SAFE TRUCK PARKING ON PACTRANS INTERSTATE CORRIDORS: I-5 AND I-90

FINAL PROJECT REPORT

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16. Abstract

An inadequate supply of parking spaces for long-haul drivers creates safety issues that may lead to severe or fatal crashes, as tired drivers face the decision of choosing between parking at unsafe locations or continuing to drive.

To better understand the current use of truck parking facilities and safety issues caused by the lack of parking capacity in high-demand locations, the authors reviewed existing research and reports that describe the lack of parking in the PacTrans region. The researchers then identified and provided a qualitative analysis of future trends that will affect this problem.

Finally, the research team developed and executed a survey of truck drivers at two long-haul trucking parking facilities. The research team focused on two high-volume, multi-state truck corridors, the Interstate 5 and 90 corridors, that are of interest to the Washington State Department of Transportation (WSDOT) and neighboring state DOTs. This study presents the data collection method, the overall survey results, and an analysis of the findings.

This research provides original data as well as expert insights to support state decision-making in determining the beneficiaries of building and maintaining public and private truck parking rest stops in Washington state.

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List of Abbreviations

ATRI: American Transportation Research Institute

CAT: Cooperative and Autonomous Trucks

DOT: Department of Transportation

ELD: Electronic logging device

FHWA: Federal Highway Administration

FMCSA: Federal Motor Carrier Safety Administration

HOS: Hours of Service

LNG: Liquefied natural gas

MATS: Mid-America Trucking Show

MPO: Metropolitan planning association

NG: Natural gas

NHS: National Highway System

NHTSA: National Highway Traffic Safety Administration

NTSB: National Transportation Safety Board

ODOT: Oregon Department of Transportation

PacTrans: Pacific Northwest Transportation Consortium

SAE: Society of Automotive Engineers

SCTL: Supply Chain Transportation and Logistics Center

USDOT: United States Department of Transportation

UW: University of Washington

WSDOT: Washington State Department of Transportation

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Executive Summary

Unresolved safety issues caused by truck parking shortages in high-demand locations are of keen importance to the state departments of transportation (DOTs) participating in the Regional PacTrans Center and to the thousands of trucking companies and drivers using the Interstate 5 (I-5) and Interstate 90 (I-90) corridors. Safety issues include serious and/or fatal crashes that may be related to a lack of safe and secure parking, and illegal/unofficial parking on entrance and exit ramps, shoulders, and freeway lanes that create hazards for motorists during severe weather.

The Washington State Department of Transportation (WSDOT) completed a statewide truck parking study in December 2016, and the Oregon Department of Transportation (ODOT) published a report on truck parking along the US 97 corridor in July 2017. Both states are interested in addressing safety issues caused by the current lack of truck parking capacity. Researchers at the Supply Chain Transportation and Logistics Center (SCTL) at the University of Washington developed this project's research goals with WSDOT to support their work. The project goals were as follows:

- Provide data-based decision support to WSDOT and neighboring states as they develop solutions for the lack of safe truck parking along the I-5 and I-90 corridors.
- Develop new and valuable insights from truck drivers' expertise on safety problems resulting from the lack of truck parking capacity in these corridors.

To achieve these goals, the research team first conducted a research scan of existing studies and other online reports that describe the lack of parking in high-demand locations along the I-5 and I-90 corridors in the PacTrans region.

Future Trends

SCTL identified three trends in the truck parking industry that will affect the truck parking shortage in the future:

(1) The rising cost of land in growing metropolitan areas will continue to intensify this problem. Rapidly increasing land costs create pressure on truck service firms to either create new revenue streams (charging for parking that was formerly included for 'free' along with retail fuel sales) or relocate farther from metropolitan centers if they cannot compete with higher-value land uses near highway interchanges. Also, manufacturing and wholesale facilities that generate a high number of truck trips will likely continue to maximize building footprints on parcels, reducing available land for on-site truck parking.

(2) Federal regulatory changes are likely to increase long-haul truck parking demand in the next 10 years. In the short term, the electronic logging device (ELD) mandate beginning in 2018 will change driver behavior. Although some long-haul drivers have not strictly followed federal hours of service (HOS) regulations in the past, under the new ELD mandate they are more likely to stop and park for required rest periods because it will be more difficult to evade detection. In the next 10 years, additional federal regulations may be enacted and again shorten drivers' HOS, thereby increasing demand for more rest stops on the Interstate Highway System and other major truck routes.

(3) In the longer term, emerging autonomous and cooperative truck technologies that address driver fatigue are likely to reduce demand for truck stops in rural areas – but

not near cities. The truck driver interviews conducted for this project showed that drivers stop for business reasons, not just for safety rest periods.

Finally, SCTL conducted 184 interviews of truck drivers over a three-week period at two high-demand truck stops along the I-5 and I-90 corridors to determine (a) origins and destinations of trips; (b) connections to the ports of Seattle and Tacoma; (c) drivers' perceptions of safety issues caused by a lack of truck parking; (d) types of commodities carried; and (e) why drivers parked at these rest stops.

Key Findings

The SCTL Center's research provides new data and insights to answer questions under discussion among state, local, and regional transportation agencies and communities in the central Puget Sound region. One of the most topical questions is whether the state's economy and/or the ports of Seattle and Tacoma benefit from truck trips that require rest stops near the Seattle-Tacoma-Bellevue metropolitan area. This question is central to understanding their proportional roles and funding responsibilities to add parking capacity where it is scarce: in the central Puget Sound region.

1. **The on-site truck driver survey showed that there is an extremely strong tie between truck parking activity and the state's economy**. Ninety-one percent of trucks parked along I-90 (at TA Seattle East Travel Center in North Bend) and 87 percent of those parked along I-5 (at the Mustard Seed in Sumner) delivered goods to businesses and other customers within Washington state. This evidence belies the hypothesis that most trucks using parking facilities in Washington are passing through the state and therefore provide no economic value to it.

2. **Most drivers using the two truck parking facilities in central Puget Sound were not going to either the Port of Seattle or Port of Tacoma.** In fact, 83 percent of truck drivers parked near I-90 and 78 percent near I-5 did not go to either of the two container ports. Although port-related traffic uses the truck parking facilities, it is not the major cause of increased parking demand at these locations.

3. Why do truck drivers park in these facilities? Surprisingly, more park there – and park longer – for business reasons than for safety reasons. The largest group of drivers (34 percent of those interviewed at TA Seattle East and 36 percent at Mustard Seed) said their primary reason for the stop was to wait to meet a specific delivery time at their destination or wait to locate another load. When SCTL compared the number of hours parked with the primary reason for parking, it found that delivery operations were the largest reason for longer stays.

Chapter 1 Introduction

The Federal Highway Administration (FHWA) has identified the truck parking shortage as a national safety concern. An inadequate supply of parking spaces for long-haul drivers creates safety issues that may lead to severe or fatal crashes, as tired drivers face the decision of choosing between parking at unsafe locations or continuing to drive.

Research by the National Transportation Safety Board (NTSB) has suggested that truck driver fatigue may be a contributing factor in as many as 30 to 40 percent of all heavy truck accidents (NTSB, 1995). The lack of truck parking also affects local communities struggling or refusing to accommodate truck parking in high-demand locations along the Interstate Highway System. Even when cities set high fines for trucks parking on local streets, the problem will persist if there is nowhere else for truck drivers to take their required rest period. Fines may also not be helpful if truck drivers must wait for a freeway to reopen from a sudden disruption, such as severe weather.

In light of this critical need, the Washington State Department of Transportation (WSDOT) and Oregon Department of Transportation (ODOT) developed truck parking studies for their respective states to build the safety and business cases to address truck parking issues.

According to the 2017 Washington State Freight Mobility Plan (WSDOT, 2017), Washington is the second most trade-dependent state per capita in the country. The state's freight system supported 1.41 million jobs in freight-dependent industries in Washington, with a gross business income of $550.5 billion. Safety is a core value in the Freight Plan, and reducing truck-related fatalities and serious injuries, as well as addressing opportunities to improve truck parking are two future focus areas for implementing the plan. The plan states that truck freight tonnage moved on the roadway network in Washington is projected to increase from 281.2

million in 2015 to 379.4 million in 2035. That translates to a total increase of 35 percent over a 20-year period and an annual growth rate of 1.5 percent. The total truck ton-miles moved will increase from 72.1 billion in 2015 to 102.7 billion in 2035 at an annual growth rate of 1.8 percent. While population and commerce grow, it is possible that even more restrictive federal hours of service (HOS) regulations will be implemented, further increasing demand for truck parking near major metropolitan areas in the state.

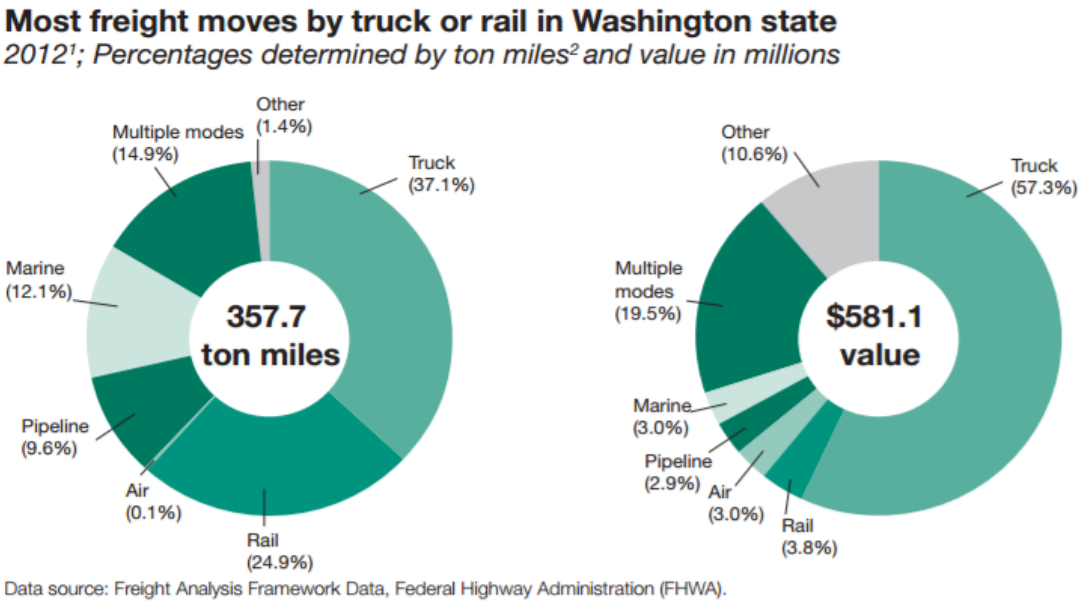

Figure 1.1 Freight ton-miles and value percentage by type of mode used for transportation in Washington state **(**WSDOT, 2015**)**

The purpose of the Federal Hours of Service of Drivers Final Rule is to improve safety; however, it also exacerbates the truck parking problem in the PacTrans region, as it reduces the number of hours that truck drivers may work. Drivers must stop for rest more frequently and therefore need increased access to safe, secure, and legal truck parking facilities.

Issues related to the lack of truck parking facilities have been well known for years, but there have not been significant increases in parking capacity in the central Puget Sound region of Washington state. Three WSDOT truck parking studies have documented these issues. However,

although truck parking capacity in the central Puget Sound region was inadequate in 2005 and 2008 and demand has continued to grow, neither the state nor the private sector has added sufficient truck parking capacity at North Bend or near the greater Seattle area. With many competing safety needs, limited budgets, and a dearth of data-based documentation of any correlation between the lack of truck parking and an increased number of serious and fatal incidents, the public sector has been unable to meet the need.

Although potential private truck stop developers, current owners, and operators may recognize the profitability of meeting demand by increasing truck parking capacity, cities control zoning and land use and may not favor permitting busy, noisy truck centers in their communities. Although the City of Sumner permitted one company, the Mustard Seed, to expand its parking facilities several years ago, more capacity is needed near the state's largest cities.

To better understand the current use of truck stops and truck safety issues caused by the lack of parking capacity in Washington state, the research team developed and executed a survey of truck drivers at two long-haul truck parking facilities located at high-demand locations along the studied corridors in the PacTrans region. This survey contained five sections: a) origins and destinations of the trips; (b) stops at the ports of Seattle and Tacoma; (c) safety issues caused by a lack of truck parking; (d) types of commodities carried; and (e) drivers' comments.

This report presents the result of a literature review of existing research and reports that describe the lack of parking in the PacTrans region and the future trends that may affect this problem. WSDOT and the SCTL Center shared information to create a map of the existing truck parking facilities and amenities along the I-5 and I-90 corridors in Washington state. SCTL researchers also identified and mapped facilities on these corridors throughout the PacTrans region. Lastly, this report provides decision support by documenting the benefits that accrue to

the state and the Northwest Seaport Alliance of building and maintaining public and private truck parking rest stops in the central Puget Sound area.

Chapter 2 Research Scan

This section provides the results of a research scan of existing studies and online reports documenting and describing the lack of truck parking in high-demand locations in states along the Interstate 5 and Interstate 90 truck corridors in the PacTrans region.

2.1 Jason's Law Truck Parking Survey

The Federal Highway Administration's (FHWA's) *Jason's Law Truck Parking Survey Results and Comparative Analysis* was conducted in 2015 to meet the requirements of the Moving Ahead for Progress in the 21st Century (MAP-21; P.L. 112-141) law. The purpose of Section 1401 of MAP-21, popularly known as 'Jason's Law,' was to address the commercial motor vehicle parking shortage at public and private facilities along the National Highway System (NHS). Key findings and themes relevant to the PacTrans region from the Jason's Law Study include the following:

- Truck drivers and company staff reported a lack of truck parking in the Pacific Coast states, as well as other areas.
- Almost half of the state DOTs, including WSDOT, reported unofficial/illegal parking on freeway interchange ramps and shoulders of highways. Similarly, state motor carrier safety officials also reported that most unofficial/illegal parking occurs in these locations. On the basis of safety and access concerns, Washington state prohibits parking within the right of way (roadway, shoulder, ramps, median, etc.) of major highways (Revised Code of Washington 47.52.120(e)).
- Adverse weather conditions have a significant impact on parking capacity, availability, and safety. This is the primary reason that the City of North Bend,

Washington, experiences sudden peak demand, as Snoqualmie Pass on I-90 closes frequently in the severe winter weather season.

- Planning and zoning is a challenge for truck parking development. There are hurdles associated with state-level attempts to coordinate with cities, counties, and regional planning organizations to demonstrate the benefits and needs of parking and to site parking locations.
- Most private truck service facilities report being at full capacity primarily during night hours. Anecdotally, facilities indicated that they would like to add parking but have faced difficulties including lack of authority, restrictions in zoning laws, lack of funding, and other expansion challenges.

2.2 Oregon Department of Transportation (ODOT)

ODOT commissioned a study (Hernandez & Anderson, 2017) to adequately assess truck parking needs and analyze safety on high-volume truck corridors. This study included the following tasks:

- Examine what other states were doing to address the truck parking shortage and related safety implications
- Administer a driver survey to truck drivers that utilized Oregon roadways
- Conducted a parking demand analysis to assess current and future truck parking demand along US-97
- Use historical crash data to identify crash trends, crash hot spots, and crash harm estimates along US-97.

The driver survey revealed that of the 201 surveyed drivers, approximately 39 percent (78 drivers) stated that they encountered trouble in finding a safe and adequate location to park. A

majority of respondents stated that parking on freeway ramps and shoulders "is most likely due to no nearby parking facilities being present and nearby truck stops and/or rest areas being at capacity."

The report's analysis of crash data showed that "the time-of-day periods with the largest number of crashes were 5:00 a.m. to 10:00 a.m. at 23 percent, 10:00 a.m. to 3:00 p.m. at 28 percent, and 3:00 p.m. to 8:00 p.m. at 24 percent. Fifty percent took place on Wednesday, Friday, or Saturday, and 50 percent happened during the winter months (November, December, January, and February)." These crash trends mirror the time periods that drivers listed regarding difficulty locating a safe and adequate location to park.

However, the report's authors noted that that existing crash data do not directly associate an inadequate supply of parking facilities with truck-related crashes. They suggest that "crash harm and other safety assessments must operate under the assumption that specific at-fault truck crashes (e.g., due to fatigue) may have been a result of inadequate truck parking."

2.3 American Transportation Research Institute (ATRI)

For the past 12 years, ATRI has released an annual industry survey to give insight into the trucking industry's most critical issues. It developed the "Top Ten" by using a formula that assigns quantitative values to respondents' ranking of the issues. The responses are based on a large-scale survey that is distributed using its own contact database and is disseminated through 50 state truck associations to their respective membership.

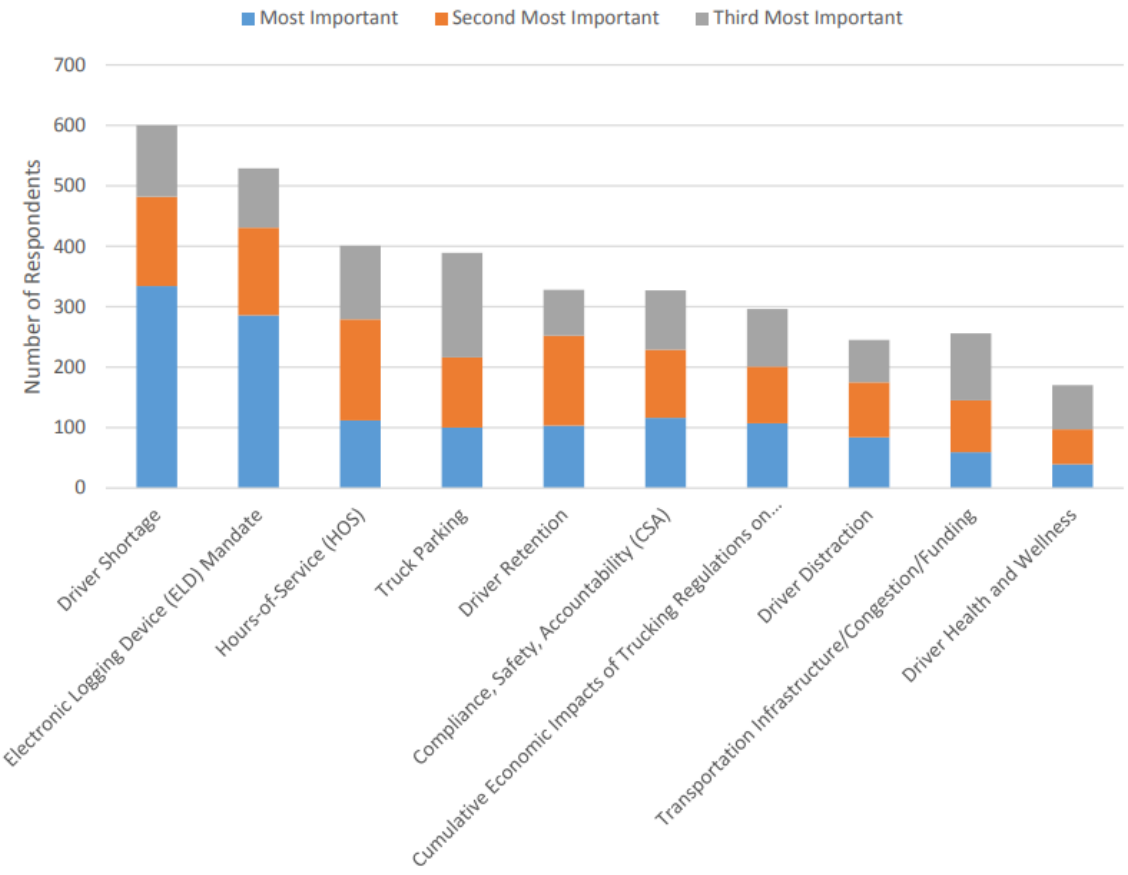

Figure 2.1 Distribution of industry issue prioritization scores
(American Transportation Research Institute, 2017)

In both 2016 and 2017, truck parking was the fourth-biggest industry issue, climbing one position from 2015. Additionally, truck parking was listed as the second biggest issue in their professional life among truck drivers in 2017.

ATRI's Research Advisory Committee (RAC) ranked "Managing Critical Truck Parking" as the most important research topic for the year at its 2015 annual meeting. Given the complexity of truck parking issues, its research was released in the following reports (Boris & Brewster, 2016):

- *Managing Critical Truck Parking Tech Memo #1: Commercial Driver Perspective on Truck Parking* (Boris & Johnson, 2015)
- The research collects and analyzes response data from driver surveys conducted in March 2015 at the Mid-America Trucking Show (MATS) and a follow-up online truck driver survey. With more than 1,400 truck driver respondents, the data collected from this survey provided information about a variety of driver issues, including the possible role of "reservation-for-fee" systems.
- *Case Study: Real World Insights from Truck Parking Diaries* (Boris & Brewster, 2016)

  This report detailed information on more than 2,000 days of truck parking activity recorded by commercial drivers.
- *Managing Critical Truck Parking Tech Memo #2: Minnesota Case Study – Utilizing Truck GPS Data to Assess Parking Supply and Demand* (Torrey & Murray, 2017)

  ATRI was contacted by the Minnesota Department of Transportation (MNDOT) to conduct first-of-its-kind research to assess truck parking supply and demand by using truck GPS data for several Minnesota rest stop locations.

2.4 National Coalition on Truck Parking

The U.S. Department of Transportation (USDOT) and several stakeholder organizations established the National Coalition on Truck Parking (Coalition) in August 2015 to address truck parking issues nationwide. Stakeholder organizations represent the truck industry, commercial vehicle safety officials, state DOTs, and the truck service center industry. The 2015-2016 Activity Report (Report) documents the first year of Coalition activities and synthesizes suggestions from participants to address truck parking problems across the nation. It summarizes

the first year of activities and details ideas put forth for expanding truck parking nationwide during four regional meetings held in 2016. The meeting's purpose was to obtain input from key public and private stakeholders on innovative approaches to address the lack of truck parking.

During the discussions, the Coalition's member organizations identified the following near-term activities (Phelan, Mantero, Purdy, & Kearney, 2017):

- Convene working groups for each of the four major topic areas (Parking Capacity, Technology and Data, Funding/Finance and Regulation, and State/Regional/Local Government Coordination) in 2017.
- Involve industry in state and metropolitan planning organization (MPO) freight planning processes during the development or update of the public agencies' freight plans.
- FHWA's second round of the Jason's Law Survey, as mandated by Section 1401 of MAP-21. The survey is scheduled to be administered in 2018.

Chapter 3 Future Trends

3.1 High Cost of Land in the Urban Centers

According to the Jason's Law Truck Parking Survey Report, "Over large geographic areas, there may be sufficient spaces available to meet the demand at any given time, but available parking is increasingly scarce in many metropolitan areas" (FHWA, 2015). Several studies have stated that sites close to urban centers and near interchanges are rarely available and, when they are, command premium prices. Consequently, the high cost of the land in urban centers frequently makes it hard to invest in and expand truck parking facilities.

According to the North Jersey Transportation Planning Authority (2008), "the high land values have made impractical to build large-scale, privately-owned travel centers in the region," making it more difficult for truck-oriented retail uses to compete with more profitable land uses near highway interchanges. In the Bay Area, for example, commercial operators have been discouraged from investing in truck parking locations because the high cost of land in the area makes it difficult to purchase a site big enough that will allow commercial success (The Tioga Group, Inc. – Dowling Associates, Inc., 2008).

In *Transport Topics*, Sheri Call, vice president of government relations for the Washington Trucking Associations, stated that the truck parking shortage problem is related to rapidly increasing land values in metro areas in Washington state. Ms. Call also said that the development of a premium outlet mall in North Bend drove up the cost of land in the area and that truck service centers found it difficult to compete (Millers, 2016).

Truck parking and rest area planning and development are often led by state DOTs to achieve safety goals and minimize local community impacts from trucks that support interstate commerce. Public-sector officials have also worked with private firms to expand truck parking

capacity, for example by providing incentives and/or regulations for them to include truck parking spaces in existing or future industrial and commercial facilities. (FHWA, 2012)

Perry et al. (2017) proposed a GIS-based parcel approach to identify vacant urban land parcels close to highways for potential truck parking areas. Data to be used include parcel boundaries, land-use classification, and road network. This report also stated that partnerships between government agencies and the private sector could mitigate the cost of land acquisition.

According to the Federal Highway Administration (FHWA, 2012) major national retailers, such as Walmart, have started to allow truck drivers to park at their stores and distribution centers to help mitigate truck parking issues. These retailers offer free parking during late night hours when the store is closed or experiencing low volumes of customer traffic. However, providing park-on-site or other truck parking facilities in adjacent residential areas may introduce liability and security issues (FHWA, 2012).

Public safety is a key consideration for sites located in dense urban areas. There are ongoing costs to providing the security required to reduce or eliminate criminal activity, as well as reducing noise, light, and emissions impacts on the neighboring community (Perry, et al., 2017) (FHWA, 2012). Tables 1 and 2 show capital and maintenance costs associated with parking services according to Perry et al (2017).

Table 3.1 Truck parking capital costs. (Perry et al, 2017)

Capital Cost	
Land purchase	$0 - $35,000 per acre
Vault toilet installation	$47,000 (High)
Fence installation or repair	Medium
Lighting and camera installation	High

Table 3.2 Truck parking operation cost. (Perry et al, 2017)

Operation Cost (per year)	
Toilet maintenance	$14,400 (High)
Electricity	Low
Surface grading, dust and plant suppression	Medium
Security camera	Low
Security staff	High

3.2 Cooperative and Autonomous Trucks (CATs)

Autonomous truck technology is likely to be implemented on major long-haul routes in the next 10 to 15 years. Google, Uber, and Ford have launched autonomous car tests in the US and Europe. Figure 3.1 shows the levels of cooperative and autonomous technologies defined by the National Highway Traffic Safety Administration (NHTSA) and the Society of Automotive Engineers (SAE) (Short & Murray, 2016).

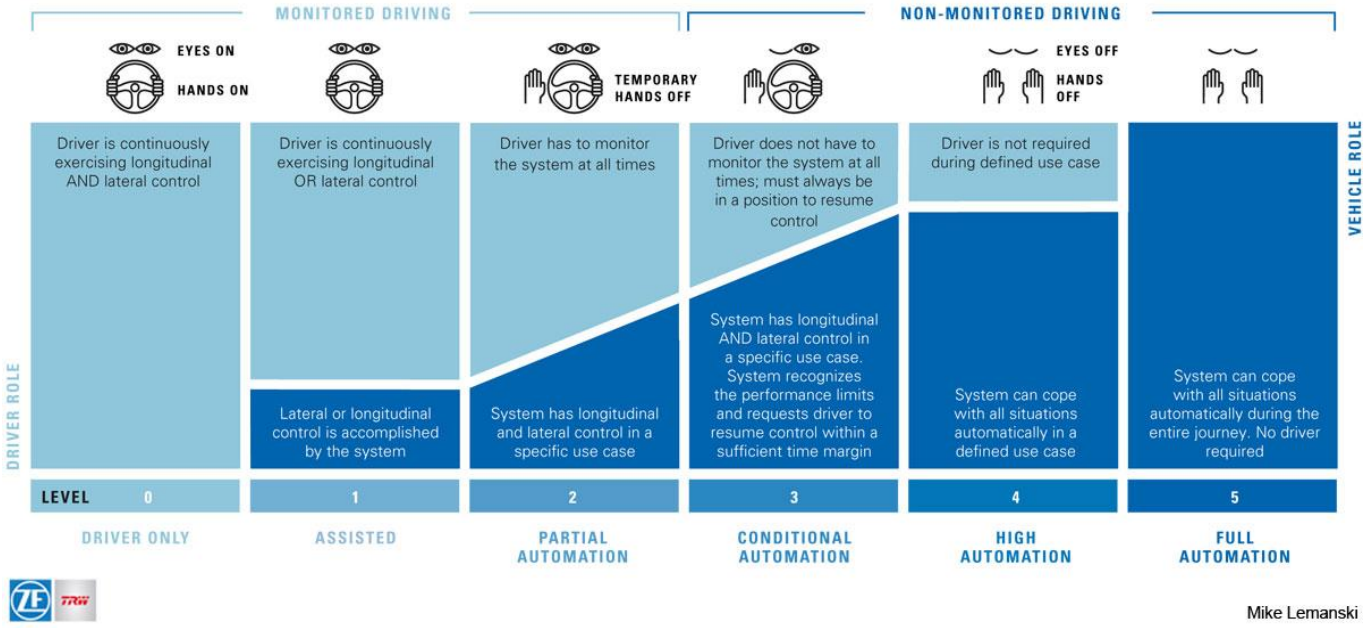

Figure 3.1 Autonomous vehicle technology levels defined by NHTSA and SAE (Luo, 2016)

In 2016, the American Transportation Research Institute's (ATRI) Research Advisory Committee (RAC) declared that an "Analysis of Autonomous Truck Impacts" was its top research priority (Short & Murray, 2016). ATRI identified the following impacts of autonomous vehicle technologies on truck parking:

- For the L3 technologies, the driver will need to be awake and alert but can drive hands-free. This could facilitate dynamic route planning, allowing the use of smartphones or other devices to locate available parking spaces or helping drivers find alternative safe parking locations in case there is no available parking (Short & Murray, 2016).
- L4 technology could significantly decrease the need for truck parking spaces because the driver will not be required to be in the driver's seat when the autonomous system is fully engaged. This could allow the driver to conduct other task or take a rest period while the truck is moving without the need to stop. According to Short & Murray (2016), "truck parking locations will still be utilized, particularly for the services provided at private truck stops (food, fuel, emergency maintenance), for vehicle inspection and for pre-delivery staging. Breaks of 30 minutes would likely disappear for authorized AT users, and 10-hour breaks will likely become less common, resulting in additional truck parking capacity for those who do need to park their vehicles."
- L5 technology has the potential to eliminate HOS regulations because this level of automation will not require a driver in the truck. Therefore, as ATRI states: "there would be no need to park other than for pre-delivery staging, though stops for fuel and maintenance would be necessary" (Short & Murray, 2016).

These technologies have the potential to significantly reduce the long-haul truck parking problem. However, the speed at which these technologies will be adopted depends on multiple factors, including investment levels from the public sector as well as the private sector. Public sector funding lags far behind private investments in new vehicle technologies. However, it is needed for essential improvements to traffic signal systems and may be needed to place sensors in public infrastructure. Public perception drives state regulations and may represent an obstacle to implementation, even though cooperative and autonomous trucks could provide safer, more productive, and cheaper options to current practice (Luo, 2016). Finally, for the 3.5 million professional truck drivers, the possibility of being replaced by autonomous trucks is of significant concern (Solon, 2016). Even if a driver is required in the cab, "trucking industry advocates remain concerned about both the technology's ability to decipher every road emergency and the danger of having a driver resting or even sleeping while a truck is at highway speeds" (Cava, 2016).

3.3 Electronic Logging Device – ELD

The Federal Motor Carrier Safety Administration (FMCSA) released the electronic logging device (ELD) decision mandate on December 10, 2015. This mandate requires all truck drivers to use an ELD by November 30, 2019. The primary objective is to help professional truck drivers and commercial motor carriers track HOS compliance by "saving time, losing irritation over keeping the paper logs, focusing on driving, and reducing safety risk" (Magoci, 2015).

On the one hand, this device has the potential to speed up roadside inspections, increase safety managers' confidence in their paperwork, and reduce DOT audit time. Additionally, one FMCSA study indicated that drivers using E-Logs had a lower crash rate (11.7 percent reduction) and a significantly lower preventable crash rate (5.1 percent reduction) than trucks not

equipped (Hickman, Camden, Guo, Dunn, & Hanowski, 2014), (Shaw Tracking, n.d.). On the other hand, an ATRI research study revealed "drivers using ELDs were more likely to spend over 30 minutes looking for available parking than drivers without them" (Boris & Brewster, 2016). These results came from 148 complete diaries—containing the truck parking activity between June and July 2016—and 587 truck drivers surveyed (Boris & Brewster, 2016). According to this study, the increase in search time could be due to the lack of flexibility between the ELDs and paper logs, "ELDs automatically record a change of duty status to the minute, while paper logs use 15-minute blocks."

ATRI's "Critical Issues in the Trucking Industry – 2016" study revealed that the number one issue for truckers that year was the ELD mandate (American Transportation Research Institute, 2016). The study discussed possible remedies to offset the increased time spent looking for parking, such as flexible delivery appointments and a shift of the driver's hours of operation. The report stated that "drivers may adjust behaviors to find safe parking with reduced flexibility. These behavioral changes may include using drive time to search for parking" (American Transportation Research Institute, 2016). The real impact of the ELD mandate on truck parking demand is still uncertain.

3.4 Alternative Fuels and Truck Parking Services

Ockedahl (2016) stated that "diesel engines accounted for 98.5 percentage of Class 8 trucks in 2015, according to a report from ACT Research." According to Hsu (2016) "cleaner options aren't popular with truckers. Managers complained that many alternative fuels are rarely available, lack a wide-reaching distribution infrastructure and a mature market to drive down cost."

While larger companies are more likely to use alternative fuels for a portion of their fleet, small one- or two-person firms –which make up the vast majority of the industry—are less likely to do so without a steep rise in diesel prices and a quick return on their investment. However, "truckers may have no choice to adapt" because of more restrictive rules regarding oil consumption (Hsu, 2016).

In an interview with Trucks.com, former U.S. Transportation Secretary Anthony Foxx said regarding the new phase of the federal greenhouse gas standards regulations, "while the technology to achieve the reductions will add to the expense of vehicles, the operators should recoup the cost in fuel savings." He added that "while the potential for real cost savings and environmental benefits under this rule are there – fleets will ultimately determine the success or failure of this rule based on their comfort level purchasing these new technologies" (Hawes, 2016).

The Department of Energy Clean Cities project's primary objective is to reduce fuel use by 2.5 billion gallons of petroleum per year by 2020 (Kelly & Singer, 2016). By 2017 this program had awarded nearly $400 million for different project initiatives across the country. The American Recovery and Reinvestment Act (ARRA) funded 25 cost-share projects in 2009. These projects have helped transform the nation's vehicle fleet by replacing nearly 9,000 vehicles (4,493 medium and heavy-duty vehicles) and establishing 542 alternative fueling stations (Kelly & Singer, 2016).

Projects such as the San Bernardino Associated Governments Alternative Fuel Truck, UPS Ontario–Las Vegas Corridor Extension, and the Maryland Hybrid Truck Goods Movement Initiative have brought together private and public stakeholders to develop strategies to achieve Clean Cities goals. They have implemented strategies such as replacing diesel heavy-duty trailer

trucks with compressed natural gas (NG) and liquefied natural gas (LNG) trucks to reduce air pollutant emissions. The Clean Cities program has also developed publically accessible alternative fueling stations (Kelly & Singer, 2016).

In November 2016, the FHWA announced that 55 routes spanning 35 states will serve as alternative fuel corridors along the National Highway System (NHS). The objective is to provide alternative fuel and charging stations along these corridors (U.S. Department of Transportation, 2016).

Chapter 4 Survey Method

To better understand the current use of truck parking facilities and truck safety issues caused by the lack of parking capacity, SCTL developed and executed a survey of truck drivers at two long-haul trucking parking facilities from March to April 2017. The research team focused on two high-volume, multistate truck corridors, the Interstate 5 and 90 corridors, that are of interest to WSDOT and neighboring state DOTs. This section describes the data collection method, the overall survey results, and an analysis of the findings.

4.1 Survey Design

The researchers developed a first draft of the survey and tested it on several experienced drivers recruited by the Washington Trucking Associations to ensure that the questions were clear. SCTL incorporated their input to develop the final version of the survey, shown in Appendix A. The survey was designed to take no more than five minutes and contained five sections:

- Origins and destinations of trips
- Stops at the ports of Seattle and Tacoma
- Safety issues caused by a lack of truck parking
- Types of commodities carried
- Drivers' comments.

4.2 Survey Instruments

SCTL developed an application using the online platform DeviceMagic. This application offers cloud storage, visualization, and an interactive and easy-to-use tool to design mobile device survey forms. The mobile data collection app instrument was chosen to make the process

- Efficient: automated data digitization and storage;
- Speedy: fast input of information in the field, with automated questions and drop list answers;
- Accurate: reduced transcript errors and data loss in transit; and
- Quality controlled: almost real-time monitoring of completed surveys.

4.3 Study Area

4.3.1 TA Seattle East Travel Center

TA Seattle East Travel Center, also known as Ken's Truck Stop, is located along I-90 in North Bend, 34 miles east of the city of Seattle. It is the only truck stop on I-90 between the city of Ellensburg (east of Snoqualmie Pass) and the large Seattle market.

Figure 4.1 Aerial view of TA Seattle East Travel Center. Source: Google maps.

This facility has \ 140 truck parking spots. Although 97 of the spots are "free" (defined as offered at no additional charge to drivers purchasing fuel or other services), 43 of the spaces may be reserved in advance at a cost of $13 to $15 per day. The truck stop also provides showers, fuel islands, truck service bays, a laundry room, and a drivers' lounge.

SCTL completed 93 driver surveys during three days of data collection at this site. To capture morning and afternoon peak arrival periods, they conducted the survey on the following days:

- Monday, April 10, from 9:00 am – 12:00 pm;
- Tuesday, April 11, from 2:00 pm – 5:00 pm; and
- Wednesday, April 12, from 2:00 pm - 5:00 pm.

4.3.1 Mustard Seed Market Deli and Travel Plaza

The Mustard Seed Market Deli and Travel Plaza is located just off Highway 167 in Sumner, near I-5 and approximately 30 miles south of the Seattle metro area. This facility has 103 truck parking spots, as well as a convenience store with a deli, fuel lanes, a truck wash, a tire shop, and mechanical services.

SCTL completed 91 driver surveys at Mustard Seed on the following days:

- Thursday, March 30, from 9:00 am – 1:00 pm;
- Monday, April 3, from 9:00 am – 1:00 pm; and
- Tuesday, April 4, from 3:00 pm – 7:00 pm.

Figure 4.2 Aerial view of Mustard Seed Travel Plaza. Source: Google maps.

4.4 Data Collection Method

The research team asked for and was given permission to conduct in-person surveys from two private truck stop operators in Washington State: the Mustard Seed Travel Plaza in Sumner and TA Seattle East Travel Center in North Bend. They selected the days of the week and time periods for the survey on the basis of the private operators' knowledge of peak parking periods for each location.

To ensure their safety, the data collectors did not interview drivers in their vehicles in the parking lot. They were stationed inside the convenience store of each truck stop, a high-traffic area where truck drivers congregate to pay parking fees, use the restroom, and purchase food.

Each surveyor was provided an iPad mini 2 with 32 GB. With DeviceMagic loaded on the tablets, collectors filled out the survey form. For each interview, the surveyor followed these steps:

1. Approach a truck driver inside the convenience store.
2. Offer a friendly greeting.
3. Give a brief explanation of the survey and its purpose.
4. If the driver agreed to participate, ask the listed questions.
5. Thank the respondent for his or her time.

Chapter 5 Survey Results

5.1 Origins and Destinations of Truck Trips

The first question on the survey identified the origins and destinations of the truck trips based on the regions and divisions of the country defined by the U.S. Census Bureau (see figure 5.1).

Most truck drivers who parked at the TA Seattle East facility on I-90 began their trip in the southern U.S. (29 percent), in Washington state (24 percent) or in the midwestern states (20 percent), as shown in figure 5.2. However, most drivers using the Mustard Seed facility, which serves the I-5 and Highway 167 corridors, began their trip either in Washington state (39 percent) or in the states of California and Oregon (28 percent). **Most trips in both truck facilities, 76 percent at TA Seattle East and 60 percent% at Mustard Seed, began outside of Washington state.**

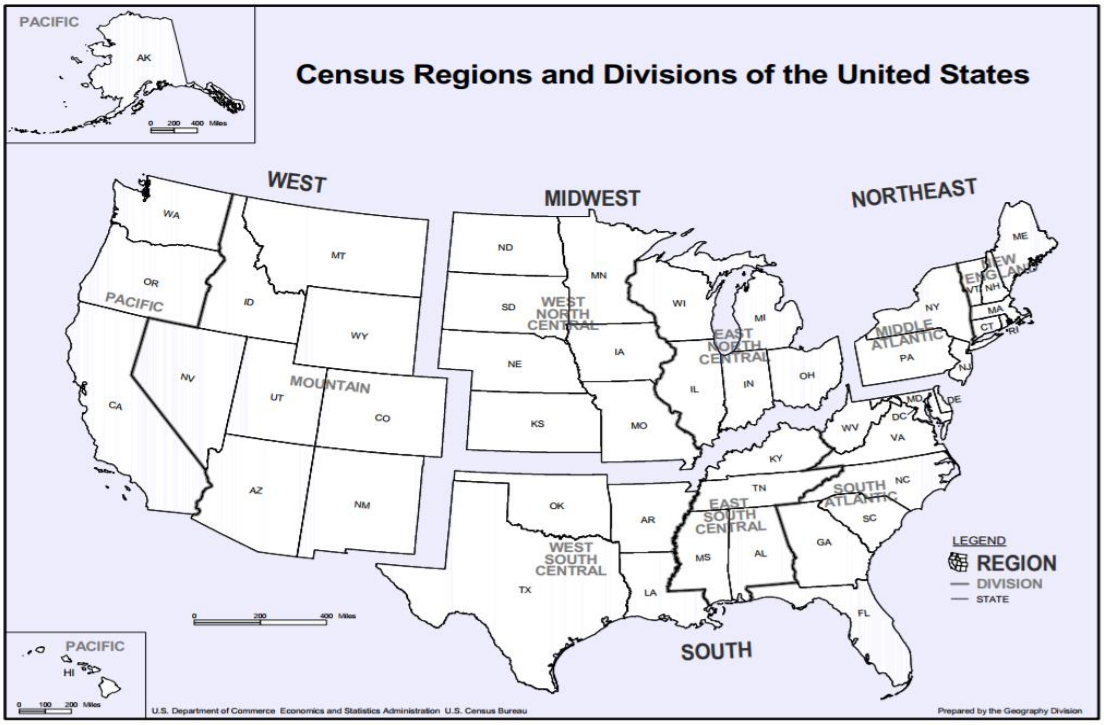

Figure 5.1 Census regions and division of the United States. (U.S. Census Bureau, 2017)

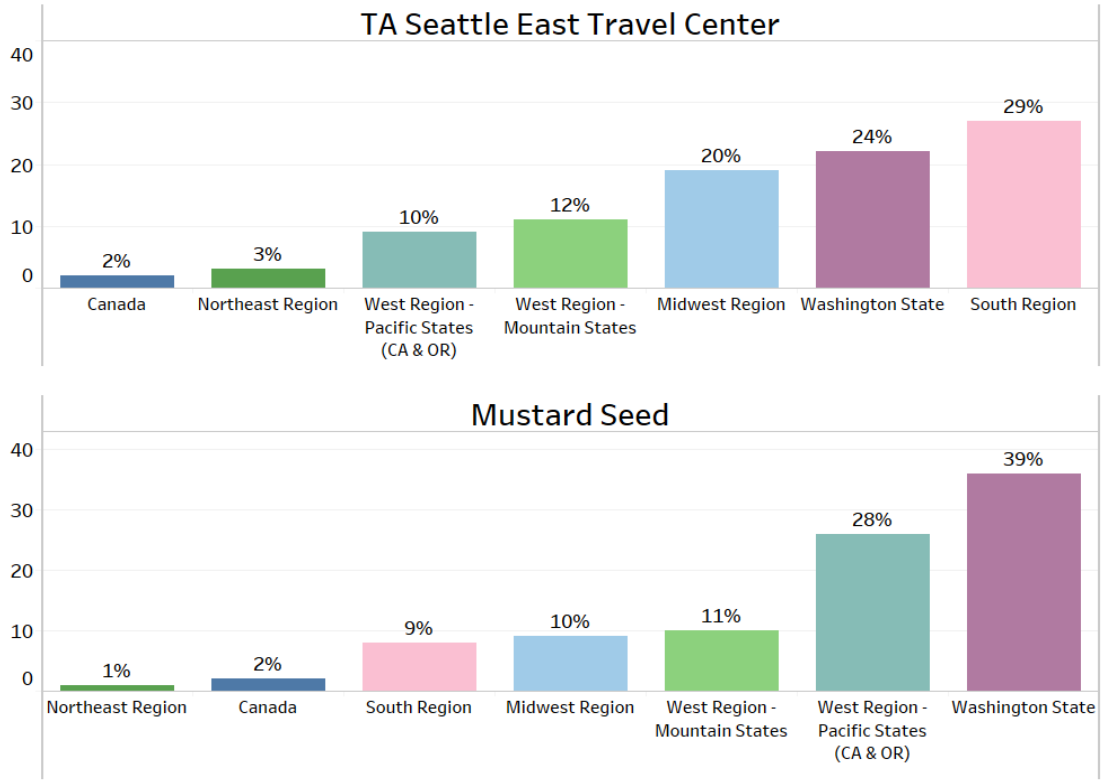

Figure 5.2 Origins of truck trips.

The vast majority of truck trips were headed to Washington state. It was the final destination for 75 percent of the drivers surveyed at the TA Seattle East Travel Center and 80 percent at Mustard Seed, as seen in figure 5.3.

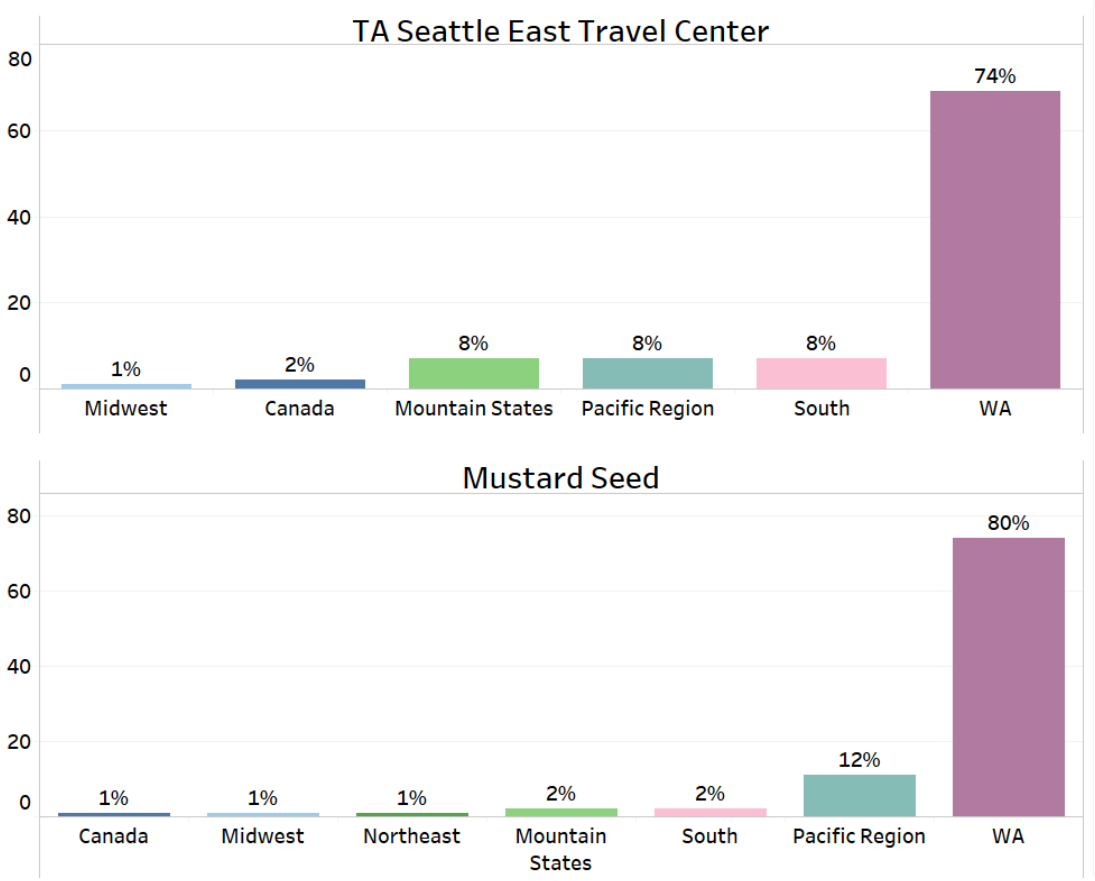

Figure 5.3 Final destinations of truck trips.

An even higher percentage of drivers delivered goods to destinations in Washington State during their trip. At TA Seattle East, 91 percent of trucks parked and 87 percent of trucks at Mustard Seed made deliveries in Washington state (figure 5.4).

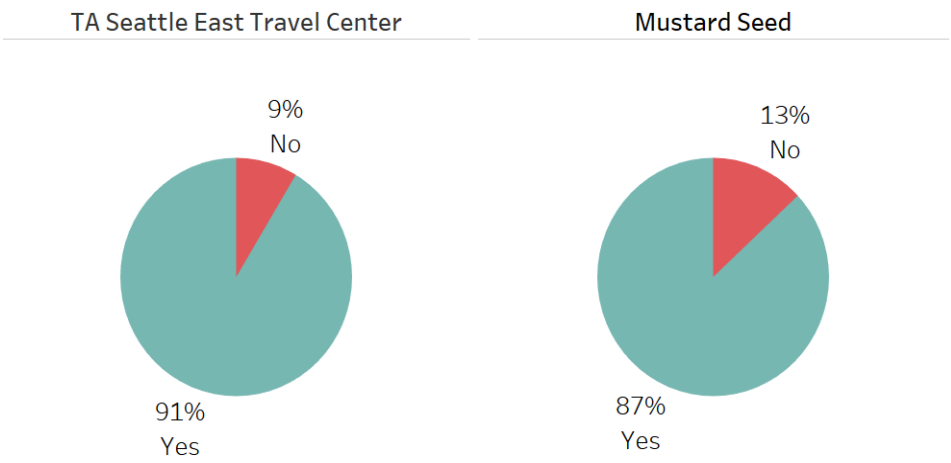

Figure 5.4 Percentage of respondents making a delivery inside Washington state.

5.2 Drivers Heading to the Ports of Seattle or Tacoma

The study found that 83 percent of truck drivers using TA Seattle East and 78 percent using Mustard Seed were *not* going to either the Port of Seattle of the Port of Tacoma.

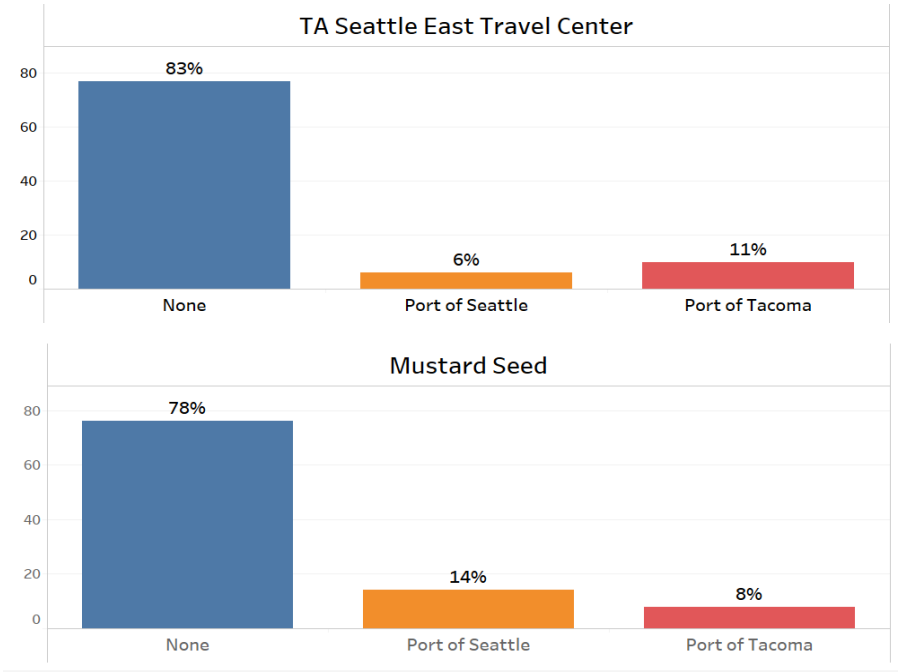

Figure 5.5 Percentage of truck drivers going to the Port of Seattle or the Port of Tacoma.

5.3 Biggest Problems Faced by Truck Drivers in Finding Parking

Drivers at both facilities said that their top two problems when the truck plazas were full were being out of compliance with their federally mandated HOS and the lack of access to personal services such as restrooms and food (figure 5.6).

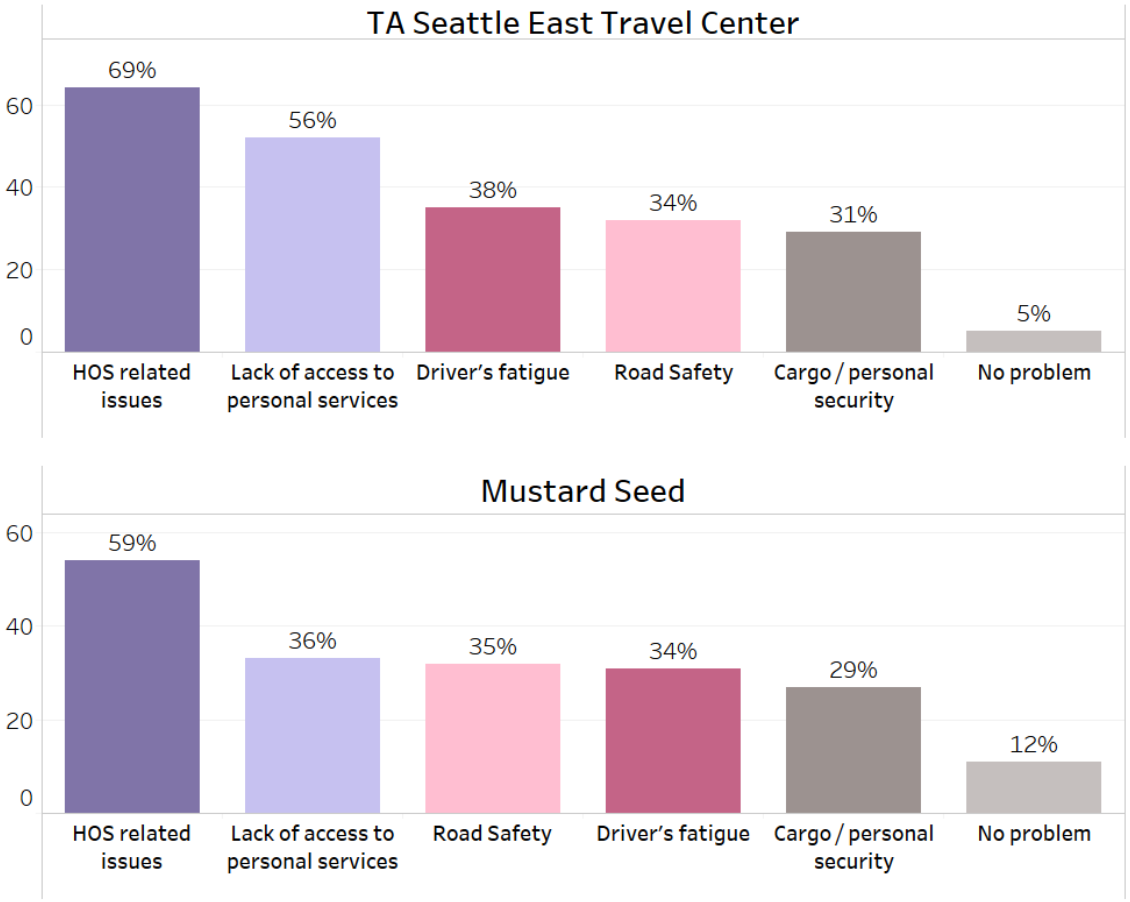

Figure 5.6 Problems faced by truck drivers when they cannot find safe and legal parking.[1]

5.4 What Truck Drivers Do When They Cannot Find Parking

When the truck plazas were full, 43 percent of all the drivers interviewed said that they had parked on a highway ramp and/or shoulder (figure 5.7). That number was higher (52 percent) for TA Seattle East than for the Mustard Seed (34 percent). Of drivers using the Mustard Seed parking, 9 percent said that they parked at their company's nearby location when the travel plaza was full.

[1] Please note that drivers indicated all responses that applied to their stay; therefore, the total does not equal 100 percent.

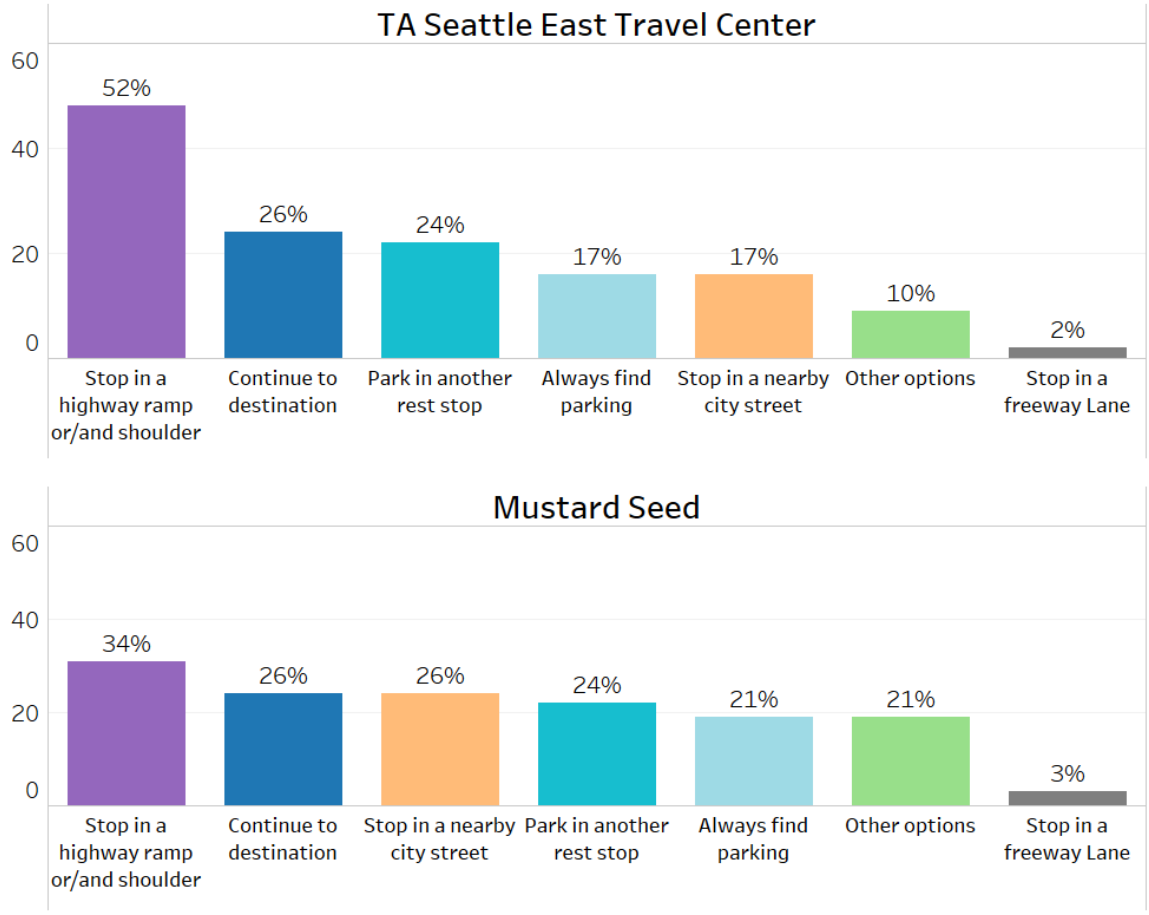

Figure 5.7 Choices made by truck drivers when they could not find space at the travel plazas.[2]

5.5 Main Reasons for Parking at the Truck Stops

The largest group of drivers, 34 percent parked at TA Seattle East and 36 percent at Mustard Seed, said that their primary reason for the stop was to wait to meet a specific delivery time at their destination or to wait to locate another load. These responses have been combined and are shown as a "delivery operation stop" in figure 5.8.

[2] Please note that drivers indicated all responses that applied to their stay; therefore, the total does not equal 100 percent.

While the other responses to the question "What is the main reason for your stop here today?" were comparable at both locations, there was a significant variance in the percentage of drivers who said that they were primarily looking for a rest break. **While 24 percent of drivers at TA Seattle East were there for a rest break, only 12 percent of the Mustard Seed respondents said that was the main reason for their stop.**

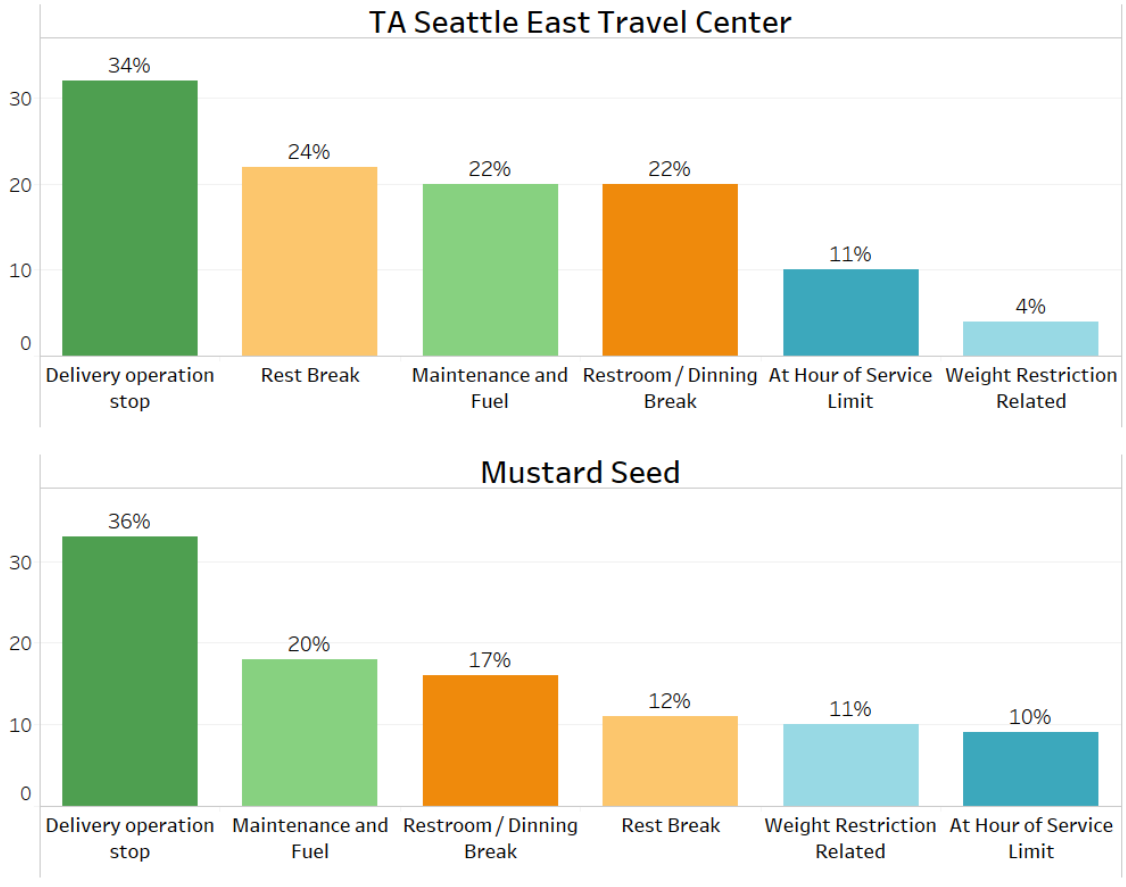

Figure 5.8 Drivers' main reasons for parking at the travel centers.[3]

[3] Please note that drivers indicated all responses that applied to their stay; therefore, the total does not equal 100 percent.

5.5 Hours Parked

Almost half of the truck drivers at both facilities parked there for only 2 hours or less. A small percentage (3-5 percent) parked for more than 2 to 9 hours. Approximately 40 percent parked longer than 10 hours (figure 5.9).

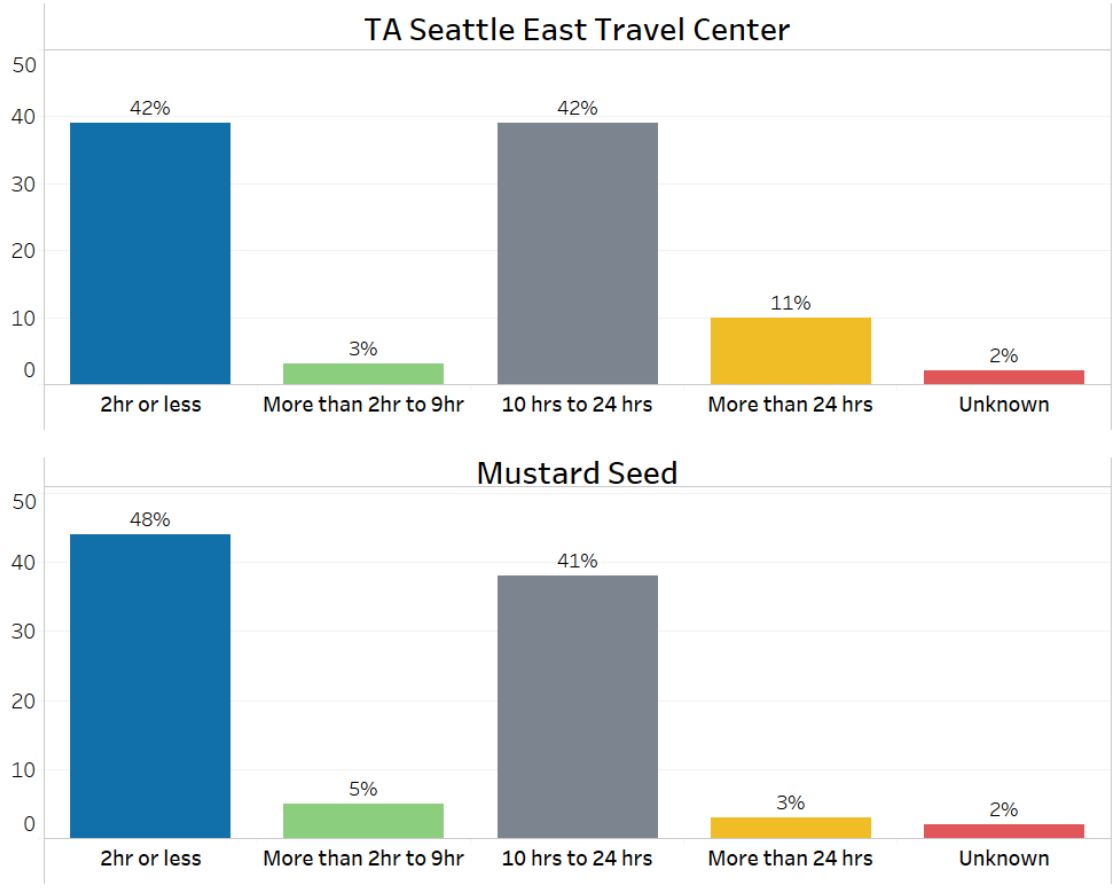

Figure 5.9 Parking durations at the truck stops.

When SCTL compared the number of hours parked with the primary reason for parking, it found that delivery operations were the largest reason for longer stays. Hours of service were the second reason for longer stays. Stays corresponding to fuel, truck cleaning, personal needs, and weight restrictions were the shortest stays (figure 5.10).

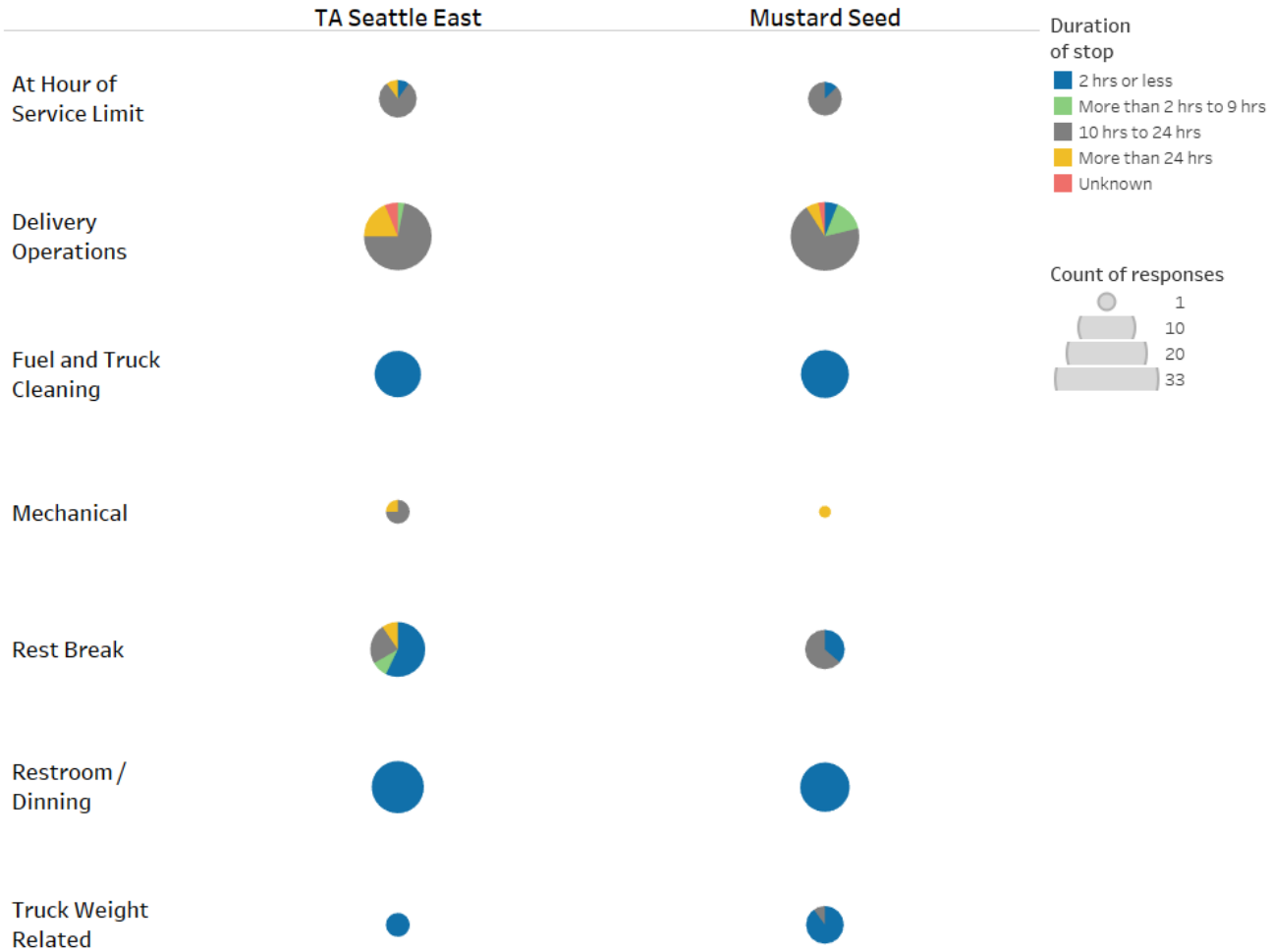

Figure 5.10 Main reasons for parking compared to the duration of parking[4].

5.5 Types of Commodities

The largest commodity group carried by the trucks parked at the facilities comprised food and agricultural products; 32 percent of trucks parked at TA Seattle East and 46 percent at Mustard Seed contained these products.

[4] The circles are sized by the number of drivers that indicated the corresponding activity as a main reason for parking at the rest stop.

Other types of commodities included household goods (HHG) and freight of all kinds (FAK). The first term includes consumer electronics; appliances and housewares; and home furnishings. The last type is a shipping industry term used to describe truck loads with various kinds of goods shipped together at one freight rate.

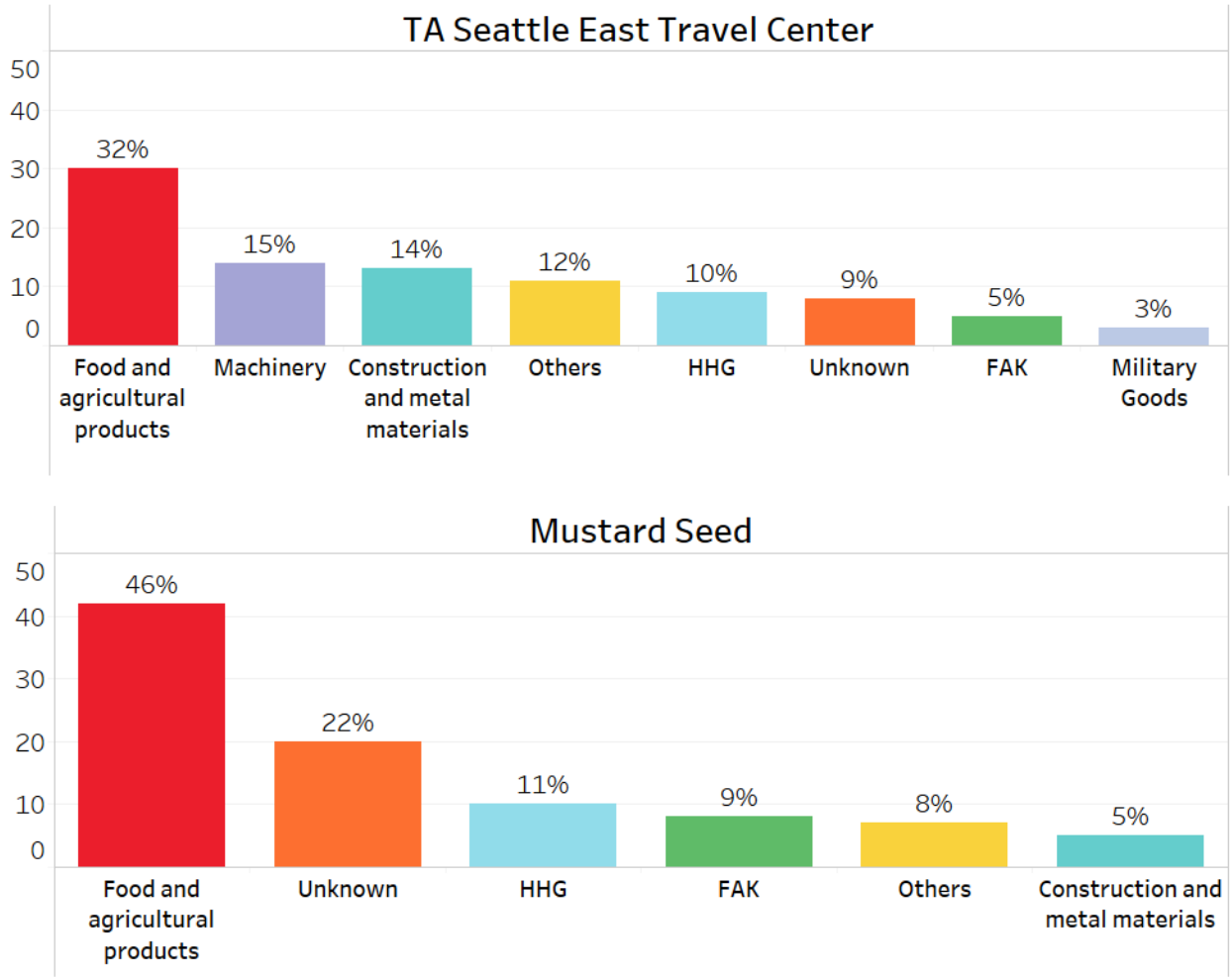

Figure 5.11 Commodity types represented in the truck parking survey.

Chapter 6 – Truck Parking Facilities Maps along the I-5 and I-90 Corridors

The research team downloaded the Geographic Information Systems (GIS) shapefile published by FHWA for the Jason's Law Truck Parking Survey report. This file provides both public and private truck parking facility locations. The data for the public truck rest stops were collected by FHWA in 2013. The data source used to locate private facilities was the Trucker's Friend website (2013). Using these files, SCTL mapped the public and private truck parking centers on the I-5 and I-90 corridors throughout the PacTrans region.

Knowing that the information in the Jason's Law Parking Survey report might be outdated, WSDOT's GIS team supplemented that data with information from additional data sources. The data sources used to compile the locations for the Washington State Truck Parking Map were:

- DieselBoss
- Truck Stop Info Plus
- Trucker's Friend
- Truck Smart Parking Services
- Google Maps.

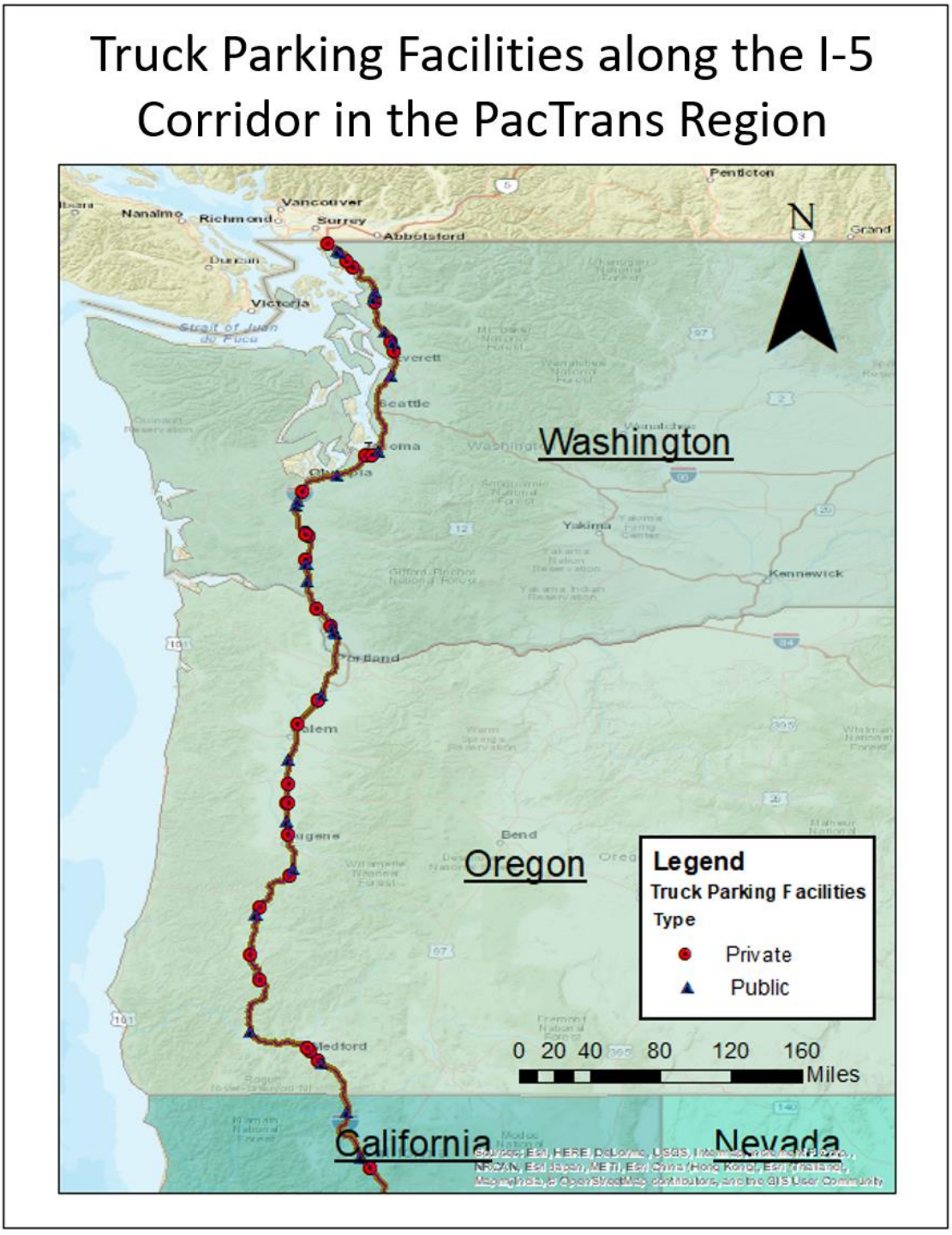

Figure 6.1 Map of truck parking facilities along the I-5 corridor in the PacTrans region based on Jason's Law Truck Parking database (SCTL Center, UW).

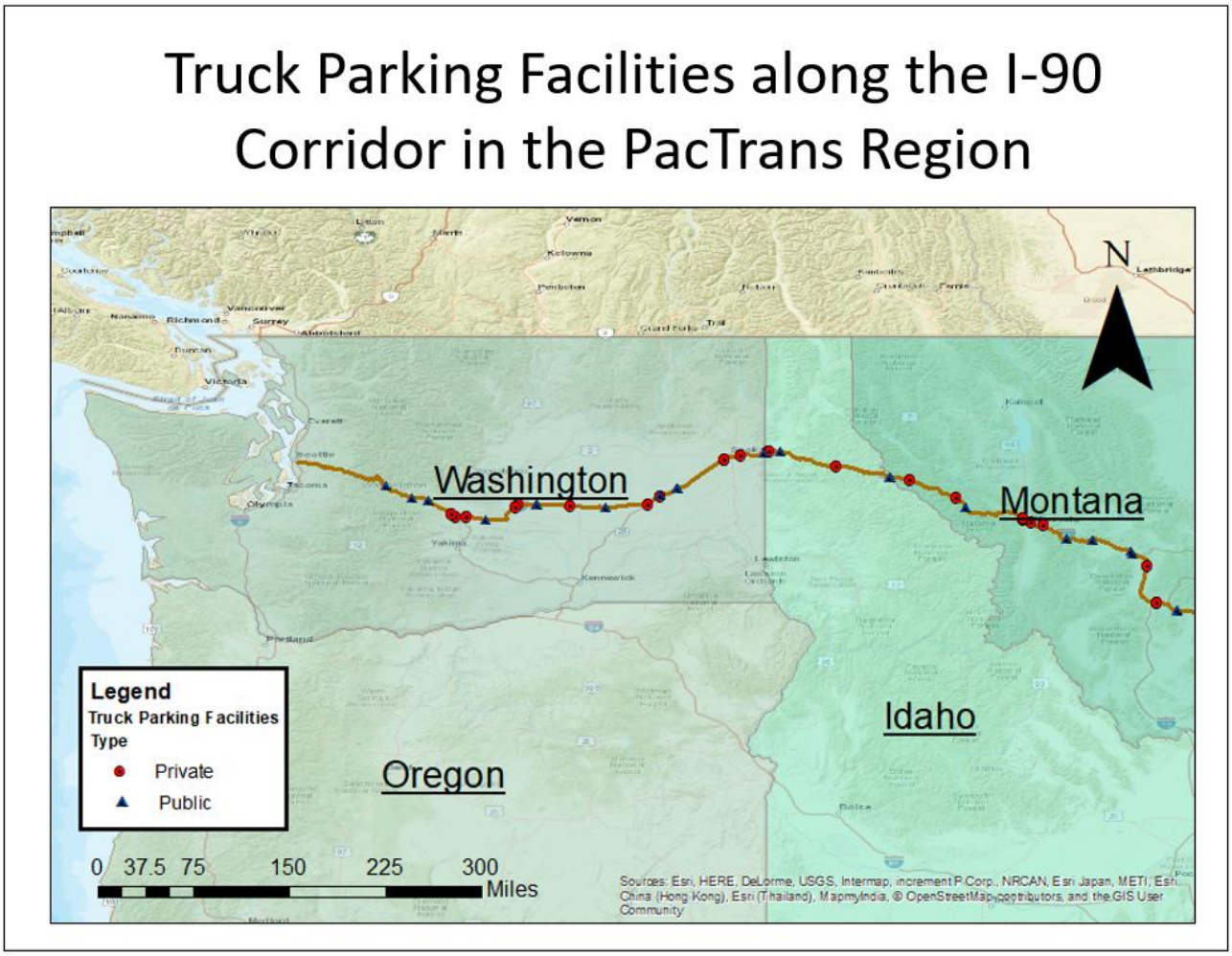

Figure 6.2 Map of truck parking facilities along the I-90 corridor in the PacTrans region based on Jason's Law Truck Parking database (SCTL Center, UW).

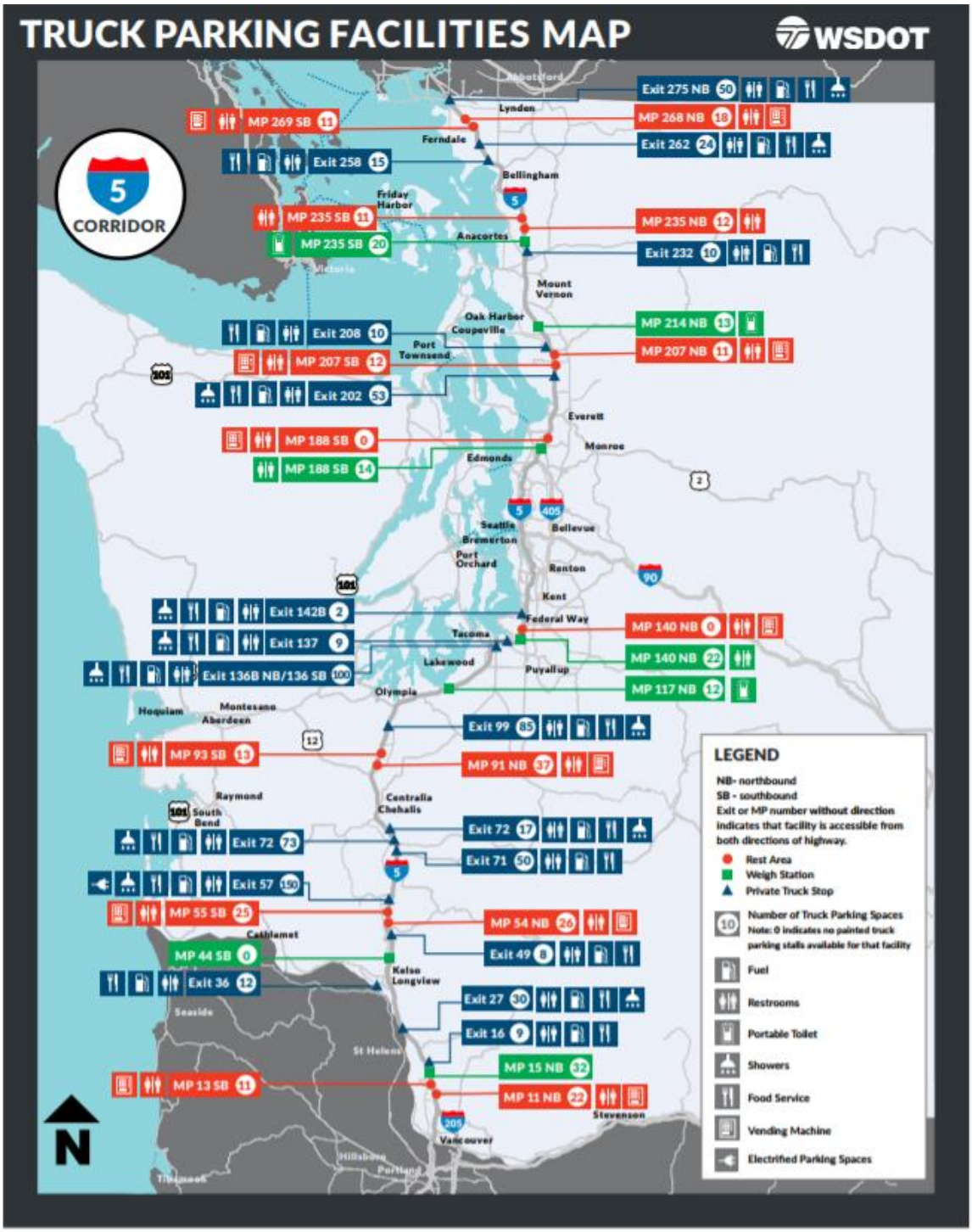

Figure 6.3 Truck parking facilities map on the I-5 corridors in Washington state. (WSDOT, 2017)

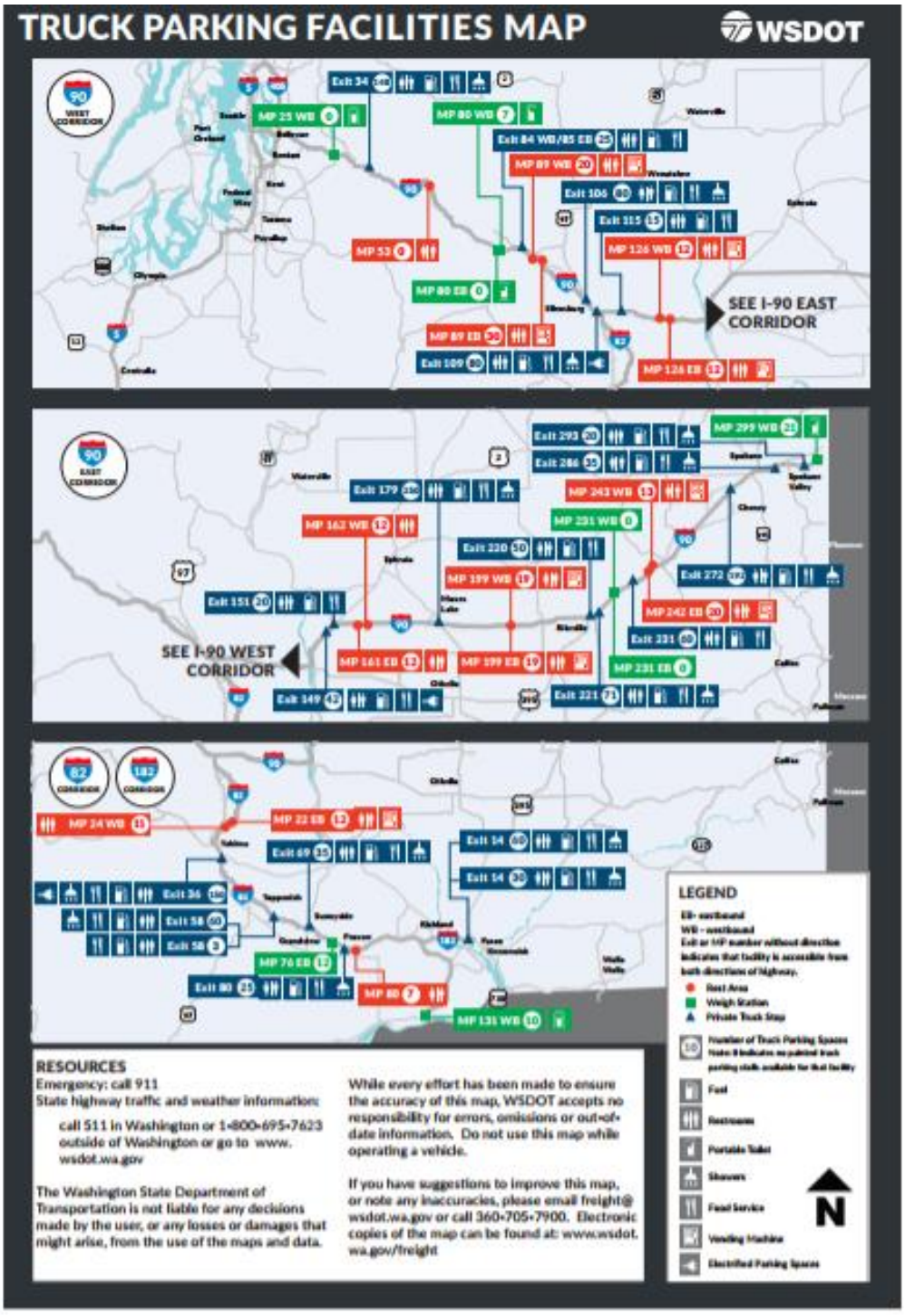

Figure 6.4 - Truck parking facilities map on the I-90 corridor in Washington state. (WSDOT, 2017)

Chapter 7 Conclusions and Recommendations

This study surveyed truck drivers at two long-haul trucking parking facilities in 2017 to obtain a better understanding of truck parking issues faced by truck drivers delivering or picking up goods in Washington. SCTL completed a total of 184 driver surveys: 91 at Mustard Seed, and 93 at TA Seattle East Travel Center rest stops. The survey results indicated the following:

- Most truck drivers parked at the plazas were not going to the ports of Seattle or Tacoma. The study found that 83 percent of truck drivers using TA Seattle East and 78 percent at Mustard Seed) were not going to either the Port of Seattle of the Port of Tacoma.
- The largest group of drivers (34 percent parked at TA Seattle East and 36 percent at Mustard Seed) said that their primary reason for the stop was to wait to meet a specific delivery time at their destination or to wait to locate another load.
- There is a strong link between the services provided by the truck parking facilities and the state's economy. 91 percent of trucks parked at TA Seattle East and 87 percent of trucks at Mustard Seed made deliveries inside Washington state. Drivers using the parking facilities brought goods into Washington to be used as components of the state's manufactured products and/or consumed by residents.
- Although the drivers said that their biggest concern when looking for a parking spot was running out of legal hours of services, a significant percentage were there to manage their delivery operations.
- When SCTL compared the number of hours parked with the primary reason for parking, it found that delivery operations were the largest reason for longer stays.

- The largest commodity group carried by the trucks parked at the facilities comprised food and agricultural products.

Safe and adequate truck parking has historically been a significant issue for carriers and drivers. In Washington state, several rest areas have been eliminated because of budget and other issues. Local communities tend to oppose expanding existing truck parking facilities and permitting new ones in their area (American Transportation Research Institute, 2016). The problem is worse near larger cities, where potential sites are rarely available and, when they are, command premium prices. Community barriers and the high cost of the land near urban centers make it difficult for both public agencies and private investors to invest in new or expanded truck parking facilities.

The research findings may be used to communicate the importance of providing truck parking in high-demand areas in Washington state, particularly near I-5 south of Seattle and along I-90 near North Bend, to local officials, WSDOT, and other state officials. By an overwhelming margin, truck drivers who parked along I-5 and I-90 near the Seattle-Tacoma-Bellevue metropolitan area delivered goods within Washington state, providing strong evidence that their activities support the state's economy and residents.

Additional research to further define the economic contribution made by out-of-state truck trips delivering into the Washington market, as well as cross-state truck trips, will help support the allocation of benefits, roles, and responsibilities for providing truck parking. To achieve this, SCTL recommends applying newly available truck GPS data sets to

- Determine origin-destination flows on a multi-state scale,
- Identify the locations in metropolitan areas where trucks regularly park, and
- Understand the impacts of the new ELD mandate on parking behavior.

This analysis, combined with information from trucking company managers and drivers, will provide data-based support for decisions regarding the selection of locations for new truck rest areas that meet the needs of truck drivers and the traveling public.

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Appendix A Survey Form

WSDOT Truck Parking Survey Form

Surveyor Name: _____ Date: _____ Time: _____

Location: ☐ Mustard Seed ☐ Ken's Truck Town – North Bend

PART I – Origin and Destination

1. **In what city did you begin your trip?**

   a. City: _____ b. State: _____

2. **What city is your final destination?**

   a. City: _____ b. State: _____

   2.1 *If the final destination city is not in WA state.*
   Are you delivering in Washington State?
   a. City _____

3. **Are you going to either Port of Tacoma or Port of Seattle?** *(Select all that apply)*

   ☐ Port of Seattle ☐ Port of Tacoma

PART III – Truck Parking

4. **When you needed to park here in the past and could not find a spot, what did you do?**
   (Select all that apply)

   ☐ Stop in a highway ramp ☐ Stop in a highway shoulder ☐ Stop in a nearby city street ☐ Stop in a freeway Lane

   ☐ Continue to destination ☐ Park in another rest stop ☐ Other: _____

   If the answer is "Another rest stop", **5.1 Which rest stop?** _____

5. **What were your biggest problems when you could not find a parking spot here?** *(Select all that apply)*

   ☐ Driver's fatigue ☐ Road Safety ☐ HOS out of compliance

   ☐ Cargo / personal security ☐ No restrooms available ☐ Other: _____

6. **What is the main reason for your stop here today?** *(Select all that apply)*

   ☐ At Hour of Service Limit ☐ Restroom / Dinning Break ☐ Rest Break ☐ Fuel Stop

   ☐ Mechanical and repair stop ☐ Weather Conditions ☐ Waiting to meet specific delivery time at final destination

   ☐ Other: _____

7. **How long do you plan to stay here today?** _____ **hr**

PART IV – Truck Load

8. **What type of commodity are you carrying?** _____

PART V

9. **Any additional comments about safety issues and the lack of truck parking:**