Needs." Presented to Joint Transportation Committee on November 17, 2015.

- Measurements of how system assets are achieving statewide goals through *outcome-based* performance measures as opposed to the output-based measures found in the annual Statewide Enforcement Plan submitted to FHWA (Recommendation 3 and 5);
- Investment needs (Recommendation 7) and priorities for a planning horizon consistent with other legislative transportation funding planning horizons (Recommendation 8); and
- A feedback loop (data) to allow for refinement based on execution of the above (Recommendation 10).

Examples of Questions to Consider in an Asset Management Strategy

Question 1 – When should stations be built? What type of station should be built? What criteria should be used to make these decisions?

Inspection stations serve to increase safety and minimize pavement damage through enforcing safety and weight regulations. An effective station can do this while minimizing impacts to freight mobility. Fixed stations where trucks must pull in cause more impacts to freight mobility, for example, than virtual stations whose primary function is collecting data and helping with mobile enforcement.

Where should a station be built, and what criteria should be used to determine this? Data and performance measures should be used to determine *where* new inspection stations should be located throughout the State. *Safety* and *infrastructure preservation* should be the main criteria, but others can be considered as well, such as the need for data collection. *Safety* is most often measured at the county level via proxy using fatalities from crashes involving a truck. Areas with a high number of fatalities should be prime targets for increased inspection activities. Mobile inspections can fulfill some of this need, yet at a certain point it is more efficient to have a permanent station. Overweight trucks damage highway infrastructure. AADTT – average annual daily truck traffic is the most basic proxy for measuring places where infrastructure preservation is a concern. WIM sites and virtual stations can also be used to identify places where a high number of oversized trucks are present and a fixed site may be warranted.

What type of station should be built? The primary consideration should be the tradeoffs between safety, infrastructure preservation, and freight mobility. Fixed facilities with inspection pits and other technology allow for more efficient safety inspections. WIM and static scales are required to enforce weight. Virtual stations or stations with electronic screening and dynamic queuing allow for more trucks that are obeying the weight and safety laws to bypass the station, increasing freight mobility. Depending on the needs in a particular location, one or another aspects of the station could be emphasized.

Characteristics of the surrounding area and available staffing should also impact what type of station is built. In rural areas with a low volume of traffic, a station with a lot of infrastructure may not be necessary, and a simple setup with static scales and an inspection area may suffice. In urban areas and on heavily used corridors, traffic management becomes a primary

concern and the station should be designed to balance traffic flow with safety and weight inspection activities. Even though the traffic volumes and safety statistics may warrant a built-out fixed inspection station, if space is tight and volumes are high, a virtual station with a roadside pull-off for mobile inspection activities may be the best option. Weather and climate also play a role, as safety inspections often require an officer to spend 30-60 minutes per truck outside and crawling under the truck. Inspection buildings and pits can make this process more efficient and comfortable, especially in areas with significant temperature variations or precipitation.

Staffing availability is also a critical consideration. A single officer can only conduct so many activities, and often has to make tradeoffs between safety and weight enforcement, and station management. In this case, technology to improve traffic flow through the station such as electronic screening or dynamic queuing (allowing trucks to pass when the station is too full and pulling in more trucks at times of low volumes) can help maximize the time the officer can spend doing safety and weight enforcement. If the station will be staffed with multiple officers, additional infrastructure to support safety and weight inspection (e.g., multiple inspection bays) can be useful.

Question 2 – Once a station is built (or conceptualized), how will the agencies ensure the station is kept both functional and in good condition? What criteria determine functionality and condition? Who is responsible for each of these criteria?

Once a station is built, WSDOT and WSP have a joint responsibility to keep the station in good working order. The criteria for determining whether a station is in good working order, both functionally and conditionally, will depend on the station type. For example, a CVISN-equipped station would be considered nonfunctional if its electronic screening equipment was not working, whereas a roadside pull-off does not have this technology and so it does not need to be considered.

Table 4.2 shows some initial questions to determine functional or conditional deficiency at a fixed site equipped with electronic screening. WSP and WSDOT should jointly explore and expand these questions as the MOU is revised. In general, functional deficiency is caused by a lack of or nonfunctioning technology, inadequate physical layout, or life-expectancy of the station infrastructure. Conditional deficiency is caused by the need for maintenance and upkeep, and other operational issues such as staffing and utilities.

Table 4.2 Functional versus Conditional Deficiency Questions

Determining Functional Deficiency	Determining Conditional Deficiency
Is the site design, ramp length, and inspection areas sufficient to process truck volumes?	What year was the administration building constructed? Is it in good physical condition?
Is the infrastructure and hardware at the right level for the station type? E.g., are the scales	What year were any ancillary buildings (inspection buildings) constructed or undergo substantive

Determining Functional Deficiency	Determining Conditional Deficiency
installed and functional? Is the electronic screening equipment installed and functional?	maintenance work? Are they in good physical condition?
Is the technology (software, fiber optics, e-screening) sufficient to process truck volumes and in good working condition?	Are the utilities (heat, electricity, water, plumbing) sufficient and in good condition?
Is the available technology within its life expectancy and performing according to design?	Is the building properly set up for optimal work flow (Computers facing the scale, signage controls easy to reach and operational?)
Is the physical infrastructure of the station (e.g., buildings) within their life expectancy?	Is there adequate staffing to operate the site?

Using Fort Lewis as an example, the site (an Intermediate Fixed Site) is designed to process a large volume of trucks (12,644 truck AADT in 2014), using electronic screening and advanced technology. However, some aspects of the technology, for example the automated infrared roadside scanning (AIRS) system that checks brake functionality are currently not performing optimally due to station configuration.⁸³ Additionally, the ramp length leading to the site is short for the volume of trucks on the roadway, and inspection areas are limited. Finally, the fiber optic system is not adequate for the station technology needs. These aspects are **functional deficiencies** of the station.

The inspection building at Fort Lewis is relatively new and in good physical condition as determined by a site examination. The utilities are functioning properly and are sufficient for the personnel needs at the site. The area inside the building is set up to allow for efficient operations. However, the station is generally staffed by only one officer, which is less than ideal given station volumes. The station has a measure of **conditional deficiency** due to the staffing needs, but is generally in good condition according to these criteria.

Applied Asset Management Matrix Framework

These two aspects – functionality and condition – can be shown on a matrix framework, illustrated by Figure 4.4. The intention this framework is to visually identify the type of need at individual stations and to see the system needs as a whole. Sites that fully meet the functional requirements for that location are at the top of the matrix, while sites that are unable to perform efficiently due to poor site design, insufficient technology, or other lack of infrastructure would fall to the bottom of the matrix. Similarly, sites that are maintained in good condition and operated efficiently will appear on the right of the matrix, while sites in poor condition or operated inefficiently will be at the left. For example, a site that can process

⁸³ The AIRS system detects heat – if the brakes are hot, they are active in slowing down the truck, if they are cool, they are not functioning properly. The system at Fort Lewis is located on an uphill portion of road, meaning that the brakes are not activated and the system cannot determine if there is a safety issue.

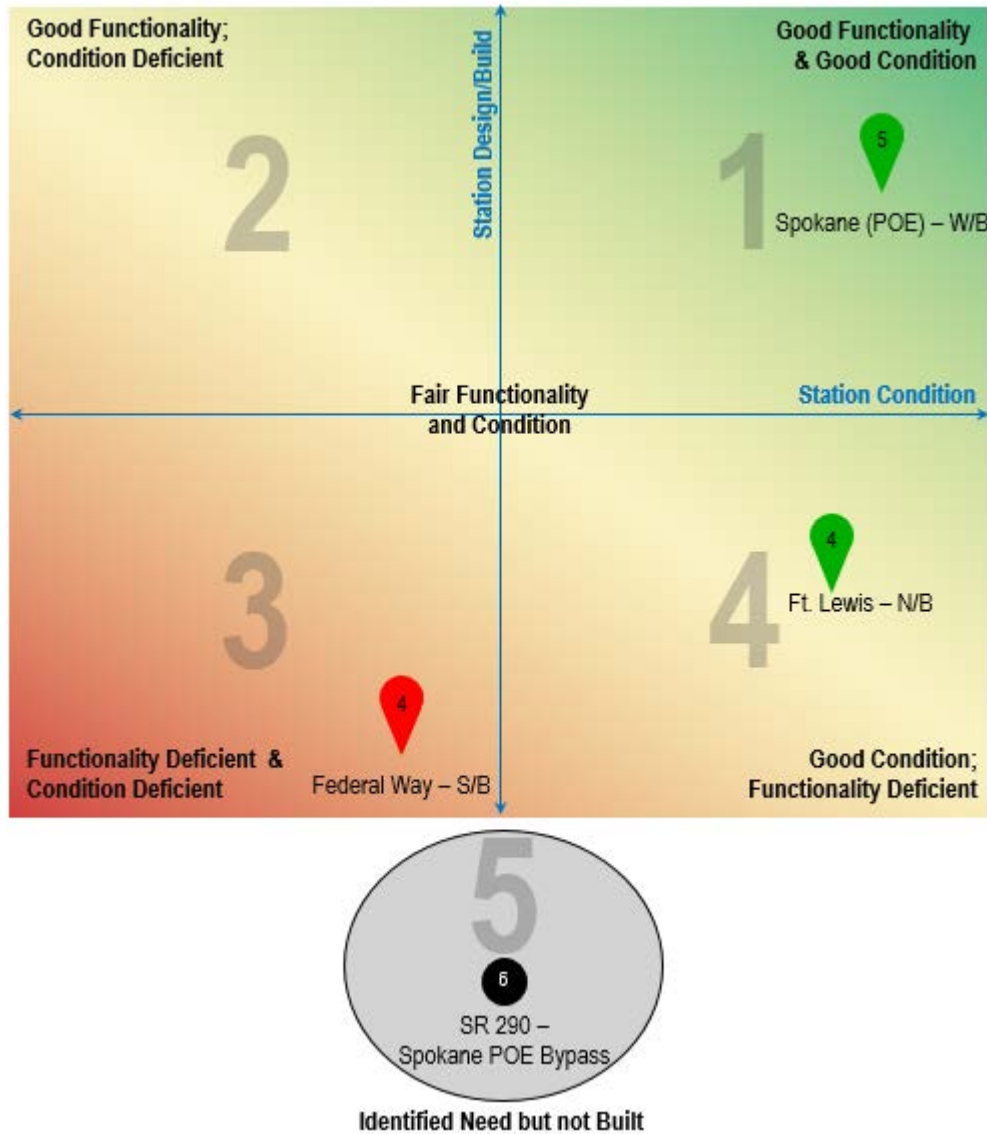
current traffic volumes and has sufficient technology but has a dilapidated building and is only open one day a week due to insufficient staffing would appear in Quadrant 2. Fort Lewis, referenced above, would appear near the middle of Quadrant 4.

Two other sites are included in Figure 4.4 for illustrative purposes. WSDOT and WSP should replicate this analysis for all sites as part of an initial task to implement an asset management program. The color and shape of each symbol matches the condition (open or closed) and classification that appears in the electronic map introduced in Section 1.0 and explained in detail in Appendix A. The numbers inside each symbol represent the site type as identified and explained in Section 2.2.

- Federal Way S/B is both functionally and conditionally deficient. The site is currently not operable due to safety concerns that arose during the construction of the I-5/S 18/SR 161 Triangle Interchange Project. The location of the mainline WIM sensor does not provide enough time and space to safely allow trucks to exit the highway into the facility once notified that they may not bypass the site. There are also safety concerns due to the proximity of the site entrance ramp (where trucks need to slow down to enter the facility) and the on-ramp to Interstate 5 (where vehicles need to speed up to merge with traffic). The site was constructed in 1960s and though WSP indicates that the facility is in adequate condition, the site may be reaching the end of its life expectancy. Additionally, Federal Way may require upgrades in order to be fully functional. The current location lacks significant truck parking, a return loop for reweighing, an inspection facility, and brake scanning technology. Due to high current and forecasted volumes on Interstate 5, this additional infrastructure and technology may be required in order for Federal Way to be fully functional.
- The Spokane Port of Entry is new and the technology and infrastructure are in good working order. The site includes mainline WIM technology, dual scales, extended truck parking, a return loop for reweighings, and an inspection building for conducting safety inspections. This technology is needed to help process and manage the more than 4,000 trucks that pass the site daily, the sixth highest volume at any existing site. Built in 2011, the Spokane facility is the newest inspection site in Washington's system and is in good physical condition. The functionality rating is below the maximum due to the location of the site; although it is on one of the highest volume routes in the State (Interstate 90), there is a convenient bypass route available. This has led to the need to consider a virtual inspection station on SR 290 to detect trucks bypassing Spokane.

A fifth "quadrant" appears below the matrix indicating locations where there is an identified need for a site but a facility has not been built (SR 290 Spokane POE Bypass). Because there is no site, the functionality does not exist and the site condition is neutral. Including identified needs in the matrix frames a discussion of the tradeoffs associated with investments in the system.

Figure 4.4 Asset Management Matrix



Source: WSDOT, WSP, Cambridge Systematics, Inc.

Recommendation 7 – Maintain and publish a biennial needs list

The framework discussed above can be used to develop a set of inspection station needs (which will also feed into the System Plan in Recommendation 8) and to prioritize which investments need to be made. We recommend that this list be updated biennially as part of the budget process, and done so jointly by both agencies, and made publically available on a web site.

In order for this approach to be effective, the responsible parties (WSP and WSDOT) need to “buy in” to the process and agree on a number of criteria for making joint decisions, including:

- Agree on definitions of functional and conditional deficiency. The concepts identified in the above table and matrix are examples; the two agencies must agree on definitions that fit their particular vision and goals for the system. These definitions need to incorporate the life expectancy of a site – for example, at some point in time, deficiencies at a station may switch from being a maintenance concern (condition) to an operational concern (functionality), leading to a shift in responsibility between the agencies.⁸⁴
- Determine basic cost assumptions for moving sites between quadrants on the matrix.⁸⁵
- Develop criteria for deciding when a station should be decommissioned. Determine what happens when this occurs. Does the site return to quadrant 5 (identified need but not built)?
- Agree on a process and metrics to identify the need for building a new station or changing the station type of an existing station. This also includes determining what station type is needed. A new station can be placed in the matrix in Quadrant 5.

Quadrant 5 is critical to this process. Identifying new needs increases the exposure of the industry to truck enforcement strategies, directly impacting the performance measures identified in Recommendation 5. But when an asset needs list is limitless and far outpaces available funding, many agencies tend to underrepresent the need. The needs list should be developed at a level of detail that is manageable for both agencies, considers both short- and long-term needs, aligns with existing WSDOT, WSP, and the Legislative capital planning processes, and allows for prioritization of projects based on funding availability and state priorities.

4.3 Finding 3 – The inspection station system is not adequately accounted for in WSDOT planning

WSDOT produces a number of long-range plans that guide the development of the State’s transportation modes and assets. This type of document is missing for the inspection system. This has led to the following:

- There is no long-term vision, goals, or principles for the inspection station system. Stations are built or replaced on ad hoc basis, based on short-term or local identified needs.
- Future system needs and use are not considered; instead planning is focused on building and rebuilding a system that is more than 50 years old.

⁸⁴ Similar considerations apply to interchanges. At some point, the design of the interchange is no longer adequate, regardless of the actual condition of the infrastructure.

⁸⁵ For example, the latest State Enforcement Plan (2016) estimates that the cost of replacing the administrative/scale building (improving both condition and functionality) at Plymouth POE and building a new inspection building (improving functionality) is \$11.3 million. Installing modern scale pads (increased functionality and condition) costs approximately \$175,000 per scale.

4.3.1 System Planning Recommendations

The following recommendation will improve the visibility of the inspection station system in WSDOT planning:

- Develop a joint statewide inspection station system plan to better forecast future needs and conditions.

Recommendation 8 – Develop a joint statewide inspection station system plan

Along the lines of other planning documents developed by WSDOT for its other modal systems (e.g., Ferry, Aviation, Freight), this planning document would:

- **Contain a vision and goals for the inspection station system:** This would elaborate goals specific to the inspection station system that go beyond the system preservation (WSDOT) and public safety (WSP) missions identified by the two agencies.
- **Identify system assets:** Information would be developed as part of the Asset Management Strategies and includes the data necessary to maintain the electronic map and develop and track performance measures.
- **Create or include performance measures:** Performance measures track the success of projects or strategies in achieving desired outcomes. These could be developed as part of this plan or create separately and included in this document.
- **Facilitate future scenario planning:** One of the weaknesses in Washington’s inspection system is that the focus is on building and maintaining a system that is in many cases 50 or more years old. There is limited visioning of how commercial vehicle trends, technology improvements, or political or policy shifts could impact the system and how they should be accounted for.

A plan for the Inspection Station System could be developed as a stand-alone plan, or it could be incorporated into existing planning efforts, such as the Freight Mobility Plan.⁸⁶ The “Minnesota Statewide Commercial Vehicle Weight Compliance Strategic Program,” developed

⁸⁶ Online at: <http://www.wsdot.wa.gov/freight/freightmobilityplan.htm>. The current Freight Mobility Plan mentions weigh stations twice, once in reference to providing and enhancing the technological capabilities of the sites and once in a list of 10-year investments that are currently unfunded. The technology update reference reads, “WSDOT continues to work closely with the Washington State Patrol (WSP) to support and enhance the technology tools the WSP uses at the state’s weigh stations and ports of entry.”⁸⁶ The document does not address any of the four elements discussed above. Chapter 4 of the Freight Mobility Plan includes information on the state’s freight transportation assets – a discussion of the inspection station system assets would fit here. Chapter 5 includes the conditions and performance of the transportation system, again the inspection station could become another component of this chapter.

by Minnesota DOT and Minnesota State Police in 2005,⁸⁷ is an example of an effective, jointly developed stand-alone plan. In either scenario, a joint approach is critical to ensure buy-in and develop a plan that will guide the actions of both agencies. WSDOT and WSP should be co-authors of this plan. It may be that a third party will be necessary to guide the development of the plan and ensure that each agency's needs and goals are being accounted for. Local enforcement agencies can also play a key role in providing data, identifying needs, and understanding local and long term development. Private sector involvement, especially of truckers, is also critical. For example, stakeholders may be able to identify locations in the system that unfairly target certain types of industries, creating an uneven playing field in the trucking industry. Gaining buy-in from both industry and local partners will help facilitate effective planning and implementation.

There is also a need for the Plan to be a "living document" that is updated at regular intervals. This requirement will foster communication between the agencies and help mitigate the impact of institutional turnover. It will also ensure that the agencies are considering new developments in the commercial vehicle enforcement field that could change how the inspection system is designed and operated. The System Plan needs to conceptualize how the commercial vehicle industry will operate 20 years in the future and determine how best to achieve system goals under that scenario. Planning for a system to handle current conditions will leave Washington State with an inspection system that is unable to meet future challenges. Understanding future needs will inform the asset management program by driving the inclusion of new inspection sites in Quadrant 5 of the asset management matrix.

4.4 Finding 4 – WSDOT and WSP have insufficient data or data-sharing arrangements to make strategic decisions regarding the inspection station system

Data has been compartmentalized and is not shared on a regular basis within or between WSP and WSDOT agencies. For example:

- In a number of cases, data provided by the agencies during the course of this study was inaccurate or out of date. For example, records of station closures were not included in documentation provided. Station IDs and naming conventions were not reliable between agencies – for example the "Federal Way" station is listed as "SeaTac" in some documents.

⁸⁷ Online at: http://www.dot.state.mn.us/ofrw/PDF/cvePlan051004_1.pdf. Minnesota noted many of the same issues that have been discovered in Washington State's system, including the negative impact of overweight vehicles, the need for greater inter-agency coordination, and staffing challenges. Although the plan is focused on weight compliance it incorporates the four elements identified above that should be included in a good long-range plan. The document provides a purpose (vision and goals) and sets the weigh station system in the context of the entire transportation system. It includes background on how the plan was developed and who was consulted and provides an overview of the system (identify system assets). It explores relevant trends that impact weight compliance, how those trends may change in the future, and proposes future system elements (future scenario planning), performance measures to gauge the effectiveness of the system (create performance measures) organizational changes, an implementation timeline, and budget issues.

- Each agency currently only collects or uses partial data relating to the inspection station system. WSDOT collects truck volumes, but does not have a record of station locations. WSDOT has data on trucks weighed by WIM throughout the state system, whereas WSP only has data on trucks physically weighed and inspected at inspection station sites.

4.4.1 Data Recommendations

To improve data collection and data-sharing between WSDOT and WSP, the following recommendations apply:

- Develop a data sharing agreement between WSDOT and WSP; and
- Collect and maintain shared data that is updated regularly and available to both agencies.

Recommendation 9 – Develop a data sharing agreement between WSDOT and WSP

A new approach to collecting and utilizing data is an essential element to implementing each of the previous recommendations in Findings 1-3. As part of formalized communication procedures between WSDOT and WSP, a data sharing agreement should be developed. The agreement should include data collection, sharing, and distribution procedures and cover the following topics:

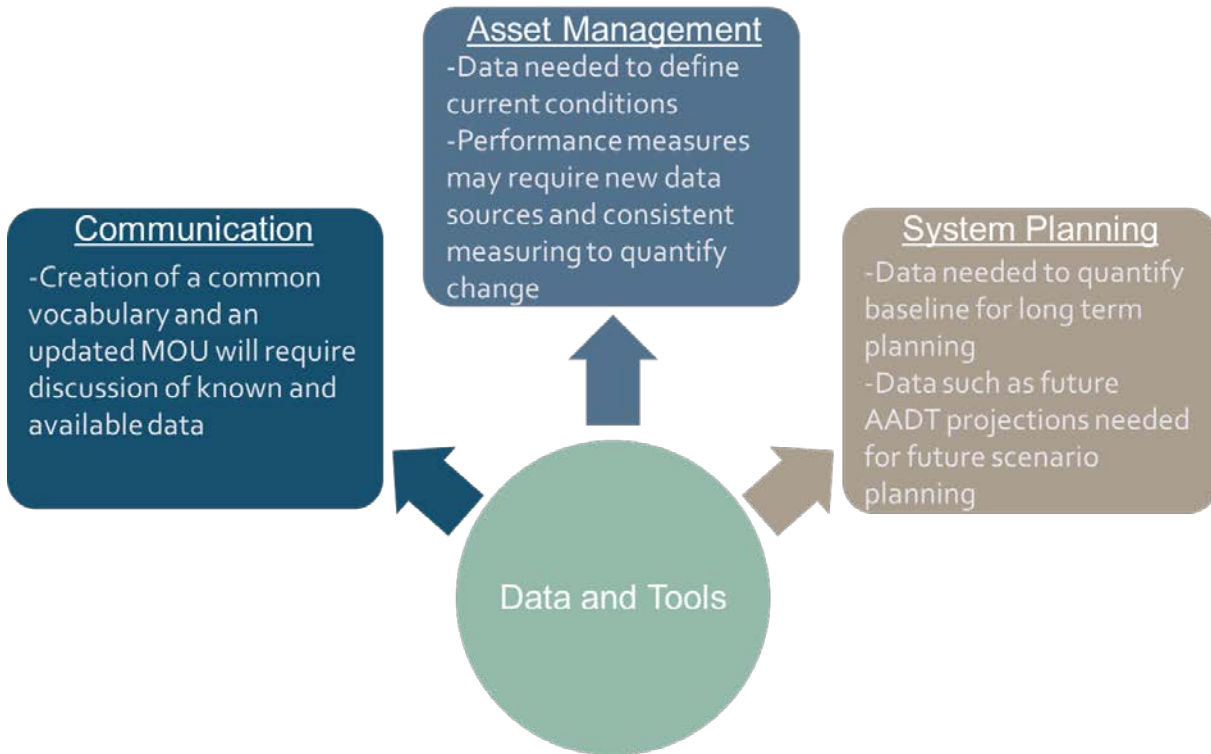
- What data should be collected?
- Who is responsible for collecting it?
- How often should data be updated?
- How should the information be stored?
- Who has control of the data?
- Who has access to the data? Alternatively, who needs to receive the data, and how often?

Data needs to implement the recommendations of this study are summarized in Figure 4.5. Some examples include:

- The need to collect, aggregate, and disseminate data and information will require increased communication between the agencies. To deal with this, data sharing practices should be formalized as part of developing communications protocols as explained in Recommendation 1.
- System asset data is needed in order to develop asset management tools as suggested in Recommendation 6 such as the matrix shown in Figure 4.4. Information needs include the status of physical infrastructure in the inspection system, system operations and enforcement outcomes.

- Performance measures (Recommendation 5) that measure the outcomes of the inspection system rather than the workload may require new data sources. Performance measures should be created based on system needs, not the available information. If there is a gap, then alternative data or new data collection measures should be implemented. Data will help benchmark current conditions and determine future progress towards performance goals.
- Understanding current conditions is a key component in developing any long-range plan (Recommendation 8), and data elements such as future AADT projections can help identify needed future investments that can inform the development of the asset management matrix (part of Recommendation 6) and the joint statewide inspection station system plan (Recommendation 8).
- The ability to share data between inspection sites and with neighboring states is a key consideration for the future. As data sharing arrangements are formalized between WSP and WSDOT (Recommendation 1), data collection, storage, and dissemination techniques utilized by neighboring states should be examined to determine if there is a potential for future integration with Washington's system. A sub-group of the interagency work group (Recommendation 1) should be created to collect, synthesize, and disseminate data. The sub-group should be directed to work with appropriate representatives from each agency to develop tools and information-sharing procedures necessary to complete the other recommendations.

Figure 4.5 Data Required to Implement Recommendations



Source: Cambridge Systematics

Recommendation 10 – Collect and maintain shared data

Data from a number of sources is required to develop outcome-based performance measures, make capital programming decisions, and implement many of the recommendations described in previous sections. The data should be maintained in a single location, in a format that is easily understandable and updatable. As part of this project, an electronic map⁸⁸ was developed that contains data from a number of sources. This map and the underlying data should be maintained by the interagency working group, and available for decision-makers in WSDOT, WSP, the Legislature, and other interested parties.

Table 4.3 summarizes the data fields included in the map. The first two columns indicate the data type and agency that is currently collecting the data. The last two columns indicate how the data is collected or where it is stored, and how often the data should be updated in the future. All of the information below is available and being collected, but it has not been aggregated in a single place. For example, WSDOT collects data from the WIM systems that prescreen for the electronic screening sites, but that data is not compared with WSP's counts of vehicles that are physically weighed at the sites. Calculating the percent of vehicles that are pulled in after WIM screening and combining this with the weight fines issued (collected by WSP) provides an understanding of the "hit rate" or efficiency for a particular site. As

⁸⁸ A detailed description of the electronic map is found in Appendix A.

additional data needs are identified by either agency or the interagency working group, this data should be added to the map and underlying database, and appropriate timelines and methodologies for maintaining the data will need to be developed.

Table 4.3 Electronic Map Data and Data Sources

Data Type	Agency Responsible	Data Source	How often Collected/ Updated?
Location Information (Lat/Long, Scalehouse Number, Highway and MP)	WSP	WSP Documentation, Google Maps	Annually
Site Type	WSP with consultation from WSDOT	NA	Annually or when there is a change
Scale size	WSP	WSP Documentation	When scales are upgraded
Mainline AADT and CAADT	WSDOT	WIM, VWIM, Automatic Traffic Recorder (ATR)	Annually
Projected Future AADT	WSDOT	–	Every 5 years
Site Technology (CVISN, Network Connectivity, etc.)	WSP/WSDOT	Site Visit, WSP/WSDOT Documentation	Annually
Staffing	WSP	WSP Documentation	Annually
Site Infrastructure (Truck parking, Truck loops, Scale house)	–	Site visit, Google Maps	When there is a change
Trucks Weighed by WIM when open	WSDOT	WSDOT CVISN WIM	Bi-annually
Trucks Physically Weighed at Site	WSP	WSP Documentation	Bi-annually
Weight Fines Issued	WSP	WSP Documentation	Bi-annually
Number of Inspections	WSP	WSP Documentation	Bi-annually
Number of Violations	WSP	WSP Documentation	Bi-annually
Site Infrastructure Conditions (building, utilities, etc.)	WSP	Site Visit, WSP Documentation	Annually
Potential Additional Data Needs			
Crash Rate for Commercial Vehicles on route within 5 miles	WSDOT/WSP	WSP/WSDOT Documentation	–
Pavement Condition Average Score on route within 5 miles	WSDOT	WSDOT Documentation	–
Number of Truck Legally By-passing a site	WSDOT	WSDOT CVISN WIM	–

Source: WSDOT, WSP.

For comparison, data collection methods and uses in other states are discussed briefly below and are found in more detail in Appendix C. One common trend is the growing use of WIM and virtual inspection sites to track infrastructure conditions and gather data on commercial vehicles movements. Caltrans in California and the New Jersey DOT both use WIM systems to collect axle and gross weights, axle spacing, vehicle classification, and speed data. The two agencies conduct pavement studies, highway monitoring and capacity studies, accident rate calculations, traffic operations planning, and analysis of truck transportation practices.^{89,90} The Maryland State Highway Administration uses weight and video camera data collected by virtual weigh stations to send warning letters to truck companies that are found to be in violation of weight or size limits.⁹¹ Indiana, Michigan, and Minnesota are upgrading their WIM systems to support preselection and act as virtual weigh stations; North Dakota's 12 weigh-in-motion sites are already designed to support both prescreening and data collection capabilities.⁹²

Finally, the ability to share data between inspection sites and with neighboring states is a key consideration for the future. As data sharing arrangements are formalized between WSP and WSDOT, data collection, storage, and dissemination techniques utilized by neighboring states should be examined to determine if there is a potential for future integration with Washington's system.

4.5 Moving Forward

To implement the findings and recommendations of this study, a four-stage approach should be taken as summarized in Table 4.4. Each implementation step may address one or more of the above recommendations.

Through implementation with the above schedule, we anticipate the following positive outcomes for the State of Washington by the end of the 12 month period:

- Consensus between agencies as to the vision and objectives of investing in truck inspection stations;
- An accurate estimate of project backlog and long-term funding needs;
- A definition of current performance of the truck inspection system, and expected performance based on anticipated future funding;

⁸⁹ "Data Weigh-in-Motion." California Department of Transportation. Online at: <http://www.dot.ca.gov/hq/traffops/trucks/datawim/>.

⁹⁰ State of New Jersey Department of Transportation. *Roadway Information and Traffic Monitoring System Program*. Online at: <http://www.nj.gov/transportation/refdata/roadway/truckwt.shtm>.

⁹¹ Discussions with Dave Czorapinski, Maryland SHA. 2014.

⁹² Federal Highway Administration. *Concept of Operations for Virtual Weigh Station*. June 2009. Online at: <http://ops.fhwa.dot.gov/publications/fhwahop09050/sec04.htm>.

- Initial integration of truck inspection station considerations into WSDOT project selection and design; and
- Guidance for WSP to make investment decisions between truck inspection stations and other agency initiatives.

With these outcomes in place, both WSP and WSDOT can then move forward more effectively on the longer term goals of leveraging truck inspection stations to reduce infrastructure damage, reduce truck-related fatalities, and improve freight mobility for the citizens of Washington.

Table 4.4 Recommended Implementation Approach

Stage	Implementation Steps	Recommendation Addressed	Timeline
1	<ul style="list-style-type: none"> • Agencies identify truck enforcement leaders (if in house) or outline approach for acquisition. • Agencies jointly form a working group to revise documentation such as the MOU (and the associated Joint Operating Statement). • WSDOT to formulate a plan to inform WSP on WSDOT asset management practices for other assets. • Identify all WSDOT projects under construction with potential impacts to truck enforcement sites. 	<ul style="list-style-type: none"> • Recommendation 1 • Recommendation 3 • Recommendations 1 and 6 • Recommendations 1, 8, and 10 	3 months
2	<ul style="list-style-type: none"> • Draft revision of the MOU presented to the Legislature, with outstanding issues to be resolved. • Recommendation for how the Joint Statewide Inspection Station System Plan should be either incorporated into existing agency documents or developed as a standalone plan. • Agency update of the electronic map developed in this project. • Initial estimate of current industry exposure to truck inspection stations. • Draft needs inventory of new sites (Quadrant 5). • Assessment checklist for Quadrants 1-4. • Combined data definition for current inventory. • Develop a schedule for updating the WSDOT Design Manual once the MOU is finalized, plus develop appropriate intermediate guidance to designers for the interim period. 	<ul style="list-style-type: none"> • Recommendation 3 • Recommendation 8 • Recommendation 10 • Recommendation 10 • Recommendation 6 • Recommendation 6 • Recommendation 10 • Recommendation 4 	6 months
	<ul style="list-style-type: none"> • Report to the 2017 Legislature on Stages 1 and 2 deliverables. 		December 2016

Stage	Implementation Steps	Recommendation Addressed	Timeline
3	<ul style="list-style-type: none"> • Final MOU executed, and process for its annual review is developed. • Completed Joint Statewide Inspection Station System Plan, including: <ul style="list-style-type: none"> – Initial presentation to whom? of all performance measures and current values; – Asset management assessment of all current and needed sites; – Data management implementation, including memorandum on any internal initiatives needed; and – Revised schedule for open items (Design Manual changes, information technology/data initiatives, etc.). 	<ul style="list-style-type: none"> • Recommendation 3 • Recommendations 2, 5, 8, and 9 	12 months, then ongoing upkeep
	<ul style="list-style-type: none"> • Report to 2018 Legislature on Stage 3 deliverables. 		December 2017
4	<ul style="list-style-type: none"> • Priority list of investments for consideration in the 2018 budget process for the 2019-2021 biennium. • Proposals for funding that reflects an analysis of: <ul style="list-style-type: none"> – Current costs of the system (both agencies, operating and capital); and – Current revenues and avoided costs generated by the system. 	<ul style="list-style-type: none"> • Recommendation 7 • Recommendations 8 and 10 	August/September 2018

Appendix A. Electronic System Map

The electronic map shown in Section 2.1 is a tool created as part of this study that will enable ongoing collaboration between the WSP and WSDOT. In addition to this final report, a separate implementation memorandum was developed by the consultant team, including:

- A link to the electronic map;
- The memorandum; and
- The base data used to create the electronic map.

The map and supporting materials is provided to the Joint Transportation Committee, WSP and WSDOT at the conclusion of the study, for their continued use and updating in the future.

The map was constructed in Google Maps with information obtained from a number of sources. Scale data, including geographic coordinates, scale size, and violation statistics was provided by the Washington State Patrol. Traffic counts and truck percentages, both for 2014 and 2034, were obtained from the WSDOT Transportation Data and GIS Office. Additional data on the CVISN-equipped sites was taken from the Federal Highway Administration's "Smart Roadside Initiative Gap Analysis- State of the Practice."⁹³ WSP sites were plotted in ArcGIS and used to find adjacent road segments from WSDOT in order to determine truck and traffic volumes at each site. Table B.1 and Figure B.1 show some of the data fields in the active map.

The Google Maps format allows for easy adjustments as more information becomes available. New information can be uploaded as spreadsheets, and layers already in the map can be edited directly in the browser. Additional information such as pending projects that could impact a site, additional enforcement or funding data, and pictures that show current conditions or needs can all help meet future needs. It also allows a user to quickly change the display variable on the map to reflect the required output. The map can act as one tool to help WSDOT and WSP standardize language and terminology used to discuss or describe the system with all of the critical information about each site available in a single location that is easily accessible.

The map was provided to the Joint Transportation Committee as a link; those with the link will have full access and control over the map, including the ability to invite other people to edit or view the map.⁹⁴ Layers can also be exported from Google Maps to Excel and used in other programs such as ArcGIS for more detailed analysis. Control of the map should be given to the inter-agency task force that is created to implement the recommendations found in

⁹³ FHWA. FHWA-JPO-14-130. Smart Roadside Initiative Gap Analysis. State of the Practice. March 2014. Online at: http://ntl.bts.gov/lib/54000/54800/54891/FHWA-JPO-14-130_2_.pdf.

⁹⁵ Field research conducted by Cambridge Systematics on a nationwide sample of fixed inspection sites for the Federal Motor Carriers Safety Administration (FMCSA) in 2012 found that the number of violations per inspection varied between 0.5 to 5.3. These numbers are representative samples provided for context, only.

Section 4.0, and should be one of the main data repositories that is maintained as part of Recommendation 10.

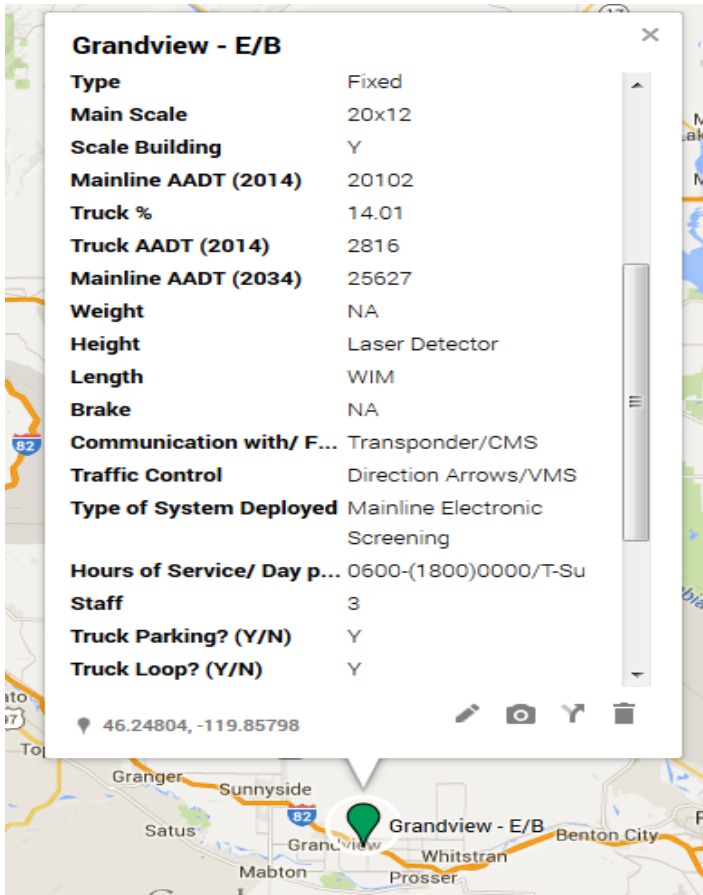
Information included in the map and associated excel files are shown in Table A.1, along with the current source of data. Figure A.1 shows a sample of data available for a given inspection station location. Note that this is data for a fixed, nonelectronic screening site. The electronic screening sites include additional data such as staffing and height and weight violation detection systems.

Table A.1 Fixed, Nonelectronic Screening Sites Data Fields and Sources

	Data	Source
District	7	WSP
Scale Number	35	WSP
Site Number	72902	WSP
ID Number	293035	WSP
City	Anacortes	WSP/WSP
County	Skagit	WSP
Highway	SR 20	WSP
MP	54	WSP
Latitude	48.44675	WSDOT/WSP
Longitude	-122.46	WSDOT/WSP
Main Scale	12×20	WSP
Scale Building?	Y	WSP
2014 AADT	31,045	WSDOT
Truck percentage	5.99	WSDOT
2014 Truck AADT	1,860	WSDOT
2034 AADT	43,624	WSDOT
Trucks Weighed	83	WSP
Weight Fines	\$290	WSP
Number of Inspections	96	WSP
Number of Violations	98	WSP
Site Type	3	Cambridge Systematics, Inc.
Comments		Cambridge Systematics, Inc.

Source: WSDOT, WSP, Cambridge Systematics, Inc.

Figure A.1 Grandview E/B Sample Data Fields



Source: WSP, WSDOT, Cambridge Systematics, Inc.

Appendix B. Additional Washington State Inspection System Data

This Appendix provides more complete data on the 53 fixed inspection stations in Washington. Information on the 12 sites with electronic screening are found in Section B.1. Information on sites without electronic screening are found in Section B.2. Additional information on CVEO and Trooper personnel and enforcement activity are found in Section B.3. All traffic volume and enforcement data is also included in the electronic map as described in Appendix A.

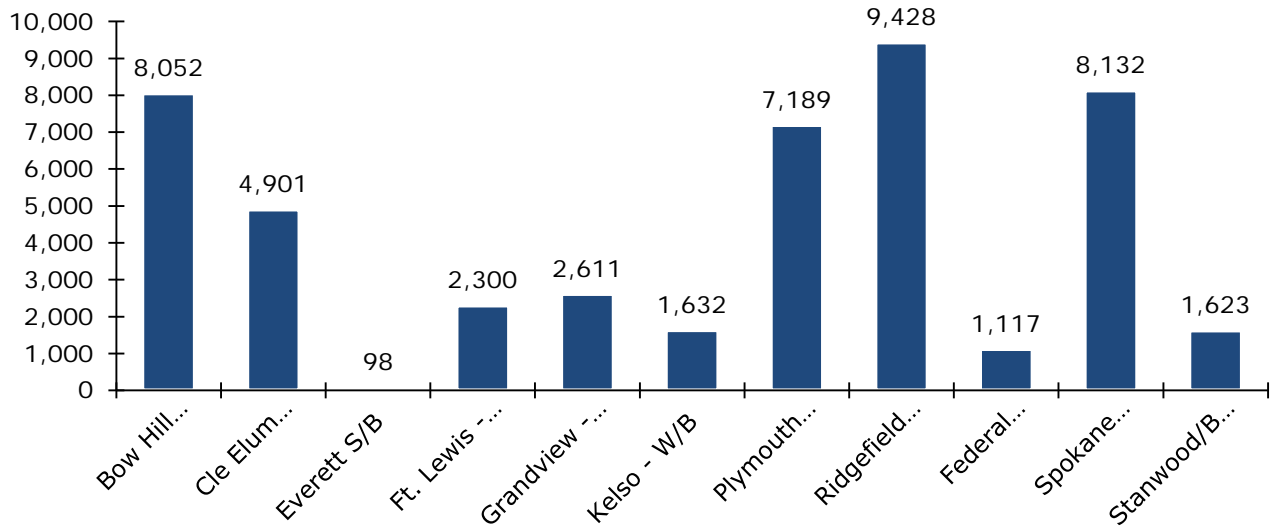
B.1 Washington State Fixed Inspection Stations with Electronic Screening

This section provides details on weight and safety activities at the 11 operating inspection sites with electronic screening capabilities.

Sites with electronic screening are typically located in areas with high traffic and truck volumes so that the advanced technology can help enforcement personnel focus their efforts on likely violators instead of every commercial vehicle that passes the site. Combined with extended operating hours at the five Ports of Entry (which all have electronic screening), the higher number of weighings, inspections, and violations makes sense. It is important to note that the vast majority of trucks at these sites are not pulled in for inspection. For example, nearly 12,000 trucks pass the Ridgefield Port of Entry each day. Of these, slightly more than 9,400 a year are physically weighed on the site's static scales. The legal bypass system in use in Washington (NORPASS) allows vehicles within weight limits and with good safety records to bypass the sites, saving the company and driver time and money.

Sites with electronic screening weighed nearly 83 percent of the 57,000 trucks physically weighed in the State in 2014. Of the more than 47,000 trucks that were weighed on fixed scales at sites with electronic screening, Ridgefield accounted for approximately 20 percent. The four sites with the most weighings are Ports of Entry – Ridgefield, Spokane, Bow Hill, and Plymouth – accounted for 70 percent of weighings at sites with electronic screening and 58 percent of all weighings in the entire system. The Ports of Entry are the busiest sites in the system in terms of trucks being physically weighed. The high truck volumes on the routes with Ports of Entry is one explanatory factor – the higher the volume, the more trucks that are likely to fail the screening (or get pulled in at random) and be physically weighed.

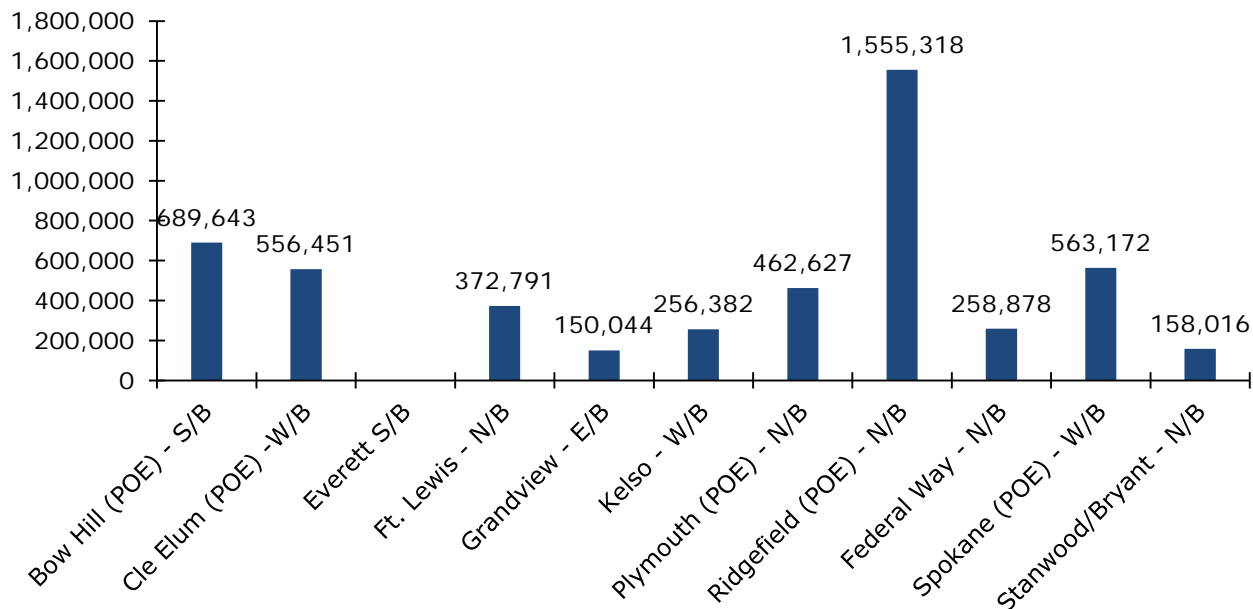
Figure B.1 Washington State Electronic Screening Sites (2014)
Trucks Physically Weighed



Source: WSP. Note that for all data, Everett S/B shows data for 2013 (site was closed in 2014 due to needed repairs from a vehicle crash). Federal Way N/B is currently being used as a mobile enforcement site as the fixed site is not operational.

These physical weighings occur after the trucks pass over the electronic screening system for an initial weight measurement by WIM. The total trucks that are weighed and screened by the WIM system is shown above. Ridgefield's WIM system screens out more than 99 percent of the trucks that pass the site, allowing inspectors to focus on trucks that are the most likely to be out of compliance. Bow Hill and Spokane, the next two busiest sites also screen out the vast majority of trucks and allow them to bypass. These sites physically weigh less than 2 percent of the trucks that pass over their WIM system. This represents one of the major benefits of using an electronic-screening system, the vast majority of trucks that pass a site that are in compliance with weight and safety regulations are able to bypass the site, saving the company and driver time and money and allowing station personnel to focus on the most likely offenders.

Figure B.2 Washington State Trucks Weighed on WIM (2014)

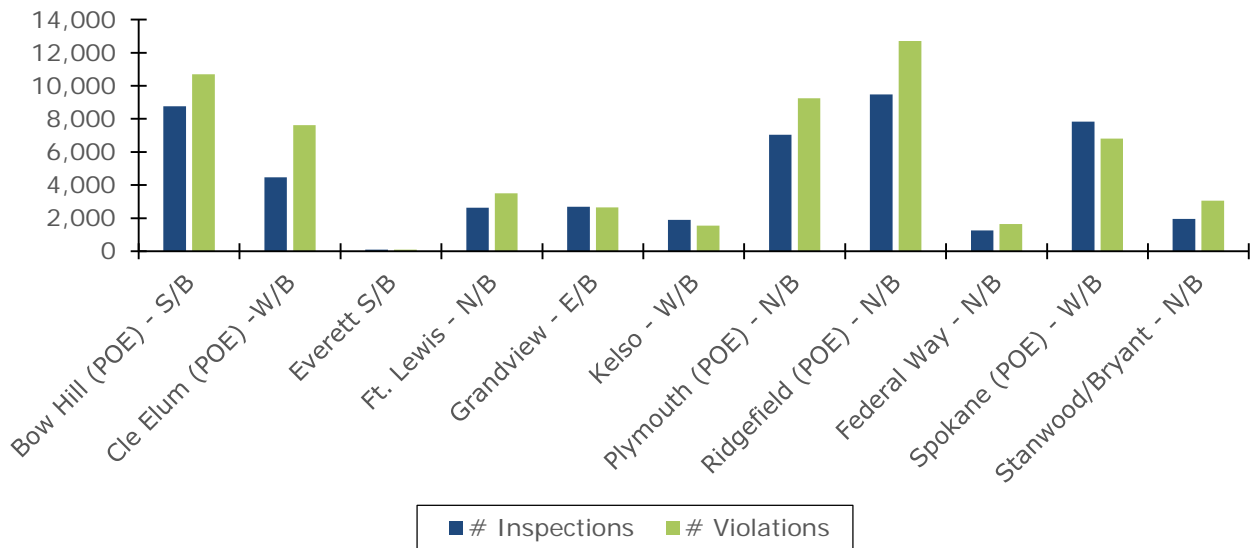


Source: WSDOT. Note that Everett S/B was not operational during this time period.

The sites with electronic screening with the most physical weighings also had the most inspections in the system. Weighings on a certified scale by an officer are required in order to issue over-weight fines since WIM technology is only considered accurate enough to act as a screening tool and currently cannot be used to issue citations directly. Consequently, the more trucks that enter a site for a physical weighing, the more trucks that are likely to be inspected for safety issues. Ridgefield, with the highest AADT in the system, accounted for nearly 20 percent of all inspections in the screening equipped system in 2014. Bow Hill performed the second highest number of inspections followed by Spokane and Plymouth. Ridgefield also discovered the highest number of violations among sites with electronic screening with more than 12,700 out of a total 59,558. Bow Hill and Plymouth were the next two stations with the highest total violations noted. The number of violations per inspection ranged from 1.70 at Cle Elum to 0.82 at Kelso. Sites with electronic screening averaged 1.24 violations per inspection.⁹⁵ This does not mean that every truck that was inspected had a violation, but instead likely indicates that some trucks had multiple violations.

⁹⁵ Field research conducted by Cambridge Systematics on a nationwide sample of fixed inspection sites for the Federal Motor Carriers Safety Administration (FMCSA) in 2012 found that the number of violations per inspection varied between 0.5 to 5.3. These numbers are representative samples provided for context, only.

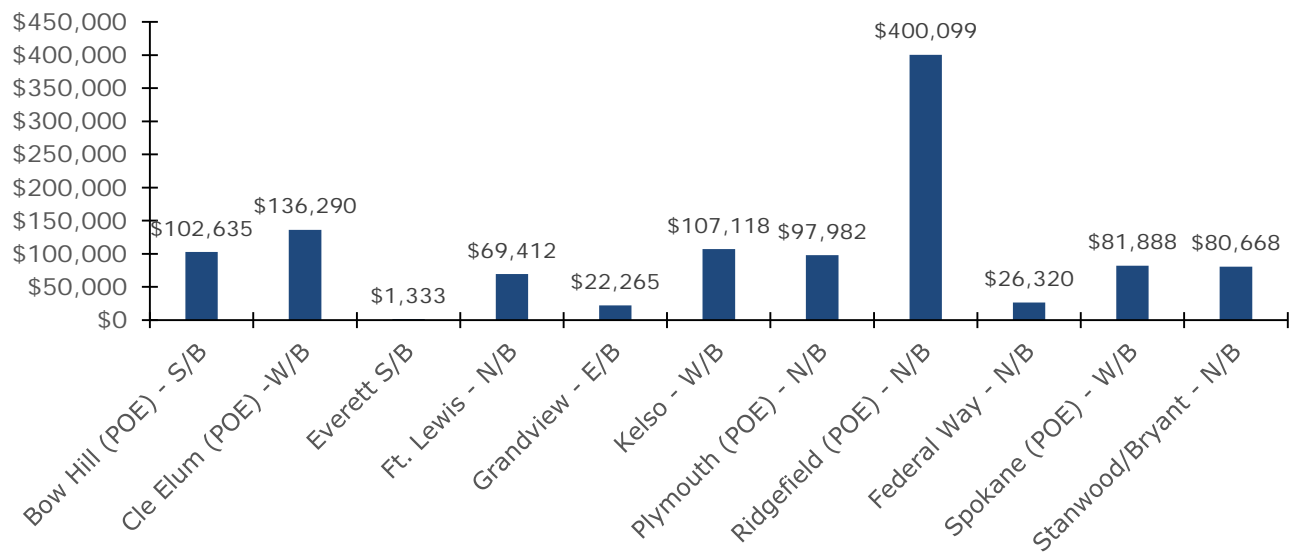
Figure B.3 Washington State Electronic Screening Sites, Inspections, and Violations (2014)



Source: WSP.

Not surprisingly, the site with the most inspections issued the most in weight fines. Electronic screening equipped locations issued more than \$1.1 million in fines in 2014. Ridgefield was responsible for approximately 36 percent of the total value of fined issued in 2014. Cle Elum, Kelso, and Bow Hill all issued more than \$100,000 in fines in 2014.

Figure B.4 Washington State Electronic Screening Sites, Weight Fines (2014)



Source: WSP.

B.2 Washington State Fixed Inspection Stations

This section provides information on the 40 fixed inspection stations in Washington that do not have electronic screening. Figure B.5 shows the annual average daily traffic for both commercial and noncommercial vehicles on the highways where inspection stations are located.⁹⁶ The highest total volume for these sites is reported at Gig Harbor (although this total is possibly erroneously high, given the roadway characteristics and location), followed by North Bend, Cle Elum E/B and Anacortes. The highest truck percent is at Plymouth, where nearly 40 percent of the vehicles that pass the site are trucks. The highest truck count is at Cle Elum E/B, which sees an average of more than 6,000 trucks pass the site each day.

Figure B.6 shows the number of commercial vehicles that were physically weighed on the fixed scales at each site. Tokio E/B weighed the most trucks in the system, followed by Brady E/B and Pasco S/B. These numbers represent only a fraction of the trucks that could have been weighed at each site – site layout, staffing, hours of operation, inspector discretion⁹⁷ and mainline traffic volume all play a role in determining how many trucks are actually weighed. In total, the fixed sites without electronic screening physically weighed nearly 6,600 trucks in 2014 – approximately 12 percent of all weighings in the State.

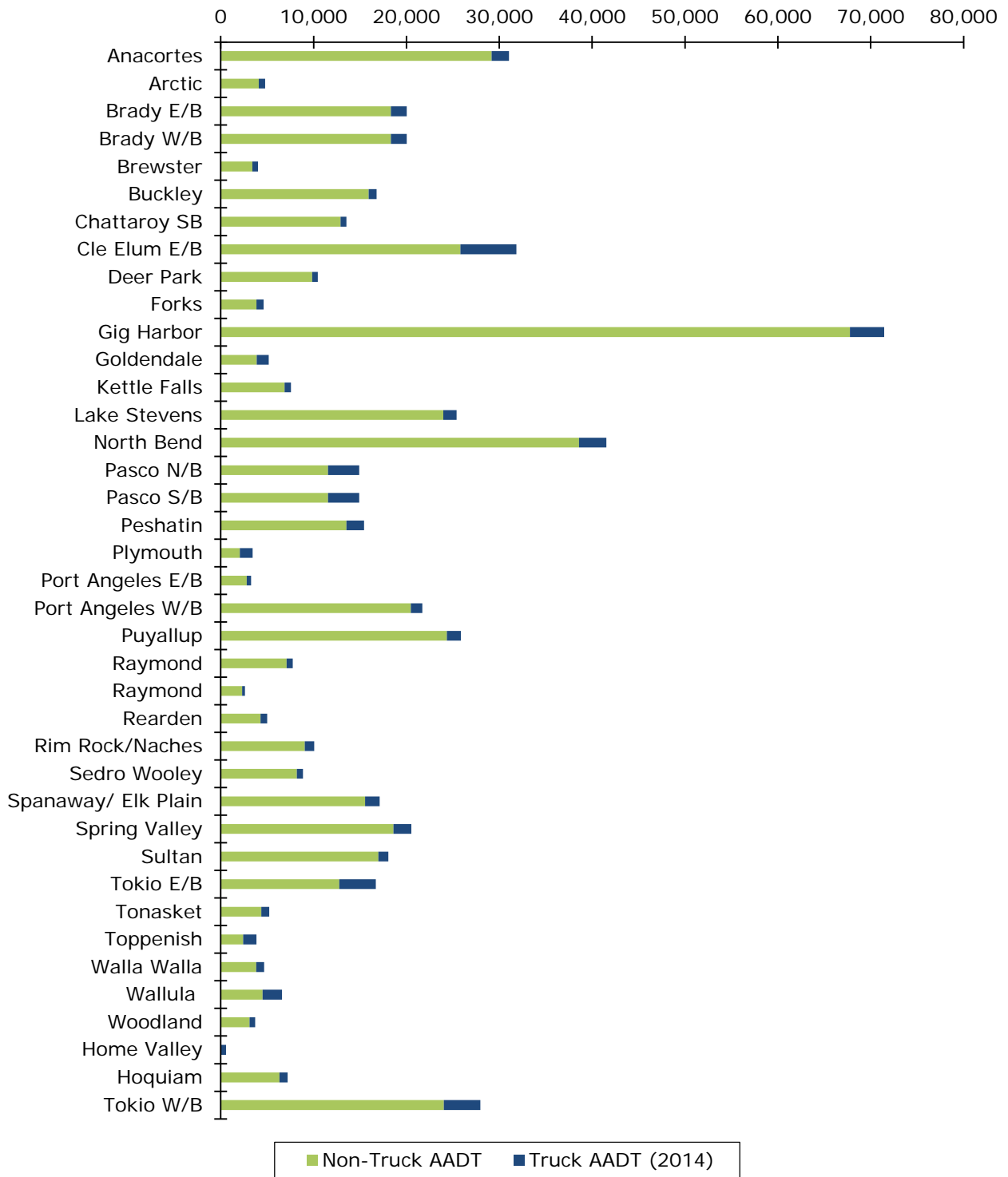
Sites that weighed the most vehicles also conducted the most inspections and discovered the most violations. Tokio E/B conducted the most inspections, followed by Pasco S/B and Brady E/B. The vast majority of the sites had violations-to-inspection ratios over 1. This does not mean that every truck that was inspected had a violation, but instead likely indicates that some trucks had multiple violations. The total number of violations per inspection at each site ranged from 0.25 at Brewster to more than 2.7 at Rim Rock and Forks. The average for all fixed sites without electronic screening was 1.48 violations per inspection, slightly higher than the 1.24 violations per inspection at the sites with electronic screening. The median ratio for both sets of sites was 1.25 at sites with screening, 1.24 at sites without. A possible explanation for this is that sites with screening are located on high freight traffic routes where vehicles are more likely to be traveling longer distances and be in better physical condition versus sites such as Rim Rock and Forks, which are not located on major freight corridors and the trucks are more likely serving local customers. These trucks are more likely to have multiple violations, increasing the average for nonscreening sites.

⁹⁶ Mainline AADT and Truck AADT are for the closest adjacent segment to the site for which data was available.

⁹⁷ Not every truck that enters the site is weighed. Some trucks may be signaled to bypass the scale based on the inspector's discretion, traffic queue, or other factors.

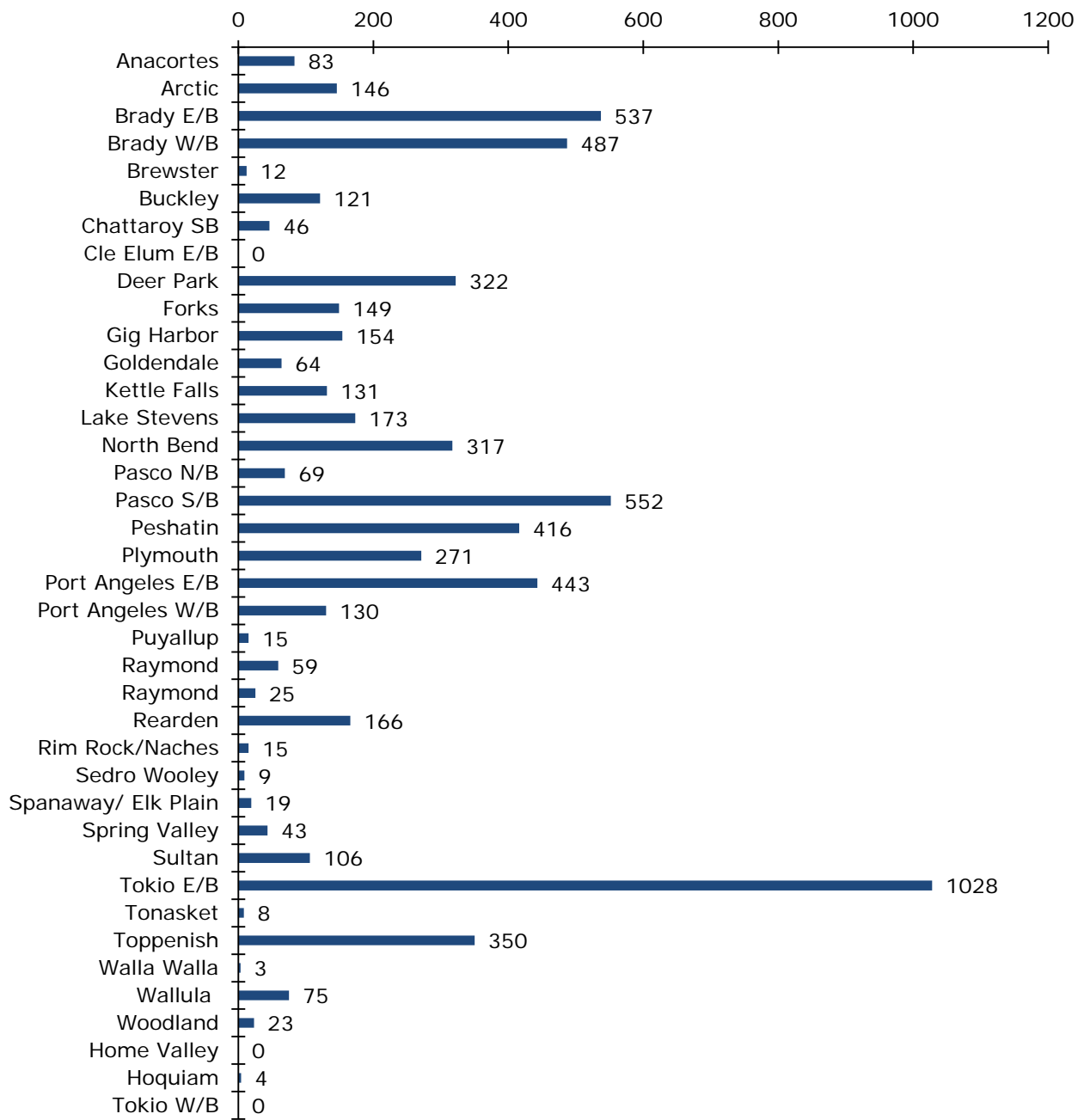
Brady E/B, Lake Stevens, and Port Angeles E/B issued the most in weight fines for sites without electronic screening in Washington. There is not sufficient data to determine if the total fines are due to a high number of violators that are slightly overweight (and thus receive smaller fines) or a few number of violators that are highly overweight (and thus receive large fines). In total, these sites collected slightly over \$180,000 in fines in 2014, well below the \$1.1 million in citations issued at sites with screening. These 40 sites averaged \$24 in fines per inspection, the same rate as seen at the sites with electronic screening.

Figure B.5 Washington State Fixed Sites, Truck and Nontruck Mainline AADT (2014)



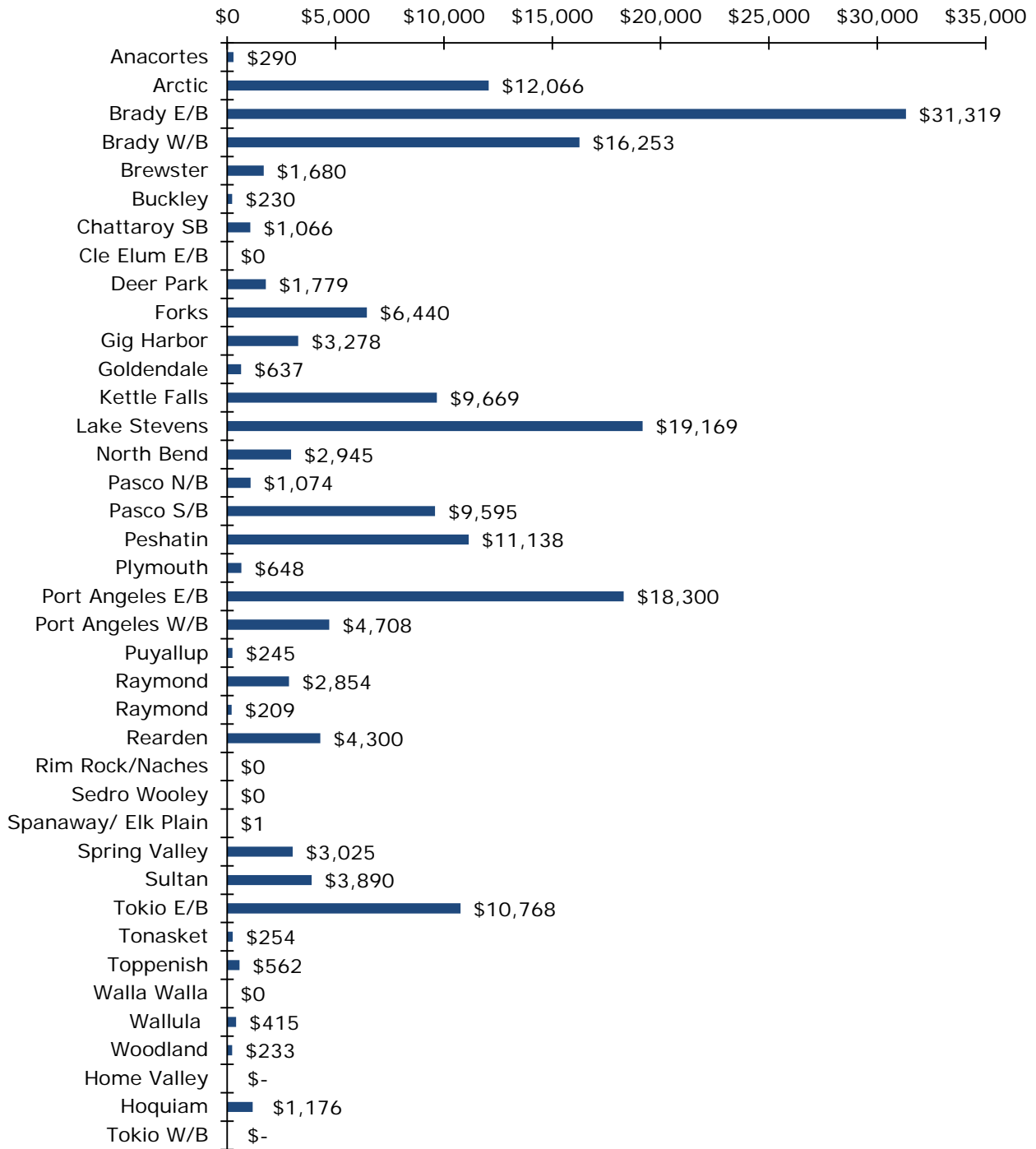
Source: WSDOT.

Figure B.6 Washington State Fixed Sites, Trucks Physically Weighed (2014)



Source: WSP.

Figure B.7 Washington State Fixed Sites, Weight Fines (2014)



Source: WSP.

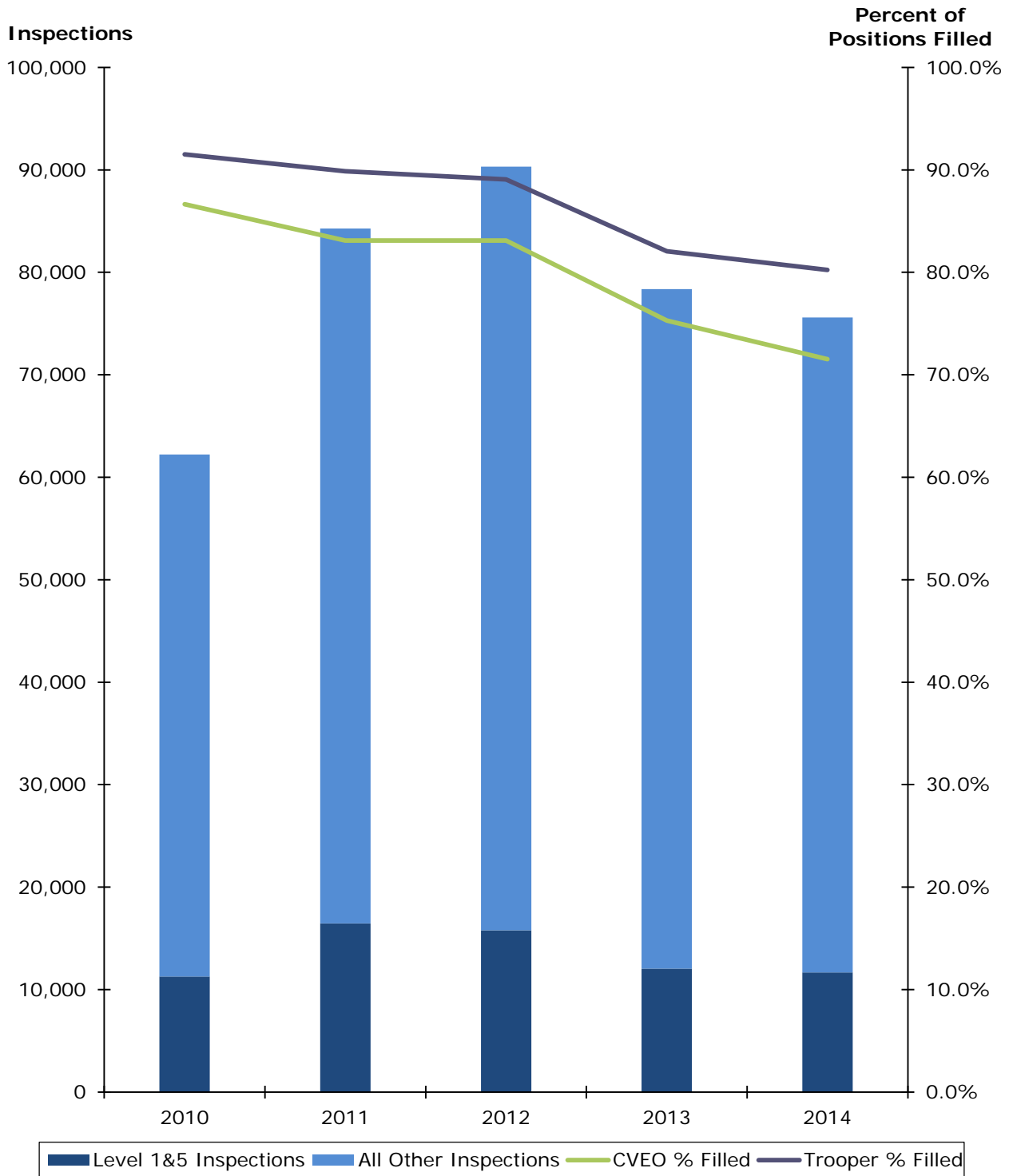
B.3 Personnel and Operations

Currently, there are 112 CVEO and 57 Trooper positions in the WSP. The largest staffing shortfalls in 2014 are for POE CVEO's in District 3 in southeast Washington (average 4.5 positions unfilled), CVEOs in District 7 north of Seattle (average 4.33 positions unfilled), and POE CVEOs in District 6 in central Washington (average 3.67 positions unfilled). All three of these top vacancy areas are CVEO positions in more rural areas of the State, including District 6 outside of the I-5 corridor.

2012 represented the peak in inspections performed in the State at 90,304. Projected total inspections in 2015 are just under 79,000, an increase from 2013 and 2014 but still more than 10,000 below 2012 highs. Levels I and V inspections have accounted for between 19.5 percent of all inspections in 2011 and 15.4 percent of all inspections in 2013. Figure B.8 shows the number of inspections and percent of CVEO and Trooper positions filled between 2010 and 2015.

Figure B.9 shows the total number of inspections in each district for 2010-2014 as well as the number of inspection stations (open and closed, fixed and commonly used mobile) in each district. Interestingly, the not every region with a higher number of inspection stations had a high number of inspections. For example, District 6 has the most inspection stations (11) but has had fewer inspections in each year than Districts 3, 4, 5, and 7 all of which have fewer inspection sites. District 5 had the second most inspections of any district in 2014 with only 6 inspection sites, the third fewest of any district. Some of this variance is likely due to truck volume, but there may be other factors that contribute to these results. The development of a joint statewide inspection station system plan (Recommendation 8) should further examine these trends to better understand what drives the number of inspections per site and how to maximize the efficiency in the system.

Figure B.8 Washington State Patrol Personnel Positions and Inspections, 2010-2014



Source: WSP JTC Staffing-Level Report, 2010-2015.

Figure B.9 Washington State Inspections and Inspection Sites per District



Table B.1 Washington State Patrol Districts

District	Counties
1	Pierce, Thurston
2	King
3	Asotin, Benton, Columbia, Franklin, Garfield, Walla Walla, Yakima
4	Adams, Ferry, Lincoln, Pend Oreille, Spokane, Stevens, Whitman
5	Clark, Cowlitz, Klickitat, Lewis, Skamania
6	Chelan, Douglas, Grant, Kittitas, Okanogan
7	Island, San Juan, Skagit, Snohomish, Whatcom
8	Kitsap, Mason, Pacific, Wahkiakum

Source: WSP

Appendix C. Peer State and Industry Outreach

C.1 Inspection Station/POE States Best Practices Interview Questions

1. Can you provide me with an overview of your state's commercial vehicle enforcement system?
 - a. What do you feel are the strengths and weaknesses of the approach taken by your state?
2. Which state agency or agencies are responsible for activities related to inspection station/POE operations and management?
 - a. What do you feel are the strengths and weaknesses of the approach taken by your state?
 - b. How are operations and improvements funded? Is there a dedicated funding source, or is it out of general funds?
3. What technology is currently deployed at your fixed facilities? Mobile facilities?
 - a. Do you feel like your state's commercial vehicle sites/technology/operations are being utilized to their maximum potential? Why or Why not?
4. Could you tell me a little bit about how your state staffs your enforcement facilities?
 - a. Are there any other business operations besides commercial vehicle enforcement that take place at your facility?
5. What qualifications are used by your state to determine when and where an inspection station/POE is justified? Who makes these decisions?
 - a. What do you feel are the strengths and weaknesses of the approach taken by your state?
6. Does your state give any special consideration for inspection station/POEs during highway planning, design, construction, or maintenance of facilities that are near or will impact inspection station/POEs?
 - a. Should this be done, i.e., consider an inspection station/POE in a manner similar to a roadway interchange in planning, design and construction phases?
 - b. If your state does not give special consideration to inspection station/POEs, how does your state ensure that inspection station/POEs are integrated into planning and improving the highway system?
7. What do you see as the future of the CV enforcement/inspection station/POE system in 20 years, based on current trends?
8. Assume that you can start with a blank slate and design a CV enforcement program from the ground up – there are no budget limitations, no staffing limitations, and you have access to any technology and software programs. What does this program look like?

C.2 Peer State Interviews

Five states other than Washington State were interviewed. These states are Florida, Idaho, Nevada, Oregon and Tennessee. Interview questions were sent to each state representative prior to interviews. Most questions were open-ended by design to allow each state representative to share openly about their state's inspection system statewide. These state representatives represent a very diverse approach to weight and safety enforcement, as discussed in the remainder of this section.

C.2.1 Types of operations (mobile versus fixed), strengths and weaknesses

Most of the states interviewed use fixed facilities as their primary tool and mobile enforcement as a secondary tool for inspection of commercial vehicles statewide. All five states utilize VIS, though the level and breadth of deployment varied widely. The study did not determine how often each state places a mobile unit at VIS sites. Of the states interviewed, only Nevada has no fixed facilities and uses a mobile only approach for their statewide inspection program. Washington State uses a full range of fixed stations, fixed stations with mainline screening, and mobile enforcement, with a planned future deployment of virtual inspection stations.

In general, the volume of commercial vehicles on a given roadway is one of the major considerations for type of facility needed. Mobile enforcement is best suited for areas with low truck volumes. As the truck volumes increase there is a point where mobile enforcement cannot keep up with demand or volume of trucks. Each state seems to have a different truck volume they use to choose which approach is merited.

All interviewees agreed that more mainline electronic screening is needed upstream of both fixed and mobile inspection sites⁹⁸ in order to increase the number of trucks that can be prescreened (if they have transponders) and thus can bypass the site if weight and safety compliant. Mainline screening is an important element, especially in higher volume areas, as it allows trucks that are within the weight limits and with clear safety records to bypass physical inspections, saving these companies' time and money regardless of facility type.

C.2.2 Agency responsibilities and station staffing

Typically, each State's Department of Transportation is charged with responsibilities of funding, planning, design, construction and maintenance of fixed and mobile facilities for commercial vehicle evaluation and inspection. In some states, including Washington, providing and maintaining equipment for mobile units such as portable scales falls under the State Police. DOTs, including the Washington State DOT, are largely responsible for roadway infrastructure and are usually actively involved in protection of its investments and safety of those who use their roadways, interchanges, bridges, rest areas and inspection stations. WSDOT designs and

⁹⁸ If upstream of mobile sites, this would be considered a virtual inspection station.

constructs inspection station facilities but is not invested in the maintenance or protection of them.

Each state has a different approach to how many agencies are involved in daily evaluation and inspection of commercial vehicles. Some use Department of Transportation employees as civilian inspection staff at fixed facilities. Some use Department of Public Safety employees for both fixed and mobile inspection sites staff. Some use a mixture of DOT personnel and law enforcement officers to operate inspection stations. They also differ in what areas of responsibilities and authorities that sworn law enforcement officers and civilian inspection staff are empowered with. Generally states empower law enforcement officers with all evaluation and inspection authority. There is a wide range between states on what responsibilities and authorities are empowered to civilian inspection staff. Some states' civilian inspectors are weigh-masters and have limited responsibilities and authorities. Other state's civilian inspectors have additional authority to conduct some level of truck safety inspection, including driver credentials and logbook checks. Washington State uses the Washington State Patrol for all commercial vehicle evaluation and inspection at fixed stations and mobile sites, though the level of authority given to officers varies depending on if they are a full Trooper or a Commercial Vehicle Enforcement Officer whose authority is limited to commercial vehicle enforcement.

A common thread is to empower each sworn and civilian employee with the highest level of authority authorized by state law. This will increase efficiency by allowing for a complete evaluation and inspection of trucks and drivers by fewer staff. For example, if civilian inspection staff (weigh-master) does not have full inspection authority and witnesses an issue on a truck while it is in the station, the civilian inspector can only inform the driver of the issue and cannot take the truck out of service. Drivers can choose to leave the inspection site without addressing the safety issue raised by the inspector. Some states have given limited authority to civilian inspection staff to hold a truck for a defined amount of time to allow law enforcement officers to arrive and take over. However, if law enforcement is not nearby and the allotted time limit has past, the civilian inspection staff must release the truck. There are exceptions for trucks that pose a clear danger to the public.

Each state uses different approaches for when and how long each fixed or mobile site is open and operational. Some fixed facilities are only open and operational once every week or every other week. Other states operate almost 24/7 except for holidays. This variance can be caused by a number of factors, including lack of available staff (both systemic due to lack of funding and temporary due to leave request), current or forecasted truck activity, and inspector's knowledge of daily or seasonal truck patterns. States with both sworn officers and civilian inspection staff face an additional challenge. Sworn officers have to balance their time and resource between mobile enforcement and being able to respond to requests for help from fixed locations; civilian inspection staff normally will work only at a fixed inspection site.

As discussed below in the section on "Use of technology," there is a growing need for states to have either more trained and equipped staff or qualified service providers to maintain, update

and repair mainline screening and virtual inspection site systems. As dependency on digital data for truck enforcement increases, so will the need to keep this vital tool healthy at all times.

C.2.3 Use of technology

Although current levels of technology use varies between states, all agree that more technology is desirable. The need for more technology is in two areas; more functionality at existing screening sites and second, more fully functional sites at new locations throughout their state. Most of the technology used or desired by other states has to do with mainline screening, which has evolved rapidly over the past 15 years to now include transponder based automated vehicle identification combined with weigh-in-motion. Table C.1 provides a list and description of commonly used technology and notes if the system is in use in Washington:

Table C.1 Technology Deployed by Peer States

Technology	Description	Used in Washington?	Notes
Weigh-in-motion (WIM)	This measures wheel weight as each truck travel over them. It also measures the distance between axles all at interstate speeds.	Y	
Automated Vehicle Identification device (AVI)	This ultimately queries a database for truck credential information.	Y	
Dimension-In-Motion device (DIM)	This either measures the height of each truck or measure height, width and length of each truck.	N	
Classification device	This will identify which of 13 Federal classifications is each truck.	Y	
Image device	This will either read a License Plate, U.S. DOT number on side of trucks or take an overview picture of tractor.	Y	LPR- License Plate Reader
Brake check device	This measures thermal heat values from brake system of each truck.	Y	One currently in use at Fort Lewis
Data linking	As truck moves from one inspection station to the next the trucks data is time stamped and moves with truck.	N	
Bypass warning	A truck that was directed to report to inspection station but chooses to remain on mainline to bypass station will have an overview picture taken and may be sent a warning in the mail.	N	

Source: Cambridge Systematics.

A healthy statewide inspection system requires data that is accurate, repeatable and reliable. Historically, when truck volumes were considerably lower, this information would be gathered during hands-on inspections. Today's truck volumes mean that states cannot afford the right-of-way, infrastructure and staffing needed to directly evaluate and inspect every truck on roadway system, necessitating the increased use of technology to fill the gap. The need for accurate information requires continual confirmation, maintenance, updating, repair and replacement of technology systems. To maintain these systems appropriately, trained and equipped staffing is required, either internally or through an outside agency or contractor. Regardless of service method, time, energy and funding is required to support the overall system. Washington State has a technology maintenance section with WSDOT that is understaffed for statewide system needs. These systems and needs are growing in functionality, complexity and number.

Data from mainline screening sites and virtual screening inspection station sites can be shared with adjacent inspection sites, downstream inspection station, operational management, neighboring states or provinces, and planning staff in order to increase its value and effectiveness.⁹⁹ Currently all states that have screening are using data gathered primarily for adjacent fixed and mobile inspection stations. Some of these states are sharing data from one inspection station to the next station downstream to automatically check logbooks.¹⁰⁰ Multiple states are collecting this data to help manage operations and set patrol and staffing for enforcement personnel. Washington State shares some limited data with adjacent inspection station sites, downstream inspection sites and operational management, but does not currently share data with neighboring states or provinces.

It is important to note that there are some areas of evaluation and inspection that technology cannot discern or support, or that are more efficiently handled by a trained employee. For example, noticing driver fatigue or other signs of impairment is a task that technology cannot fulfill.

C.2.4 Fixed Infrastructures

Most states utilize a blend of fixed and mobile enforcement. One state – Nevada – has adopted a mobile enforcement approach that has reduced the need for all of the infrastructure associated with fixed inspection sites – control buildings, inspection buildings, scale beds, parking lots and truck loop lanes. Thus, the right-of-way required is minimal and the Nevada DOT designs, builds and maintains pull-off areas that provide a safe area to conduct mobile enforcement. The Nevada Highway Patrol has a good working relationship with the Nevada

⁹⁹ Screening data in WA (such as from WIM) is only saved in aggregate. Data associated with an individual vehicle is not saved long-term.

¹⁰⁰ Trucks pass an inspection station, their remaining hours in the logbook is checked, and the time is noted. When the vehicle passes an inspection site further downstream, the site can compare the hours remaining in the log with the known travel time between stations in order to detect any inconsistencies.

DOT, partially due to the reduced demands of time and infrastructure funding that the Highway Patrol requires to operate.¹⁰¹

Other states operate a large number of fixed facilities with large land footprints, including control and inspection buildings, parking lots and truck loop lanes. In most states, personnel from the Department of Public Safety are responsible for daily operations of the site, while the Department of Transportation is responsible for planning, design, construction, maintenance and funding. This arrangement can prove to be more challenging as decision-making processes must meet both Department of Transportation and Department of Public Safety's needs.

C.2.5 Policy and Performance Measures

Both State Patrol and DOT agencies have a wide range of responsibilities, of which commercial vehicle programs are a small portion of overall activities. Hence, policies for commercial vehicle programs are often broadly defined or built into other agency wide policies, such as safety. Most states have not yet implemented comprehensive commercial vehicle policies nor outcome-based performance measures for commercial vehicle activities. A common thread between states interviewed was the need to answer "why" a weigh station program is needed and how it fits into the overall missions of the State Patrol, DOT, and any other relevant agencies.

Fundamentally, inspection station programs exist to be a good steward and guardian of the DOT built roadway system. For example, commercial vehicle enforcement activities are used to protect investments in roadway system (i.e., be a good steward), and make the roadway safe for those that use it (i.e., be a good guardian). Washington State has two agencies involved in this mission. If WSDOT did not build a roadway system, then WSP would not have to provide this service, and WSP supplements the guardianship responsibility of WSDOT to provide a safe roadway system.

Additional "what" questions need to be addressed by states looking to develop comprehensive policies. These types of questions are essential to develop a foundation that drives additional questions such as "how," "when," and "who." For example:

- What does an effective and efficient statewide inspection network look like?
- What does the statewide roadway system look like with an optimum inspection stations and operations network?
- What is measured to confirm direction and compliance of the program?

Using this framework, the Washington State Memorandum of Understanding (MOU) and Joint Operations Policy Statement (JOPS) between WSDOT and WSP do not articulate "what" a successful statewide inspection station and operations program look like. The State

¹⁰¹ It should be noted that Nevada is a heavily "through" state and does rely on enforcement in neighboring states, including California, Arizona, and Utah to help deter out-of-compliant operations.

Enforcement Plan (SEP) from the WSP echoes this – there are no performance metrics within the document, only a list of workload measures such as “weigh X vehicles on mobile scales.” This focus on workload metrics and a lack of true system performance measures appears to be a deficiency throughout many of the states examined. Similarly, WSDOT’s Gray Notebook reports a workload measures (Number of trucks bypassing sites using green light), without setting a performance target or comparing the number of trucks bypassing to total truck volume. Thus, performance measures that could be used to determine if the overall vision for the system is being met, are lacking in both organizations.

C.2.6 Data Usage

Data collection methods and uses in other states that were touched upon in the interviews are discussed briefly below. One common trend mentioned by multiple states is the growing use of WIM and virtual inspection sites to track infrastructure conditions and gather data on commercial vehicles movements.

- California: Caltrans is using axle and gross weights, axle spacing, vehicle classification, and speed data collected by WIM systems to conduct pavement studies, highway monitoring and capacity studies, accident rate calculations, and analysis of truck transportation practices.¹⁰² Data from WIM that feeds into pavement condition analysis and crash rates calculations could be of particular benefit to Washington State as the State explores ways to quantify the damage caused by oversize/overweight vehicles and thus the benefits of having a fully functioning and efficient weight and safety inspection program. The FHWA notes that California uses 190 WIM scales to collect this data; this does not include a further 88 scales that are used for enforcement only and do not collect data from all lanes of traffic. California is also developing a data warehouse in order to manage accumulated WIM data and make the data accessible to multiple interested users.¹⁰³
- New Jersey: New Jersey DOT uses WIM data for infrastructure design and management, freight/trade planning and regulation, detection and enforcement, and traffic operations and management. Data collected includes axle and gross weights, axle spacing, speed, and vehicle class.
- Maryland: The Maryland State Highway Administration uses weight and video camera data collected by virtual weigh stations to send warning letters to truck companies that are found to be in violation of weight or size limits. Although citations cannot be issued based on WIM data, repeat offenders can be identified and contacted in order to attempt to modify behavior. If violations continue, further enforcement through on-site auditing can

¹⁰² Federal Highway Administration. *Concept of Operations for Virtual Weigh Station*. June 2009. Online at: <http://ops.fhwa.dot.gov/publications/fhwahop09050/sec04.htm>.

¹⁰³ Federal Highway Administration. *Concept of Operations for Virtual Weigh Station*. June 2009. Online at: <http://ops.fhwa.dot.gov/publications/fhwahop09050/sec04.htm>.

be initiated.¹⁰⁴ Washington State does conduct audits of trucking companies based on safety ratings, but does not have a similar program in place for weight infractions.¹⁰⁵

- Indiana, Michigan, and Minnesota are upgrading their WIM systems to support preselection and act as virtual weigh stations. Generally, existing WIM equipment can be utilized for screening when enhanced with wireless connectivity, specialized software, and user-selected data for viewing purposes. North Dakota's 12 WIM sites are designed to provide both data collection and prescreening capabilities.¹⁰⁶

Finally, the ability to share data between inspection sites and between neighboring states is a key consideration for the future. As data sharing arrangements are formalized between WSP and WSDOT, data collection, storage, and dissemination techniques utilized by neighboring states should be examined to determine if there is a potential for future integration with Washington's system.

C.3 Industry Input

The study team received input from members of the Washington Trucker's Association (WTA) through a roundtable discussion and an online survey. Comments from these two sources indicated general acceptance of Washington's current inspection station system, especially sites equipped with CVISN technology. Multiple respondents indicated that they participate in the transponder system and are generally pleased with how the system works. A major source of frustration in both the roundtable and survey was the need to report to multiple weigh stations along a route even if a vehicle was cleared at the first location (i.e., the weight is close to the legal limit, so they are not given a green light by the WIM system even though they are legal when measured on a scale). Additionally, fixed scale locations that lack CVISN technology were mentioned multiple times by respondents in a generally negative light. These sites can create serious delays for companies that must respond to just-in-time supply chain demands from customers or that carry time-sensitive goods as they must pull in every truck that passes the location. Trucks that pass multiple open sites during a trip must stop at each, increasing the chance for delays.

Another issue mentioned was specific to the Everett inspection station. The S/B on-ramp from Rt. 526 is located between the inspection station and the WIM/transponder reader. This means that *all* trucks, including those with transponders and those without, entering I-5 from this ramp must stop at the Everett inspection station when it is open. Multiple companies, including Boeing, are located on Rt. 526. Although data for that specific ramp is unavailable, SR 526 just west of the interchange has truck AADT above 3,000. This is above the level seen

¹⁰⁴ Discussions with Dave Czorapinski, Maryland SHA. 2014.

¹⁰⁵ Washington State DOT. Washington State Commercial Vehicle Guide. 2014-2015.

¹⁰⁶ Federal Highway Administration. *Concept of Operations for Virtual Weigh Station*. June 2009. Online at: <http://ops.fhwa.dot.gov/publications/fhwahop09050/sec04.htm>.

at some of the electronic screening sites, confirming industry observations that the lack of screening on this ramp is an issue that should be examined further.

Additional comments and suggestions from the WTA roundtable include:

- Get data management systems from one inspection station to share its data with next inspection station downstream to help eliminate multiple pull-ins at inspection stations during one trip. This would save time, fuel, and brakes for each truck and also save wear on weigh station infrastructure and improve the efficiency of operations staff.
- Get data management systems to share and receive data with neighboring states. While CVISN data may already be available at ports of entry, real-time truck trip data is not. This real-time truck trip data is valued information to improve efficiency and effectiveness of these ports of entry, especially for cross-checking logbooks.
- Upgrade scales at non-Interstate locations and include better training for officers not familiar with older scales. Some of these weigh station are more than 25 years old. When these static scales were designed and built the size of truck for design was shorter than modern current standards. This means existing static scales and approach slabs (control pavement) is not long enough for entire truck to be in one plane throughout the weighing process. If a truck is not in one plane throughout weighing process, then weight can shift through king-pin to other portion of truck. This anomaly can cause inaccuracy in weighing of these trucks.
- Increase mobile enforcement to help protect against bypassing and help level the playing field for trucking industry. As the Interstate Highway System was built, it would parallel an existing major highway. In many locations, both of these roadways are permissible for commercial vehicle to use. Weigh stations are primarily on the Interstate System and some on secondary highways. Trucks can use these secondary highways to bypass weigh stations on Interstates. By placing appropriate enforcement facilities on these bypass highway segment, this would protect these secondary highways and level the playing field for trucking industry.
- Increase use of electronic information to target trouble companies and leave the “good guys” alone by using transponders. The concern is information sharing from trucks versus willingness to operate in a level playing field with other members of trucking industry. Washington State currently charges \$35 for a one-time purchase of a transponder with no per trip cost and batteries last about five years.
- Technology use amongst the trucking companies was prevalent.
- The transponder system was mentioned multiple times as a positive system that saves companies time and money.
 - Companies are also integrating new technology such as automatic side and front spacing control while in cruise.

- Other trucks have cameras that can recognize stationary metal objects and stop the truck without human interaction.
 - Lane change warning systems that alert drivers to other vehicles in their blind spots are becoming more prevalent
 - Slack-adjusters, also becoming more prevalent, automatically apply the brakes if truck leans too far off-center (on a curve). This device disengages some of the electronic components in the vehicle, such as cruise control, and will only reset once the driver has pulled over and turned off the vehicle.
 - An online respondent mentioned that some of their trucks have on-board scales so that the company knows exactly how much each vehicle weights.
 - Finally, some managers have immediate access to electronic log-books, on-board scale data, and slack-adjuster use so that they can monitor driver safety and vehicle performance.
 - Although the use of technology was generally seen positively, participants were less convinced of the viability (at least in the short to mid-term) of autonomous vehicles.
- Oregon uses Oregon Truck Tracking Online (OTTO). OTTO allows approved trucking companies to download a list of scale crossings to internally verify Hours Of Service (HOS) for only their trucks. Oregon State Patrol uses real-time truck trip data to check logbooks and hour of service, data that is also provided to trucking companies to allow for self-regulation. Online systems such as this should be explored by WSP to increase efficiency and effectiveness.
 - Return of permit sales at Ports of Entry. Currently, drivers guess axle and gross weights to purchase the appropriate permit before entering the State. If they guess too low they are not in compliance, if they guess too high they are wasting money. If they enter the State without a permit they are not in compliance. Allowing trucks to purchase permits at the Port of Entry would allow truckers to get permits for their actual weight based on a static scale reading.
 - Suggestion for inspection station placement to explore hilltop sites instead of valley sites for increased truck efficiency. This recommendation encourages weigh stations to be placed at the top of hills so gravity can help slow trucks down as they enter weigh station, reducing wear on brakes. Gravity would then help trucks to accelerate as they return to the highway, reducing fuel consumption.

C.4 State Profiles

This section provides an overview of the inspection station system in Washington and five peer states: Oregon, Idaho, Nevada, Tennessee, and Florida. States were chosen based on their leadership status in the CVISN community, or in the case of Nevada to provide a contrasting

operational approach from that employed in Washington. Much of the data for the profiles is drawn from the most recent State Enforcement Plan (SEP) that each state must file with the Federal Highway Administration to certify that state and Federal laws have been properly applied and enforced on the national highway system.

C.4.1 Washington

Table C.2 Washington State Inspection Station System Statistics

Criteria	Status
Number of Sites	52 fixed sites, 12 with WIM; 11 commonly used mobile sites
Number of Additional Scales	434 mobile scales
Personnel	169 total positions, average of 127 filled in 2014. Split between 81 Commercial Vehicle Enforcement Officers (CVEO) and 46 Troopers
Annual Site Traffic Volume	40 million trucks annually on adjacent roads
Number of Screenings (Mainline WIM)	1.9 million (2014)
Number of Inspections	82,400 (2014)
Total Annual Vehicles Weighed	57,000 (fixed scales)
Total Annual Citations	8,000 weight violations, 105,000 safety violations (weight and safety violations), \$1.9 million in weight fines
Permits/Credentials Issued	No Data

Source: WSDOT. Washington State Enforcement Plan (2016). Interview with Captain Mike Dahl, September 17, 2015.

Infrastructure: Washington uses a mixture of 52 fixed sites and 11 mobile enforcement locations.

Technology: The state uses electronic screening, including 12 sites with WIM and automatic vehicle identification systems. One location (Fort Lewis) has an active brake detection system that scans the thermal energy produced during braking and is a sign of poor brakes. The Washington State Patrol is also looking at incorporating data from 35 additional weigh-in-motion sensors (operated by Washington State DOT Traffic Data Office) in order to help program mobile enforcement.

Staffing: Washington State Patrol has a total of 169 positions with some weight and safety function. Commercial Vehicle Enforcement Officers (CVEO) represent 112 of the positions (81 filled in 2014). CVEOs are not full law enforcement personnel, their authority is limited to commercial vehicle enforcement. The remaining 57 positions (46 filled in 2014) are full Troopers who focus on commercial vehicle enforcement operations. Mobile operations are conducted by a combination of Washington State Troopers and commercial vehicle enforcement personnel.

Authority/Funding: FFY 2016 funding includes \$12 million for personnel and just under \$900,000 for facilities (utilities, vehicles, maintenance of scales and WIM). The Washington State DOT is responsible for building the system.

Policy and Performance Measures: The WSP State Enforcement Plan does not include performance measures. In general, the focus is on workload measures that relate to operational goals and funding requirements.

- Short Term Goals from the 2016 plan:
 - Decrease the number of vehicles weighed at fixed sites by leveraging technology;
 - Weigh 5,500 vehicles on mobile scales statewide;
 - Weigh 3,000,000 vehicles at WIM equipped facilities; and
 - Continue to hire and train new staff to address staffing shortfalls created through attrition. This includes a new testing process.

- Long Term Goals from the 2016 plan:
 - Installation VWIM sites on SR 9 (Sedro Woolley) and SR 290 at Idaho/Washington Border to better detect trucks bypassing Bow Hill and Spokane, respectively; and
 - Reopen/relocate Federal Way S/B scale.

WSDOT's quarterly performance measure report, the "Gray Notebook," has one measure that counts the number of green light bypasses that transponders receive each year and the associated time and money the trucking industry saves. This is also a workload measure (how many trucks are processed and given a green light) and is not connected to the total commercial vehicle traffic moving on the route and does not have any performance target. Additional information on the CVISN program is included in Annual Reports.¹⁰⁷

¹⁰⁷ <http://www.wsdot.wa.gov/Accountability/GrayNotebook/navigateGNB.htm>.

C.4.2 Oregon

Table C.3 Oregon Inspection Station System Statistics

Criteria	Status (2014)
Number of Sites	93 fixed weigh stations, including 6 POE, 22 WIM.
Number of Additional Scales	199 portable scales, 3 ramp scales
Personnel	87.5 FTE. 96, including partner agencies
Annual Site Traffic Volume	Unknown
Number of Screenings (Mainline WIM)	3.5 million (WIM scales, FY 2014)
Number of Safety Inspections	52,564 (FY 2013) – 4,359 found safety violations
Total Annual Vehicles Weighed	5.5 million (including mobile) FY 2014
Total Annual Citations	19,259 (weight only, FY 2014)
Permits/Credentials Issued	302,084 permits (FY 2014)

Source: State Enforcement Plan (2015). FHWA Enforcement Certificate (2014). Summary of Oregon Truck Safety and Guide to the 2014 Commercial Vehicles Safety Plan (<http://www.oregon.gov/odot/mct/docs/cvsplan2014.pdf>). Interview with Ed Scrivner, September 3, 2015.

Infrastructure: Oregon uses an extensive fixed scale system, including multiple electronic screening components such as WIM and automated vehicle identification/license plate readers. It also utilizes mobile enforcement to cover gaps in the fixed system.

Technology: Twenty-two sites use weigh-in-motion and automated vehicle identification/license plate readers to both screen traffic approaching fixed weigh stations and to help detect trucks attempting to bypass an open station. Oregon heavily relies on data from WIM to set hours and decide which sites to open. Limited data sharing in place with Idaho and Washington for carrier/driver citation history and log book data.

Staffing: Motor Carrier Transportation Division (MCTD) of the Oregon Department of Transportation and law enforcement officers from the Oregon State Patrol both carry out inspections. MCTD employs 87.5 FTE in FY 2015 with another 8 FTE from partner agencies. This represents an approximately 28 percent decrease over the past five years due to funding limitations.

Authority/Funding: DOT staff have authority to issue civil penalties against companies and officials for safety, weight, registration, and taxes. Repeat offenses can lead to a shutdown order suspending the carrier's authority to operate in the State. Majority of funding for system drawn from state-funded ODOT sources. Federal MCSAP funds provided \$2,593,256 in FFY 2014 for inspector training, equipment, and safety-related expenses as well as compensation for traffic enforcement work and truck safety inspections (Oregon matched 20 percent).

Policy and Performance Measures: Policy – Trucks more than 1,000 pounds over limit are issued citations. Under 1,000 is left to officer discretion based on driver/company history. “Educate first, enforce if education fails” philosophy is used to effect compliance.

- Short-Term Goals (FFY 2015):
 - Static weigh 2,100,000 trucks on platform scales, 5,500,000 on WIM screenings/legal bypasses and scale weighing.
 - Portable weighings should represent 0.10 percent to 0.25 percent of static weighings.
- Medium-Term Goals:
 - Increase weighings and WIM screenings to 5,750,000.
 - Weigh and Bypass at least 50 percent of trucks on National Network highways.
- Long-Term Goals:
 - Increase weighings and WIM screenings to 6,000,000 and 60 percent, respectively.

C.4.3 Idaho

Table C.4 Idaho Inspection Station System Statistics

Criteria	Status (2014)
Number of Sites	17 Fixed sites, 11 Mobile enforcement units, 3 Virtual WIM
Number of Additional Scales	195 portable scales
Personnel	85
Annual Site Traffic Volume	3.1 million (fixed)
Number of Screenings (Mainline WIM)	Unknown
Number of Safety Inspections	Unknown
Total Annual Vehicles Weighed	2.4 million
Total Annual Citations	8,256
Permits Issued	9,297 (fixed), 422 (rover), 18,833 (online Access Idaho)
Credentials Issued	39,822 (fixed), 1,106 (rover), 14,489 (online Access Idaho)

Source: Idaho Transportation Department (ITD).

Infrastructure: Permanent locations include a mixture of site configurations – one direction only, bidirection with scales on both sides of the highway, bidirection with only one scale, and two center-median, bidirectional facilities at the Lewiston POE on U.S. 95, 1 mile east of Lewiston, ID and Haugan POE (16 miles east of Idaho border). Haugan is located in Montana and is jointly operated and funded by Idaho and Montana. Roving sites monitor bypass routes and conduct targeted enforcement plans.

Technology: Three sites, East Boise, Haugan, and Lewiston, currently utilize electronic screening on the main roadway through weigh-in-motion and limited AVI capabilities.¹⁰⁸ A third site, Huetter, is currently constructing weigh-in-motion for the main roadway. Much of the data entry and credential/registration/safety checks are completed manually and then later added to an electronic database. All of the fixed POE sites have wireless access; roving sites must access Federal and state databases with an air card, which can fail due to limited cell reception.

Staffing: The Port of Entry system is operated by 85 Idaho Transportation Department (ITD) personnel. Additionally, Technical Record Specialists work at four of the busier POE sites and handle clerical and administrative duties.

¹⁰⁸ AVI at these sites takes photographs of trucks and adds it to the WIM profile. It is not used to identify vehicles as in an LPR system.

Authority/Funding: POE personnel are peace officers, not full law enforcement officials. ITD civilian staff can:

- Perform a modified Level III inspection based on the North American Standard Inspection Levels,¹⁰⁹ including credential and registration checks and a walk-around safety inspection;
- Detain a vehicle, but they do not have authority to detain or arrest a driver; and
- Perform traffic stops ONLY if a vehicle is observed bypassing an open Port of Entry or if there is an imminent danger to the public due to safety (flat tire, unsecured load, etc.).

While the ITD works closely with Idaho State Police, their limited authority can create inefficiencies, especially when State Police are not available to aid ITD in enforcement activities. Construction and capital investments are controlled through ITD.

Policy and Performance Measures: ITD policy goals related to the POE system include:

- Limited workload measures are included as part of the Annual Certification of Size and Weight Enforcement Program regarding the number of vehicles weighed on fixed, portable, and weigh-in-motion scales.

¹⁰⁹ http://www.cvsa.org/programs/nas_levels.php.

C.4.4 Florida

Table C.5 Florida Inspection Station System Statistics

Criteria	Status (2014)
Number of Sites	34 Fixed Sites, 23 with WIM, 16 virtual WIM.
Number of Additional Scales	7 semi-portable ramp scales, 1,051 portable scales
Personnel	173 civilian weight inspectors, 256 law enforcement officers
Annual Site Traffic Volume	Unknown
Number of Screenings (Mainline WIM)	Approximately 14 million.
Number of Safety Inspections	110,811 (2011)
Total Annual Vehicles Weighed	20 million annually –WIM and Fixed Scales combined
Total Annual Citations	66,807 (weight), 26,414 (safety), 25,903 (UTC)
Permits/Credentials Issued	No Data

Source: Florida Department of Transportation State Enforcement Plan (2016). Interview with Craig Wilson, September 16, 2015.

Infrastructure: Florida operates 34 fixed inspection stations and 16 VWIM sites (with plans to add 3 more in the coming year). Twenty-three of the fixed sites have WIM. This includes four Interstate and one U.S. highway locations that utilize WIM for mainline screening upstream of the fixed site.

Technology: Florida operates 19 VWIM sites, 23 with ramp and mainline WIM. License plate readers and 3D lasers to measure dimensions are in place at all Interstate weigh stations. One site is currently being fitted with a roadside infrared brake scanner (Yulee WIM on I-95), which can tell if brakes are functioning properly. Electronic screening is currently in use. Florida does not currently share data with adjacent states.

Staffing: Weigh stations on Interstate System operate approximately 90-95 percent of the time, with a goal of 24/7 operation. Sites on secondary routes average 16 hours of operation, staffing is done every 2 weeks and is based on staff availability and data/local knowledge of high volume times and locations.

Authority/Funding: DOT civilian staff conduct weight enforcement and safety enforcement. Staff do not have the ability to hold drivers for more than one hour, though they can ask trucks to park for obvious safety violations and out-of-service notices. Police are called in order to make arrests or detain drivers. Police are also responsible for mobile enforcement and pay for acquiring and maintaining portable scales. All funding for construction, maintenance, and operation of the inspection system comes through the DOT. DOT budget for FFY 2016 is approximately \$11.2 million for facilities and personnel. Siting for fixed locations is almost entirely dependent on AADT, truck percentage, and location of intermodal facilities.

Policy and Performance Measures:

- Short-term (1 year):
 - Weigh 14 million vehicles with WIM, 6 million on static scales, and 29,000 on mobile scales; and
 - Construct and maintain 3 new VWIM sites during 2015/2016.
- Medium-term:
 - Construct and maintain 5 VWIM sites FY 2016/2017; and
 - Remodel and maintain 1 bidirectional platform scale at U.S. 1 Hilliard.

C.4.5 Nevada

Table C.6 Nevada Inspection Station System Statistics

Criteria	Status (2014)
Number of Sites	Mobile and temporary sites only. 10 VWIM. 8 "Improved" Inspection sites at set locations, 16 total set locations.
Number of Additional Scales	302 portable, 11 semi-portable
Personnel	57 officers
Annual Site Traffic Volume	
Number of Screenings (Mainline WIM)	
Number of Safety Inspections	21,358
Total Annual Vehicles Weighed	21,358
Total Annual Citations	228
Permits/Credentials Issued	No data

Source: Nevada Department of Transportation State Enforcement Plan (2015). Interview with Lt. Roy Baughman, Nevada Highway Patrol, September 10, 2015.

Infrastructure: No fixed infrastructure – all enforcement is conducted by mobile units. There are 16 locations that are commonly used for mobile enforcement but do not have permanent infrastructure beyond additional parking areas.

Technology: Virtual WIM at 10 sites used by Nevada DOT to collect data and shared with enforcement to schedule patrols. Credentials are checked via laptop when cell service is available. Limited data sharing with California and Utah, potential to share information with Idaho in the future.

Staffing: Nevada Highway Patrol (NHP) commercial enforcement section has 57 officers. There are also 10 civilian inspectors who are authorized through the law enforcement agency they are part of – they can write tickets but cannot take enforcement action on inspections. Priority placed on logbook checks and Level III inspections to reduce safety concerns. Staffing is at a 10-20 percent vacancy rate. The DMV Motor Carrier Division is responsible for writing permits.

Authority/Funding: The Nevada Highway Patrol is responsible for the majority of enforcement, and are the lead MCSAP agency. Nevada DOT uses highway funds to build and maintain sites as identified by the NHP. Currently there are 16 dedicated inspection sites. There is a special need in rural/secondary road areas for safe sites due to road geometry, most of the Interstate System is sufficient. Nevada just received funding for a complete Department of Motor Vehicle (DMV) modernization project that will include extensive funding for the Commercial Vehicle Information Exchange Window system (CVIEW) and extended CVISN. As

of March 2013, commercial enforcement sections of the NHP annual total costs are approximately \$4.5 million.

Policy and Performance Measures:

- Short-term (1 year):
 - Screen 19,845 vehicles using slow-speed weigh-in-motion technology;
 - Expend 8,400 man-hours conducting roving weight-enforcement;
 - Install two permanent “turn-key” WIM systems (NDOT).
- Medium-term (four years):
 - Increase weight enforcement goals 5 percent over previous year;
 - Install 4 permanent “turn-key” WIM systems (NDOT).
- Long-term (after 2019):
 - Increase weight enforcement goals 5 percent over previous year; and
 - Maintain 6 portable scales per officer.

C.4.6 Tennessee

Table C.7 Tennessee Inspection Station System Statistics

Criteria	Status (2014)
Number of Sites	6 Permanent Sites, 2 VIS
Number of Scales	9 fixed, 269 portable, 2 ramp scales
Personnel	60 officers assigned to weigh stations. Approximately 650 officers total who can conduct safety/weight inspections
Annual Site Traffic Volume	No data
Number of Screenings (Mainline WIM)	No data
Number of Safety Inspections	No data
Total Annual Vehicles Weighed	No data
Total Annual Citations	35,045 (2012)
Permits/Credentials Issued	No data

Source: TN State Patrol.

Infrastructure: Tennessee operates 9 scales at 6 fixed sites all located on the Interstate Highway System. Three fixed sites cover traffic in both directions, 3 are Ports of Entry (only cover inbound traffic). There are two VIS in the State.

Technology: All fixed sites have WIM on the entrance ramps to the site; there is no mainline WIM in the State. All 6 fixed sites have license plate and U.S. DOT number readers. There are a limited number of thermal brake scanners in operation in the State. The state utilizes PrePass and DriveWyze as a screening tool for credentials only. Weight is only checked once the truck is on the entrance ramp to the site.

Staffing: All enforcement is done by Tennessee Highway Patrol officers. Fixed sites are open 5 days a week for two shifts and are scheduled according to District priorities with varying schedules. Approximately 60 officers are assigned to the inspection facilities, there are approximately 650 officers in the State that are trained to conduct weight and safety inspections through mobile roadside enforcement.

Authority: Highway Patrol officers have authority to conduct weight and safety inspections and detain vehicles or drivers.

Policy and Performance Measures: TN DOT has stated a goal of keeping weigh stations open 24/7 (currently at 70 percent). Short-term enforcement goals include weighing 10 million trucks total using WIM, fixed scales, and portable scales. A long-term goal is to consider the increased use of virtual inspection sites. Interviews with officials confirmed the desire to see an increase in virtual inspection sites, especially in areas where geography or available land make a fixed site impracticable.

Appendix D. Additional Best Practices

D.1 Median Siting Case Study

Inspection stations located in a median allow trucks to enter one station from two directions of travel on the same segment of roadway. This approach can be an efficient and effective means of truck evaluation and enforcement by operations staff. However, siting and placement of this type of inspection station configuration can be challenging with several limitations. As a result, this siting alternative must be evaluated on a case-by-case basis. Strategic siting and placement of inspection stations are vital for operational effectiveness and return on the investment of site infrastructure. Median sites, such as Old Town, FL on U.S. 27 pictured at right and through the rest of this section, are in use in states such as Florida and Idaho (Lewiston POE).



D.1.1 Comparison between Median and Traditional Stations

Comparing median and traditional locations, a median location is a viable alternative where, among other factors, traffic volumes are moderate and there is no need for an inspection station.

Table D.1 provides a comparison between median inspection stations and traditional inspection stations:

Table D.1 Median versus Traditional Station Siting

Items	Median Station (One facility in median)	Traditional Station (Two facilities, one on each side of roadway)
Staffing needs	Approx. half the staff of a traditional station	Approx. double the of a median station
Control buildings needed	1	2
Number of static scales needs	Same	Same
Employee parking	Approx. half the parking of a traditional station	Approx. double the parking of a median station
Inspection building	Typically no- right-of-way constraints	Yes, if right-of-way size and landscape allow

Items	Median Station (One facility in median)	Traditional Station (Two facilities, one on each side of roadway)
Mainline roadway screening	One per direction of travel	One per direction of travel
Queue lengths needed for trucks	Same	Same
Multilane roadway in each direction of travel	Trucks are required to exit from roadway in high speed lane (left lane)	Trucks are required to exit from roadway in slower speed lane (right lane)
Multilane roadway with HOV lane in left most lane	Not desirable due to safety; truck would be required to use HOV to enter and exit station	No conflicts
Deceleration length of exit ramp into station	Could be longer due to higher speed at entry point into station	Standard length apply
Acceleration length of ramp back onto roadway	Merging into higher speed lane could require longer site-exit ramp length	Standard length apply
FHWA position on Interstate Highways	Policy strongly discourages left handed diverges and merges on Interstate Highways	Preferred
Signage needs	More signs are required to move trucks to left lane and signs to notify roadway traffic that trucks are entering from left after station	Standard signs apply
Operations staff on which side of truck at static scale	Located on driver's side of truck	Can be on either side of truck
Truck parking	Minimal truck parking spaces available due to constrained right-of-way	Roadway only flanks one side of station thus size/scape of right-of-way is more likely to accommodate needed truck parking spaces
Reweigh of trucks	Due to flanking roadway on both side, truck loops for reweigh typically not feasible	Roadway only flanks one side of station thus size/scape of right-of-way more probable to allow lane for reweigh of trucks
Total traffic volumes and speed managed safely	As traffic volume and speed increases, the ability of this approach to manage traffic safely could be reduced	Standard considerations apply

Items	Median Station (One facility in median)	Traditional Station (Two facilities, one on each side of roadway)
Site placement with respect to longitudinal slope of roadway	Preferred to be placed at top of vertical curve, gravity will help trucks slow down coming into station, and help accelerate truck when leaving station and merging with roadway traffic	Preferred to be placed at top of vertical curve, gravity will help trucks slow down coming into station, and help accelerate truck when leaving station and merging with roadway traffic
Safety of merge onto roadways	Truck driver are required to make merge back into roadway using right mirror with limited site lines	Truck driver could merge back into roadway by looking through front window, left window and closer left mirror
Existing median width is inadequate for station	Relocation of one or both directions of travel lanes on roadway to accommodate station in median could be cost prohibitive	Not an issue
Impacts to median opening and median crossings	Could impact existing median opening and median crossings	Not an issue
Effectiveness of station	Same, but less when inspection building is required and could not be integrated into facility	Same, but more when inspection building is required and is integrated into facility
Efficiency of station	More efficient due to decreased need of operational staff	Less efficient due to increased need of operational staff
Cost to WSP	Much less costly, about half number of staff needed to operate station, only one building and facility to maintain, lower utility cost	Much more costly, twice number of staff needed to operate station, two buildings and facilities to maintain, higher utility cost
Cost to WSDOT	Possibly less, but there are too many variables, one building, ramps are longer, little to no right-of-way acquisition cost...	Probably more costly but there are too many variables, two buildings, standard ramps, could have right-of-way acquisition cost...

Source: BGM Consulting, LLC.

D.1.2 Pros and Cons of Median Inspection Stations

WSP operates and maintains all inspection stations in Washington State. Median inspection sites can meet a need for higher productivity from a smaller number of staff, as WSP has a number of vacancies at Ports of Entry as described in Section 2.0 and Appendix B. Other potential benefits to WSP with median inspection station include: increased officer safety due to concentration of personnel in one location, only one building to maintain, staffing flexibility as only one staff member can operate both directions of travel, staff familiarity with trucks due to encountering vehicles traveling in both directions, and location on driver's side of truck for quick and safe checking of permit and other documents. Potentially unfavorable items for WSP with median inspection stations include: reduced truck parking availability, limited area for an inspection building, limited opportunity for a truck loop to allow reweighing of trucks, and limited availability of additional right-of-way for future growth of the station. For locations that do not need inspection buildings and have moderate traffic volumes, set-up could be a viable alternative.



WSDOT designs, funds and builds all inspection stations in Washington State. WSDOT faces similar funding constraints as WSP. A median inspection station offers a number of potential cost benefits to WSDOT, including:

- Savings associated with limited or no right-of-way acquisition;
- Smaller amount of land to survey and plan;
- Centralized utilities (electrical power, phone, water, sewer, data communications);
- Only one building to design and build;
- No cost to design/build an inspection building due to site limitations;
- No cost to design and build large amounts of truck parking or a truck loop for reweighing due to site limitations; and
- CVISN equipment is centralized in one building for two directions of truck travel.



Potentially unfavorable factors associated with a median inspection facility include:

- Safety risks due to diverging and merging from the inside (left) lane with typically higher-speed traffic;
- Increased ramp length into station to accommodate trucks decelerating from higher speeds;
- Much longer ramp and drop lane could be needed from station back to roadway for heaviest trucks to speed up and match roadway speeds then start a safe lane change into left lane of roadway;
- Installation and maintenance of CVISN system would be in higher speed left lane;
- Increased signage needed to inform roadway traffic that trucks are entering roadway; and
- Potential impacts of future capacity improvement or addition of lanes could be diminished depending on section of roadway.

D.1.3 Conclusion

Inspection stations located in a median can be an efficient and effective means of truck evaluation and enforcement by operations staff. With the growing push towards automation and technology both within the private trucking industry and within weight and safety enforcement, the need for all types of dedicated weigh facilities may decrease in the coming years. However, the need for a trained inspector to conduct an inspection is unlikely to be met with technological advances. The typical lack of an inspection building at a newly placed median site could be a serious impediment for this goal. However, for agencies facing budgetary constraints, median sites do offer the potential for significant cost savings in both the design/construction and operation of the stations. Median inspection stations could be an efficient and effective approach for WSDOT and WSP and should be explored in the development of the joint statewide inspection station system plan (Recommendation 8 of this report).

However, the following threshold criteria need to be met for siting any inspection facility in the median:

- Location should have moderate to low traffic volumes – typically non-Interstate locations;
- Location needs to be strategically significant – sites where another facility is in close proximity are less suitable;
- Site should already have a median with sufficient space to locate the facility;
- Mainline should not have high occupancy vehicle lanes;

- The roadway is not projected to see a large growth in traffic requiring extra capacity or there is sufficient space to accommodate any capacity expansions without impacting the station;
- The site does not require an inspection building; and
- Location should minimize the number of median openings and crossings impacted to reduce impact on emergency, law enforcement, or weather management operations.

These considerations should be examined in more detail during the development of a joint statewide inspection station system plan. Identifying potential locations for a median inspection station could be a component of that plan, discussed in Recommendation 8 in Section 4.0.

D.2 International Practices

While international practices are not always applicable to Washington, there are lessons learned that are important for Washington. The heavy reliance on data derived from WIM to drive enforcement, the use of virtual/mobile sites instead of fixed facilities, and data sharing between agencies are important considerations for Washington. Also, the continued refinement of WIM technology in order to directly issue citations is a key future consideration for the State; if adopted in the United States, it would drastically reduce the need for fixed facility weight enforcement.

Europe

An extensive FHWA report from July 2007, "Commercial Motor Vehicle Size and Weight Enforcement in Europe,"¹¹⁰ noted a number of best practices from across the European Union. Information was derived from site visits, literature reviews, and extensive interviews with industry experts and European Union members. Key conclusions and observations include:

- Extensive use of Weigh-in-motion (WIM) technology for preselection and limited use of low-speed WIM for direct enforcement (reported in United Kingdom and Germany, pending in France). Washington's use of WIM to screen vehicles at their CVISN sites fits with this conclusion, though the U.S. does not currently have any direct enforcement through WIM.
- Increased use of mobile enforcement and fewer fixed sites. This trend is also occurring in some U.S. states, including Nevada and New York. Washington is in the planning stages for its first virtual inspection sites.
- High level of collaboration between jurisdictional levels (national and regional) and different agencies (transportation and law enforcement). For example, in Switzerland, the Ministry of

¹¹⁰ Federal Highway Administration Office of International Programs. *Commercial Motor Vehicle Size and Weight Enforcement in Europe*. July 2007. Online at: http://international.fhwa.dot.gov/pubs/pl07002/vsw_eu07.pdf.

Transport funds additional police officers who specialize in commercial vehicle size and weight enforcement but are not full officers (do not carry weapons). A close working relationship between private industry and government/research bodies was also noted. The German Federal Highway Research Institute was one example cited for collaboration between Federal agencies, universities, associations and industry.

- Limited data sharing and collaboration between member countries. This is similar to the lack of data sharing between states in the U.S.
- Money collected via tolls is a common source of funding for operation, maintenance, and improvement of highways. Germany for example charges tolls based on a fixed registered weight (i.e., up to 12 metric tons), which encourages trucking companies to be efficient and avoid empty loads.
- Size and weight limits are largely harmonized between EU member nations. This is an important consideration in the U.S. where each state can have different size/weight regulations. There is a need for better harmonization between neighboring states.

One of the recommended practices discussed in the above document is described in a 2007 study by the FHWA, "Effective Use of Weigh-in-Motion Data: The Netherlands Case Study."¹¹¹ This report examined weigh-in-motion technology used in the Netherlands. The Dutch system relies on WIM in addition to video capture and focuses on roadways leading to/from the Port of Rotterdam. The system captures vehicle classification, length, axle weight, gross weight, and speed. These sites are paired with mobile enforcement instead of fixed locations to inspect suspected overweight vehicles (based on WIM data). Data from the WIM sites is also shared every week with enforcement officials in order to better schedule operations, an approach that is not yet widespread in the U.S. At the policy level, the increased efficiency in the system has allowed for additional preventative contact with habitually noncompliant companies, emphasizing the need for education over enforcement. A similar system of virtual inspection sites paired with additional targeted mobile enforcement based on data collected from the virtual sites joined with increased preventative contact for habitual offenders could be used in similar high freight-intensity, high-density areas with limited access points in Washington such as the Port of Tacoma or the Seattle-Tacoma Airport.

A 2013 examination of European best practices is a presentation by Hans van Loo and Bernard Jacob titled, "Weigh-in-Motion for Enforcement in Europe."¹¹² The presentation notes that WIM is useful for protecting road infrastructure, enforcing size/weight limits, and can also be used in

¹¹¹ Federal Highway Administration Office of International Programs. *Effective Use of Weigh-in-Motion Data: The Netherlands Case Study*. October 2007. Online at: <http://permanent.access.gpo.gov/LPS105956/LPS105956/international.fhwa.dot.gov/pubs/pl07028/pl07028.pdf>.

¹¹² Hans van Loo and Bernard Jacob. *Weigh-in-Motion for Enforcement in Europe*. International Society for Weigh -in Motion-motion Workshop. 27 February 2013. Online at: http://www.is-wim.org/doc/workshop_enf130227_vanloo_jacob.pdf.

conjunction with toll road systems. WIM is heavily used for screening and preselection for further enforcement activity throughout Europe. France has 30 systems installed and the Netherlands has 20 systems in place on the highway network that support activities such as preselection and company profiling, pavement loading and maintenance, and tax and customs administration for international transports. The presentation notes the need for additional information exchange between member nations, harmonization of equipment specifications, and comparable data formatting between EU partners. Finally, legal acceptance of WIM for direct enforcement¹¹³ is one of the ultimate goals advocated by Hans van Loo and Brandon Jacob, but will require extensive testing and certification to ensure the accuracy of the systems employed.

D.2.1 Australia

Austrroads, an association of road transport and traffic agencies in Australia, published a national best practice report in 2010 titled, "Weigh-in-motion Management and Operation Manual."¹¹⁴ The report discussed WIM's application in four areas: asset management and pavement design, road safety and enforcement, freight management, and traffic management and network operations. The report points out that permanent weigh sites are costly to operate and can be inefficient due to bypass opportunities while portable enforcement by itself is too random and time consuming. WIM, especially if it can be directly enforceable, would reduce disruptions to industry and greatly increase efficiencies for public agencies. Australia has pioneered the use of WIM at culverts instead of stand-alone or bridge sites as done in the U.S. and Europe.¹¹⁵ The report briefly discussing integrating WIM with other technologies such as license plate readers and using other data collection methods such as visual counts or traffic counters to validate WIM data, but does not discuss topics such as inter-agency cooperation or funding mechanisms.

A July 2014 study by the National Transport Commission of Australia¹¹⁶ highlights inspection practices in Australia. Each territory uses a different mix of personnel to conduct "second party inspections," which are inspections conducted by government officials or hired directly by the government.¹¹⁷ The study reveals that Australia uses a mix of police, government inspectors and outsourced private inspection groups with a wide variety of training requirements to

¹¹³ Direct enforcement is the ability to issue tickets based solely on reported WIM weight. Current U.S. systems are used to screen only, citations can only be issued based on static or mobile scale weighings.

¹¹⁴ Austrroads. AP-T171/10. Weigh-in-motion Management and Operations Manual. December 2010. Online at: <https://www.onlinepublications.austrroads.com.au/items/AP-T171-10>.

¹¹⁵ On the culvert system, the weight is recorded by measuring the bending strain caused by the axle load on the culvert. Siting WIM at culverts reduces the damage to the system from tires and weather. For more on the Australian "Culway" system, see <http://ntl.bts.gov/lib/jpodocs/edldocs1/443/sess9c.pdf>.

¹¹⁶ National Transport Commission Australia. *Heavy Vehicle Roadworthiness Review: Phase One – Report of Current Practice*. July 2014. Online at: <https://www.nhvr.gov.au/files/heavy-vehicle-roadworthiness-report-of-current-practice.pdf>.

¹¹⁷ First party inspections are done by the party that owns and operates the vehicles.

enforce heavy vehicle requirements. Road transport compliance officers, Department of Transport Vehicle Inspectors, and police were the most common categories. However, the report does not delve into working relationships between the various groups.

D.2.2 Canada

Canadian policy and practice directly impacts the State of Washington through international trade along a shared border with the province of British Columbia. Trucks are evaluated, inspected and processed by both parties as they traverse the international border. Increases in efficiency and effectiveness are possible if the two municipalities and their respective agencies are able to increase cooperation and information sharing.

Canadian Inspection stations near the Washington State International Border

Canada has five primary inspection station locations near the international border with Washington State. These five inspection stations – Pacific, Nordel, Midway, Kaleden, Castlegar – are briefly described below.

Pacific Inspection station: this location has facilities that serve both northbound and southbound traffic. The southbound facility has a single platform static scale that is approximately 12 x 12 feet with overhead sign function to inform drivers of truck/axle weights. The southbound facility is remotely operated from the Northbound side facility with no enforcement staff or buildings. The Northbound facility contains the control building with staff, a single platform static scale that is approximately 12 x 12 feet and is equipped with a mainline screening system named Weigh2GoBC (Weigh2GoBC is clarified later in this section).

Nordel Inspection station: this location has one facility that serves many roadways around it. There is a control building for staff with a single platform static scale equipped with Weigh2GoBC.

Midway Inspection station: this location has one facility that serves both eastbound and westbound traffic. This is a self-service facility. There is one single platform static scale and no enforcement staff or buildings at this location.

Kaleden Inspection station: this site lacks permanent enforcement staff, buildings, or static scales, but is commonly used by mobile enforcement teams. There are two pull-off areas, one for each direction of travel. Mobile enforcement works these areas on an as needs basis. Drivers can perform self safety checks on commercial vehicles at these locations.

Castlegar Inspection station: this site has one facility that serves both directions of travel. There is a control building for staff with one single platform static scale.

Weigh2GoBC Technology

Since Washington shares a border with British Columbia, Canada, the technology and programs used in that province have a direct impact on trucks in the State – any vehicle

engaging in international trade needs to be aware of (and potentially uses) technology in both. Attempts to harmonize these technologies could lead to increased economic competitiveness and reduce costs for trucking companies in both nations. For example, at the border between Washington State, USA and British Columbia, Canada both truck enforcement agencies uses an Automatic Vehicle Identification (AVI) system. This AVI is used to gather data about each truck that is equipped with appropriate transponder. Many trucks crossing this national boarder are equipped with Weigh2GoBC transponders. The Washington State Department of Transportation has recently integrated the Weigh2GoBC with the states own NORPASS system. Benefits of integrating the technologies includes faster processing and throughput at border crossing, higher volume of trucks able to bypass Washington State inspection stations, and the elimination of redundant equipment from the truck. Additional details are found in Appendix E.

Figure D.1 shows Weigh2GoBC enabled stations in British Columbia.

Figure D.1 Weigh2GoBC Enables Stations



Source: British Columbia, Ministry of Transportation and Infrastructure, *Weigh2GoBC web site*.

The Canadian New West Partnership Trade Agreement

An example of harmonizing regulations between adjoining municipalities comes from Canada's New West Partnership Trade Agreement (NWPTA),¹¹⁸ a multiagency agreement for governmental entities to function as one team to better the efficient and effective movement of goods and commerce through its western provinces. Washington State could adopt the overarching direction of this concept at a State level for how agencies could communicate and help solve the needs and responsibilities they have in common. It could also use this agreement as a template to work towards coordinating policy between states on topics such as overweight permitting.

Premium Carrier Program

On October 13, 2010, British Columbia Ministry of Transportation and Infrastructure Minister Shirley Bond launched a new Premium Carrier Program¹¹⁹ to recognize and reward trucking firms for exceptional safety practices. The Premium Carrier Program is a recognition program initiated in partnership with the BC Trucking Association (BCTA). It is based on the premise that sound driving practices lead to safer highways and more competitive businesses.



By identifying the best carriers and including them in the Premium Carrier Program, it will allow Ministry staff to focus roadside enforcement activities on carriers that are more likely to need attention.

Benefits to industry include:

- Recognition as being the “best of the best,” which the carriers can use to market themselves to shippers. This recognition is publicized by:
 - A certificate that can be displayed at the carrier’s premises;
 - A watermark for use on company stationery and their web site;
 - Inclusion on the list of recommended carriers on CVSE’s web site;
 - Automatic assignment of the lowest random report percentage (5 percent) for Program participants registered in the Weigh2GoBC Program; and
 - Free transponders provided for the carrier’s entire fleet to participate in the Weigh2GoBC Program.

¹¹⁸ New West Partnership Trade Agreement-British Columbia: Alberta: Saskatchewan. Online at: http://www.newwestpartnershiptrade.ca/faq_standards_regulations.asp#standardRegs3.

¹¹⁹ Ministry of Transportation and Infrastructure. *Premium Carrier Program*. Online at: <http://www.th.gov.bc.ca/cvse/PremiumCarrier/index.htm>.

This proactive, positive approach to weight and safety enforcement is not commonly employed in the U.S. Potential benefits for Washington State include more safe trucks on the highway, a reduction in accidents caused by trucks, and a reduction in the number of trucks that must enter inspection stations, saving time and reducing damage to infrastructure. Additionally, Washington may be experiencing some of the benefits of the program already as trucks in the Premium Carrier Program may be engaged in international trade.

Appendix E. Additional Descriptions of Inspection Station Technology

E.1 Technology Employed at Washington State Inspection Stations

Washington utilizes a large variety of technology to enforce weight and safety regulations.

For mobile enforcement, the State has 434 HAENNI brand portable scales. Each officer assigned to mobile enforcement carries at least six portable, or “jump,” scales. There are limitations to where these portable wheel scales can be accurately used. These scales need a firm, mostly smooth and very flat pavement surface for about 300’ in length, with limited variances in elevation. Mobile staff evaluate the segment of roadway under observation for locations that meet these requirements, then find a safe spot upstream of one of these workable locations to visually screen trucks and escort potential violator to the predefined location for evaluation and inspection. This is one reason that there are 11 commonly used mobile sites in Washington – these sites have been preselected and evaluated for mobile enforcement. Once a truck is stopped at the predetermined site, officer will check truck and driver credentials, then setup for weighing the truck with a set of 6 portable wheel scales that can weigh 3 axles at one time. Each of these wheel scales will be placed in front of each wheel per axle. The officer then directs the driver to carefully pull up on to the wheel scale and stop. Officers will wait for the scale to register a number, document these values for each wheel and axle and then repeat this process as many times as needed to weigh each wheel of each axle. Most truck configurations have 5 axles or more, thus, multiple weighments must be made for most truck configurations. The officer will then need to evaluate weights gathered for axle, bridge or gross weight violations. As part of this weighing process, officers will be looking for potential safety issues to inspect after weighing of the truck is complete. There are 2 primary inspection types performed at mobile sites, Level I and Level III inspections.¹²⁰ Level III inspections are less time consuming and do not require officers to get under the truck but do include a complete walk around checking tires, lights, horn, windshield wipers and truck and driver credentials. Level I inspections include all activities of a Level III inspection in addition to checking brake rods, air pressure, and linkage. Many of these activities require an inspector to go under the truck using a sliding board called a creeper.

Some weather events can make it impractical to perform portable wheel weighing and Level I inspections, including heavy rain, moderate to high winds and accumulation of snow. Sheet flow from rain can under-mind some nonpaved areas. Moderate to high winds will keep the truck moving from side to side and a true static weighment cannot be made. Accumulation of

¹²⁰ As defined by the Commercial Vehicle Safety Alliance. More information is available online at: http://www.cvsa.org/programs/nas_levels.php.

snow will allow wheel scale to sink into snow causing inaccurate weighments.¹²¹ All of these issues mean that mobile inspections take more time and are less efficient than those conducted using a fixed scale and a location that is prepared for inspection activity. Adding an electronic screening component to mobile enforcement – virtual inspection stations – greatly increases the probability that an inspection or physical weighing will find a violation. Figure E.1 shows a portable scale in use in Alabama.

Figure E.1 HAENNI Brand Portable Scale



George Conner, ALDOT

Source: FHWA. <https://www.fhwa.dot.gov/publications/publicroads/09june/03.cfm>.

In order to better understand the fixed technology used in Washington State, the following series of images¹²² illustrates the approach on Interstate 5 northbound to the busiest inspection station in the State – the Ridgefield Port of Entry. The technology visible in each image is described. Note that the Ridgefield Port of Entry is one of the most advanced sites in the State (a Type 5 site); not all inspection stations in Washington will incorporate all of the technology described.

¹²¹ Ideal conditions include a pavement area that is about 12-16' wide and about 300' long with a preferred cross slope of 2-3% percent for drainage. This will increase speed of weighing trucks and eliminate potential issues from rain.

¹²² Images are taken from Google Streetview. June 2015.

Approximately half a mile south of the Ridgefield Port of Entry, a variable message sign (VMS) informs drivers if the site is open or not. Some signs will incorporate colors into this message (green "Open" and red "Closed"). The white sign in the middle of the image reads "TRUCKERS WITH TRANSPONDERS FOLLOW IN-CAB SIGNAL." These two signs are shown in Figure E.2.

Figure E.2 Initial Approach to Ridgefield POE



Figure E.3 is approximately 300 feet downstream from the variable message sign. The overhead gantry holds a transponder reader and a camera used to take an overview photo of the entire truck. The transponder reader identifies if the truck is equipped with NORPASS and collects identification information in order to query the system. The box to the right at the tree line has a control system that will stamp the overview photo with relevant data if any weight, credential, or safety issues are identified during the screening process.

Figure E.3 Gantry Arm and WIM Pavement Segment Approaching Ridgefield POE



In the ground below the gantry arm is a Single Load Cell Weigh-in-Motion (WIM) Scale. Produced by International Road Dynamics (IRD), these scales provide weight screening capability while trucks move at highway speed.

Although it is not accurate enough to issue a citation directly, the WIM allows Ridgefield to concentrate on trucks that are at or near the weight limit, reducing the number of trucks they must physically weigh on the static scales at the fixed site. The State Patrol contracts with IRD to install and maintain the WIM scales.¹²³



¹²³ Washington State Patrol State Enforcement Plan, 2016. \$306,482 per year. WIM equipped stations collected slightly over \$1.1 million in weight citations in 2014.

The discolored pavement is due to control pavement – rigid concrete placed 200 feet in front of and 100 feet past the WIM in order to reduce bouncing and increase the accuracy of the WIM reading.¹²⁴

Figure E.4 shows the same gantry viewed from the opposite direction. Two devices near the top of the vertical section of the gantry are visible. These are both part of a license plate reader (LPR) system that is used to identify vehicles by their license plate and can be queried by inspection personnel. There is also a laser emitting device on the side of the road on the left edge of the image that measures the height of vehicles. If the laser beam is broken, the vehicle is above the legal dimensions and either must have an overweight or oversize permit or is operating illegally.

Figure E.4 Back of Gantry Arm, Approaching Ridgefield POE



¹²⁴ ASTM E1318-09 specifies standards regarding control pavement.

The next technology encountered is a pair of variable message signs shown in Figure E.5 below. There are four panels that can be activated by site personnel indicating to trucks whether they need to enter or can bypass the site.

Figure E.5 Variable Message Signs, Approaching Ridgefield POE



Just beyond the variable message signs is another gantry arm, shown in Figure E.6 with a device that tells trucks equipped with a transponder whether they must exit to the inspection station or bypass the site.

Figure E.6 Transponder Unit, Approaching Ridgefield POE



Figure E.7 shows the approach to the actual inspection station. Any commercial vehicle that has not received a transponder signal or message via VMS to bypass the station must exit the Interstate and enter the weigh station, unless the station is closed.

Figure E.7 Exit Ramp to Ridgefield POE



Figure E.8 shows the entrance ramp to the station. Where the lane splits, there is a set of lights that the officer at the site uses to direct trucks to either the left or right scale. This decision can be based on a number of factors, including truck size (different lanes have different sized scales), existing station traffic, or the inspector's preference. An inspection building for conducting safety inspections is also visible behind the speed limit sign.

Figure E.8 Entrance Ramp, Ridgefield POE



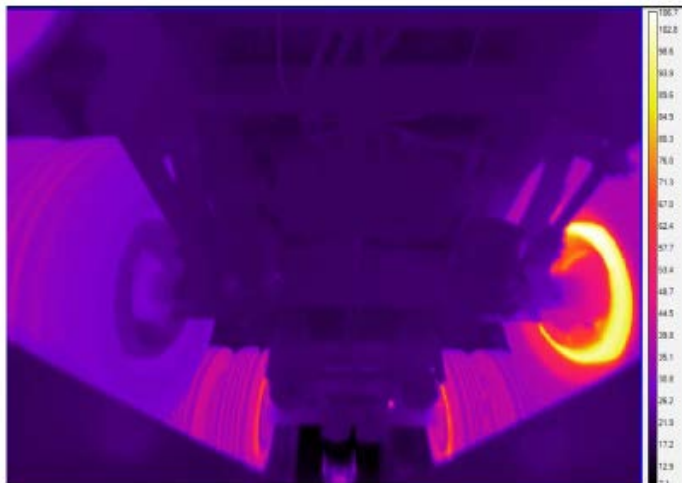
Just beyond the static scale (not visible to the right in Figure E.9) is another variable message sign that directs drivers to either report for further inspection or return to the mainline after their vehicle's weight and records have been checked. There is also a public address system and two lights above the VMS. The two lights are a red or green ball that are used in conjunction with the VMS. This is shown in Figure E.9.

Figure E.9 Scale Control Signals, Ridgefield POE



One further piece of technology that is only in use at the Fort Lewis inspection site is an Automated Infrared Roadside Screening (AIRS) system, shown in Figure E.10. This system uses an infrared thermal camera to detect the lack of residual heat (left side of Figure E.10) around a brake pad that indicates that the brake is not producing heat as it should if it is engaging to slow down the vehicle.

Figure E.10 Automated Infrared Screening System Image



Inoperable brakes, like that shown on the left, are a leading cause of highway traffic accidents. AIRS can detect these and other vehicle-related safety hazards.

Source: http://www.automation.com/pdf_articles/Automation_white_paper4.pdf

By placing these cameras recessed into the ground of the entrance ramp to inspection stations, enforcement officers can see if the brakes are producing heat; if not the truck can be pulled off for further inspection.¹²⁵ Similar systems, like that shown below in Figure E.11 can be placed above ground to accomplish the same goal.

¹²⁵ David Lee. "Automated Thermal Imaging Improves Highway Safety." *Automation*. N.D. Online at: http://www.automation.com/pdf_articles/Automation_white_paper4.pdf.

**Figure E.11 Thermal Inspection Device with Full Color and Thermal/
Infrared Camera – Kentucky**



Source: http://ntl.bts.gov/lib/jpodocs/repts_te/14400_files/chap5.htm.

E.2 Electronic Screening Technology

Goal 6 of WSDOT's Strategic Plan for 2014-2017, "Results WSDOT,"¹²⁶ speaks about the need to use of technology to improve system efficiency. Acquiring data about each truck in real time is the primary objective of inspection stations and of smart technology. Automated Vehicle Identification (AVI) systems are used to gather data from different sources while a truck is traveling at highway speeds. There are two types of AVI systems, voluntary and non-voluntary.

Voluntary Systems

These types of systems require trucking industry buy-in to be effective. Incentives for using these systems include saving time, fuel, and vehicle wear leading to a higher probability of making an on time delivery. Voluntary systems typically do not have much saturation of the market, though WSDOT estimates that 40.6 percent of commercial vehicles operating in the state have transponders.¹²⁷ Thus, most trucks are not being screened on the mainline for credentialing issues and most truck continue to be required to report to inspection stations for physical evaluation.

Transponder – Transponders are devices that are affixed in the cab of tractors. As trucks with transponders approach an inspection station that is equipped with transponder readers, the system will identify the truck and its data and determine if the truck is potentially in violation. Those trucks that may be in violation will have a message sent to the transponder to turn on a red light that is part of transponder. This red light notifies the driver to report to the inspection station. If the truck is determined not to be potentially in violation then the system will send a message to the transponder to turn on a green light. This green notifies the driver to remain on the roadway and bypass the site.

Cellular geo-fencing – The platform for this system is a smart phone application drivers download. When a cellular device is equipped with this application and it is in the open setting, the system will recognize when the device enters a virtual fence or a geo-fence that is upstream of inspection station, and pull truck identity and data. Those trucks that may be in violation will have a message sent to their cellular device to turn the screen to red. This red screen notifies the driver to report to the inspection station. If the truck is determined not to be in violation then the system will send a message to the cellular device to turn the screen green. This green screen notifies driver to not report to inspection station and remain on roadway.

¹²⁶ Results WSDOT. No Date?. Online at:
<http://www.wsdot.wa.gov/publications/fulltext/secretary/WSDOTStrategicPlan.pdf>.

¹²⁷ WSDOT Gray Notebook. March 31, 2015. Online at:
<http://wsdot.wa.gov/publications/fulltext/graynotebook/Mar15.pdf#page=25>.

Non-voluntary Systems

These systems do not require the trucking industry to add new equipment or download applications to their cellular device. They use cameras and Optical Character Recognition (OCR) to read passive information from the front or side of tractor. These systems have limitations for accurately identifying each truck. The latest technology in the best environment has approximately an 85-90 percent accuracy rate. This accuracy rate drops dramatically during fog, moderate to heavy rain and snow, or if there is dirt or mud on the truck.

License Plate Readers – License plate readers (LPR) are cameras and software that are placed on the side of the road upstream of inspection a station. As trucks enter the camera field of view, the system will identify trucks license plates on front of tractor and gather its data, and use this to query the safety database and determine if the truck is potentially in violation. Trucks that may be in violation will be notified by Variable Message Signs (VMS) to report to the inspection station. If the truck is determined not to be potentially in violation then the VMS will notify the driver to not report to the inspection station.

U.S. DOT Readers – U.S. DOT Readers are cameras and software also located on the site of the road upstream of an inspection station. As trucks enter the camera field of view, the system will identify truck's U.S.-DOT number from the side of tractor and gather its data and query the safety database. If the truck is potentially in violation, drivers will be notified by Variable Message Signs (VMS) to report to the inspection station. If the truck is determined not to be potentially in violation, the VMS will notify the driver to remain on the roadway.

Weigh2GoBC System

Weigh2GoBC is a mainline screening system in use in British Columbia, including the Pacific and Nordel Weigh Stations. It operates similarly to the PrePass/NORPASS system used in the United States and is designed to enable the more efficient movement of commercial vehicles in the province. Weigh2GoBC is a network of Weigh-in-Motion (WIM) and Automatic Vehicle Identification (AVI) technologies



When a commercial vehicle equipped with a registered transponder approaches a WIM or AVI enabled station, the commercial vehicle is identified and checked electronically for height, weight, insurance and safety credentials to regulate compliance to certain regulations. Once this is checked and completed, the commercial vehicle transponder is signaled with either a red light or a green light to inform the driver as to whether or not the vehicle is required to report to the weigh station. This all happens while the vehicle is traveling at highway speeds. If the driver receives a red light, they are required to report, and if they receive a green light, they can bypass. Once a commercial vehicle has been initially checked at a Weigh2GoBC enabled station, it can be given a bypass at all subsequent inspection stations for up to the next 12 hours. All vehicles are subject to a Random Report Rate percentage (RRP) determined by a vehicle's past on-road performance and history of intervention by authorities. This means that regardless of previous checks, some vehicles will receive a red light and be required to report to the site.

Appendix F. Glossary

AADT – Annual Average Daily Traffic. This is calculated by taking the total traffic count for a year and dividing by 365.

AVI – Automatic Vehicle Identification.

CMV – Commercial motor vehicle.

CVEO – Commercial Vehicle Enforcement Officer. A WSP officer with duties and authority limited to commercial vehicle enforcement.

CVISN – Commercial Vehicle Information Systems and Networks.

FAHP – Federal Aid Highway Program.

FHWA – Federal Highway Administration.

FMCSA – Federal Motor Carrier Safety Administration.

FTE – Full-time Employee.

GIS – Geographic Information Systems.

Inspection or Weigh Station – Location used to weigh commercial vehicles and/or conduct safety inspections.

ITS – Intelligent Transportation System. Advanced applications that aim to provide improve road conditions and safety through the use of technology. Examples include weigh-in-motion, and variable message signs.

Level of Inspection (I, II, III, IV, V) – The type of safety inspection conducted, Level I is the most comprehensive, Level V is the least comprehensive. These are defined by the Commercial Vehicle Safety Alliance (CVSA). For full details see: http://www.cvsa.org/programs/nas_levels.php.

MCSAP – Motor Carrier Safety Assistance Program.

Plug and run – Fixed sites that include infrastructure such as a scale house and/or scale bed but no computer or software connection. Enforcement personnel use a laptop to “plug in” and run the site.

Port of Entry – Inspection station typically located near a state or national border. These facilities typically conduct weight and safety checks, and often offer further services such as selling registration or permits and collecting fuel taxes and registration fees.

Self Service facility – Facility where permits and other documents are obtained without personnel staffing the location.

VIS – Virtual Inspection Station. Sites are built at a “fixed” location, but they lack the physical infrastructure found at fixed sites and are based on the concept of electronic screening using integrated software systems to capture information about vehicles as they travel down the mainline.

VWIM – Virtual Weigh-in-motion. A weigh-in-motion system that provide vehicle information electronically in real-time. They are the critical component in virtual weigh stations.

WIM – Weigh-in-motion – System used to weigh commercial vehicles at speed. Typically located either on the mainline or on the entrance ramp to an inspection station. In Washington, WIM systems are located on the main roadway where trucks pass over the device at highway speeds.

WSDOT – Washington State Department of Transportation.

WSP – Washington State Patrol.