Oregon Commercial Truck Parking Study

Final Report

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Prepared for

Oregon Department of Transportation

Prepared by

WSP

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EXECUTIVE SUMMARY

BACKGROUND

Truck drivers need regular rest. However, it is more efficient for drivers to travel as far as possible between breaks, which can lead to safety problems. To ensure drivers get the breaks necessary to support safe operation of trucks, the Federal Motor Carrier Safety Administration established Hours of Service regulations. The national growth in trucking and the requirement for regular rest has led to increased demand for truck parking; however, the public and private supply hasn't kept up at a national level.

The Oregon Commercial Truck Parking Study (OCTPS) explores truck parking issues in Oregon. It aims to address commercial parking needs along the six key freight corridors in Oregon with innovative and cost-effective strategies.

STUDY PURPOSE AND GOALS

The OCTPS aimed to achieve three broad goals over the course of the study:

- Assess and address commercial truck parking needs for required rest periods in Oregon to increase safety with practical, innovative and cost-effective strategies that include effective technologies.
- Enhance the economic competitiveness of the state's major freight routes and improve safety.
- Develop the information necessary to support decisions regarding future approaches to truck parking issues in Oregon including determination of the State of Oregon's role in the provision of truck parking.

STAKEHOLDER AND PUBLIC ENGAGEMENT

Study Advisory Committees

A Technical Advisory Committee (TAC) was formed to provide industry insight on study issues. The TAC included representatives from public agencies and business and industry associations involved in the delivery of goods, truck parking and public safety The TAC met three times at various points in the study and provided feedback on study methodology, results and recommendations. Members of the project team briefed the Oregon Freight Advisory Committee at two points during the study.

Outreach Methodology

An online survey tool gathered opinions from travelers who use truck parking within Oregon. In total, the survey received 729 responses, including 662 online submissions and 67 in-person

surveys. Longer, in-person and phone interviews were conducted with 26 respondents. The vast majority of respondents were truck drivers or dispatchers.

Both survey and interview respondent's identified insufficient truck parking in Oregon, particularly near urban areas. They also provided useful input as to the problems and potential solutions.

BEST PRACTICES REVIEW

A literature review was conducted to learn about the methods, findings, and conclusions of previous truck parking studies. Eleven regional, statewide and local truck parking studies from around the country were summarized, noting the results of outreach efforts (if applicable) and how truck parking needs were evaluated. Several federal studies were also reviewed, including the guidance coming from the National Coalition on Truck Parking. Finally, 16 recent research studies were also reviewed (mostly from the past 5 years) to better understand the cutting edge of truck parking demand modeling, needs evaluation, and technological solutions.

TRUCK PARKING INVENTORY

The Truck Parking Inventory Technical Memorandum (Appendix E) provides an inventory of designated truck parking locations in the study corridors, including rest areas, truck stops and ports of entry. There are approximately 5,500 truck parking spaces at rest areas, truck stops, and ports of entry on the study corridors. Of these, approximately 4,300 are striped and 1,100 are unstriped. There are 914 striped spaces at rest areas, about 4,400 at truck stops, and 154 at ports of entry.

CURRENT DEMAND ANALYSIS

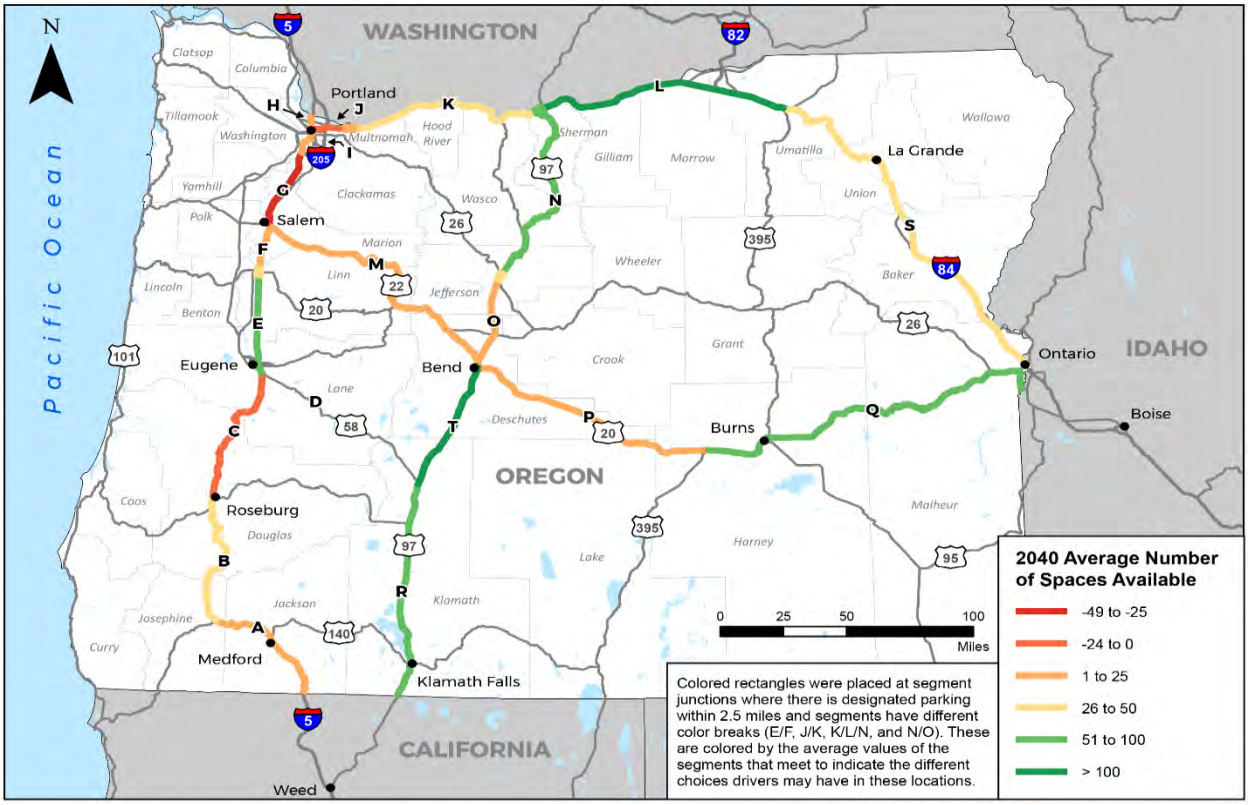
The Current Demand Analysis Technical Memorandum (Appendix F) expanded the parking demand observed in truck GPS data using observations from video recordings and reports from a leading truck parking application. This analysis allowed for parking demand to be measured in all the rest areas and truck stops statewide and to be compared against existing capacity to identify corridors where shortfalls are likely. Undesignated parking refers to parking at locations where it is not permitted, such as highway shoulders, interchanges, etc. Based on GPS data, high demand locations for undesignated parking were also identified.

FUTURE PARKING DEMAND

The Future Demand Analysis Technical Memorandum (Appendix G) estimated truck parking demand in 2040 using the baseline results described in the Current Demand Analysis Technical Memorandum (Appendix F). The results indicate the number of parking spaces that need to be added to the corridors in order to avoid future shortfalls. Truck parking demand was forecast by

escalating current parking demand by the growth rate in the Oregon Statewide Integrated Model.[1] Figure ES-1 shows the areas where, by 2040, on average, the increase in truck parking demand is expected to overcome the supply of parking.

Figure ES-1: 2040 Average Number of Spaces Available (Supply minus Demand) Weekdays at Midnight



TRUCK PARKING SOLUTIONS

A breakdown of recommendations from the federal, state and regional truck parking plans reviewed in the Literature Review Technical Memorandum (Appendix C) yielded six key strategies:

- Data and Technology Deployment
- Creative Use of Right-of-Way / Public Capacity Expansion
- Expansion using public-private partnerships
- Policy and Regulations
- Coalitions and Institutional Oversight
- Public and Private Outreach

[1] https://www.oregon.gov/ODOT/Planning/Documents/Statewide-Integrated-Model-Vers2-5.pdf

Site-specific and statewide solutions were identified to meet the forecasted needs across the state in the Strategy and Recommendations Memorandum (Appendix H). They were prioritized according to the following criteria:

- Effectiveness at addressing identified needs
- Cost
- Private resource utilization
- Ease of implementation/previous success

NEXT STEPS

As a next step, the State of Oregon should develop an implementation plan for this study in order to identify the more specific tasks needed to implement the study. In some cases, feasibility studies and proof-of-concept pilots may be appropriate to determine effectiveness, limitations and projected costs of implementing specific recommendations under consideration. Pilot programs for low-cost solutions—such as expanding rest areas with existing rights-of-way, re-designing/re-marking rest areas to better utilize existing footprints or increasing participation in existing truck parking web applications—could speed implementation.

1. BACKGROUND, PURPOSE AND GOALS

1.1 NATIONAL TRUCK PARKING PROBLEM

Truck drivers need regular rest. However, it is more efficient for drivers to travel as far as possible between breaks, which can lead to safety problems. In order to ensure drivers get the breaks necessary to support safe operation of trucks, the Federal Motor Carrier Safety Administration (FMCSA) established Hours of Service (HOS) regulations. The national growth in trucking and the requirement for regular rest, has led to increased demand for truck parking but the public and private supply hasn't kept up at a national level.

In 2009, a young truck driver, Jason Rivenburg, was robbed and killed while resting in his truck in an undesignated parking lot. In 2012, "Jason's Law" was established to provide a "national priority on addressing the shortage of long-term parking for commercial motor vehicles on the National Highway System (NHS) to improve the safety of motorized and non-motorized users and for commercial motor vehicle operators."[2]

A national survey conducted in 2015 as part of Jason's law identified truck parking shortages during the evening and night time hours, particularly in high-freight locations such as urban and Ports and during weather events. It also found a lack of funding for truck parking projects and enforcement, among many other things.[3] Jason's Law requires all states to conduct an inventory of existing truck parking, assess the volume of commercial motor vehicles in the state, and measure the adequacy of commercial motor vehicle parking facilities in the state. The Oregon Commercial Truck Parking Study (OCTPS) explores truck parking issues within six key freight corridors in Oregon and aims to address commercial parking needs along these corridors with innovative and cost-effective strategies.

[2] United States Public Law 112-141 Section 1401.
[3] ops.fhwa.dot.gov/freight/infrastructure/truck_parking/jasons_law/truckparkingsurvey

Hours of Service Rules

As of 2012 these rules were made more stringent and included the following requirements:

- 11-Hour Driving Limit: May drive a maximum of 11 hours after 10 consecutive hours off duty.
- 14-Hour Limit: May not drive beyond the 14th consecutive hour after coming on duty, following 10 consecutive hours off duty. Off-duty time does not extend the 14-hour period.
- Rest Breaks: May drive only if 8 hours or less have passed since end of driver's last off-duty or sleeper berth period of at least 30 minutes. Does not apply to drivers using either of the short-haul exceptions.
- 60/70-Hour Limit: May not drive after 60/70 hours on duty in 7/8 consecutive days. A driver may restart a 7/8 consecutive day period after taking 34 or more consecutive hours off duty.

In May 2020, FMCSA announced its intention to publish a final rule on hours of service that makes four key revisions to the existing HOS rules. These changes were published in the Federal Register on June 1 and will become effective on September 29, 2020 (https://www.federalregister.gov/documents/2020/06/01/2020-11469/hours-of-service-of-drivers).):

- The 30-minute break rule, which requires a break after no more than eight hours of consecutive driving, can now be satisfied by the on duty/not driving status, rather than off duty status. That means a driver's "break" could be satisfied by stopping to fuel the truck, for instance.
- The sleeper berth rules will now allow drivers to split their required 10 hours off duty into two periods.
- The new rule changes the adverse driving conditions exception by extending by two hours the maximum window during which driving is permitted. The new rule allows the workday to be extended to as much as 16 hours in the case of adverse conditions such as extreme weather or congestion.
- The agency will change the short-haul exception available to certain commercial drivers by lengthening the drivers' maximum on-duty period from 12 to 14 hours and extending the distance limit within which the driver may operate from 100 to 150 air miles.

1.2 PRIOR STUDIES IN OREGON

In 2018 ODOT and FHWA published a research study titled *Truck Parking: An Emerging Safety Hazard to Highway Users.*[4] It included an extensive literature review and completed a survey of agencies in several states. The study also used a stated-preference survey to understand the factors causing truck drivers to park on ramps, shoulders, interchanges, and other facilities. Through statistical modeling, the study found the following factors were important - driver characteristics (particularly years of experience), trip characteristics, parking difficulty, real-time information availability, and parking features. It also completed a safety assessment and estimated future truck parking demand on US-97. It called for a more detailed state-wide supply and demand analysis.

[4] Hernandez and Anderson

1.3 STUDY PURPOSE AND GOALS

The OCTPS aimed to achieve three broad goals over the course of the study:

- Assess and address commercial truck parking needs for required rest periods in Oregon to increase safety with practical, innovative and cost-effective strategies that include effective technologies.
- Enhance the economic competitiveness of the state's major freight routes and improve safety.
- Develop the information necessary to support decisions regarding future approaches to truck parking issues in Oregon including determination of the State's role in the provision of truck parking.

More specifically, the study scope elements included the following objectives intended to deliver study goals:

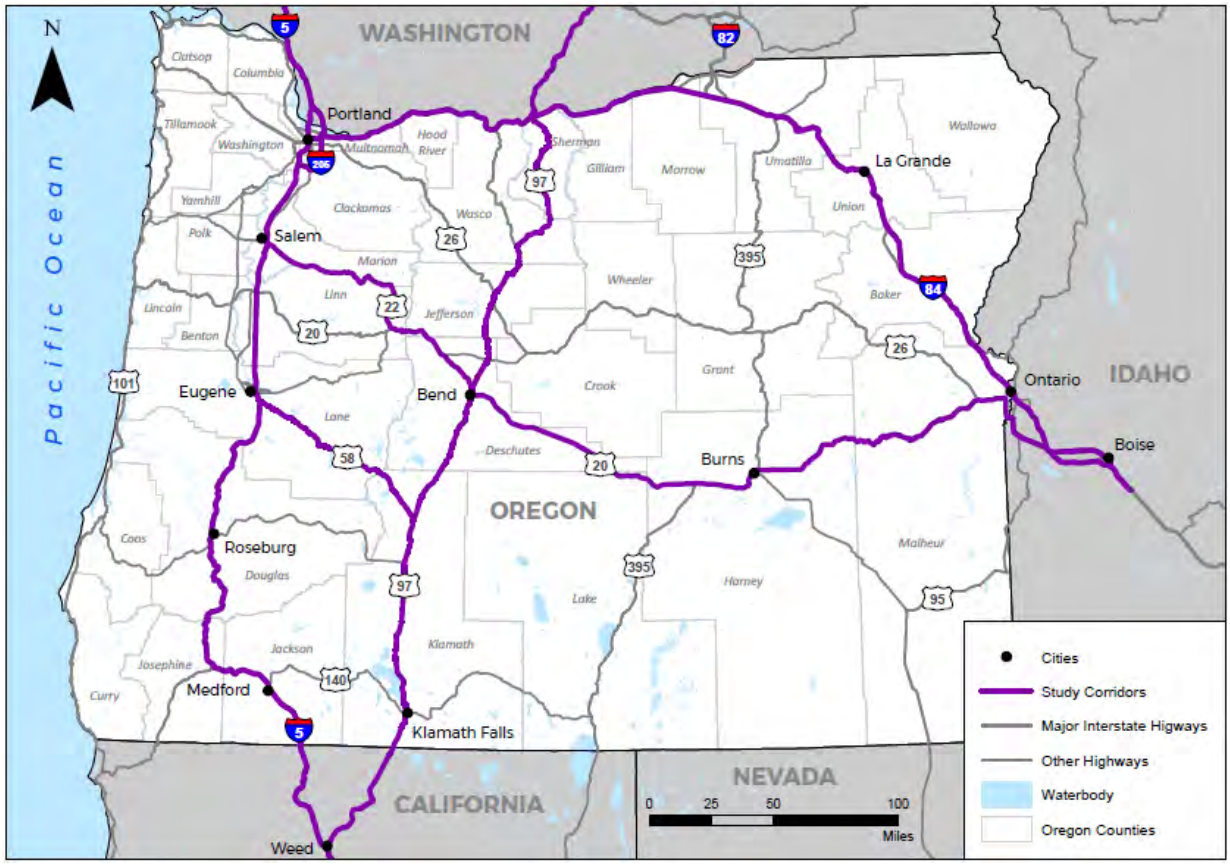
- Measure current truck parking capacity and demand on the Study corridors, including legal and undesignated sites, and identify the gaps in truck parking locations today.
- Gather opinions of truck drivers, company officials of motor carriers, shippers, state agencies and private truck stop operators on parking location decisions, shortages and other issues.
- Estimate future capacity and demand for truck parking and identify priority locations or gaps where truck parking will be an issue (e.g. rest stops, private truck stops, exit ramps, shoulders and local streets).
- Identify types of cost-effective solutions and potential federal programs to improve truck parking facilities and services including, but not limited to, support to private development and public-private-partnerships, effective technology, signage, and/or provision of additional parking locations.

1.4 STUDY CORRIDORS

As Jason's Law requires an inventory of all truck parking in each state, the study corridors must include substantially all major freeways (interstate as well as state highways) in Oregon that are served by public rest areas and/or private truck stops. As the need for long-term truck parking is primarily associated with significant volumes of long-haul trucks, the first criterion for the selection of OCTPS corridors was a designation as an Oregon Highway Plan (OHP) freight route. OHP freight routes are the highways in the state with annual truck tonnages that are moderate to high and provide connectivity to significant freight generating areas of Oregon. Therefore, the first scan of the OHP freight routes looked at the corridors that are over hundred miles long with over 500 trucks per day. Four study corridors were drafted using the above criteria Interstate 5 (I-5), Interstate 84 (I-84), US Route 20/Oregon Route 22 (US20/OR22) from Salem

to the Idaho border, and US Route 97 (US97). A review of other freight routes that may carry significant volumes of long-haul freight yielded two further study corridors - Interstate 205 (I-205) and Oregon Route 58 (OR58). The study area for each corridor extends 50 miles into adjacent states (Washington, Idaho, and California). Figure 1 shows the location of these freight-important corridors within Oregon.

Figure 1: OCTPS Study Corridors



1.5 REPORT ORGANIZATION

The rest of this report is organized as follows:

- Chapter 2 – Stakeholder and Public Engagement: This chapter provides a description of the study team and summarizes the results of outreach and stakeholder engagement efforts undertaken as part of the study.
  - The OCTPS Feedback Summary document (Appendix B) provides more details on the results of the outreach efforts described in this chapter.
- Chapter 3 – Best Practices Review: This chapter expands on the existing literature around truck parking through a review of federal, state, and local truck parking plans. A description of the OCTPS study methodology is also included in this chapter.

  - The Literature Review Technical Memorandum (Appendix C) provides more details on the best practices summarized in this chapter.
  - The Methodology and Data Assessment Technical Memorandum (Appendix D) provides more details on the analysis methodology for estimation of current and future truck parking demand along study corridors.
- Chapter 4 – Truck Parking Inventory: This chapter describes the methodology used to build an inventory of designated truck parking locations in the study corridor.
  - The Truck Parking Inventory Technical Memorandum (Appendix E) provides more details on the parking inventory summarized in this chapter.
- Chapter 5 – Current Demand Analysis: This chapter summarizes the methodology and results of the supply and demand analysis.
  - The Current Demand Analysis Technical Memorandum (Appendix F) provides more details on the analysis summarized in this chapter.
- Chapter 6 – Future Parking Demand: This chapter summarizes the methodology and results of the future supply and demand analysis that estimated truck parking demand in 2040.
  - The Future Demand Analysis Technical Memorandum (Appendix G) provides more details on the analysis summarized in this chapter.
- Chapter 7 – Strategy and Recommendations: This chapter summarizes the truck parking needs that were identified in previous memoranda, outlines the State's truck parking goals, and identifies and prioritizes solutions that would help achieve these goals. Top solutions and recommended actions by segment for each study corridor are also provided in this section. Finally, a discussion of public-private partnership strategies and potential state and federal sources of truck parking funding is included.
  - The Strategy and Recommendations Technical Memorandum (Appendix H) provides more details on the study materials described in this chapter.
- Chapter 8 – Next Steps: This chapter briefly describes potential next steps to identify action needed to implement the recommendations from this study.

2. STAKEHOLDER AND PUBLIC ENGAGEMENT

The primary purpose of the public engagement study was to understand public perceptions about the availability and quality of commercial truck parking at public and private locations in Oregon. The study sought feedback particularly from truck drivers on truck parking issues within key freight corridors of the State, including I-5, I-205, I-84, US97, OR 22, US 20/26, and OR 58. The study included questions about capacity, safety and convenience and sought to determine where additional truck parking may be needed. The data collected was intended to help decision makers prioritize future initiatives related to truck parking.

2.1 STUDY ORGANIZATION

2.1.1 Project Management and Study Team

The study team included staff from ODOT's Freight Planning and Transportation Planning and Analysis units, the Motor Carrier Division, Maintenance Districts and consultants. WSP was the prime consultant and was supported by Jeanne Lawson and Associates, Freight Insights, and the American Transportation Research Institute (ATRI). The agency and study project managers met twice monthly throughout the study to review study progress. Members of the larger study team convened as needed to provide input and direction on key deliverables.

2.1.2 Technical Advisory Committee (TAC)

TAC Purpose and Role

A TAC was formed to provide industry insight on study issues. The TAC included representatives from public agencies and business and industry associations involved in the delivery of goods, truck parking and public safety. Appendix A lists the full membership. The TAC met three times at various points in the study and provided feedback on study methodology, results and recommendations.

TAC Meetings

At the first TAC meeting, held in April 2019, the study team presented results from the Literature Review Technical Memorandum (Appendix C), the Data Assessment and Methodology Technical Memorandum (Appendix D), and the Truck Parking Inventory Technical Memorandum (Appendix E). TAC members reviewed the inventory of rest areas and truck stops throughout the state in detail and identified potential additional designated truck parking facilities, including Ports of Entry. Some TAC members highlighted the unreliability of crowd sourced parking information as it relies on estimates from truck drivers selecting among a few categories of occupancy. TAC members also discussed the various factors in selecting truck parking locations, including the importance of specific amenities. Several members noted the difficulty of siting additional truck parking locations in urban areas where they are needed the most

At the second TAC meeting, held in November 2019, the study team presented results from the Survey Feedback Summary, the Current Demand Analysis and the Future Demand Analysis. TAC members discussed the relative importance of different factors truck drivers use in deciding where to park, including both designated and undesignated truck parking locations. They further discussed design of rest areas and various approaches to, and benefits of, real-time parking information to drivers. The group also floated ideas around potential solutions, including regulating undesignated parking, provision of low-development truck parking as well as working with shippers and distributers to provide truck parking.

At the third TAC meeting, held virtually in April 2020, the study team presented results from the Strategy and Recommendations Technical Memorandum. TAC members provided feedback on the detailed segment needs and prioritized solutions. The group discussed the potential benefits of a parking reservation system and public private partnerships.

2.1.3 Oregon Freight Advisory Committee (OFAC)

Members of the project team briefed OFAC at two points during the study. During the first meeting, in April 2019, OFAC reviewed and provided input on the study scope and goals, the literature review, draft methodology, the draft inventory and proposed next steps. OFAC members offered to help with the distribution of the survey and discussed the difficulty of siting truck parking in urban areas, where it is allowed by land use laws. The second meeting, held in January 2020, covered the survey and interview results and current and future truck parking demand. OFAC members provided input on potential solutions and discussed the potential for truck parking at large warehouses, among other strategies. It is expected that OFAC will be presented the final study in July of 2020 along with an implementation plan.

2.1.4 Website

ODOT hosted a webpage for the study which provided an overview of the study, timeline and included all project deliverables. It also included TAC meeting agendas and a link to the survey while it was open.

2.2 OUTREACH METHODOLOGY

In addition to the TAC, OFAC and website, study outreach relied on three key tools:

- **Survey:** The online survey tool was intended to gather opinions from travelers who use truck parking within Oregon. The survey was intended to help supplement the in-person outreach by increasing the geographic breadth of potential participation and make the survey available over a longer time period. The survey questions were formatted to complement the in-person interview questions.
- **Interviews:** The team conducted 26 in-person and phone interviews with key stakeholders familiar with commercial truck parking in Oregon and/or nationally. The interviews provided an opportunity to gather feedback, educate industry leaders about the study process, and

further disseminate survey materials through internal networks to drivers and other relevant contacts.

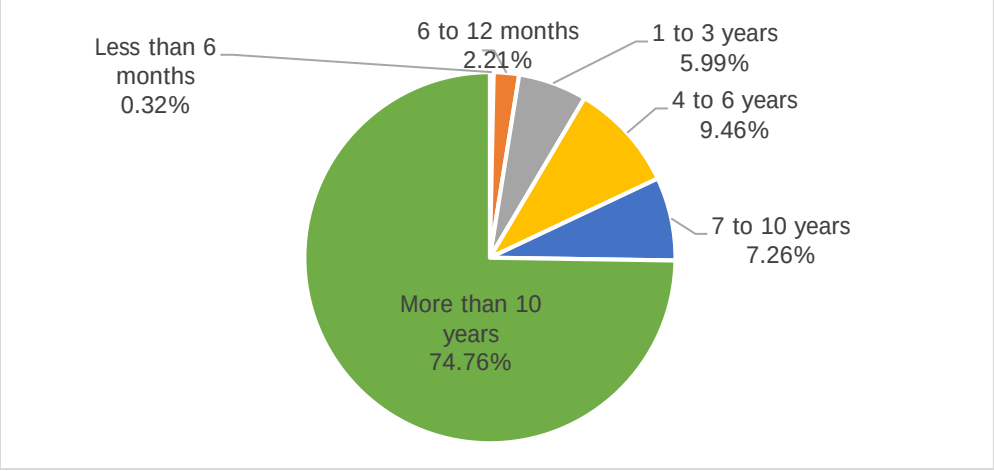
- **Tabling / In-Person Surveys:** Previous outreach has noted the difficulty of collecting freight industry feedback. In accordance with studies recommending best practices for reaching truck drivers, the team conducted in-person surveys at the following locations:
  - Jubitz Travel Center (Portland, I-5)
  - Pilot Travel Center and Grand Central Travel Center (Biggs Junction, I-84)
  - Truck 'N' Travel (Coburg, I-5)
  - 2019 Oregon Truck Driver Championships (Portland)

The design of the survey tool followed a literature review of similar studies and stakeholder surveys. The survey included questions about how, why and when truck drivers choose their parking locations, where they are going, and what amenities they prefer when parking. The survey instrument was also designed to allow respondents to provide corridor-based geographic data that would offer insights into specific problematic corridor segments throughout the state.

In total, the survey received 729 responses, including 662 online submissions and 67 in-person surveys. Longer, in-person and phone interviews were conducted with 26 respondents. The majority of survey respondents (80%) self-identified as truck drivers. The second most common choice was "Dispatcher" (11%). Of interview participants, only about 22% identified as truck drivers, with the other two highest categories being "Truck stop operator/employee" (25%) and "Other" (35%), which primarily included transportation management and planning personnel. Several associations were also interviewed.

Respondents were experienced, with the vast majority having driven a truck for more than 10 years as shown in Figure 2.

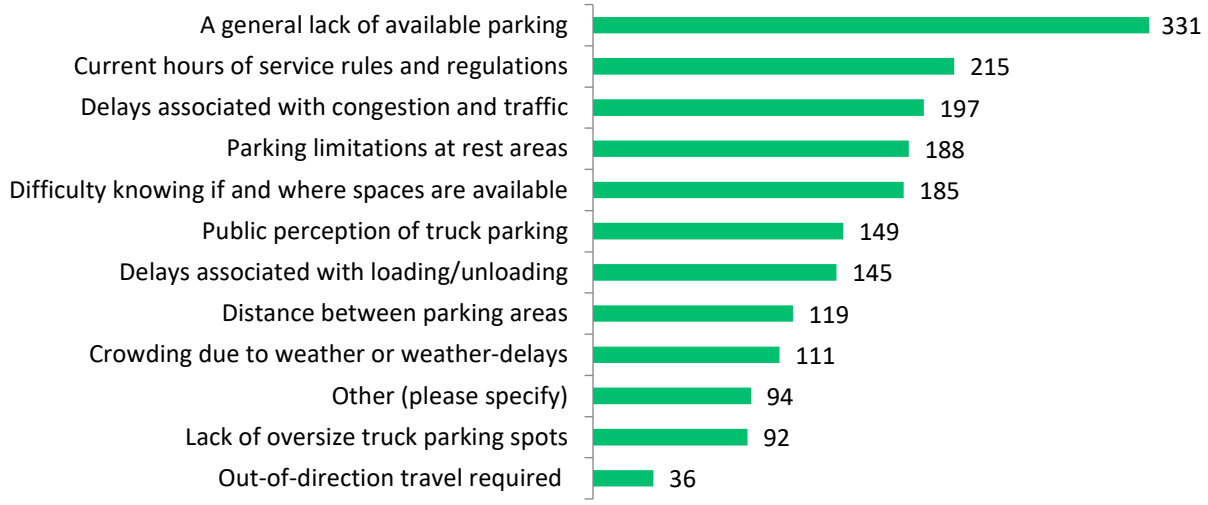
Figure 2: How long have you been driving a truck?



2.3 SURVEY - KEY FINDINGS

Survey respondents were asked to comment on aspects of the state of truck parking in Oregon. They indicated that the main problem with truck parking in Oregon respondents is the lack of availability. This is followed by hours of service rules and travel delays as shown in Figure 3.

Figure 3: What do you think are the main problems and issues with truck parking in Oregon?



Key themes included:

- **General availability of truck parking in Oregon -** Most respondents identified the general availability of truck parking in Oregon as "Poor" (39.7%) or "Very Poor" (19.1%). Less than 14% of respondents held a positive view regarding parking availability.
  - Lack of available parking for trucks was rated a significant issue in Oregon. The deficiency was particularly pronounced near urban areas, but problematic throughout the state.
  - Rules and regulations surrounding hours of service were a significant issue related to truck parking. Many respondents also viewed delays, both with traffic and loading/unloading, that impact their schedule as an issue.
  - Parking limitations at rest areas, and the difficulty associated with knowing if and where spots are available were also popular problems identified by survey takers.
  - Local regulations and public perception were also identified as issues affecting parking and the ability to create new parking areas.
- **Causes of demand for truck parking -** 60% of respondents said that the number one reason they stop driving is because they are required to do so by hours of service rules. 75% of respondents identified this as one of their top three reasons for stopping. "Personal

safety or cargo safety" was identified by just under half of respondents as one of their top three reasons for stopping. "Cost/rates" was one of the least common reasons for stopping.

- **Locating truck parking spaces in Oregon -** The survey also sought to determine how respondents typically find parking. Most respondents (65%) said that they have "favorite locations" that they visit frequently. Almost 40% said that they use smartphone apps such as "Park my Truck" or "Truckers Path" to find parking. Only a small portion of respondents indicated that they use printed material or that their companies provide parking options.
- **Choice of truck parking stops and rest areas -** When choosing truck stops based on amenities, respondents cited restrooms (80%) and expected parking availability (66%) as the top criteria. Food, ease of vehicle access, and showers were also important factors. Internet/Wi-Fi availability, maintenance centers, facilities for pets, and vending machines were the least common answers. See Figure 4 for full results on this question. Interviewees generally agreed, although they added refueling options as a significant consideration. They also emphasized proximity to the delivery location as a main factor in choosing stop locations.

Figure 4: What amenities do you look for when stopping to rest?

- **Respondent behavior to truck parking issues and availability -** Interviewees said that drivers tend to respond to parking problems by parking on highway ramps or in other undesignated areas. This is often due to HOS rules which either require drivers to plan ahead and often stop short of their hours (impacting utilization) or find themselves having to pull over in unplanned locations for mandatory breaks. Several interviewees believed that some truck drivers may not mind parking in undesignated parking, particularly in rural areas, as they tend to be pretty self-sufficient.

Survey takers were presented with a series of possible solutions for alleviating truck parking issues and asked to identify all that they thought would be helpful:

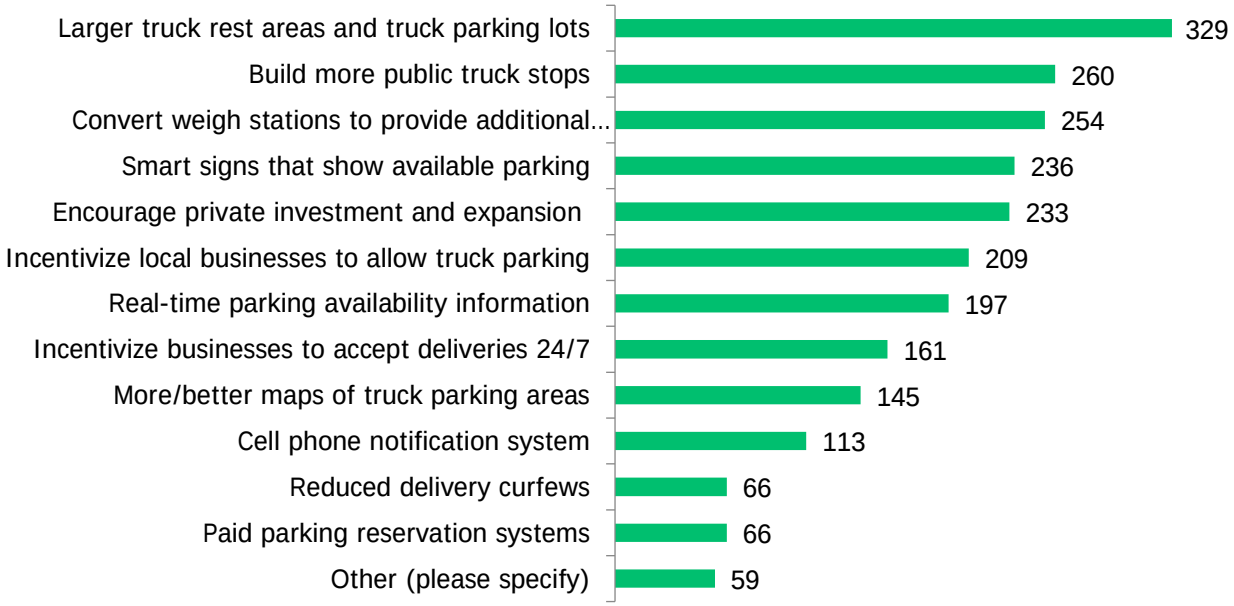
- The most popular option among survey takers was creating larger truck rest areas and parking lots. All of the methods that involved the creation or expansion of parking space were popular selections among respondents.
- Options such as “paid parking reservation systems”, “cell phone notification system”, and “reduced delivery curfews” were among the least popular of the proposed strategies. Interviewees also favored the expansion of parking areas but were more amenable to paid reservation systems.
- Interviewees also doubted the efficacy of reduced delivery curfews, incentivizing businesses to accept delivery 24/7, and cell phone notifications as methods to relieve parking problems.
- Interviewees tended to offer specific recommendations for incentivizing new parking areas, such as regulatory changes to allow truck parking in more areas and tax breaks for truck stop owners.

Further, survey respondents were asked specific questions on each study corridor segment. Primary inquiries were in relation to:

- Reasons for truck parking demand within the segment
- Main truck parking issues within the segment
- Amount of time spent looking for parking within the segment
- Time-of-day when parking availability is lowest

The Feedback Summary Technical Memorandum details statistical responses to each of the segment-specific questions for all study corridor segments, as well as for system-level survey questions. It also asks about potential solutions. As shown in Figure 5, larger truck rest areas and truck stops both public and private were the most popular solution followed by smart signs that show available parking.

Figure 5: Which of the following strategies make sense to you?



2.4 STAKEHOLDER INTERVIEWS - KEY FINDINGS

The study team also conducted 26 in-person and phone interviews with key stakeholders familiar with commercial truck parking in Oregon and/or nationally. Interview participants included representatives from truck and rest stop operators, ODOT district maintenance staff State police, freight carriers, industry associations and federal safety regulators, among others. Appendix B, "Feedback Summary" includes the full list of interviewees.

These interviews covered similar questions as the survey. Key findings included the following:

- Interviewees tended to be unsure or feel negatively about the general availability of truck parking. Only approximately 25% of the respondents rated parking availability as "neutral" or better.
- In addition to current HOS rules and regulations, this general lack of availability was perceived as the most common issue with truck parking in Oregon.
- Urban areas and particularly the Portland metro area have the most significant parking problems. Trucks must stop outside these areas to rest and stage before deliveries/pickups. City ordinances and business prohibitions against truck parking in the city near delivery locations keep trucks from using convenient space.
- Drivers tend to park in undesignated or unsafe locations when they can't find parking.
- There are not enough useful parking tools such as online reservation systems or websites with availability information. However, it was also indicated that some drivers do not want to pay for reservations.

- Interviewees also felt that there are not enough incentives to create new parking and there are often cost prohibitive challenges associated. Tax breaks could help counter the cost of improvements, land, design, permitting, maintenance, and zoning restrictions.

3. BEST PRACTICES REVIEW

3.1 LITERATURE REVIEW– FEDERAL, STATE, AND LOCAL TRUCK PARKING PLANS

The Literature Review Technical Memorandum focused on methods and approaches of previous truck parking studies, as well as on their findings and conclusions. Eleven regional, statewide and local truck parking studies from around the country were summarized, noting the results of outreach efforts (if applicable) and how truck parking needs were evaluated. These studies included truck parking plans from Arizona, Virginia, Washington, North Carolina, Atlanta, Wisconsin and others. Emphasis was placed on more recent and comprehensive studies. A review of the Mid America Association of State Highway Officials (MAASTO) Regional Truck Parking Information Management System (TPIMS) was also provided in the memorandum.

Several federal studies were also reviewed, including the guidance coming from the National Coalition on Truck Parking. Finally, sixteen recent research studies were reviewed (mostly from the past 5 years) to better understand the cutting edge of truck parking demand modeling, needs evaluation, and technological solutions.

The purpose of the literature review was to inform the OCTPS about what the studies covered, how they presented the information and what were the recommendations. Lessons learned from peer state truck parking plans and the other plans reviewed were organized according to the relevant tasks in the study and are briefly summarized below.

3.1.1 Truck Parking Inventory

Key lessons learned for the truck parking inventory task included the following:

- Previous studies used a wide range of information to identify the locations and amenities of designated and undesignated truck parking facilities, including:
  - Designated: Jason's Law Inventory, State DOT Maintenance District staff, Trucker Path, Trucker's Friend, National Truck Stop Directory, Park my Truck, driver interviews and surveys, Google Earth, etc.
  - Undesignated: State DOT Maintenance District Staff, ATRI's truck GPS records (manual or automated cluster analysis), law enforcement officers, parking citations, driver interviews and surveys, Google Earth, etc.
- Undesignated roadside locations include shoulders, ramps, access roads to rest areas, weigh stations, and mountain chain-up areas.
- Many commercial establishments permit overnight truck parking on their private parking lots (e.g. Wal-Mart, Home Depot, vacant lots)

- The most important amenities for truck drivers to be considered in the inventory were proximity to route, showers/restroom, parking spaces, refueling services, width of parking spaces/ease of access, restaurant, internet, laundry, and service centers.

Figure 6: Undesignated Parking Near a Truck Parking Stop

3.1.2 Current and Future Parking Demand

Key takeaways for the current and future truck parking demand tasks included the following:

- Many studies used the FHWA model published in 2002 to estimate truck parking demand. These formulas describe the hours of truck parking demanded along a corridor as a function of truck volumes and other factors. The main limitation of this approach is the reliance on previously estimated parameters that are typically not validated with local data. In addition, the HOS regulations have changed since 2002; for example, the standard work shift lengthened from ten to eleven hours.
- Another approach, which has been implemented in Arizona, uses data from a crowd-sourced truck parking application to describe truck parking demand. These apps only offer a few categories of level of occupancy. While it could be helpful to identify those parking facilities that are full more often – it is not precise. Another significant limitation of this approach is that data from truck parking applications does not adequately capture parking at undesignated locations. This represents a significant blind-spot, particularly in high volume corridors where parking lots are often full.
- Some states used video evidence to calculate GPS parking demand expansion factors. This approach has the advantage of considering truck parking in both designated and undesignated locations, for any reason. It also has the ability to provide great detail on parking patterns, throughout the day and throughout the year, in addition to describing

parking along specific corridors or regions. The main disadvantage with this approach is that it only considers trucks instrumented with GPS recorders, which is estimated at approximately 80% of all class 7/8 trucks on the road.

- Truck volume forecasts should be ascertained from the Oregon Statewide Integrated Model (SWIM) while current truck volumes are better obtained from traffic counts. Transearch routed data should be used to estimate proportion of short haul vs. long haul truck volumes.

These approaches are further detailed in Table 1 of the Methodology and Data Assessment Technical Memorandum. The methodology that was selected for this study is discussed in Section 3.2 below.

3.2 STUDY METHODOLOGY

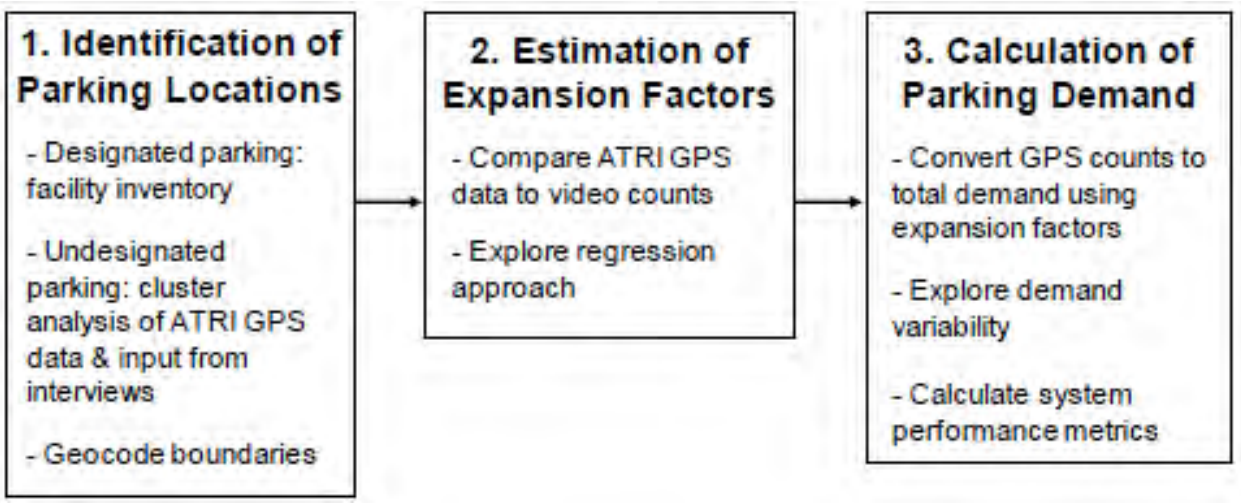
The Methodology and Data Assessment Technical Memorandum (Appendix D) built upon the findings of the Literature Review Technical Memorandum (Appendix C) and detailed the analysis methodology for estimation of current and future truck parking demand along study corridors. This estimate was then compared against existing truck parking capacity to identify shortfalls and inform proposed investments that would improve truck operations in the state.

The study approach proposed in the Methodology and Data Assessment Technical Memorandum is outlined below (Figure 7).

- First, the locations where trucks are parking were identified and geocoded in GIS. Designated parking locations were obtained from the truck parking inventory task completed as part of the study. Geocoding the off-ramps and on-ramps to these facilities were also completed as trucks tend to park at these locations when lots are full.
- For undesignated parking, ATRI's truck GPS data was analyzed to identify clusters of parking along the project corridors that appear to represent undesignated truck parking. These locations were geocoded as well. A set of ATRI's truck GPS data covered 16 weeks in the past year (4 weeks per quarter) for all trucks traveling less than 25 mph in Oregon (within a 10-mile buffer of the state's boundary). An algorithm was developed to process this data to identify stopped trucks.
- The next step involved the estimation of expansion factors, by comparing the ATRI's truck GPS data to video evidence at certain parking facilities. Six rest stops were recorded for 24 hours and four rest stops were recorded for 48 hours. These videos were processed, noting how parking utilization fluctuated throughout the day. A regression approach was utilized for calculating the expansion factors. This regression approach was chosen as it was deemed to generate better results than the simple comparison of averages used in previous studies.

- Finally, total parking demand along the corridors was calculated by counting the GPS records in the designated and undesignated parking locations, using the expansion factors to estimate how many trucks were represented in real-life.

Figure 7: Overview of Approach to Truck Parking Demand Estimation



A variety of system metrics were also proposed based on this demand analysis:

- **Supply Metrics**
  - Average supply of parking spaces per centerline mile of highway
  - Average supply of parking spaces per type, and amenities offered
- **Demand Metrics**
  - Average peak period parking demand per centerline mile of highway
  - Average peak period parking demand per parking type, per major amenities available
  - Average peak period parking demand for peak day of the week per centerline mile of highway
  - 95th percentile peak period parking demand
  - Proportion of facilities with 100% utilization
  - Average demand for undesignated parking per centerline mile of highway (to identify unmet needs)
  - Average time spent parking per time spent driving
- **System Performance Metrics**
  - Average shortfall of peak parking demand per centerline mile of highway, in 2019
  - Average shortfall of peak parking demand per centerline mile of highway, in 2040
  - Average shortfall of peak parking demand per roadway segment, in 2019
  - Average shortfall of peak parking demand per roadway segment, in 2040
  - Average time spent looking for overnight parking per roadway segment

4. TRUCK PARKING INVENTORY

As mentioned earlier, MAP-21 Section 1401 (Jason's Law) requires an inventory of existing truck parking for each state, assessment of the volume of commercial trucks in each state, and a measurement of the adequacy of commercial truck parking facilities in each state. The Truck Parking Inventory Technical Memorandum (Appendix E) provided an inventory of designated truck parking locations in the study corridors, including rest areas, truck stops and Ports of Entry (POE). The POE that have designated truck parking spaces that can be used for complying with hours-of-service regulations.

4.1 METHODOLOGY

The methodology for developing a statewide inventory of the three types of designated truck parking locations (rest areas, private truck stops, and Ports of Entry) is detailed in this subsection.

4.1.1 Rest Areas

Information on ODOT-owned rest areas was gathered from the ODOT/Travel Information Council (OTIC) Management, ODOT Maintenance Districts and Improvement of Roadside Rest Areas Agreement No. 32,946 Exhibit D. This information was supplemented by a desktop survey using current aerial maps and confirmed by the Rest Area Program and Contracts Manager at OTIC on March 19, 2019. An attempt was made to include unstriped and/or unofficial truck parking spaces at the facilities, although these are denoted separately within the inventory. Counts for all unstriped/unofficial truck parking spaces at rest areas were provided by ODOT. If there were distinct rest areas depending on the direction of travel, then the facilities were counted separately (e.g., if there is a northbound facility and a separate southbound facility directly across the highway, each facility is included separately in the inventory). There are 39 rest areas when counting rest areas in each direction of travel.

4.1.2 Truck Stops

A list of privately owned truck stops on major highways was provided by ODOT's Motor Carrier Transportation Division (revised September 4, 2018). Truck stops within the study area from this list were included in the inventory. The project team consulted available online resources including third-party sources and truck stop websites (see Appendix E, "Truck Parking Inventory" (Table A-3) and aerial maps to gather the information on the 62 sites for the inventory.

The truck parking spaces reported on available online resources were not always consistent. Therefore, the following sequential methodology was used to determine the number of truck parking spaces at each privately owned truck stop.

- If a truck stop's website indicates that there is designated truck parking, and that is consistent with the number reported by third-party sites, then it was assumed that the reported number is accurate. If a truck stop's website is inconsistent with the third-party sites, striped parking spaces were counted on an aerial map. The number counted from the aerial map was used.
- If a truck stop's website did not indicate that there is designated truck parking, but all third-party sites reported a consistent number of truck parking spaces, then it was assumed that the third-party sites are accurate.
- If all consulted sources provided inconsistent data, striped truck parking spaces were counted on an aerial map.
- If there was no data available online, striped truck parking spaces were counted on an aerial map.
- If there was a paved or unpaved area for parking use without striped parking spaces, estimates of truck parking spaces available based on third-party sites or from an aerial map were included in a separate column.
- Representatives of truck stop facilities were contacted where significant questions remained.

4.1.3 Ports of Entry (POE)

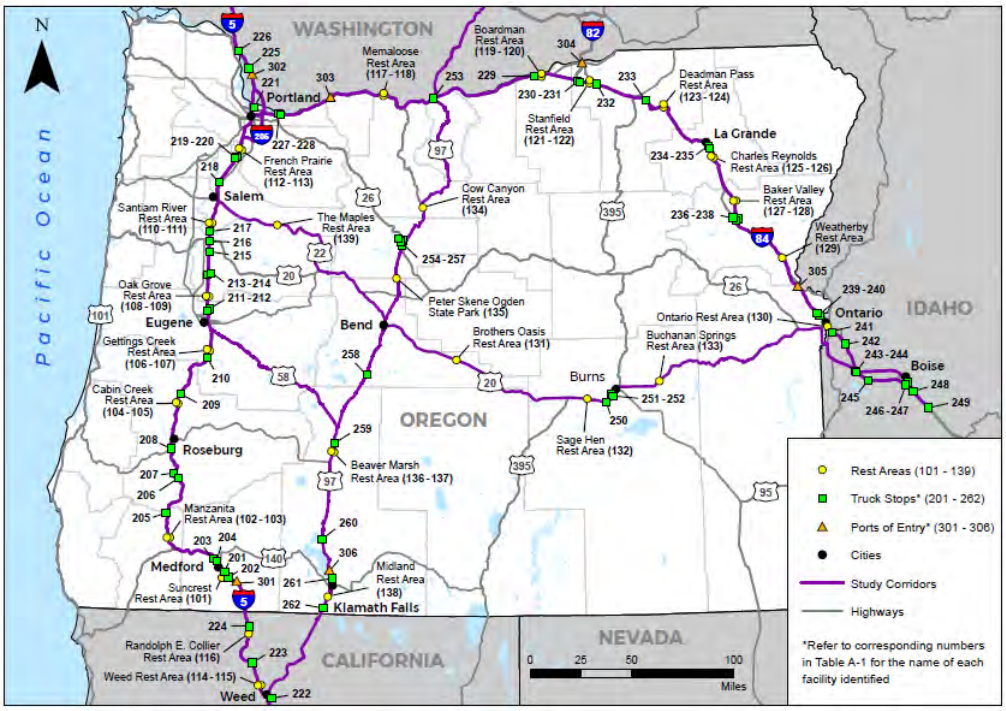
A list of POEs in or near the study corridors was provided by the ODOT Freight Planning unit. The Woodburn POE was not included in the inventory because it has no truck parking spaces. The POE at Ridgefield, WA was added to the inventory following input at the Technical Advisory Committee (TAC) Meeting on April 1, 2019. Information on amenities and services available to drivers were obtained by telephone calls to each POE. Most of the 5 POEs have two static scales, weigh-in-motion scales with automated vehicle identification systems, a truck inspection building and several parking spaces or areas for truck parking.

4.2 KEY FINDINGS

Figure 8 depicts the truck parking facilities (rest areas, truck stops and POE) within the study corridors. As shown in Figure 8, there are a total of 109 facilities consisting of 39 rest areas, 62 truck stops and 6 POE. Most of the truck parking facilities are located on I-5 and I-84. There are no truck parking locations on I-205 or OR58.

Most of the truck stops are located in the urban areas while the rest areas are located in the rural areas. This is primarily due the nature of Oregon land use laws that allow very little commercial development in rural areas. POE are typically located near state borders. Appendix E, "Truck Parking Inventory Technical Memorandum" provides detailed truck parking inventory.

Figure 8: Oregon Truck Parking Inventory Map



There are approximately 5,500 truck parking spaces at rest areas, truck stops, and ports of entry on the study corridors. Of these approximately 4,300 are striped and 1,100are unstriped. There are 914 striped spaces are at rest areas, about4,400 at truck stops, and 154 at ports of entry.

As shown in Figure 9, on average, the truck stops have a lot more truck parking than rest areas. Most of the rest areas have less than 50 truck parking spaces but 14 truck stops have over 100 truck parking spaces (including striped and unstriped/unofficial). Most facilities with unstriped/undesignated truck parking have less than 50 such spaces.

Figure 9: Breakdown of Number of Truck Parking Spaces by Rest Area and Private Truck Stop

Truck stops offer several more amenities or services than the other parking location types. They nearly all have fuel, restrooms, convenience markets, and cell phone service. Most have a restaurant, laundry facilities, and parking lot lighting. None of the rest areas provide fuel, showers, a convenience market, restaurant, laundry machines, repair facilities, idle-reduction, or truck wash. However, all (or nearly all) of the rest areas have basic amenities such as restrooms, drinking fountains, cell phone service, vending machines and parking lot lighting. Appendix E, “Truck Parking Inventory Technical Memorandum” also includes a complete inventory of amenities and services at each facility.

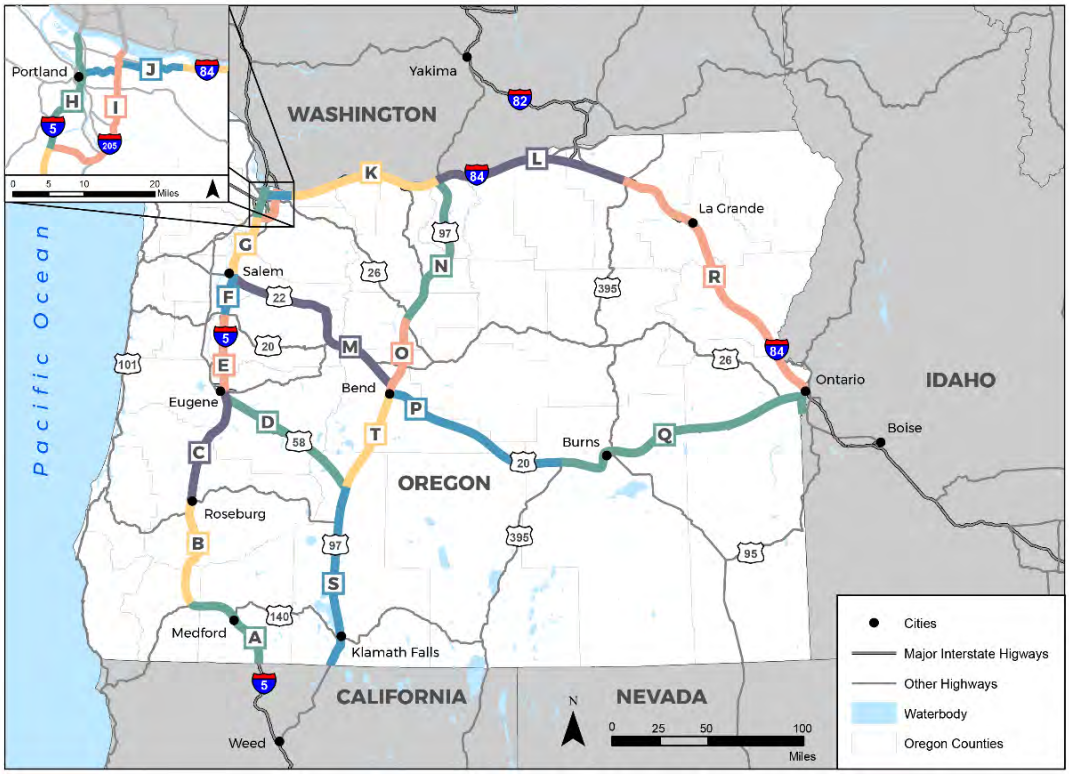
5. CURRENT DEMAND ANALYSIS

The Current Demand Analysis Technical Memorandum detailed the results of the demand analysis completed utilizing the approach described in the Methodology and Data Assessment Technical Memorandum. This approach relies on expanding the parking demand observed in truck GPS data using observations from video recordings and reports from a leading truck parking application. This is necessary given that the truck GPS data available to this study only covers a subset of trucks, and the representativeness of this subset might vary by corridor or type of parking facility. This allows for parking demand to be measured in all the rest areas and truck stops statewide and compared against existing capacity to identify corridors where shortfalls are likely.

5.1 METHODOLOGY

The methodology used to estimate truck parking demand is described in detail in the Methodology and Data Assessment Technical Memorandum. In brief, the five study corridors were divided into study segments (Figure 10) and locations where trucks are parking were identified and geocoded in GIS. Designated parking locations were obtained from the truck parking inventory technical memorandum.

Figure 10: Study Segments



For undesignated parking, ATRI's truck GPS data was analyzed to identify clusters of parking along the study corridors that appear to represent undesignated truck parking. These locations were geocoded as well. Next, expansion factors were estimated by comparing these truck GPS data to observations from video and a parking application at certain facilities. A regression model was used to estimate the set of expansion factors for the truck GPS data that best replicate observations.

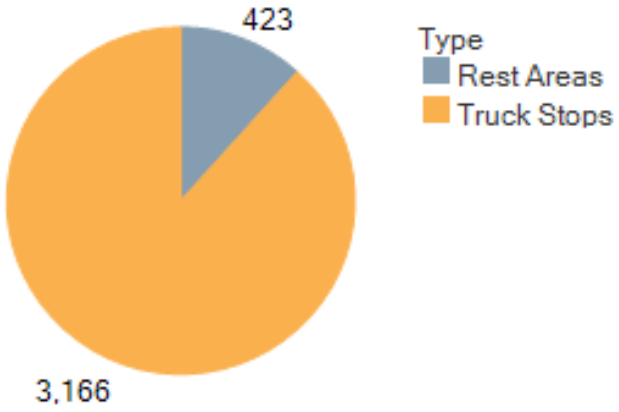
Total parking demand along the corridors was then calculated by counting the GPS records in the designated and undesignated parking locations, using the expansion factors to estimate how many trucks are represented in real-life. Variability in demand was described throughout the day, week, and year.

5.2 KEY FINDINGS

5.2.1 Designated Parking

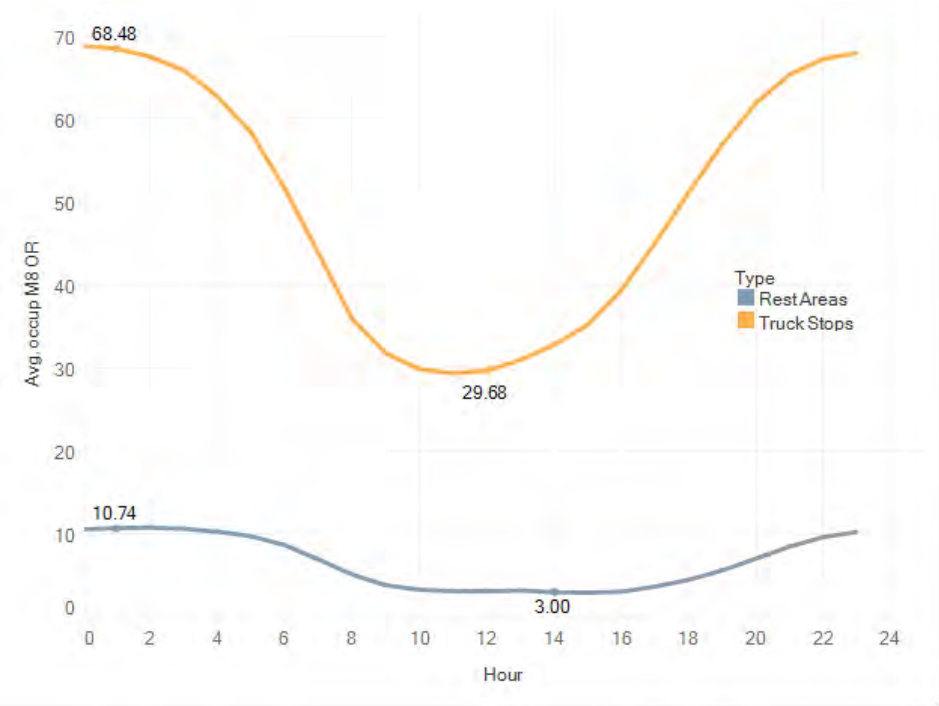
As shown in Figure 11, on an average weekday at midnight (roughly when demand peaks), there are 3,166 trucks parked at truck stops and 423 trucks parked in public rest areas, accommodating for 88 percent and 12 percent of parking demand, respectively.

Figure 11: Total Weekday Midnight Occupancy in Oregon



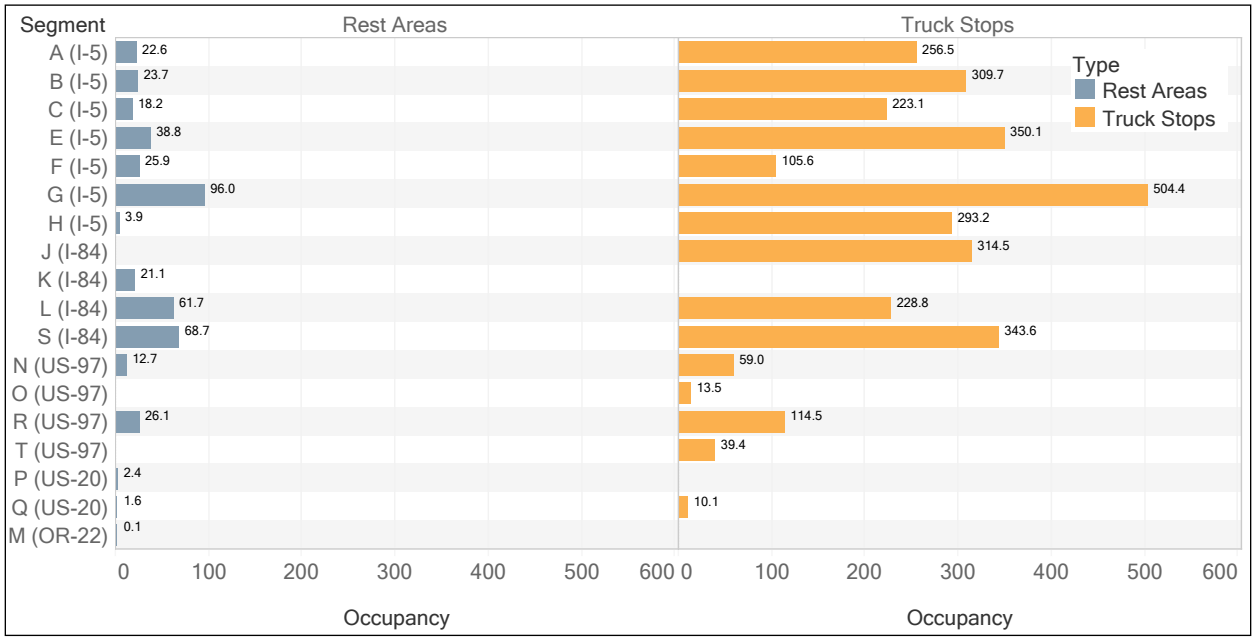
As expected, demand for truck parking peaks from 11pm to 1am (see Figure 12). Demand for the average truck stop reaches a maximum of 68 during this time, and decreases to 30 during the day time, from 11am to 12pm. The average rest area was found to have a maximum demand of 11 at midnight and decrease to 3 at 2 pm.

Figure 12: Average Occupancy per Facility throughout the Day



Demand for truck parking is concentrated unevenly throughout the state. Figure 13 breaks down the demand into 18 segments along the study corridors. Segments D and I were not included in the following discussion because no parking facilities were identified on these corridors.

Figure 13: Average Weekday Midnight Occupancy per Segment

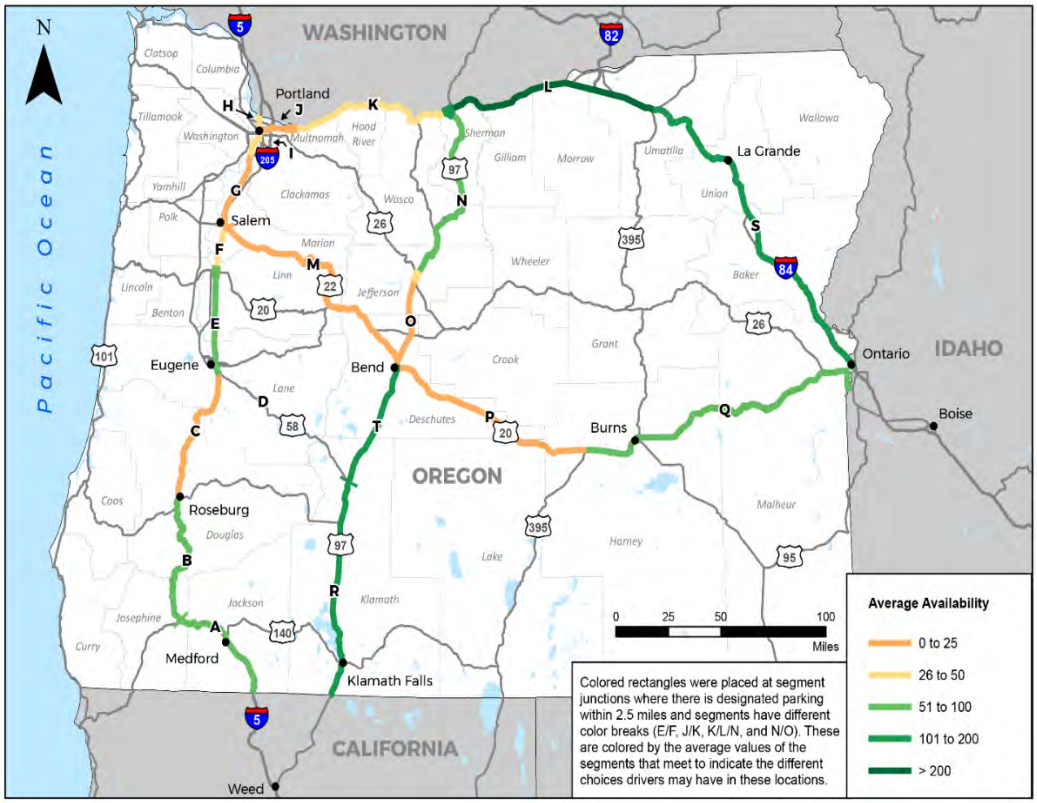


As expected, the segment with the highest average midnight demand is Segment G, which spans between Salem and Portland on I-5. Truck stops on this segment on average accommodate 504 trucks, and rest areas accommodate 96. On Segment G, demand can reach 140 in rest areas and 609 in truck stops.

The other segments rounding out the top 5 in terms of demand are: Segment E between Albany and Eugene on I-5; Segment S between the Idaho border and Pendleton in I-84; Segment B between Grants Pass and Roseburg on I-5; and Segment J from Portland to Troutdale on I-84. Some of these segments with high demand are on this list because they are much longer than others.

The demand for truck parking was then compared against the supply of spaces at rest areas and truck stops in the state. The supply of parking spaces was obtained from the truck parking inventory task conducted earlier in this study. The overage, which is defined as the average demand at midnight during a weekday minus the available supply, is then calculated. Negative overage implies the availability of spaces. The higher the overage, the higher the likelihood that available parking capacity is outstripped by demand. Figure 14 visualizes the demand overage or the segments analyzed. From this map it is clear that parking facilities I-5 have less available parking on average than elsewhere in the state.

Figure 14: Average Availability at Midnight (2019)

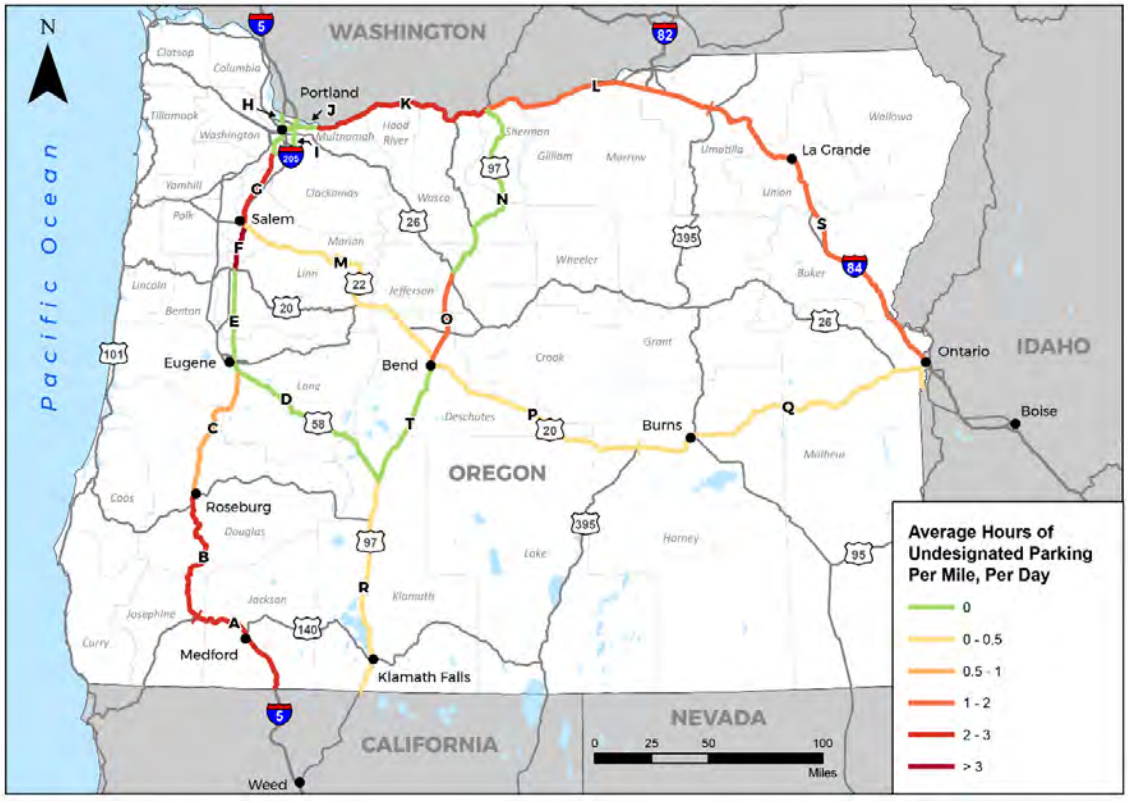


5.2.2 Undesignated Parking

Locations of undesignated truck parking were identified from feedback provided by ODOT, the survey responses of stakeholders, and a cluster analysis of truck GPS data. The study corridors were then manually reviewed to identify places with some truck parking activity in the truck GPS data. If a location was included in any of three sources of information, it was reported as a potential area for undesignated parking. A total of 108 areas were identified throughout the state along the study corridors. Truck parking related to commercial or industrial establishments was excluded to focus on locations where parking is truly undesignated.

The frequency and duration of truck parking at these locations was estimated using the processed truck GPS data. The GPS counts were expanded using the same factors used in the designated parking analysis. On an average weekday 733 trucks park at the undesignated areas identified, accumulating 1,435 hours of parking a day. Figure 15 shows the average hours of undesignated parking for each study segment during weekdays normalized by segment length.

Figure 15: Hours of Undesignated Parking per Mile by Segment

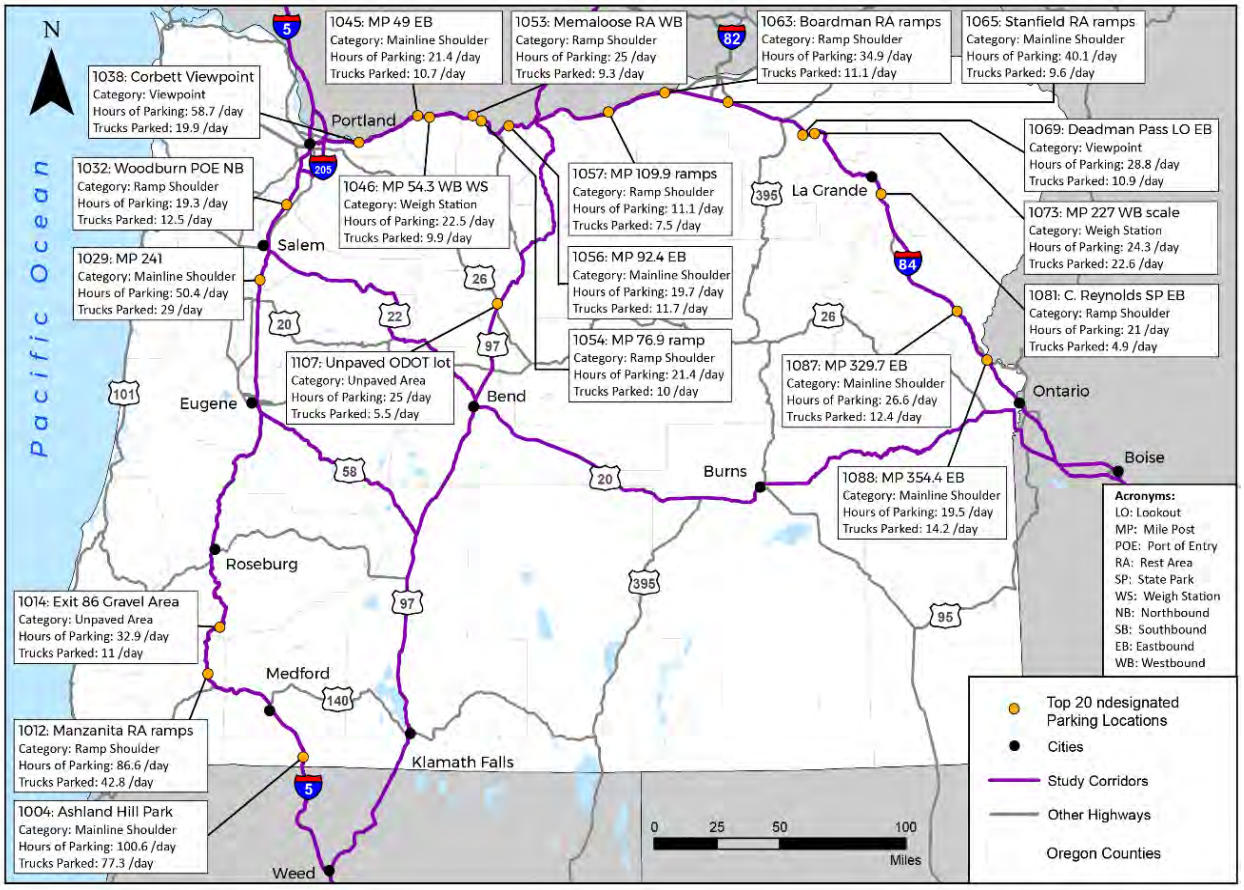


On a per mile basis, the highest rates of undesignated parking occur on Segments A, B, F, and G on I-5. This is likely caused by difficulties in finding parking on I-5 when demand exceeds capacity.

Figure 16 shows the locations with the most undesignated truck parking in the state. The segment with the most undesignated parking is Segment B along I-5 between Grants Pass and

Roseburg. Each day, 115.8 different trucks parked along this segment in the undesignated locations, accumulating 201.9 hours of parking time. Segment A, which is just south of Segment B and connects to the border with California, has the fourth highest prevalence of undesignated parking, accumulating 150 hours of parking time in an average weekday. The designated parking analysis found that both these segments had the second and third highest demand overage in the state, indicating that the demand often outstrips available supply, which helps explain the high degree of undesignated parking. It appears that truckers are having particular difficulty finding parking in this part of I-5. Another explanation for the frequency of undesignated parking in these segments is that they are located roughly between San Francisco and Portland, providing a natural stopping ground for trucks traveling between these two cities.

Figure 16: Top 20 Locations of Undesignated Truck Parking



6. FUTURE PARKING DEMAND

The Future Demand Analysis Technical Memorandum outlined the results of the future demand analysis that estimated truck parking demand in 2040 using the baseline results described in the Current Demand Analysis Technical Memorandum. The results provide an indication of the number of parking spaces that need to be added to the corridors in order to avoid future shortfalls.

6.1 METHODOLOGY

Truck parking demand was forecasted by escalating current parking demand by the growth rate in the Oregon Statewide Integrated Model (SWIM)[5]. This model translates economic forecasts by industry into inbound and outbound commodity flows, and then assigns these flows to the network based on transportation costs faced by users, such as travel time and operating costs. As a result, the model simulates how truck volumes will evolve year-over-year along Oregon's highways.

The Oregon Department of Transportation ran SWIM out to year 2040—the analysis horizon for this study—and forecast truck traffic volumes for the analysis segments. A linear growth rate for years 2019-2040 was then calculated for each segment, summarizing the percentage growth in truck activity forecasted by the model.

The future truck parking demand was estimated by assuming that it grows proportionately to truck volumes. For example, a 20 percent increase in truck volumes on a particular segment was assumed to increase truck parking demand on that segment by 20 percent. It is assumed that growth rates from SWIM are representative of the trucks that use parking facilities.

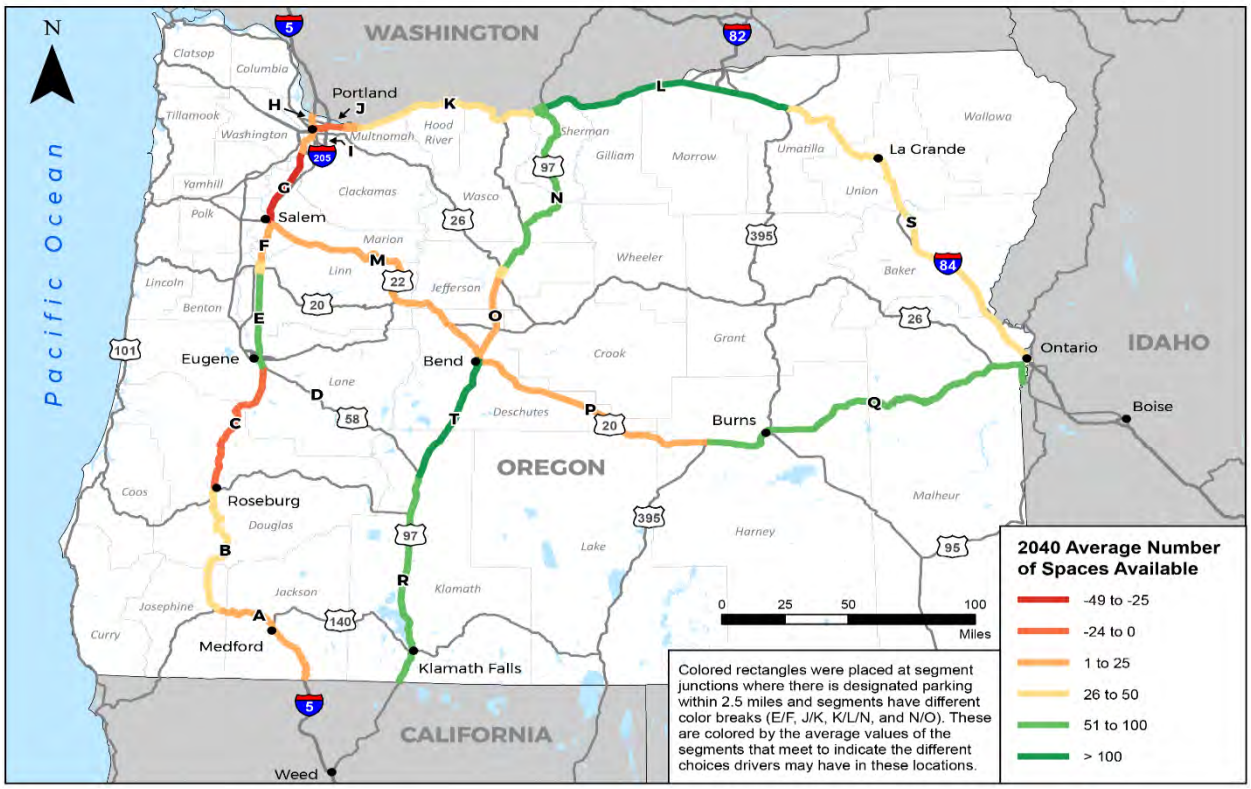
6.2 KEY FINDINGS

Segment S along I-84 was found to see the largest growth in parking demand between 2019 and 2040, which will result in an additional 118 trucks parked on weekdays during midnight. Segment L, also along I-84, will see the second highest additional parked trucks, at 72. Segment R on US 97 will see the third highest increase in parking demand, a total of 63 additional trucks needing parking by 2040.

By 2040, on average, the increase in truck parking demand is expected to overcome the supply of parking in Segments G, J, and C, which are the three segments identified in the Current Demand Analysis Technical Memorandum as having limited availability in 2019. It is also forecasted that Segment H will reach capacity during this time period, on average.

[5] https://www.oregon.gov/ODOT/Planning/Documents/Statewide-Integrated-Model-Vers2-5.pdf

Figure 17: 2040 Average Availability (Supply minus Demand) Weekdays at Midnight



6.3 STUDY LIMITATIONS

Forecasting truck parking demand is challenging because the need for parking depends on multiple variables. A few key sources of uncertainty in the results presented are discussed below:

- A study of forecasted truck parking demand is inherently sensitive to model accuracy and assumptions. It is possible that the model used to estimated truck parking demand has biases that cause the estimates to over-represent or underrepresent existing and future parking demand. While the model was estimated using an adequate amount of data (achieving statistically significant estimates), unobserved factors could have caused the model to be inaccurate in some segments or parking facility, particularly where no on-the-ground observations were available. However, the model controlled for this by relying on truck GPS data, which was observed at all of the parking facilities considered.
- The amount of freight that needs to be moved in the future has a direct impact on the amount of trucks on the roads and the number of parking spaces needed. Oregon's SWIM model estimated truck activity growing at an average of 1% per year for the study corridors. This growth rate is smaller than the national growth rate for truck tonnage from

the Freight Analysis Framework, which is 1.2% compounded annually.[6] Therefore, while the growth rate assumed by SWIM falls in line with other estimates, it is possible that truck activity might grow at a different rate over the next 20 years because of changes in consumption and production patterns. The economy could shift in ways that are not anticipated by the model.

- Moreover, the tons that each truck carry may change, impacting the number of trucks on the roads. For example, heavier or longer trucks could become commonplace, requiring fewer vehicles, or the economics of motor carriers could favor smaller trucks providing greater frequency, which would increase truck volumes. The latter is possible if smaller electric trucks become common, or if e-commerce deliveries, which are made in smaller trucks, continue growing at their current pace. E-commerce is a also changing warehousing and distribution decisions, which in-turn could also affect where long-haul trucks travel to.
- The demand forecasts assume that truck drivers need to stop at the same intervals as they do today. Rest requirements today are regulated by the Federal Hours-of-Service regulations, which could be changed in the future[7]. Additionally, changes in enforcement can affect truck parking. In the recent past, hours of service enforcement changed from manual logs to electronic devices, which affected when and where trucks need to park. Relaxing or tightening compliance mechanisms could lead to different truck parking patterns.
- In the medium term and long term, connected and autonomous technologies could affect truck parking needs. For one, the Hours-of-Service regulations could be changed in response to the deployment of technologies that make driving trucks less tiring or safer. In the long term, connected vehicle technologies could enable truck platoons to have a single driver is responsible for multiple trailers. The longer vehicle might require less surface area for parking than if the freight were carried in traditional trucks

[6] https://ops.fhwa.dot.gov/publications/fhwahop16083/fhwahop16083.pdf
[7] On May 14, 2020 the FMCA announced a final rule that would relax several provisions of the current HOS regulations including allowing drivers to split their 10 hours of rest into two time periods. https://www.trucker.com/regulations/article/21131382/fmcsa-reveals-final-hos-rule

7. STRATEGY AND RECOMMENDATIONS

The Strategy and Recommendations Technical Memorandum summarized the truck parking needs that were identified in previous memoranda and identified and prioritized solutions that would help achieve the State's goals. These recommendations focused on low-cost strategies that effectively address the identified needs, on a segment-by-segment basis and statewide. The memorandum drew from various memoranda completed as part of this study:

- **Literature Review Technical Memorandum –** The literature review of state, regional and federal truck parking plans completed in 2019 was a source for the list of recommendations and potential solutions evaluated as part of this memorandum.
- **OCTPS Feedback Summary –** The results of this survey were used to confirm truck parking needs and goals and prioritize potential solutions for Oregon.
- **Truck Parking Inventory Technical Memorandum and Current Demand Analysis Technical Memorandum –** An analysis of the supply and demand of truck parking spaces in Oregon was completed as the first step to developing an understanding of truck parking imbalances within the state and to identify specific locations or corridors with high need for capacity expansion or other improvements. Segment-specific or statewide truck parking needs identified as part of the demand analysis will ultimately be matched with the tools evaluated as part of this memorandum. The Methodology and Data Assessment Technical Memorandum detailed the methodology used to complete this truck parking need analysis.

7.1 ROLE OF THE STATE

In general, the primary role of the State Department of Transportation (DOT) is to support the safe and efficient use of the highway system and the economic competitiveness of the state. Regarding truck parking, this includes minimizing the time spent looking for a parking spot, ensuring the safety of the truck driver and passengers of other vehicles, and promoting compliance with hours of service requirements. This not only benefits motor carriers and the broader transportation sector, but also other vehicles on the roads and the community at large, both directly via reduced congestion and other traffic improvements as well as indirectly via induced air quality benefits.

7.2 TRUCK PARKING GOALS

Through a combination of input from ODOT stakeholders via Technical Advisory Committee (TAC) meetings and interviews, a survey of truckers in Oregon, as well as a review of overall study goals, a number of state priorities were identified that are affected by truck parking needs in Oregon. These priorities are categorized into six primary goals:

- Improve safety and security of driver and cargo at parking facilities and on the road.

- Improve roadway safety by reducing the likelihood of crashes involving trucks parked in undesignated locations.
- Improve safety by reducing the likelihood of crashes involving trucks at rest areas.
- Maintain the competitiveness of Oregon's economy by increasing the utilization of and/or expanding the number of truck parking spaces in high-demand areas.
- Reduce the time required to find safe and legal parking space (public and private).
- Provide truck drivers access to real-time and accurate information about the availability of safe, legal parking places (public and private).

7.3 GENERAL METHODOLOGY

The results of the truck parking demand analysis were used to identify locations where there is insufficient capacity to accommodate forecasted truck parking demand. Needs identified at the segment level focused on categories of demand, such as parking availability with basic amenities (lighting / bathrooms / security), parking with comprehensive amenities (fuel, restaurant, showers, etc.), and parking with services (retail, mechanics, etc.). The results of the demand analysis were then compared with the results of the survey, noting areas of agreement, rendering an assessment of needs across the various segments of the network. Areas of high need were then described and prioritized.

Truck parking solutions from other state, regional and federal truck parking plans detailed in the Literature Review Technical Memorandum are used to populate a toolbox of truck parking solutions and best practices for truck parking management in North America. The solutions are categorized into:

- Data and Technology Deployment
- Creative use of ROW / Public Capacity Expansion
- Expansion using public-private partnerships
- Policy and Regulations
- Coalitions and Institutional Oversight
- Public and Private Outreach

Based on their intended purpose, these tools were then categorized according to the one or more of the truck parking goals identified in Section 7.2 that it was intended to achieve. An evaluation framework using qualitative elements (and quantitative where available) was then developed to prioritize the truck parking solutions. The evaluation framework consisted of the following criteria:

- Effectiveness at addressing identified needs
- Cost
- Private resource utilization
- Ease of implementation/previous success

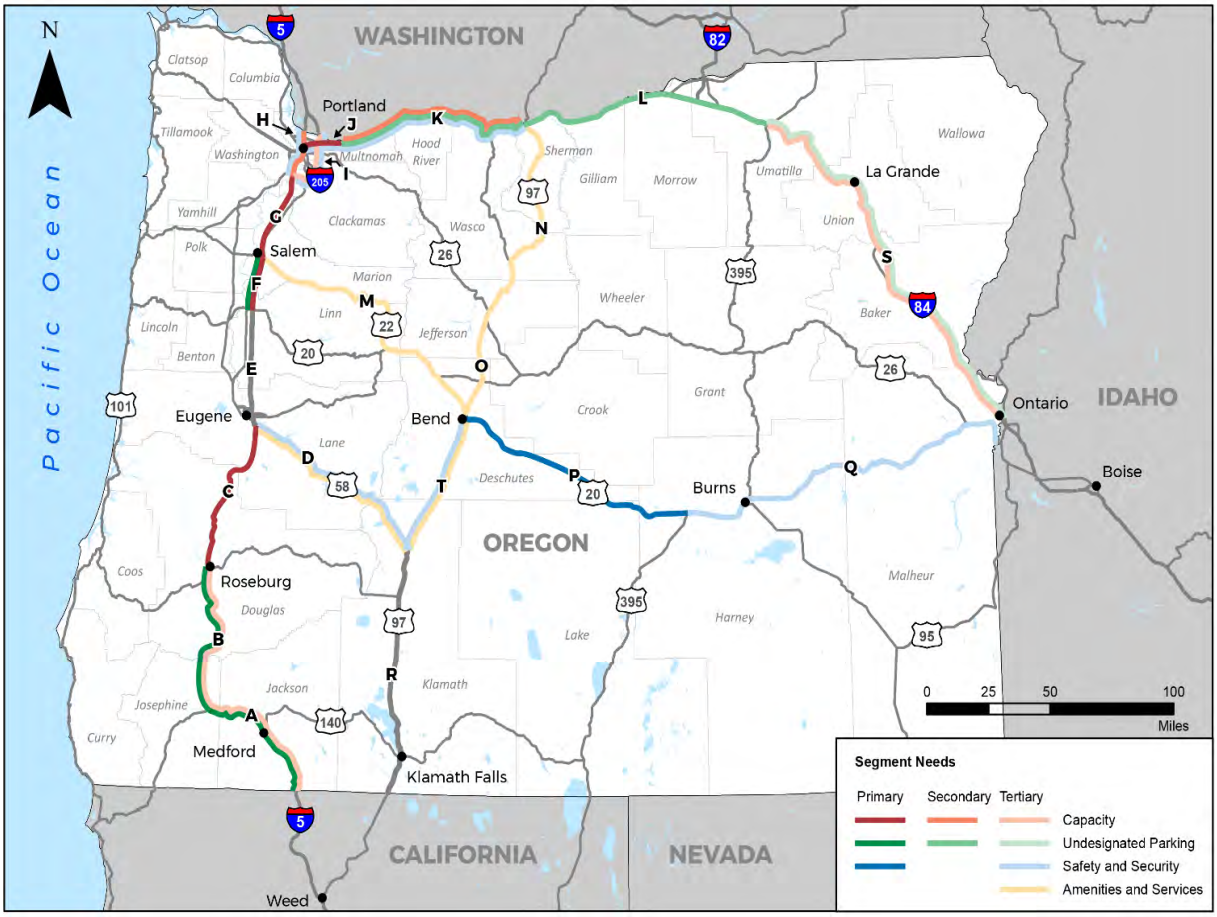
Points were awarded to each strategy along these categories with a high, medium or low score. Strategies that score the highest were then identified as solutions for a given type of need and corridor. The evaluation framework is described in more detail in the Strategy and Recommendations Technical Memorandum (Section 5.1).

7.4 NEEDS ANALYSIS

The Current Demand Analysis Technical Memorandum and the Future Demand Analysis Technical Memorandum identified segments with a supply/demand mismatch of truck parking spaces in 2019 and 2040. These analyses, as well as the results of surveys and interviews and input from stakeholders were considered when defining segment needs. The four areas of need are identified as capacity, undesignated parking, safety and security, and amenities and services were identified. These needs were categorized as Primary, Secondary, and Tertiary, in relation to the priority in which these needs must be addressed.

Figure 18 illustrates these Primary, Secondary and Tertiary needs for each roadway segment.

Figure 18: Segment Needs - Primary, Secondary and Tertiary

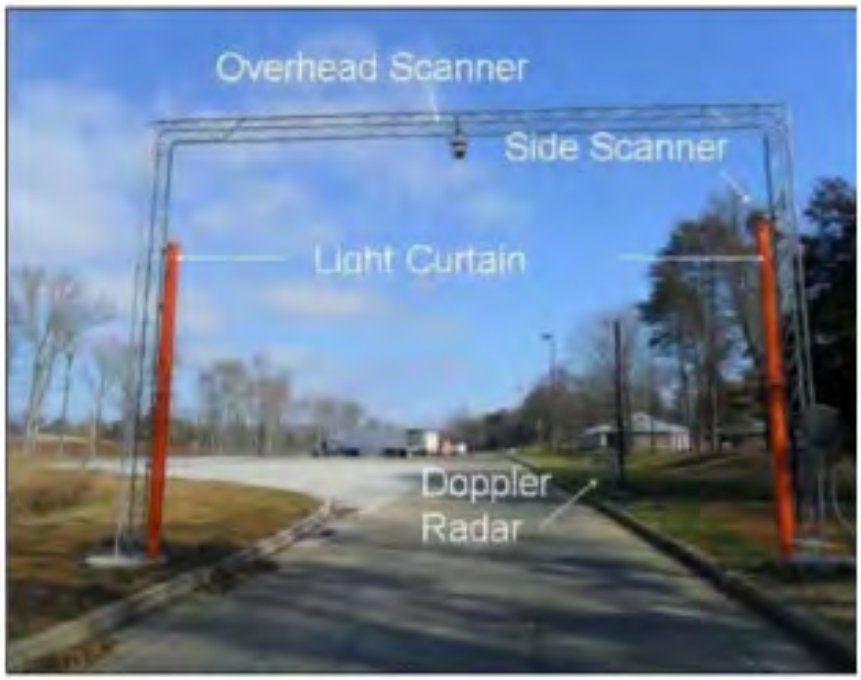


7.5 TOOLBOX OF TRUCK PARKING SOLUTIONS

A breakdown of recommendations from the federal, state and regional truck parking plans reviewed in the Literature Review Technical Memorandum yielded six key strategies:

- **Data and Technology Deployment**
  - Primarily utilized to provide real-time communication to truckers on availability and location of truck stops and rest areas.
  - Includes sensing technologies such as in-pavement sensors, entry-exit gates, radar, camera systems to determine utilization and availability of parking spaces and communication media such as dynamic message signs, smartphone and web apps and in-cab navigation to disseminate the information to truckers in real time.
  - An associated parking reservation system further assists truck drivers in planning their trips in advance and ensures predictability.
  - For a lower cost solution, some states also recommend installing static truck parking signage on highways and distributing visor card trucking maps to truckers at trucking conferences and other meets.
  - Interoperability with neighboring states should be considered in development of specific solutions in this area.

Figure 19: Smartpark Truck Detection technology



Note: Smartpark Truck Detection technology counts trucks entering the parking facility and is used to determine remaining availability (Tennessee)

- **Creative use of ROW for public truck parking capacity expansion**
  - This would be primarily focused on expanding truck parking spaces on interstate or other segments with significant parking needs.
  - Use of publicly-owned excess ROW at existing rest areas, weigh stations, and other locations on interstates, as well as improving geometrics at existing locations are also recommended.
  - GIS analyses may be completed on urban land parcels to determine viability of conversion into truck parking areas.
- **Capacity expansion through public-private partnerships**
  - , Partnering with private businesses and truck stops to expand parking facilities and coordinate signage is recommended, since improved parking spaces and information was found to be important to drivers.
  - Where public funding is insufficient, cost-sharing agreements for construction and maintenance of parking areas with private partner may be useful. Private partners may also be allowed to set up convenience and food stalls at such facilities to provide revenue incentives for engaging truck parking expansion.
  - Partnering with businesses that are served by freight to explore warehouse and distribution center parking may provide an opportunity to allow for parking required by drivers.
- **Policy and Regulations**
  - Review local, state, and regional policies on truck parking and staging requirements to confirm whether parking expansion is being hampered by regulations.
- **Coalitions and Institutional Oversight**
  - Designate truck parking champions and/or establish truck parking committees within the agency to champion truck parking goals and oversee implementation of truck parking plans and objectives.
  - Participate in a cohesive regional multi-state truck parking coalition with a goal to matching supply and demand, increase roadway safety and policy conformity reduces the time required by drivers to find safe parking spaces. Collaborative initiatives could include multi-state implementations of real-time parking availability systems such as the MAASTO example of a corridor-level Truck Parking Information Management System (TPIMS).
- **Public and Private Outreach**
  - To counteract public perception that leads communities to restrict truck parking, coordinate with MPOs and local governments to develop guidelines and mitigation strategies aimed at easing such public opposition.

Section 4 in the Strategy and Recommendations Technical Memorandum details all the recommendations compiled from the literature review. Figures 19–21illustrate deployment of truck parking solutions such as truck detection technology, dynamic message signs and real-time parking availability apps respectively.

Figure 20: Dynamic Message Signs

Note: Dynamic message signs are used to display number of available parking spaces at weigh station and rest area.

7.6 PRIORITIZATION METHODOLOGY

These strategies and solutions were first categorized as follows:

- **Site-specific solutions –** These solutions are implemented at specific locations and facilities where supply or utilization is low or where the technology is feasible. Examples include creative use of ROW at rest areas, undesignated parking locations and weigh stations. The costs and resultant benefits are limited to the location where the solution is implemented.
- **Statewide solutions –** These solutions are either implemented at the state level or corridor level and have costs and resultant benefits that impact truck parking across the entire state or corridor. Examples include installing dynamic message signs across entire corridors or developing a statewide truck parking availability mobile application.

In general, site-specific solutions gravitated towards technology deployment at parking locations or public capacity or partnering with private sector. Statewide solutions focused on data and technology deployment such as real-time parking availability dissemination, as well as

policy and regulatory modifications, creative use of ROW and public and private outreach. Based on their intended purpose, these tools were then categorized according to the one or more of the six truck parking goals identified in Section 7.2 and evaluated using the four criteria listed in Section 7.3 on a high/medium/low scale. The complete results of the prioritization and the evaluation scores of each of the identified statewide and site-specific solutions are presented in the Strategy and Recommendations Technical Memorandum (Section 5.2 and Section 5.3 respectively).

7.7 SUMMARY OF TOP SOLUTIONS

Solutions that focused on creative use of ROW or deployment of low-cost technology tended to score the best based on the evaluation framework described in Section 7.3. These top solutions are summarized in Table 1 and are considered the best alternatives for each identified state truck parking goal.

Table 1: Summary of Top Solutions for Truck Parking

Tool / Solution	Oregon Goal(s)	Effective in Addressing Oregon Goal	Cost	Private Resource Utilization	Ease of Implementation	Solution Score
Real-time parking availability communication utilizing web or smartphone app - ODOT to push availability data to private apps such as Park My Truck	Provide truck drivers access to real-time and accurate information about the availability of safe, legal parking places (public and private)	High	Low	High	High	36
Camera sensors to determine parking space usage	Provide truck drivers access to real-time and accurate information about the availability of safe, legal parking places (public and private)	High	Low	Medium	High	33
Explore warehouse parking partnerships and/or requirements with private vendors for end-of-trip parking and staging	Maintain the competitiveness of Oregon's economy by increasing the utilization of and/or expanding the number of truck parking spaces in high-demand areas. Reduce the time required to find safe and legal parking space (public and private)	High	Low	High	Medium	33

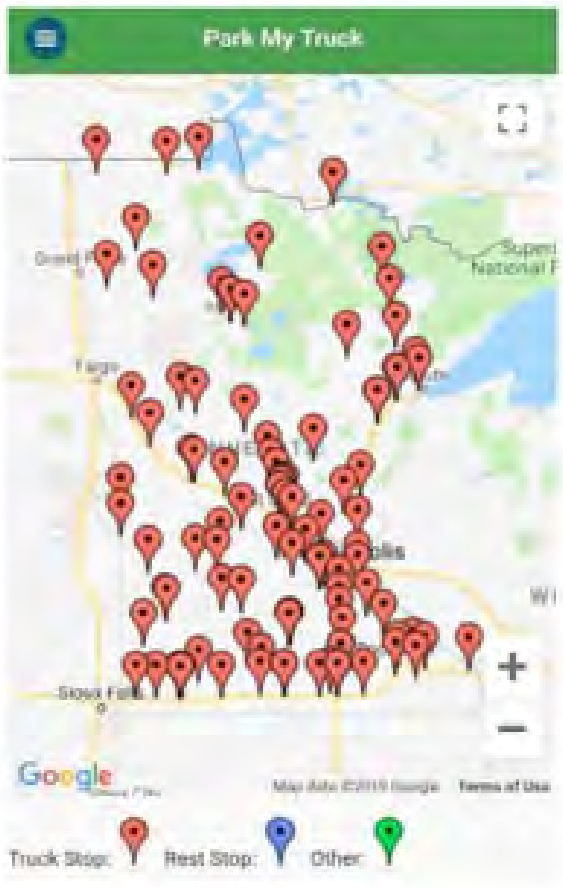
Table 1: Summary of Top Solutions for Truck Parking (continued)

Tool / Solution	Oregon Goal(s)	Effective in Addressing Oregon Goal	Cost	Private Resource Utilization	Ease of Implementation	Solution Score
Develop revised design standards for rest areas	Improve roadway safety by reducing the likelihood of crashes involving trucks parked in undesignated locations. Improve safety by reducing the likelihood of crashes involving trucks at rest areas	High	Low	Low	High	30
Identify alternate truck parking locations such as closed weigh stations, chain-up areas, excess shoulders and safety pullouts	Maintain the competitiveness of Oregon's economy by increasing the utilization of and/or expanding the number of truck parking spaces in high-demand areas.	High	Low	Low	High	30
Improved/expanded truck parking areas using excess ROW, rest areas and other locations on interstates, improved geometrics and capacity expansion	Maintain the competitiveness of Oregon's economy by increasing the utilization of and/or expanding the number of truck parking spaces in high-demand areas Improve safety by reducing the likelihood of crashes involving trucks at rest areas	High	Low	Low	High	30

Table 1: Summary of Top Solutions for Truck Parking (continued)

Tool / Solution	Oregon Goal(s)	Effective in Addressing Oregon Goal	Cost	Private Resource Utilization	Ease of Implementation	Solution Score
Investigate expanding parking via public private partnerships - utilizing excess ROW owned by state near private facilities and entering cost-sharing agreements for construction and maintenance of parking areas.	Maintain the competitiveness of Oregon's economy by increasing the utilization of and/or expanding the number of truck parking spaces in high-demand areas. Reduce the time required to find safe and legal parking space (public and private)	High	Low	High	Low	30
Surveillance cameras, improved lighting and/or night-time surveillance patrol by Oregon State Police to enhance security onsite	Improve security and safety of driver and cargo at parking facilities.	High	Medium	Medium	High	30
Coordinate with MPOs and RPOs to develop guidelines and mitigations strategies aimed at easing public opposition to private sector parking facilities	Maintain the competitiveness of Oregon's economy by increasing the utilization of and/or expanding the number of truck parking spaces in high-demand areas Reduce the time required to find safe and legal parking space (public and private)	Medium	Low	Medium	High	30

Figure 21: Sample Apps (Park My Truck and TruckSmart) Interfaces Used to Help Drivers Find Rest Stops and Travel Centers and Inform Parking Availability



7.8 RECOMMENDED ACTIONS

The solutions identified above are matched to the prioritized needs statewide and by segment presented in Section 7.4 to yield recommended actions as shown in the following section.

7.8.1 Recommended Actions - Statewide

1. Place high importance on interoperability with other states when implementing improvements that will disseminate real-time information about parking availability.
2. A parking reservation system further assists truck drivers in planning their trips in advance and ensures predictability. Many truck drivers spend over an hour looking for a spot and/or park earlier to ensure they get a spot. This hurts efficiency and as such many trucks try to stay east of Portland.
3. Work with Metropolitan Planning Organizations (MPO) and cities to address truck parking in MPO freight plans and Transportation System Plans.
4. Develop materials to educate the public and elected officials about the importance of truck parking in freight transportation and industrial development.
5. Consider developing policies and regulations that could limit or prohibit truck parking in certain areas on ODOT ROW to increase safety
6. Consider development of a coalition with neighboring states in order to address truck parking issues on I-5.
7. Develop a Truck Parking Information Management System (TPIMS) to better address commercial vehicle parking needs throughout the state.

Table 2: Recommended Actions: I-5

Segment	Segment Needs	Issues	Suggested Solutions
H (I-5) from I-205 to WA border (20 miles long)	**Primary**: None **Secondary**: Capacity **Tertiary**: Safety & Security	**Secondary**: Limited parking availability in this segment – 50% of survey respondents indicated parking spaces are never available. Limited availability of parking in the Portland metro area may mean that truck's park just outside of the Portland metropolitan area where parking availability is perceived to be greater. This may mean that the demand analysis underestimates truck parking needs in this segment.	▪ Work with the Jubitz truck stop to determine if real-time parking info needs to be more accessible. If so, determine what type of assistance ODOT can provide. ▪ Work with WA state to provide real-time parking information for the truck stops on I-5 in the Vancouver/Portland area. ▪ Investigate public private partnerships with other businesses to see how the state can help businesses that operate and develop private truck parking facilities.
		Tertiary: Approximately 40% of respondents indicated that truck parking was not safe or secure in this segment.	▪ Investigate perception of unsafe conditions at stops in this segment and determine whether installation of surveillance cameras/improved lighting/fencing/signage is feasible and/or addresses the problem.
G I-5 from I-205 to Salem (35 miles long)	**Primary**: Capacity **Secondary**: None **Tertiary**: None	**Primary**: This segment sees the highest truck parking demand in the state, is running at capacity, and is projected to have a shortfall of spaces in 2040. Because truck parking in the Portland metro area is so limited, this segment and others just outside of the Portland metropolitan area may see outsize demand compared to the number of origins and destinations.	▪ Investigate possibility of expanding the French Prairie Rest Area (utilizing excess ROW, restriping, improved geometrics). ▪ Investigate the provision of real-time parking information for the rest area using dynamic message signs, smartphone apps or websites. ▪ Investigate creation of a public-private partnership to work with Aurora Flying J and Aurora TA truck stops to see how ODOT can help with parking demand. ▪ Work with Aurora Flying J and Aurora TA truck stops to determine if real-time parking info needs to be more accessible. If so, determine what type of assistance ODOT can provide.

Table 2: Recommended Actions: I-5 (continued)

Segment	Segment Needs	Issues	Suggested Solutions
F I-5 from Salem to Albany (21 miles long)	**Primary**: Undesignated Parking Capacity **Secondary**: None **Tertiary**: None	**Primary**: Undesignated parking at the Santiam Rest area and the highway shoulders may partly be due to insufficient spaces at the rest area and Albany's Love truck stop. However, safety and convenience could be other reasons for undesignated parking.	▪ Increase truck parking capacity through expansion and other improvements to the Santiam River rest area (utilizing excess ROW, restriping, improved geometrics). ▪ Consider managing and improving the undesignated truck parking in and around the rest areas. Consider expanding the undesignated parking using excess ROW, if available, and making it into designated parking. ▪ Investigate the provision of real-time parking information for the rest area using dynamic message signs, smartphone apps or websites. ▪ Investigate creation of a public-private partnership with Albany's Love truck stop to see how ODOT can help with parking demand. ▪ Work with Albany's Love truck stop to determine if real-time parking info needs to be more accessible. If so, determine what type of assistance ODOT can provide.
E I-5 from Albany to Eugene (45 miles long)	**Primary**: None **Secondary**: None **Tertiary**: None		

Table 2: Recommended Actions: I-5 (continued)

Segment	Segment Needs	Issues	Suggested Solutions
C I-5 from Eugene to Roseburg (64 miles long)	**Primary**: Capacity **Secondary**: None **Tertiary**: None	**Primary**: Most spaces in this segment are at the Rice Hill Pilot which is estimated to operate close to capacity. There are two rest areas, Gettings Creek and Cabin Creek in the segment.	▪ Work with the Rice Hill Pilot truck stop to determine if real-time parking info needs to be more accessible. If so, determine what type of assistance ODOT can provide. ▪ Investigate potential to expand truck parking capacity at/near Rice Hill Pilot using excess ROW or identify alternate truck parking locations using public private partnerships or other means. ▪ Increase truck parking capacity in the two rest areas if they are not usually full during peak hours utilizing excess ROW, restriping, improved geometrics).
B I-5 from Roseburg to Grants Pass (68 miles long)	**Primary**: Undesignated Parking **Secondary**: None **Tertiary**: Capacity	**Primary**: Undesignated parking at Manzanita Rest Area is the primary concern in this segment even though, on average, there are 63 spaces available at 4 truck stops and the rest area. Undesignated parking may be occurring due to several reasons including safety and convenience.	▪ Manage and/or increase undesignated truck parking in the rest area utilizing excess ROW. Determine if restriping and improving access to rest area will reduce the likelihood of collisions and sideswipes. ▪ Review access and parking design issues at rest area, develop and implement revised design standards, if warranted. ▪ Investigate the provision of real-time parking information for the rest area using dynamic message signs, smartphone apps or websites. ▪ Work with the truck stops to determine if real-time parking info needs to be more accessible. If so, determine what type of assistance ODOT can provide.
		Tertiary: Only 26 spaces are projected to be available in this segment in 2040. Parking availability should be tracked as there is potential for capacity constraints in the future.	▪ Track availability trends at rest areas/truck stops in this segment to ascertain likelihood of adding capacity in the future. ▪ Review infrastructure improvements required at closed rest area at milepost 82 as well as the closed weigh station near Roseburg to investigate potential for reopening them as a cost-effective method for expanding parking capacity.

Table 2: Recommended Actions: I-5 (continued)

Segment	Segment Needs	Issues	Suggested Solutions
A I-5 from Grants Pass to CA border (56 miles long)	**Primary**: Undesignated Parking **Secondary**: None **Tertiary**: Capacity	**Primary**: Undesignated parking at Ashland Hill park is the primary concern even though on average there are 51 spaces available at 3 truck stops and one small rest area. Most utilized undesignated parking location in the state. Parking is primarily on the NB direction along a wide paved shoulder after a long steep upgrade. Many truck drivers stop here to rest and check their brakes. Further, there may be seasonal weather-related parking needs in this segment as closures over the Siskiyou would be expected to affect parking demand.	▪ Consider managing and/or increasing undesignated truck parking in the area near Ashland Hill park utilizing excess ROW.
		Tertiary: Parking demand may exceed capacity in the future. More than 25% of respondents take more than 1 hour to find parking in this segment. Further, there may be seasonal weather-related parking needs in this segment as closures over the Siskiyou would be expected to affect parking demand.	▪ Work with the truck stops to determine if real-time parking info needs to be more accessible. If so, determine what type of assistance ODOT can provide. ▪ Work with CA state to help provide real-time parking information for rest areas/truck stops in this corridor. Track availability trends at rest area/truck stops in Medford and Phoenix to ascertain likelihood of requiring additional capacity in the future.

Table 3: Recommended Actions: I-84

Segment	Segment Needs	Issues	Suggested Solutions
J I-84 from I-5 to Troutdale (16 miles long)	**Primary**: Capacity **Secondary**: None **Tertiary**: Safety & Security	**Primary**: This segment is the primary connection to Portland from the east -as such limited parking availability in this segment – 40% of respondents indicated parking spaces are never available.	▪ Work with the Jubitz truck stop to determine if real-time parking info needs to be more accessible. If so, determine what type of assistance ODOT can provide. ▪ Some portion of the demand here is truck drivers trying to pre-position themselves further out in the Gorge due to lack of predictability in parking spots closer to Portland. As such, drivers in this segment would benefit from a parking reservation system that increases travel reliability of their trip. ▪ Investigate creation of a public-private partnership with other businesses to work with the truck stops to see how ODOT can help with parking demand. ▪ Existing truck stops operate in a constrained footprint, therefore consider use excess ODOT ROW to identify alternate parking locations near existing stops. ▪ Investigate the possibility of better managing or providing real-time parking info at the Cascade Locks POE at MP45 as they have 19 spaces. ▪ Investigate public private partnerships with warehouse or distribution centers near the segment.
		Tertiary: Approximately 40% of respondents indicated that truck parking was not safe or secure in this segment. High winds are a problem, especially with empty trucks	▪ Work with truck stops to determine if installation of surveillance cameras/improved lighting, signage is feasible and/or solves the problem.

Table 3: Recommended Actions: I-84 (continued)

Segment	Segment Needs	Issues	Suggested Solutions
K I-84 from Troutdale to US97 (86 miles long)	**Primary**: None **Secondary**: Undesignated Parking, Capacity **Tertiary**: Safety & Security	**Secondary**: This segment has no truck stops and ranks second in terms of undesignated parking hours, with Corbett Viewpoint being the most used location. Trucks park at the viewpoint area and on the shoulders of the access road. The segment also has capacity constraints with only 25 designated spaces available on average in 2040. Per TAC, drivers often park in this segment to pre-position for the trips into and out of the Portland metro area in this segment.	▪ Provide or improve real-time parking information for rest area and truck stops in this segment to improve utilization. ▪ Investigate if capacity constraints at the Memaloose Rest area are a major cause of undesignated parking in this area (currently can only fit 10 trucks in westbound direction). If there are capacity constraints, then consider expanding the rest area using excess ROW if available. If the capacity constraints are not the issue, then manage and improve the undesignated truck parking in and around the rest area. Consider expanding the undesignated parking using excess ROW if available. ▪ At viewpoint consider better managing the undesignated truck parking with signage, striping and lighting to increase safety. If warranted, investigate the possibility of providing e additional parking at or near the viewpoint using excess ROW if available.
		Tertiary: Approximately 40% of respondents indicated that truck parking was not safe or secure in this segment. High winds are a problem, especially with empty trucks	▪ Investigate cause of safety concerns in this segment by working with the OSP, ODOT maintenance districts, OTA and others.

Table 3: Recommended Actions: I-84 (continued)

Segment	Segment Needs	Issues	Suggested Solutions
L I-84 from US97 to Pendleton (105 miles long)	**Primary**: None **Secondary**: Undesignated Parking **Tertiary**: None	**Secondary**: Undesignated parking at the Arlington Viewpoint, Stanfield and Boardman rest areas should be addressed. Lack of designated parking spaces does not seem to be main cause of undesignated parking. Could be occurring due to several reasons including safety and convenience. There may be weather-related issues that contribute to seasonal parking.	▪ Provide or improve real-time parking information for rest areas and truck stops in this segment to improve utilization. ▪ Investigate the reasons for undesignated parking. If capacity constraints at the rest areas are a major cause of undesignated parking in this segment, consider expanding the rest areas using excess ROW if available. If capacity constraints are not the issue, then manage and improve the undesignated truck parking. Consider expanding the undesignated parking using excess ROW, if available.
S I-84 from Pendleton to Idaho border (169 miles long)	**Primary**: None **Secondary**: None **Tertiary**: Undesignated Parking, Capacity	**Tertiary**: Significant undesignated parking at rest areas such as Deadman Pass and Reynolds Rest Areas. Lack of current spaces at the truck stops and rest areas does not seem to be the main cause of undesignated parking. However, there may be seasonal weather-related parking needs in this segment. Projected decline in availability in the future due to significant expected traffic growth.	▪ Provide or improve real-time parking information for rest areas and truck stops in this segment to improve utilization. ▪ Investigate the possibility of better managing or providing real-time parking info at the Farewell Bend POE at MP353 (36 spaces) and the weigh station at MP227. ▪ Manage and/or increase undesignated truck parking in the rest area utilizing excess ROW if available. ▪ Consider developing a winter truck parking strategy to provide parking for trucks that can't travel on the highway due to poor weather conditions. ▪

Table 4: Recommended Actions: US97

Segment	Segment Needs	Issues	Suggested Solutions
N US97 from I-84 to Madras (93 miles long)	**Primary:** None **Secondary**: None **Tertiary:** Amenities & Services	**Tertiary**: Approximately 60% of respondents indicated that services are inadequate. There are however some services in Shaniko, Grass Valley and Moro.	▪ Investigate the signage in this segment to determine if there needs to be additional signage indicating miles to towns or services. ▪ Investigate which amenities and services are deficient at the Cow Canyon rest area and truck stops and how the state can help improve amenities
O US97 from Madras to Bend (42 miles long)	**Primary:** None **Secondary:** None **Tertiary:** Amenities & Services	**Tertiary**: Approximately 60% of respondents indicated that services are inadequate on this segment. There are however some services in Terrebonne and Redmond.	▪ Investigate the signage in this segment to determine if there needs to be additional signage indicating miles to towns or services. ▪ Investigate which amenities and services are deficient at the Peter Skene Ogden State Park rest area and truck stops and how the state can help them with improving amenities.
T US97 from Bend to OR58 (58 miles long)	**Primary:** None **Secondary**: None **Tertiary:** Safety & Security, Amenities & Services	**Tertiary**: Approximately 70% of respondents indicated that services are inadequate on this segment and 40% indicated parking was not safe or secure.	▪ Investigate the signage in this segment to determine if there needs to be additional signage indicating miles to towns or services. ▪ Investigate cause of safety concerns in this segment with the OSP, local law enforcement, OTA and ODOT maintenance districts ▪ Work with the truck stop to see if installation of surveillance cameras/improved lighting is feasible and/or solves the problem.
R US97 from OR58 to CA border (96 miles long)	**Primary:** None **Secondary:** None **Tertiary:** None		

Table 5: Recommended Actions: Segments not on I-5, I-84, US97

Segment	Segment Needs	Issues	Suggested Solutions
D OR58 from I-5 to US97 (86 miles long)	**Primary**: None **Secondary**: None **Tertiary**: Safety & Security, Amenities & Services	**Tertiary**: Approximately 70% of respondents indicated that services are inadequate on this segment and 40% indicated segment was not safe or secure. The main cause is likely the lack of any designated parking facility in this segment.	▪ The city of Oakridge has indicated a desire to provide more truck services in their city. Work with the city to determine if truck parking could be accommodated in the city. ▪ Investigate cause of safety concerns in this segment with the OSP, local law enforcement, OTA and ODOT maintenance districts ▪ Manage and/or increase undesignated truck parking in the segment utilizing excess ROW and provide lighting, striping, fencing to improve safety. Because there is currently no rest area in this segment, adding one would benefit truck drivers as well as drivers of passenger vehicles on this facility that provides one of these few connections between US 97 and I-5 and access to unique recreational areas.
I I-205 from I-5 to WA border (28 miles long)	**Primary**: None **Secondary**: None **Tertiary**: Capacity, Safety & Security	**Tertiary**: Approximately 50% of respondents indicated parking spaces are never available and 40% indicated segment was not safe or secure. The main cause is the lack of any designated or undesignated parking in this segment. Because I-205 is used primarily by trucks seeking to bypass the Portland area and through-traffic may be more likely to park at truck stops and rest areas on I-5 in OR and WA. This may mask the true demand for parking within the metro area.	▪ Investigate public private partnerships to see how the state can help businesses that operate and develop private truck parking facilities. ▪ Explore warehouse parking partnerships and/or requirements with private vendors for end-of-trip parking and staging. - In general, parking facilities in segments that are just outside the Portland metro area see outsized demand from trucks driving to/from Portland, as these facilities have or are perceived to have greater availability and/or reliability of parking. As such, any solutions devised must consider that segment demand may not be representative of O/D traffic in that segment. ▪ Provide real-time parking information using dynamic message signs, smartphone apps or websites.to let truckers know where the parking and services are as they approach the metro area and improve parking utilization. ▪ Work with WA state to develop a coordinated approach to addressing truck parking on the I-205 corridor.

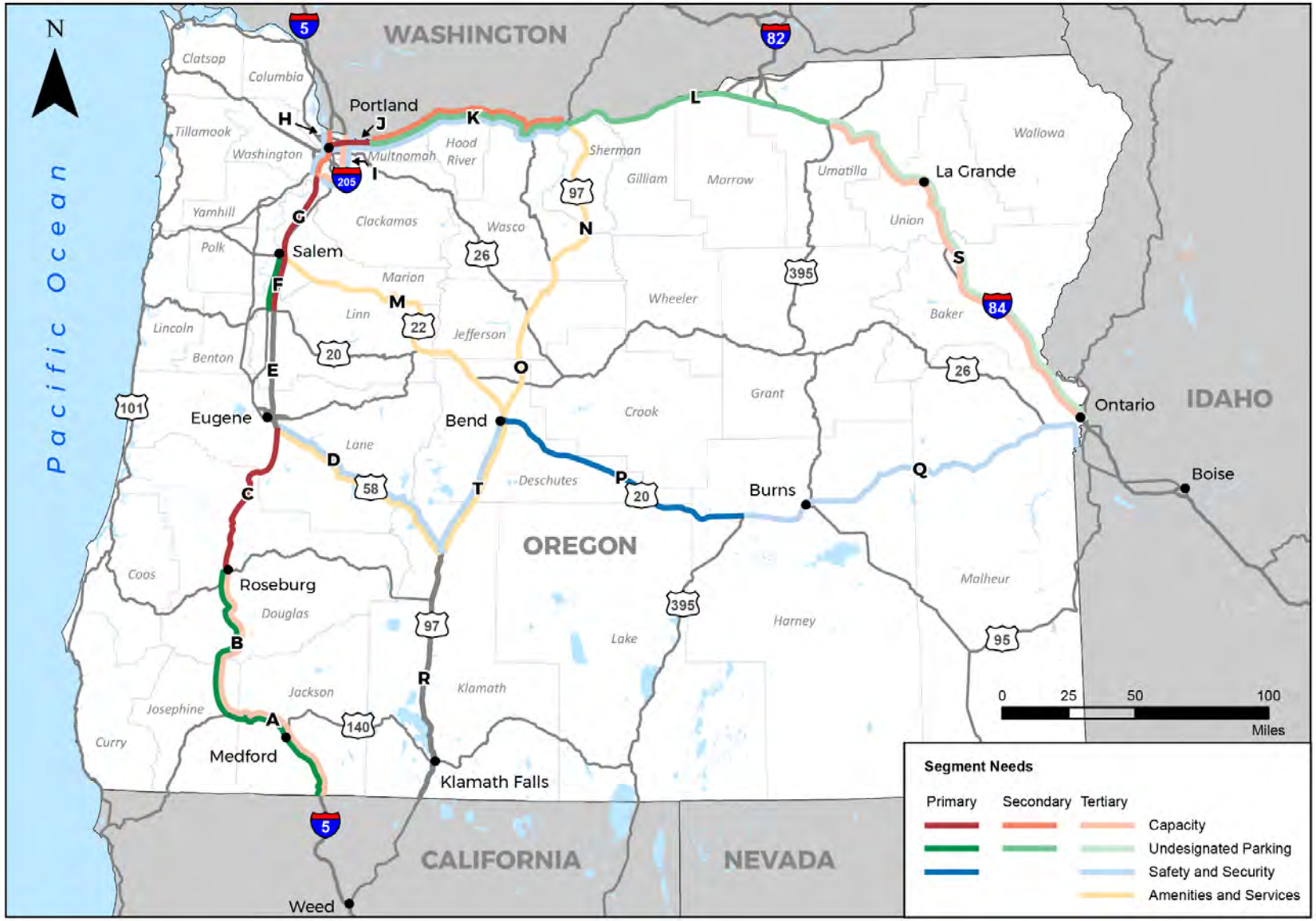
Table 5: Recommended Actions: Segments not on I-5, I-84, US97 (continued)

Segment	Segment Needs	Issues	Suggested Solutions
M OR22/US20 from I-5 to US97 (126 miles long)	**Primary**: None **Secondary**: None **Tertiary**: Amenities & Services	**Tertiary**: This segment has low truck traffic volumes and only 1 rest area with 15 parking spaces even though it is one of the longest segments. 35% of respondents indicated that they routinely spend more than 1 hourly looking for parking.	▪ Provide real-time parking information using dynamic message signs, smartphone apps or websites.to let truckers know where the parking and services are as they approach the metro area and improve parking utilization. ▪ Investigate the signage in this segment to determine if there needs to be additional signage indicating miles to towns or services.
P US20from US97 to US395 (104 miles long)	**Primary**: Safety & Security **Secondary**: None **Tertiary**: None	**Primary:** This is the only segment where safety & security was rated as a primary need. Approximately 60% of respondents indicated that truck parking was not safe or secure, one of the highest responses to this question in the survey. This is a rural segment that carries a small volume of trucks, with only one small rest area (Brothers Oasis) in over 100 miles.	▪ Investigate cause of safety concerns in this segment with the OSP, local law enforcement, OTA and ODOT maintenance districts. ▪ Manage and/or increase undesignated truck parking in the segment utilizing excess ROW and provide lighting, signage, striping, fencing to improve safety.

Table 5: Recommended Actions: Segments not on I-5, I-84, US97 (continued)

Segment	Segment Needs	Issues	Suggested Solutions
Q US20 from US395 to ID border (160 miles long)	**Primary**: None **Secondary**: None **Tertiary**: Safety & Security	**Tertiary:** While this segment represents low truck volumes, the lack of parking facilities in the middle of this segment may be causing trucks to park in undesignated parking areas or drive a long distance to reach the next parking facility. 40% of respondents indicated that parking was not safe or secure on this segment.	▪ Investigate cause of safety concerns in this segment with the OSP, local law enforcement, OTA and ODOT maintenance districts. ▪ Manage and/or increase undesignated truck parking in the segment utilizing excess ROW and provide lighting, signage, striping, fencing to improve safety. ▪ Provide real-time parking information using dynamic message signs, smartphone apps or websites to let truckers know where the parking and services are as they approach the metro area and improve parking utilization.

Figure 22: Truck Parking Needs by Segment



7.9 FUNDING

Funding will be essential to the implementation of many of the recommended truck parking solutions. Historically, ODOT has not set aside any funding for truck parking improvements. This chapter discusses various federal and state sources as well as public private partnership strategies. It draws from the work of the National Truck Parking Coalition as well as efforts in other states.

7.9.1 Federal Funding Sources

Formula Programs

Truck parking is eligible under the following federal programs that provide funding by formula to states[8]:

- Surface Transportation Block Grant – for the construction of truck parking on Federal-aid highways.
- National Highway Freight Program - truck parking facilities and real-time traffic, parking, roadway condition, and multimodal transportation information systems are all eligible activities. Must be on the national highway freight network
- Highway Safety Improvement Program – truck parking can be funded under this program if it is consistent with the State Strategic Highway Safety Plan
- National Highway Performance Program – highway safety, including truck parking, is eligible if it supports meeting national performance goals.
- Congestion Mitigation and Air Quality Improvement Program (CMAQ) – truck stop electrification systems are eligible under the federal guidelines if they primarily benefit a non-attainment or maintenance area. This use is not eligible under Oregon state guidelines, so would necessitate an exception.

Discretionary Grants

Truck parking is eligible under the following federal competitive grant programs:

- **Infrastructure for Rebuilding America (INFRA) Grants** cover up to 60 percent of total project costs for critical freight and highway projects. Highway freight projects on the National Highway freight Network, highway projects on the NHS and other specified intermodal projects. In 2016, the state of Colorado received a $9 million grant under the predecessor program (Fast Lane) for a Truck Parking Information Management System (TPIMS).
- **Better Utilizing Investments to Leverage Development (BUILD) Grant** funds are intended to support innovative projects that generate economic development and improve

[8] Eligibility of Title 23 Federal Funds for Commercial Motor Vehicle Parking, USDOT Memorandum from Martin C. Knopp, October 18, 2018.

access to reliable, safe and affordable transportation. Under the predecessor program (TIGER), MAASTO obtained a $25 million grant for its TPIM system.

- **Diesel Emissions Reduction Act (DERA) program** makes funds available for diesel emissions reduction, including installing emission reduction systems (See 42 U.S.C 16132). Seventy percent of the DERA appropriation is used for national competitive grants and rebates that use certified diesel emission reduction technologies. Thirty percent of the appropriation is allocated to States to fund programs for clean diesel projects.[9]

CMAQ and DERA-eligible truck idle reduction project types include:

- Verified Onboard Idle Reduction Technologies
- Truck Stop Electrification (TSE) and Electrified Parking Spaces (EPS)

For more information on emission reduction grant programs and examples of their successful application to idle reduction technologies see the Emissions Reduction Grant Program Fact Sheet.[10]

7.9.2 State Funding

State gas tax and other state sources could potentially fund truck parking projects. However, projects would need to be eligible under the various programs and would need to compete with numerous other priorities.

7.9.3 Public Private Partnerships

Since most of the truck parking in Oregon is located in private truck stops, working with the private sector could be beneficial in addressing the truck parking problem.. Some examples are provided below:

- Under a collaborative venture in Fernley, Nevada that could serve as a model for this type of relationship, the Nevada Department of Transportation has entered into an agreement to build a new truck parking lot adjacent to a Flying J truck stop off I-80, with the truck stop providing litter control and basic maintenance of the site[11].
- In another P3, the Brainerd Lakes Area Welcome Center in Minnesota Figure 23 is sited in the middle of a highway right of way. The site, which is operated as a rest area includes 30 truck parking spaces, bathrooms and vending machines. A gift shop helps support the operating costs of the facility.[12]

[9] Emissions Reduction Grant Program Fact Sheet, National Coalition on Truck parking, 2018, p 1.
[10] Emissions Reduction Grant Program Fact Sheet, National Coalition on truck parking, 2018.
[11] Activity Report, National Coalition on Truck Parking, 2015-2016, p. 18.
[12] Final Report, I-95 Corridor Coalition National Coalition on Truck Parking Synthesis, April 2019.

Figure 23: The Brainherd Lakes Area Welcome Center in Minnesota

- Virginia DOT invited the private sector to sponsor any of the 43 Virginia rest areas and welcome centers to defray the costs of operation. Florida DOT pursued a similar sponsorship program for its TPAS message signs.[13]
- The Interstate Oasis Program created under SAFETEA-LU allows states to partner with private operators who provide basic rest area services in exchange for online highway signing and official designation near an Interstate highway but not within the right-of-way. Oases exist in Connecticut, Illinois, Idaho, Pennsylvania, Ohio, and Utah.[14]

[13] Final Report, I-95 Corridor Coalition National Coalition on Truck Parking Synthesis, April 2019.
[14] Ibid.

8. NEXT STEPS

Prioritized needs and solutions were reviewed with relevant ODOT stakeholders at the final TAC meeting. Final priorities were identified and the study team matched solutions to areas of the particular needs. Recommended actions, drawn from the toolbox of prioritized solutions and matched to existing needs statewide and in each of the segments, are presented in section 7.8 of this report.

As a next step, the State should develop an implementation plan for this study in order to identify the more specific tasks needed to implement the study. In some cases, feasibility studies and proof-of-concept pilots may be appropriate to determine effectiveness, limitations and projected costs of implementing specific recommendations under consideration. Pilot programs for low-cost solutions, such as expanding rest areas with existing ROW, redesign/remarking of rest areas to better utilize existing footprint or increasing participation in existing truck parking web applications, could speed implementation.

APPENDIX A
TECHNICAL ADVISORY COMMITTEE MEMBERSHIP

Technical Advisory Committee Membership

June 24, 2020

	Company or Organization Name	Name and Contact Info	Location
1	Owner-Operator Independent Drivers Association (OOIDA	Mike MATOUSEK 816-229-5791 mike_matousek@ooida.com	Grain Valley, Missouri
2	Jubitz Corporation	Tom Faricy 503-240-5871 Tom.faricy@jubitz.com	Portland
3	Pilot/Flying J	Kacie Skeen 865-474-2352 kacie.skeen@pilottravelcenters.com	Knoxville, TN
5	May Trucking	Rick Kokel 503-881-7020 rickk@maytrucking.com	Brooks
6	Siskiyou Transportation	Mark Gibson 541-488-2755 tllmark1@gmail.com	Ashland
7	Schneider Trucks	Kristin Gomez 503-251-3002 gomezk@schneider.com	Portland
8	Central Oregon Trucking	Brad Aimone 800-394-0222 baimone@cotruck.net	Redmond
9	National Association of Truck Stop Owners (NATSO)	Tiffany Wlazlowski Neuman 703-739-8578 twlazlowski@NATSO.com	Washington, DC.
10	Oregon Trucking Associations (OTA)	Jana Jarvis (Waylon Buchan as an alternate) 503-513-0005 Jana@ortrucking.org	Portland

	Company or Organization Name	Name and Contact Info	Location
11	Walmart Distribution Center	Gordon Oldham 541-564-4692 gordan.oldham@walmart.com	Hermiston
12	Truck Depot	Richard Greer 360-356-6624 rrg1107@gmail.com	Troutdale
13	Oregon Travel Information Council (TIC)	Jim Denno 503-373-0946 Jim.Denno@state.or.us	Salem
14	FHWA	Nick Fortey 503-316-2565 nick.fortey@dot.gov	Salem
15	ODOT Maint District 12	Marilyn Holt 541-278-6021 Marilyn.M.HOLT@odot.state.or.us	Pendleton
16	ODOT Motor Carrier Division (MCTD)	Carla Phelps 503-378-6071 Carla.D.Phelps@odot.state.or.us	Salem
17	Rogue Valley Metropolitan Planning Organization (MPO)	Mike Quilty 541-621-4853 Michael.quilty@centralpointoregon.gov	Central Point
18	Port of Portland	Scott Drumm	Portland
19	Oregon State Police	Kevin Ely	

OCTPS Friends of the Committee and Project Staff

	Organization/Company	Name	Notes
1	ODOT TPAU	Becky Knudson	Commodity flow, modeling
2	ODOT Freight Planning	Robin Marshburn	Agency PM
3	ODOT Freight Planning	Ed Scrivner	
4	ODOT Systems Operations & ITS Unit	Galen McGill	ITS
5	ODOT MCTD	Audrey Lawson	Trucking data and other trucking info
6	ODOT Freight Planning	John Boren	Freight Planning
7	ODOT Statewide Policy and Planning Manager	Erik Havig	ODOT
8	ODOT Planning Administration	Sunshine Mancuso	
9	WSP, PM	Bridget Wieghart	
10	WSP, PIC	Joseph Bryan	
11	WSP, lead analyst	Sebastian Guerrero	
12	WSP, freight analyst	Shashank Pulikanti	
13	WSP, Planning and GIS	Matthew Gray	

APPENDIX B

FEEDBACK SUMMARY TECHNICAL MEMORANDUM

Oregon Commercial Truck Parking Study

Contents

Overview

The primary purpose of the survey was to understand public perceptions about the availability and quality of commercial truck parking in Oregon. The study sought feedback particularly from truck drivers on truck parking issues within key freight corridors of the State, including I-5, I-205, I-84, US97, OR 22, US 20/26, and OR 58. The study included questions about capacity, safety and convenience and sought to determine where additional truck parking may be needed. The data collected will help decision makers prioritize projects related to future parking infrastructure.

Methodology

The outreach approach included three methods:

- **Survey**: The online survey tool was intended to gather opinions from travelers who use truck parking within Oregon. The survey was intended to help supplement the in-person outreach by increasing the geographic breadth of potential participation and make the survey available over a longer time period. The survey questions were formatted to complement the in-person interview questions.
- **Interviews**: The team conducted 26 in-person and phone interviews with key stakeholders familiar with commercial truck parking in Oregon and/or nationally. The interviews provided an opportunity to gather feedback, educate industry leaders about the study process, and further disseminate survey materials through internal networks to drivers and other relevant contacts.
- **Tabling/In-Person Surveys**: Previous outreach has noted the difficulty of collecting freight industry feedback. In accordance with studies recommending best practices for reaching truck drivers, the team conducted in-person surveys at the following locations:

  Jubitz Travel Center (Portland, I-5)
  Pilot Travel Center and *Grand Central Travel Center* (Biggs Junction, I-84)
  Truck 'N' Travel (Coburg, I-5)
  2019 Oregon Truck Driver Championships (Portland)

The design of the survey tool followed a literature review of similar studies and stakeholder surveys. The survey included questions about how, why and when truck drivers choose their parking locations, where they are going, and what amenities they prefer when parking. The survey instrument was also designed to allow respondents to provide corridor-based geographic data that would offer insights into specific problematic corridor segments throughout the state.

The online survey was live from June 7 through August 26, 2019. A link to the online survey was provided to interviewees and advertised using direct email to members of the study Technical Advisory Committee, with the request that they relay the survey to their constituencies. The survey link was subsequently distributed to the Oregon Trucking Association email listserv, the ODOT Motor Carrier Division GovDelivery listserv and the ODOT MCTD internal email bank. The survey and related project information was also the subject of an article in the online magazine "OverDrive" (July 22).

The online survey was supplemented by physical surveys at the four tabling events. Event participants were also provided with fact sheets and sharable cards with a link to the online version of the survey.

Feedback Summary

The survey received **729 responses**, including 662 online submissions and 67 in-person surveys. Longer, in-person and phone interviews were conducted with **26 respondents**.

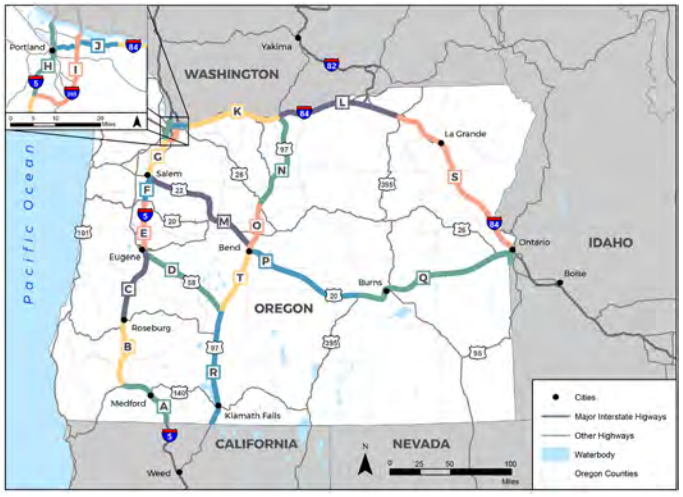
Respondent Profile

The majority of survey respondents (80%) self-identified as truck drivers. The second most common choice was "Dispatcher" (11%). Of interview participants, only about 22% identified as truck drivers, with the other two highest categories being "Truck stop operator/employee" (25%) and "Other" (35%), which primarily included transportation management and planning personnel. Several associations were also interviewed.

Roughly two thirds of survey respondents (68%) said that they look for parking in Oregon between "2-3 times per month". and "3-4 times per week". A significant majority of survey takers (75%) said that they have been driving for more than 10 years. Most respondents indicated that they drive vehicles with five (71%) or more axles (25%), and usually operate regionally (48%) or nationally (40%). Survey respondents tended to be older, with half of respondents over 55 and 75% over 45 years old.

Parking Availability

Map of study segments.



Most respondents identified the general availability of truck parking in Oregon as "Poor" (39.7%) or "Very Poor" (19.1%). Only 13.57% of respondents held a positive view regarding parking availability. Interview participants were less sure about overall parking availability, but also tended to rate parking availability negatively.

By far, survey takers and interviewees identified a general lack of available parking for trucks as a significant issue in Oregon. The deficiency was particularly pronounced near urban areas, but problematic throughout the state. Another common response was that rules and regulations surrounding hours of service were a significant issue related to truck parking. Many respondents also viewed delays, both with traffic and loading/unloading, that impact their schedule as an issue. Parking limitations at rest areas, and the difficulty associated with knowing if and where spots are available were also popular problems identified by survey takers. Interviewees also identified local regulations and public perception as issues affecting parking and the ability to create new parking areas.

Survey respondents were asked to rate truck parking availability on select Oregon travel corridors. Sections in the Portland Metropolitan Area (I, H, J); I-5 between Portland and Roseburg (G, F, E, C); I-84 between Portland and The Dalles (K); US 97 between The Dalles and Bend (O, N); I-5 between Medford and the California Border (A); and OR 58 were all ranked by 50% or more of respondents as having low parking availability. More than half of the respondents ranked *all* the sections unfavorably with regard to availability.

The three sections that were judged to have the least availability were the three sections surrounding the Portland area (I, H, and J). The areas that were viewed to have the most availability were in the northeast corner of Oregon on the border with Washington and near La Grande, and the southwest near Roseburg (L, S, and B). Even the areas ranked best, however, didn't have more than about 3% of respondents select any of them as "Always Available".

Consistent with the statewide ratings, the **most common complaint within individual segments** was that there were not enough parking spaces and/or parking lots. Another common complaint was that the amenities available at truck stops were inadequate, with some citing a lack in overall quality of things like restrooms, showers, and meal services. Interviewees who called out individual segments also rated nearly all of them as not having enough parking space during peak hours. They particularly called out the Portland Metro area as a major concern due to the amount of demand for very limited parking.

The **time required to locate parking** varied, though only two segments were cited as taking less than 15 minutes: segment D (OR 58 from I-5 in Eugene to US 97 near Chemult, 37%) and segment Q (US 20 from US 395 in Riley to the Idaho State Border in Nyssa, 33%.) For segments that interviewees commented upon, most responses indicated that drivers spend at least 60 minutes looking for parking there.

Nights and evenings were ranked as the **most difficult times to find parking**, with weekday evenings and weeknights consistently ranked as the top two most difficult times to find parking in all segments. Interviewees generally agreed, but a few noted that some shipping models experience peak travel times at other times of day.

Required breaks due to hours of service rules was the **most popular reason for stopping** in all segments except for segments in and around the Portland metropolitan area, where "overnight stays waiting for next day deliveries" was the most popular response. This was consistent with interviewee feedback.

Survey takers were presented with a series of possible **solutions for alleviating** truck parking issues and asked to identify all that they thought would be helpful. The most popular option among survey takers was creating larger truck rest areas and parking lots. All of the methods that involved the creation or expansion of parking space were popular selections among respondents. Options such as "paid parking reservation systems", "cell phone notification system", and "reduced delivery curfews" were among the least popular of the proposed strategies. Interviewees also favored the expansion of parking areas but were more amenable to paid reservation systems. Interviewees also doubted the efficacy of reduced delivery curfews, incentivizing businesses to accept delivery 24/7, and cell phone notifications as methods to relieve parking problems. Interviewees tended to offer specific recommendations for incentivizing new parking areas, such as regulatory changes to allow truck parking in more areas and tax breaks for truck stop owners.

Interviewees said that **drivers tend to respond to parking problems** by parking on highway ramps or in other undesignated areas. This is often due to HOS rules which either require drivers to plan ahead and often stop short of their hours (impacting utilization) or find themselves having to pull over in unplanned locations for mandatory breaks. Several interviewees believed that some truck drivers may not mind parking in undesignated parking, particularly in rural areas, as they tend to be pretty self-sufficient.

Respondent Behavior

The survey sought to determine **how respondents typically locate parking** in Oregon. Most respondents (65%) said that they have "favorite locations" that they visit frequently. 39% said that they use smartphone apps such as "Park my Truck" or "Truckers Path" to find parking. Only a small portion of respondents indicated that they use printed material or that their companies provide parking options. Some public sector interviewees were not aware of what options truckers use.

60% of respondents said that the number one **reason they stop driving** is because they are required to do so by hours of service rules. 75% of respondents identified this as one of their top 3 reasons to stop. "Personal safety or cargo safety" was identified by just under half of respondents as one of their top three most common reasons to stop. "Cost/rates" was one of the least common reasons for stopping. The least common reason for stopping was "Established stops provided by my company." Other reasons for stopping included general schedule planning, available amenities, and overall parking availability.

Interviewees also cited HOS rules as a main reason for stopping, as well as proximity to route/destination and customer availability. These factors were noted as particularly challenging when it comes to planning deliveries to high demand urban areas where drivers must balance HOS requirements with the possibility of not finding parking near their destinations.

When choosing truck stops based on **amenities**, respondents cited restrooms (80%) and expected parking availability (66%) as the top criteria. Food, ease of vehicle access, and showers were also important factors. Internet/Wi-Fi availability, maintenance centers, facilities for pets, and vending machines were the least common answers. Interviewees generally agreed, although they added refueling options as a significant consideration. They also reemphasized proximity to the delivery location as a main factor in choosing stop locations.

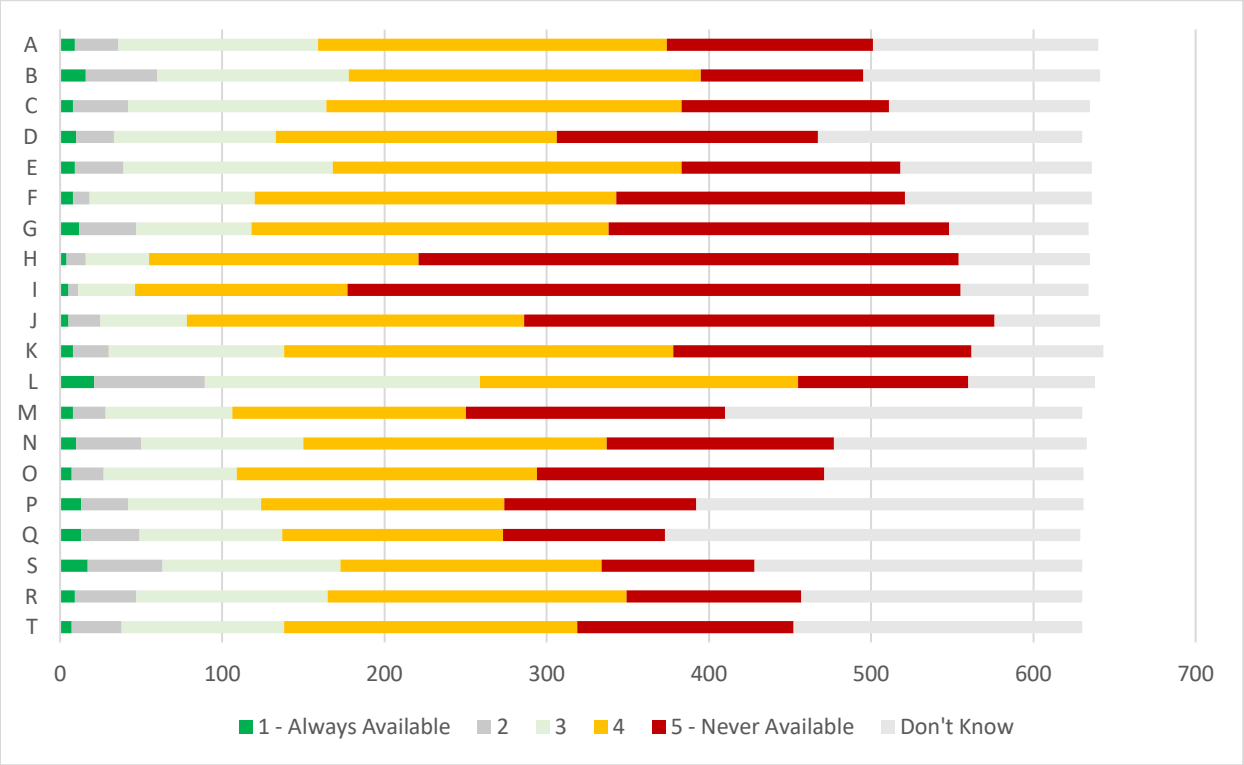
Survey takers were asked to **how often they take required breaks at different types of parking areas**. Private truck stops were the most popular with 51% stopping three or more times per week. Terminals were the least popular (8% stopping three or more times per week), followed by businesses (9%) and customer locations (15%). Out of all the options, private truck stops have the most daily visits. 34% of respondents said they visited public rest areas three or more times per week. Over of half of survey respondents said that they never take breaks at a terminal. These findings may indicate some bias towards non-terminal users, many of whom are specifically routed and scheduled for breaks at terminal locations.

Survey Questions

Segment Feedback

Q1: How would you rate the availability of truck parking within each of the following segments? (Choose one for each row)

651 respondents answered this question.

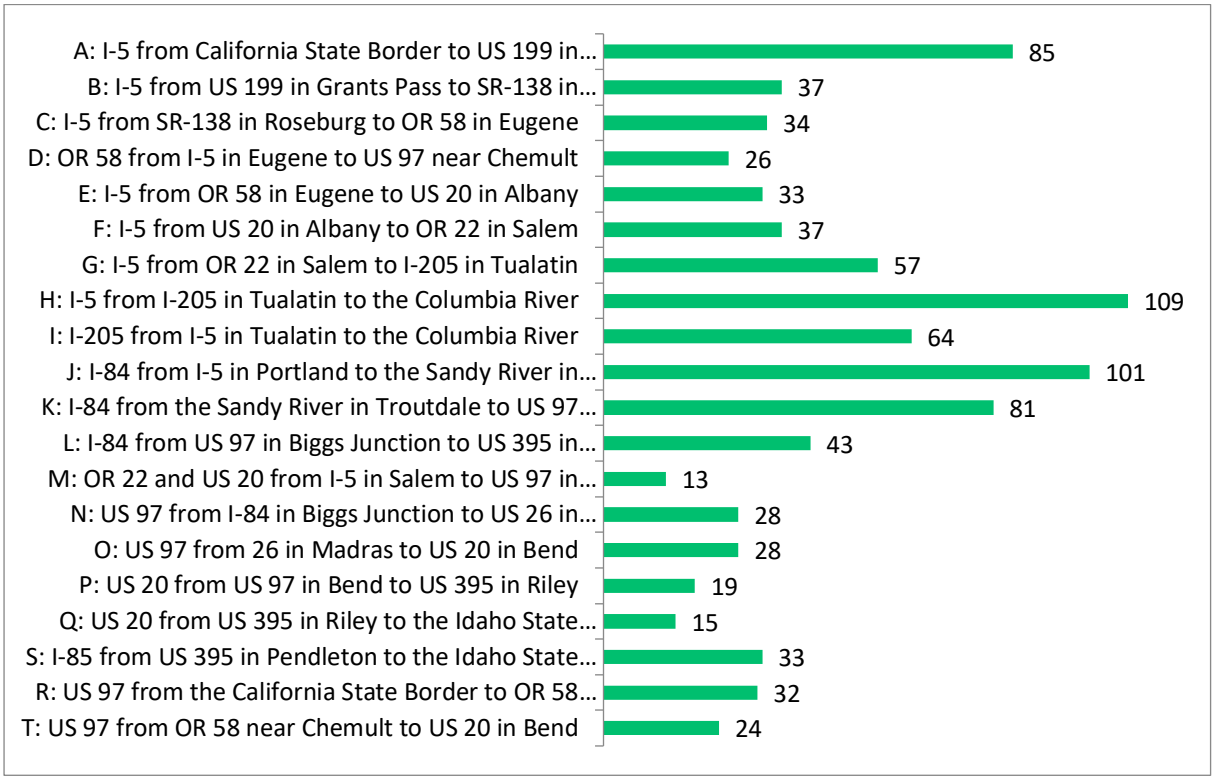


- A: I-5 from California State Border to US 199 in Grants Pass
- B: I-5 from US 199 in Grants Pass to OR 138 in Roseburg
- C: I-5 from OR 138 in Roseburg to OR 58 in Eugene
- D: OR 58 from I-5 in Eugene to US 97 near Chemult
- E: I-5 from OR 58 in Eugene to US 20 in Albany
- F: I-5 from US 20 in Albany to OR 22 in Salem
- G: I-5 from OR 22 in Salem to I-205 in Tualatin
- H: I-5 from I-205 in Tualatin to the Columbia River
- I: I-205 from I-5 in Tualatin to the Columbia River
- J: I-84 from I-5 in Portland to the Sandy River in Troutdale
- K: I-84 from the Sandy River in Troutdale to US 97 in Biggs Junction
- L: I-84 from US 97 in Biggs Junction to US 395 in Pendleton
- M: OR 22 and US 20 from I-5 in Salem to US 97 in Bend
- N: US 97 from I-84 in Biggs Junction to US 26 in Madras
- O: US 97 from US 26 in Madras to US 20 in Bend
- P: US 20 from US 97 in Bend to US 395 in Riley
- Q: US 20 from US 395 in Riley to the Idaho State Border in Nyssa
- R: US 97 from the California State Border to OR 58 near Chemult
- S: I-85 from US 395 in Pendleton to the Idaho State Border
- T: US 97 from OR 58 near Chemult to US 20 in Bend

Observations: Parking availability was rated most frequently as "Never Available" in the areas around or just outside of Portland. Only a relatively small number of respondents thought that any of the sections in Oregon has parking a "Always Available". The response data suggests that, while some sections may be better than others, the state of Oregon as a whole has a parking availability problem. The data also suggests that a large portion of respondents may not have experience looking for parking in all of the map sections.

Q2: Choose a segment below, then click "Next" to answer questions about it.

193 respondents answered this question.



Observations: Respondents had the most to say about segment A (I-5 from California State Border to US 199 in Grants Pass), segment H (I-5 from I-205 in Tualatin to the Columbia River), and segment J (I-84 from I-5 in Portland to the Sandy River in Troutdale).

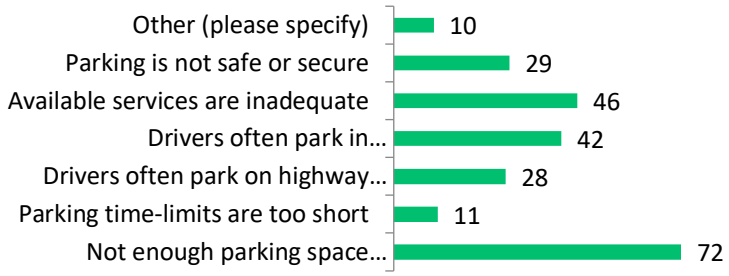
Responses by individual segment are included below.

Segment A: I-5 from California State Border to US 199 in Grants Pass

Q3 What are the main truck parking issues within this Segment?

85 respondents answered this question.

Observations: By far the most common response by survey takers was that the main issue in this area was that there was "Not enough parking space specifically during peak hours". This complaint tracks with the fact that most respondents also found that parking availability was inadequate statewide. The second complaint was that available services are inadequate.



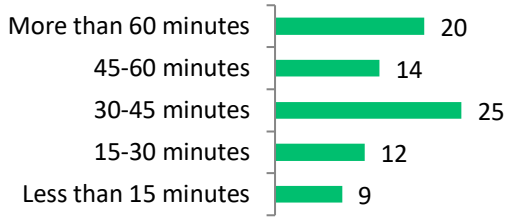
Other (please specify)

- One respondent said there was **not enough training** for drivers, creating problems.
- One respondent suggested that no one has budgeted for **increased truck traffic** or the **impact of Electronic Logging Devices (ELDs)**, which has led to congestion and crowded parking.
- 2 survey takers noted that they feel that parking is **not safe** in this segment.

Q4 How much time do you typically spend looking for parking in this segment that would otherwise be spent traveling? (Choose one.)

80 respondents answered this question.

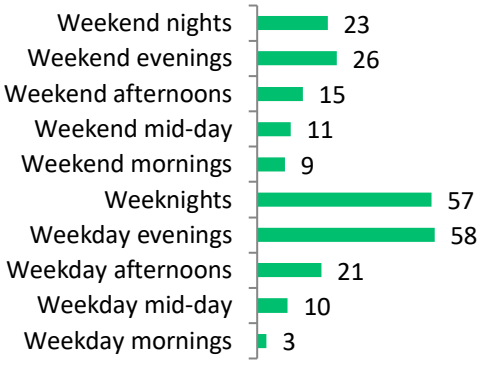
Observations: More than half of the respondents that answered this question spend more than 30 minutes looking for parking in this area. One quarter of the respondents spend an hour or more searching for parking.



Q5 When do you have the most trouble finding available parking in this segment? (Choose all that apply.)

79 respondents answered this question.

Observations: The most popular responses were that of "Weeknights" and "Weekday evenings". The overall tone of the graph suggests that as time goes on throughout the day, it become more difficult to find parking as more people come in from the road. The popularity of "Weekend evenings" as a response suggests that the tide of drivers coming to find parking may begin earlier on the weekend. The data points to the fact that evenings and nights are the most difficult times to find parking.

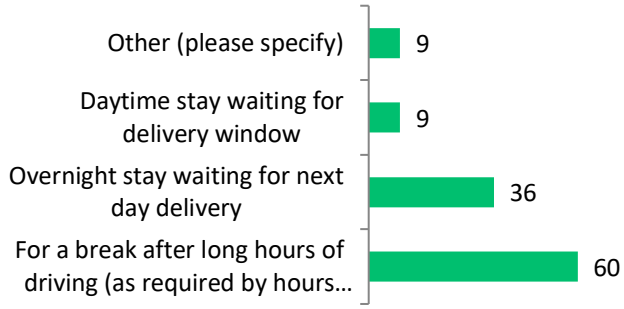


Q6 Do you have other comments on this segment or on specific locations within this segment?
28 respondents answered this question.

- 11 respondents cited the need for **more truck parking** areas in this segment. Some noted that there are parking areas that allow too many RVs and campers, while others said that there was simply a lack of places to park.
- 4 survey takers noted that **safety** was an issue in this segment. Most that cited this said there was just a general lack of safe places in the area.

Q7 Why do you typically park in this segment? (Check all that apply.)
82 respondents answered this question.

Observations: Most respondents stated that they were stopping in this segment due to the fact that they were required to stop after a certain number of hours as required by service rules. The next most popular answer was that they were stopping overnight to wait for a delivery the next day.



Other (please specify)
9 respondents provided follow-up information.

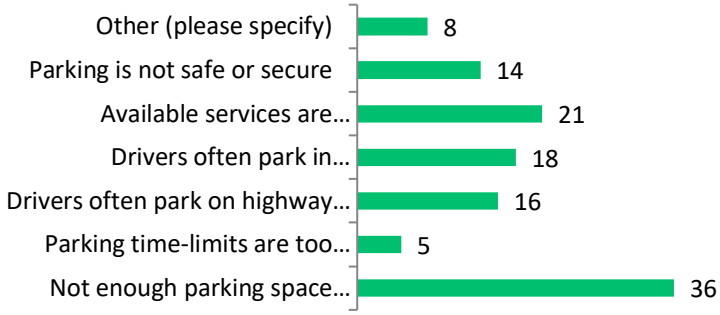
- 2 respondents cited being **out of hours** as their main reason for stopping in this area.
- 1 survey taker said that this is a location they choose to **take a break** in, but not stay in.

Segment B: I-5 from US 199 in Grants Pass to OR 138 in Roseburg

Q8 What are the main truck parking issues within this segment? (Check all that apply.)

37 respondents answered this question.

Observations: The most common answer in this section was that there was "Not enough parking space specifically during peak hours". This is a common theme throughout the study as a whole, as well. The next most common complaint was that the "Available services are inadequate". More than 97% selected the lack of parking as an issue, while the next most popular complaint about services only received about 57% of selections.



Other (please specify)

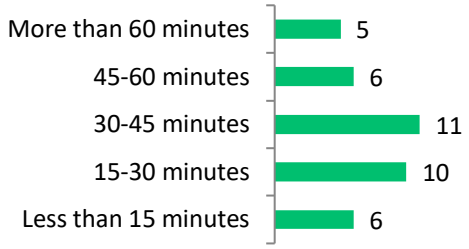
8 respondents provided follow-up information.

- 6 respondents said that the main issue in this area was that there are **limited parking areas** that quickly become overcrowded.
- 1 respondent said the problem is **not enough training** for drivers, creating problems.
- 1 survey taker cited **ELDs** as the reason parking gets so crowded, as everyone is coming in at the same time.

Q9 How much time do you typically spend looking for parking in this segment that would otherwise be spent traveling? (Choose one.)

38 respondents answered this question.

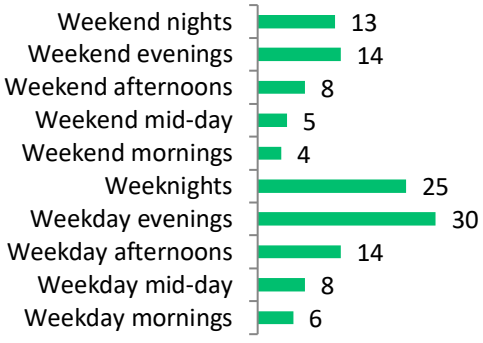
Observations: The most common amount of time that respondents said they spent looking for parking in this section was between 15 and 45 minutes. More respondents said that they spend "Less than 15 minutes" looking for parking in this segment than respondents that said they spend "More than 60 minutes".



Q10 When do you have the most trouble finding available parking in this segment? (Choose all that apply.)

35 respondents answered this question.

Observations: The most common responses from survey takers were that they had the most difficulty finding parking on "Weeknights" and "Weekday evenings". Those two selections were far above the rest, with the next two most popular answers being "Weekday afternoons" and "Weekend evenings". These results track with other data sets that promote the idea that it becomes more and more difficult to find parking as the day goes on.



Q11 Do you have other comments on this segment or on specific locations within this segment?

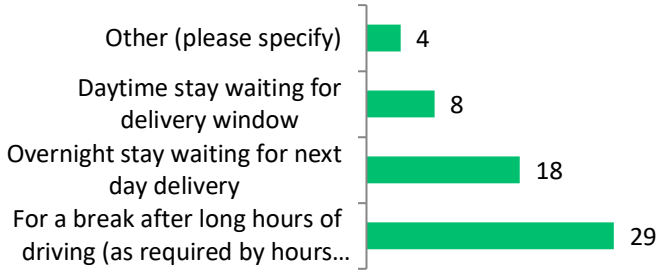
8 respondents answered this question.

- 3 respondents said that an issue is simply **more parking** is needed. Some noted that there are summertime conflicts with RVs and campers, while others just want more spaces.
- 2 survey takers cited **safety** as a concern in this area.

Q12 Why do you typically park in this segment? (Check all that apply.)

8 respondents answered this question.

Observations: Most respondents stated that they were stopping in this segment for due to the fact that they were required to stop after a certain number of hours as required by service rules. The next most popular answer was that they were stopping overnight to wait for a delivery the next day.



Other (please specify)

4 respondents provided follow-up information.

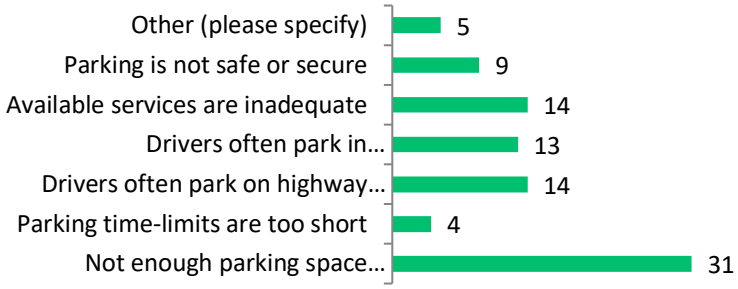
- Weather- road closed
- If I can get into this area, is usually for break, or I barely made it to park for the night to get some rest, when I couldn't make to segment A.
- Meal break
- 34hr reset

Segment C: I-5 from OR 138 in Roseburg to OR 58 in Eugene

Q13 What are the main truck parking issues within this segment? (Check all that apply.)

34 respondents answered this question.

Observations: The most common answer in this section was, again, that there was "Not enough parking space specifically during peak hours". This is a common theme throughout the study as a whole, as well. The next most common complaint was that "Drivers often park on highway ramps here" and "Available services are inadequate", followed closely by "Drivers often park in undesignated areas (besides highway ramps)". More than 91% selected the lack of parking as an issue, while the next most popular complaint about services only received about 51% of selections. The priority for a basic need to park is evident.



Other (please specify)

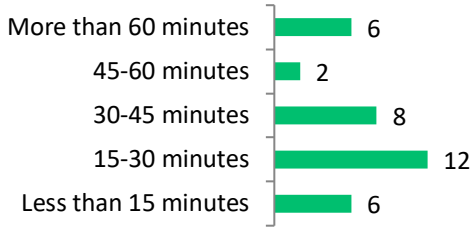
5 respondents provided follow-up information.

- No parking until certain areas, and very Dark and unsafe. Usually if you leave Segment B, you are aiming for Oakland, OR at the Pilot Truck Stop. If not good luck, park anywhere or hope to find something into TA at Eugene, OR.
- Cars parked in truck parking
- Parallel parking rest areas are next to impossible to squeeze into when your 75 ft long. Rest area that are not truck accessible is a waste of time money and resources. Cars and even motor homes can get off at many off ramps to go to local business' for rest breaks and leaves truckers (also human beings) waiting for the next available place to pull off.
- Oregon City viewpoint area
- Parking on freeway shoulder

Q14 How much time do you typically spend looking for parking in this segment that would otherwise be spent traveling? (Choose one.)

34 respondents answered this question.

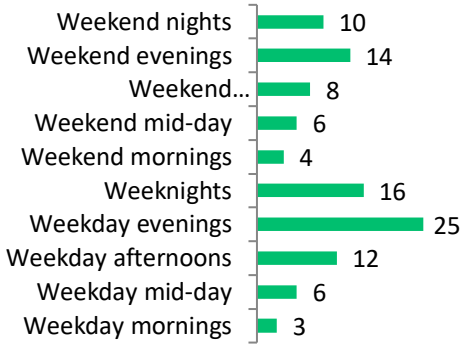
Observations: The most common amount of time that respondents said they spent looking for parking in this section was between 15 and 45 minutes. The same number of respondents that said that they spend "Less than 15 minutes" looking for parking in this segment said they spend "More than 60 minutes" looking.



Q15 When do you have the most trouble finding available parking in this segment? (Choose all that apply.)

32 respondents answered this question.

Observations: The most common responses from survey takers were that they had the most difficulty finding parking on "Weekday evenings" and "Weeknights". Those sections were followed by "Weekend evenings" and "Weekday afternoons". These results track with other data sets that promote the idea that it becomes more and more difficult to find parking as the day goes on.



Q16 Do you have other comments on this segment or on specific locations within this segment?

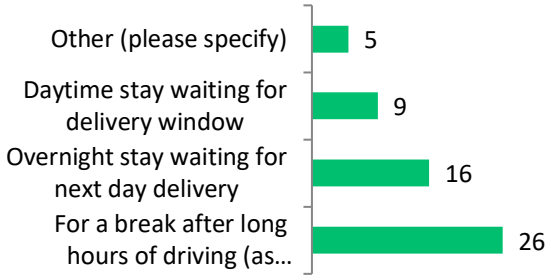
11 respondents answered this question.

- 3 respondents said that they believed there needed to be **more parking**. There were similar complaints to other sections regarding conflicts with RVs, and also a call for just more parking.
- Another respondent said this segment was in need of some attention for the state, implying that it needed more care and upkeep.

Q17 Why do you typically park in this segment? (Check all that apply.)

34 respondents answered this question.

Observations: Most respondents stated that they were stopping in this segment for a due to the fact that they were required to stop after a certain number of hours as required by service rules. The next most popular answer was that they were stopping overnight to wait for a delivery the next day.



Other (please specify)

5 respondents provided follow-up information.

- I run out of hours sometimes, or I feel tired, or the weather is bad and I sometimes stop. This is an area that would benefit with parking.
- Don't park here if I can avoid it, either stop before or after.
- Lunch break
- Bathroom break. I travel with my wife and she requires a bathroom.
- 34 reset

Segment D: OR 58 from I-5 in Eugene to US 97 near Chemult

Q18 What are the main truck parking issues within this segment? (Check all that apply.)

26 respondents answered this question.

Observations: The most common response by survey takers was that "Available services are inadequate" in this segment. The next most popular response was that there was "Not enough parking space specifically during peak hours", which is a common complaint for the state of Oregon as a whole, and a common complaint for many other segments. Another popular complaint was that "Drivers often park in undesignated areas (besides highway ramps)".

Other (please specify)

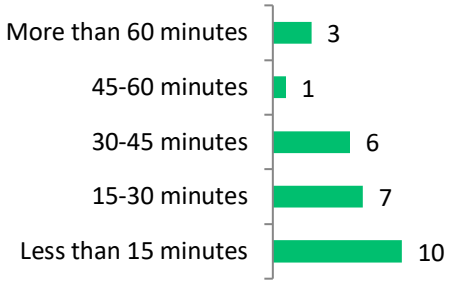
4 respondents provided follow-up information.

- This segment has literally no designated safe truck Parking, and services. Very few places to park along the way and near highway on shoulder, and I deem this area not safe at all. This is a very busy highway and specially in the winter, when the US 26 or US 20 are packed with snow or unsafe to drive, this is an alternate route as well in both directions.
- Always a place to park along road.
- Don't run this route
- There are literally no designated spaces along the entire length of Hwy 58

Q19 How much time do you typically spend looking for parking in this segment that would otherwise be spent traveling? (Choose one.)

27 respondents answered this question.

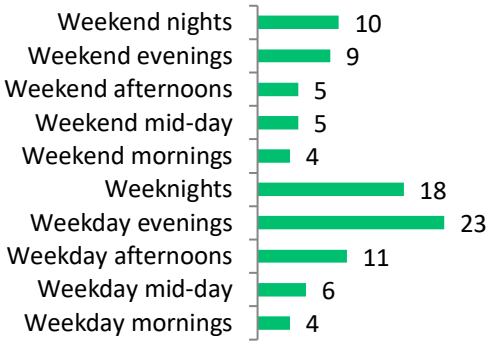
Observations: The most common amount of time that respondents said they spent looking for parking in this section was "Less than 15 minutes". The trend in this segment suggests that most respondents spend less time searching for parking in this area than many others.



Q20 When do you have the most trouble finding available parking in this segment? (Choose all that apply.)

25 respondents answered this question.

Observations: Respondents most commonly said that they had difficulty finding parking on "Weekday evenings". The next most common responses were "Weeknights", "Weekend evenings", and "Weekday afternoons". This data suggests that parking difficulty increases throughout the day, on both weekdays and weekends.



Q21 Do you have other comments on this segment or on specific locations within this segment?

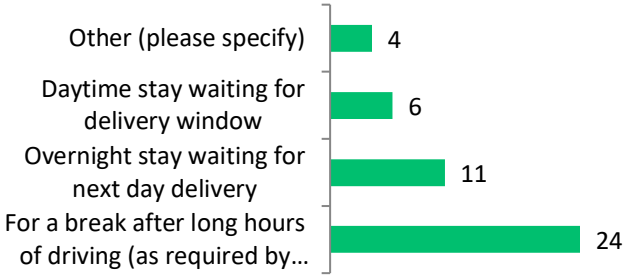
6 respondents answered this question.

- 2 respondents noted that this section needs **more parking**. There was a complaint about summer conflicts with RVs and a general call for more parking.
- One respondent said they don't feel safe traveling on this stretch at night, due to the lack of lighting.

Q22 Why do you typically park in this segment? (Check all that apply.)

26 respondents answered this question.

Observations: Most respondents stated that they were stopping in this segment for a due to the fact that they were required to stop after a certain number of hours as required by service rules. The next most popular answer was that they were stopping overnight to wait for a delivery the next day.



Other (please specify)

5 respondents provided follow-up information.

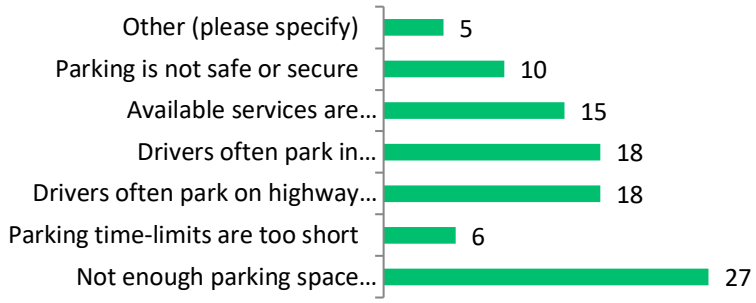
- I only park for a break if at all, but never considered it, to Park or rest due to no safe, lit, services or Parking. Avoid at all Cost.
- I cannot park along this segment as there are no designated spaces. I would park there if designated spaces existed for HOS rest breaks
- To use the restroom.
- 34 reset

Segment E: I-5 from OR 58 in Eugene to US 20 in Albany

Q23 What are the main truck parking issues within this segment? (Check all that apply.)

33 respondents answered this question.

Observations: The most common response by survey takers was that the main issue in this segment was "Not enough parking space specifically during peak hours", which is a common complaint in other areas and throughout Oregon. The next two most common issues for survey takers are "Drivers often park in undesignated areas (besides highway ramps)" and "Drivers often park on highway ramps here", which are followed by "Available services inadequate". Other than there not being enough parking spaces, it appears that respondents had an issue with drivers parking in areas they aren't supposed to be parking in.



Other (please specify)

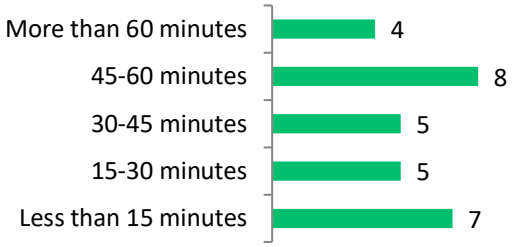
5 respondents provided follow-up information.

- This area has several safe areas to stop along the way. Although at Peak times, and in the winter time, everything goes out the window. This area gets a lot of traffic and gets crowded during winter.
- Car dwellers
- Loop
- Unsafe in Albany. Eugene/Corvallis lots of people parked in undesignated areas.
- Overcrowded

Q24 How much time do you typically spend looking for parking in this segment that would otherwise be spent traveling? (Choose one.)

29 respondents answered this question.

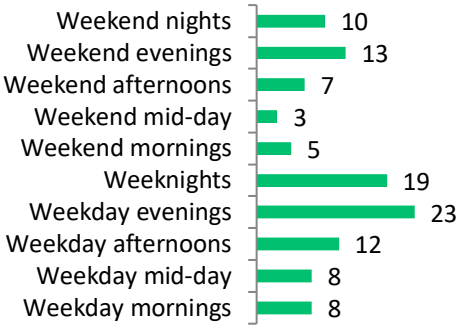
Observations: The response to this question was varied. The two most common answers were that it took between "45-60 minutes" and "Less than 15 minutes" to find parking.



Q25 When do you have the most trouble finding available parking in this segment? (Choose all that apply.)

31 respondents answered this question.

Observations: Respondents most commonly said that they had difficulty finding parking on "Weekday evenings". The next most common responses were "Weeknights", "Weekend evenings", and "Weekday afternoons". This data suggests that parking difficulty increases throughout the day, on both weekdays and weekends.



Q26 Do you have other comments on this segment or on specific locations within this segment?

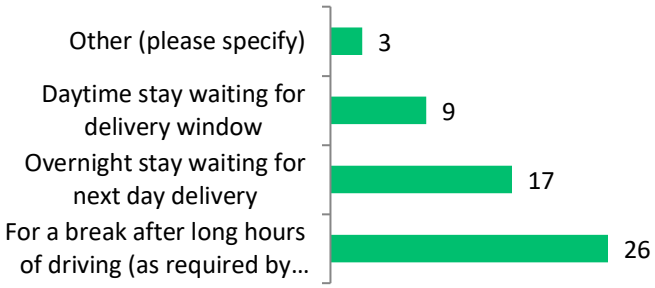
5 respondents answered this question.

- 2 respondents said there is a need for **more parking** in this segment. One noted that there is a variation in availability during different seasons, and another just said there needs to be more.
- 1 respondent said there is a lot of parking, but there are also a lot of trucks.

Q27 Why do you typically park in this segment? (Check all that apply.)

33 respondents answered this question.

Observations: Most respondents stated that they were stopping in this segment for a due to the fact that they were required to stop after a certain number of hours as required by service rules. The next most popular answer was that they were stopping overnight to wait for a delivery the next day.



Other (please specify)

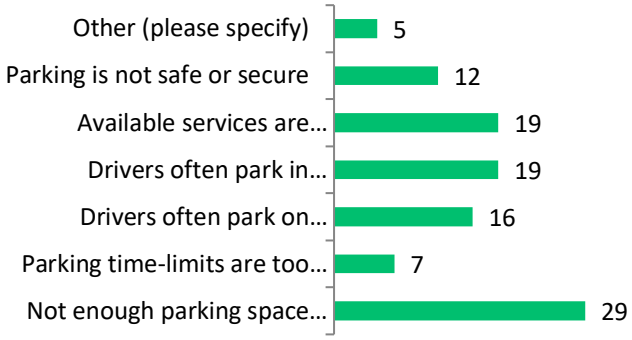
3 respondents provided follow-up information.

- I will stop to rest, sleep or stop/wait for a delivery next day.
- Meal break
- Sleep

Segment F: I-5 from US 20 in Albany to OR 22 in Salem

Q28 What are the main truck parking issues within this segment? (Check all that apply.)

37 respondents answered this question.



Observations: The most common response by survey takers was that the main issue in this segment was "Not enough parking space specifically during peak hours", which is a common complaint in other areas and throughout Oregon. The next two most common issues for survey takers are "Drivers often park in undesignated areas (besides highway ramps)" and "Available services inadequate", which are followed by "Drivers often park on highway ramps here". Other than there not being enough parking spaces, it appears that respondents had an issue with drivers parking in areas they aren't supposed to be parking in and a lack of adequate services.

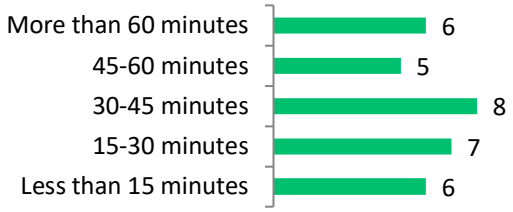
Other (please specify)

5 respondents provided follow-up information.

- All of 1-5 doesn't have enough parking.
- Not enough room for oversize length loads in rest areas
- I don't usually stop to sleep in this area, breaks only, but I do see a lot of trucks on the shoulder along the interstate and the rest area, and truck Parking seems inadequate for the trucks that make deliveries around Albany to Salem.
- Worst
- Overcrowded

Q29 How much time do you typically spend looking for parking in this segment that would otherwise be spent traveling? (Choose one.)

32 respondents answered this question.

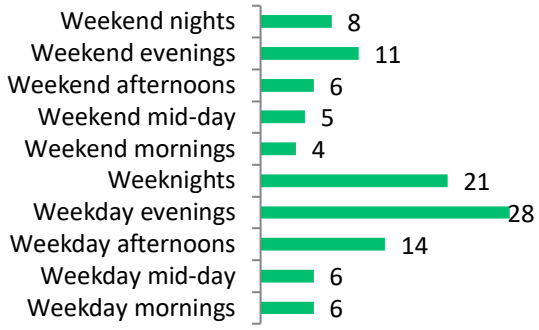


Observations: The most common amount of time that respondents said they spent looking for parking in this section was between "30-45 minutes". The variation between times spent looking for parking is pretty small, suggesting that there is wide range of difficulty in searching for parking in this area.

Q30 When do you have the most trouble finding available parking in this segment? (Choose all that apply.)

36 respondents answered this question.

Observations: Respondents most commonly said that they had difficulty finding parking on "Weekday evenings". The next most common responses were "Weeknights" and "Weekday afternoons". This data suggests that parking difficulty increases throughout the day and is more difficult on weekdays than weekends.



Q31 Do you have other comments on this segment or on specific locations within this segment?

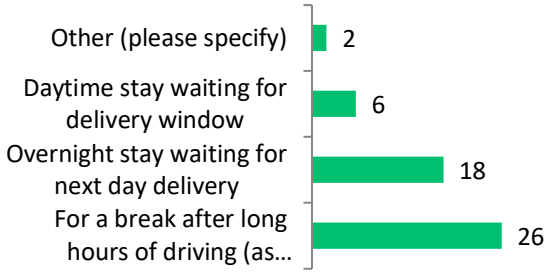
12 respondents answered this question.

- 7 respondents said that they thought there needed to be **more parking**, 3 of which said it was **too crowded**.
- One respondent noted that some drivers have more difficulty in this area during the winter.

Q32 Why do you typically park in this segment? (Check all that apply.)

35 respondents answered this question.

Observations: Most respondents stated that they were stopping in this segment for a due to the fact that they were required to stop after a certain number of hours as required by service rules. The next most popular answer was that they were stopping overnight to wait for a delivery the next day.



Other (please specify)

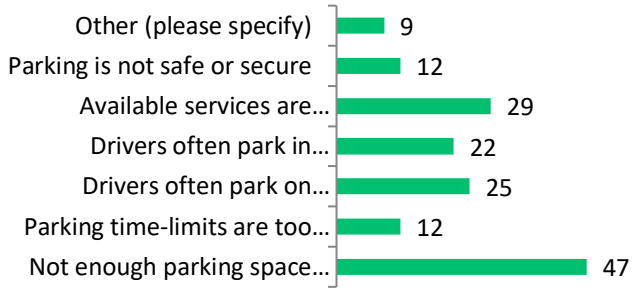
2 respondents provided follow-up information.

- Don't park here, because, there's no parking.
- Restroom

Segment G: I-5 from OR 22 in Salem to I-205 in Tualatin

Q33 What are the main truck parking issues within this segment? (Check all that apply.)

57 respondents answered this question.



Observations: The most common response by survey takers was that the main issue in this segment was "Not enough parking space specifically during peak hours", which is a common complaint in other areas and throughout Oregon. The next most common issue for survey takers was "Available services inadequate", which is followed by "Drivers often park in undesignated areas (besides highway ramps)" and "Drivers often park on highway ramps here". Other than there not being enough parking spaces, it appears that respondents had an issue a lack of services and with drivers parking in areas they aren't supposed to be parking in.

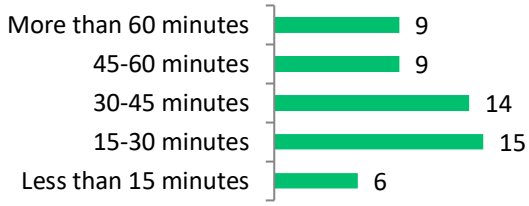
Other (please specify)

9 respondents provided follow-up information.

- 2 respondents said this segment as **limited parking**.
- 2 respondents noted that **non-trucks taking up spots** is a problem. People in RVs and cars that appear to some respondents to live at the lot, take up valuable truck parking.
- 1 respondent said this are has **traffic control** problems that deter them from parking there.
- 1 respondents noted **homelessness** as a problem in the area.

Q34 How much time do you typically spend looking for parking in this segment that would otherwise be spent traveling? (Choose one.)

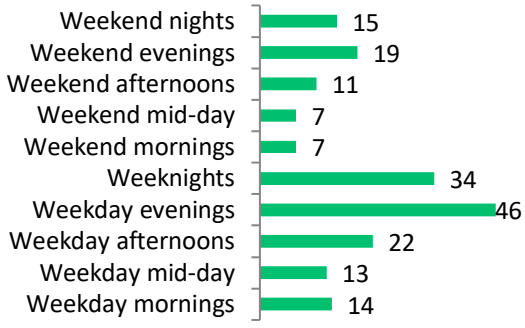
53 respondents answered this question.



Observations: The most common amount of time that respondents said they spent looking for parking was between 15 and 45 minutes. Approximately 11% of respondents said that the spend "Less than 15 minutes" looking for parking in this segment, meaning most respondents tend to spend a significant chunk of time searching for a place to park.

Q35 When do you have the most trouble finding available parking in this segment? (Choose all that apply.)

55 respondents answered this question.



Observations: Respondents most commonly said that they had difficulty finding parking on "Weekday evenings". The next most common response was "Weeknights", followed by "Weekday afternoons". This data suggests that parking difficulty increases throughout the day, and is more difficult on weekdays than weekends.

Q36 Do you have other comments on this segment or on specific locations within this segment?

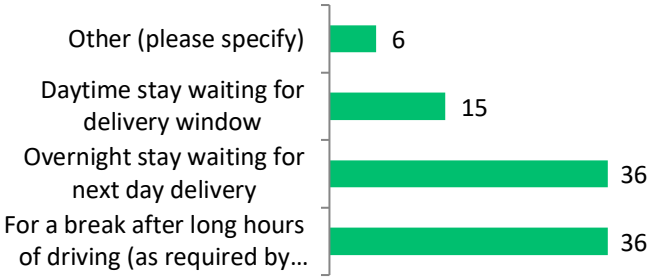
15 respondents answered this question.

- 3 respondents said that they wanted there to be **more parking**. The survey takers noted that it gets very crowded, and that parking in this area is always in-demand.
- 2 respondents cited **non-truckers at stops** as an issue. One survey taker said that there were too many car-dwellers, while another noted that there tended to be homeless in the lots.

Q37 Why do you typically park in this segment? (Check all that apply.)

56 respondents answered this question.

Observations: Most respondents stated that they were stopping in this segment for a due to the fact that they were required to stop after a certain number of hours as required by service rules and that they were stopping overnight to wait for a delivery the next day.



Other (please specify)

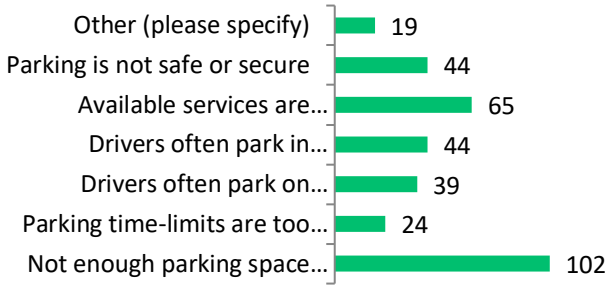
6 respondents provided follow-up information.

- 2 respondents said that they stop in this area for quick **breaks**.
- 1 respondent said they utilize stops in this segment for **everything**.

Segment H: I-5 from I-205 in Tualatin to the Columbia River

Q38 What are the main truck parking issues within this segment? (Check all that apply.)

109 respondents answered this question.



Observations: The most common response from survey takers was that there was "Not enough parking space specifically during peak hours", which is a common complaint throughout this study. The complaint about the lack of parking space garnered more than 93% of responses, while the next closest to that, "Available services inadequate", received about 60% of responses. This suggests that, even though there are complaints about other issues in this segment, the most prominent issue is parking availability.

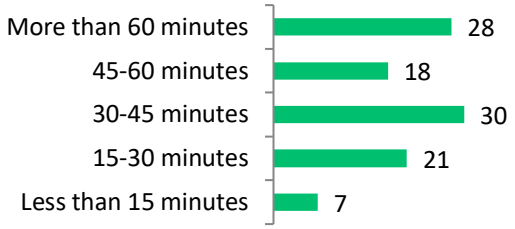
Other (please specify)

19 respondents provided follow-up information.

- 14 respondents said there is just **not enough parking** in this segment. Some said there were too few truck stops, some cited a lack of parking for deliveries, and some noted that the area has too much traffic for so few places to park.
- 1 respondent said that **local drivers parking at stops** and leaving their trucks there was an issue taking up space.
- 1 respondent noted **homelessness** as an issue that they run into here.

Q39 How much time do you typically spend looking for parking in this segment that would otherwise be spent traveling? (Choose one.)

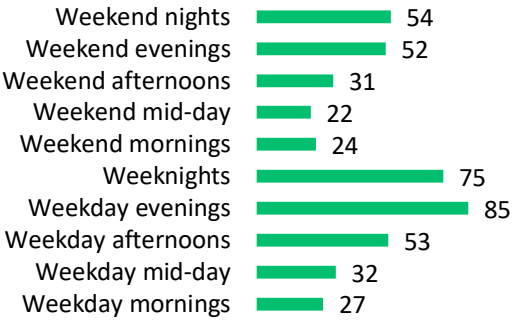
104 respondents answered this question.



Observations: The most common response from survey takers was that finding parking typically takes between "30-45 minutes" but is closely followed by "More than 60 minutes". There were very few respondents that said it took "Less than 15 minutes" to find parking, meaning that, although the time it takes varies, it is still time consuming.

Q40 When do you have the most trouble finding available parking in this segment? (Choose all that apply.)

103 respondents answered this question.



Observations: Respondents most commonly said that they had difficulty finding parking on "Weekday evenings". The next most common response was "Weeknights", followed by "Weekend nights", "Weekday afternoons", and "Weekend evenings". This data suggests that parking difficulty increases throughout the day on both the weekday and weekend.

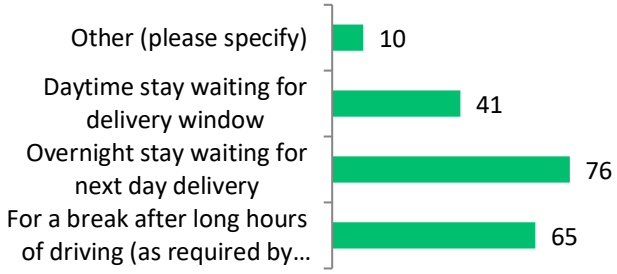
Q41 Do you have other comments on this segment or on specific locations within this segment?

34 respondents answered this question.

- 22 respondents said that they believed there needed to be **more parking** or that there simply wasn't enough. Some said that there was absolutely nothing available in the area, while others said the lack of availability forces them to park in less safe areas.
- 5 respondents said there is just **no space** for trucks, both on the roads and in the city.
- One respondent said there tended to be a lot of **non-truckers in lots** in this area taking up space.

Q42 Why do you typically park in this segment? (Check all that apply.)

104 respondents answered this question.



Observations: Most respondents stated that they were stopping in this segment for an "Overnight stay waiting for next day delivery". The second most common response was that respondents took a break as required by hours of service rules. The two most common responses track with many of the other areas, but in this segment more respondents tended to stay for next day delivery rather than because they were required by hours of service rules, which is different than most other sections.

Other (please specify)

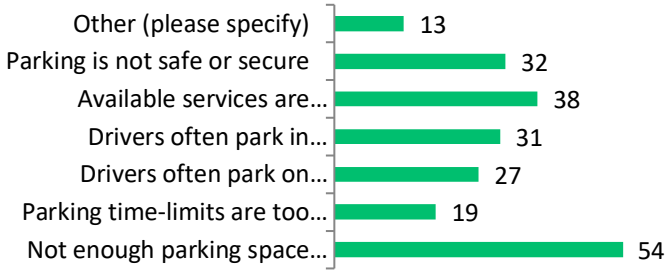
10 respondents provided follow-up information.

- 3 respondents said that they will **avoid this area** at all costs.
- 2 respondents said they stop in this section for **home time**.

Segment I: I-205 from I-5 in Tualatin to the Columbia River

Q43 What are the main truck parking issues within this segment? (Check all that apply.)

64 respondents answered this question.



Observations: The most common response from survey takers was that there was "Not enough parking space specifically during peak hours", which is a common complaint throughout this study. The complaint about the lack of parking space garnered more than 84% of responses, while the next closest to that, "Available services inadequate", received about 59% of responses. This suggests that, even though there are complaints about other issues in this segment, the most prominent issue is parking availability.

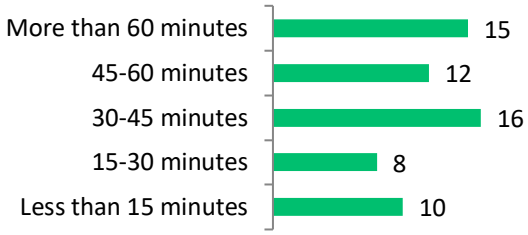
Other (please specify)

13 respondents provided follow-up information.

- 13 respondents said there is virtually **no parking** in this area. Many cited the high demand that contrasts with the low availability.

Q44 How much time do you typically spend looking for parking in this segment that would otherwise be spent traveling? (Choose one.)

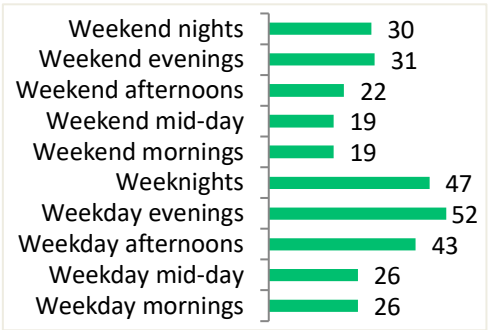
61 respondents answered this question.



Observations: The most common response from survey takers was that finding parking typically takes between "30-45 minutes" but is closely followed by "More than 60 minutes" and then "45-60 minutes". Only about 16% of respondents said that it took "Less than 15 minutes", while about 71% said that it took them more than 30 minutes.

Q45 When do you have the most trouble finding available parking in this segment? (Choose all that apply.)

62 respondents answered this question.



Observations: Respondents most commonly said that they had difficulty finding parking on "Weekday evenings". The next most common response was "Weeknights", followed by "Weekday afternoons". This data suggests that parking difficulty increases throughout the day, specifically on weekdays.

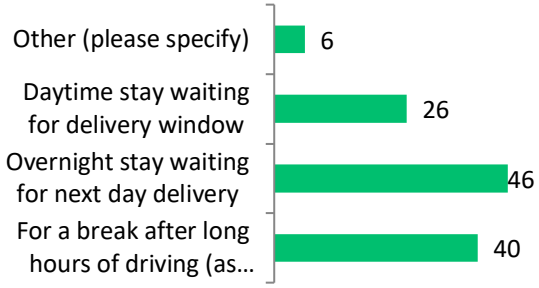
Q46 Do you have other comments on this segment or on specific locations within this segment?

23 respondents answered this question.

- 17 respondents said there is virtually no parking and that there needed to be **more parking** in this segment. Several said they don't even bother looking in this area.
- One respondent noted that the only parking is hard to find, and you have to know where to look.

Q47 Why do you typically park in this segment? (Check all that apply.)

61 respondents answered this question.



Observations: Most respondents stated that they were stopping in this segment for an "Overnight stay waiting for next day delivery". The second most common response was that respondents took a break as required by hours of service rules. The two most common responses track with many of the other areas, but in this segment more respondents tended to stay for next day delivery rather than because they were required by hours of service rules, which is different than most other sections.

Other (please specify)

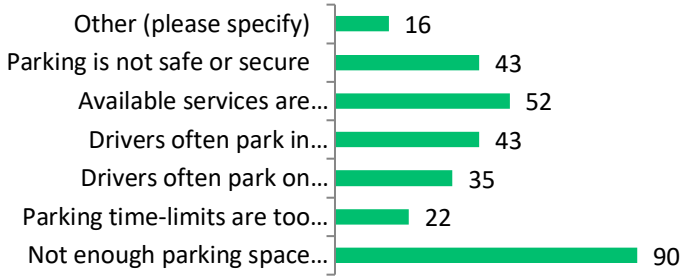
6 respondents provided follow-up information.

- 2 respondents said they stop in this segment **after deliveries** to rest.
- 2 respondents said there is **no place to stop** in this segment.

Segment J: I-84 from I-5 in Portland to the Sandy River in Troutdale

Q48 What are the main truck parking issues within this segment? (Check all that apply.)

101 respondents answered this question.



Observations: The most common response from survey takers was that there was "Not enough parking space specifically during peak hours", which is a common complaint throughout this study. There were also complaints about inadequate services, parking not being safe or secure, and drivers not parking where they should be parking, but far fewer respondents selected those as pressing issues than parking availability.

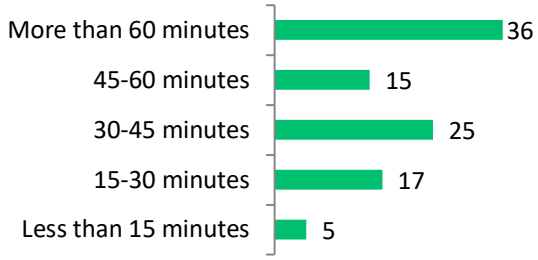
Other (please specify)

16 respondents provided follow-up information.

- 8 respondents said they saw **high demand and a need for additional parking**. Many said that lots fill up quick, and there is a need for more lots.
- 1 respondent said they felt **mistreated** when parking in commercial areas.
- 1 respondent cited **homelessness** in the area as a problem.

Q49 How much time do you typically spend looking for parking in this segment that would otherwise be spent traveling? (Choose one.)

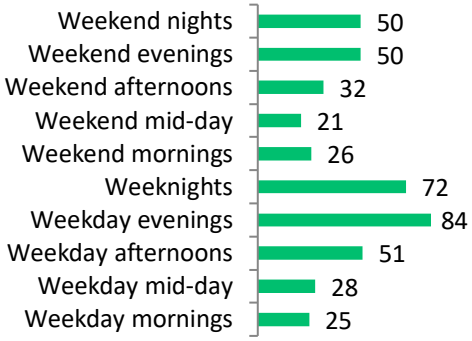
98 respondents answered this question.



Observations: The most common response from survey takers was that finding parking typically takes "More than 60 minutes". About 83% of respondents said that it takes them more than 15 minutes to find parking in this section. The responses show that the time it takes to find parking varies, but generally takes respondents quite a while.

Q50 When do you have the most trouble finding available parking in this segment? (Choose all that apply.)

99 respondents answered this question.



Observations: Respondents most commonly said that they had difficulty finding parking on "Weekday evenings". The next most common response was "Weeknights", followed by "Weekday afternoons", "Weekend evenings" and "Weekend nights". This data suggests that parking difficulty increases throughout the day, specifically on weekdays, but also later in the day on weekends.

Q51 Do you have other comments on this segment or on specific locations within this segment?

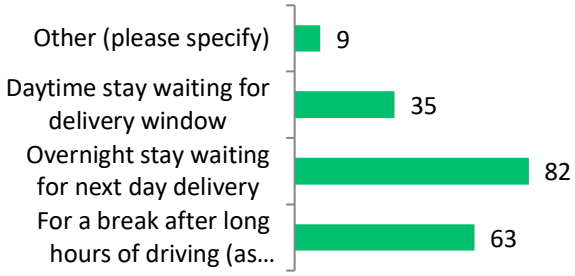
35 respondents answered this question.

- 18 respondents cited the need for **more parking** in this area. 2 of those respondents also noted that the parking needs to be **dedicated truck parking**, as there is not enough available.
- 3 survey takers noted that **homeless** people were a problem in this area, making them feel unsafe.

Q52 Why do you typically park in this segment? (Check all that apply.)

99 respondents answered this question.

Observations: Most respondents stated that they were stopping in this segment for an "Overnight stay waiting for next day delivery". The second most common response was that respondents took a break as required by hours of service rules. The two most common responses track with many of the other areas, but in this segment more respondents tended to stay for next day delivery rather than because they were required by hours of service rules, which is different than most other sections.



Other (please specify)

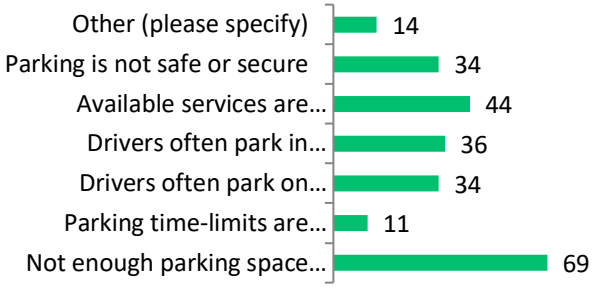
9 respondents provided follow-up information.

- 3 respondents said they stop here for **hours of service** regulation compliance.
- 3 respondents said they stop in this segment for various **breaks**, such as for meals or sleep.

Segment K: I-84 from the Sandy River in Troutdale to US 97 in Biggs Junction

Q53 What are the main truck parking issues within this segment? (Check all that apply.)

81 respondents answered this question.



Observations: The most common response from survey takers was that there was "Not enough parking space specifically during peak hours", which is a common complaint throughout this study. There were also complaints about inadequate services, parking not being safe or secure, and drivers not parking where they should be parking, but far fewer respondents selected those as pressing issues than parking availability.

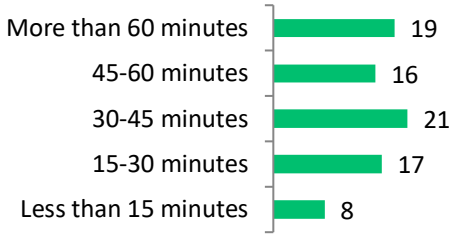
Other (please specify)

14 respondents provided follow-up information.

- 7 respondents said that there is a general **lack of parking** in this area. Some said the parking that is available is not safe, and 1 respondent said the problem is that there is only one rest area.

Q54 How much time do you typically spend looking for parking in this segment that would otherwise be spent traveling? (Choose one.)

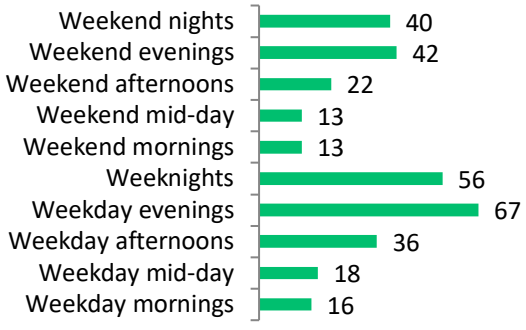
81 respondents answered this question.



Observations: The most common response from survey takers was that finding parking typically takes between "30-45 minutes". About 90% of respondents said that it takes them more than 15 minutes to find parking in this section. The responses show that the time it takes to find parking varies, but generally takes respondents quite a while.

Q55 Segment K: I-84 from the Sandy River in Troutdale to US 97 in Biggs Junction - When do you have the most trouble finding available parking in this segment? (Choose all that apply.)

79 respondents answered this question.



Observations: Respondents most commonly said that they had difficulty finding parking on "Weekday evenings". The next most common response was "Weeknights", followed by "Weekend evenings", "Weekday afternoons", and "Weekend nights". This data suggests that parking difficulty increases throughout the day, specifically on weekdays, but also later in the day on weekends.

Q56 Do you have other comments on this segment or on specific locations within this segment?

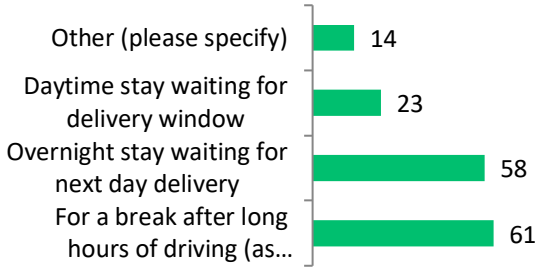
31 respondents answered this question.

- 15 respondents said that they believed there needed to be **more parking**. There were similar complaints to other sections a general lack of parking in the area.
- One survey taker said that the parking that is available is unsafe.

Q57 Why do you typically park in this segment? (Check all that apply.)

79 respondents answered this question.

Observations: Most respondents stated that they were stopping in this segment for either a break as required by hours of service rules or an "Overnight stay waiting for next day delivery". The two top responses track with most other segments as popular reasons respondents stop.



Other (please specify)

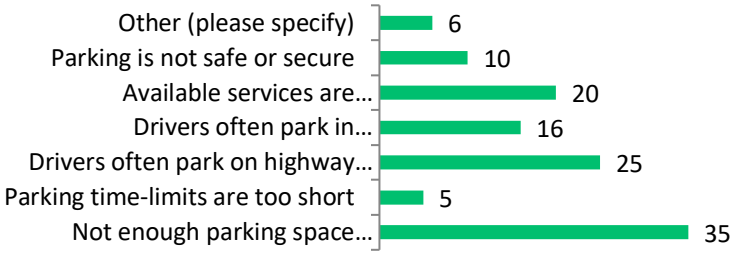
14 respondents provided follow-up information.

- 3 respondents said they stop in this area due to **hours requirements**.
- 2 respondents said that this area is a good place to stop at and is **highly sought after** for meal and rest breaks.

Segment L: I-84 from US 97 in Biggs Junction to US 395 in Pendleton

Q58 What are the main truck parking issues within this segment? (Check all that apply.)

43 respondents answered this question.



Observations: The most common response from survey takers was that there was "Not enough parking space specifically during peak hours", which is a common complaint throughout this study. There were also complaints about inadequate services, parking not being safe or secure, and drivers not parking where they should be parking, but far fewer respondents selected those as pressing issues than parking availability.

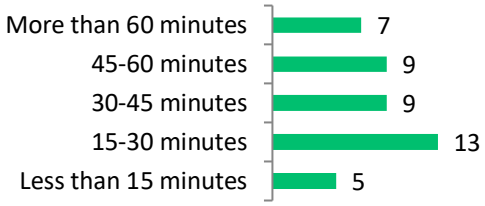
Other (please specify)

6 respondents provided follow-up information.

- 2 respondents said there is simply **not enough** parking in this area.
- 1 respondent noted that, of the available parking, there is **too much paid parking**.

Q59 How much time do you typically spend looking for parking in this segment that would otherwise be spent traveling? (Choose one.)

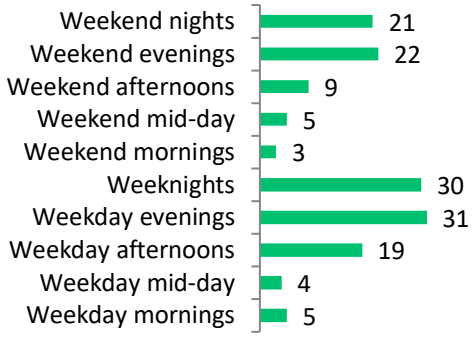
43 respondents answered this question.



Observations: The most common response from survey takers was that finding parking typically takes between "15-30". About 88% of respondents said that it takes them more than 15 minutes to find parking in this section. The responses show that the time it takes to find parking varies, but generally takes respondents quite a while.

Q60 When do you have the most trouble finding available parking in this segment? (Choose all that apply.)

41 respondents answered this question.



Observations: Respondents most commonly said that they had difficulty finding parking on "Weekday evenings". The next most common response was "Weeknights", followed by "Weekend evenings", "Weekend nights", and "Weekday afternoons". This data suggests that parking difficulty increases throughout the day, specifically on weekdays, but also later in the day on weekends.

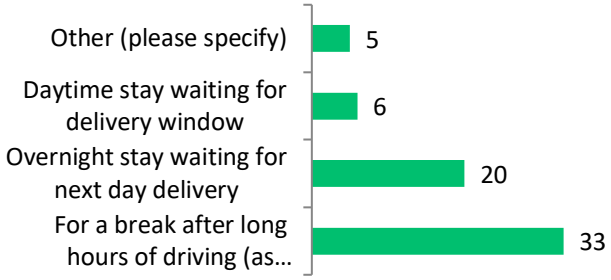
Q61 Do you have other comments on this segment or on specific locations within this segment?

13 respondents answered this question.

- 6 respondents said there is **limited parking** in this area and there needs to be more. The complaint was similar to other segments, but some survey takers said parking is adequate.

Q62 Why do you typically park in this segment? (Check all that apply.)

41 respondents answered this question.



Observations: Most respondents stated that they were stopping in this segment for a break as required by hours of service rules. More than 80% of respondents identified the hours of service reason as why they typically park, with the next closes response being "Overnight stay waiting for next day delivery", which about 49% of respondents identified as a reason. The two top responses track with most other segments as popular reasons respondents stop, but there is more disparity between them here than in other segments.

Other (please specify)

5 respondents provided follow-up information.

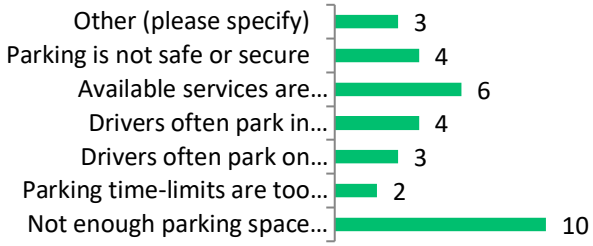
- I stop to eat, sleep and for breaks.
- Tired RV drivers need more rest areas too.
- Weather conditions
- Sleep
- Road closures due to weather

Segment M: OR 22 and US 20 from I-5 in Salem to US 97 in Bend

Q63 What are the main truck parking issues within this segment? (Check all that apply.)

13 respondents answered this question.

Observations: The most common response from survey takers was that there was "Not enough parking space specifically during peak hours", which is a common complaint throughout this study. There were also complaints about inadequate services, parking not being safe or secure, and drivers not parking where they should be parking, but far fewer respondents selected those as pressing issues than parking availability. The most prevalent complaint other than the lack of parking was that of inadequate services.



Other (please specify)

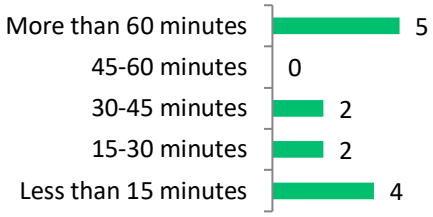
3 respondents provided follow-up information.

- I didn't find this route to appealing, nevertheless I am glad for this route, for is alternate for US 26 and US 58 in the winter. This area would benefit from a smaller truck rest area.
- No truck parking anywhere
- There's no place to PARK. I been run out of anyplace I try to park. Security cops. Bend has no parking

Q64 How much time do you typically spend looking for parking in this segment that would otherwise be spent traveling? (Choose one.)

13 respondents answered this question.

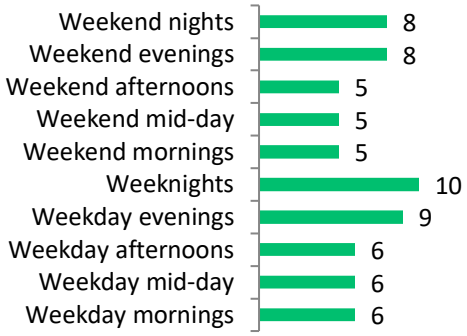
Observations: The responses in this segment present a varied amount of time it takes to park. The two most popular responses were "More than 60 minutes" and "Less than 15 minutes".



Q65 When do you have the most trouble finding available parking in this segment? (Choose all that apply.)

12 respondents answered this question.

Observations: Respondents most commonly said that they had difficulty finding parking on "Weeknights". The next most common response was "Weekday evenings", followed by "Weekend evenings" and "Weekend nights". This data suggests that parking difficulty increases throughout the day, specifically on weekdays.



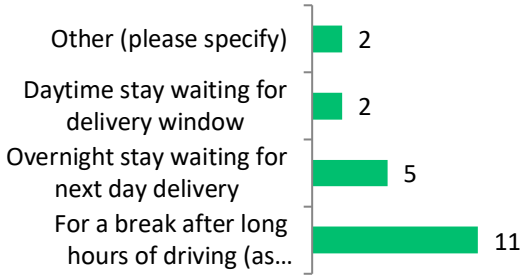
Q66 Do you have other comments on this segment or on specific locations within this segment?

5 respondents answered this question.

- 2 respondents said there is a need for **more parking**.

Q67 Why do you typically park in this segment? (Check all that apply.)

12 respondents answered this question.



Observations: Most respondents stated that they were stopping in this segment for a break as required by hours of service rules. More than 91% of respondents identified the hours of service reason as why they typically park, with the next closes response being "Overnight stay waiting for next day delivery", which about 42% of respondents identified as a reason. The two top responses track with most other segments as popular reasons respondents stop, but there is more disparity between them here than in other segments. Hours of service rules are by far the most popular reason that respondents say they stop in this segment.

Other (please specify)

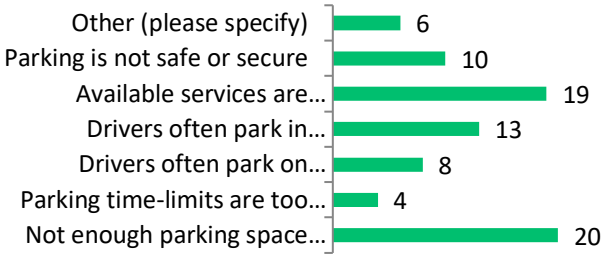
2 respondents provided follow-up information.

- Whatever I need according to the log
- Sleep

Segment N: US 97 from I-84 in Biggs Junction to US 26 in Madras

Q68 What are the main truck parking issues within this segment? (Check all that apply.)

28 respondents answered this question.



Observations: The most common responses from survey takers were that there was "Not enough parking space specifically during peak hours", which is a common complaint throughout this study, and "Available services are inadequate". There were also complaints about parking not being safe or secure and drivers not parking where they should be parking, but far fewer respondents selected those as pressing issues than parking availability and lack of adequate services.

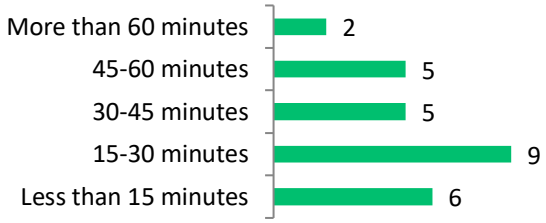
Other (please specify)

6 respondents provided follow-up information.

- 6 respondents said that there was **no parking** or **not enough places to stop** in this segment.

Q69 How much time do you typically spend looking for parking in this segment that would otherwise be spent traveling? (Choose one.)

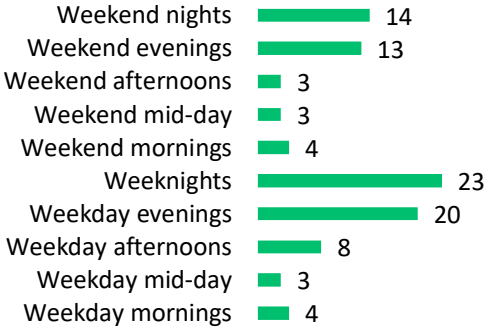
27 respondents answered this question.



Observations: The most popular response in this segment was that parking took between "15-30 minutes" which is followed by "Less than 15 minutes". While many respondents cited longer parking search times, many said they didn't spend as much time here as in some other places.

Q70 When do you have the most trouble finding available parking in this segment? (Choose all that apply.)

25 respondents answered this question.



Observations: Respondents most commonly said that they had difficulty finding parking on "Weeknights". The next most common response was "Weekday evenings", followed by "Weekend nights" and "Weekend evenings". This data suggests that parking is specifically difficult in the evening and nighttime during both the week and the weekend.

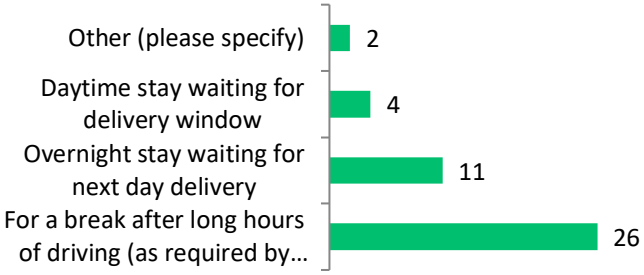
Q71 Do you have other comments on this segment or on specific locations within this segment?

7 respondents answered this question.

- 4 respondents noted that there is **little to no designated parking**. Some said that there are rest areas to park at, but many drivers wind up parking on the side of the road due to a lack of availability in this segment.

Q72 Why do you typically park in this segment? (Check all that apply.)

26 respondents answered this question.



Observations: Most respondents stated that they were stopping in this segment for a break as required by hours of service rules. 100% of respondents identified the hours of service reason as why they typically park, with the next closes response being "Overnight stay waiting for next day delivery", which about 42% of respondents identified as a reason. Hours of service rules are by far the most popular reason that respondents say they stop in this segment.

Other (please specify)

2 respondents provided follow-up information.

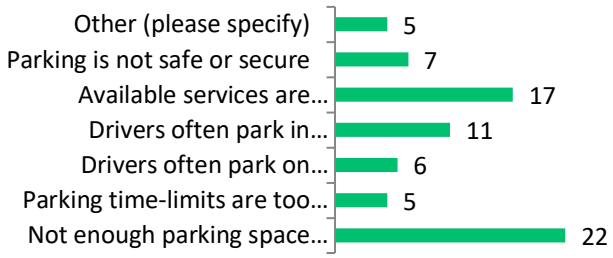
- I stop for sleep in the winter, and for breaks.
- Most of the time my driving hours ends in middle of this road

Segment O: US 97 from US 26 in Madras to US 20 in Bend

Q73 What are the main truck parking issues within this segment? (Check all that apply.)

28 respondents answered this question.

Observations: The most common responses from survey takers were that there was "Not enough parking space specifically during peak hours", which is a common complaint throughout this study. Another common complaint was that "Available services are inadequate", which is also a frequent complaint in this study. There were also complaints about parking not being safe or secure and drivers not parking where they should be parking, but far fewer respondents selected those as pressing issues than parking availability.



Other (please specify)

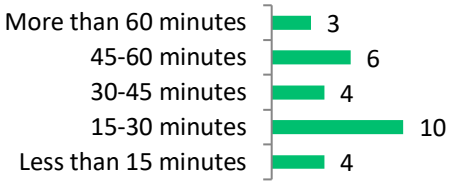
5 respondents provided follow-up information.

- There is no parking
- Limited parking for over dimensional loads
- No designated parking.
- The Bend Sisters area has become very truck unfriendly
- Do not plan on stopping

Q74 How much time do you typically spend looking for parking in this segment that would otherwise be spent traveling? (Choose one.)

27 respondents answered this question.

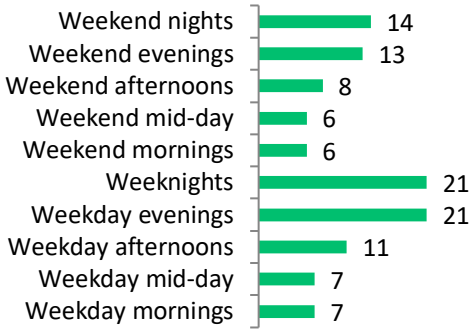
Observations: The most popular response in this segment was that parking took between "15-30 minutes". While respondents had various difficulty finding parking in this segment, the data suggests most don't spend more than 30 minutes searching in this area.



Q75 When do you have the most trouble finding available parking in this segment? (Choose all that apply.)

26 respondents answered this question.

Observations: Respondents most commonly said that they had difficulty finding parking on "Weeknights" and "Weekday evenings". The next most common response was "Weekend nights", followed by "Weekend evenings" and "Weekday afternoons". This data suggests that parking is specifically difficult in the evening and nighttime during both the week and the weekend, but more difficult during the week.



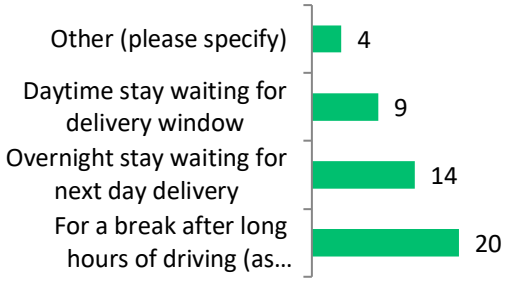
Q76 Do you have other comments on this segment or on specific locations within this segment?

11 respondents answered this question.

- 6 respondents noted that there is **limited parking** in this segment. Some said there is no parking at all, while others said that if you don't arrive early you will not find parking.

Q77 Why do you typically park in this segment? (Check all that apply.)

26 respondents answered this question.



Observations: Most respondents stated that they were stopping in this segment for a break as required by hours of service rules. Approximately 77% of respondents identified the hours of service reason as why they typically park, with the next closes response being "Overnight stay waiting for next day delivery", which about 54% of respondents identified as a reason. Hours of service rules are again the most popular reason that respondents say they stop in this segment, but "Overnight stay waiting for next day delivery" was a relatively close second.

Other (please specify)

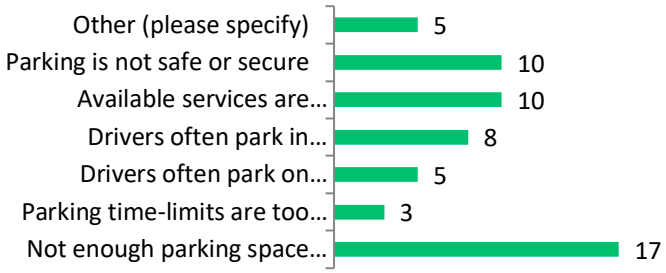
4 respondents provided follow-up information.

- For my 10-hour break or my 30 minutes mandatory break
- When out of hours for the day
- One cannot stop
- I don't bother to look

Segment P: US 20 from US 97 in Bend to US 395 in Riley

Q78 What are the main truck parking issues within this segment? (Check all that apply.)

19 respondents answered this question.



Observations: The most common responses from survey takers were that there was "Not enough parking space specifically during peak hours", which is a common complaint throughout this study. Other common complaints were that "Available services are inadequate", which is also a frequent complaint in this study, and "Parking is not safe or secure". There were also complaints about drivers not parking where they should be parking, but the prevalence of responses noting safety and security as an issue sets this section apart from many others.

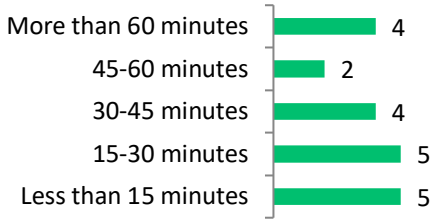
Other (please specify)

5 respondents provided follow-up information.

- Only a very few pull outs available, none are safe from accidents.
- Parking is not much of a problem in this area. there are a few places to stop along the way.
- More parking
- There is no safe, legal truck parking in Bend. There is also no fueling for big trucks other than cardlocks
- Basically, no parking available except the few spaces at the Brothers rest area.

Q79 How much time do you typically spend looking for parking in this segment that would otherwise be spent traveling? (Choose one.)

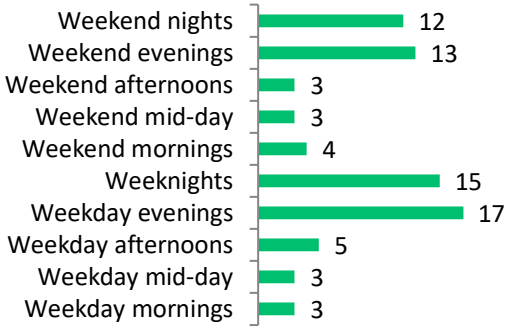
20 respondents answered this question.



Observations: 50% of respondents said that finding parking in this section took 30 minutes or less. While respondents had various difficulty finding parking in this segment, the data suggests most don't spend more than 30 minutes searching in this area.

Q80 When do you have the most trouble finding available parking in this segment? (Choose all that apply.)

18 respondents answered this question.



Observations: Respondents most commonly said that they had difficulty finding parking on "Weekday evenings", followed by "Weeknights". The next most common response was "Weekend evenings", followed by "Weekend nights". This data suggests that parking is specifically difficult in the evening and nighttime during both the week and the weekend, but more difficult during the week.

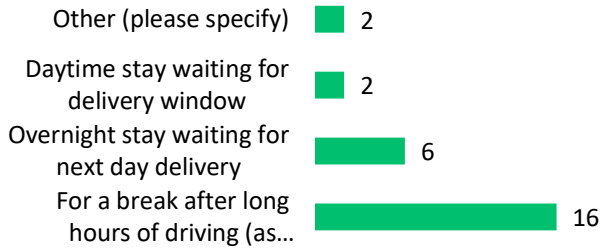
Q81 Do you have other comments on this segment or on specific locations within this segment?

8 respondents answered this question.

- 4 respondents said that they believed there needed to be **more parking**.
- 2 respondents said that they thought **parking was** adequate in this segment.

Q82 Why do you typically park in this segment? (Check all that apply.)

20 respondents answered this question.



Observations: Most respondents stated that they were stopping in this segment for a break as required by hours of service rules. Approximately 80% of respondents identified the hours of service reason as why they typically park, with the next closes response being "Overnight stay waiting for next day delivery", which about 30% of respondents identified as a reason. Hours of service rules are again the most popular reason that respondents say they stop in this segment, but "Overnight stay waiting for next day delivery" was a far second.

Other (please specify)

2 respondents provided follow-up information.

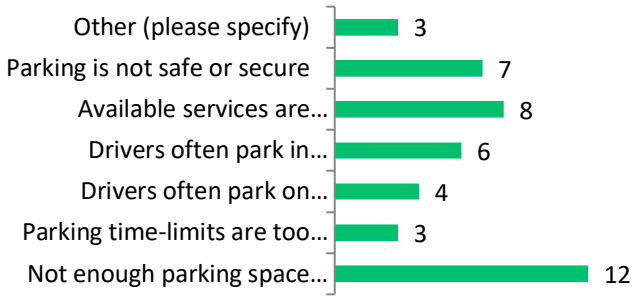
- I do this trip every week and know every stop. I plan my break at the couple of safe places there
- Sleep

Segment Q: US 20 from US 395 in Riley to the Idaho State Border in Nyssa

Q83 What are the main truck parking issues within this segment? (Check all that apply.)

15 respondents answered this question.

Observations: The most common responses from survey takers were that there was "Not enough parking space specifically during peak hours", which is a common complaint throughout this study. Other common complaints were about inadequate services, safety and security, and drivers not parking where they should be parking, but these complaints are all grouped around the same percentage of respondents. The most prevalent complaint is again about a lack of parking.



Other (please specify)

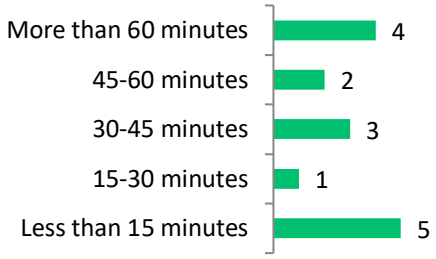
3 respondents provided follow-up information.

- Parking is not a big problem in my opinion in this segment
- There is only 1 truckstop available in Hines, OR with 1 small rest area available.
- The whole state is short on parking between the locals and the rvs there is a hand full of spots

Q84 How much time do you typically spend looking for parking in this segment that would otherwise be spent traveling? (Choose one.)

15 respondents answered this question.

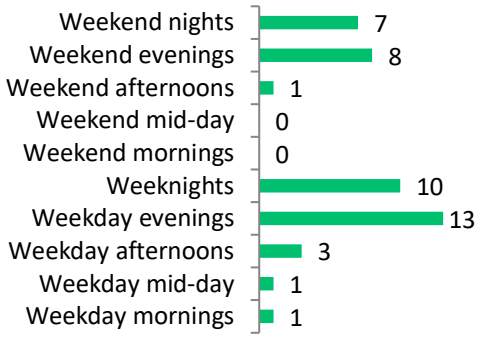
Observations: The parking times in this area were varied, as reported by respondents. With "Less than 15 minutes" being the most response, followed by "More than 60 minutes", suggesting that the amount of time it takes to park in this segment varies depending on several factors.



Q85 When do you have the most trouble finding available parking in this segment? (Choose all that apply.)

14 respondents answered this question.

Observations: Respondents most commonly said that they had difficulty finding parking on "Weekday evenings", followed by "Weeknights". The next most common response was "Weekend evenings", followed by "Weekend nights". This data suggests that parking is specifically difficult in the evening and nighttime during both the week and the weekend, but more difficult during the week.



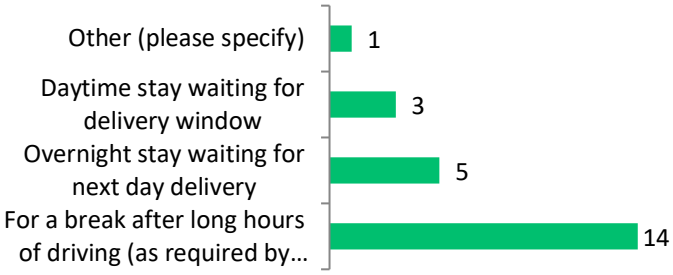
Q86 Do you have other comments on this segment or on specific locations within this segment?

3 respondents answered this question.

- 2 respondents said that they found there to be **no parking** in this section.

Q87 Why do you typically park in this segment? (Check all that apply.)

16 respondents answered this question.



Observations: Most respondents stated that they were stopping in this segment for a break as required by hours of service rules. Approximately 80% of respondents identified the hours of service reason as why they typically park, with the next closes response being "Overnight stay waiting for next day delivery", which about 30% of respondents identified as a reason. Hours of service rules are again the most popular reason that respondents say they stop in this segment, but "Overnight stay waiting for next day delivery" was a far second.

Other (please specify)

1 respondent provided follow-up information.

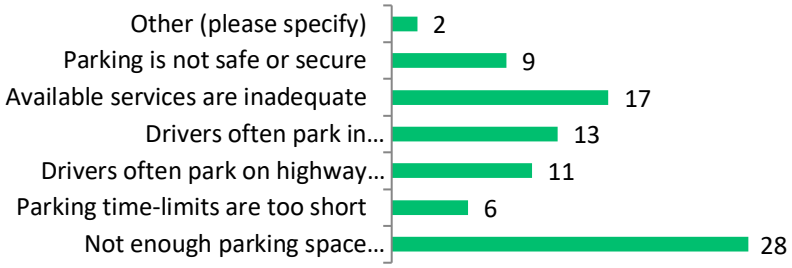
- I stop to sleep when I drive through here.

Segment R: US 97 from the California State Border to OR 58 near Chemult

Q93 What are the main truck parking issues within this segment? (Check all that apply.)

32 respondents answered this question.

Observations: The most common responses from survey takers were that there was "Not enough parking space specifically during peak hours", which is a common complaint throughout this study. Other common complaints were about inadequate services and drivers not parking where they should be parking. The most prevalent complaint, is again about a lack of parking.



Other (please specify)

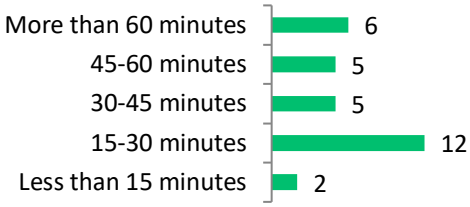
2 respondents provided follow-up information.

- Parking is needed along this route specially in the winter
- More parking

Q94 How much time do you typically spend looking for parking in this segment that would otherwise be spent traveling? (Choose one.)

30 respondents answered this question.

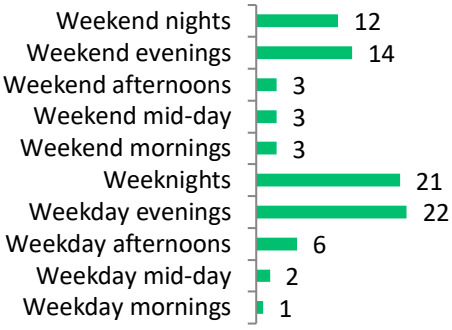
Observations: The most popular response by survey takers was that parking in the area took "15-30 minutes", which was selected by 20% more respondents than the next closest answer. 80% of respondents said that parking in the area took under an hour, which means that while parking is difficult in this segment, it is not as bad as some other areas.



Q95 When do you have the most trouble finding available parking in this segment? (Choose all that apply.)

31 respondents answered this question.

Observations: Respondents most commonly said that they had difficulty finding parking on "Weekday evenings", followed by "Weeknights". The next most common response was "Weekend evenings", followed by "Weekend nights". This data suggests that parking is specifically difficult in the evening and nighttime during both the week and the weekend, but more difficult during the week.



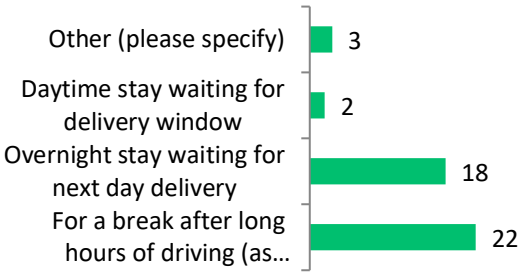
Q96 Do you have other comments on this segment or on specific locations within this segment?

10 respondents answered this question.

- 7 respondents noted that there was **limited parking** in this segment. One noted that parking couldn't be found after 3pm, another said winter is more difficult, and another said that there is limited safe parking.

Q97 Why do you typically park in this segment? (Check all that apply.)

31 respondents answered this question.



Observations: Most respondents stated that they were stopping in this segment for a break as required by hours of service rules. Approximately 71% of respondents identified the hours of service reason as why they typically park, with the next closes response being "Overnight stay waiting for next day delivery", which about 58% of respondents identified as a reason. Hours of service rules are again the most popular reason that respondents say they stop in this segment, but "Overnight stay waiting for next day delivery" was again the second most popular answer.

Other (please specify)

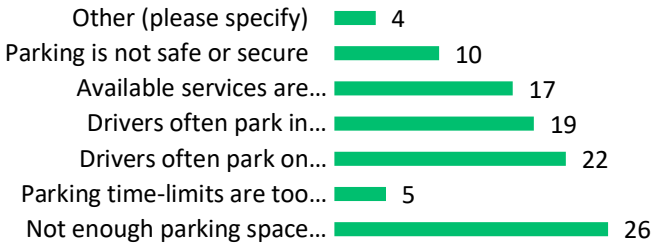
3 respondent provided follow-up information.

- I stop at various locations depending on availability, and winter is bad in this segment.
- Meal and fuel stops
- Sleep

Segment S: I-85 from US 395 in Pendleton to the Idaho State Border in Ontario

Q88 What are the main truck parking issues within this segment? (Check all that apply.)

33 respondents answered this question.



Observations: The most common responses from survey takers were that there was "Not enough parking space specifically during peak hours", which is a common complaint throughout this study. Other common complaints were about drivers not parking where they should be parking and inadequate services, but these complaints are all grouped around the same percentage of respondents. The most prevalent complaint, is again about a lack of parking.

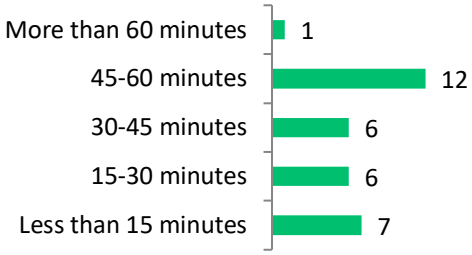
Other (please specify)

4 respondents provided follow-up information.

- Truck stop has overflow parking and they do not use it.
- There is parking along this segment but more is needed for the winter season, when parking is in high demand
- Oregon often shut road down or uses chain laws when not really necessary
- Not enough room to park during road closures

Q89 How much time do you typically spend looking for parking in this segment that would otherwise be spent traveling? (Choose one.)

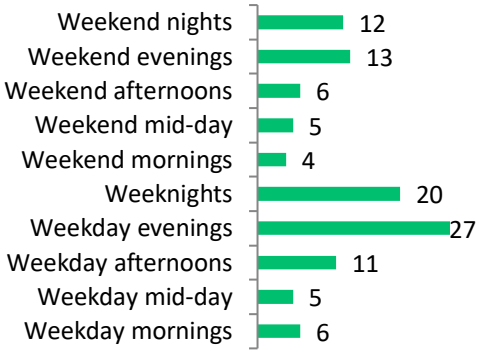
32 respondents answered this question.



Observations: The most popular response by survey takers was that parking in the area took "45-60 minutes". Only about 3% pf respondents said that it took "More than 60 minutes" to find parking, whereas about 22% of respondents said that parking took them "Less than 15 minutes", suggesting parking likely takes most people between 15 minutes to an hour.

Q90 When do you have the most trouble finding available parking in this segment? (Choose all that apply.)

31 respondents answered this question.



Observations: Respondents most commonly said that they had difficulty finding parking on "Weekday evenings", followed by "Weeknights". The next most common response was "Weekend evenings", followed by "Weekend nights". This data suggests that parking is specifically difficult in the evening and nighttime during both the week and the weekend, but more difficult during the week.

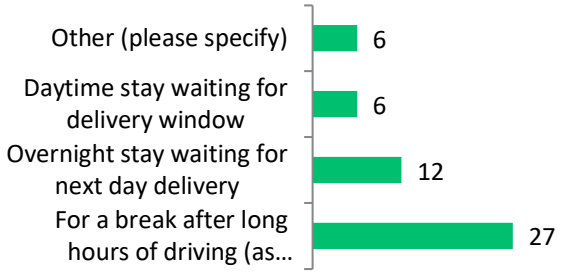
Q91 Do you have other comments on this segment or on specific locations within this segment?

9 respondents answered this question.

- 2 respondents said that they believed there needed to be **more parking**.
- One respondent cited a need for **more services**.

Q92 Why do you typically park in this segment? (Check all that apply.)

16 respondents answered this question.



Observations: Most respondents stated that they were stopping in this segment for a break as required by hours of service rules. Approximately 87% of respondents identified the hours of service reason as why they typically park, with the next closes response being "Overnight stay waiting for next day delivery", which about 39% of respondents identified as a reason. Hours of service rules are again the most popular reason that respondents say they stop in this segment, but "Overnight stay waiting for next day delivery" was again the second most popular answer.

Other (please specify)

6 respondent provided follow-up information.

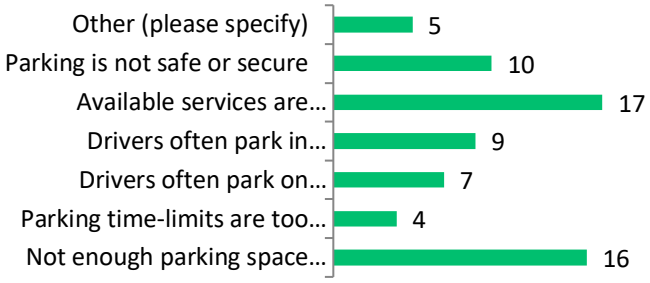
- 4 respondents said they stop in this segment for **routine breaks** such as some sleep, safety checks, restroom use, or just a 30-minute break.
- 2 respondents said they stop in this segment for **closures and weather conditions**.

Segment T: US 97 from OR 58 near Chemult to US 20 in Bend

Q98 What are the main truck parking issues within this segment? (Check all that apply.)

24 respondents answered this question.

Observations: The most common responses from survey takers were that there was "Available services are inadequate", which is a common complaint in most areas, but not usually the most identified. The lack of parking is a close second to inadequate services, and the two are much more popular selections than any other options, as is the case throughout this study.



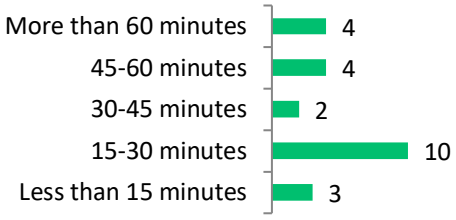
Other (please specify)

5 respondents provided follow-up information.

- This area would benefit from a truck parking location
- To many RV taking up space
- Need more designated spaces
- More parking
- Only 1 truckstop available at Wikiup Jct / no rest areas NB / SB

Q99 How much time do you typically spend looking for parking in this segment that would otherwise be spent traveling? (Choose one.)

23 respondents answered this question.

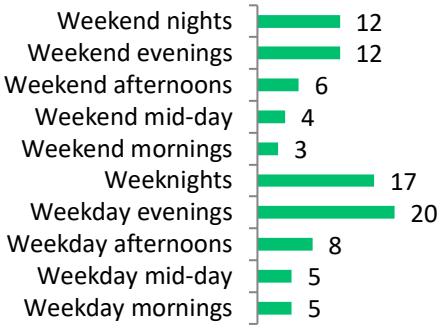


Observations: The most popular response by survey takers was that parking in the area took "15-30 minutes", which was selected by more than 25% more respondents than the next closest answer. About 83% of respondents said that parking in the area took under an hour, which means that while parking is difficult in this segment. More than half of respondents said that parking took under 30 minutes in this section.

Q95 When do you have the most trouble finding available parking in this segment? (Choose all that apply.)

25 respondents answered this question.

Observations: Respondents most commonly said that they had difficulty finding parking on "Weekday evenings", followed by "Weeknights". The next most common response was "Weekend evenings" and "Weekend nights". This data suggests that parking is specifically difficult in the evening and nighttime during both the week and the weekend, but more difficult during the week.



Q101 Do you have other comments on this segment or on specific locations within this segment?

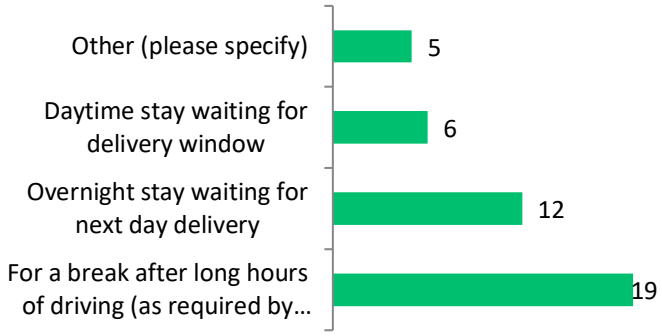
8 respondents answered this question.

- 5 respondents noted that there is **limited parking** in this segment.

Q102 Why do you typically park in this segment? (Check all that apply.)

25 respondents answered this question.

Observations: Most respondents stated that they were stopping in this segment for a break as required by hours of service rules. The two most common answers in all other sections apply here as well. Respondents tend to park due to requirements of hours of service rules or "Overnight stay waiting for next delivery".



Other (please specify)

5 respondent provided follow-up information.

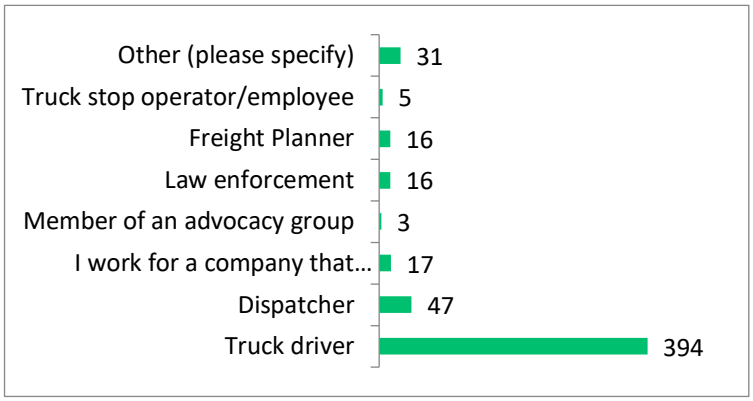
- I stop to rest and sleep along this segment.
- Loads take me this way
- To comply with HOS
- Sleep
- Overnight parking for required 10 break

Respondent Information

Q103 How would you describe yourself? (Check all that apply.)

447 respondents answered this question.

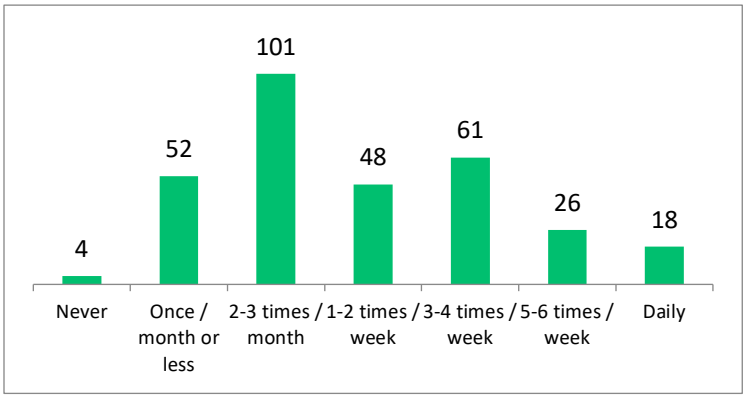
Observations: The most prevalent descriptor that respondents used to identify themselves was "Truck Driver" at about 88%. The next closest respondent was a "Dispatcher". The overwhelming message of these demographics is that the people providing responses about what parking in Oregon is like are the same ones that are looking for parking on a regular basis.



Q104 How often do you look for parking in Oregon? (Choose one.)

310 respondents answered this question.

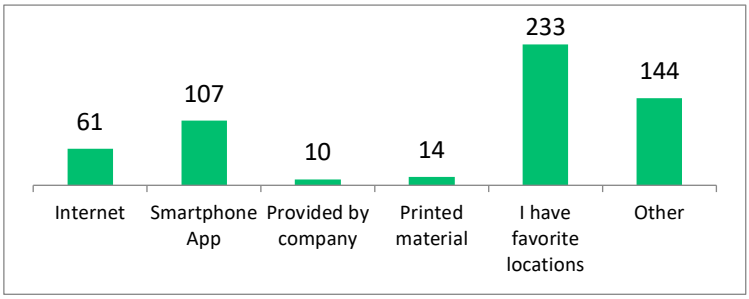
Observations: The most common response by survey takers was that they look for parking in Oregon about "2-3 times a month", with the second most popular answer being "3-4 times per week". There were a wide variety of respondents involved in this survey, from those that frequently park in Oregon, to those that rarely do. The wide variety suggests there is some expertise offered up alongside some notions from a common observer.



Q105 How do you typically locate parking in Oregon? (Check all that apply.)

361 respondents answered this question.

Observations: The most popular response among survey takers was that they frequented favored destinations, but many had their own unique methods as well. Smartphone apps were also popular means of locating parking. "Printed material" and using locations provided by their company were the least selected options, suggesting that respondents, like most of the world, are utilizing technology to find what best fits their needs.



Other (Please specify)

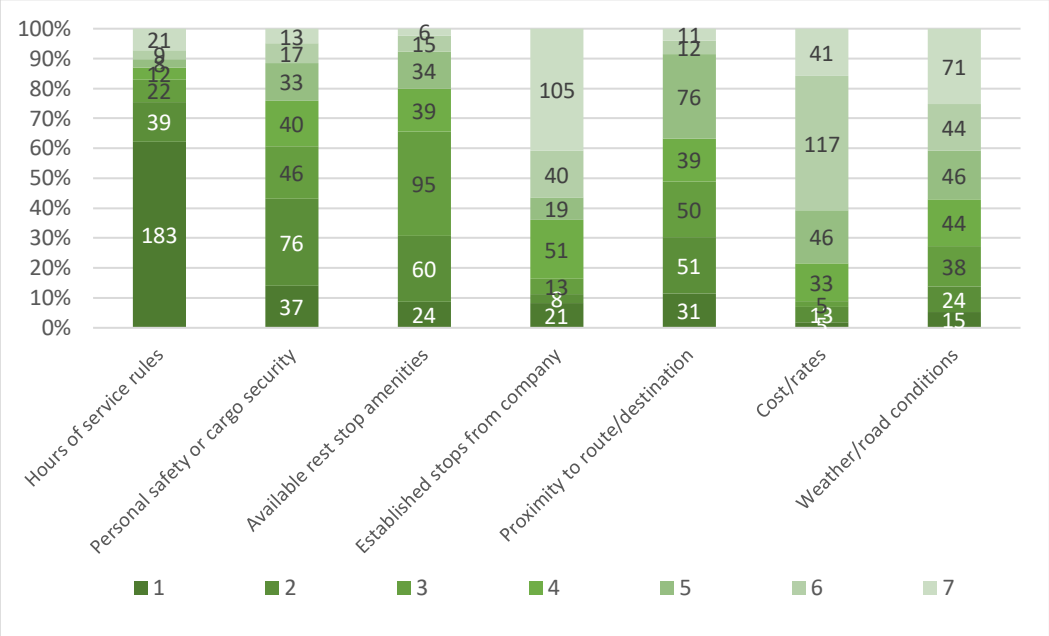
144 respondents provided follow-up information.

- 42 respondents said they use the **Truckers Path** App to locate parking. This app was mentioned several times, and noted many more times than any other app.
- 26 respondents said they try their luck and take **whatever is there**. Many survey takers said that they hope they just get lucky or they come in from the road at a certain time to find more open spots. Some respondents said they will stop if they see available parking from the road.
- 10 survey takers said they actively **search while driving.** Respondents noted that they often look for parking as the go about their route throughout the day, taking the best option they find.
- 9 respondents said they relied on **word of mouth** to find parking. Some survey takers said they belonged to chat groups, while others said they spoke to other drivers over the radio or at breaks.
- 7 respondents noted that they did some sort of **planning** to ensure that they would have a place to stop.
- 3 respondents noted that they relied on personal **relationships** or connections with customers to find a place to stop.

Q106 What are the main factors that influence where and when you stop for breaks? (Rank the following options.)

341 respondents answered this question.

Observations: Hours of service rules that require drivers to stop are the most popular reason respondents said they stop for breaks. This is consistent with frequent comments about drivers feeling hampered by scheduling rules.



Q107 What other factors influence where and when you stop for breaks?

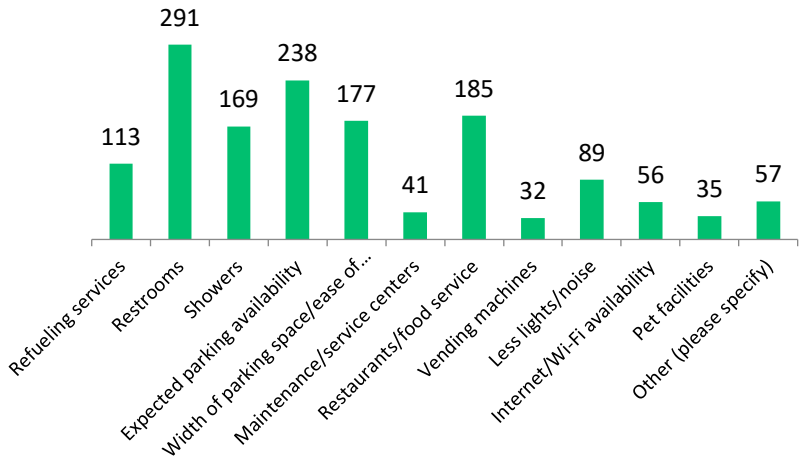
165 respondents provided follow-up information.

- The most popular theme present in respondents answers was that of **schedule**. 34 survey takers noted that they usually found a place to stop when hours of service rules force them to, when they have mapped out a destination for a certain time, or when they have to wait to make a delivery. E-Logs were also a common complaint under this theme.
- 31 respondents noted that **amenities** were a big factor in why they stopped driving. Survey takers stated that they wanted a place that had what they needed, and also had some things to provide them with entertainment.
- **Availability** was also a common theme among respondents, with 29 people citing it as a reason they stop or a reason why they stop when they do.
- 15 survey takers stated that they stop depending on **traffic**. Some respondents said they stop based on the time of day to avoid traffic, some said they stop if traffic gets bad, and some said they stop more frequently in cities like Portland because of the increased traffic.
- Another popular theme was that of **fatigue**. 14 respondents said they stop when they get tired, need a short break, or feel like driving has "taken it out of them".
- **Safety** was another recurring theme among 13 survey takers. One respondent noted that as a woman driver it was important for her to find some place she felt safe. Many respondents said they just want to find a place where they don't have to worry about their safety or the security of their truck.
- 8 respondents said that they looked for **quality** when searching for a place to stop. Many looked for cleanliness or better options at their stops.

Q108 What specific features and/or amenities do you look for when choosing a rest area? (Choose all that apply.)

363 respondents answered this question.

Observations: The most important amenities for respondents were restrooms. The priorities for those that took the survey seem to be necessities, such as parking availability, restrooms, showers, space and ease of vehicle access, and food. The other options such as "Less light/noise", internet availability, and pet facilities, didn't seem to be as high of a priority as finding a place they knew they could park, eat, use the restroom/shower, and rest.



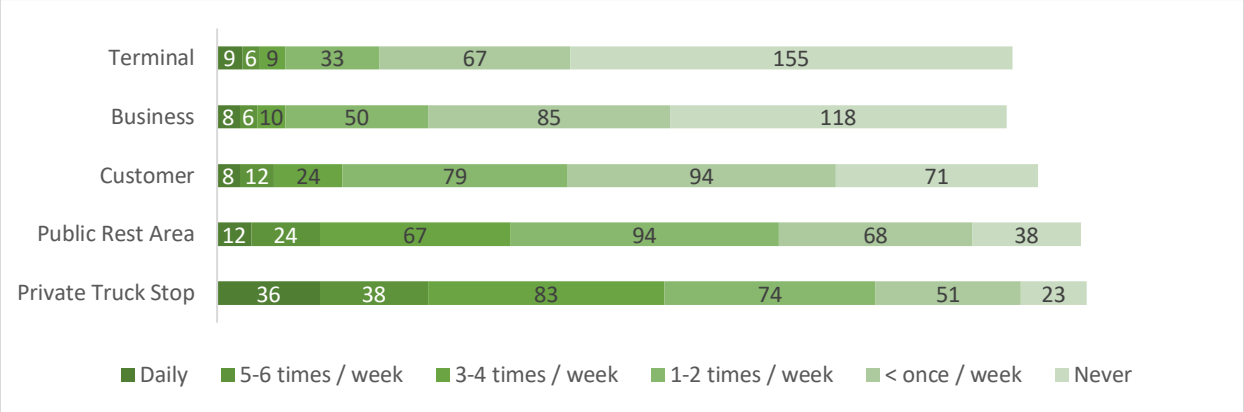
Other (please specify)

57 respondents provided follow-up information.

- 11 respondents made comments about **safety** and security as being a main factor that they consider when looking for parking. Some survey takers tied that to lighting, a lack of crime, or a general sense of being safe.
- 15 survey takers cited **quality** as a chief concern when looking for a spot. Some said they look for good coffee/food, clean restrooms, and others just noted that they preferred facilities that had generally better upkeep.
- One respondent made note of how they like to have some sort of access to **exercise**. The survey taker said they enjoy having access to a bike or walking trail in order to stretch their legs.

Q109 How often do you take required (10-hour) breaks at the following types of locations? (Choose one for each.)

311 respondents answered this question.

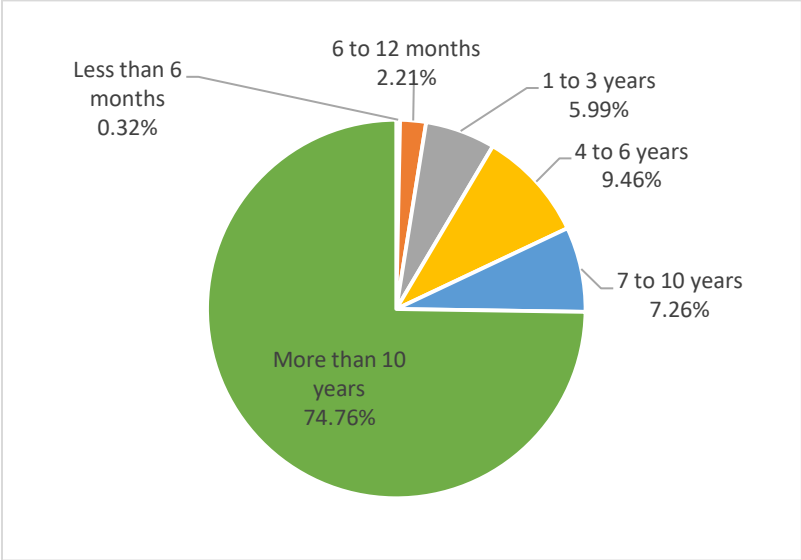


Observations: The most common "Never" responses came at "Terminal" and "Business" with the most frequent breaks being noted at "Private Truck Stops". Respondents tended to answer that they stop at "Public Rest Areas" and "Private Truck Stops" more than the other options. These findings may indicate some bias towards non-terminal users, many of whom are specifically routed and scheduled for breaks at terminal locations.

Q110 How long have you been driving a commercial truck?

317 respondents answered this question.

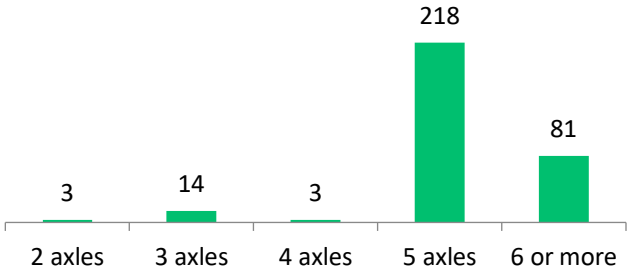
Observations: The large majority of respondents have been driving for "More than 10 years". The depth of experience in truck driving suggests that they may have noticed changes in truck parking availability over time and/or in other places.



Q111 How many axles does your vehicle(s) have? (Check all that apply.)

308 respondents answered this question.

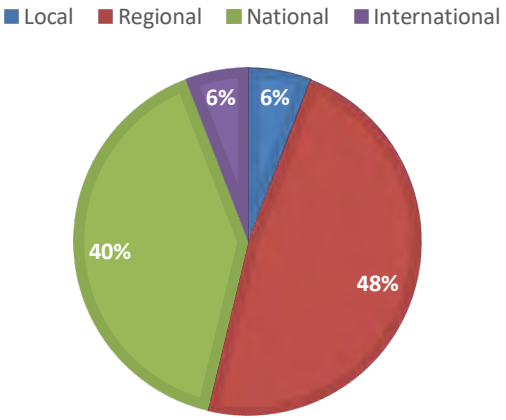
Observations: Most respondents reported having 5 or axles on their vehicle.



Q112 What is your usual range of operation? (Choose one.)

307 respondents answered this question.

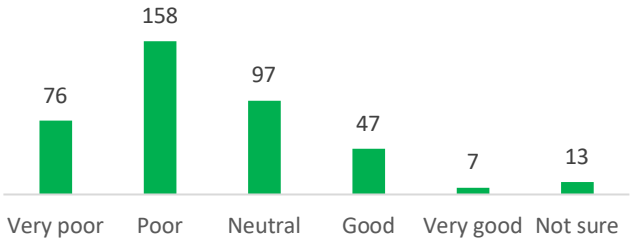
Observations: Most respondents are "Regional" or "National", which suggests that they may have more comparative knowledge about truck parking in other areas than respondents that are "Local" drivers.



Q113 In general, how would you rate the availability of truck parking in Oregon? (Choose one.).

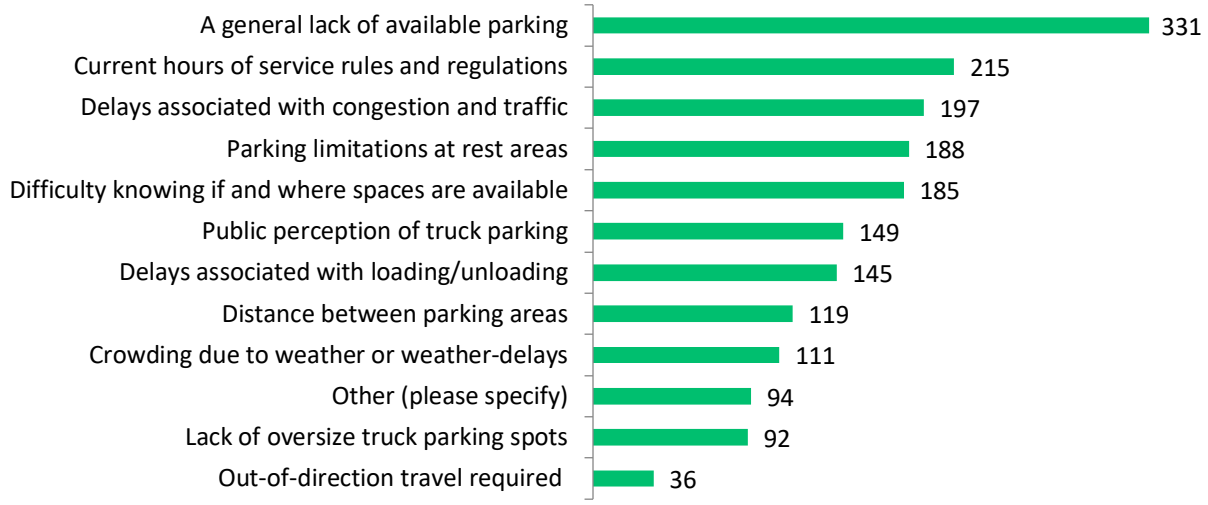
398 respondents answered this question.

Observations: Most respondents ranked parking availability in Oregon in the negative. The overwhelming sentiment is that truck parking is poor in the state. Only about 14% of respondents thought that parking was either good or very good, meanwhile about 69% saw it as poor or very poor.



Q114 What do you think are the main problems and issues with truck parking in Oregon? (Choose your top 5.)

426 respondents answered this question.



Observations: The lack of available parking and issues with hours of service were the two most popular responses from survey takers. There is a common thread of being delayed by traffic or having to interrupt their schedule in order to meet service rules which goes hand in hand with the perception that there is a lack of available parking.

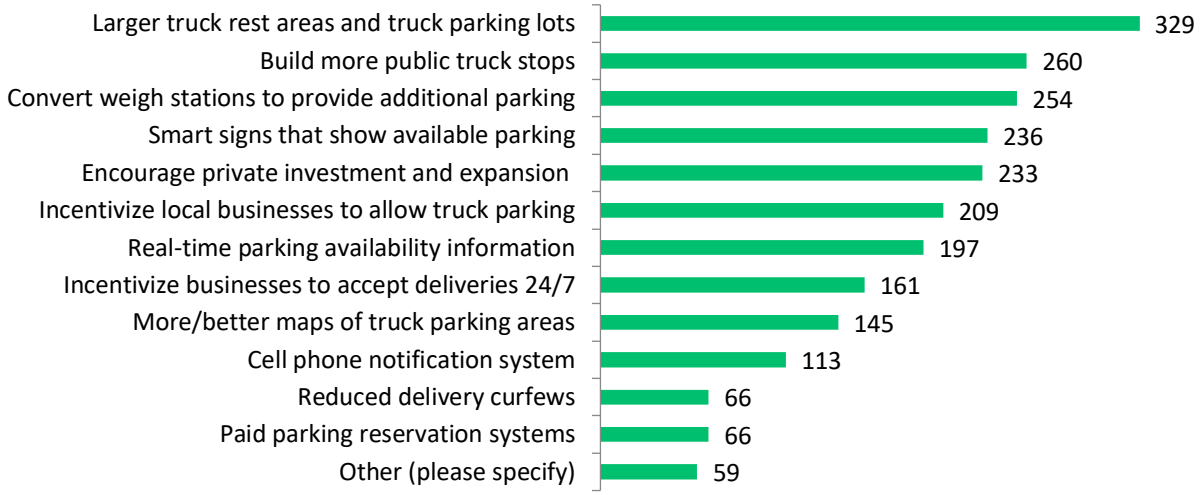
Other (please specify)

94 respondents provided follow-up information.

- 7 respondents described one of the biggest issues is that **people are unkind to truckers/trucks.** Several respondents noted that a lot of places are not truck friendly, and that some large shopping lots will kick trucks out.
- 7 respondents noted the prevalence of **no parking signs** in the form of restrictions on where they can park. Some said there is a lack of parking in populated areas and near delivery areas, and others cited that despite there being room to park, there are often no parking signs or no truck parking signs.
- 5 survey takers noted that they run into problems with **non-truckers in lots**. Some said that they deal with homeless people that make them feel unsafe, while others noted RVs and campers that take-up spots.
- 9 respondents cited **rules and regulations** as a significant issue, with 3 specifically noting **hours of service/e-logs** as the problem. Several felt there was contempt from truckers from lawmakers, and saw the rules placed on them as unhelpful and event hurtful to the way they do their business.
- 1 survey taker said there needs to be some sort of **comprehensive list** of legal truck parking areas.

Q115 Which of the following strategies to alleviate truck parking issues make sense to you? (Check all that apply.)

416 respondents answered this question.



Observations: The most popular option that respondents selected was that of "Larger truck rest areas and truck parking lots". Any strategy that increased access to parking or increased parking was a popular answer, which reflects the fact that the most common complaint, that parking availability is the biggest problem in Oregon. Respondents did not respond as positively to things such as "Paid parking reservation systems", "Cell phone notification system", and "Reduced delivery curfews", which had nothing to do with expanding available parking, and was just a means to better find current parking.

Other (please specify)

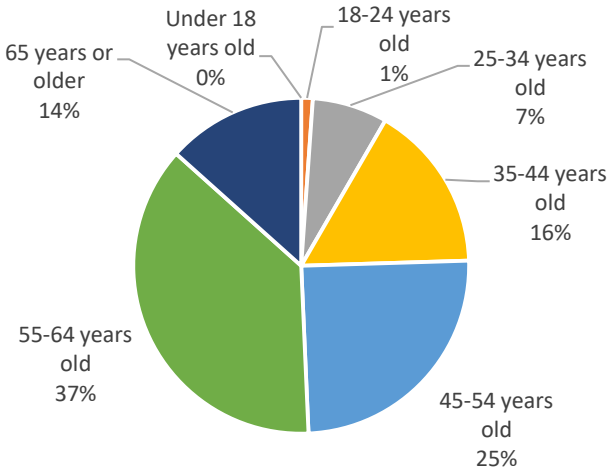
59 respondents provided follow-up information.

- The most common response surrounded the theme of **expanding parking** (27 respondents) for trucks. Some respondents stated that there needed to simply be more space provided, some pushed for opening up more areas (commercial, stadium lots, etc.) to truck parking, and others believed municipalities need to be forced to allow more parking in city limits. A very common theme was making parking areas more exclusive to trucks, expanding the area that trucks can park, but prohibiting RVs and other types of vehicles
- Some survey takers noted that **hours of service changes** (3 respondents) would make a big difference. Those that commented on this issue stated that it prevents them from driving their way, and makes finding a spot, and driving in general, more difficult.
- Some respondents (3) noted that **local drivers leave their trucks at nearby truck stops** when they are at home, taking up valuable parking. One suggestion was that drivers should have to prove they have a spot for their own truck before they receive their license.

Q116 How old are you? (Choose one.)

359 respondents answered this question.

Observations: Most of the respondents were older. About 92% of respondents said they were 35 years old or older, and more than 50% were 55 years old or older.



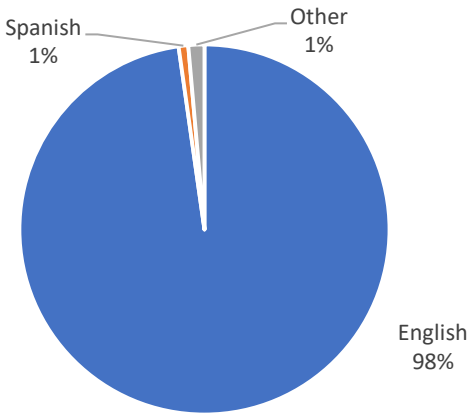
Q117 What is your preferred language? (Choose one.)

357 respondents answered this question.

Other (please specify)

5 respondents provided follow-up information.

- English & Spanish
- French
- That should be the only language used!
- No one cares every thinks we are low life
- Punjabi Hindi Urdu

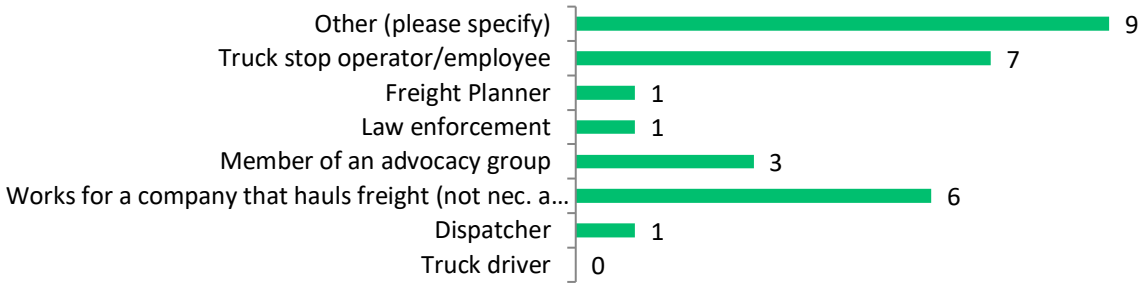


Interview Feedback

Q1. Interview participants included:

- Jim Anderson (Truck and Travel, TA Coburg)
- Amy Mills (Pilot Travel Centers)
- Steve Kubishta (District 4 ODOT Maintenance)
- Mike Matousek (Owner Operator Independent Drivers Association)
- Kelly Sills, Mike Crebs (City of Portland)
- Andrew Gleason (FedEx Freight)
- Brad Aimone (Central Oregon Truck)
- Scott Grenerth (Truck Specialized Parking Services, Inc.)
- Robert Norris, VP; Todd Boldin Division Safety Manager (Reddaway)
- Steve Duval (Oregon State Police)
- Richard Greer (Truck Depot)
- Jason Beloso and Travis Daviscourt (WSDOT)
- Tiffany Wlazlowksi Neuman (NATSO)
- Andrew Eno (Federal Motor Carrier Safety Administration)
- John Kane (TravelCenters of America)
- Tyler McMullen, Ryan Hanyak (J.B. Hunt Transport, Intermodal Operations)
- Dennis Ruikka (Woodburn POE/ODOT)
- Jim Denno (Travel Oregon Information Council)
- Barry Brown (POE/ODOT)
- John R. Barri (I-84 Farwell/Bend POE/ODOT)
- Dave C. (Flying J/Aurora)
- Tom Fine (Arrowhead Truck Plaza, Pendelton/I-84)
- David Pilot (C.R. England)
- Dennis Hyland (Koch Trucking)
- Jana Jarvis (OTA)
- Rod Iwata (Jubitz)

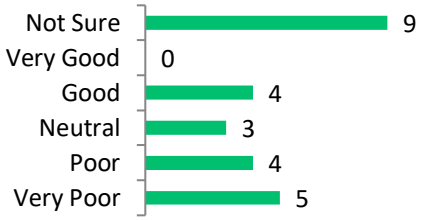
Q2. Interviewee categories:



Other:

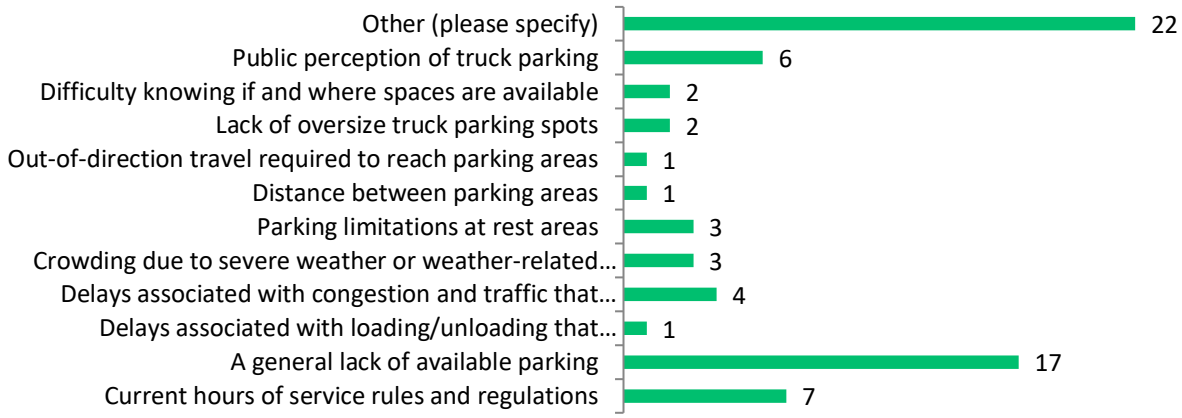
- Highway and facility maintenance
- City Planner/MPO?
- Provider of technology and systems to truck stops and public agencies such as state dot
- Oversight Agency
- Woodburn POE
- Oregon Travel Information Council
- POE, ODOT
- POE staff
- OTA

Q3. In general, how would they rate the availability of truck parking in Oregon? (Choose one.)



Observations: Interviewees tended to be unsure (9) or feel negatively about the general availability of truck parking (9). Only four rated parking availability as better than "neutral".

Q4. What do you think are the main problems and issues with truck parking in Oregon? (If applicable) Are there unique problems and issues that specifically affect you/your customers?



Observations: As with survey respondents, interviewees also perceived a general lack of availability as the most common issue with truck parking in Oregon. Likewise, HOS rules were also an important issue.

Other (please specify)

- **Urban areas and particularly the Portland metro area** have the most significant parking problems (7). Trucks must stop outside these areas to rest and stage before deliveries/pickups. City ordinances and business prohibitions against truck parking in the city near delivery locations keep trucks from using convenient space. Some drivers park and take Ubers off-site, due to parking restrictions in the Metro area. This does not support the truck stop and takes up parking space.
- **HOS rules and electronic logging** (4) impact driver behavior. There is some perception of more vehicles parking on the shoulder since December [2018]. Drivers can't fudge hours the way they used to with written logs. Drivers wait until the last second to find parking, and there are fewer opportunities later in the day. This is partially an issue of driver experience and training.
- There are not enough useful **parking tools** (3) such as online reservation systems, websites with availability information.
- **Drivers tend to park illegally or in unsafe locations** (3) when they can't find parking. This seems to be happening more than it used to. Some drivers don't want to pay for reservations.
- There is **old infrastructure** (2) that does not accommodate freight needs and/or leads to broader traffic problems. Traffic has increased but supply hasn't kept pace.
- **Rest areas** (2) are not designed for trucks. They have too limited parking and services.
- There are not enough **incentives** to create new parking and there are often cost prohibitive challenges associated. Tax breaks could help counter the cost of improvements, land, design, permitting, maintenance, and zoning restrictions. The public often has a negative perception of truck stops.

Q5. In general, how do parking issues with rest areas and/or parking directly and indirectly impact you/commercial haulers/your customers? (In terms of lost business, overtime wages, etc.)

- **Utilization impacts** (drivers stopping work early) was the most common response (7). Respondents noted that drivers must often stop driving before they are ready in order ensure that they have a safe, secure parking spot that is close to the delivery location. Hours of service rules are also a factor in forcing drivers to stop before they want to, since there is a risk of exceeding HOS constraints in order to find parking. Most drivers will start to seek parking when they have up to two hours of drive time left. Fleets that work within HOS rules have higher fixed costs. HOS rules can negatively impact driver wages due to lost driving time. Some drivers don't want to pay for reservations, and this can make it more difficult to locate parking.
- **New parking rules** (6) are created because of parking deficits. These impact drivers because of related towing, fines, new fees (that are often not covered by the fleet), and new loyalty programs. Some locations are seeing truckers park for multiple days, and new rules are intended to help recoup costs and free up space for working drivers.
- **Parking safety and security** (5) are increasingly problematic as parking density increases. Parking areas can bring prostitution, drugs, and theft. While parking on ramps and in unofficial locations can lead to accidents with other vehicles, allowing drivers to recover from fatigue is also an acknowledged safety concern.
- **Increased truck stop maintenance** (3) is necessary as loads increase. This includes cost related to security improvements such as cameras and fencing and costs to address environmental rules.
- **Weather** (2) is a significant factor in drivers parking in unsafe or unofficial locations.

Q6. What do haulers usually do to compensate for parking issues in Oregon?

- Drivers often **park illegally or in unsafe locations** (6) such as on highway ramps, shoulders, or unsanctioned parking areas.
- Drivers **stop short or adjusting their schedule** (5) to make parking easier. Not all drivers have this option, however; traffic related delays are usually unavoidable (particularly around urban areas) and delivery-windows may not be inflexible.
- Drivers **adjust trip planning** (4) to change routes and travel times. Some drivers try to avoid the need for overnights at truck stops altogether by parking at customer locations or terminals or avoiding multi-day trips.
- Drivers resort to **reservation systems** (3) that require payment.
- Drivers **avoid locations** (2) altogether.

Q7-Q13. Issues and feedback on specific segments.

Interviewees identified the following problem and features within individual study segments:

Segment	#	Main Parking Issues
A: I-5 from California State Border to US 199 in Grants Pass	**3**	**Problems**: Not enough parking space specifically during peak hours; not safe or secure. **Most trouble finding parking** weekday mornings and nights. (Weekday mornings and nights for interlining.) **Drivers stop here because** of HOS rules, waiting for next-day deliveries, Medford is a big interline point on the N-S route. **Drivers typically spend** more than 60 minutes looking for parking. **Drivers address problems by** parking on highway ramps, shoulders, or undesignated areas (besides highway ramps).
B: I-5 from US 199 in Grants Pass to OR 138 in Roseburg	**3**	**Problems**: Not enough parking space specifically during peak hours (3); not safe or secure. **Most trouble finding parking** weekday mornings and nights. (Weekday mornings and nights for interlining.) **Drivers stop here because** of HOS rules, waiting for next-day deliveries. **Drivers typically spend** more than 60 minutes looking for parking. **Drivers address problems by** parking on highway ramps, shoulders, or undesignated areas (besides highway ramps).

Segment	#	Main Parking Issues
C: I-5 from OR 138 in Roseburg to OR 58 in Eugene	**4**	**Problems**: Not enough parking space specifically during peak hours (3); not safe or secure. **Most trouble finding parking** weekday mornings, weekday and weekend afternoons, evenings, and nights. (Weekday mornings and nights for interlining.) **Drivers stop here because** of HOS rules, waiting for next-day deliveries. **Drivers typically spend** more than 60 minutes looking for parking. **Drivers address problems by** parking on highway ramps, shoulders, or undesignated areas (besides highway ramps).
D: OR 58 from I-5 in Eugene to US 97 near Chemult	**1**	**Problems**: Not enough parking space specifically during peak hours; not safe or secure. **Most trouble finding parking** weekday mornings, evenings/nights. **Drivers stop here because** of HOS rules, waiting for next-day deliveries. **Drivers typically spend** more than 60 minutes looking for parking. **Drivers address problems by** parking on highway ramps, shoulders, or undesignated areas (besides highway ramps).
E: I-5 from OR 58 in Eugene to US 20 in Albany	**3**	**Problems**: Not enough parking space specifically during peak hours (2); not safe or secure. **Most trouble finding parking** weekday mornings, evenings/nights. (Weekday mornings and nights for interlining.) **Drivers typically spend** more than 60 minutes looking for parking. **Drivers stop here because** of HOS rules, waiting for next-day deliveries. **Drivers address problems by** parking on highway ramps, shoulders, or undesignated areas (besides highway ramps). Between Eugene and Coburg some people lease land for parking on private property.

Segment	#	Main Parking Issues
F: I-5 from US 20 in Albany to OR 22 in Salem	**3**	**Problems**: Not enough parking space specifically during peak hours (3); not safe or secure. ODOT investigating. Traffic increases, even ramps are overloaded. Ramps are too short going on to freeways. Commuters, rush hour are problems. **Most trouble finding parking** weekday mornings, evenings, nights, and during peak traffic times. (Weekday mornings and nights for interlining.) **Drivers stop here because** of HOS rules, waiting for next-day deliveries. **Drivers typically spend** more than 60 minutes looking for parking. **Drivers address problems by** parking on highway ramps, shoulders, or undesignated areas (besides highway ramps). Trucks park at I-5 Jefferson exit NB to position for deliveries the next day.
G: I-5 from OR 22 in Salem to I-205 in Tualatin	**6**	**Problems**: Not enough parking space specifically during peak hours (6); parking on highway ramps (2); parking in other undesignated areas (2); not safe or secure. ODOT investigating. Traffic increases, even ramps are overloaded. Ramps are too short going on to freeways. Commuters, rush hour are problems. Problems with ramp parking near Baldock Rest Area (near Aurora). TA truck stop has safety issues and drivers prefer to park elsewhere. **Most trouble finding parking** weekday mornings, afternoons, evenings, nights; weekend afternoons, evenings, and nights. (Weekday mornings and nights for interlining.) No parking available after 7 PM in Metro area. Mondays and Fridays are peak for JBI; weekends are not an issue when drivers are at home. **Drivers stop here because** of HOS rules, waiting for next-day deliveries. **Drivers typically spend** more than 60 minutes looking for parking (3). **Drivers address problems by** parking on highway ramps, shoulders, or undesignated areas (besides highway ramps); reserving parking space.

Segment	#	Main Parking Issues
H: I-5 from I-205 in Tualatin to the Columbia River	**6**	**Problems**: Not enough parking space specifically during peak hours (6); not safe or secure; trucks park on ramps. **Most trouble finding parking** weekday mornings, afternoons, evenings, nights; weekend afternoons, evenings, nights. (Weekday mornings and nights for interlining.) Tues-Thurs are fully booked for TA. Mondays and Fridays are peak for JBI; weekends are not an issue when drivers are at home. **Drivers stop here because** of HOS rules, waiting for next-day deliveries, some leave their trucks parked and go home. **Drivers typically spend** more than 60 minutes looking for parking (4). **Drivers address problems by** circling parking lots, parking on highway ramps, shoulders, or undesignated areas (besides highway ramps); reserving parking space; parking elsewhere.
I: I-205 from I-5 in Tualatin to the Columbia River	**4**	**Problems**: Not enough parking space specifically during peak hours (4); not safe or secure; trucks park on ramps. **Most trouble finding parking** weekday mornings, afternoons, evenings, and nights; weekend afternoons, evenings, nights. (Weekday mornings and nights for interlining.) Tues-Thurs fully booked for TA. Mondays and Fridays are peak for JBI; weekends are not an issue when drivers are at home. **Drivers stop here because** of HOS rules, waiting for next-day deliveries. **Drivers typically spend** more than 60 minutes looking for parking. (2) **Drivers address problems by** circling parking lots, parking on highway ramps, shoulders, or undesignated areas (besides highway ramps).
J: I-84 from I-5 in Portland to the Sandy River in Troutdale	**6**	**Problems**: Not enough parking space specifically during peak hours (6); not safe or secure; weather is an issue on I-84; trucks park on ramps. **Most trouble finding parking** weekday mornings, afternoons, evenings, nights; weekend afternoons, evenings, nights. Tues-Thurs fully booked for TA (busier than Aurora TA location). Mondays and Fridays are peak for JBI; weekends are not an issue when drivers are at home. **Drivers stop here because** of HOS rules, waiting for next-day deliveries. **Drivers typically spend** more than 60 minutes looking for parking (4). **Drivers address problems by** stopping short of hours, circling parking lots, parking on highway ramps, shoulders, or undesignated areas (besides highway ramps); reserve parking space; park elsewhere.

Segment	#	Main Parking Issues
K: I-84 from the Sandy River in Troutdale to US 97 in Biggs Junction	**3**	**Problems**: Not enough parking space specifically during peak hours (2); not safe or secure; weather is an issue on I-84 (2). **Most trouble finding parking** weekday mornings, evenings, nights. **Drivers stop here because** of HOS rules, waiting for next-day deliveries. **Drivers typically spend** more than 60 minutes looking for parking. **Drivers address problems** by stopping short of hours; parking on highway ramps, shoulders, or undesignated areas (besides highway ramps).
L: I-84 from US 97 in Biggs Junction to US 395 in Pendleton	**4**	**Problems**: Not enough parking space specifically during peak hours (3); parking on highway ramps (2); parking in other undesignated areas; not safe or secure; weather is an issue on I-84 (2), trucks stack up at La Grande and Pendleton. Exit 216 w/ overflow and HWY 31 there is truck traffic on the side of the road. **Most trouble finding parking** weekday mornings, afternoons, evenings, nights; weekend afternoons, evenings, and nights. Thursdays after 2pm are heaviest. **Drivers stop here because** of HOS rules, waiting for next-day deliveries. **Drivers typically spend** more than 60 minutes looking for parking. **Drivers address problems by** parking on highway ramps, shoulders, or undesignated areas (besides highway ramps). *There has been an improvement with ODOT meeting with Tribal Police and coordinating actions.*
M: OR 22 and US 20 from I-5 in Salem to US 97 in Bend	**3**	**Problems**: Not enough parking space specifically during peak hours (2); not safe or secure; parking on highway ramps; parking in other undesignated areas; weather is an issue on I-84; **Most trouble finding parking** weekday mornings, evenings, nights **Drivers stop here because** of HOS rules, waiting for next-day deliveries. **Drivers typically spend** more than 60 minutes looking for parking. **Drivers address problems by** parking on highway ramps, shoulders, or undesignated areas (besides highway ramps).

Segment	#	Main Parking Issues
N: US 97 from I-84 in Biggs Junction to US 26 in Madras	**2**	**Problems**: Not enough parking space specifically during peak hours (2); weather is an issue on I-84 and US 97; competition with other travelers for parking. **Most trouble finding parking** weekday evenings, nights. Parking unavailable after 6 pm. **Drivers typically spend** more than 60 minutes looking for parking. **Drivers address problems by** parking on highway ramps, shoulders, or undesignated areas (besides highway ramps).
O: US 97 from US 26 in Madras to US 20 in Bend	**3**	**Problems**: Not enough parking space specifically during peak hours (3); not safe or secure; weather is an issue on US 97; competition with other travelers for parking. **Most trouble finding parking** weekday mornings, evenings, nights. Parking unavailable after 6 pm. **Drivers stop here because** of HOS rules, waiting for next-day deliveries. **Drivers typically spend** more than 60 minutes looking for parking. **Drivers address problems by** parking on highway ramps, shoulders, or undesignated areas (besides highway ramps).
P: US 20 from US 97 in Bend to US 395 in Riley	**1**	**Problems**: Not enough parking space specifically during peak hours (2); not safe or secure. **Most trouble finding parking** weekday mornings, evenings, nights. **Drivers stop here because** of HOS rules, waiting for next-day deliveries. **Drivers typically spend** more than 60 minutes looking for parking. **Drivers address problems by** parking on highway ramps, shoulders, or undesignated areas (besides highway ramps).
Q: US 20 from US 395 in Riley to the Idaho State Border in Nyssa	**0**	*No feedback provided.*
S: I-85 from US 395 in Pendleton to the Idaho State Border	**1**	**Problems**: Not enough parking space specifically during peak hours. **Drivers address problems by** parking on highway ramps; undesignated areas (besides highway ramps).

Segment	#	Main Parking Issues
R: US 97 from the California State Border to OR 58 near Chemult	**2**	**Problems**: Not enough parking space specifically during peak hours (2); weather is an issue on I-84 and US 97; competition with other travelers for parking. **Most trouble finding parking** weekday evenings, nights. Parking unavailable after 6 pm. **Drivers typically spend** more than 60 minutes looking for parking. **Drivers address problems by** parking on highway ramps; undesignated areas (besides highway ramps).
T: US 97 from OR 58 near Chemult to US 20 in Bend	**2**	**Problems**: Not enough parking space specifically during peak hours (2); weather is an issue on I-84 and US 97; competition with other travelers for parking. **Most trouble finding parking** weekday evenings, nights. Parking unavailable after 6 pm. **Drivers typically spend** more than 60 minutes looking for parking. **Drivers address problems by** parking on highway ramps; undesignated areas (besides highway ramps).

Observations: Interviewee responses regarding specific segments were generally consistent with online survey findings about the same segments.

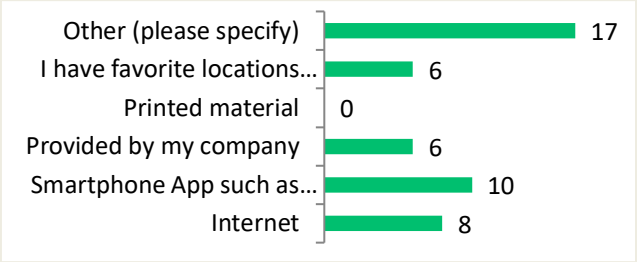
- Problems with **a general lack of parking during peak hours** were reported as problematic in nearly all segments that were commented upon.
- Parking tends to be **less available later in the day.** There are some different types of delivery models may have different "peak" travel times, such one example of a linehaul fleet which typically moves between terminals at night. They rely on terminal parking for breaks and overnights built into their schedule. Finding suitable space for interlining (swapping trailers and reversing direction) can be difficult.
- **60-minutes was considered the amount of time required** to locate parking in nearly all segments that interviewees commented upon.
- Drivers most **commonly address parking problems by parking on highway ramps** or other undesignated areas. Some companies have strict rules about illegal parking, so drivers also tend to either stop short or be forced to drive over HOS rules. In winter weather adverse to travel, drivers will often look for the closest legal and safe spot to park like chain-up areas. Some can park at customer locations or company facilities, others do not. Some drivers try to avoid parking in problematic areas. Parking at casinos was mentioned as a viable option. While parking may be available at paid sites, drivers are not always compensated for the parking reservation expense, and so many drivers avoid paying for reservations unless all other options are exhausted.
- Generally, most **deliveries are made within the I-5 and I-84 corridors**.
- **Portland Metro area** (segments G, H, I, J) traffic and available parking is a major concern for similar reasons as online survey takers. Shipping activity and the customer base in and around Portland is what makes drivers want to park there. The lack of parking can affect parking much farther away. A best practice is for drivers to park as close to their morning customer delivery location as possible, but urban

sprawl and aversion to new truck stops means drivers must park far from their optimal location. This is a nationwide issue.

- **Rural areas were perceived as less problematic**.
- **US 97** (segments N, O, R, T) is remote, heavily travelled, and subject to adverse winter weather. Parking capacity is scarce and traffic volumes can be high due to conflicts with tourist traffic. As in Portland, customer deliveries in Central Oregon drive the demand for parking on the US 97 segments. Due to distances, interstate deliveries are often not possible in a single day. Bend is a busy area and drivers who need to park there often must drive to Chemult to find available parking.

Q14. Based on what you know, how do drivers typically locate parking in Oregon? (Check all that apply.)

Observations: Interviewees described several approaches to locating parking in Oregon.



- **Apps** included: *Truckerpath*, *Trucksmart*, *Park My truck*, *My Pilot* and other (unnamed) truck stop operator specific apps. The *TripCheck* and *Google Maps* websites were also mentioned.
- **Other** responses included: experience, guessing, dispatch. Some respondents felt that parking issues were largely due to poor driver planning, unfamiliarity with routes, and mistrust of data about available parking.

Q15. (For TS operators) Do you post real-time information about availability of parking? (Open ended.)

- Yes (2)
- No (3)

Comments: An increasing number of operators do post available parking information, though some post only to company and NATSO applications and not to third party apps. Some drivers are perceived to be concerned about the accuracy of parking counts; new systems will automatically update based on cameras.

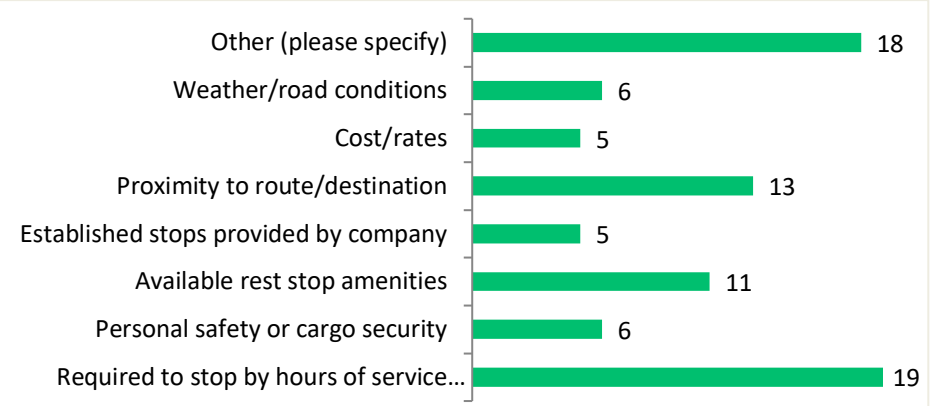
Q16. (For TS operators) Do you take reservations for parking? (Open ended.)

- Yes (5)
- No (0)

Comments: While all respondents to the question said that they take reservations, one commenter said that reservations are not typical. Two interviewees said that they take reservations by phone only at this time, and one said that these were primarily used to accommodate oversize or hazardous loads. Two have a limited number of reservable spots; most are not reservable. Pricing for reservations can vary with demand.

Q17. Based on your experience, what are the main factors that influence where and when drivers usually stop for breaks in Oregon? (Check all that apply.)

Observations: Consistent with earlier comments, HOS rules and proximity to route and destination were the top factors that determine where drivers usually stop. Available amenities were also important. Respondents echoed these priorities in the "other" responses.

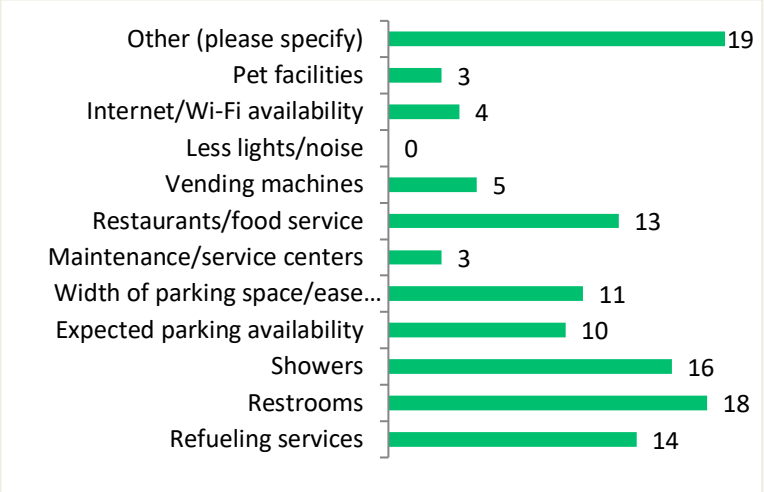


Other answers:

- **Hours of Service** rules (7) and ELD
- **Customer hours** (4)
- Available **amenities** (4)
- **Weather** (2)
- **Personal preference** (2)
- Avoiding **peak traffic hours** (2)
- **Other responses**: associated fees, local rules that impact trucks (idling ordinances, inspection traps), and company policy.

Q18. What specific features and/or amenities do drivers typically look for when choosing a rest area? As applicable: What services are the most important to your customers? Are there other specific reasons that drivers tend to stop and use your truck stop?

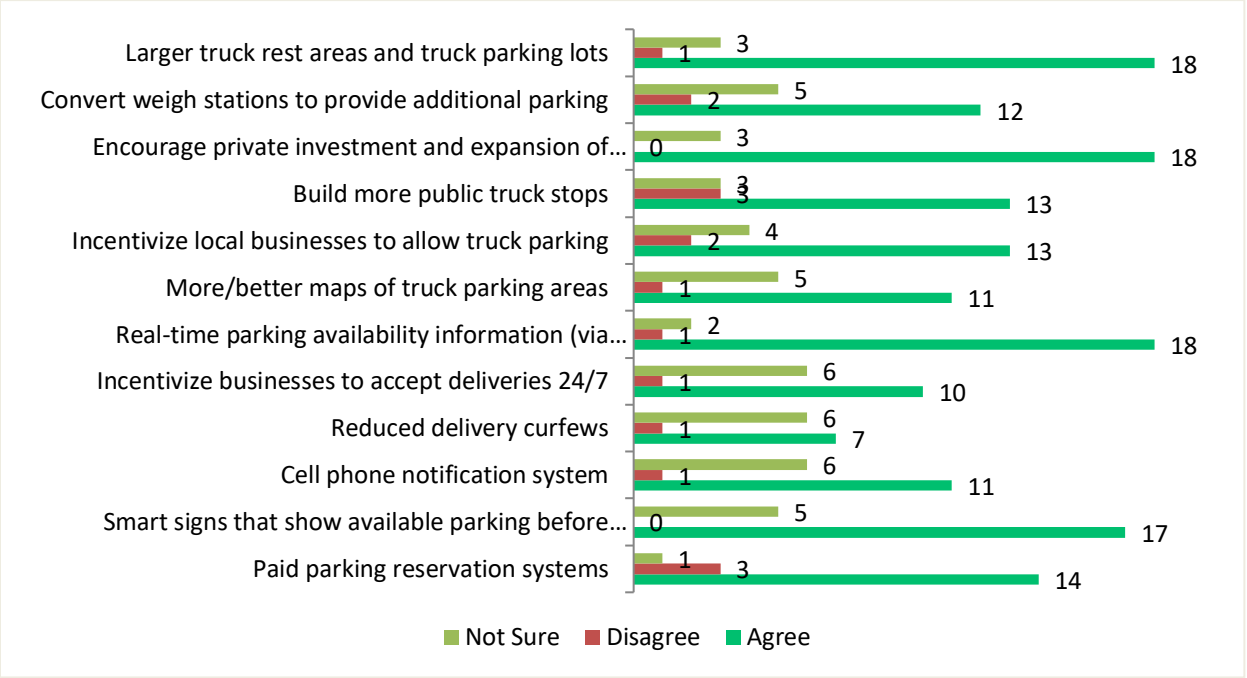
Observations: Restrooms, showers, fuel, and food were cited as the most popular amenities. Features such as less noise and light, pet facilities, maintenance/service centers, internet, and vending machines were the least popular reasons for selecting a stop location.



Other:

- **Proximity to delivery location (5)** or route was the most popular "other" option.
- **General safety and security (5)** was noted as an important consideration.
- While some interviewees noted **food (4)** and proximity to restaurants, others said that sit-down service is in low demand. Most drivers carry tend to carry their own food, so it may not be a critical factor.
- **Loyalty programs (4)** draw drivers to locations on provider networks where companies have fuel discounts, or where parking and showers are free with fuel purchase.
- **Showers** (3) were reiterated as very important for some drivers, as was the distance between truck parking spots and the shower itself.
- **Other comments:** Needs often depend on the type of vehicle (trucks with sleepers don't need lodging) and individual needs. One truck stop reported that drivers don't seem particularly interested in access to "shore" power hook-ups or on-site heating/cooling for trucks.

Q19. Which of the following strategies to alleviate truck parking issues make sense to you? (Indicate whether you agree or disagree with the following list.)



Observations: Respondents were generally supportive of all of the proposed solutions. Larger truck stops, encouraging private investment, providing real-time parking information, and smart signs were the most popular options. Interviewees were the least sure about providing business incentives, reducing delivery curfews, and cell phone notifications.

Other:

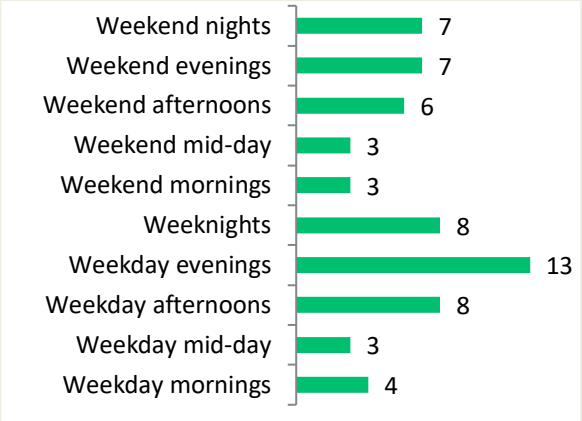
- **Provide incentives** to local jurisdictions to allow truck parking and reduce costs to truck stop operators. Create market driven incentives for new parking; do not make private truck stops compete against the state. Incentives can be hard to offer if most parking is currently free. Consider tax breaks to address high land prices which make truck stop expansion difficult.
- **Change rules** (primarily HOS rules) to be more flexible, but also do a better job of enforcing and regulating. Revise local ordinances and use restrictions that currently make it difficult to site new truck stops.
- **Leverage public investment** by making sure infrastructure exists to support improvements. Consider providing portable restrooms and using surplus (undeveloped) public property or public lands for parking.
- **Minimize new public investment**: expect more from private investors; don't add more expensive rest areas.
- **Customers and local businesses** should help provide parking or flexible solutions; currently some penalize drivers for early/late delivery.
- **Technology**: use satellite radio to provide notifications. Provide new emergency communication in bad weather. Avoid distracting drivers with "push notifications". Avoid technologies that invade trucker privacy.
- Improve security at **public rest areas** with patrols. Review public rest area designs to better accommodate trucks.

- Consider changes to **truck stop design**. Build more small truck stops instead of fewer large ones. TA provides "premium" parking closer to facilities with reservations; some large facilities provide on-site transportation (trams).
- Improve staffing availability at **points of entry**.
- There may not be enough room for parking at **weigh stations.** Parked trucks can make inspections more difficult.
- **Different business models have different needs**. The LTL business model requires more localized parking in metro areas. The linehaul operation is affected by weather. Triple trailers require larger parking spaces.

Additional Questions for Truck Stop Operators and Ports of Entry

Q20. What times of the day and week do you usually see the most trucks? (Choose all that apply.)

Observations: Consistent with other answers, weekday and weekend afternoons, evenings, and nights experience the most truck traffic.



Q21. Where are your customers typically coming from and going to?

Observations: While the sample size was small, respondents represented a range of primarily regional and western interstate travelers.

Origins

- California (4)
- Varies (4)
- Washington (2)
- *Unknown (2)*
- Eastern OR (1)

Destination

- Washington (3)
- California (2)
- Oregon (2)
- *Varies (2)*
- Canada (1)
- Idaho (1)
- *Unknown (1)*

Q22. How many of your customers are independent owners as opposed to part of a larger fleet? (Open ended.)

- Mostly larger fleets (5)
- Mostly independent owners (2)
- Unknown (3)
- Varies (1)

Q23: How often do you think that you go over-capacity? (Open ended.)

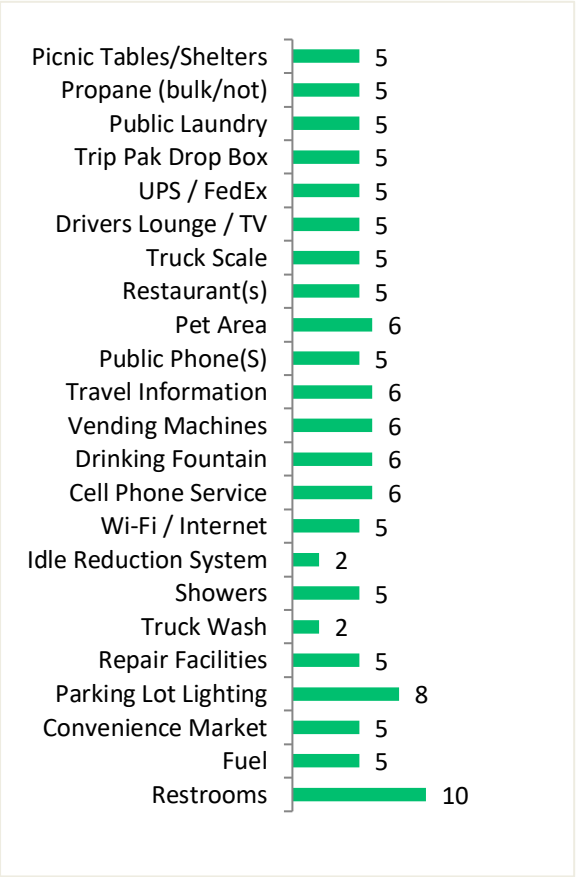
- Every Day (3)
- A few times per week (1)
- Other (7)

Comments: Varies by location, day of the week, weather, or if traffic is impacted by accidents. Urban areas are consistently bad.

Q24: What services do you offer?

Observations: Respondents noted that services varied by location. Some services and features are not open 24/7 (restrooms, lighting, vending machines). Pay phones are not usually available anymore.

Other services not listed: pet wash, hotel, cinema, bar.



Q25: How much do you typically charge for parking?

- **Free** (5) – Some offer both free and paid parking; some is free with purchase or loyalty program membership.
- **$15-$20** (3)
- **$12-$15** (2)
- **$25-$35** (1) (Includes an option to purchase parking days in bulk for less: $200-$350/30 days).

Q26. Do you have expansion plans for your facility? If so, what considerations are you making for parking? (Open ended.)

Yes (5) - *Considerations include:*

- Autonomous truck needs.
- Exploring expansion criteria for different locations (community acceptance, weather, trip generators, hours of service rules that compel drivers to stop).
- Costs of planning, development, maintenance; zoning restrictions; requirements to pay for local street, interchange, and infrastructure improvements.
- ADA accessibility; improved lighting for safety and security.
- Paving gravel parking lots.

No (7) – *Comments:*

- No room to expand (2)
- Changing from free to paid/reservation system to help pay for upkeep and changing driver habits. Drivers are buying less at the truck stop. Some are parking and using Uber to reach other destinations.
- Focusing on franchising.
- Parking at this location is secondary to regulating/inspecting vehicles.

Q27. Recommendations for conducting future outreach. (Open ended.)

- Truck stops
- Oregon Trucking Association Conference(s)
- Distribute surveys by SMS text
- Provide survey in Russian (a large number of drivers are Russian or Ukrainian)

Q28. Other comments? (Open ended.)

Problems

- Increasing truck volumes mean **increased impact to ramps and shoulders**.
- Some cities won't allow large trucks downtown, so there must be **more locations to unload to smaller trucks**. There is a need for secure sites for staging before deliveries or unhitching trailers to get service. Most places won't let you bring your trailer when you get service due to space constraints.
- **I-84 Eastbound fills up overnight** and then trucks park unsafely on ramps.

Changing Technology and Approach

- Truck Depot is currently developing a **camera for monitoring the utilization of truck parking** and automatically updating a website every three minutes without sensors in the pavement.
- Be mindful of advances in **driving assistance technologies** and autonomous vehicles, platooning (allowing trucks to travel closely together) and Uber freight, which may reduce the demand for truck parking in the future.
- Services like **cross docking** may be offered at truck stops.
- Carriers are **putting more pressure on shippers to provide some amenities or flexibility** with new regulations.
- Look to **other states and interstate solutions**. (Washington passed SB 5506 which provides parking for commercial vehicles one hour beyond federal rest periods at rest areas.)
- **ODOT traffic cams** on websites and in-store displays can be a tool for drivers.

Helping new truck stops happen

- If states and localities want to help, they need to **lower the costs and barriers to parking** areas through tax incentives, land acquisition, zoning. Maintenance of truck stops is expensive and includes things like trash collection, lighting, sealing and snow removal. To expand, local operators need to be able to more easily bid on available land.
- **Public perception and "NIMBYism" must be addressed**. Communities get caught up in stereotypes and may not realize that most truck stops are family-owned businesses that also cater to buses and RVs for recreational customers. Truck stop visitors have ability to support local businesses such as medical clinics, pharmacies, movie theaters, fitness center, and dining.
- **Look for public-private partnerships** like the "oasis program" in Utah: this is an agreement between the state and truck stop operators so that if truck stops agree to be open for 24 hours, allow use of the restroom without purchase, and is near to interstate, then they can get signage on interstate that points travelers to the oasis. This allowed Utah to close rest areas and direct people to alternative facilities.
- **Improve communication**. DOT personnel should talk with truck stop owners about problems. There is usually a reason if demand exists, but new parking still isn't being added.
- **Address questions about parking on public lands**. Can it be allowed? Who covers the cost of maintenance? Who is responsible/liable if there is are problems?

Weigh Stations, Ports of Entry, and Rest Areas

- **Ports of entry and weigh stations allow parking if it is safe** and doesn't interfere with business.
- **Parking at weigh stations is perceived as safer than rest areas** due to prostitution and crime.
- Weigh stations and POEs tend to be **limited to parking and restrooms**. No vending machines or other amenities.
- There are concerns about **enforcing rules** and the ability to expel drivers if increased parking is allowed at weigh stations or POEs.

Truck stop issues

- Some drivers leave trucks parked for extended periods of time. There are **no systems for tracking and monitoring time limits**.
- Repair **services sometimes do not have their own parking** areas to do work.
- Some **drivers are not aware of available reservable spaces**.
- Truck Depot focuses on parking and does not offer fuel or restaurants. Lots are secured with fences and password accessible 24/7. The sites are not paved or striped, but offer other services such as maintenance, cross docking and warehousing.

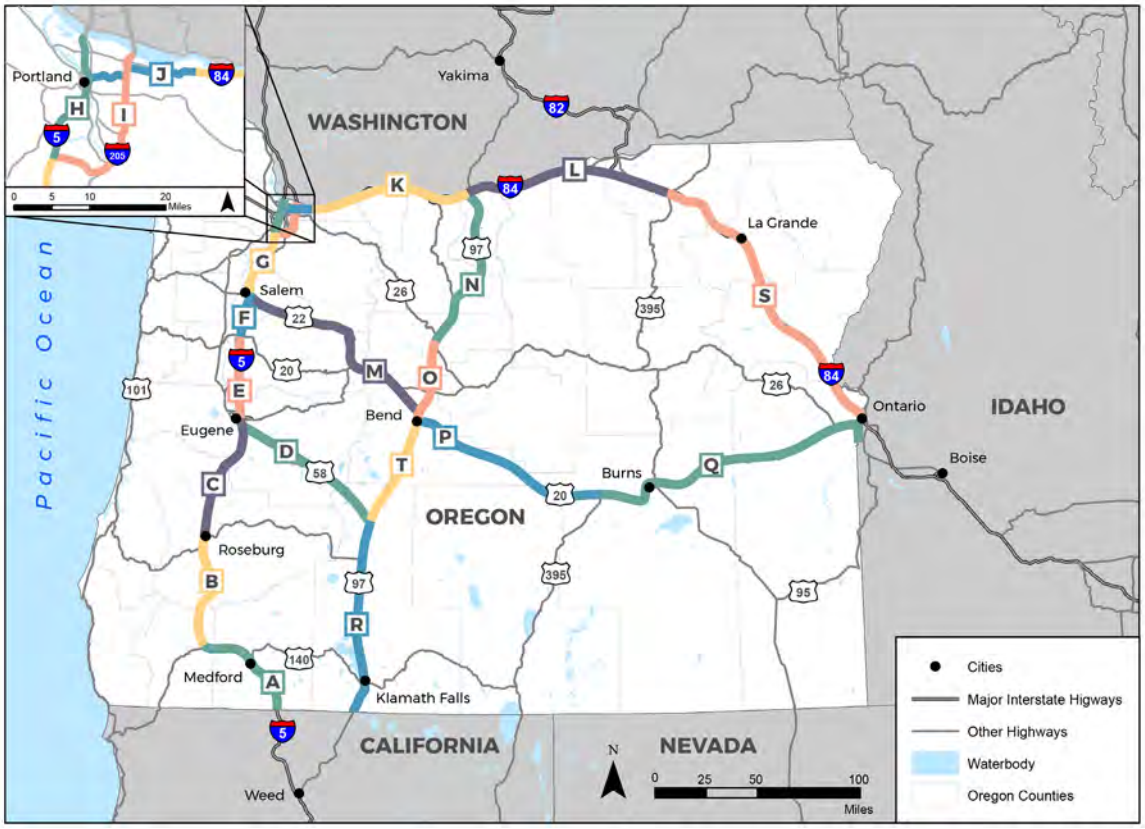
Appendix A: Online Survey Instrument

Overview: The design of the survey tool follows a literature review of similar studies and stakeholder surveys. This survey is intended to determine how, why and when truck drivers choose their parking locations in Oregon, where they are going, and what amenities they prefer when parking.

The survey has two parts. The first part allows respondents to provide location-based data that offers insights into specific problem areas. These questions are primarily oriented towards truck drivers and others with specific knowledge of the corridors and locations in question. The second section allows for more general feedback on truck parking in Oregon as a whole.

Page 1: Parking availability

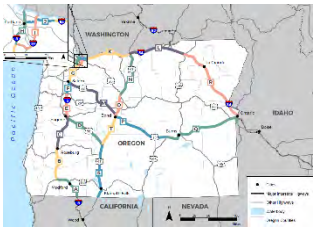
Map Instructions: The segments on the map are being studied to identify possible commercial truck parking improvements.



1. How would you rate the availability of truck parking within each of the following segments?

	1 *(Always Available)*	**2**	**3**	**4**	**5** *(Never Available)*	*Don't know*
A: I-5 from California State Border to US 199 in Grants Pass	○	○	○	○	○	○
B: I-5 from US 199 in Grants Pass to OR 138 in Roseburg	○	○	○	○	○	○
C: I-5 from OR 138 in Roseburg to OR 58 in Eugene	○	○	○	○	○	○
D: OR 58 from I-5 in Eugene to US 97 near Chemult	○	○	○	○	○	○
E: I-5 from OR 58 in Eugene to US 20 in Albany	○	○	○	○	○	○
F: I-5 from US 20 in Albany to OR 22 in Salem	○	○	○	○	○	○
G: I-5 from OR 22 in Salem to I-205 in Tualatin	○	○	○	○	○	○
H: I-5 from I-205 in Tualatin to the Columbia River	○	○	○	○	○	○
I: I-205 from I-5 in Tualatin to the Columbia River	○	○	○	○	○	○
J: I-84 from I-5 in Portland to the Sandy River in Troutdale	○	○	○	○	○	○
K: I-84 from the Sandy River in Troutdale to US 97 in Biggs Junction	○	○	○	○	○	○
L: I-84 from US 97 in Biggs Junction to US 395 in Pendleton	○	○	○	○	○	○
M: OR 22 and US 20 from I-5 in Salem to US 97 in Bend	○	○	○	○	○	○
N: US 97 from I-84 in Biggs Junction to US 26 in Madras	○	○	○	○	○	○
O: US 97 from US 26 in Madras to US 20 in Bend	○	○	○	○	○	○
P: US 20 from US 97 in Bend to US 395 in Riley	○	○	○	○	○	○
Q: US 20 from US 395 in Riley to the Idaho State Border in Nyssa	○	○	○	○	○	○
S: I-85 from US 395 in Pendleton to the Idaho State Border	○	○	○	○	○	○
R: US 97 from the California State Border to OR 58 near Chemult	○	○	○	○	○	○
T: US 97 from OR 58 near Chemult to US 20 in Bend	○	○	○	○	○	○

Page 2: Tell us more



1. Where is it the most difficult to find parking in Oregon? *(Select a segment from the map to answer questions about specific truck parking issues and problems. You will be able to come back and provide feedback on multiple segments if you wish.)*

- ○ A: I-5 from California State Border to US 199 in Grants Pass
- ○ B: I-5 from US 199 in Grants Pass to OR 138 in Roseburg
- ○ C: I-5 from OR 138 in Roseburg to OR 58 in Eugene
- ○ D: OR 58 from I-5 in Eugene to US 97 near Chemult
- ○ E: I-5 from OR 58 in Eugene to US 20 in Albany
- ○ F: I-5 from US 20 in Albany to OR 22 in Salem
- ○ G: I-5 from OR 22 in Salem to I-205 in Tualatin
- ○ H: I-5 from I-205 in Tualatin to the Columbia River
- ○ I: I-205 from I-5 in Tualatin to the Columbia River
- ○ J: I-84 from I-5 in Portland to the Sandy River in Troutdale
- ○ K: I-84 from the Sandy River in Troutdale to US 97 in Biggs Junction
- ○ L: I-84 from US 97 in Biggs Junction to US 395 in Pendleton
- ○ M: OR 22 and US 20 from I-5 in Salem to US 97 in Bend
- ○ N: US 97 from I-84 in Biggs Junction to US 26 in Madras
- ○ O: US 97 from US 26 in Madras to US 20 in Bend
- ○ P: US 20 from US 97 in Bend to US 395 in Riley
- ○ Q: US 20 from US 395 in Riley to the Idaho State Border in Nyssa
- ○ S: I-85 from US 395 in Pendleton to the Idaho State Border
- ○ R: US 97 from the California State Border to OR 58 near Chemult
- ○ T: US 97 from OR 58 near Chemult to US 20 in Bend
- ○ *I don't have any more specific feedback to share.*

[Skip logic: Respondents will be taken to the "Page 3: Segment questions" for each of the Segment choices above. If they select "I don't have any more specific feedback to share" they will be taken to "Page 4: Tell us about you."]

Page 3: Segment questions

1. What are the main truck parking issues within this segment? *(Check all that apply.)*

- ☐ Not enough parking space specifically during peak hours
- ☐ Parking time-limits are too short
- ☐ Drivers often park on highway ramps here
- ☐ Drivers often park in undesignated areas (besides highway ramps)
- ☐ Available services are inadequate
- ☐ Parking is not safe or secure
- ☐ Other_____

2. How much time do you typically spend looking for parking in this segment that would otherwise be spent traveling? *(Choose one.)*

- ○ Less than 15 minutes
- ○ 15-30 minutes
- ○ 30-45 minutes
- ○ 45-60 minutes
- ○ More than 60 minutes

3. When do you have the most trouble finding available parking in this segment? *(Choose all that apply.)*

- ☐ Weekday mornings
- ☐ Weekday mid-day
- ☐ Weekday afternoons
- ☐ Weekday evenings
- ☐ Weeknights
- ☐ Weekend mornings
- ☐ Weekend mid-day
- ☐ Weekend afternoons
- ☐ Weekend evenings
- ☐ Weekend nights

4. Why do you typically park in this segment? *(Check all that apply.)*

- ☐ For a break after long hours of driving (as required by hours of service rules)
- ☐ Overnight stay waiting for next day delivery
- ☐ Daytime stay waiting for delivery window
- ☐ Other _____

5. Do you have other comments on this segment or on specific locations within this segment? *(Open ended.)*

_____

Page 4: Tell us about you

1. How would you describe yourself? *(Check all that apply.)*

- ☐ Truck driver
- ☐ Dispatcher
- ☐ I work for a company that hauls freight (not necessarily as a dispatcher or driver)
- ☐ Member of an advocacy group
- ☐ Law enforcement
- ☐ Freight Planner
- ☐ Truck stop operator/employee
- ☐ Other _____

Page 5: Questions for truck drivers

1. How often do you look for parking in Oregon? *(Choose one.)*

- ○ Never
- ○ Once per month or less
- ○ 2-3 times per month
- ○ 1-2 times per week
- ○ 3-4 times per week
- ○ 5-6 times per week
- ○ Daily

2. How do you typically locate parking in Oregon? *(Check all that apply.)*

- ☐ Internet
- ☐ Smartphone App such as "Park My Truck" (please list any apps you use below)
- ☐ Provided by my company
- ☐ Printed material
- ☐ I have favorite locations I visit regularly
- ☐ Other_____

3. What are the main factors that influence where and when you stop for breaks? *(Rank the following options.)*

1. I'm required to stop by hours of service rules
2. Personal safety or cargo security
3. Available rest stop amenities
4. Established stops provided by my company
5. Proximity to route/destination
6. Cost/rates
7. Weather/road conditions

Other _____

4. What specific features and/or amenities do you look for when choosing a rest area? *(Choose all that apply.)*

- ☐ Refueling services
- ☐ Restrooms
- ☐ Showers
- ☐ Expected parking availability
- ☐ Width of parking space/ease of access
- ☐ Maintenance/service centers
- ☐ Restaurants/food service
- ☐ Vending machines
- ☐ Less lights/noise
- ☐ Internet/Wi-Fi availability
- ☐ Pet facilities
- ☐ Other _____

5. How often do you take required (10-hour) breaks at the following types of locations? *(Choose one for each.)*

	Never	Less than once a week	1-2 times per week	3-4 times per week	5-6 times per week	Daily
Private Truck Stop	○	○	○	○	○	○
Public Rest Area	○	○	○	○	○	○
Customer	○	○	○	○	○	○
Business	○	○	○	○	○	○
Terminal	○	○	○	○	○	○

6. How long have you been driving a commercial truck? *(Choose one.)*

- ○ Less than 6 months
- ○ 6 to 12 months
- ○ 1 to 3 years
- ○ 4 to 6 years
- ○ 7 to 10 years
- ○ More than 10 years

7. How many axles does your vehicle(s) have? *(Check all that apply.)*

- ☐ 2
- ☐ 3
- ☐ 4
- ☐ 5
- ☐ 6 or more

8. What is your usual range of operation? *(Choose one.)*

- ○ Local
- ○ Regional
- ○ National
- ○ International

Page 6: Questions for all respondents

1. In general, how would you rate the availability of truck parking in Oregon? *(Choose one.)*

- ○ Very good
- ○ Good
- ○ Neutral
- ○ Poor
- ○ Very poor
- ○ *Not sure*

2. What do you think are the main problems and issues with truck parking in Oregon? *(Choose your top 5.)*

- ☐ Current hours of service rules and regulations
- ☐ A general lack of available parking
- ☐ Delays associated with loading/unloading that impact schedule and the ability to plan rest stops
- ☐ Delays associated with congestion and traffic that impact schedule
- ☐ Crowding due to severe weather or weather-related delays
- ☐ Parking limitations at rest areas
- ☐ Distance between parking areas
- ☐ Out-of-direction travel required to reach parking areas
- ☐ Lack of oversize truck parking spots
- ☐ Difficulty knowing if and where spaces are available
- ☐ Public perception of truck parking
- ☐ Other _____

3. Which of the following strategies to alleviate truck parking issues make sense to you? *(Check all that apply.)*

- ☐ Paid parking reservation systems
- ☐ Smart signs that show available parking before reaching destinations
- ☐ Cell phone notification system
- ☐ Reduced delivery curfews
- ☐ Incentivize businesses to accept deliveries 24/7
- ☐ Real-time parking availability information (via website or app)
- ☐ More/better maps of truck parking areas
- ☐ Incentivize local businesses to allow truck parking
- ☐ Build more public truck stops
- ☐ Encourage private investment and expansion of truck stops
- ☐ Convert weigh stations to provide additional parking
- ☐ Larger truck rest areas and truck parking lots
- ☐ Other _____

4. How old are you? *(Choose one.)*

- ○ Under 18 years old
- ○ 18-24 years old
- ○ 25-34 years old
- ○ 35-44 years old
- ○ 45-54 years old
- ○ 55-64 years old
- ○ 65 years or older

5. What is your preferred language? *(Choose one.)*

- ○ English
- ○ Spanish
- ○ Other _____

6. Please provide the following information if you would like to receive more information about this project.

Name _____ **Email** _____

Appendix B: Interview Questions

Suggested Introduction: Thank you for speaking with us. These questions are intended to determine how, why and when truck drivers choose their parking locations in Oregon, where they are going, and what amenities they prefer when parking.

Parking availability

1. In general, how would you rate the overall availability of truck parking in Oregon? *(Choose one.)*

- ○ Very good
- ○ Good
- ○ Neutral
- ○ Poor
- ○ Very poor
- ○ *Not sure*

2. What do you think are the main problems and issues with truck parking in Oregon?

3. What do haulers usually do to compensate for parking issues in Oregon? *(For example, avoiding travel in certain areas, or at specific times.)*

4. In general, how do parking issues with rest areas and/or parking directly and indirectly impact you/commercial haulers? *(In terms of lost business, overtime wages, etc.)*

5. The following facilities are being studied to identify possible truck parking improvements. Based on this list, where is it the most difficult to find truck parking in Oregon? *(Choose from the list of facilities and segments listed below or on the map.)*

[Phone interviews: provide copy of map by email, or list facilities below and ask interviewee to refine by segment.]

- **Interstate 5**
  - A: I-5 from California State Border to US 199 in Grants Pass
  - B: I-5 from US 199 in Grants Pass to OR 138 in Roseburg
  - C: I-5 from OR 138 in Roseburg to OR 58 in Eugene
  - E: I-5 from OR 58 in Eugene to US 20 in Albany
  - F: I-5 from US 20 in Albany to OR 22 in Salem
  - G: I-5 from OR 22 in Salem to I-205 in Tualatin
  - H: I-5 from I-205 in Tualatin to the Columbia River
- **OR 58**
  - D: OR 58 from I-5 in Eugene to US 97 near Chemult
- **I-205**
  - I: I-205 from I-5 in Tualatin to the Columbia River
- **I-84**
  - J: I-84 from I-5 in Portland to the Sandy River in Troutdale
  - K: I-84 from the Sandy River in Troutdale to US 97 in Biggs Junction
  - L: I-84 from US 97 in Biggs Junction to US 395 in Pendleton
  - S: I-84 from US 395 in Pendleton to the Idaho State Border
- **OR 22 and US 20**
  - M: OR 22 and US 20 from I-5 in Salem to US 97 in Bend
- **US 97**
  - N: US 97 from I-84 in Biggs Junction to US 26 in Madras
  - O: US 97 from US 26 in Madras to US 20 in Bend
  - R: US 97 from the California State Border to OR 58 near Chemult
  - T: US 97 from OR 58 near Chemult to US 20 in Bend
- **US 20**
  - P: US 20 from US 97 in Bend to US 395 in Riley
  - Q: US 20 from US 395 in Riley to the Idaho State Border in Nyssa
- *Not sure.*

For each identified segment

1. What are the main truck parking issues in this segment?

2. How much time do drivers typically spend looking for parking in this segment that would otherwise be spent travelling?

3. Based on your experience, *when* do you/drivers have the most trouble finding available parking in this segment?

4. What do drivers typically do when they encounter the problems or issues you describe?

5. Why do drivers typically park in this segment?

6. Do you have other comments on this segment or on specific locations within this segment?

Questions about driver experience

1. How do drivers typically locate parking in Oregon? *(Internet, apps, etc.)*

2. Based on your experience, what are the main factors that influence where and when drivers usually stop for breaks in Oregon? *(Examples: Required by hours of service rules; safety and security; available amenities; set by company; proximity to route or destination; cost/rates; weather/road conditions.)*

3. What specific features and/or amenities do drivers look for when choosing rest areas?

4. Which of the following strategies to alleviate truck parking issues make sense to you? *(Indicate whether you agree or disagree with the following list.)*

- ☐ Paid parking reservation systems
- ☐ Smart signs that show available parking before reaching destinations
- ☐ Cell phone notification system
- ☐ Reduced delivery curfews
- ☐ Incentivize businesses to accept deliveries 24/7
- ☐ Real-time parking availability information (via website or app)
- ☐ More/better maps of truck parking areas
- ☐ Incentivize local businesses to allow truck parking
- ☐ Build more public truck stops
- ☐ Encourage private investment and expansion of truck stops
- ☐ Convert weigh stations to provide additional parking
- ☐ Larger truck rest areas and truck parking lots
- ☐ Other _____

Final Questions

5. Do you have recommendations for upcoming events or locations where we might collect in-person feedback about truck parking?

6. Would you like to receive more information about the study in the future?

- ○ Yes
- ○ No

7. Are you willing to send the truck parking survey to your internal email list?

- ○ Yes
- ○ No

8. Would you like copies of the project fact sheet?

- ○ Yes
- ○ No

Appendix C: Tabling Questions

The following questions are intended to streamline feedback from intercept surveys and collect the most vital information from busy travelers. Respondents will be directed to use the online survey if they wish to provide more in-depth feedback.

Suggested Introduction: "Thank you for speaking with us. These questions are intended to determine how, why and when truck drivers choose their parking locations in Oregon, where they are going, and what amenities they prefer when parking."

Parking availability

1. In general, how would you rate the overall availability of truck parking *in Oregon*? *(Choose one.)*

- ○ Very good
- ○ Good
- ○ Neutral
- ○ Poor
- ○ Very poor
- ○ *Not sure*

2. What do you think are the main problems and issues with truck parking *in Oregon*?

3. The following facilities are being studied to identify possible truck parking improvements. Based on this list, where is it the most difficult to find truck parking in Oregon? *(Choose from the list of facilities and segments listed below or on the map.)*

For each identified segment

1. What are the main truck parking issues in this segment? *(For example: Not enough parking space specifically during peak hours; time-limits are too short; Drivers often park on highway ramps or undesignated areas; inadequate services; parking is not safe or secure.)*

2. How much time do you typically spend looking for parking in this segment that would otherwise be spent travelling?

3. When do you have the most trouble finding available parking in this segment? *(Choose all that apply.)*

4. Why do you typically park in this segment? *(Examples: required by hours of service rules; overnight stay waiting for next day delivery; daytime stay waiting for delivery window.)*

Questions about driver experience

1. How do drivers typically locate parking in Oregon? *(Internet, apps, etc.)*

2. What are the main factors that influence where and when drivers usually stop for breaks in Oregon? *(Examples: Required by hours of service rules; safety and security; available amenities; set by company; proximity to route or destination; cost/rates; weather/road conditions.)*

3. What specific features and/or amenities do drivers look for when choosing rest areas?

4. Which of the following strategies to alleviate truck parking issues make sense to you? *(Indicate whether you agree or disagree with the following list.)*

- ☐ Paid parking reservation systems
- ☐ Smart signs that show available parking before reaching destinations
- ☐ Cell phone notification system
- ☐ Reduced delivery curfews
- ☐ Incentivize businesses to accept deliveries 24/7
- ☐ Real-time parking availability information (via website or app)
- ☐ More/better maps of truck parking areas
- ☐ Incentivize local businesses to allow truck parking
- ☐ Build more public truck stops
- ☐ Encourage private investment and expansion of truck stops
- ☐ Convert weigh stations to provide additional parking
- ☐ Larger truck rest areas and truck parking lots
- ☐ Other _____

Final Questions

Please provide the following information if you would like to receive more information about this study.

Name _____ **Email** _____

APPENDIX C
LITERATURE REVIEW TECHNICAL MEMORANDUM

OREGON COMMERCIAL TRUCK PARKING STUDY

Date: March 15, 2019

Subject: Literature Review (Technical Memorandum #1)

1. INTRODUCTION

This Technical Memorandum summarizes the literature that is relevant to the Oregon Commercial Truck Parking Study. The review focuses on methods and approaches of previous studies, as well as on their findings and conclusions. Eleven statewide and local truck parking studies from around the country were summarized, noting the results of outreach efforts (if applicable) and how truck parking needs were evaluated. Emphasis was placed on more recent and comprehensive studies. Several federal studies were also reviewed, including the guidance coming from the National Coalition on Truck Parking. Finally, sixteen recent research studies were reviewed (mostly from the past 5 years), to better understand the cutting edge of truck parking demand modeling, needs evaluation, and technological solutions. A brief section is included at the end of this Memorandum that summarizes the lessons learned from the literature in relation to the Oregon Commercial Truck Parking Study.

The reviews for each study focus on three areas: outreach methodology (surveys and interviews), approach for supply-demand analysis, and key findings. However, the exact topics covered for each study vary depending on the emphasis placed in the study and usefulness to our project.

1.1 Hours of Service Regulations

The demand for truck parking is determined by the need of drivers to take the required rest breaks to ensure the safe operation of the trucks. Rest requirements are described by the Hours of Service regulations, which the Federal Motor Carrier Safety Administration summarizes as:

- 11-Hour Driving Limit: May drive a maximum of 11 hours after 10 consecutive hours off duty.
- 14-Hour Limit: May not drive beyond the 14th consecutive hour after coming on duty, following 10 consecutive hours off duty. Off-duty time does not extend the 14-hour period.
- Rest Breaks: May drive only if 8 hours or less have passed since end of driver's last off-duty or sleeper berth period of at least 30 minutes. Does not apply to drivers using either of the short-haul exceptions.

- 60/70-Hour Limit: May not drive after 60/70 hours on duty in 7/8 consecutive days. A driver may restart a 7/8 consecutive day period after taking 34 or more consecutive hours off duty.
- Sleeper Berth Provision: Drivers using the sleeper berth provision must take at least 8 consecutive hours in the sleeper berth, plus a separate 2 consecutive hours either in the sleeper berth, off duty, or any combination of the two.
- 34-Hour Restart Provision: Drivers may restart a 7 or 8 consecutive day period after taking 34 or more consecutive hours of rest. FMCSA recently revised regulations to limit the use of the 34-hour restart provision to once every 168 hours and to require that anyone using the 34-hour restart provision have as part of the restart two periods that include 1 a.m. to 5 a.m. It also includes a provision that allows truckers to drive if they have had a break of at least 30 minutes, at a time of their choosing, sometime within the previous 8 hours.

Changes in HOS regulations, or how they are enforced, will likely lead to changes in the location and quantity of truck parking demanded.

2. FEDERAL AND NATIONAL STUDIES

2.1 USDOT Second Jason's Law Survey

In 2015 USDOT published the results of the first Jason's Law truck parking survey. A second survey is currently underway, in order to update the inventory of truck parking and improvements to truck parking availability; evaluate truck travel by state to ascertain increases in truck parking demand; assess the types of technology being used to monitor availability and demand; and compile truck parking plans, studies and projects completed by states and metropolitan planning organizations. USDOT will also be conducting a field survey. This survey and studies will also include private truck stops.

2.2 ATRI (2016) Managing Critical Truck Parking Case Study – Real World Insights from Truck Parking Diaries

This report details the findings of the "Truck Parking Diaries" research conducted by ATRI, which collected and analyzed qualitative data on the daily issues truck drivers face related to truck parking. Drivers were provided with a postage-paid return envelope to ship the completed diary back to ATRI. In total, 148 completed diaries were returned between June and September 2016, representing a total of 2,035 days of truck parking activity and 4,763 unique stops.

2.2.1 FINDINGS

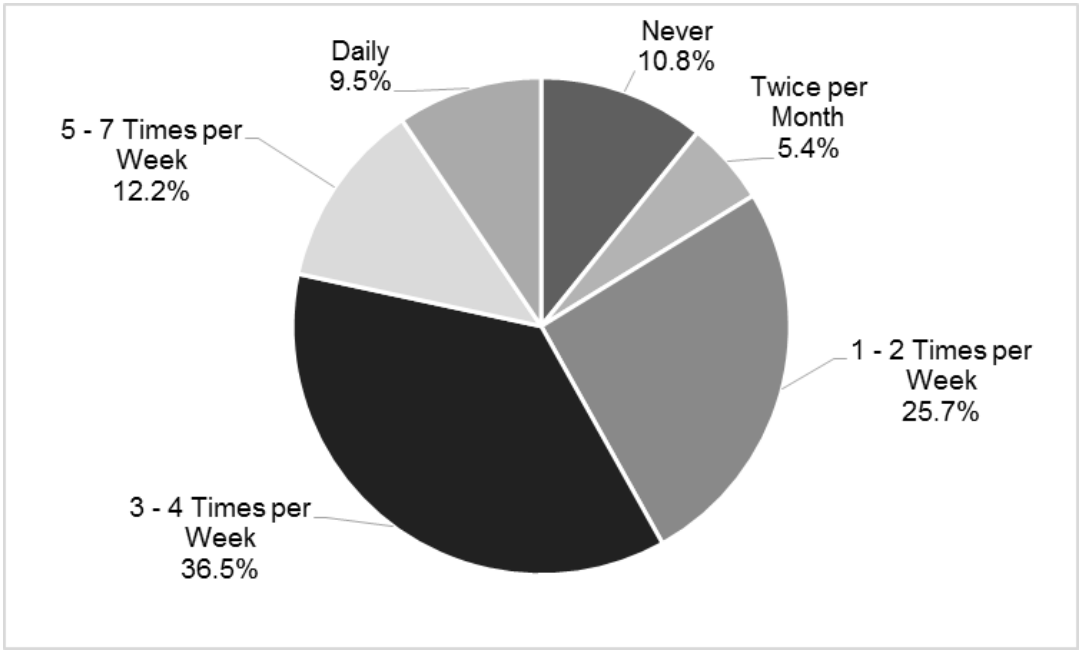
Some of the findings include:

- Drivers primarily select truck parking locations on their own (93.8 percent).
- Drivers predominantly use websites or smartphone applications (55.5 percent), GPS (53.4 percent) and books (37.7 percent) for selecting parking locations.
- A small percentage of drivers (4.1 percent) indicated that they do not do any advance planning for their parking locations.
- 61.6 percent of drivers report that time-of-day impacts truck parking availability. The diary data supports driver statements, showing that unauthorized/undesignated parking peaks between 7:00pm and 4:59am.

Issues related to public rest areas were cited by 24.4 percent of drivers. The closing of public rest areas and the distance between parking locations were identified as problematic by drivers. Another issue cited was parking time limits at public rest areas, as required 10-hour HOS breaks usually exceed these time limits, which range between two and ten hours.

The frequency of unauthorized/undesignated parking is shown in Figure 1. Over one-third of the drivers parked in undesignated locations three to four times per week (36.5 percent), followed by once or twice per week (25.7 percent). A small percentage of drivers (9.5 percent) in the sample rely heavily on shoulder and ramp parking to meet their parking needs, parking in an undesignated location at least once per day.

Figure 1. Unauthorized/Undesignated Parking Frequency



Source: ATRI

Observations of non-trucks occupying truck parking spaces peak on Sundays (40.2 percent), followed by Saturdays and Mondays (37.3 percent). The weekend peaks of non-truck demand for parking spaces observed here are likely the result of weekend travel patterns for the general population. Non-truck occupation of truck parking spaces is more likely to be observed in public rest areas (48.8 percent) than private truck stops (43.0% percent), in this sample.

Proximity to routes and destinations, restroom and shower facilities and expected parking availability were the top reasons for where drivers chose to stop for their required 10-hour breaks (see Table 1). The types of facilities that drivers use for their 10-hour break are shown in Table 2. Private truck stops were the most frequently used.

Table 1. Factors Influencing Where Drivers Stop for Required 10-Hour HOS Breaks

Important Factor	Percent of Responses
Proximity to Route / Destination	96.5%
Restroom / Showers	79.8%
Expected Parking Availability	75.5%
Width of Parking Space / Ease of Access	31.9%
Restaurant	30.5%
Security	20.3%
Company Policy / Loyalty Program	18.1%
Internet	6.9%
Laundry	4.0%
Maintenance / Service Center	3.7%
Weather Conditions	3.6%

Source: ATRI

Table 2. Stop Locations for Required 10-Hour Breaks

Location Type	Percent
Private Truck Stop	71.4%
Public Rest Area	9.6%
Customer	8.9%
Business	4.3%
Terminal	4.1%

Source: ATRI

Respondents “gave up” an average of 56 minutes of available drive time per day by parking early rather than risking not being able to find parking later in the day. This unused drive time effectively reduces a driver’s productivity by 9,300 revenue-earning miles annually – which equates to lost wages of $4,600 annually. These productivity losses may reduce driver wages by up to 10 percent.

2.3 National Coalition on Truck Parking

The National Coalition on Truck Parking (NCTP) is an FHWA initiative that created four working groups to implement various truck parking opportunities identified in the 2016 National Coalition of Truck Parking Activity Report. These working groups focused on parking capacity, data and technology, innovative funding options, and state and local government coordination. Below is a brief summary of the work that has been done in these areas.

2.3.1 PARKING CAPACITY

The Parking Capacity working group developed three work products to assist states in developing strategies to increase truck parking capacity:

- **Creative use of Right-of-Way (ROW)**: This document provides examples of low-cost solutions for creating parking capacity using existing facilities in ROW or adjacent to the ROW. The examples focused on rest area and weigh station conversions to increase truck parking capacity, as well as on attempts to create parking at tourism centers. Other examples included truck parking inside an interchange (at Big Springs, Nebraska), and consolidation of public ROW at the Golden Glades Interchange in northern Miami-Dade County to accommodate truck parking.
- **Involving Shippers/Receivers to Address Truck Parking Capacity**: This document provided examples of methods that private companies have used to alleviate the shortage of truck parking. These strategies include:
  - providing designated “bullpen” areas outside distribution centers
  - using dispatchers to assign drivers parking spots at or near distribution centers for staging purposes.
- **Considerations for Low Cost Truck Parking**: This document describes some of the factors truck parking operators may consider to minimize maintenance and operation costs at their facilities. These factors include:
  - trash removal
  - using soil-cement as a low-cost paving material
  - vault toilets
  - safety measures such as emergency phones, fire extinguishers, and defibrillators

2.3.2 DATA AND TECHNOLOGY

The Data and Technology working group, chaired by ATRI, developed several products & recommendations:

- **Truck Parking App Survey:** This document provided a summary of a truck driver survey ATRI conducted at the Mid America Trucking Show in Louisville, KY to determine truck driver opinions on parking apps. The survey found that mapping features and driver-input on parking spot availability are the two most important features. Trucker Path and myPilot are the two most popular apps used by truckers to find available truck parking.

- **Best Practices for Truck Parking Availability Detection and Information Dissemination by States**: This document described the implementations of Truck Parking Information Management System (TPIMS) used by different states. Examples included:
  - Entry/exit sensors used by Indiana DOT and Kentucky DOT that count the number of trucks using parking lots.
  - In-pavement and entrance/exit ramp sensors used by Iowa DOT.
  - "Computer vision" system used by Kansas DOT that employs cameras at 18 rest areas along I-70 to build a "3D image" of the parking area, and automatically identifies available spaces.
  - The use of stereoscopic video analytics by Minnesota DOT.
  - Other similar systems used by states such as California, Colorado, and Florida.
- **A recommended guidebook on standards and Best Practices for national TPIMS program**

2.3.3 FUNDING, FINANCING, AND REGULATIONS

The Funding, Financing, and Regulations working group developed two work products:

- **Emissions Reduction Grant Programs Fact Sheet:** This document provides an overview of the various emission reductions grant programs available to states and local governments to fund transportation projects. The document discussed the Congestion Mitigation and Air Quality (CMAQ) program and the Diesel Emissions Reduction Act (DERA) program. It also provided examples of CMAQ and DERA-eligible Idle Reduction Technology (IRT) system implementations and truck stop electrification projects.
- **Public-Private Partnerships (P3) Examples and Considerations**: This document highlighted P3 initiatives and non-traditional funding sources to increase truck parking capacity. Examples included:
  - The use of a P3 to develop the Brainerd Lakes Area Welcome Center in Minnesota, which provides short-term truck parking, bathrooms, and vending machines.
  - An agreement between Virginia DOT and private sector sponsors through which the private sector may sponsor Virginia rest areas to assist funding of operation costs.
  - The leveraging of local fuel tax revenue by the City of Decatur to incentivize a private company to create a truck stop in the community.

2.3.4 STATE, LOCAL, AND REGIONAL GOVERNMENT COORDINATION

The State, Local, and Regional Government Coordination working group developed four products:

- **MPO-101 (How to improve truck parking in your region):** This guide provides background and a list of resources for engaging with MPO officials to improve truck parking.

- **Parking and Staging Requirements in Local Zoning:** This document provides examples of local governments efforts, including provision of truck parking and staging in local planning and zoning.
- **The Importance of Considering Truck Parking in Local Zoning:** This document highlights the safety, commercial and congestion relief benefits that local communities may obtain from considering truck parking in plans for commercial development.

2.4 ATRI (2018) Critical Issues in the Trucking Industry

ATRI conducts an annual survey of industry stakeholders to identify and monitor the issues that are most likely to affect the trucking industry in the coming years. Since its inception in 2005, the "Top Industry Issues" survey has provided important insight into the most pressing issues facing truck drivers and executives alike.

The issue of truck parking has generally climbed higher in the top issues list for the last decade. While the "truck parking" issue ranked 5th in the overall list, among truck drivers it was the number 2 issue for the last two straight years.

Table 3. 2018 Top Industry Issues by Respondent Type

Rank	Commercial Drivers	Motor Carriers
1	Hours-of-Service	Driver Shortage
2	**Truck Parking**	Hours-of-Service
3	Electronic Logging Device (ELD) Mandate	Driver Retention
4	Driver Distraction	Electronic Logging Device (ELD) Mandate
5	Driver Retention	**Truck Parking**
6	Compliance, Safety, Accountability (CSA)	Compliance, Safety, Accountability (CSA)
7	Driver Health and Wellness	Driver Distraction
8	Transportation Infrastructure/ Congestion/Funding	Transportation Infrastructure/ Congestion/Funding
9	Driver Shortage	Driver Health/Wellness
10	Automated Truck Technology	Economy

Source: ATRI

2.5 FHWA (2002) Study of Adequacy of Commercial Truck Parking Facilities

This study developed an analytical model to predict parking demand on a corridor segment as a function of the proportion of truck traffic, the annual total traffic, the length of the segment, the average speed of trucks, and the average parking time per travel time. The demand predictions can be adjusted by peak traffic, proportion of truck trip types (long-haul vs. short-haul), and loading and unloading times, using previously estimated factors.

3. STATE, REGIONAL AND LOCAL STUDIES

3.1 MAASTO (Ongoing) Regional Truck Parking Information Management System

In 2016, an 8-state coalition within the Midwest division of AASHTO received a $25 million Federal TIGER grant to develop a regional truck parking information system (TPIMS). The TPIMS program developed in response to the critical need for truck parking in the region. The lead state for the TPIMS project is Kansas DOT.

The primary objective of the TPIMS is to reduce time searching for parking and to provide safe truck parking alternatives in the states of Indiana, Iowa, Kansas, Kentucky, Michigan, Minnesota, Ohio and Wisconsin.

The state systems differ somewhat in design, technologies and management approaches, but will all monitor truck parking availability and provide real-time information to truck drivers via a combination of apps, websites and dynamic message signs. Five of the 8 state systems will be active by June, 2019.

Phase 1 of the TPIMS project is nearing completion, and includes the following tasks:

- Systems Engineering: Develop the TPIMS concept of operations, system and design requirements, design standards and 30-percent design plans.
- Stakeholder Engagement: Secure input regarding system concepts, and create project communications and branding.
- Performance Measures: Develop metrics for tracking TPIMS progress and effectiveness.
- Grant Oversight: Oversee federal TIGER grant compliance.
- Project Management: Coordinate project team tasks and quality control/quality assurance activities.
- Future Needs: Identify future needs for TPIMS final design, procurement and deployment.

3.2 Hernandez and Anderson (2017) Truck Parking: An Emerging Safety Hazard to Highway Users

This study, funded by the Oregon Department of Transportation, sought to better understand truck parking needs in Oregon by conducting a stated-preference survey of truck drivers that operate in the state and a survey of public agencies in other states. Then, the study conducted a demand analysis to model truck parking demand along a specific corridor in the state (US-97) and assess whether enough parking spaces are available to meet parking demand. Finally, the study conducted a safety hot-spots analysis along this corridor, finding that crashes tended to concentrate at the locations and during the time periods that trucks typically have difficulty finding parking. The approach and findings of this safety analysis are not covered in this section because they are not relevant.

3.2.1 SURVEY OF PUBLIC AGENCIES

A survey was administered using Qualtrics to: Oregon's Area Commissions on Transportation (ACT), Oregon's Metropolitan Planning Organizations (MPO), transportation engineers and planners in each Oregon county, the Commercial Vehicle Safety Alliance for states across the country, Departments of Transportation in several states, and FHWA administrators across the country. Out of the 120 surveys sent by email, 20 were completed. Of the responses, 74 percent came from State Departments of Transportation, 21 percent came from federal agencies, and 5 percent came from city level agencies. No responses were obtained from MPOs or county-level agencies in Oregon. The following were the main findings:

- 70 percent of respondents indicated that they have a problem with truck parking in their jurisdiction., Over half of respondents are extremely concerned about shoulder parking, and very or extremely concerned with parking on freeway on-ramps or conventional highway roadsides. One-third are very or extremely concerned about truck parking at public rest areas.
- The survey included an open-ended section that allowed respondents to detail the steps they are taking to address truck parking issues. The main responses were:
  - To increase truck parking availability in Montana, trucks are permitted to park at weigh stations if they do not impede normal operations.
  - Missouri has experimented with ways of cheaply increasing the number of spots available, including turning decommissioned rest areas into gravel "truck only" parking. As a result, the state has the most truck parking spaces per truck miles traveled.
  - Nevada seeks to have parking facilities at two-hour intervals, and is conducting research into systems that provide real-time parking information to drivers. Truck stop electrification is also being considered to reduce engine idling.
  - Idaho is working with law enforcement agencies to improve the truck parking situation; however, funding shortfalls make it difficult to construct new rest areas.
- The rest stops in southern Oregon tend to be older (40- to 50-year structures) and require significant renovations, including improving access to water and sewer.

3.2.2 SURVEY OF TRUCK DRIVERS

A stated-preference survey was administered by the researchers to truck drivers that operate in the Northwest, obtaining 201 usable responses. The main findings were:

- 85 percent of drivers decide where to park themselves, with the rest relying on plans provided by their companies.
- Drivers report most trouble finding parking in the evening, with the most difficult period to being 9:00pm - 11:59pm and the second most difficult period being 4:00pm - 8:59pm. Finding spots on Friday is considerably more difficult than any other day of the week. Because of the holiday rush, finding spots in December is considerably more difficult than other months of the year.

- The main reasons for parking on ramps and shoulders are: no nearby parking facilities, no available parking at nearby facilities, difficulty maneuvering around parking lots, and convenience of road access.
- The most important amenities at private truck stops/public rest areas are:
  - restrooms
  - convenience to highway
  - refueling services
  - security
  - restaurants (note that public rest stops typically can only provide vending machines and restrooms)
- 39 percent of respondents indicated that they would benefit from knowing in real-time the number of parking spaces available at upcoming facilities. The majority of these (56 percent) indicated that they would like to receive real-time parking information through smartphone applications.
- Respondents rated the following as the most effective ways of improving truck parking:
  - build more parking spaces
  - improve parking layout/configuration
  - improve real-time information availability
  - improve public rest area amenities

3.2.3 SUPPLY AND DEMAND ANALYSIS

This study estimated demand for truck parking using the FHWA model published in 2002. Truck volumes were obtained from the Oregon Department of Transportation for 2014, and growth forecasts were obtained from the Oregon Statewide Integrated Model (SWIM). Following the FHWA model, the corridor was broken up into 2 segments on US-97 and 1 segment on I-84.

For each segment, the short-haul and long-haul travel hours were calculated using truck volumes, the proportion of short-haul travel (derived from a previous study[1]), and the average speeds. Drawing from the literature, it was assumed that short-haul trucks on average stop for 5 minutes every 60 minutes of travel. For long-haul trucking, the ratio of stop time to hours of travel was obtained by comparing allowable travel times in HOS regulations with drive times from a survey conducted earlier in the literature. The actual ratio was not explicitly reported in the study.

The estimated hours of parking demand for short-haul and long-haul trucks were then converted to peak hour demand using specific factors from the literature. The proportion of demand at rest areas versus truck stops was also determined using factors from the literature.

[1] Pecheux et al. (2002). The values of 0.36 and 0.64 are applied to analysis segments within 200 miles of a city with a population of at least 200,000.

These last two calculations represent a key weakness of this study because previous results were used instead of Oregon specific data. The demand for public rest areas will obviously depend on the availability of these facilities. It is likely that Oregon has a different prevalence of rest areas, and therefore the factors used in this study are likely not representative.

The Trucker Path application was used to describe the supply of parking spaces throughout US-97. Google Earth was used to verify the number of spaces at certain locations. This supply of truck parking spaces was compared to the demand estimated previously to assess shortfalls.

3.3 ADOT (2018) Arizona Truck Parking Supply, Demand, and Needs Analysis

This is an ongoing project conducted by the Arizona Department of Transportation (ADOT).

3.3.1 SURVEY AND OUTREACH

This study conducted an online survey of truck drivers with the help of the Arizona Trucking Association, and the Owner Operators Independent Driver Association (OOIDA). This survey achieved 164 responses from truck drivers that operate at least partially in the state. Various stakeholders were also consulted in developing their conclusions.

From the survey and consultations, this study found the following were the main reasons for truck parking: 1) legally-required 10+ hour rest breaks, 2) legally-required 30 min rest breaks, 3) short breaks for meals and restrooms, and 4) staging for pick-up or delivery at specific businesses. Different types of trucking were found to have different parking needs. Long-haul trucking required both legally mandated breaks and short rest breaks, while short-haul trucking only required short rest breaks.

The survey found that 93 percent of truck drivers had problems finding available spaces. Half of these problems finding parking occurred in urban areas. Also, 72 percent of truck drivers indicated that parking availability has gotten much worse or worse during the past year. The inability to find truck parking was found to generate the following problems:

- **Increased time searching for parking**: Half of all respondents indicated that they spend more than 16 minutes searching for parking. As parking availability decreases, drivers spend even more time searching, which has a large negative impact on productivity.
- **Stop early to secure available parking spot**: Since parking demand peaks in the evening, some drivers might give up searching and secure a spot earlier in the day than they would prefer. In Arizona, 63 percent of drivers give up 30 minutes or more of productive drive time to find a stop.
- **Parking in undesignated locations**: In Arizona, 77 percent of drivers indicated that they park in undesignated locations at least once per week, with 36 percent indicated that they park 1-3 times per week, 6 percent indicated they park 4-6 times per week, and 9 percent indicated that they use undesignated spots daily. Drivers are forced to use undesignated locations when they cannot find a spot that allows them to meet their delivery schedules and satisfy HOS regulations.

The survey found the following potential solutions:

- **Improved parking information:** The top 3 sources of information were smartphone applications, variable message signs, and in-cab messaging systems. About 41 percent of respondents preferred to receive parking information 20 miles or more ahead of the parking location.
- **Reservation of Parking Spaces:** Around 28 percent of respondents indicated that they are willing to pay to reserve a parking space. This finding falls in line with previous studies. While a small percent, this could represent a way of ensure parking availability. Around 13 percent indicated that they would be willing to pay $1 to $5 per reservation, which is less than the typical reservation fees at major truck stop chains.

The survey also asked about the factors that respondents perceived as limiting parking availability. Most respondents blamed the HOS regulations and lack of new construction to keep up with traffic increases. This report then described in detail the HOS regulations, how trucks manage these restrictions, the violations recorded throughout the state, and the effect of Electronic Logging Devices. The study further described economic factors that are leading truck traffic to increase (with corresponding increases of parking demand), including recent changes in the structure of supply-chains. The effect of recent innovations in truck technology were also discussed, albeit at a high-level.

3.3.2 SUPPLY AND DEMAND ANALYSIS

This study developed an inventory of truck parking locations in Arizona. This included public rest areas (owned and operated by the Arizona Department of Transportation) and private truck stop facilities. The inventory described overflow capacity (from satellite imagery) and amenities.

Informal/undesignated parking locations (inspection stations, closed rest areas, etc.) were identified manually by looking at clusters of parked trucks from ATRI's GPS data, as shown in Figure 2. The study found that most truck parking was in private truck stops, including some at vacant warehouses.

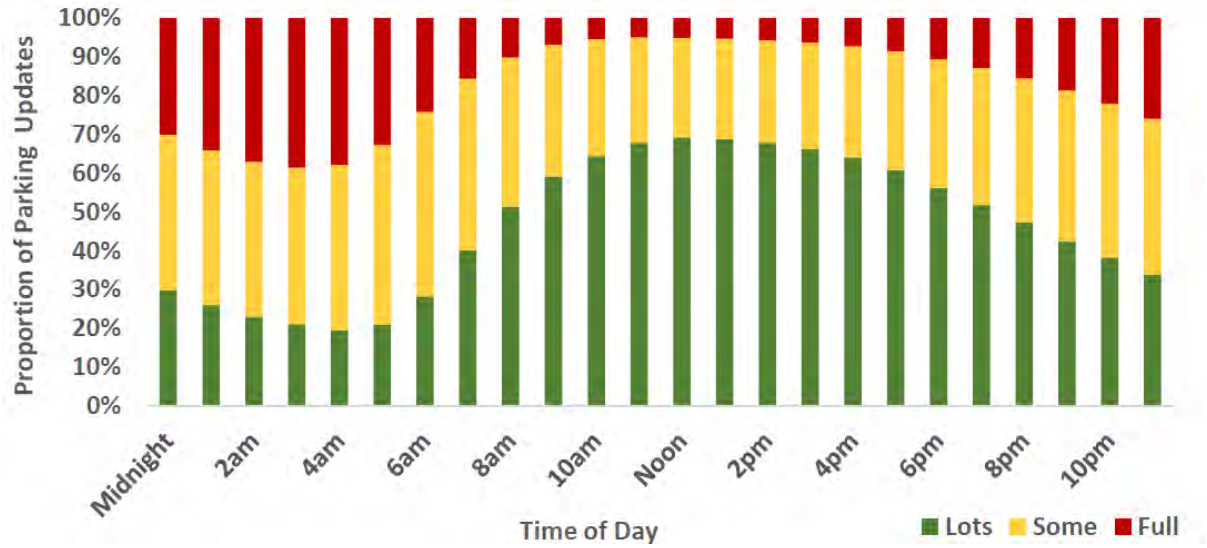
Figure 2. Identification of Informal Parking Stops

Source: CPCS Analysis of ATRI GPS Data

Truck GPS data was used to provide insights into different aspects of truck parking, including how demand varied throughout the day, the length of stay, and types of trips involved. Several descriptive figures were included for statewide parking demand.

To assess the availability of truck parking information, this study analyzed crowdsourced data from Trucker Path, as shown in Figure 3. This data only covered locations being monitored by the Trucker Path application (designated only), excluding facilities with few records. This application asks truck drivers to rate whether there are “lots”, “some”, or “none” parking spaces available at specific facilities.

Figure 3. Statewide Truck Parking Availability

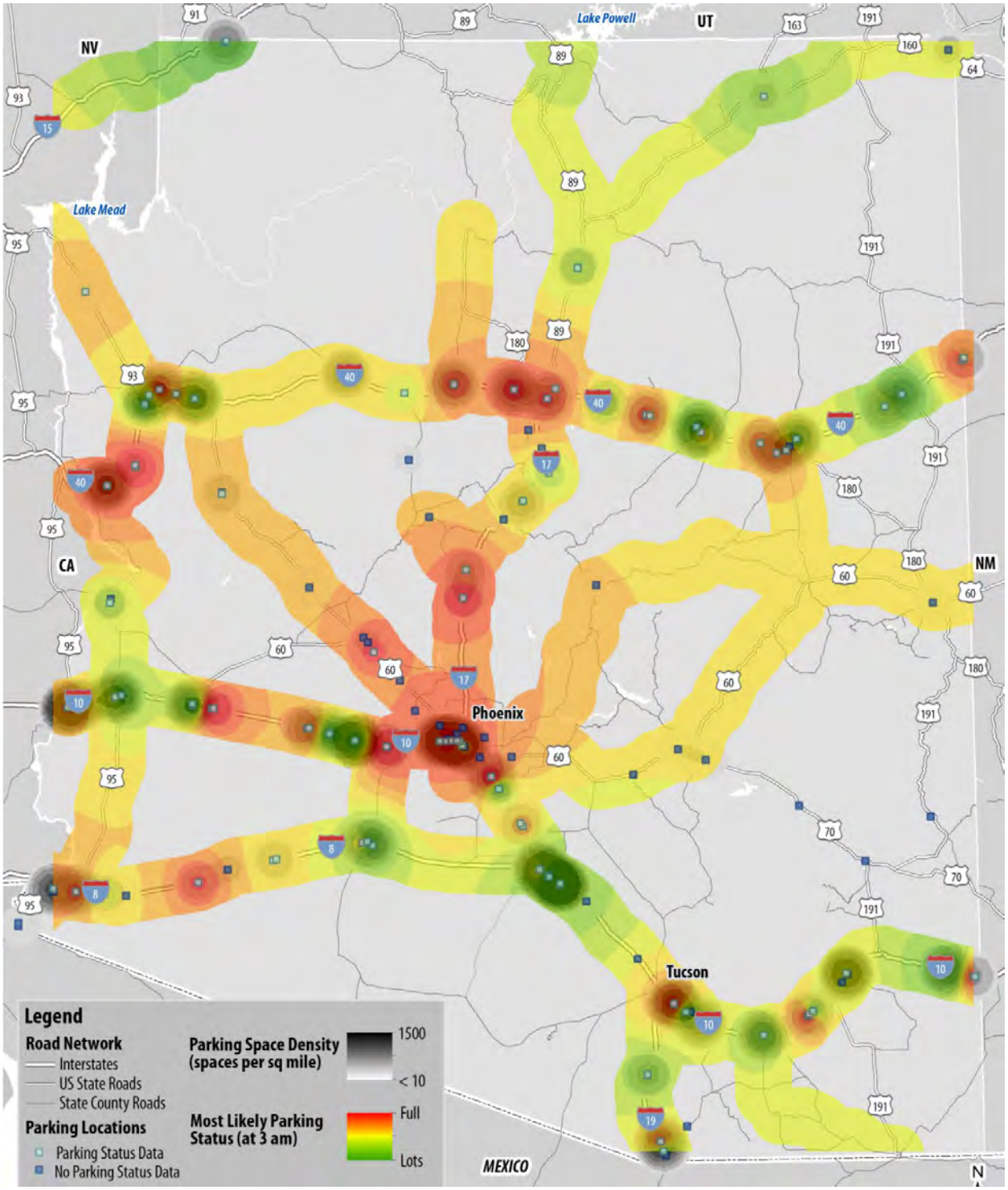


Source: CPCS Analysis of Trucker Path Data

Gaps in the supply and demand of parking spaces were identified as shown in Figure 4 by overlaying two pieces of information on maps: the density of parking spaces per sq. mile (from the inventory), and the availability of those spaces as reported by Trucker Path. This analysis was conducted for 6 times of day to capture how availability changes throughout the day. This analysis identifies places that have open spaces during high demand periods, and vice versa. The analysis was then conducted in greater detail for specific corridors. A limitation of this analysis is that the Trucker Path application only considers designated parking facilities.

To quantify undesignated truck parking, the study conducted a cluster analysis of data from ATRI. This was a manual process that did not rely on algorithms. It is unclear the level of detail used in the manual identification, or the criteria used to filter truck stops for other reasons (such as making deliveries).

Figure 4. Locations of Truck Parking Demand



Source: CPCS

3.4 VDOT (2015) Virginia Truck Parking Study

The Virginia Department of Transportation (VDOT) published in 2015 the Virginia Truck Parking Study.

3.4.1 SURVEY AND OUTREACH

The study reached out to five separate stakeholder groups (state troopers, VDOT staff, VDOT rest area staff, truck drivers, and owners and operators of truck stops).

Truck Drivers

An online survey was administered to approximately 3,000 members of OOIDA in Virginia, 580 members of the Virginia Trucking Association (VTA), and 3,131 members of ATA, yielding 445 responses. The main findings were:

- Most respondents reported having parked in undesignated areas such as shoulders of ramps for both short-term and long-term parking needs.
- VDOT rest areas were preferred over private truck stops for short term parking (33 percent vs 26 percent), whereas for longer term parking, private truck stops were widely preferred over VDOT rest areas (49 percent vs 15 percent)
- 97 percent of respondents indicated the lack of sufficient parking spaces at rest areas, particularly overnight.

State Troopers

A survey of 1,000 state troopers indicated that more than half of the respondents had observed trucks parking in undesignated spots, such as highway ramps. Ninety percent of such undesignated parking was observed overnight. This is in part caused by designated parking being over capacity, with 66 percent of respondents confirming this finding. Of the state troopers observing undesignated parking, 70 percent indicate that they request the driver to move. Since HOS compliance is a primary reason for seeking parking, requesting drivers to find somewhere else to park may introduce issues with HOS compliance. It is worth noting that this survey was conducted before the ELD mandate took effect in 2018, which may affect enforcement attitudes.

Rest Area Staff

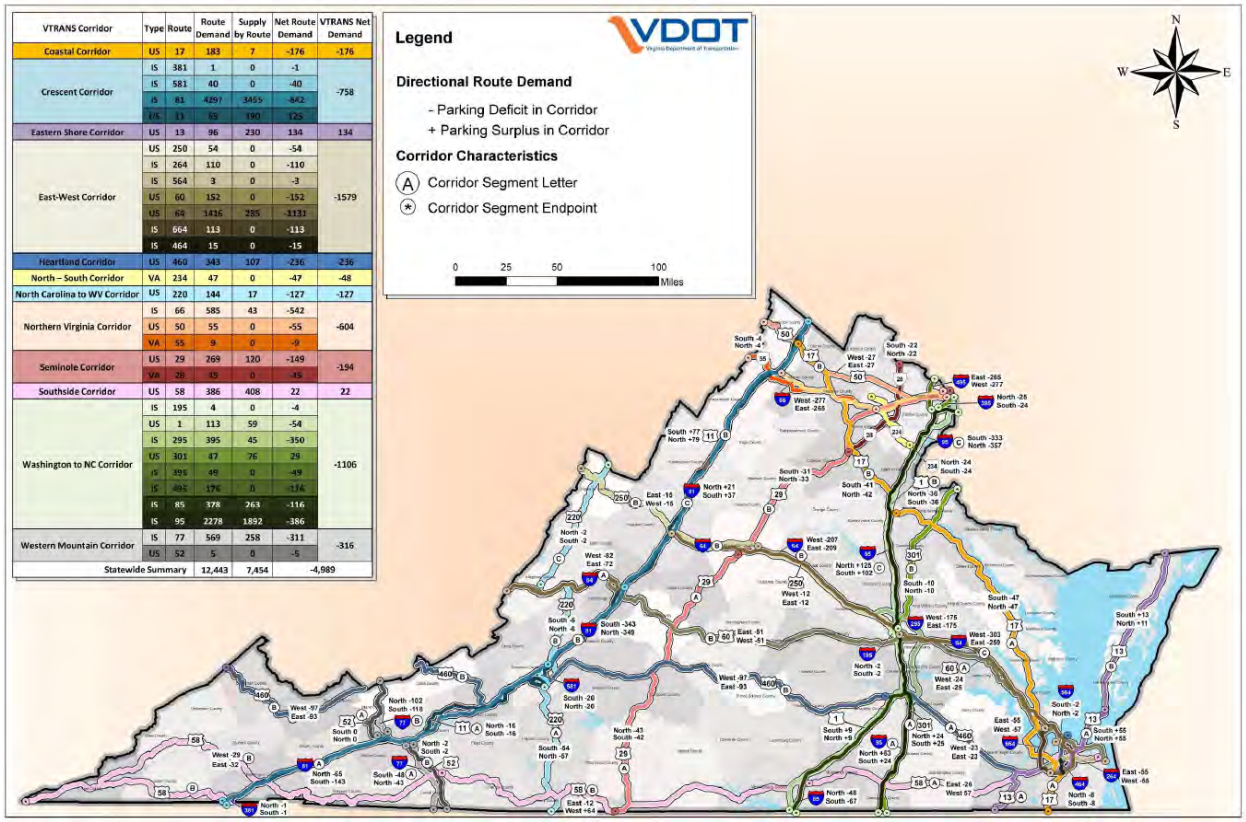
VDOT maintains 43 public rest areas, of which 36 include truck parking. A survey of VDOT rest area staff indicated that 97 percent of these rest areas are over capacity, with trucks regularly parking on exit ramps at over 80 percent of the facilities.

3.4.2 SUPPLY AND DEMAND ANALYSIS

The study also developed a demand profile for truck parking spaces in the various freight corridors. To this end, the authors used the demand equation from the FHWA *Study of Adequacy of Commercial Truck Parking Facilities – Technical Report* to calculate the demand for truck stops. The average parking duration per hour of travel came from "*Truck Parking in Pennsylvania – Final Report*", a 2007 report from the Pennsylvania State Transportation Advisory Committee. The parking demand calculated by this equation was then matched

against existing truck parking supply in Virginia to identify gaps. The results of this analysis are presented in Figure 5 and Figure 6.

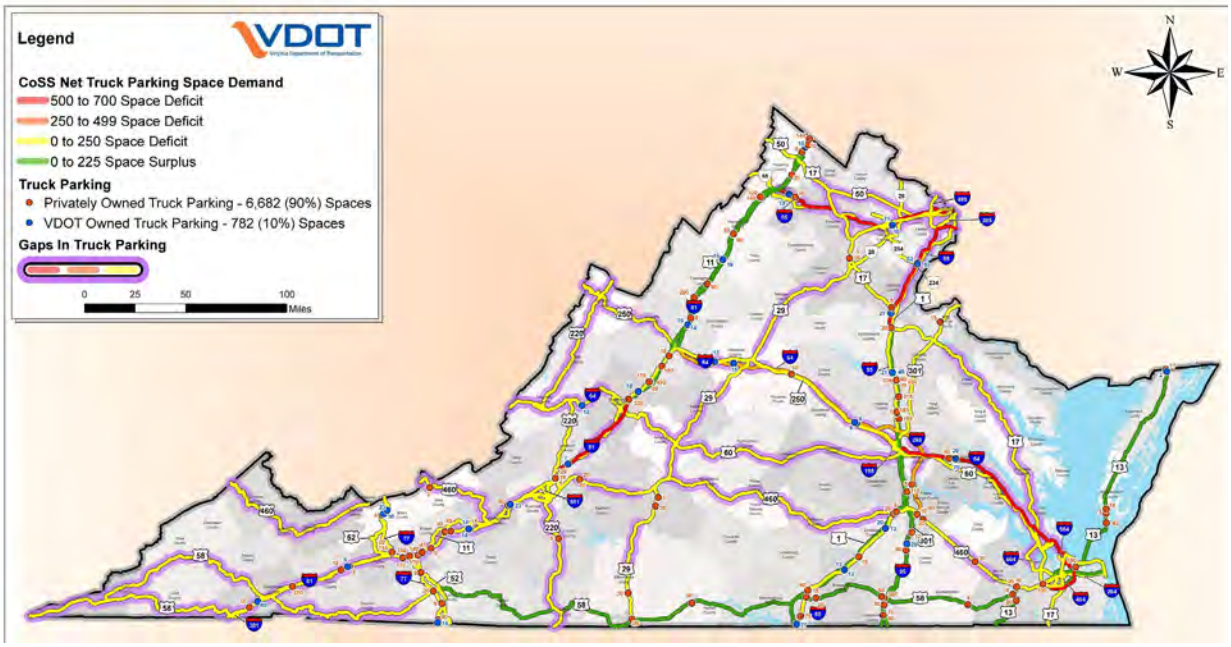
Figure 5. Truck Parking Demand Profile



VTRANS Corridor	Type	Route	Route Demand	Supply by Route	Net Route Demand	VTRANS Net Demand
Coastal Corridor	US	17	183	7	-176	-176
Crescent Corridor	IS	381	1	0	-1	-758
	IS	581	40	0	-40	
	IS	81	4297	3455	-842	
	US	13	69	190	121	
Eastern Shore Corridor	US	13	96	230	134	134
East-West Corridor	US	250	54	0	-54	-1579
	IS	264	110	0	-110	
	IS	564	3	0	-3	
	US	60	152	0	-152	
	US	58	1416	285	-1131	
	IS	664	113	0	-113	
	IS	464	15	0	-15	
Heartland Corridor	US	460	343	107	-236	-236
North – South Corridor	VA	234	47	0	-47	-48
North Carolina to WV Corridor	US	220	144	17	-127	-127
Northern Virginia Corridor	IS	66	585	43	-542	-604
	US	50	55	0	-55	
	VA	55	9	0	-9	
Seminole Corridor	US	29	269	120	-149	-194
	VA	29	45	0	-45	
Southside Corridor	US	58	386	408	22	22
Washington to NC Corridor	IS	195	4	0	-4	-1106
	US	1	113	59	-54	
	IS	295	395	45	-350	
	US	301	47	76	29	
	IS	395	49	0	-49	
	IS	495	176	0	-176	
	IS	85	378	263	-116	
	IS	95	2278	1892	-386	
Western Mountain Corridor	IS	77	569	258	-311	-316
	US	52	5	0	-5	
Statewide Summary			12,443	7,454	-4,989	

Source: Virginia Truck Parking Study

Figure 6. Net Truck Parking Space Demand



Source: Virginia Truck Parking Study

3.5 UDOT (2012) Utah I-5 Truck Parking Study

Using a Federal Highway Administration grant, the Utah Department of Transportation (UDOT) completed in 2012 a study on truck parking needs along 400 miles of I-15 in Utah. The primary objectives were to understand the adequacy of truck parking facilities along I-15, and hear from truck drivers about parking issues in general.

3.5.1 SURVEY AND OUTREACH

A survey was completed by 433 truck drivers at commercial truck stops. The survey sought to gain insights into truck drivers' experience with long-term parking (defined as more than four hours) along the I-15 corridor. The main findings were:

- Commercial truck stops and public rest areas are the main parking options available to truck drivers. Drivers tend to prefer public rest areas for short-term parking, while they prefer commercial truck stops for long-term parking (more than four hours) and meals. Restrooms, convenient connection to the highway, showers, and refueling service are the features that are most important to drivers.
- Almost all drivers determine their own stopping locations, and the majority do so while driving. Road conditions and speed may affect compliance with HOS regulations, therefore rest locations often need to be evaluated mid-trip. Only 21 percent of drivers plan where to stop before they started driving for the day.
- Most drivers indicate they would plan long-term rest stops better if they were aware of the locations of parking facilities, which highlights the need for better signage and roadside

parking information. More than half of the drivers surveyed would prefer to know the number of spaces available and amenities at parking facilities along the direction of travel.

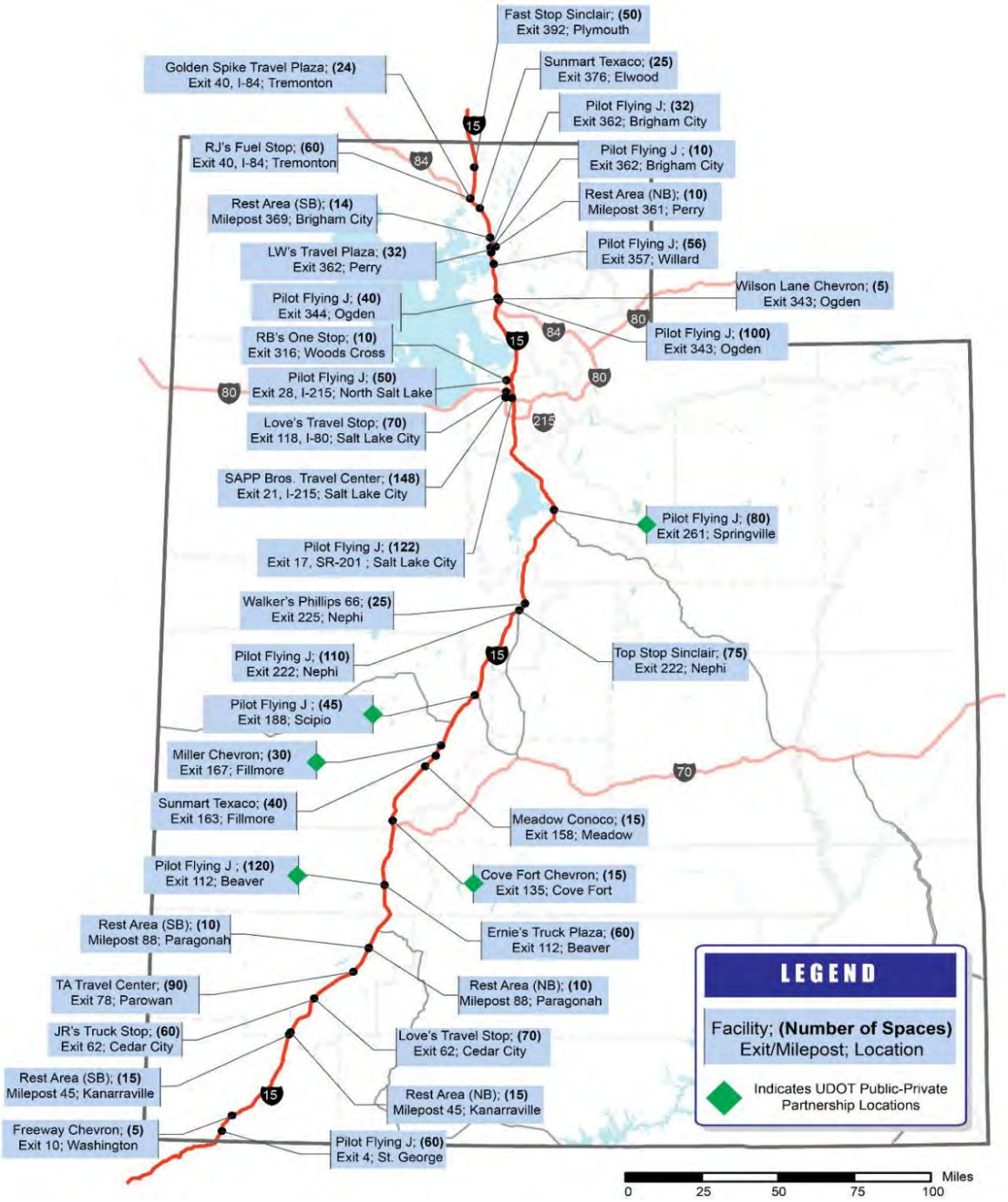
- More than 70 percent of respondents indicated that the primary reasons for parking on shoulders and on/off ramps were the lack of information about nearby parking facilities and the lack of available spaces. Blocked spaces and convenience of getting back on the highway were other reasons for undesignated parking.
- In addition to expanding truck parking facilities along the I-15 corridors, drivers would also like to see time limits on truck parking eliminated (used to ration available spaces at public parking facilities), and the layout and configuration of facilities improved (such as pull-through spaces and marked spaces).

UDOT also conducted interviews with long-haul truck drivers and commercial truck stop owners and operators. Both long-haul drivers and truck stop operators suggested increasing the amount of parking signage on the highway (such as “truck stop ahead” or “next rest area”), and identifying truck stops and parking facilities on maps distributed by UDOT. Participants suggested distributing such maps and other resources at state welcome centers, ports-of-entry, public rest areas, and commercial truck stops.

3.5.2 SUPPLY AND DEMAND ANALYSIS

An inventory of known commercial truck stops, public rest areas, and ports-of-entry along the I-15 corridor was completed by UDOT. The port-of-entry inventory was developed through calls to individual ports-of-entry, where the number of spaces available for long-term parking was confirmed. The commercial truck stop inventory was verified against commercial truck stop directories and guides, while the public rest areas inventory was compared to the Utah Statewide Rest Area Plan. An overview of these known parking facilities is presented in Figure 7.

Figure 7. Public Rest Areas and Commercial Truck Stops on I-15 in Utah



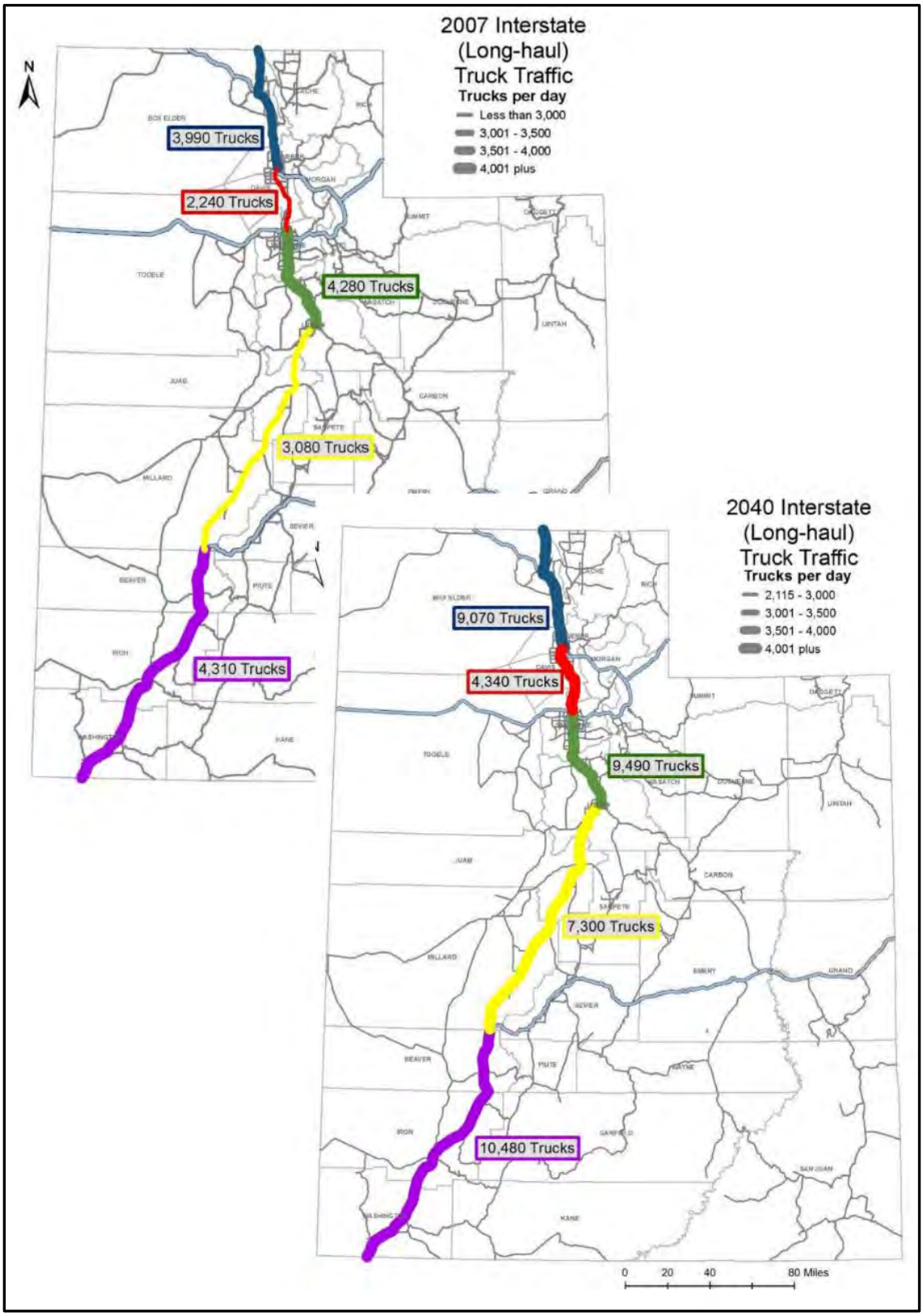
Source: Utah I-15 Truck Parking Study

Truck parking demand was calculated using the *Study of Adequacy of Commercial Truck Parking Facilities* developed by FHWA in 2002. This method implicitly assumes that demand for parking can be explained better by truck-hours of driving than by the locations or attributes of parking facilities. This represents an assumption that could be relaxed in future studies with the appropriate data.

Demand was estimated by first determining the long-haul truck traffic over 5 segments of the I-15 corridor. This was done using a combination of Freight Analysis Framework 3 (FAF3) data, and origin-destination data from the Truck Parking Survey. Truck flows were routed on I-15 using the shortest path method between freight districts, and matched with the reported truck traffic at Utah's borders to estimate long-haul traffic (presented in Figure 8). Short-haul truck traffic was calculated by subtracting the estimated long-haul truck traffic on each highway segment from the reported truck traffic.

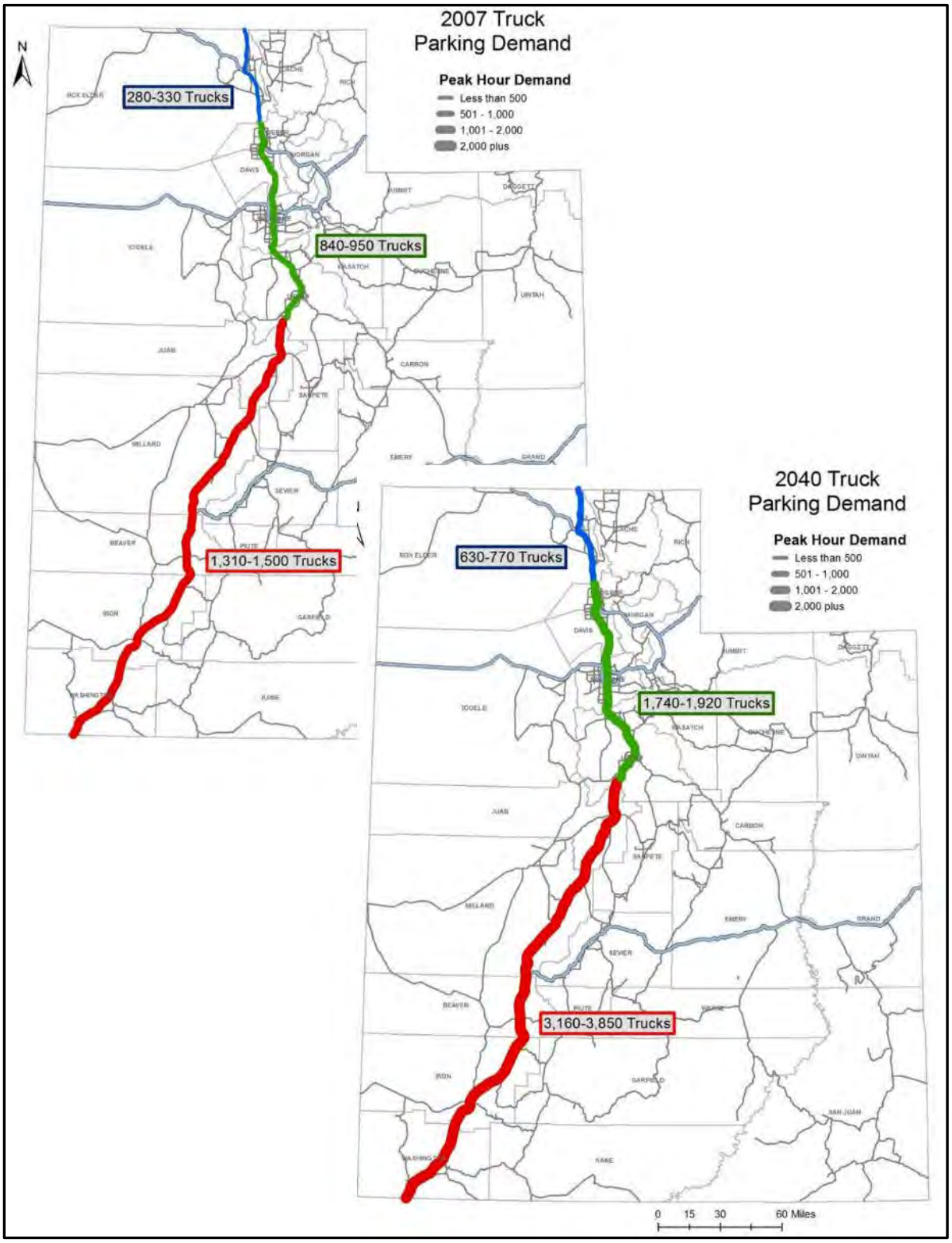
The daily truck-hours of travel on each segment were calculated from traffic volumes, segment length, and average speed (75mph for rural areas and 65mph for urban areas). Then, the truck-hours of parking demand per day were calculated using the daily truck-hours of travel estimates and national ratios showing the average amount of time that trucks spend parked relative to moving. These ratios differ between the short-haul and long-haul traffic. For long-haul traffic, this ratio is 49 hours of parking time to 70 hours of driving. For short breaks, the assumption was a stop of five minutes per hour of driving. The demand for truck-hours of parking was calibrated using peak hour factors and seasonal factors. The net peak season, peak hour truck parking demand was then calculated (shown in Figure 9).

Figure 8. Long-haul truck traffic (2007 and 2040) on I-15



Source: Utah I-15 Truck Parking Study

Figure 9. Peak Season, Peak-hour Truck Parking Demand in 2007 and 2040



Source: Utah I-15 Truck Parking Study

3.5.3 FINDINGS

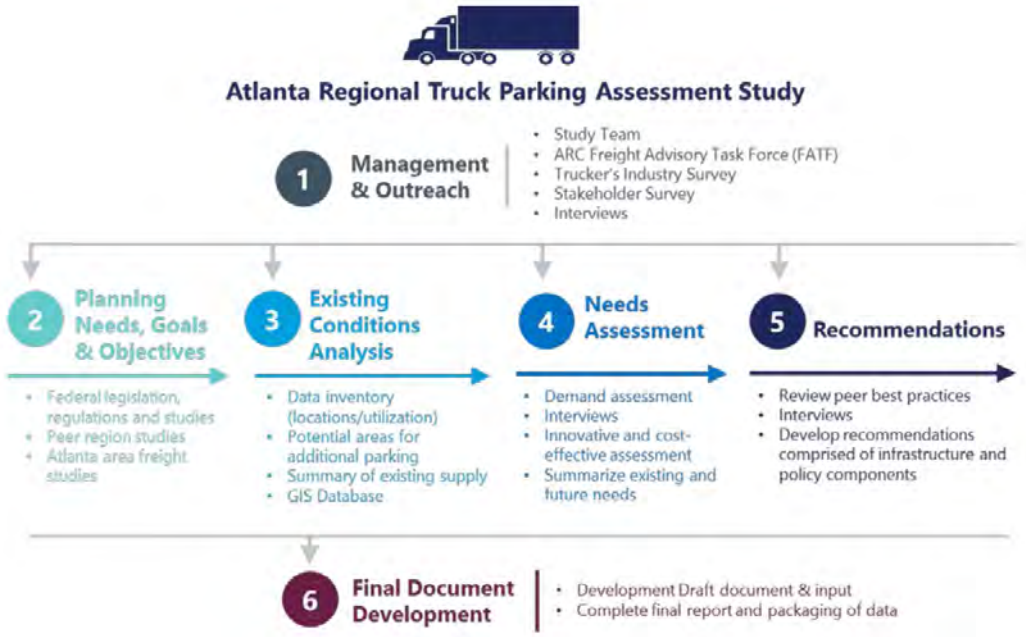
Based on the results of the survey and the demand analysis, the report makes the following recommendations that have already been implemented in Utah:

- Develop a visor card or truck parking map that indicates the locations of commercial truck stops and public rest stops along the National Highway System in Utah. This map, developed in 2012, also includes relevant information, such as telephone numbers, how many long-term parking spaces are available, and amenities offered.
- Enhance an existing smartphone application that informs motorists of road conditions to include the locations of commercial truck stops and public rest areas.
- Develop an interactive map and make available on the UDOT website that allows truck drivers to locate truck parking facilities in the state.
- Organize a Highway Rest Facility Committee (HRFC) to oversee the development and implementation of a formal Highway Rest Facility System Program (HRFP). This program would promote efforts to increase truck parking at public rest areas along the corridor, by identifying locations where parking is most needed as well as providing cost estimates and identifying potential funding sources.

3.6 ARC (2018) Atlanta Regional Truck Parking Assessment Study

The Atlanta Regional Commission (ARC) published in 2018 the "Atlanta Regional Truck Parking Assessment Study". This study had the components described in Figure 10.

Figure 10. Atlanta Regional Truck Parking Assessment Study Tasks



Source: Atlanta Regional Truck Parking Assessment Study

3.6.1 SURVEY AND OUTREACH

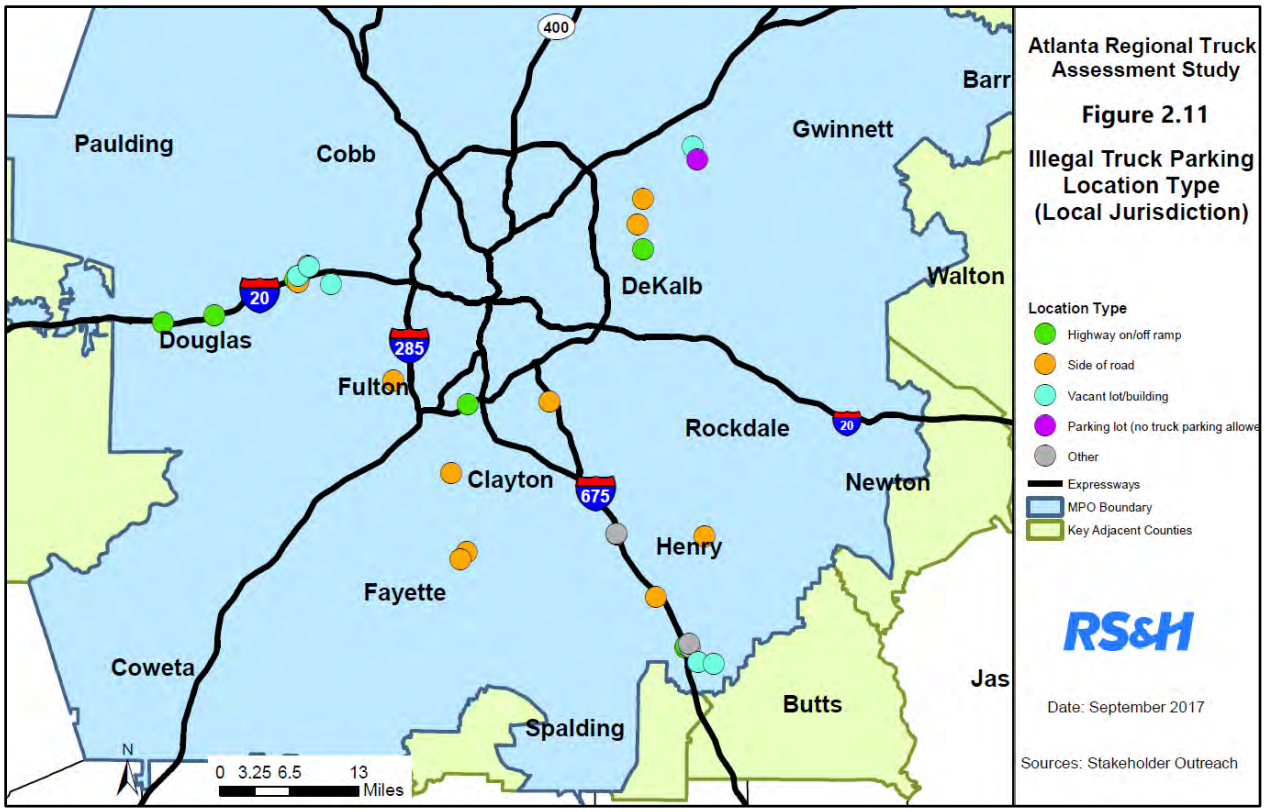
This study included extensive outreach efforts to collect information from various sources. The study team participated in several local committee meetings, including the ARC Freight Advisory Task Force Meeting, the ARC Transportation Coordinating Committee Meeting, and the ARC Land Use Coordinating Committee Meeting. Preliminary results were presented at these meetings and feedback was sought on study findings.

- An online survey was administered to local jurisdictions/community improvement districts, law enforcement officers, truck stop/convenience store owners or operators, and trucking companies/shippers.
- Almost half of the responses came from local jurisdictions and community improvement districts (37 responses).
  - Of these, 22 percent indicated that they do take an active role in truck parking issues, mostly indicating that trucks cause substantial disruptions to regular traffic and sometimes even damage roadway infrastructure, like streetlights.
  - Other issues mentioned included: truck parking in large parking lots, residential parking, and road shoulders.
  - Zoning was the favored policy to address truck parking, and enforcement and communication were the preferred strategies to deal with specific parking issues.
- Law enforcement responses to the survey focused on the use of warnings, citations, and vehicle impounding.
- The sample received for truck stop owners or operators was too small to derive conclusive findings.
- Responses from trucking companies/shippers indicated that:
  - 73 percent thought that truck parking was a serious issue, with a majority explaining in detail how limitations in truck parking availability affect their operations.
  - Almost half also indicated that HOS regulations had a negative impact on their operations.
  - Ninety-five percent of respondents indicated that they expected truck parking demand to increase over the coming decade.
  - Thirty two percent of respondents indicated that dispatchers assist the truck to find parking.
  - Roughly half of the respondents indicated that truck drivers were the ones responsible for paying for parking, with 1/3 of these respondents indicating that they do not receive reimbursement from the trucking company.

The survey presented 10 interstate corridors in the metropolitan region, and asked respondents to indicate the level of parking availability on a six-point scale. About half of these corridors were perceived as having limited parking or rarely available parking, and three had 15 percent of respondents indicating that they did not have any parking available. The survey also

contained a “mapping exercise” using Wikimapping where respondents could annotate issues and comments on the map. This tool was used by local jurisdictions and law enforcement to identify illegal truck parking locations (shown in Figure 11).

Figure 11. Illegal Truck Parking Locations Identified through Wikimapping Survey



Source: Atlanta Regional Truck Parking Assessment Study

A survey was conducted of truck drivers with the assistance of ATRI, OOIDA, and the trucking associations of neighboring states. The survey contained questions about the background of the truck drivers and the parking challenges within the Atlanta region. This survey received 277 responses.

Respondents rated the most important amenities at truck stops to be:

- restrooms
- adequate security
- access to the interstate
- showers
- fueling services

Over half indicated that it takes them on average over 1 hour to find parking. The methods most commonly used to find parking were:

- continue driving until a safe location is found (69 percent)
- smartphone applications (55 percent)
- being aware of destination in advance (47 percent)

Truck drivers were also asked to rate the availability of parking along certain highway segments in the Atlanta region.

The stakeholder outreach also included interviews of truck drivers, carriers, truck owners, and enforcement officers. The findings of these interviews are described in detail in the study but in general, they simply provide additional explanation for the issues raised.

3.6.2 SUPPLY AND DEMAND ANALYSIS

An inventory of truck parking facilities in the region was obtained by mining data from various sources, including:

- Federal Highway Administration
- the Georgia Department of Transportation
- the Georgia Environmental Protection Division
- website and smartphone applications (Trucker's Friend, National Truck Stop Directory, and NATSO's Park My Truck)

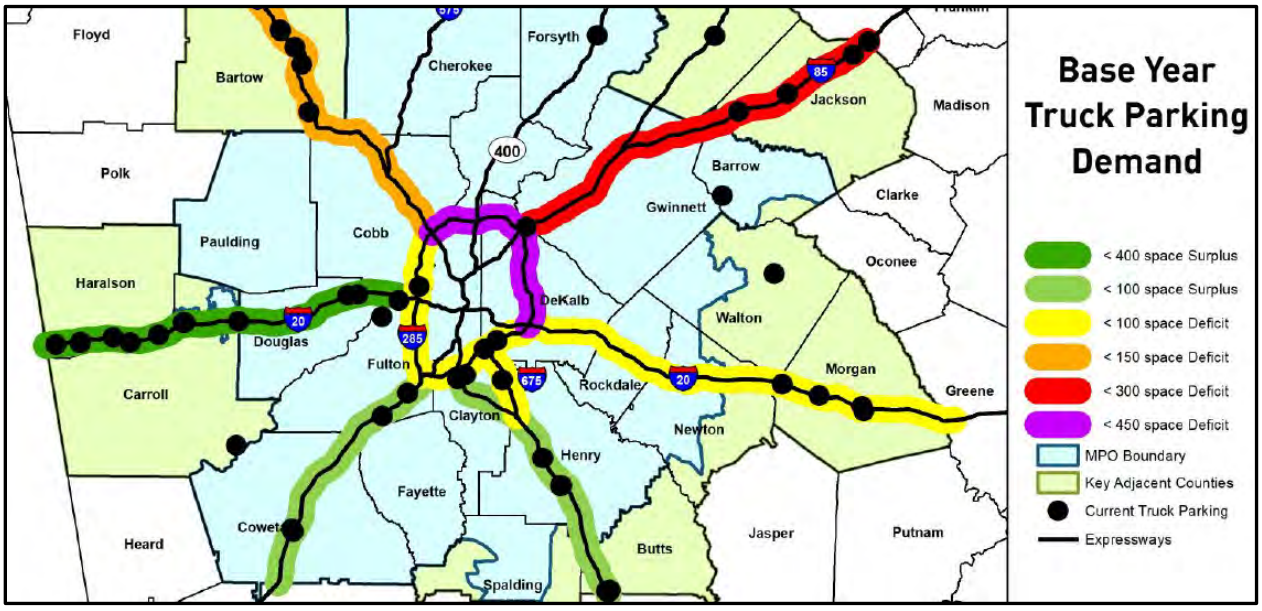
The inventory included information on facility name, location (geocoded), number of spaces, amenities, and data source.

To identify private or undesignated parking, the study relied on GPS data from ATRI to manually identify locations where truck stops cluster.

The demand for truck parking along interstates was calculated using a model published by the FHWA in 2002. A key input of this model is freight volume information, which this study obtained from the Freight Analysis Framework database, for current and future conditions. This might represent a limitation of this study as the volumes in this database are sometimes substantially different than the volumes observed on the ground, because the database values result from several national modeling efforts that cannot replicate conditions precisely throughout the country, particularly in complex urban areas such as Atlanta. Parking demand estimates were compared to the supply of public and private spaces found in the inventory to estimate the deficit or surplus of truck parking spaces. The results were mapped as shown in Figure 12.

Parking utilization was also quantified using truck GPS data from ATRI. This analysis compared the number of truck stopping locations longer than 2 hours on the corridor between 12am and 4am, to the availability of parking spaces. The GPS routes from ATRI were then used to show how trucks that pass through a specific polygon, for example at a milepost in I-74, are routed through the regional network.

Figure 12. Parking Surplus or Deficit



Source: Atlanta Regional Truck Parking Assessment Study

3.7 WSDOT (2016) Washington State Truck Parking Study

In 2016, the Washington State Department of Transportation (WSDOT) published the Washington State Truck Parking Study.

3.7.1 INVENTORY

Findings for Private Parking

WSDOT identified 49 private truck stops in Washington with a combined 2,442 parking spaces for trucks. Most of these truck stops are located along major truck routes, such as I-5, I-90 and I-82, although there are no truck stops around the Seattle metro region. Truck stops range in size from just a couple of spaces to over 200 spaces.

The study noted the presence of private retail locations, such as Wal-Mart or Home Depot, that allow truck parking in their parking lots, especially after hours. Many truck drivers park in these locations as they are well-lit, easy to find, and are close to food outlets and restrooms.

The study also considered truck parking facilities in vacant or abandoned lots on privately owned land, which arise in response to the deficit of truck parking spaces. However, it is difficult to gauge the exact supply and demand for these spaces as most are not documented. Further, these stops typically lack the basic amenities desired by truckers.

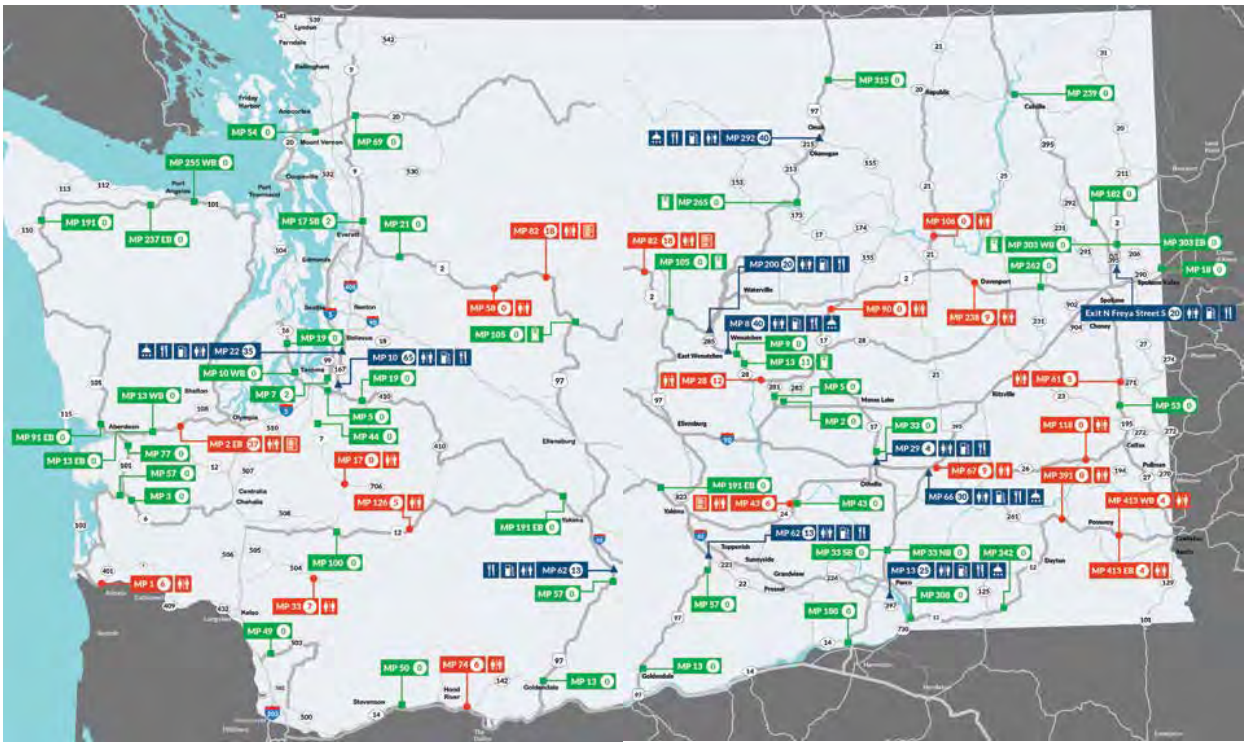
Findings for Public Parking Spots

WSDOT owns and operates 47 rest areas in Washington, with over 500 truck parking stalls. These rest areas are located 35 to 40 miles apart in accordance with FHWA recommendations. Weigh station locations owned by WSDOT are also commonly used for undesignated truck parking and consequently WSDOT regional offices have reported littering at some of these sites.

WSDOT owned right of way (ROW), including highway shoulders, exit ramps, mountain chain-up areas, and passing zones, are also unofficial truck parking locations, as it is easy for trucks to identify vacancies. Land owned by cities, counties, and ports may also be designated for truck parking facilities. Some municipalities, however, severely restrict truck parking. Seattle limits commercial vehicles to a loading time of 30 minutes and bans vehicles over 80 inches in width from parking on city streets between midnight and 6am.

Ports also experience truck parking issues in surrounding areas from short-term and longer-term parking or truck storage. Truck drivers may require temporary staging locations while waiting for port gates to open. Longer-term parking is required to satisfy HOS requirements or for truck storage. Truck parking options are often limited near port facilities, forcing truck drivers to park on the streets in industrial areas or even in residential neighborhoods.

Figure 13. Truck Parking Locations in Washington



Source: WSDOT Truck Parking Study

3.7.2 SURVEY AND OUTREACH

WSDOT engaged truck drivers in an online survey, as well as other industry stakeholders in roundtable discussions. The survey received 1,118 responses, 84 percent of which were from truck drivers. The main findings of the survey were:

- Private truck stops are the number one preference for both short-term and overnight parking (32 and 36 percent of respondents, respectively).
- Short-term and overnight parking is generally difficult to find, with 60 percent of respondents taking one-hour or longer to find overnight parking.

- Truck parking shortages increase safety and legal risks, such as driving while fatigued or outside allowed HOS.
- The interstate highways (I-5, I-405, I-82, and I-90) have the greatest truck parking shortage.

Among others, the main issues identified in the survey were:

- **Driver safety**, with 59 percent of respondents expressing concern over finding safe parking at night.
- **Highway safety**, with trucks parked in unofficial locations such as exit and entrance ramps, chain up/down areas on mountain passes, and on roadway shoulders, posing a safety hazard to the public.
- **Mismatch between parking preference and use**. Truck drivers prefer to park in private truck stops, followed by public rest areas. However, many drivers find these parking spots unavailable, leading to parking in undesignated locations. As can be seen in Figure 14, there is a mismatch between the preferences of drivers and the availability of different facilities.

Figure 14. Mismatch between Parking Availability and Preference

Parking Type	Preference	Actual Usage
Private truck stop	1	1
Public rest area	2	2
Shipper/reciever location	3	7
Abandoned lot	4	5
Weigh station	6	8
Roadside	7	4
Temporary parking lot (e.g., WalMart, casino)	8	6
Highway on-ramp/off-ramp	9	3

Source: WSDOT survey

3.7.3 RELEVANT FINDINGS

Based on the outreach and engagement efforts highlighted above, WSDOT identified locations of high truck parking interest, as well as technologies to meet the demand for truck parking. These could include using intelligent transportation systems (ITS) solutions such as real-time parking availability information to better match supply and demand of parking spots, using FHWA's Freight Advanced Traveler Information System (FRATIS) and private mobile device apps that provide parking information to truckers.

In particular, the Freight-Specific Dynamic Travel Planning and Performance application of FRATIS includes travel information, dynamic routing and performance monitoring elements that would be useful in reducing street wait times, travel times, and turn-around times at terminals. The wait time data provided to drivers may assist them to better plan their parking locations in advance of the trip.These features are available in commercial software used by truck lines; FRATIS offers a public-source alternative for operators who have not acquired other systems.

3.8 WisDOT (2009) Low Cost Strategies to Increase Truck Parking in Wisconsin

A report titled "Low Cost Strategies to Increase Truck Parking in Wisconsin" was published by Wisconsin DOT (WisDOT) in 2009. The study aimed to identify truck parking problems and solutions from stakeholders through surveys and in-person interviews.

3.8.1 SURVEY AND OUTREACH

The study team developed a GIS-based online tool that allowed the collection of data from participants throughout the study period. This GIS tool was distributed to truckers, highway patrol officers, and public freight planners.

The survey primarily inquired about freight corridor locations with truck parking issues, and the frequency with which these issues were observed. In total, over 50 locations with truck parking issues were identified. Around 300 offline surveys were also completed at truck shows to supplement the online survey.

3.8.2 RELEVANT FINDINGS

The major findings of this study were:

- In order of importance, truckers were mainly concerned with:
  - location of parking areas,
  - available amenities,
  - space availability, and
  - time limits.
- Truck parking problems primarily occur at the outskirts of large metro areas, where truckers park for staging before customer appointment times.
- When there is a lack of sufficient parking spaces during peak demand hours, overflow trucks often park on the ramps.
- Parking capacity shortages occur in the early evening or late at night.
- Truckers not familiar with the location and conditions of truck parking spots are less likely to find a parking spot when needed, thereby highlighting the need for advance information about available spaces.
- Poor geometrics and design at some locations make entry and exit movements difficult, and some trucks take up more than one spot due to poor lane markings, wasting parking capacity.

In December 2016, WisDOT joined seven other Midwestern states by installing a Truck Parking Information Management System (TPIMS) that uses sensors and cameras to create real-time information about the availability of truck parking. Truck drivers can monitor parking availability using tools such as dynamic roadside signs.

3.9 NCTCOG (2018) Truck Parking Study: A Freight North Texas Study

This study was conducted to determine the locations and capacity of truck parking (short term and long term) in the Dallas-FortWorth region of Texas by the North Central Texas Council of Governments (NCTCOG). As with the other studies, this study attempted to identify corridors where truck parking demand exceeds the supply. The study also developed possible solutions to address truck parking concerns at the regional level.

3.9.1 SUPPLY AND DEMAND ANALYSIS

Inventory

In addition to reviewing data from prior truck parking studies in Texas and elsewhere, this study gathered information on all truck stop facilities and Texas Department of Transportation (TxDOT) sponsored rest areas, including their location, total truck-parking lanes available, amenities offered, overnight parking availability, and any relevant technology installed. An illustration of the location of existing parking facilities is presented in Figure 15.

Demand

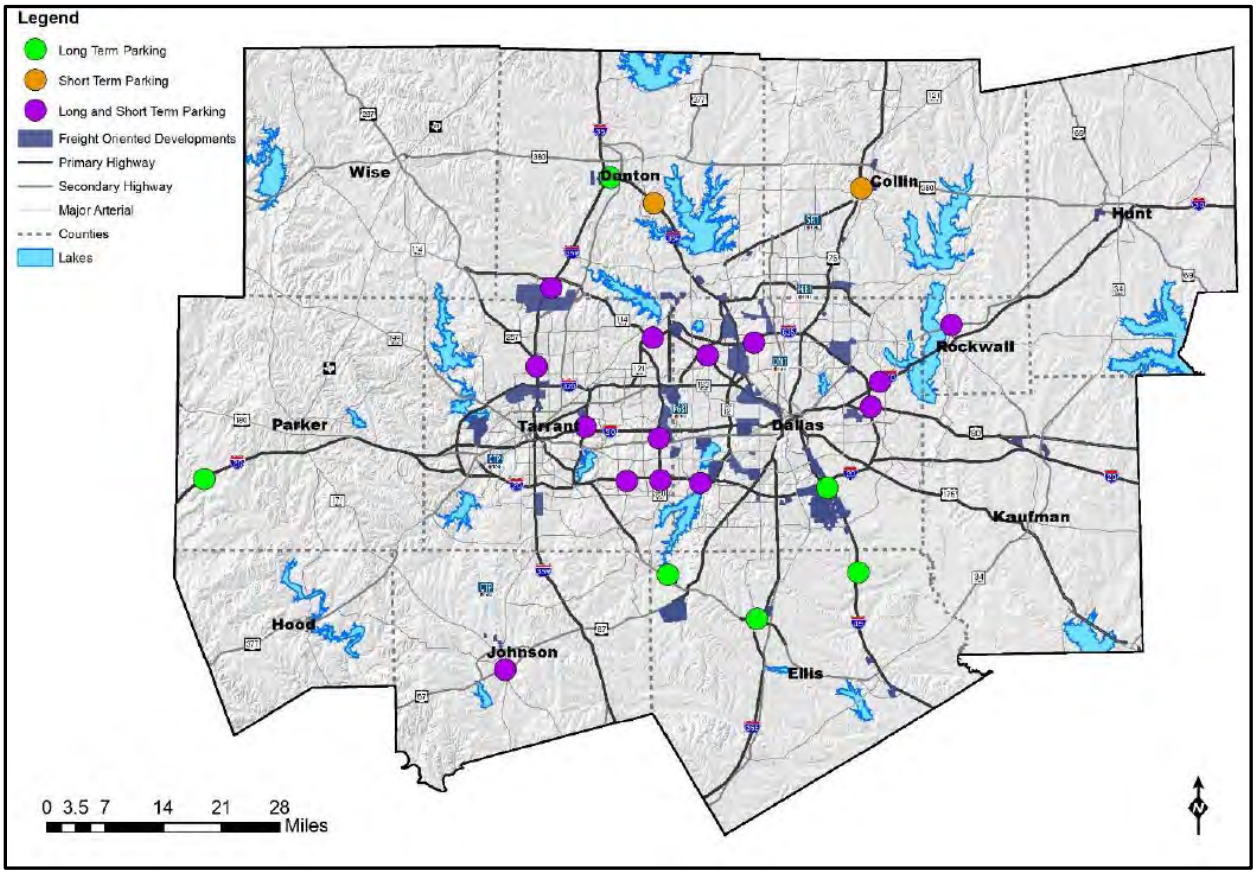
On the demand side, the study reviewed the most heavily traveled freight corridors to identify the average truck volume on these highways, as well as travel time data from across the region. This was done to determine how long it takes to travel across a given corridor, the effect of a drivers' HOS, and the travel time to and from Freight Oriented Developments (FODs), and major freight facilities. Local truck parking ordinances were also reviewed to identify corridors that lack adequate parking due to restrictions on commercial vehicles. This analysis was performed corridor by corridor; however, because of the availability of data on parking demand, it is difficult to ascertain the accuracy of the results.

3.9.2 SURVEY AND OUTREACH

A driver survey was conducted where different groups of motor carriers were surveyed to obtain their observations regarding truck parking availability and the amenities and characteristics that are valuable to drivers. NCTCOG staff distributed the survey at The Great American Truck Show to drivers that frequent the North Central Texas region and are familiar with truck parking facilities in the region. The survey was also available online (the number of responses was not shown).

For both short-term and long-term truck parking stops, drivers graded safety and security as the highest priority factors. For short-term stops, highly valued amenities included food choices, restrooms and shopping choices.

Figure 15. Location of Parking Facilities



Source: Truck Parking Study: A Freight North Texas Study

Other Outreach

In addition to the survey, other forms of stakeholder outreach were conducted. Fleet managers were engaged to determine specific areas of concern for short-and long-term parking. Site visits to truck stops were conducted to identify availability of parking and amenities at specific locations. The study was also discussed at the Regional Freight Advisory Committee public meetings to gather stakeholder input and to help determine specific corridors of concern.

3.9.3 FINDINGS

In addition to corridor-specific solutions and recommendations, this study also leaned on similar truck parking studies around the country to provide solutions for truck parking concerns. The study recommended strategies such as:

- Unused right-of-way owned by TxDOT, including weigh stations and closed rest areas, may be a short-term option for truck parking capacity.
- Requiring on-site parking at FODs and freight facilities such as distribution centers and warehouses would reduce the need for short-term truck parking. This would include parking facilities specifically set aside for drivers who arrive too early or who are mandated to take a break due to their hours of service.

- The study identified the need for a review of land use and zoning study around FODs and freight-focused areas. Residential lots that are often near or mixed with these freight facilities are not compatible with providing adequate truck parking spaces at these terminals.
- Funding agreements between the state and local/regional public agencies could be arranged for facility construction, maintenance, and operation of public rest areas.
- The public and private sectors could collaborate to develop more truck parking along with the development of incentives that mutually benefit the two parties. This could include roadway improvements, entrance/exit upgrades, competitive leasing, special zoning districts, intelligent parking availability notification (advanced signage), electrified parking, security measures, and other driver amenities.
- Technologies may be implemented to promote a more cohesive relationship between actual truck parking availability or projected availability, notification of availability, and amenities specific to individual facilities.

3.10 NCDOT (2017) North Carolina Statewide Multimodal Freight Plan: Truck Parking Study

This study analyzes the adequacy of truck parking resources in North Carolina.

3.10.1 SURVEY AND OUTREACH

Overall, the outreach efforts of this study were similar to the efforts of parking studies in Virginia and other states. Multiple private and public sector stakeholders were contacted or surveyed as part of the data collection process. A project steering committee consisting of representatives from the NCDOT, North Carolina Trucking Association (NCTA), North Carolina State Highway Patrol, and North Carolina Department of Commerce were surveyed. In-person and telephone interviews were conducted with private parking facility managers, State Highway Patrol officers, and North Carolina DOT Division Engineers.

An online truck driver survey was also conducted. The survey was developed and administered by ATRI, who distributed the final survey online to carriers operating in North Carolina through the NCTA and trucking associations in surrounding states. In addition, OOIDA distributed the survey directly to drivers on behalf of ATRI.

Almost 87 percent of respondents indicated that it took over 30 minutes on average to find truck parking, for both public and private parking facilities. Shipper unwillingness to provide truck parking also increased demand for off-site parking. The study notes that truck driver compensation models often do not reimburse drivers for non-revenue miles accrued while searching for parking. If the time required to secure truck parking reduces the revenue-earning miles for a driver, drivers will be impacted negatively.

Figure 16. Rest Stop Type and Frequency of Usage

Metric	Public Rest Area	Private Truck Stop	Shipper/ Receiver	Ramp/Road Shoulder	Other
Average	27.7%	46.0%	21.1%	15.4%	17.4%
Median	20.0%	40.0%	20.0%	10.0%	10.0%

Source: ATRI

The HOS 10-hour rest break and 30-minute rest break ranked number one and two, respectively, as the top reasons drivers require truck parking. Other reasons included parking while awaiting dispatch, and parking to access restrooms or food establishments. Private truck stops were the most-utilized facility type by drivers, followed by public rest areas and shipper/receiver locations (see Figure 16).

3.10.2 ADDITIONAL FINDINGS

Besides corridor-specific solutions, this study recommended the following strategies to ensure adequate and safe truck parking spaces:

- Partner with private truck travel centers to expand parking facilities and coordinate signage, since improved parking information was found to be important to drivers.
- Develop and employ communication and signage systems to provide information on truck facility locations and parking availability to drivers so that they can plan rest periods ahead of time or while in-transit. Detection systems to monitor the safety of truck parking spaces were also recommended.
- Explore the possibility of piloting truck parking at weigh stations. The advantages of this option would be the relatively low cost of implementation to provide some additional truck parking spaces. Disadvantages include disrupting weigh station activities with entering and exiting trucks, increased maintenance, and potential confusion over where trucks should park.
- Referencing efforts in Virginia, Kansas, Wisconsin and Florida, the study recommends developing a truck parking notifications pilot system that estimates truck parking availability based on demand at participating truck parking facilities.
- Coordinate with Metropolitan Planning Organizations and Rural Planning Organizations to develop guidelines and mitigation strategies aimed at easing public opposition to private truck parking facilities.
- Create a Truck Parking standing subcommittee within the DOT to assist the implementation of the corridor-specific and regional study recommendations.

3.11 ATRI (2017) Managing Critical Truck Parking Tech Memo #2: Minnesota Case Study

ATRI was contracted by the Minnesota Department of Transportation (MNDOT) to conduct an analysis using truck GPS data for several rest stop locations, based on a customized methodology that utilizes ATRI's large database of truck GPS points. This first-of-its-kind research assessed truck parking supply and demand by cross-referencing GPS data (i.e. truck activity) at several Minnesota rest stops. The findings were used to justify investments in expanded truck parking spaces.

3.11.1 METHODOLOGY

ATRI selected October 2015 as the observation period for the Goose Creek Rest Area, which lies along the I-35 northbound corridor north of the Twin Cities. ATRI used rest area truck counts derived from its GPS database and expanded these counts, using an extrapolation factor associated with MNDOT truck count data, to estimate the total number of trucks at the stop for each hour of the observation month.

To prepare the October 2015 data, first a geographic bounding box was created around truck parking in the rest area, and the needed data was extracted based on if a point's latitude and longitude fell inside this bounding box. Next, the point data were joined with spatial polygons resulting in the points receiving a text identifier of the study area. The number of trucks parked by hour of day and day of week were then found by:

- Removing trucks with a speed greater than zero miles per hour (MPH) to establish that a truck is parked;
- Converting the date/time stamp on a truck's GPS ping from Greenwich Mean Time (GMT) to Central Standard Time (CST);
- Extracting hour of day and day of week information from the converted date/time stamp;
- Creating a unique identifier (UID) for each point using the truck identification number, hour of day, and day of week indicator;
- Removing duplicate UIDs to account for a truck pinging a location more than once in any given hour on any given day; and
- Aggregating the number of UIDs by the hour of the day and day of the week.

Truck Count Expansion

ATRI developed an expansion factor for every hour in the observation period. This factor was used to expand GPS rest area counts in order to estimate the total number of trucks occupying the location. ATRI used truck count data at a MNDOT weigh-in-motion (WIM) traffic counting station 17 miles upstream of the Goose Creek rest area, and ATRI GPS data at the same geographical location to develop the expansion factor.

First, the MNDOT WIM data was analyzed to determine the number of trucks observed by day and hour of day on I-35. Next, ATRI GPS data was cross-referenced with the truck count data

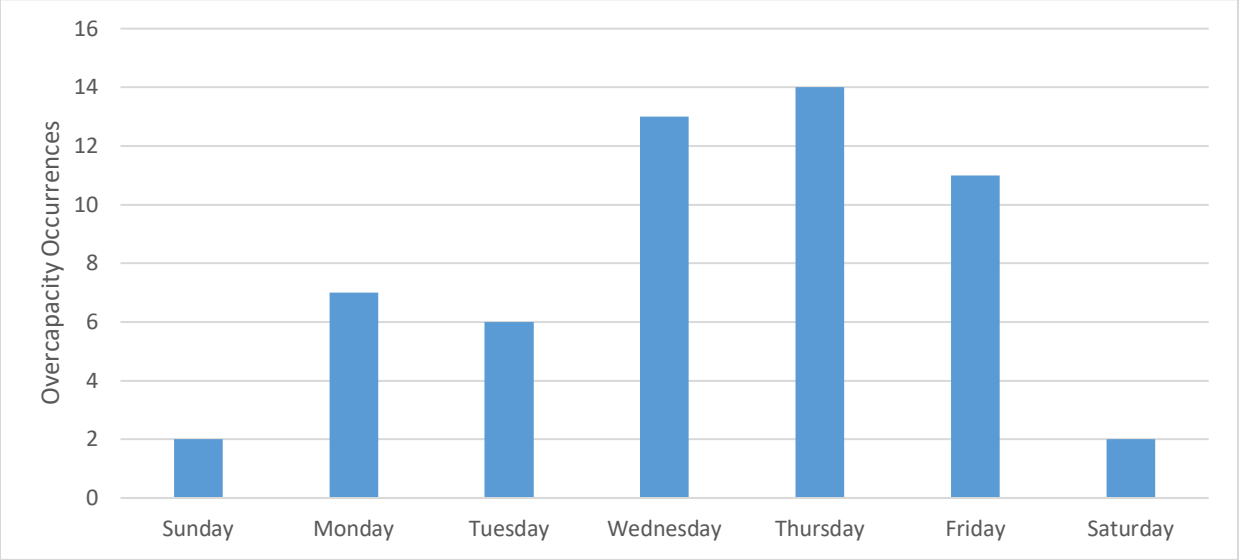
to determine the proportion of the sample to the WIM data, for each hour for each day. This expansion factor was then applied to the ATRI GPS data found at the Goose Creek rest stop, providing a reasonable estimation of the number of trucks parked in the rest stop. For example, if the MNDOT WIM data showed 18 trucks on the road at a particular time on a particular day, and the ATRI GPS data showed nine trucks, it can reasonably be assumed that ATRI GPS data is capturing 50 percent of the trucks for that time period, and applying a factor of two to the GPS counts at Goose Creek estimates truck parking usage.

When the expansion factors were applied for all hours of the selected dates at Goose Creek, a truck parking usage matrix was able to be developed, including occurrences where capacity was exceeded during certain hours of certain days.

3.11.2 RESULTS

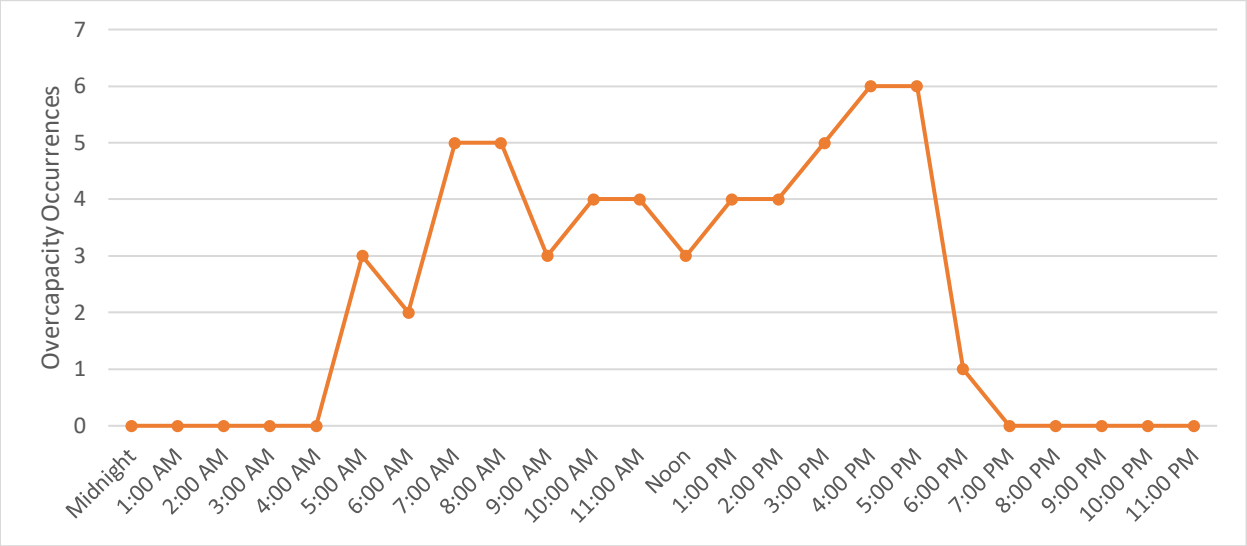
The Goose Creek Rest Area experienced 55 hours at overcapacity in October of 2015. This equates to being overcapacity 7.4 percent of the month. The latter part of the week experienced more crowding, with Wednesday, Thursday, and Friday seeing the bulk of the issue (see Figure 17). Additionally, the issue was concentrated during the daylight hours between 5:00 AM and 6:00 PM, with the other hours of the day seeing no overcapacity issue, suggesting that overcapacity is caused by drivers stopping for their hours-of-service (HOS) rest break (Figure 18).

Figure 17. Goose Creek Rest Area - Overcapacity by Day of Week



Source: ATRI

Figure 18. Goose Creek Rest Area - Overcapacity by Hour of Day



Source: ATRI

This quantitative analysis, using real world truck GPS data, corroborates that truck parking capacity assessments can be developed for planning and management purposes. The analysis showed that while overcapacity occurs at some locations more frequently than others, all of the locations examined experienced overcapacity at some point during October 2015. Additionally, this analysis uncovered a trend whereby truck drivers had the greatest difficulty finding available parking in the second half of the week.

3.12 KDOT (2016) Kansas Statewide Freight Network Truck Parking Plan

The objective of this study was to improve the freight network's safety, efficiency, and competitiveness, especially along main freight corridors in the state, such as I-70 and the Kansas Turnpike.

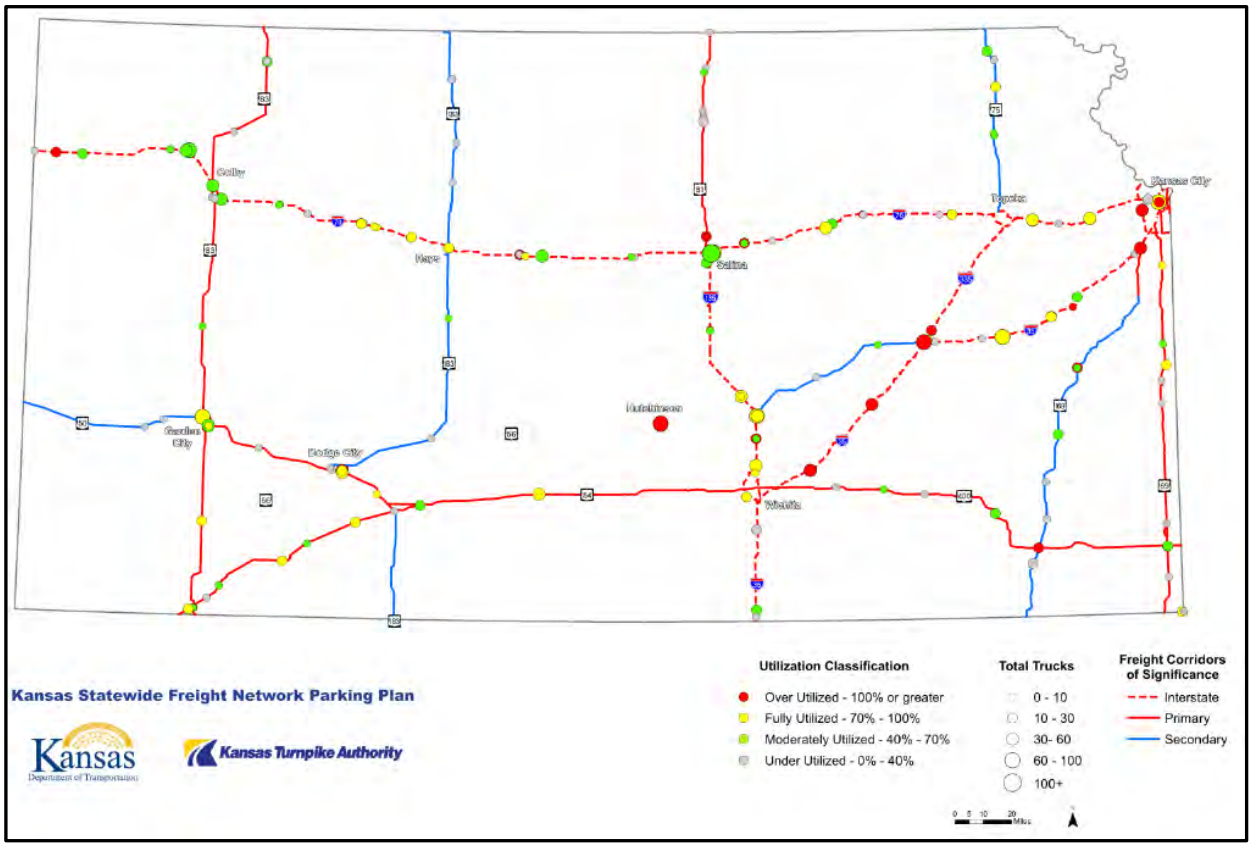
3.12.1 DEMAND AND SUPPLY ANALYSIS

After conducting a review of previous national studies, KDOT performed a statewide inventory of truck parking facilities and characterized their usage patterns. This was completed in two steps:

- Aerial imagery from Google Earth was used to identify truck parking facilities on major freight corridors, from which a count of parking spaces was established. A geographic database of designated parking spaces was created during this review to guide the field teams in the following step.
- Field review teams drove to the truck parking facilities in the database to collect data on parking utilization, type of facility (rest area, service area, commuter lot, truck stop, etc.), condition of the facility, amenities offered, and whether it was public or private. The field teams found that in many cases truck parking facilities were fully utilized, with undesignated truck parking occurring nearby.

- The parking database was enhanced with the data collected from the field review and then mapped to illustrate locations with high utilization rates (shown in Figure 19).

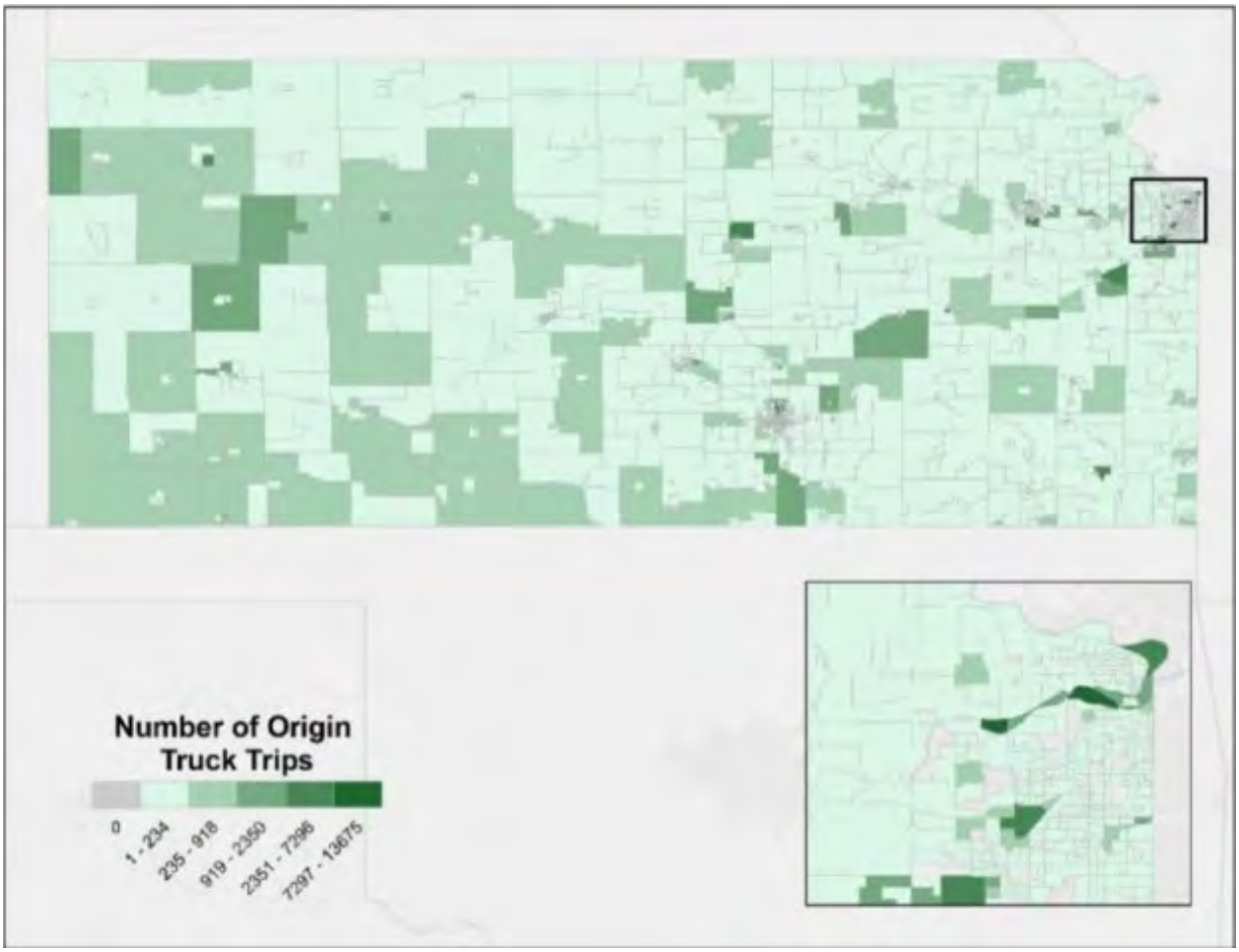
Figure 19. Parking Facility Utilization and Geographic Concentration



Source: Kansas Statewide Freight Network Parking Plan

This truck parking inventory was supplemented with a study of GPS data from trucks to determine when and where drivers are parking overnight and for their mandated 30-minute breaks. This GPS data was collected by ATRI for four two-week periods over the course of a year. The data collected was mapped (shown in Figure 20) to analyze geographic trends and corroborate other findings (such as the ease in finding parking in rural areas relative to urban areas).

Figure 20. Freight Network Census Block by Origin Trip Volumes



Source: Kansas Statewide Freight Network Parking Plan

3.12.2 SURVEY AND OUTREACH

An electronic survey was prepared and distributed by ATRI to truckers operating in and through Kansas. About 750 surveys were completed. The key findings were:

- 83 percent of respondents cited HOS as the main factor in their decision to park.
- 78 percent required up to one hour or more to find adequate parking
- 52 percent found it equally difficult to find parking in public or private rest stops
- 48 percent were most likely to find parking in rural areas versus only 25 percent in metropolitan areas.

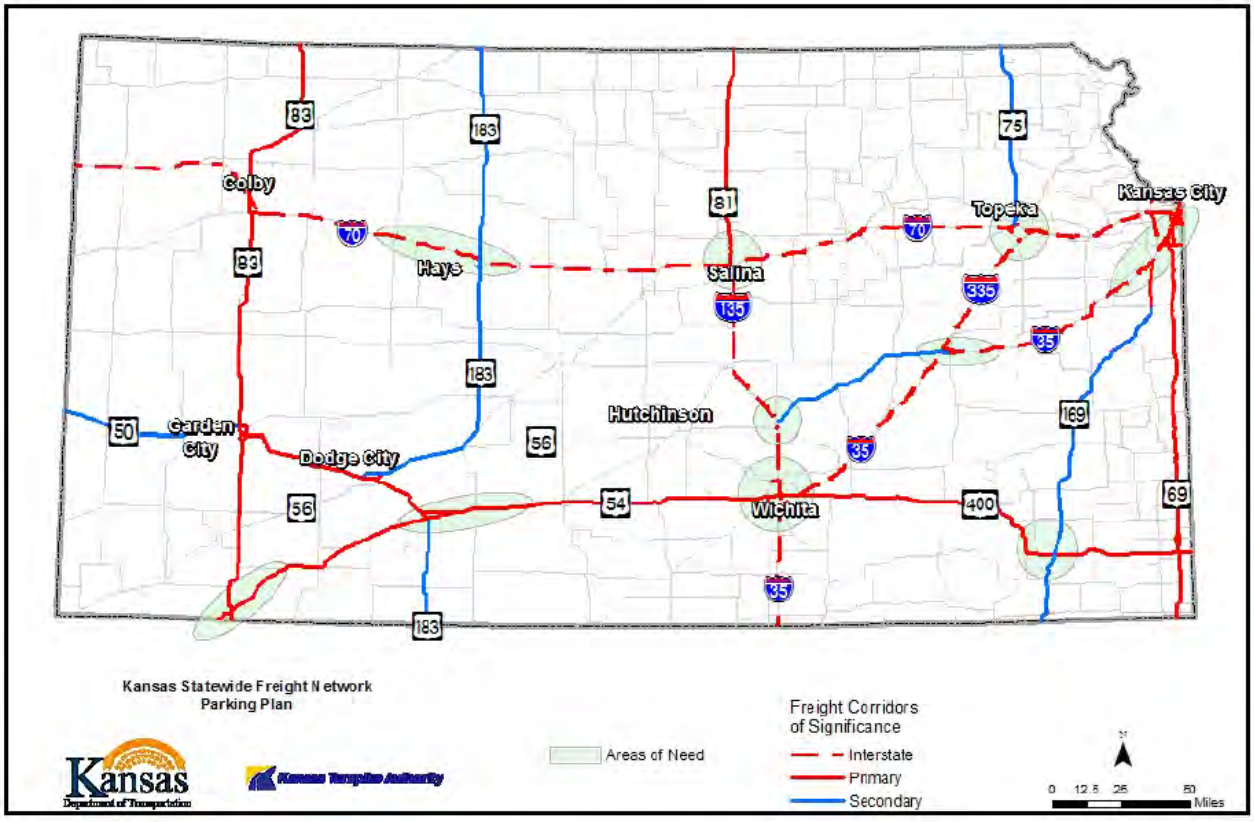
Further, interviews were conducted with MAASTO and the Mid-America Freight Coalition (MAFC), as well as peer organizations such as DOTs in Iowa, Minnesota, Missouri, Colorado and Wisconsin, to gain insights on best practices for evaluating the benefits of truck parking improvements, and factors affecting parking decisions.

According to the study, peer DOTs also experienced difficulties from truck parking demand exceeding supply at some locations that are near urban areas. The interview with the MAFC further stressed the need for truckers to have real-time information on truck parking availability and amenities offered to allow them to plan their trips. Many of the interviews mentioned the need to leverage public-private partnerships to enhance truck parking supply in major freight corridors. To address these problems, DOTs have added parking capacity and have started using technology to provide parking availability information to truckers.

3.12.3 FINDINGS

Based on the field work and outreach efforts, KDOT developed a map of potential opportunity locations for truck parking improvements (shown in Figure 21)

Figure 21. Opportunity Zones for Truck Parking Improvements



Source: Kansas Statewide Freight Network Parking Plan

The general recommendations of this study were:

- Developing new (or improving existing) public and private truck parking facilities where the need is greatest.
- Overcoming barriers to using existing designated parking facilities in urban and rural areas.
- Identifying information and technology services to help truckers make better parking decisions.

- Creating partnerships with public- and private-sector entities to improve parking facilities and amenities.

The study also mentioned specific implementation strategies to fulfill the above recommendations:

- Deploy a dynamic truck parking information management system (TPIMS).
- Use excess right of way for parking and improve geometrics where applicable for better parking.
- Investigate benefits of creating multistate, regional truck parking policies, as well as integrated local parking policies and pro-freight truck tax policies.

3.13 Woodrooffe J. et al. (2016) Evaluation of MDOT Truck Parking Information and Management System

Michigan sought to evaluate the impact on the truck drivers exposed to their original real-time truck parking system on I-94. Sixty truck drivers were surveyed during four site visits, at both private truck stops and public rest areas, in 2015. Drivers overwhelmingly reported that they found TPIMS personally valuable, and that TPIMS saves them time. Dynamic roadside message signs were considered the best method to disseminate information on truck parking availability.

4. RECENT RESEARCH

4.1 Diaz-Corro, K. et al. (2018) Comparison of overnight truck parking counts on GPS derived counts for truck parking facility utilization analysis

This study estimated expansion factors for calculating truck parking demand from GPS data. This study is particularly important for the proposed work in Oregon because one of the approaches that will be explored involves using expansion factors to estimate parking demand at locations that were not monitored through video.

The expansion factors in this study were calculated by comparing observations on the ground in Arkansas of overnight parking and truck volumes with GPS data. Expansion factors were calculated for different types of facilities: public, private commercial (e.g. restaurants, stores, etc.), and private truck stops. Ground observations were obtained from an Overnight Truck Parking Study that is conducted each year by the Arkansas Department of Transportation. During the first week of September, teams of observers counted the number of trucks parked at 102 facilities around the state, between 10pm and 6am (at the time the observers reached the facilities).

The results of this data collection effort were compared to GPS data from ATRI for the same time period. Stops in the GPS data were identified through two sequential filters. First, trucks with few GPS pings (less than 20) or unrealistic speeds were removed from the sample. Then,

trucks that have pings that do not move in space (within a certain tolerance) for 30 minutes were identified as being stopped.

The expansion factors were calculated through the following steps:

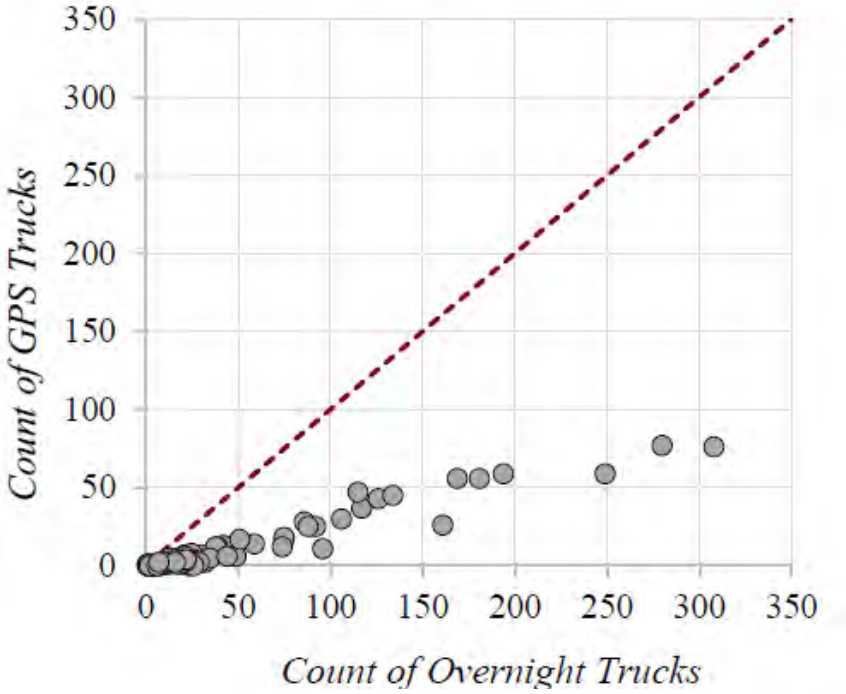
1. defining geographic bounding boxes or polygons for truck parking facilities from satellite imagery;
2. identifying parked trucks from the GPS sample;
3. estimating parking facility capacity, and
4. matching observed and GPS-derived counts to estimate expansion factors.

Parking capacity was determined from satellite imagery by counting available spaces. Where spaces were not visible, or shared with passenger vehicles (such as in commercial establishments), the capacity was determined using a linear regression with the surface area of the facility as the independent variable.

A perfect match between GPS data and observed counts could not be made because the date and time of the observation was not recorded in the yearly surveys. Therefore, the GPS parking data for 10pm to 6am during the first week of November was averaged and compared to the ground observation. This represents a significant limitation of the study because the GPS data showed large variability in demand throughout these hours of the day, and even from day to day, particularly for public parking facilities. Therefore, the exact time that ground observations were made is likely to have a large impact on the expansion factors calculated through this method. For the Oregon study, we will have video data that precisely indicates the demand at certain times of the day, which should produce more reliable estimates.

The study calculated an overnight truck parking expansion factor of 6.4 for public rest stops, 4.2 for private commercial property, and 5.4 for private truck stops. These represent the average number of real-life trucks parking at these facilities per GPS records parked. As can be seen in Figure 22, the relationship appears to be roughly linear—a greater number of observed parked trucks corresponds to a proportionally greater number of GPS records. The study then used the expansion factors to calculate demand at truck stops throughout the state, and compared these figures with estimated capacity to identify locations where there is a scarcity of designated truck parking spaces.

Figure 22. GPS Data vs. Observed Counts



Source: Diaz-Corro, K. et al. (2018)

4.2 Morris, T. et al. (2017) A Comprehensive System for Assessing Truck Parking Availability

This project developed a system that uses video cameras to continuously monitor the availability of truck parking spaces at specific facilities, and then provides real-time occupancy information through roadside signs, a web portal, and an onboard geolocation application.

A survey was also collected as part of this project; however, the questions focused on how drivers would prefer to receive parking occupancy information, and how they would use this information in their day-to-day operations.

4.3 Ioannou, P. et al. (2018) Intelligent Parking Assist for Trucks with Prediction

This project developed a parking assist algorithm that could help truck drivers better plan their trips by providing information about parking availability. Several methods for predicting truck parking were explored, although the study concludes that no single method is clearly better than all others in all situations, and therefore recommends that different prediction models be used in different cases. The approach taken in this paper is not directly useful in the Oregon project because the paper focused on modeling demand in real time.

4.4 Anderson, J.C. et al. (2018) Understanding Probable Reasons for Freeway Ramp and Shoulder Parking by Truck Drivers: An Emerging Safety Issue to Oregon Highway Users

This study used a stated-preference survey to understand the factors causing truck drivers to park on ramps, shoulders, interchanges, and other facilities. Through statistical modeling, the study found the following factors were important:

- driver characteristics (particularly years of experience)
- trip characteristics
- parking difficulty
- real-time information availability
- parking features

These factors could be included in the specification of a parking demand model in the Oregon project.

4.5 Bassel, S.A. et al. (2018) Truck Parking Forecasting and Error Correction Using a Fourier Method: A Case Study of the I-5 in California

This study developed a statistical model to predict the occupancy of truck parking locations in California at a specific time of the day, based only on historical data and real-time parking occupancy information. The model is intended to help truck drivers better plan trips by predicting parking availability later in the day. The model was estimated on 1 year of data from I-5 in California, and provided reasonable approximations of parking availability. It is unclear where the historical data came from.

4.6 Cherry, C. et al. (2016) Truck Parking Facilities and Ramp Parking: Role of Supply, Demand, and Ramp Characteristics.

This study analyzed the use of shoulders on ramps for overnight parking in Tennessee. An inventory of truck parking locations in the state was created. Utilization rates at illegal ramp shoulders were monitored through field observation. A survey was also conducted at privately owned truck parking facilities to ascertain the perceptions of truck drivers regarding parking availability. This study found that the following factors increased the likelihood of ramp shoulder parking:

- wider shoulders
- absence of no parking signs
- diamond interchanges
- longer ramps
- smaller width with fewer lanes near intersection

These factors could be considered for inclusion in the model that estimates undesignated truck parking demand.

4.7 Lawrence, J. et al. (2017) Modeling and Evaluating a Truck Parking Information Management System Using Microscopic Traffic Simulation: A Case Study of the New York State Thruway

This study used PTV Vissim microsimulation software to study truck parking demand along a corridor. It routed origin-destination data along the corridor, and then simulated how trucks would travel, stopping at the designated and undesignated truck stops to meet HOS regulations. The parking demand at different stops was then observed through multiple simulation iterations.

A significant limitation of this study is that little effort was placed on calibrating the simulation using observed data to increase its realism and ability to predict existing demand. The author asserts that this was the first instance in the literature of using Vissim to simulate truck parking behavior.

4.8 Dulebenets, M.A. et al. (2017) Development of Tolls for Processing Truck GPS Data and Analysis of Freight Transportation Facilities

A tool was developed that processes and extracts GPS data for use in planning analyses. The tool has several scripts that provide: truck trip tables, truck performance estimates between TAZ, and truck parking demand estimates. In this latter script, the user inputs two GIS files, one with the GPS trips, and another with the truck parking locations identified by polygons. The script then processes the GPS data and extracts truck tour information, including demand for truck parking at specific facilities, as well as on the approaches nearby. The main value of this tool is the algorithm used to define truck tours, which itself can be used to estimate parking demand.

4.9 Heinitz, F. and Hesse, N. (2014) Estimating Time-Dependent Demand for Truck Parking Facilities Along a Federal Highway

This study used a simulation model to replicate current parking demand at spaces along a highway in Germany. This simulation considered local HOS regulations. While interesting, it is unlikely that simulation would be able to replicate truck parking behavior in Oregon corridors, because of the range of factors involved.

4.10 Rajabioun, T. and Ioannou, P.A. (2015) On-Street and Off-Street Parking Availability Prediction Using Multivariate Spatiotemporal Models

This study developed an autoregressive model that considers temporal and spatial correlations in modeling parking availability in cities. The model is intended to be used in near-real time conditions to identify the parking location that is most likely to have a spot available at the

anticipated arrival time. While this paper does not focus on trucks, the model could be applied to study truck parking availability as well.

4.11 Bayraktar, M.E. (2012) Commercial Motor Vehicle Parking Trends at Rest Areas and Weigh Stations

This study collected data on truck rest areas in Florida, and then evaluated parking availability along several key interstate corridors. The study evaluated various truck parking detection technologies, and made recommendations for how to improve information on parking availability in the state.

4.12 Garber, N.J. (2004) Estimation of the Demand for Commercial Truck Parking on Interstate Highways in Virginia

This study compared the supply and demand for truck parking in Virginia to identify gaps. Demand was modeled as a function of traffic volumes, truck percentage, parking duration, and distance from another highway rest stop. Once calibrated, the model was used to forecast parking demand to 2020. An inventory of rest stops was developed to identify parking capacity shortfalls. The study found that some of the key interstates had a parking shortfall as high as 40 percent. There are more recent studies available that have implemented comparable approaches to identify parking shortfalls.

4.13 Boggs, A. et al. (2019) Shortage of Commercial Vehicle Parking and Truck-Related Interstate Ramp Crashes in Tennessee

This study notes that interstate ramps are the locations in the roadway system with the highest crash rates, yet trucks often chose these locations to park overnight, potentially exacerbating safety issues. This study analyzed police reported truck crashes where the truck was parked illegally on the side of the road, finding that one-third of these crashes occurred adjacent to parking facilities with 90 percent or higher utilization. The study then estimated statistical models to investigate the causes of accidents, finding that these crashes tended to concentrate on ramps with wide shoulders, diamond-shaped ramp configurations, and the presence of adjacent public parking facilities that are at capacity. This could provide important information about where to look for undesignated truck parking.

4.14 Kawamura, K. et al. (2015) Analysis of Factors Affecting Truck Parking Violation Frequency

This study investigated the frequency of illegal truck parking in urban Chicago by analyzing citation data. The study found that illegal parking issues are more frequent in downtown urban areas with a high density of establishments, particularly food-related businesses. It also found that illegal parking was common in newly developed neighborhoods because they have not allocated enough curbside space for freight uses.

4.15 Nevland, E.A. et al. (2019) Development of a Classification Scheme and Supply-model for Inter-regional Truck Parking Facilities

This study developed an inventory of truck parking facilities using establishment data and truck GPS data. It classified truck parking facilities into the following categories:

- public rest areas and gas stations
- weigh stations
- publicly accessible truck parking
- privately accessible truck parking
- legal roadside parking
- illegal roadside parking
- illegal highway ramp parking
- illegal parking on public property
- illegal parking on private property

A statistical model was then estimated on the availability of parking spaces at these facilities, however, the results were not presented in this report. It is likely that these results will be presented in an up-coming paper.

4.16 Gaddy, A. et al. (2018) Incorporating Truck Parking and Hours of Service into a Truck Routing Heuristic

This study developed a truck routing model that considers the HOS regulations. It improved on the literature by considering all of the details in the HOS regulations, including the 60/70 rule, and not assuming that truck parking is always available, as had been done before. This resulted in a model that is more realistic than previous models, and better able to simulate the effect of different parking policies.

4.17 Trucker Path – Truck Parking Report (2018)

Trucker Path is one of the most frequently used smartphone applications by truck drivers to identify available parking. In 2018, Trucker Path surveyed drivers and analyzed how the implementation of the Electronic Logging Device (ELD) mandate impacted truck parking issues. Major findings from the driver survey included:

- 85 percent of drivers cite truck parking as the biggest source of stress at work
- 70 percent of drivers have violated HOS as a result of not being able to locate available truck parking
- 96 percent of drivers have parked in unauthorized areas as a result of not being able to locate available truck parking

Drivers have increased the average number of times they look up information on parking availability in the Trucker Path application from April 2017 (pre-ELD mandate) to April 2018 (post-ELD mandate).

5. LESSONS LEARNED FOR PROJECT

The literature review is intended to inform the conduct of this study. This section describes the key lessons learned from the literature review. The lessons learned are organized according to the relevant task of this project so that they can easily be cross referenced while conducting that task.

5.1 Truck Parking Inventory (Task 6)

Previous studies have used a wide range of information to identify the locations and amenities of designated and undesignated truck parking facilities, including:

  - Designated: Jasons's Law Inventory, State DOT District staff, Trucker Path, Trucker's Friend, National Truck Stop Directory, Park my Truck, driver interviews and surveys, Google Earth, etc.
  - Undesignated: State DOT District Staff, ATRI GPS records (manual or automated cluster analysis), law enforcement officers, parking citations, driver interviews and surveys, Google Earth, etc.
- Undesignated roadside locations could include: shoulders, ramps, weigh stations, and mountain chain-up areas.
- Many commercial establishments permit overnight truck parking on their private parking lots (e.g. Wal-Mart, Home Depot, vacant lots)
- The most important amenities for truck drivers that should be considered in the inventory are: proximity to route, showers/restroom, parking spaces, refueling services, width of parking spaces/ease of access, restaurant, internet, laundry, and service center.
- If possible, it could be beneficial to indicate in the boundary of the facility the on/off-ramps that provide access to the facility, because overnight parking on these areas is common in many places.

5.2 Current and Future Parking Demand (Task 7)

The following are the key lessons learned regarding the supply-demand analysis of parking needs:

- Many studies used the FHWA model published in 2002 to estimate truck parking demand. While not a bad tool for providing high-level estimates, this approach relies on factors for

average parking time per drive time and other factors that come from older, national research or from other states.

- Use video evidence to calculate GPS parking demand expansion factors, building on Diaz-Corro et al. (2018).
- Consider parking demand variability throughout the day and throughout the year. Estimate peak demand by considering how demand varies throughout the day, week, month and year. The influence of weather was not explored in studies reviewed here, and could be revealing.
- Think of parking demand as a stochastic process that varies randomly from time to time.
- The Oregon Statewide Integrated Model (SWIM) can provide truck volume forecasts.
- Truck volumes are better obtained from traffic counts than from models (such as state transportation demand models or the Freight Analysis Framework). TRANSEARCH routed data could be used to estimate the proportion of short-haul vs long-haul truck volumes, and the incidence of traffic types where drivers may rely on terminals (such as LTL carriage).

5.3 Stakeholder Survey (Task 8)

Many of the studies conducted surveys that shed light on the parking needs of the trucking industry. The results of these surveys agreed that many truck drivers often have difficulty finding parking, leading to a variety of responses and behaviors that pose safety risks (such as undesignated parking) and compliance issues (HOS). It also decreases the productivity of the sector with most drivers stopping 30 to 60 minutes before HOS time expires to secure an overnight parking spot.

The surveys described how it is already difficult for truck drivers to plan where to stop for the day. Most drivers have to make this decision themselves using limited information (considering the amount of driving they have done in the day, the HOS regulations, and the location of parking facilities) and are not reimbursed for parking reservation fees, time or mileage driven searching for a space. These problems are expected to worsen over the coming years as freight volumes outstrip new parking construction and HOS regulations are enforced through electronic logs. Currently truck driver's most important tool is the availability of information about the location, services, and availability of parking facilities. Having more, and more accurate information will benefit truck drivers make better use of existing parking facilities.

Having said this, the degree of parking shortage varies dramatically between different regions and different corridors. There typically tends to be a deficit of parking spaces around metropolitan areas and on high volume corridors. This deficit also varies by time of day, day of the week, and time of the year.

The surveys also demonstrated the need to differentiate between short-haul and long-haul trucking, and recognize that there are large differences between the amenities and types of facilities that are preferred by different drivers and for different types of stops.

The following are the main lessons learned from the literature regarding the development and implementation of surveys:

- The following can be surveyed: truck drivers, truck owners, State DOT staff (for study state and other states), FHWA staff, law enforcement officers, rest area staff, MPOs, county government, city government, community improvement districts, etc.
- There have already been many surveys about general attitudes regarding truck parking. Greater value can be obtained from a survey that focuses on specific problems and locations in Oregon.
- It is challenging to obtain a large sample from MPOs and local/county government agencies in Oregon (Hernandez et al. 2017).
- It is valuable to obtain specific location information. Several studies have had success with use of a map-based online component to the survey. This allows respondents to pinpoint undesignated truck parking locations and identify other problems geographically. This approach was implemented successfully in the Atlanta Regional Truck Parking study using Wikimapping and in Wisconsin using a GIS-based online tool.
- Support from local trucking associations increases the reach of the survey and response rates (e.g. Owner Operators Independent Driver Association, American Trucking Associations).
- An open ended question in surveys allows respondents to detail their specific issues and to describe solutions being implemented.

APPENDIX D

METHODOLOGY AND DATA ASSESSMENT TECHNICAL MEMORANDUM

OREGON COMMERCIAL TRUCK PARKING STUDY

Date: March 19, 2019

Subject: Methodology and Data Assessment Technical Memorandum

1. INTRODUCTION

One of the main analyses of the Oregon Commercial Truck Parking Study will be the estimation of truck parking demand along the study corridors (see Figure 1). This estimate will be compared against existing truck parking capacity to identify shortfalls and inform proposed investments that would improve truck operations in the state. However, this is not a simple task because no single data set exists that provides a complete picture of where trucks are parking.

To better understand the state of practice in truck parking studies, the study team prepared a Literature Review (Technical Memorandum #1). The review focuses on methods and approaches of previous studies. It included eleven state and local truck parking studies from around the country, several federal studies (including the guidance coming from the National Coalition on Truck Parking) and sixteen recent research studies. The Literature Review included a summary of lessons learned pertinent to each task.

This Technical Memorandum describes an approach for estimating total parking demand while attempting to overcome the challenges and limitations of other studies. The approach builds on lessons learned in previous studies and develops innovative ways of leveraging the data available in Oregon. Section 2 of this Memorandum presents a summary of the previous approaches that have been used in the literature and provides an overview of the approach proposed for this study, which consists of three steps that are described in greater detail in Sections 3 through 5.

Truck drivers stop for a variety of reasons. They take a mix of 30-minute breaks and 10-hour (typically overnight) stays in order to meet the federal Hours-of-Service (HOS) regulations (described in the Literature Review Memorandum). However, some need to spend additional time parked waiting for a scheduled delivery or pickup, and even waiting for their next load. Short-haul trucks have different parking needs than long-haul trucks, and refrigerated trucks might need to stop more frequently. This variety of needs makes it challenging to estimate total parking demand throughout the system.

The demand for truck parking also varies spatially and temporally. Understanding these patterns is critical to isolate the roads with persistent or occasional truck parking issues, and

develop solutions that address the specific issues. Parking demand typically varies in the following way:

- **Hourly Variability:** Demand for truck parking follows a distinct pattern throughout typical weekdays, with space availability peaking at around 2-4pm, and then decreasing progressively throughout the afternoon and into the night, until for some lots all spaces are taken up. Generally, availability is at its lowest at around 4am in the morning.
- **Daily Variability:** Not only does demand fluctuate between weekdays and weekends, it also fluctuates Monday through Friday. For example, previous studies have found that Wednesdays and Thursdays have significantly higher parking demand than other weekdays.
- **Seasonal Variability:** Freight demand spikes during certain times of the year, such as in the lead-up to the holiday season. The greater volume of trucks on the roads will necessarily increase parking needs.
- **Random Variability:** Even if the variability described above is accounted for, parking demand could fluctuate significantly between two days with seemingly identical conditions. A component of parking demand is random in nature. This implies that enough evidence or data is needed to estimate truck parking demand from observational data, to average out the random variations.

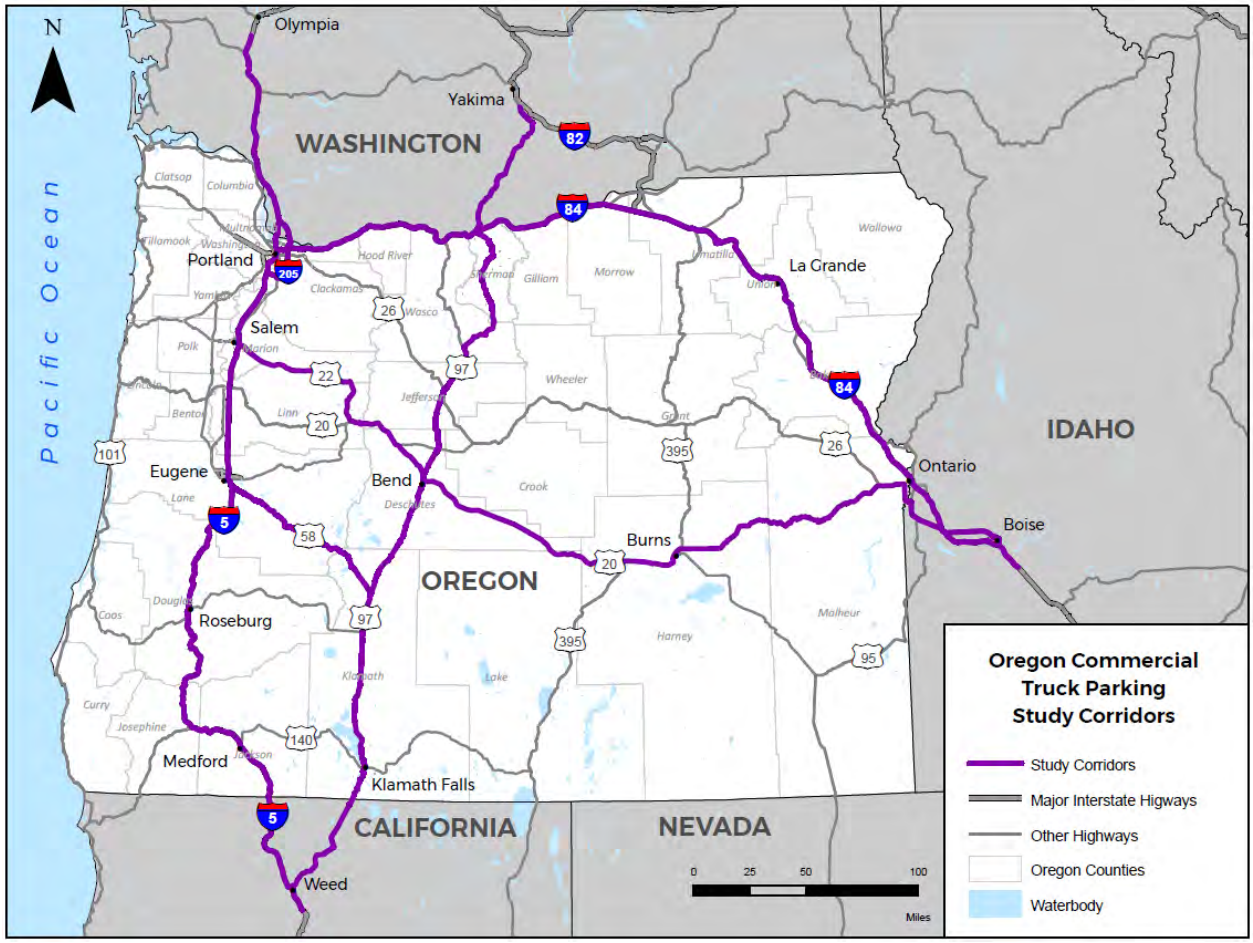
Estimating parking demand is made more challenging by the fact that trucks park in different types of locations. Generically, these can be described as formal or designated and undesignated but there is some grey area in these definitions. For clarity, this study breaks down designated and undesignated parking into more specific types, as follows:

- **Rest Areas:** Publicly operated parking facilities that serve both passenger vehicles and trucks. They typically offer few amenities (regulators forbid providing commercialized services at these facilities). There are 32 rest areas managed by TIC along the corridors being studied.
- **Commercial Truck Stops:** Privately owned and operated parking facilities, some of which cater specifically to truckers. These facilities typically offer many more amenities than rest areas.
- **Commercial Establishments:** Privately owned parking lots that serve retail establishments where overnight truck parking is permitted (such as some Walmarts).
- **Undesignated Sites:** Locations along the right-of-way, or in nearby parking lots where truck parking is technically not allowed.
- **Truck Terminals:** Truck lines in some for-hire market segments (e.g. LTL, small package, tank trucking) maintain terminals that also function as driver domiciles. Terminals are not everywhere and drivers do make use of rest areas and other facilities, but they have in-house options serving many of their needs. Similarly, private fleets (e.g. Sysco, Coca-Cola) typically base their drivers at company facilities such as plants and distribution centers.

Despite these challenges, developing a reliable estimate of truck parking demand is fundamental to ensure that the State implements strategies that address the parking issues faced by trucks as they operate throughout Oregon. Ideally, the demand estimate would consider parking at all these locations, and for any reason. Most previous studies have only considered a subset of parking demand, by focusing only on some of the reasons for parking (such as HOS regulations) or using facility data from a limited number of rest areas or truck stops. While this could provide a partial picture of truck parking trends in the state, it doesn't provide a complete estimate of the shortfall along corridors.

The approach detailed in the next sections, attempts to be as inclusive as possible, within study budget. Truck Terminals will not be analyzed in detail, as they are self-contained. However, truck terminal locations that are identified will be noted in order to provide a more complete picture.

Figure 1: Study Corridors



2. METHODOLOGY ASSESSMENT

2.1 Previous Approaches

The Literature Review Memorandum describes the many approaches that have been used in the past to estimate truck parking demand. These approaches can be roughly categorized into the four types shown in Table 1. The most popular approach has been to use the Federal Highway Administration's truck parking demand formulas first published in 2002.[1] These formulas describe the hours of truck parking demanded along a corridor as a function of truck volumes and other factors. However, as indicated in the table, this approach has several weaknesses that lead to biased estimates. The main limitation is the reliance on previously estimated parameters that are typically not validated with local data. In addition, the HOS regulations have changed since 2002; for example, the standard work shift lengthened from ten to eleven hours.

Another approach, which has been implemented in Arizona, uses data from a truck parking application to describe truck parking demand. This type of data could be helpful to identify those parking facilities that are full more often, however it also has limitations as described in the table. Foremost, data from truck parking applications does not adequately capture parking at undesignated locations. This represents a significant blind-spot, particularly in high volume corridors where parking lots are often full.

Several studies have tried to quantify truck parking demand using GPS data. This approach has the advantage of considering truck parking in both designated and undesignated locations, for any reason. It also has the ability to provide great detail on parking patterns, throughout the day and throughout the year, in addition to describing parking along specific corridors or regions. The main disadvantage with this approach is that it only considers trucks instrumented with GPS recorders, which could be a fraction of all trucks on the road.

Lastly, the latest research in truck parking demand has focused on developing expansion factors for the GPS data that indicate the proportion of truck activity represented by each GPS record. The main challenge in this approach has been that ground-level observations are needed to develop the expansion factors. Often, the observed data is not precise enough to be compared directly to the GPS data, as occurred in Diaz-Corro et al. (2018).

[1] FHWA (2002) Model Development for National Assessment of Commercial Vehicle Parking

Table 1: Main Approaches Used to Estimate Demand in Previous Studies[2]

Approaches	Previous Uses	Strengths	Weaknesses
2002 FHWA Demand Formula: analytical model to predict parking demand on a corridor segment as a function of the proportion of truck traffic, the annual total traffic, the length of the segment, the average speed of trucks, and the average parking time per travel time.	US-97 (Oregon), Virginia, Utah, Atlanta	Simple to implement. Inputs are readily available. Provides high-level estimate. In theory, estimates total parking demand.	The main weakness of this model is the use of parameters that represent average parking time per drive time, which were estimated over 15 years ago and are not likely to be representative of local conditions. Additionally, daily demand fluctuations are accounted for through generic peaking factors that are also not representative of local conditions. Finally, the estimation parameters focus on the effect of hours-of-service regulations, and ignore other reasons for parking.
Facility Availability from Trucker Path Application: Analysis of Trucker Path data showing whether facilities were reported as "full", "some spots available", "lots of spots available".	Arizona	Provides detailed description of availability at some facilities, throughout the day and throughout the year.	Ignores parking in undesignated locations. Crowdsourced reports from drivers might be infrequent, inaccurate, or withhold locations drivers wish not to be widely known. Availability categories are very coarse and subjective. Proprietary access.
Analysis of GPS Records: Counts number of parking stops within the boundaries of public facilities. Sometimes undesignated parking is quantified as well.	Arizona, Kansas, Atlanta	Can consider parking at designated and undesignated locations, for any reason. Provides time of day and day of the year detail. Can track ultimate origin or destination of trips.	Only a subset of all trucks are included in GPS database. Does not estimate total demand. Parking at loading/unloading facilities needs to be excluded.
Analysis of Expanded GPS Records: Expansion factors are calculated using observed counts to estimate the number of real-life trucks that each GPS truck represents. Total demand is estimated as described above.	Minnesota, Diaz-Corro et al. (2018)	Can potentially provide the most comprehensive demand estimate, considering total designated and undesignated.	Ground-level observations required, preferably that coincide with the GPS database.

[2] This covers only the demand estimation approaches and does not include all data sources. Data sources are covered in more detail in the next section.

2.2 Information Sources

2.2.1 Data

Below is a list of sources of information that are available in Oregon or could be acquired. Note that not all of these will be used in the estimation of parking demand.

- **GPS Data:** There are several vendors of truck GPS data. The American Transportation Research Institute (ATRI) maintains the largest database, tracking approximate 800,000 trucks that operate nationwide. INRIX and other commercial vendors also track trucks and develop their own databases, however they are less transparent about the number of trucks included and their characteristics.
- **Ground-level Observations:** Some previous studies have relied on site surveys to estimate the demand at truck parking facilities. More sophisticated attempts have involved taking video of the truck parking facilities and recording demand levels throughout the day. Because of the costs involved, it is common for these efforts to be limited in scope and duration.
- **Smartphone and Web Applications:** Several applications have been developed to help truck drivers find parking spaces. Two of the more popular ones are Park My Truck and Trucker Path. Park My Truck is an application that provides information about the location and amenities of selected truck stops, and for some of them includes information about the availability of parking spaces. This application only covers a subset of all the facilities. Trucker Path crowdsources parking availability information by asking truck drivers whether facilities are “full”, or have “some spaces” or “lots of spaces”. This data has been used in previous studies to describe truck parking demand, however, there are several limitations with relying solely on this information. As described previously, not only are the availability categories too coarse to quantify needs, but different drivers are likely to have different definitions of “some” and “lots”. The reporting frequency is also too low at certain facilities to characterize demand fluctuations throughout the day.
- **Law Enforcement Records:** Citations for undesignated parking could provide valuable information on where such parking is taking place. This data has been used successfully in previous studies, however, it provides a partial picture, so would need to be used in combination with other data. If desired, we could explore how citations of this kind are handled in Oregon and inquire about obtaining this data.
- **EROAD:** This company developed in-cab technology for displaying information to drivers with the objective of improving efficiency and safety. This technology also tracks trucks, creating a log of their speeds and where they stop, among other characteristics of the trips. We do not believe this data is critical for this study because it provides some of the same location information available in ATRI’s GPS database. Moreover, to our knowledge, ATRI’s database is the most expansive truck location database available in the U.S.
- **FleetSeek:** This is a database of trucking operations and contacts. Users can access detailed information about the trucking sector, including demographics, contact information,

and fleet information. We do not believe that this database would be useful to estimate truck parking demand because, based on a review of their website, it does not appear to provide stop location information.

- **Transearch:** This is a proprietary nationwide commodity flow database that describes shipments by commodity, mode, geography, industry, etc. The flows can be routed on the roadway network. Detailed in terms of volumes, the information provided by this database is most useful as a segmentation tool, allowing distinction between traffic types with different categories of need. Some of the key categories Transearch identifies are private trucking, LTL, tank and temperature controlled trucking, and general separation of the traffic mix by length of haul. However, because they are the output of an assignment model that makes assumptions about the operations of the sector, the truck volume estimates from Transearch are less accurate than the truck volume information already available from ODOT (truck AADT).

2.2.2 Results of Outreach

Twenty-five interviews will be conducted as part of this project. These interviews will include questions to identify the corridors or segments that have high levels of truck parking demand. Questions will also be included to identify the locations of undesignated truck parking. A survey with similar questions will also be distributed broadly. The following groups of stakeholders will be interviewed and surveyed:

- Oregon DOT HQ Staff
- Oregon DOT District Staff
- Local Government Staff
- Truck Drivers and Fleet Managers
- Oregon State Police (OSP)
- Private Truck Stops
- Oregon Travel Information Council (TIC)

The survey will include a mapping exercise where respondents will be able to identify places along the corridor that face specific truck parking problems. The results will be available for the demand and needs estimation.

2.3 Overview of Proposed Approach

The approach proposed to estimate truck parking demand is outlined in Figure 2. First, the locations where trucks are parking will be identified and geocoded in GIS. Designated parking locations will be obtained from the facility inventory that is being developed in another task of this project. Geocoding the off-ramps and on-ramps to these facilities is important as trucks tend to park at these locations when lots are full.

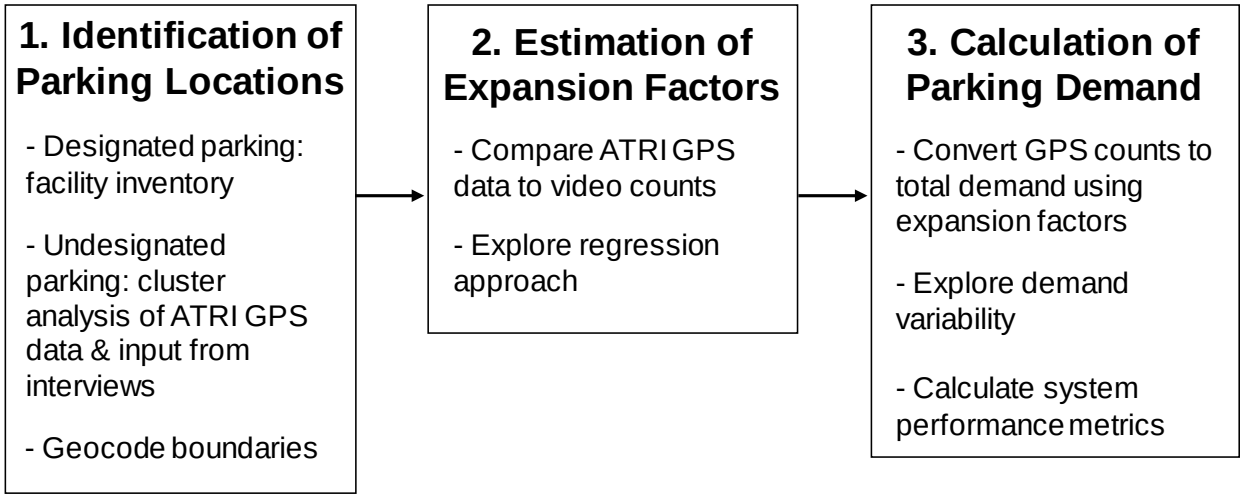
For undesignated parking, ATRI's GPS data will be analyzed to identify clusters of parking along the project corridors that appear to represent undesignated truck parking. These locations will

be geocoded as well. A set of ATRI GPS data covering 16 weeks in the past year (4 weeks per quarter) for all trucks traveling less than 25 mph in Oregon (within a 10-mile buffer of the state's boundary). An algorithm will be developed to process this data to identify stopped trucks.

The next step involves the estimation of expansion factors, by comparing the ATRI GPS data to video evidence at certain parking facilities. Six rest stops will be recorded for 24 hours and four rest stops will be recorded for 48 hours. These videos will be processed, noting how parking utilization fluctuates throughout the day. As described later in this memo, a regression approach will be explored for calculating the expansion factors. It is likely that this approach will generate better results than the simple comparison of averages used in previous studies. If it doesn't produce better results, then we will revert to using the previous approach.

Finally, total parking demand along the corridors will be calculated by counting the GPS records in the designated and undesignated parking locations, using the expansion factors to estimate how many trucks are represented in real-life. Variability in demand will be described throughout the day, week, and year. The analysis will focus first on overnight parking, although shorter rest periods will be captured as well and will be analyzed to the degree possible within study resources. Random variations in demand will also be characterized. A variety of system performance metrics will be calculated based on this demand analysis. Details for all these steps are provided in the following section.

Figure 2: Overview Truck Parking Demand Estimation



3. IDENTIFICATION OF PARKING LOCATIONS (STEP 1)

The first step of the analysis will be to identify the locations where trucks are parking. This would then allow us to count the number of GPS parking events within the boundaries of these facilities. Parking locations will be identified through the following:

3.1 Rest Areas and Commercial Truck Stops

These facilities will be identified using the facility inventory that is being developed by another task of this project. A GIS file will be created that delineates the boundaries of the area where trucks are able to park. The amenities and services available at these locations will also be noted.

3.2 On/off Ramps to Rest Areas

Many previous studies have found that trucks often tend to park on the shoulders of the on-ramps or off-ramps leading to parking facilities. In some cases, parking on these shoulders is prevalent even when the facilities have availability. Given this, the on/off ramps will also be delineated with a boundary file in GIS so that demand can also be quantified at these locations.

3.3 Commercial Establishments

Trucks park overnight at the parking lots of some commercial establishments, such as Home Deport or Walmart. Some of these commercial retailers have policies that allow overnight truck parking. This type of parking will be identified by finding clusters (in the GPS data) of truck stopped overnight around commercial establishments. Trucks stopped for shorter periods will be excluded to eliminate trucks that make deliveries throughout the day. Research will be conducted to identify major locations of this nature and rules that govern their use. Some parking applications, such as Trucker Path, provide information on commercial establishments that allow parking.

3.4 Undesignated Sites

Undesignated parking can occur at:

- Shoulders
- Interchanges
- Pullouts
- Chain-up areas
- Vista points
- On/off ramps

Parking in undesignated areas is typically difficult to identify because these locations are not listed anywhere and their popularity tends to change over time.

The primary way that undesignated parking will be identified will be through interviews and surveys of local agency staff. There are numerous places that are known for having this issue throughout the study corridors. In addition to this, we will manually scan ATRI's GPS data of the corridors in Oregon to identify other undesignated places that see substantial numbers of trucks routinely parking overnight. The boundaries of these sites will then be geocoded in GIS.

4. ESTIMATION OF EXPANSION FACTORS (STEP 2)

Expansion factors will be calculated that quantify the number of actual trucks that each GPS record represents. ATRI's truck GPS database is extensive, encompassing 10 to 40 percent of all trucks operating on any given corridor, however we are interested in estimating the parking demand for all trucks, not just trucks that are instrumented by GPS devices. To calculate the expansion factors, we will compare the counts obtained from the video recordings to the GPS parking counts during those exact same time periods.

Estimating truck parking demand by expanding GPS data has been attempted twice before, by ATRI in Minnesota[3] and university researchers in Arkansas[4]. However, both of these studies had limitations that restricted their ability to precisely calculate the expansion factors. In the ATRI study, the expansion factors were calculated comparing mainline traffic volumes to GPS volumes, and not directly on trucks parking activity. In the Arkansas study, GPS records could only be compared to the average parking occupancy during night time hours, because observation data came from a site survey that did not indicate precisely when the measurements were recorded. The approach described below avoids these limitations by calculating the expansion factors directly on truck parking activity, and using video data that can be compared directly to the GPS data.

4.1 Comparison of Averages

At a basic level, the expansion factor E for a particular parking facility (or group of parking facilities) can be calculated through

$$E = \frac{N}{R} \tag{1}$$

where N is the average number of trucks observed parked (from the videos in our case) and R is the average number of GPS records of trucks parked. Given that our data include time resolution $t = 1,2, \dots, T$, where T is the number of time periods in the day, the average expansion factor throughout the day can be calculated as

$$E = \sum_{j=1}^{J}\sum_{t=1}^{T}\frac{N_t}{R_t}N_t \Big/ \sum_{j=1}^{J}\sum_{t=1}^{T}N_t \tag{2}$$

where $j = 1,2, \dots, J$ is an index of parking facilities, N_t is the number of parked trucks observed at t, and R_t is the number of GPS records showing parked trucks at t. This equation calculates

[3] ATRI (2015) Managing Critical Truck Parking Tech Memo #2: Minnesota Case Study
[4] Diaz-Corro, K. et al. (2019) Comparison of overnight truck parking counts on GPS derived counts for truck parking facility utilization analysis, Proceedings of the Transportation Research Board Conference, Washington, DC.

the expansion factor for each facility for each time period, and then averages these values over all the facilities and time periods, weighting the values by the number of observations. In other words, the aggregate expansion factor is calculated as the weighted average of expansion factors at each facility for each time of the day. Combinations of j and t without data for both N_t and R_t can be ignored.

4.2 Regression Model

The approach described in the previous section follows the literature in calculating the expansion factors directly from the data. Depending on the density of the GPS data (how many instrumented trucks park overnight), it might be possible to estimate the expansion factors more robustly through a regression model. This model could have the general structure

$$N_i = \alpha R_i + \boldsymbol{\beta} \boldsymbol{X}_i + \varepsilon \quad (3)$$

where i represents distinct observations (different time periods and different facilities), N_i is the ground-level observation of truck parking, R_i is the number of GPS records parking, α is the parameter estimate for the number of GPS records, $\mathbf{X}_i$ is a vector of covariates that can explain differences between observed counts and GPS records, $\boldsymbol{\beta}$ is a vector of parameter estimates, and ε is the error term of the model. In this approach, the parameter estimate α represents the average expansion factor in the dataset, controlling for other variables $\mathbf{X}_i$ that might be causing GPS records to deviate from observations.

Estimating the expansion factors this way has the advantage that other variables can be considered to explain truck parking demand in addition to GPS records, which will lead the model to produce better demand estimates. Some of the covariates that could be considered include: truck volumes (short-haul vs. long-haul) on the mainline road, time of day, day of the week, specific corridors, type of parking facility (private vs. public vs. undesignated), etc. Different variables could be considered to explore whether their inclusion improves the estimates. This approach recognizes that the objective of the analysis is not to generate expansion factors per se, but instead to develop a model that predicts truck parking demand as a function of available data (given that observed data is not available everywhere). The more variables are included in the model, the more data will be needed to estimate significant parameters (if they are significant). This represents a tradeoff that will be explored once the models are estimated.

Different model structures will also be explored, such as multiplicative structure instead of an additive structure. Ultimately the type of model that can be estimated depends on the amount and quality of the data available. It is difficult to distill patterns if too much noise is present in the data. Whether this is the case can only be known once the data is analyzed.

As was done by FHWA (2002), parking demand can be estimated in terms of vehicle hours of parking (VHP) per vehicle hours of travel (VHT). In that previous study, this ratio was calculated based on the typical rest hours of truck drivers relative to the hours of driving. This value was

assumed based on the HOS regulations, and was not calculated from observational data. ATRI's GPS database can potentially offer a more precise way of estimating this ratio. The network can be discretized into 100-mile segments, and from this data it is possible to estimate the vehicle hours of parking in the GPS data for segment s in time period t as VHP_{st}. This data can also be used to estimate the vehicle hours of travel in the GPS data on the mainline segment as VHT_{st}. The relationship between VHP_{st} and VHT_{st} can be explored with the following model

$$VHP_{st} = \rho VHT_{st} + \boldsymbol{\beta X}_{st} + \varepsilon \quad (4)$$

where ρ represents the average vehicle hours of parking per vehicle hours of travel, and $\mathbf{X}_{st}$ is a vector of covariates that might help explain other factors that contribute towards increasing or decreasing truck parking, such as type of parking, location, corridor, etc.

Another possibility is to segment the models by type, and estimate different values of ρ that correspond to different circumstances. For example, one ρ could represent travel on a certain highway and another ρ could represent travel on a different highway).

It is difficult, if not impossible to know beforehand which regression model will work the best. For this reason, we have described different options that will be explored. If none of the regression models produce improved demand estimates , we will revert to using the comparison of averages approach described in the previous section.

5. CALCULATION OF TRUCK PARKING DEMAND (STEP 3)

5.1 Current Demand Estimation

The GPS database will be analyzed to count the number of parking events recorded at all of the designated and undesignated locations identified previously, for every hour of the day. Then, the expansion factors will be used to extrapolate to the number of trucks represented in real life.

5.2 Forecasted Demand Estimation

A 2040 forecasts will be developed by assuming that truck parking demand is proportional to the truck volumes on the roads. The growth in truck volumes will be obtained from the growth in freight tonnage forecasted by the SWIM model maintained by ODOT, which assigns freight flows to the corridors in Oregon and uses economic forecasts to project freight volumes. It will be assumed that no substantial changes to the HOS regulations will be implemented within the forecast period.

5.3 System Metrics

We will explore the use of the following metrics for use in the analysis:

- **Supply Metrics**
  - Average supply of parking spaces per centerline mile of highway
  - Average supply of parking spaces per type, and amenities offered
- **Demand Metrics**
  - Average peak period parking demand per centerline mile of highway
  - Average peak period parking demand per parking type, per major amenities available
  - Average peak period parking demand for peak day of the week per centerline mile of highway
  - 95th percentile peak period parking demand
  - Proportion of facilities with 100% utilization
  - Average demand for undesignated parking per centerline mile of highway (to identify unmet needs)
  - Average time spent parking per time spent driving
- **System Performance Metrics**
  - Average shortfall of peak parking demand per centerline mile of highway, in 2019
  - Average shortfall of peak parking demand per centerline mile of highway, in 2040
  - Average shortfall of peak parking demand per roadway segment, in 2019
  - Average shortfall of peak parking demand per roadway segment, in 2040
  - Average time spent looking for overnight parking per roadway segment

It is difficult to know which metric will best capture parking needs before working with the data.

6. CONCLUSION

This Memorandum describes an approach to estimate truck parking demand that avoids some of the pitfalls of previous studies and leverages the data available in Oregon. The approach will be finalized in April and the analysis will be implemented this spring. The results are anticipated to be available this summer and will be shared with the TAC when complete.

APPENDIX E
TRUCK PARKING INVENTORY TECHNICAL MEMORANDUM

OREGON COMMERCIAL TRUCK PARKING STUDY

Date: August 23, 2019

Subject: Final Technical Memorandum #4 - Truck Parking Inventory

1. INTRODUCTION AND PURPOSE OF MEMORANDUM

1.1 Purpose of Study

The Moving Ahead for Progress in the 21st Century Act (MAP-21) includes specific language to address the nation's shortage of long-term truck parking along the National Highway System (NHS). MAP-21 Section 1401 (Jason's Law) requires an inventory of existing truck parking for each state, assessment of the volume of commercial trucks in each state, and a measurement of the adequacy of commercial truck parking facilities in each state. Consistent with these requirements, the Oregon Department of Transportation (ODOT), is conducting this study to analyze truck parking issues on key freight corridors in the state of Oregon in terms of capacity, safety, and convenience to truck drivers and determine where additional truck parking is needed. ODOT will use the results of this study to make informed decisions when looking for opportunities to improve truck parking, highway performance, and safety to support the freight industry. The study will help decision-makers prioritize projects, meet multiple needs more efficiently, and provide acceptable returns on investment for freight projects.

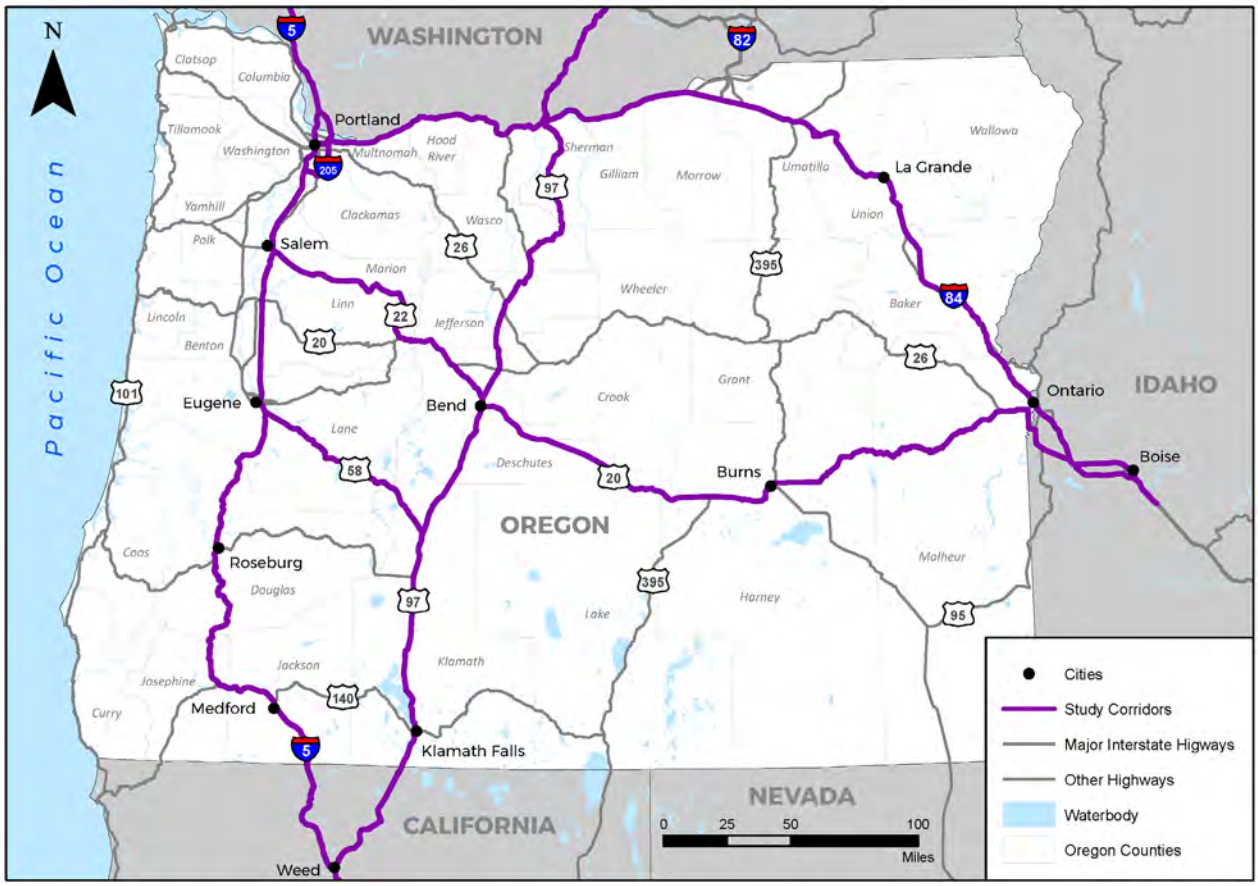
1.2 Study Area

For the purposes of this truck parking inventory, the study area consists of six corridors within Oregon identified by ODOT: Interstate 5 (I-5), Interstate 84 (I-84), Interstate 205 (I-205), US Route 20/Oregon Route 22 (US20/OR22) from Salem to the Idaho border, US Route 97 (US97), and Oregon Route 58 (OR58). The study area for each corridor extends 50 miles into adjacent states (Washington, Idaho, and California). Figure 1 shows the location of the study corridors. Truck stops and rest areas along the study corridors, and any truck stop or rest area within 2 miles of a study corridor, are included in this inventory.

1.3 Purpose of Memorandum

This memorandum provides an inventory of designated truck parking locations in the study corridors, including rest areas, truck stops and Ports of Entry (POE). The inventory includes truck parking locations at ODOT-owned rest areas, private truck stops, and State-managed POE that have designated truck parking spaces that can be used for complying with hours-of-service regulations.

Figure 1. Truck Parking Study Corridors



2. METHODOLOGY

2.1 Rest Areas

Information on ODOT-owned rest areas was gathered from the ODOT/Travel Information Council (OTIC) Management, Maintenance, and Improvement of Roadside Rest Areas Agreement No. 32,946 Exhibit D. This information was supplemented by a desktop survey using current aerial maps and confirmed by Heather Swanson, Rest Area Program and Contracts Manager at OTIC on March 19, 2019. An attempt was made to include unstriped and/or unofficial truck parking spaces at the facilities, although these are denoted separately within the inventory. Counts for all unstriped/unofficial truck parking spaces at rest areas were provided by Heather Swanson. If there are distinct rest areas depending on the direction of travel, then the facilities are counted separately (e.g., if there is a northbound facility and a separate southbound facility directly across the highway, each facility is included separately in the inventory).

Figure 2 shows the location of each truck parking site included in this inventory. Identification numbers for rest areas (101-139), truck stops (201-262), and POE (301-306) correspond to identification numbers listed in Table A 1 in Appendix A.

2.2 Truck Stops

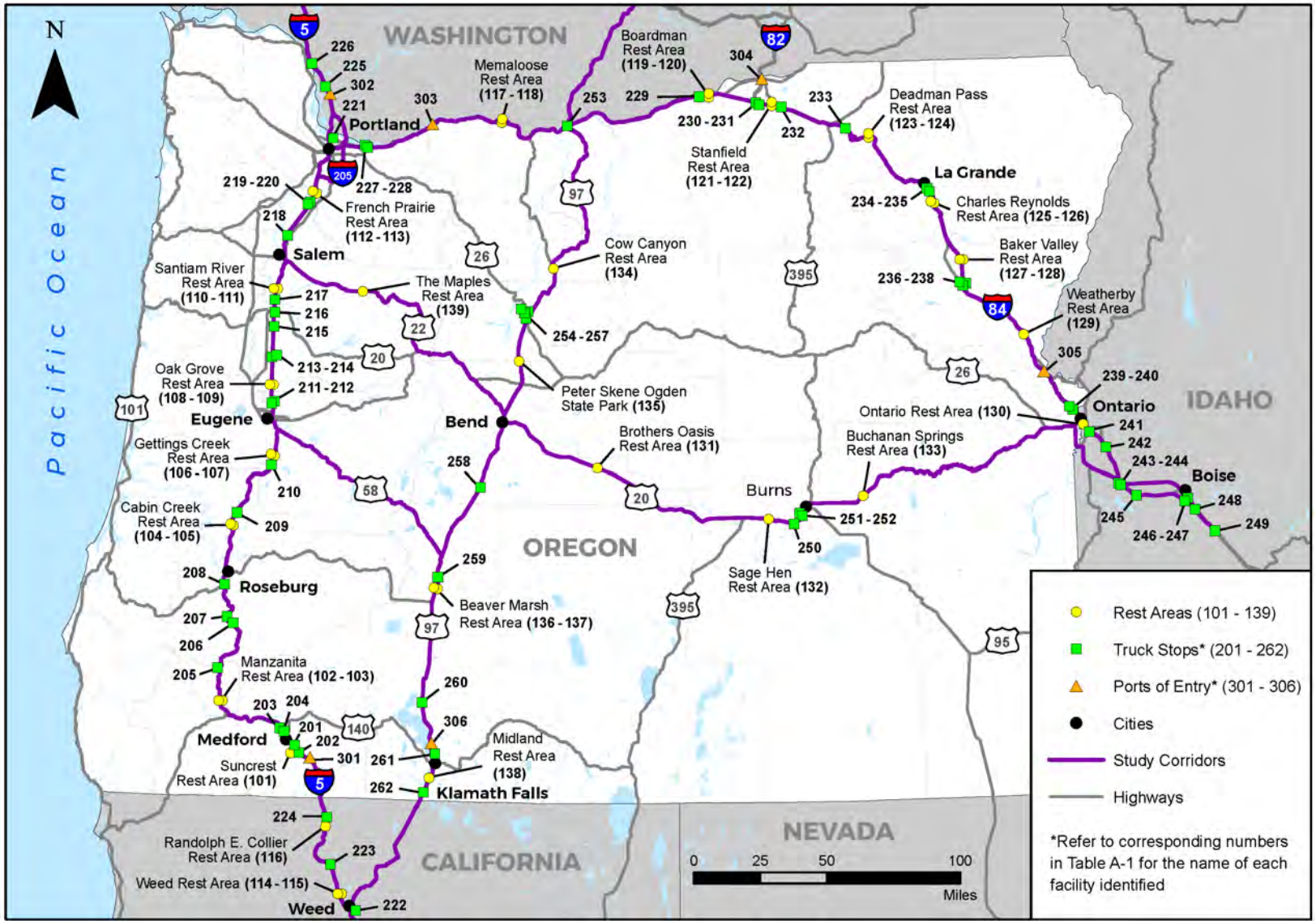
A list of privately-owned truck stops on major highways was provided by ODOT's Motor Carrier Transportation Division (revised September 4, 2018). Truck stops within the study area from this list were included in the inventory. The project team consulted available online resources including third-party sources[1] and truck stop websites (see Table A-3 in Appendix A) and aerial maps to gather the information on each site for the inventory.

The truck parking spaces reported on available online resources were not always consistent. Therefore, the following sequential methodology was used to determine the number of truck parking spaces at each privately-owned truck stop.

1. If a truck stop's website indicates that there is designated truck parking, and that is consistent with the number reported by third-party sites, then it is assumed that the reported number is accurate.
    a. If a truck stop's website is inconsistent with the third-party sites, striped parking spaces are counted on an aerial map. The number counted from the aerial map is used.

[1] Third-party websites used in this inventory include the Park My Truck mobile app, Allstays.com, and truckstopsandservices.com.

Figure 2. Truck Stops and Rest Areas within the Study Area



2. If a truck stop's website does not indicate that there is designated truck parking, but all third-party sites report a consistent number of truck parking spaces, then it is assumed that the third-party sites are accurate.
3. If all consulted sources provide inconsistent data, striped truck parking spaces are counted on an aerial map.
4. If there are no data available online, striped truck parking spaces are counted on an aerial map.
5. If there is a paved or unpaved area for parking use without striped parking spaces, estimates of truck parking spaces available based on third-party sites or from an aerial map[2] are included in a separate column.
6. A few calls or emails were made with representatives of truck stop facilities where significant questions remained.

Table A-2 in Appendix A shows the truck parking counts for each truck stop facility.

2.3 Ports of Entry (POE)

A list of POE in or near the study corridors was provided by the ODOT Freight Planning unit on April 3, 2019. The Woodburn POE was not included in the inventory because it has no truck parking spaces. The POE at Ridgefield, WA was added to the inventory following input at the Technical Advisory Committee (TAC) Meeting on April 1, 2019. Information on amenities and services available to drivers was obtained by telephone call to each POE. Most POE have two static scales, weigh-in-motion scales with automated vehicle identification systems, a truck inspection building and several parking spaces or areas for truck parking.

3. TRUCK PARKING INVENTORY

The map above (Figure 2) depicts the truck parking facilities (rest areas, truck stops and POE) within the study corridors. Rest areas are ODOT owned facilities adjacent to state highways that provide basic rest area services for cars and trucks. Truck stops are private businesses that provide overnight parking, fuel, food and a variety of other services for truck drivers. POE are ODOT facilities where truck inspections occur for commercial truck compliance. The following tables provide a summary of the locations, total number of truck parking spaces, and common amenities at the identified rest areas[3], truck stops, and POE.

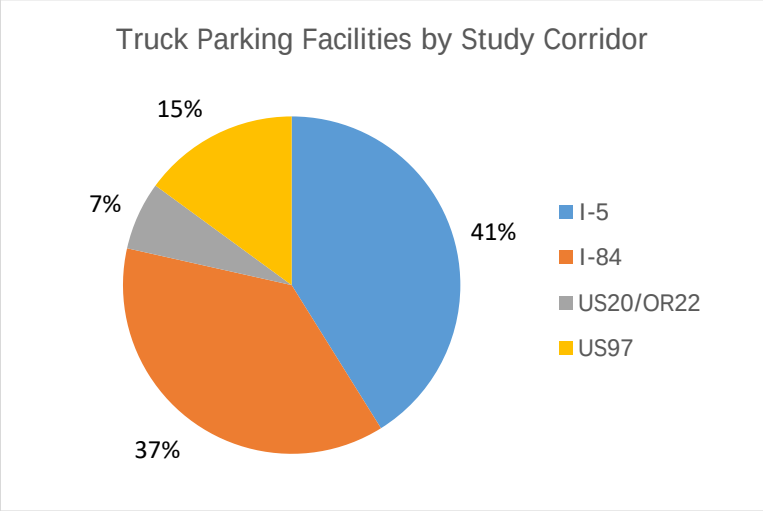
Table 1 and the following pie chart show the total number of truck parking facilities, by study corridor. As shown, there are a total of 109 facilities consisting of 39 rest areas, 62 truck stops and 6 POE. Most of the truck parking facilities are located on I-5 and I-84. There are no truck parking locations on I-205 or OR58. Most of the trucks stops are located in the urban areas while the rest areas are located in the rural areas. This is primarily due the nature of Oregon land use laws that allow very little commercial development in rural areas. POE are typically

[2] A visual count was made of the aerial map by measuring the assumed truck parking areas and assuming 12-foot-wide parking spaces.
[3] A rest area with separate facilities for each travel direction is counted as two rest areas in this study.

located near state borders. The detailed truck parking inventory is included as Table A-1 in Appendix A.

Table 1. Total truck parking facilities by study corridor

	I-5	I-84	I-205	US20/OR22	US97	OR58	**Total**
Rest Areas	16	14	0	4	5	0	39
Truck Stops	26	23	0	3	10	0	62
Ports of Entry	2	3	0	0	1	0	6
Total	**44**	**40**	**0**	**7**	**16**	**0**	**107**



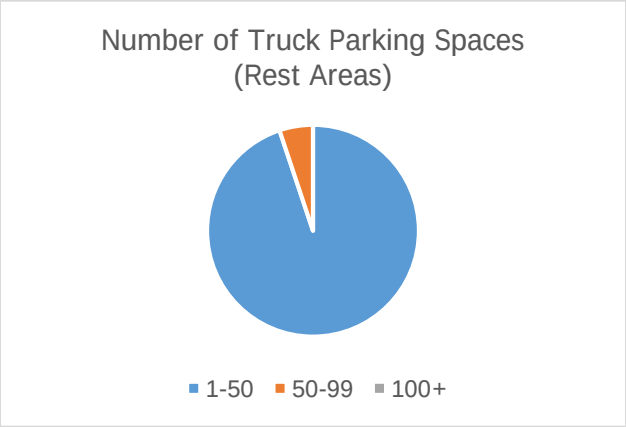
As shown in Table A-1 in Appendix A, there are a total of 5,410-5,540 truck parking spaces at rest areas, truck stops, and ports of entry on the study corridors. [4] Of these, 4,326-4,336 are striped and 1,084-1,204 are unstriped. 914 striped spaces are at rest areas, 4,342-4,472 are at truck stops, and 154 are at ports of entry.

Table 2 and the following pie charts show the breakdown of striped, unstriped/unofficial, and total truck parking spaces by facility type and in total. On average, the truck stops have more truck parking than rest areas. Most of the rest areas have less than 50 truck parking spaces but 14 truck stops have over 100 truck parking spaces (including striped and unstriped/unofficial). Most facilities with unstriped/undesignated truck parking have less than 50 such spaces.

[4] The range in total parking spaces in the corridor accounts for uncertainties at two truck stops. A range was provided by a representative of Jubitz Truck Stop, and data sources reported inconsistent counts for Gordy's Truck Stop.

Table 2. Total number of truck parking spaces by facility

	Striped			Unstriped/Unofficial			Total Parking		
	1-50	50-99	100+	1-50	50-99	100+	1-50	50-99	100+
Rest Areas	37	2	0	31	0	0	37	2	0
Truck Stops	15	17	10	18	4	2	27	18	14
Ports of Entry	6	0	0	0	0	0	6	0	0
Total	58	19	10	49	4	2	**70**	**20**	**14**



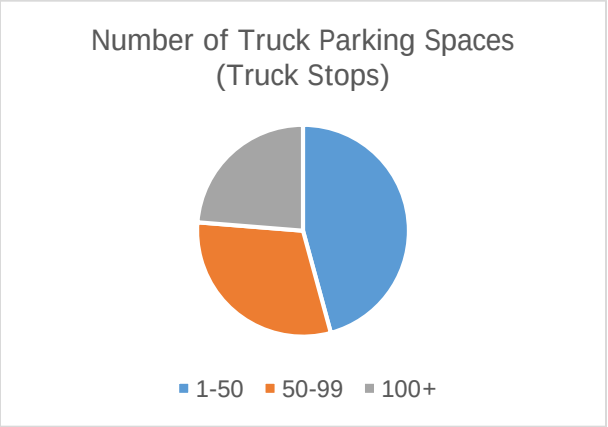


Table A-1 in Appendix A includes a complete inventory of amenities and services at each facility. It is important to note that information is not available for every amenity at each truck stop. Where information was unavailable, the cell in Table A-1 was shaded grey.

Table 3 summarizes the percentage of observed rest areas, truck stops, and POEs that provide each of several listed amenities or services. Truck stops offer several more amenities or services than the other parking location types. They nearly all have fuel, restrooms, convenience markets, and cell phone service. Most have a restaurant, laundry facilities, and parking lot lighting. None of the rest areas provide fuel, showers, a convenience market, restaurant, laundry machines, repair facilities, idle-reduction, or truck wash. However, all (or nearly all) of the rest areas have basic amenities such as restrooms, drinking fountains, cell phone service, vending machines and parking lot lighting. Most rest areas also have dog walk areas but this information was not readily available for truck stops. The six POEs vary in what amenities are available. All POEs offer a restroom during office hours and three have a porta-potty with 24-hour access.

Table 3. Percent of facilities with amenities/services (rounded to the nearest whole number)

	Fuel	Restrooms	Drinking fountain	Showers	Convenience market	Internet connection	Cell phone service	Parking lot lighting	Vending machines	Travel information	Public phones	Pet area	Idle-reduction	Public laundry	Restaurant
Rest Areas	0	100	92	0	0	3	100	95	69	49	28	77	0	0	0
Truck Stops	100	98	0	70	98	59	100	85	0	0	7	8	48	57	74
Ports of Entry	0	100	50	0	0	0	100	100	50	71	33	17	0	0	0
Total	**58**	**99**	**37**	**41**	**57**	**35**	**100**	**90**	**28**	**23**	**16**	**34**	**27**	**33**	**42**
Information unavailable	--	--	59	--	--	22	--	2	59	83	56	64	30	3	3

4. Next Steps

The inventory included in this technical memorandum will be used to evaluate current and future parking demand at all locations listed in Table A-1. The project team will develop a report and maps that describe the current parking demand, including peak demand and where and when the demand exceeds the capacity at each truck parking location.

APPENDIX A

Detailed Inventory Tables

Table A-1. Oregon Truck Parking Inventory

							Truck Parking Spaces					Services/Amenities																							
ID #	Name	City	State	Highway	Mile Point	Direction of Travel	Designated/striped	Unpaved/unstriped	Total	Adjacent/Nearby	Count assumption (see notes)	Restrooms	Fuel	Convenience Market	Parking Lot Lighting	Repair Facilities	Truck Wash	Showers	Idle Reduction System	Wi-Fi / Internet	Cell Phone Service	Drinking Fountain	Vending Machines	Travel Information	Public Phone(S)	Pet Area	Restaurant(s)	Truck Scale	Drivers Lounge / TV	UPS / FedEx	Trip Pak Drop Box	Public Laundry	Propane (bulk/not)	Picnic Tables/Shelters	Other
Rest Areas																																			
101	Suncrest, southbound	Talent	OR	I-5	22.22	SB	10	0	10			Y	N	N	Y	N	N	N	N	N	Y	Y	Y			Y	N	N	N	N	N	N	N	Y	
102	Manzanita, north bound	(near Grants Pass)	OR	I-5	62.78	NB	15	7	22			Y	N	N	Y	N	N	N	N	N	Y	Y	Y	N	N	Y	N	N	N	N	N	N	N	Y	Interpretive panels
103	Manzanita, south bound	(near Grants Pass)	OR	I-5	62.78	SB	13	2	15			Y	N	N	Y	N	N	N	N	N	Y	Y	Y	Y	N	Y	N	N	N	N	N	N	N	Y	
104	Cabin Creek, north bound	(near Oakland)	OR	I-5	142.83	NB	9	3	12			Y	N	N	Y	N	N	N	N	N	Y	Y	Y	Y	Y	Y	N	N	N	N	N	N	N	Y	
105	Cabin Creek, south bound	(near Oakland)	OR	I-5	142.83	SB	5	2	7			Y	N	N	Y	N	N	N	N	N	Y	Y	Y	Y	Y	Y	N	N	N	N	N	N	N	Y	
106	Gettings Creek, north bound	(near Creswell)	OR	I-5	178.07	NB	10	1	11			Y	N	N	Y	N	N	N	N	N	Y	Y	Y	Y	Y	Y	N	N	N	N	N	N	N	Y	
107	Gettings Creek, south bound	(near Creswell)	OR	I-5	178.07	SB	10	0	10			Y	N	N	Y	N	N	N	N	N	Y	Y	Y	Y	Y	Y	N	N	N	N	N	N	N	Y	
108	Oak Grove, north bound	(near Harrisburg)	OR	I-5	206.06	NB	23	9	32			Y	N	N	Y	N	N	N	N	N	Y	Y	Y	Y	N	Y	N	N	N	N	N	N	N	Y	
109	Oak Grove, south bound	(near Harrisburg)	OR	I-5	206.06	SB	23	9	32			Y	N	N	Y	N	N	N	N	N	Y	Y	Y	Y	N	Y	N	N	N	N	N	N	N	Y	
110	Santiam River, north bound	(near Jefferson)	OR	I-5	240.95	NB	12	11	23			Y	N	N	Y	N	N	N	N	N	Y	Y	Y	Y	N	Y	N	N	N	N	N	N	N	Y	River view
111	Santiam River, south bound	(near Jefferson)	OR	I-5	240.95	SB	11	21	32			Y	N	N	Y	N	N	N	N	N	Y	Y	Y	Y	N	Y	N	N	N	N	N	N	N	Y	Coffee
112	French Prairie (Baldock), north bound	(near Wilsonville)	OR	I-5	281.63	NB	57	9	66			Y	N	N	Y	N	N	N	N	N	Y	Y	Y	Y	N	Y	N	N	N	N	N	N	N	Y	
113	French Prairie (Baldock), south bound	(near Wilsonville)	OR	I-5	281.63	SB	57	4	61			Y	N	N	Y	N	N	N	N	N	Y	Y	Y	Y	N	Y	N	N	N	N	N	N	N	Y	
114	Weed Rest Area, northbound	(near Weed)	CA	I-5	752.84	NB	11	0	11			Y	N	N	Y	N	N	N	N	N	Y	Y	N		Y		N	N	N	N	N	N	N	Y	
115	Weed Rest Area southbound	(near Weed)	CA	I-5	752.82	SB	10	0	10			Y	N	N	Y	N	N	N	N	N	Y	Y	N		Y		N	N	N	N	N	N	N	Y	
116	Randolph E. Collier Rest Area	(near Hornbrook)	CA	I-5	786.0	NB/SB	33	0	33			Y	N	N	Y	N	N	N	N	N	Y	Y	N		Y		N	N	N	N	N	N	N	Y	
117	Memaloose, east bound	(near Mosier)	OR	I-84	72.92	EB	14	5	19			Y	N	N	Y	N	N	N	N	N	Y	Y	N	Y	N	Y	N	N	N	N	N	N	N	Y	Oregon Trail Kiosk, RV Dump (out of service)
118	Memaloose, west bound	(near Mosier)	OR	I-84	72.92	WB	8	10	18			Y	N	N	Y	N	N	N	N	N	Y	Y	N	Y	N	Y	N	N	N	N	N	N	N	Y	
119	Boardman, east bound	(near Boardman)	OR	I-84	160.90	EB	12	13	25			Y	N	N	Y	N	N	N	N	N	Y	Y	Y	Y	Y	Y	N	N	N	N	N	N	N	Y	
120	Boardman, west bound	(near Boardman)	OR	I-84	160.90	WB	10	13	23			Y	N	N	Y	N	N	N	N	N	Y	Y	Y	N	Y	Y	N	N	N	N	N	N	N	Y	
121	Stanfield, east bound	(near Stanfield)	OR	I-84	186.49	EB	22	17	39			Y	N	N	Y	N	N	N	N	N	Y	Y	Y	N	N	Y	N	N	N	N	N	N	N	Y	Livestock Corral, Oregon Trail Kiosk
122	Stanfield, west bound	(near Stanfield)	OR	I-84	186.49	WB	22	17	39			Y	N	N	Y	N	N	N	N	N	Y	Y	Y	N	N	Y	N	N	N	N	N	N	N	Y	Livestock Corral, Oregon Trail Kiosk
123	Deadman Pass, east bound	Pendleton	OR	I-84	228.90	EB	13	5	18			Y	N	N	Y	N	N	N	N	N	Y	Y	Y	Y			N	N	N	N	N	N	N	Y	
124	Deadman Pass, west bound	Pendleton	OR	I-84	228.90	WB	11	6	17			Y	N	N	Y	N	N	N	N	N	Y	Y	Y				N	N	N	N	N	N	N	Y	
125	Charles Reynolds, east bound	(near La Grande)	OR	I-84	269.22	EB	10	16	26			Y	N	N	Y	N	N	N	N	N	Y	Y	Y	N	N	Y	N	N	N	N	N	N	N	Y	Oregon Trail Kiosk, RV Dump
126	Charles Reynolds, west bound	(near La Grande)	OR	I-84	269.22	WB	12	13	25			Y	N	N	Y	N	N	N	N	N	Y	Y	Y	N	N	Y	N	N	N	N	N	N	N	Y	Old Water Wheel, Charles Reynolds marker, Oregon Trail Kiosk
127	Baker Valley, east bound	(near Baker City)	OR	I-84	295.06	EB	24	6	30			Y	N	N	Y	N	N	N	N	N	Y	Y	Y	N	N	Y	N	N	N	N	N	N	N	Y	Oregon Trail Kiosk
128	Baker Valley, west bound	(near Baker City)	OR	I-84	295.06	WB	9	6	15			Y	N	N	Y	N	N	N	N	N	Y	Y	Y	N	N	Y	N	N	N	N	N	N	N	Y	Oregon Trail Kiosk
129	Weatherby, west bound	(near Weatherby)	OR	I-84	335.97	EB/WB	31	9	40			Y	N	N	Y	N	N	N	N	N	Y	Y	Y	Y	N	Y	N	N	N	N	N	N	N	Y	Oregon Trail Kiosk
130	Ontario, west bound	Ontario	OR	I-84	377.36	WB	24	0	24			Y	N	N	Y	N	N	N	N	Y	Y	Y	Y	Y	N	Y	N	N	N	N	N	N	N	Y	Welcome Center, Travel Information Center, RV Dump Oregon Trail Kiosk
131	Brothers Oasis, west bound	Brothers	OR	US 20	42.86	EB/WB	7	0	7			Y	N	N	Y	N	N	N	N	N	Y	Y	N		N		N	N	N	N	N	N	N	Y	
132	Sage Hen, east bound	(near Hines)	OR	US 20	114.11	EB/WB	27	0	27			Y	N	N	Y	N	N	N	N	N	Y	Y	N	Y	N		N	N	N	N	N	N	N	Y	
133	Buchanan Springs	(near Burns)	OR	US 20	155.9	EB/WB	0	13	13			Y	N	N	N	N	N	N	N	N	Y						N	N	N	N	N	N	N	Y	
134	Cow Canyon, south bound	Wasco County	OR	US 97	68.69	NB/SB	16	8	24			Y	N	N	Y	N	N	N	N	N	Y	N	N	N	N	Y	N	N	N	N	N	N	N	Y	
135	Peter Skene Ogden State Park	(near Terrebonne)	OR	US 97	112.6	NB/SB	6	2	8			Y	N	N	N	N	N	N	N	N	Y				Y		N	N	N	N	N	N	N	Y	NOTE: Under TIC Management July 1, 2019
136	Beaver Marsh, north bound	(near Chemult)	OR	US 97	206.50	NB	25	5	30			Y	N	N	Y	N	N	N	N	N	Y	Y	N	N	N	Y	N	N	N	N	N	N	N	Y	
137	Beaver Marsh, south bound	(near Chemult)	OR	US 97	206.50	SB	13	4	17			Y	N	N	Y	N	N	N	N	N	Y	Y	N	N	Y	Y	N	N	N	N	N	N	N	Y	Volcanic Legacy Kiosk
138	Midland, north bound	Midland	OR	US 97	282.26	NB/SB	25	3	28			Y	N	N	Y	N	N	N	N	N	Y	Y	Y	Y	N	Y	N	N	N	N	N	N	N	Y	Livestock Corral, Volcanic Legacy Kiosk
139	The Maples, east bound	Gates	OR	OR 22	34.62	EB/WB	10	5	15			Y	N	N	Y	N	N	N	N	N	Y	Y	Y	N	N	Y	N	N	N	N	N	N	N	Y	
Truck Stops																																			
201	Gordy's Talent Truck Stop	Talent	OR	I-5	21.21	NB/SB	45	0	45	0	6	Y	Y	Y				Y			Y														
202	Petro Stopping Center	Phoenix	OR	I-5	24.27	NB/SB	87	0	87	0	1a	Y	Y	Y	Y	Y	N	Y	Y	Y	Y					Y	Y	Y	Y	N	N	Y	Y	N	Tire Care, Oil & Lube, Walking trail
203	Withham Truck Stop	Medford	OR	I-5	30.44	NB/SB												CLOSED																	
204	Pilot Travel Center	Central Point	OR	I-5	32.59	NB/SB	93	0	93	0	3	Y	Y	Y	Y	N	N	Y	Y	Y	Y						Y	Y		Y	Y	Y	Y	N	Game Room, Roadside Assistance, Natural Gas
205	Wolf Creek Truck N' Travel	Wolf Creek	OR	I-5	76.18	NB/SB	0	8	8	0	3,5	Y	Y	Y	Y	N	N	N			Y						Y	N	N	N	N	N	N	N	
206	Seven Feathers Truck & Travel Center	Canyonville	OR	I-5	99.49	NB/SB	178		178		3	Y	Y	Y	Y	N	N	Y	Y	Y	Y						Y	Y	Y	Y	Y	Y	Y	N	RV Dump Site
207	Chevron/Pacific Pride	Myrtle Creek	OR	I-5	103.96	NB/SB	0	11	11	8	3,5	Y	Y	Y	N	N	N	N			Y						Y	N						N	
208	Love's Travel Stop	Roseburg	OR	I-5	119.29	NB/SB	76	0	76	0	1a	Y	Y	Y	Y	Y	N	Y	Y	Y	Y						Y	Y		N	N	N	N	N	Tire Care, RV Dump site, Bulk DEF
209	Pilot Travel Center	Rice Hill	OR	I-5	148.59	NB/SB	141	0	141	0	3	Y	Y	Y	Y	N	N	Y	Y	Y	Y						Y	Y	Y	Y	N	Y	N	N	Roadside Assistance, Bulk DEF
210	Chevron Market Express	Cottage Grove	OR	I-5	174.61	NB/SB	0	19	19	0	3,5	Y	Y	Y	Y	N	N	Y		Y	Y						Y	N	Y	Y	N	Y	Y	N	
211	Fuel N Go	Coburg	OR	I-5	199.15	NB/SB	0	20	20	0	5	Y	Y	Y	Y	N	N	N			Y						Y	N	N	N	N	N	Y	N	
212	TA Travel Center	Coburg	OR	I-5	199.16	NB/SB	86	49	135	0	1a	Y	Y	Y	Y	Y	Y	Y	Y		Y				Y		Y	Y	Y	N	Y	Y	Y		Theater Room, Arcade Room, RV Dump Site, Motel, DEF
213	Mobil/Shell	Halsey	OR	I-5	216.56	NB/SB	0	12	12	0	5	Y	Y	Y	Y	N	N	N		Y	Y						N	N	N	N	N	N	Y	N	
214	Pioneer Villa Truck Plaza	Halsey	OR	I-5	216.56	NB/SB	0	93	93	0	5	Y	Y	Y	Y	Y	Y	N			Y						Y					Y	N	N	Barber Shop, Motel on-site, Urgent care
215	Virk I-5 Truck Stop	Albany	OR	I-5	228.06	NB/SB	0	50	50	0	2	Y	Y	Y	Y	N	N	Y			Y						Y	Y					N	Y	
216	Jack's Truck Stop	Albany	OR	I-5	233.21	NB/SB	0	15	15	0	3,5	Y	Y	Y	N	N	N	Y			Y						Y	Y	Y	N	N	Y	Y	N	
217	Love's Travel Stop	Albany	OR	I-5	237.98	NB/SB	72	0	72	0	1	Y	Y	Y	Y	N	N	Y		Y	Y						Y	Y	N	N	Y	Y	Y	N	RV Dump Service, Tire care
218	Pilot Travel Center	Brooks	OR	I-5	263.48	NB/SB	87	0	87	0	3	Y	Y	Y	Y	N	N	Y	Y	Y	Y						Y	Y	N	Y	Y	Y	N	N	Game Room
219	Flying J Travel Center	Aurora	OR	I-5	278.62	NB/SB	93	0	93	0	3	Y	Y	Y	Y	N	N	Y		Y	Y						Y	Y	Y	Y	Y	Y	Y	N	
220	TA Travel Center	Aurora	OR	I-5	278.72	NB/SB	275	0	275	0	1	Y	Y	Y	Y	Y	N	Y	Y	Y	Y					Y	Y	Y	Y	N	N	Y	N	N	DEF, Fitness room, Ministry Services
221	Jubitz Truck Stop	Portland	OR	I-5	306.70	NB/SB	325-335	0	325-335	0	6	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y						Y	Y	Y	Y	N	Y	Y	N	Hotel, Cinema, Dog Wash, Hair Salon, USPS, def
222	Pilot Travel Center	Weed	CA	I-5	744.92	NB/SB	80	0	80	0	3	Y	Y	Y	Y	N	N	Y	Y	Y	Y					N	Y	Y	N	Y	Y	Y	Y	N	Game room
223	Three Js Deli and Mini Mart	Grenada	CA	I-5	765.28	NB/SB	0	0	0	0	3,5	Y	Y	Y	N	N	N	N			Y						N	N	N					Y	
224	Chevron	Hornbrook	CA	I-5	788.58	NB/SB	0	48	48	0	3,5	Y	Y	Y	N	N	N	N		Y	Y						N	N	N			N		N	Post Office
225	Paradise Quick Stop	Ridgefield	WA	I-5	16.85	NB/SB	10	0	10	0	2	Y	Y	Y	Y	N	N	N	Y		Y						N	N	N	N	N	N	Y	N	
226	Rebel Truck Stop	Kalama	WA	I-5	28.05	NB/SB	11	15	26	0	3	Y	Y	Y	Y	N	N	Y			Y				Y		Y	N					Y	N	
227	TA Travel Center	Troutdale	OR	I-84	17.12	EB/WB	240	0	240	0	1	Y	Y	Y	Y	Y	N	Y	Y	Y	Y					Y	Y	Y	Y	N	N	Y	N	N	Tire service, DEF, Barber shop, Ministry Services

							Truck Parking Spaces					Services/Amenities																							
ID #	Name	City	State	Highway	Mile Point	Direction of Travel	Designated/striped	Unpaved/unstriped	Total	Adjacent/Nearby	Count assumption (see notes)	Restrooms	Fuel	Convenience Market	Parking Lot Lighting	Repair Facilities	Truck Wash	Showers	Idle Reduction System	Wi-Fi / Internet	Cell Phone Service	Drinking Fountain	Vending Machines	Travel Information	Public Phone(S)	Pet Area	Restaurant(s)	Truck Scale	Drivers Lounge / TV	UPS / FedEx	Trip Pak Drop Box	Public Laundry	Propane (bulk/not)	Picnic Tables/Shelters	Other
228	Love's Travel Stop	Troutdale	OR	I-84	17.36	EB/WB	93	0	93	0	1a	Y	Y	Y	Y	Y	N	Y	Y	Y	Y					N	Y	Y	N	N	Y	Y	Y	N	Tire Care, DEF
229	Love's Travel Stop	Boardman	OR	I-84	159.30	EB/WB	95	0	95	0	1	Y	Y	Y	Y	Y	N	N		Y	Y					N	Y	Y	N	N	Y	N	Y	N	Tire care, DEF
230	Western Express	Hermiston	OR	I-84	180.40	EB/WB	0	100	100	0	3,5	Y	Y	Y	Y	N	N	N	Y		Y					N	N	N	N	N	N	N	Y	N	
231	Space Age Truck Stop	Hermiston	OR	I-84	182.86	EB/WB	122	0	122	7	3	Y	Y	Y	Y	N	N	Y	Y	Y	Y					N	Y	Y	Y	Y	Y	Y	Y	N	
232	Pilot Travel Center	Stanfield	OR	I-84	188.81	EB/WB	122	0	122	0	3	Y	Y	Y	Y	N	N	Y	Y	Y	Y						Y	Y	N	Y	Y	Y	Y	N	Natural Gas, RV Park, Roadside assistance
233	Arrowhead Truck Plaza	Pendleton	OR	I-84	216.04	EB/WB	117	0	117	0	3	Y	Y	Y	Y	N	N	Y	Y	Y	Y						Y	Y	Y	N	N	Y	Y	Y	RV Dump Site
234	Chevron	La Grande	OR	I-84	261.84	EB/WB	0	10	10	0	3,5	Y	Y	Y	N	N	N	Y			Y						Y	N	N	N	N	N	N	N	
235	Flying J Travel Center	La Grande	OR	I-84	264.61	EB/WB	45	0	45	0	3	Y	Y	Y	Y	N	N	Y	Y	Y	Y						Y	Y	Y	Y	N	Y	N	N	
236	Chevron	Baker City	OR	I-84	304.13	EB/WB	0	30	30	0	3,5	Y	Y	Y	Y	N	N	N			Y						N	N	N	N	N	N		N	
237	Jacksons Food Stores	Baker City	OR	I-84	304.15	EB/WB	22	0	22	0	3	Y	Y	Y	Y	N	N	Y		Y	Y						N	N	Y	N	N	N	Y	N	
238	Baker Truck Corral	Baker City	OR	I-84	304.22	EB/WB	0	77	77	0	3,5	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y						Y	Y	Y	Y	N	Y	y	N	Game Room, RV Dump Site, Barber, fenced-in outdoor tables
239	Love's Travel Stop	Ontario	OR	I-84	374.66	EB/WB	49	40	89	0	3,5	Y	Y	Y	Y	Y	N	Y	N	Y	Y						Y	Y	N	N	Y	N	N	N	Tire care, Bulk DEF
240	Pilot Travel Center	Ontario	OR	I-84	376.74	EB/WB	96	0	96	0	3	Y	Y	Y	Y	N	N	Y	Y	Y	Y					Y	Y	Y	N	Y	Y	Y	N	N	Game room, Audio Book Rental
241	Hammer Diesel	Fruitland	ID	I-84	2.60	EB/WB	26	0	26	0	4	Y	Y	Y	Y	N	N	N			Y						Y	N	N					N	
242	Black Canyon Stinker Truck Stop	Caldwell	ID	I-84	12.90	EB/WB	7	28	35	0	3,5	Y	Y	Y	Y	N	N	Y			Y						Y	Y	Y	Y	Y	Y	Y	N	Barber, Free air
243	Jacksons Food Stores	Caldwell	ID	I-84	19.90	EB/WB	7	0	7	0	4	Y	Y	Y	Y	N	N	N			Y						N	N	N			N	Y	Y	
244	Flying J Travel Center	Caldwell	ID	I-84	28.80	EB/WB	102	0	102	0	3	Y	Y	Y	Y	N	N	Y	N	Y	Y						Y	Y	Y	Y	Y	Y	Y	Y	Natural Gas, Game Room
245	Jacksons Food Stores	Nampa	ID	I-84	35.90	EB/WB	77	0	77	0	77	Y	Y	Y	Y	N	Y	Y			Y						N	N	N			Y	Y	Y	
246	TA Travel Center	Boise	ID	I-84	54.40	EB/WB	171	0	171	0	1	Y	Y	Y	Y	Y	N	Y	Y	Y	Y					Y	Y	Y	Y	N	N	Y	N	Y	Fitness Room
247	Flying J Travel Center	Boise	ID	I-84	54.60	EB/WB	58	0	58	0	3	Y	Y	Y	Y	N	N	Y	Y	Y	Y						Y	N	Y	N	Y	Y	Y	N	Emission Testing, RV Dump Site
248	Blu Fuels	Boise	ID	I-84	58.80	EB/WB	30	0	30	0	4	N	Y	N	Y	N	N	N			Y						N	N	N	N	N	N	N	N	
249	Boise Stage Shop	Boise	ID	I-84	70.80	EB/WB	59	83	142	0	3,5	Y	Y	Y	Y	N	Y	Y	Y	Y	Y						Y	Y	Y	N	Y	Y	Y	N	TV, Game Room, Livestock Corral
250	Eddie's Truck & Auto Center	Hines	OR	US 20	128.14	EB/WB	50	0	50	0	2	Y	Y	Y	Y	Y	N	Y	N	Y	Y						Y	Y	Y	N	N	Y	Y	N	
251	Chevron	Hines	OR	US 20	129.89	EB/WB	0	10	10	0	2	Y	Y	Y	N	N	N	N			Y						N	N	N	N	N	N	Y	N	RV Dump Site
252	Leather's Fuel	Hines/Burns	OR	US 20	130.09	EB/WB	0	17	17	0	5	Y	Y	Y	Y	N	N	Y	Y		Y				Y		N	N	N	N	N	N	Y		
253	Pilot Travel Center	Biggs Junction	OR	US 97	0.03	NB/SB	41	0	41	0	3	Y	Y	Y	Y	N	N	Y	Y	Y	Y						Y	Y	N	Y	Y	N	N	N	
254	Plateau Travel Plaza	Madras	OR	US 97	91.20	NB/SB	70	0	70	0	1	Y	Y	Y				Y		Y	Y											Y	Y		Casino, Game room, DEF, Kitchen
255	Madras Safeway	Madras	OR	US 97	91.68	NB/SB	4	0	4	0	4	Y	Y	Y	Y	N	N	N			Y							N						N	
256	Ahern's Stop N Shop	Madras	OR	US 97	91.97	NB/SB	0	0	0	3	4	Y	Y	Y	N	N	N	N			Y							N						Y	
257	Madras J&L	Madras	OR	US 97	96.18	NB/SB	0	20	20	0	5	Y	Y	Y	Y	N	N	N	Y		Y						Y	N	N	N	N	Y	N	N	RV Dump Site
258	Gordy's Truck Stop	La Pine	OR	US 97	165.04	NB/SB	52	30-150	82-202	0	3,5	Y	Y	Y	Y	N	N	Y	Y	Y	Y				Y		Y	Y	Y	N	N	Y	Y		Game room, RV Dump Site
259	Pilot Travel Center	Chemult	OR	US 97	203.41	NB/SB	34	0	34	0	1a	Y	Y	Y	Y	N	N	Y	Y	Y	Y						Y	Y	Y	N	N	Y	N	N	Game room
260	Crater Lake Junction Travel Center	Chiloquin	OR	US 97	251.55	NB/SB	17	25	42	16	3,5	Y	Y	Y	Y	N	N	Y		Y	Y						Y	N	Y	Y	N	Y	Y	N	DEF,
261	Pilot Travel Center	Klamath Falls	OR	US 97	272.37	NB/SB	47		47	0	1a	Y	Y	Y	Y	N	N	Y	Y	Y	Y						Y	Y	N	Y	Y	Y	Y	N	RV Dump Site, Game Room
262	Worden Truck Stop	Worden	OR	US 97	288.48	NB/SB	0	20	20	0	5	Y	Y	Y	Y	N	N	Y			Y						Y	N	Y	N	N	N	Y	N	
Ports of Entry																																			*Port of Entry Notes*
301	Ashland Port of Entry	Ashland	OR	I-5	18.10	NB/SB	29	0	29			Y	N	N	Y	N	N	N	N	N	Y	N	N	Y	N	N	N	Y	N	N	N	N	N	N	Restroom during office hours only
302	Ridgefield Port of Entry	Ridgefield	WA	I-5	15.45	NB/SB	32	0	32			Y	N	N	Y	N	N	N	N	N	Y	Y	N	Y	Y	N	N	Y	N	N	N	N	N	N	Restroom is a porta-potty. Water and phone available during office hours only
303	Cascade Locks Port of Entry	Cascade Locks	OR	I-84	44.93	NB/SB	19	0	19			Y	N	N	Y	N	N	N	N	N	Y	N	Y	Y	N	N	N	Y	N	N	N	N	N	N	Restroom and vending machine during office hours only. Porta-potty outside
304	Umatilla Port of Entry	Umatilla	OR	I-82	1.02	NB/SB	30	0	30			Y	N	N	Y	N	N	N	N	N	Y	Y	Y	Y	N	N	N	Y	N	N	N	N	N	N	All amenities during office hours only
305	Farewell Bend Port of Entry	Huntington	OR	I-84	353.31	NB/SB	36	0	36			Y	N	N	Y	N	N	N	N	N	Y	N	Y	N	N	Y	N	Y	N	N	N	N	N	N	Restroom during office hours only
306	Klamath Falls Port of Entry	Klamath Falls	OR	US 97	271.70	NB/SB	8	0	8			Y	N	N	Y	N	N	N	N	N	Y	Y	N	Y	Y	N	N	Y	N	N	N	N	N	N	Restroom during office hours only
						Rest Area Subtotal	*660*	*254*	*914*	*0*	*-*	*39*	*0*	*0*	*37*	*0*	*0*	*0*	*0*	*1*	*39*	*36*	*27*	*19*	*11*	*30*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*39*	
						Truck Stop Subtotal	*3,512-3,522*	*830-950*	*4,342-4,472*	*34*	*-*	*60*	*61*	*60*	*52*	*13*	*6*	*43*	*29*	*36*	*61*	*0*	*0*	*0*	*4*	*5*	*45*	*33*	*25*	*18*	*19*	*35*	*36*	*8*	
						Port of Entry Subtotal	*154*	*0*	*154*	*0*	*-*	*6*	*0*	*0*	*6*	*0*	*0*	*0*	*0*	*0*	*6*	*3*	*3*	*5*	*2*	*1*	*0*	*6*	*0*	*0*	*0*	*0*	*0*	*0*	
						Total	**4,326-4,336**	**1,084-1,204**	**5,410-5,540**	**34**	**-**	**105**	**61**	**60**	**95**	**13**	**6**	**43**	**29**	**37**	**106**	**39**	**30**	**24**	**17**	**36**	**45**	**39**	**25**	**18**	**19**	**35**	**36**	**47**	

Notes:

Truck parking spaces at truck stops were estimated using the following assumptions corresponding to footnotes next to the facilities' names:

1. If a truck stop's website indicates that there is designated truck parking, and that is consistent with the number reported by third-party sites, then it is assumed that the reported number is accurate.

a. If a truck stop's website is inconsistent with the third-party sites, striped parking spaces are counted on an aerial map. The number counted from the aerial map is used.

2. If a truck stop's website does not indicate that there is designated truck parking, but all third-party sites report a consistent number of truck parking spaces, then it is assumed that the third-party sites are accurate.

3. If all consulted sources provide inconsistent data, striped truck parking spaces are counted on an aerial map.

4. If there are no data available online, striped truck parking spaces are counted on an aerial map.

5. If there is a paved or unpaved area for parking use without striped parking spaces, estimates of truck parking spaces available based on third-party sites or from an aerial map (assuming 12-foot parking spaces) are included in a separate column.

6. Personal communication with representative of truck stop facility

Grey shaded cells indicate that information is not available online or from a desktop survey.

Table A-2. Truck Stop Parking Spaces by Source

		Truck Parking Counts							
		From company's website		Park My Truck App	Allstays.com	Truckstops and services.com	Aerial Counts		
ID #	Truck Stop	Parking	Designated as "truck parking"				Striped	Unstriped	Notes
201	Gordy's Talent Truck Stop	--	--	--	--	--	--	--	No aerial imagery
202	Petro Stopping Center	87	y	123	123	123	87		
203	Withham Truck Stop	--	--	40	8	10	0	10	
204	Pilot Travel Center	93 Public, 10 Prime	n	100	100	100	93	0	
205	Wolf Creek Truck N' Travel	--	--	--	5	--	0	8	
206	Seven Feathers Truck & Travel Center	--	--	190	150/180	150+	178		
207	Chevron/Pacific Pride	--	--	--	--	--	0	11	8 nearby spaces
208	Love's Travel Stop	76	y	80	80	76	76		
209	Pilot Travel Center	140 Public, 10 Prime	n	160	160	160	141	0	
210	Chevron Market Express	--	--	75	10	50	0	19	
211	Fuel N Go	--	--	--	20	5		20	
212	TA Travel Center	160	y	160	160	163	86	49	
213	Mobil/Shell	--	--	20	--	15	0	12	
214	Pioneer Villa Truck Plaza	--	--	150	100	150	0	93	
215	Virk I-5 Truck Stop	--	--	50	--	50	0	36	
216	Jack's Truck Stop	--	--	10	10	20	0	15	
217	Love's Travel Stop	72	y	--	72	72			
218	Pilot Travel Center	88 Public, 15 Prime	n	125	110	110	87	0	
219	Flying J Travel Center	90 Public, 15 Prime	n	93	80	95	93	0	
220	TA Travel Center	275	y	275	275	275			

		Truck Parking Counts							
		From company's website		Park My Truck App	Allstays.com	Truckstops and services.com	Aerial Counts		
ID #	Truck Stop	Parking	Designated as "truck parking"				Striped	Unstriped	Notes
221	Jubitz Truck Stop	300	--	320	150	150	250		
222	Pilot Travel Center	80 Public, 10 Prime	n	120	80		80	0	
223	Three Js Deli and Mini Mart	--	--	--	20	--		50	
224	Chevron	--	--	--	--	--	0	48	
225	Paradise Quick Stop	--	--	10	10	10	10		
226	Rebel Truck Stop	--	--	30	25	50	11	15	
227	TA Travel Center	240	y	240	240	240			
228	Love's Travel Stop	100	y	150	150	100	93	0	
229	Love's Travel Stop	95	y	95	95	95			
230	Western Express	--	--	100	50	100	0	100	
231	Space Age Truck Stop	--	--	100	80	150	122		Additional 7 spaces in Comfort Inn lot
232	Pilot Travel Center	117 Public, 10 Prime	n	90	90	90	122	0	
233	Arrowhead Truck Plaza	--	--	250	150	100+	117		
234	Chevron	--	--	--	--	--	0	0	
235	Flying J Travel Center	50 Public	--	50	50	50			
236	Chevron	--	--	30	--	50	0	30	
237	Jacksons Food Stores	--	--	12	20	20	22	0	
238	Baker Truck Corral	120	n	150	120	150+	0	77	Additional 22 spaces across the street
239	Love's Travel Stop	86	y	58	60	50	49	40	
240	Pilot Travel Center	99 Public, 10 Prime	--	100	105	105	96		

		Truck Parking Counts							
		From company's website		Park My Truck App	Allstays.com	Truckstops and services.com	Aerial Counts		
ID #	Truck Stop	Parking	Designated as "truck parking"				Striped	Unstriped	Notes
241	Hammer Diesel	--	--	--	--	--	26	0	
242	Black Canyon Stinker Truck Stop	30	n	75	30	50	7	28	
243	Jacksons Food Stores	--	--	--	--	--	7	0	
244	Flying J Travel Center	100 Public, 10 Prime	--	100	100	100			
245	Jacksons Food Stores	--	--	100	150	50	77	0	
246	TA Travel Center	171	y	171	171	171			
247	Flying J Travel Center	60 Public, 5 Prime	n	60	60	60	58		
248	Blu Fuels	--	--	--	--	--	30	0	
249	Boise Stage Shop	--	--	300	200	150	59	83	
250	Eddie's Truck & Auto Center	--	--	50	50	50	50		
251	Chevron	--	--	10	0	10	0	10	Difficult to count
252	Leather's Fuel	--	--	17	10	10	0	17	
253	Pilot Travel Center	37 Public, 7 Prime	n	55	25/30	55	41	0	
254	Plateau Travel Plaza	70	y	--	70				
255	Madras Safeway	--	--	--	--	--	4		
256	Ahern's Stop N Shop	--	--	--	--	--	0		3 spaces at McDonald's
257	Madras J&L	--	--	20	10	10	0	20	
258	Gordy's Truck Stop	200	n	80	192	50	52	150	
259	Pilot Travel Center	37 Public, 5 Prime	--	50	60	60	34	0	
260	Crater Lake Junction Travel Center	--	--	20		50	17	25	

		Truck Parking Counts							
		From company's website		Park My Truck App	Allstays.com	Truckstops and services.com	Aerial Counts		
ID #	Truck Stop	Parking	Designated as "truck parking"				Striped	Unstriped	Notes
261	Pilot Travel Center	48 Public, 10 Prime	n	50	50	75	47	0	
262	Worden Truck Stop	--	--	30	25	10	0	20	

Table A-3. Truck Stop Company Website Sources

ID#	Truck Stop	Truck Stop Website
201	Gordy's Talent Truck Stop	N/A
202	Petro Stopping Center	https://www.ta-petro.com/location/or/petro-phoenix
203	Withham Truck Stop	N/A
204	Pilot Travel Center	https://pilotflyingj.com/stores/934/
205	Wolf Creek Truck N' Travel	N/A
206	Seven Feathers Truck & Travel Center	N/A
207	Chevron/Pacific Pride	N/A
208	Love's Travel Stop	https://www.loves.com/locations/312
209	Pilot Travel Center	https://pilotflyingj.com/stores/233/
210	Chevron Market Express	N/A
211	Fuel N Go	N/A
212	TA Travel Center	https://www.ta-petro.com/location/or/ta-coburg
213	Mobil/Shell	N/A
214	Pioneer Villa Truck Plaza	https://pioneervillatruckplaza.com/
215	Virk I-5 Truck Stop	N/A
216	Jack's Truck Stop	N/A
217	Love's Travel Stop	https://www.loves.com/locations/728
218	Pilot Travel Center	https://pilotflyingj.com/stores/386/
219	Flying J Travel Center	https://pilotflyingj.com/stores/584/

ID#	Truck Stop	Truck Stop Website
220	TA Travel Center	https://www.ta-petro.com/location/or/ta-aurora
221	Jubitz Truck Stop	http://jubitz.com/travel-center-truck-stop/truck-stop-amenities/
222	Pilot Travel Center	https://pilotflyingj.com/stores/137/
223	Three Js Deli and Mini Mart	N/A
224	Chevron	N/A
225	Paradise Quick Stop	N/A
226	Rebel Truck Stop	N/A
227	TA Travel Center	https://www.ta-petro.com/location/or/ta-troutdale
228	Love's Travel Stop	https://www.loves.com/locations/449
229	Love's Travel Stop	https://www.loves.com/locations/650
230	Western Express	N/A
231	Space Age Truck Stop	N/A
232	Pilot Travel Center	https://pilotflyingj.com/stores/390/
233	Arrowhead Truck Plaza	N/A
234	Chevron	N/A
235	Flying J Travel Center	https://pilotflyingj.com/stores/934/
236	Chevron	N/A
237	Jacksons Food Stores	N/A
238	Baker Truck Corral	https://roadys.com/location/132/Baker-City-OR/Roadys-Baker-Truck-Corral/
239	Love's Travel Stop	https://www.loves.com/locations/372
240	Pilot Travel Center	https://pilotflyingj.com/stores/232/
241	Hammer Diesel	N/A
242	Black Canyon Stinker Truck Stop	https://roadys.com/location/711/Caldwell-ID/Roadys-Black-Canyon-Stinker-Truck-Stop-45/
243	Jacksons Food Stores	N/A
244	Flying J Travel Center	https://pilotflyingj.com/stores/638/
245	Jacksons Food Stores	N/A
246	TA Travel Center	https://www.ta-petro.com/location/id/ta-boise
247	Flying J Travel Center	https://pilotflyingj.com/stores/777/
248	Blu Fuels	N/A
249	Boise Stage Shop	https://www.boisestagestop.org/

ID#	Truck Stop	Truck Stop Website
250	Eddie's Truck & Auto Center	N/A
251	Chevron	N/A
252	Leather's Fuel	N/A
253	Pilot Travel Center	https://pilotflyingj.com/stores/195/
254	Plateau Travel Plaza	N/A
255	Madras Safeway	N/A
256	Ahern's Stop N Shop	N/A
257	Madras J&L	N/A
258	Gordy's Truck Stop	N/A
259	Pilot Travel Center	https://pilotflyingj.com/stores/133/
260	Crater Lake Junction Travel Center	N/A
261	Pilot Travel Center	https://pilotflyingj.com/stores/504/
262	Worden Truck Stop	N/A

APPENDIX F
CURRENT DEMAND ANALYSIS TECHNICAL MEMORANDUM

OREGON COMMERCIAL TRUCK PARKING STUDY

Date: December 20, 2019

Subject: Current Demand Analysis Technical Memorandum – Technical Memorandum #5

Table of Contents

1. INTRODUCTION

The purpose of this Memorandum is to present the results of implementing the approach in the Methodology and Data Assessment Technical Memorandum to estimate truck parking demand throughout Oregon. This approach relies on expanding the parking demand observed in Global Positioning System (GPS) data, using observations from video recordings and reports from a leading parking application. This is necessary given that the GPS data available to this study only cover a subset of trucks, and the representativeness of this subset might vary by corridor or type of parking facility. The adopted approach allows for parking demand to be measured in all the rest areas and truck stops statewide, and compared against existing capacity to identify corridors with limited parking availability.

This memo is organized as follows:

- Section 2 describes the data sets used in the analysis: truck GPS records, video recordings, and parking application queries. It also describes the data processing steps required to translate the raw GPS records into the frequency, location, and times of truck parking activity.
- Section 3 describes the estimation of the regression model that was used to expand the GPS parking data to total parking demand. We call this regression the GPS Expansion Model.
- Section 4 reports the results of the analysis of designated truck parking, assessing the balance between the supply and demand of parking spaces by study corridor.
- Section 5 reports the results of the analysis of undesignated truck parking, showing when and where this type of parking is most common.
- Section 6 summarizes the conclusions.

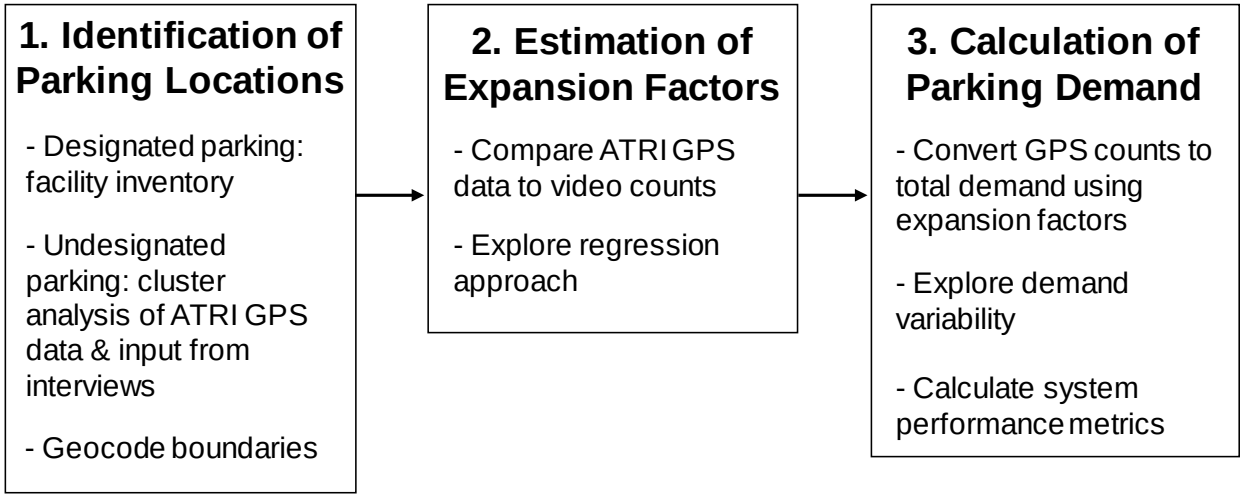
2. METHODOLOGY AND DATA

2.1 Methodology

The methodology used to estimate truck parking demand is described in detail in the Methodology and Data Assessment Technical Memorandum. An outline of this methodology is provided in Figure 1. First, the locations where trucks are parking were identified and geocoded in GIS. Designated parking locations were obtained from the facility inventory. These are places with parking spaces allocated specifically for trucks. They can be publicly operated, at rest areas, or privately operated at truck stops. For undesignated parking, GPS data were analyzed to identify clusters of parking along the study corridors that appear to represent undesignated truck parking. These locations were geocoded as well. An algorithm was developed to process theses data to identify stopped trucks.

The next step involved the estimation of expansion factors, by comparing the GPS data from the American Transportation Research Institute (ATRI) to observations from video and a parking application at certain facilities. A regression model was used to estimate the set of expansion factors for the GPS data that best replicate observations. Total parking demand along the corridors was calculated by counting the GPS records in the designated and undesignated parking locations, using the expansion factors to estimate how many trucks are represented in real-life. Variability in demand was described throughout the day, week, and year.

Figure 1: Overview Truck Parking Demand Estimation



2.2 ATRI GPS Data

2.2.1 Overview

Since 2002, ATRI has collected and processed truck GPS data as part of its Freight Performance Measurement program (FPM), using these data in support of myriad local, state and federal freight analyses. At present, the FPM database is composed of more than 1,000,000 anonymized GPS-instrumented trucks in North America, reporting spot speeds, timestamp, location, and anonymous truck identifiers. The data's unique characteristics include:

- High-frequency ping rates (less than 5 minutes; often 30 secs to 1 minute)
- Static IDs (the only North American database that doesn't cycle IDs every 24 hours)
- Data feeds in real-time
- Lane-level GPS resolution

This resource provides the Oregon Department of Transportation (ODOT) unique access to anonymous information related to where trucks are parking (designated or undesignated) and for the length of time trucks remain parked at any location.

More specifically, ATRI's GPS data are based on embedded GPS devices that stay with the truck. This reduces the "noise" associated with smart phones that often move around outside of the truck and may be transported in other vehicles. In comparison to national samples (see Table 1), ATRI's truck GPS data set is slightly over-represented by medium- to large-fleets; slightly over-represented by the truckload sector; and over-represented by combination trucks.

In summary, ATRI's GPS data can be described as:

- Over-represented among combination trucks (e.g. 89% Class 7/8) in terms of U.S. Department of Transportation registrations, which is not necessarily undesirable to study truck parking. Combination trucks are more likely to park overnight, when demand peaks, while medium duty trucks are more likely to park during the day time, when there is typically more ample availability.
- Sufficiently representative by operating sectors (e.g. 62% Truckload) based on Trucking Trends 2017[1], although the distinction between truckload and less than truckload is likely less important for studying truck parking, as it should not affect stopping needs.

[1] "American Trucking Trends 2017." American Trucking Associations. Arlington, VA. 2017.

Table 1: ATRI GPS Data Composition (2016)

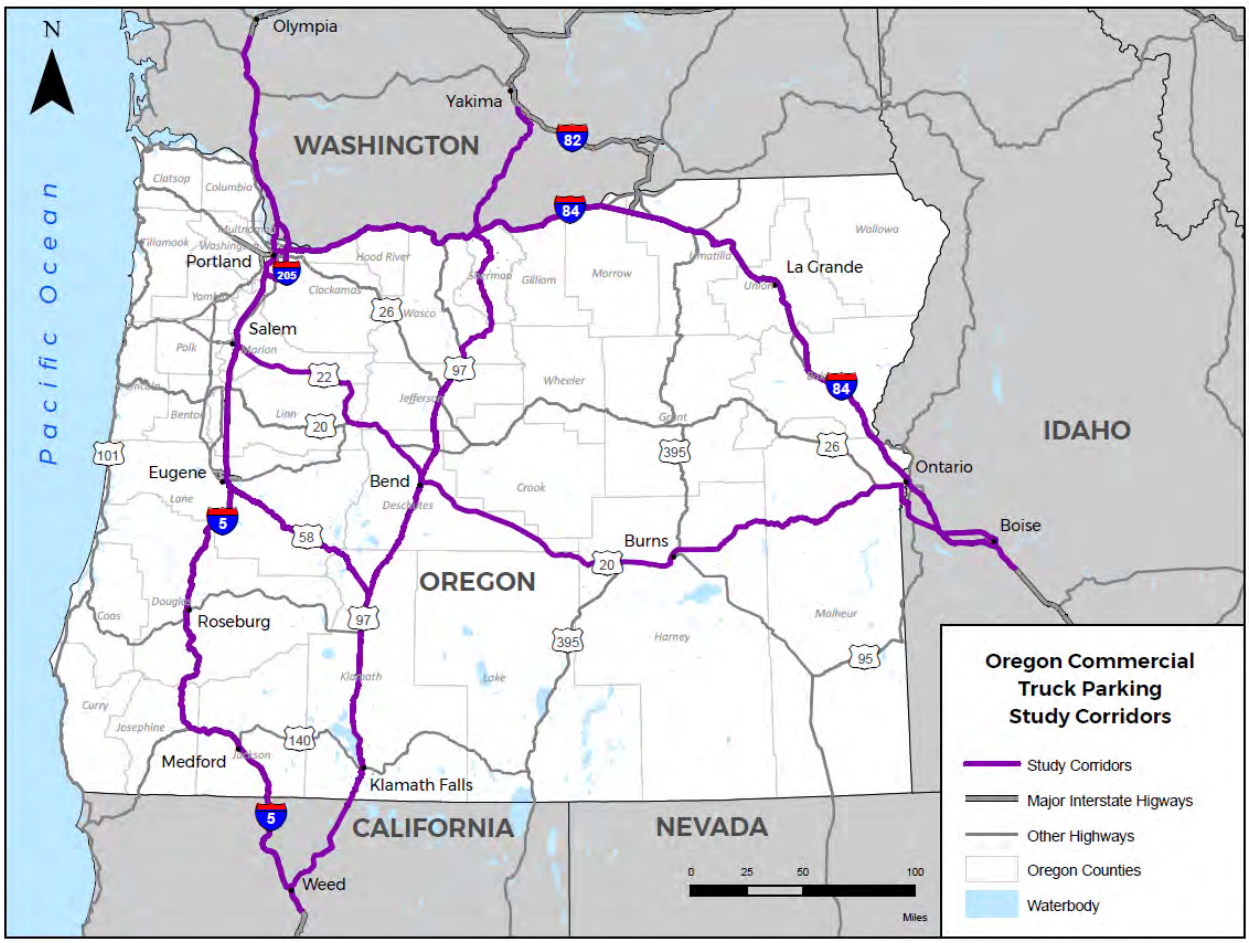
	SOURCE						
	ATRI's FPM Data			VIUS		ATA/FMCSA/POLK	
		Trucks	Fleets	Trucks		Fleets	
Sector	TL/Private	62%	68%	TL	77.4%	TL	48.7%
	LTL	12%	5%	LTL	22.6%	LTL	1.5%
	Other	27%	27%	Other	-	Other	49.8%
	TOTAL	100%	100%	TOTAL	100%	TOTAL	100%
Fleet Size	Small (1-50)	16%	69%	1-5	59.0%	6 or fewer trucks	90.6%
	Medium (50-250)	27%	20%	6-10	11.3%	7-20	6.7%
	Large (250-1,000)	22%	7%	11-20	9.3%	More than 20	2.7%
	Very Large (1000+)	36%	3%	21-50	9.8%		-
	-	-	-	50+	10.6%	-	-
	TOTAL	100%	100%	TOTAL	100%	TOTAL	100%
Truck Type	Combination Truck	89%	86%	Tractor (Class 7-8)	68.7%	Combination Truck (Class 7-8)	50.4%
	Straight Truck	11%	14%	Straight Truck (Class 3-5)	31.3%	Straight Truck (Class 3-5)	49.6%
	TOTAL	100%	100%	TOTAL	100%	TOTAL	100%

*Not all totals equal 100% due to rounding.
VIUS: Vehicle Inventory and Use Survey
FMCSA: Federal Motor Carrier Safety Administration
POLK: Polk Automotive IHS Markit

2.2.2 Oregon Data Set

The GPS data for Oregon were extracted to analyze designated and undesignated truck parking throughout the state. Only data within half a mile of the analysis corridors were extracted (see Figure 6). Data extending 30 miles into surrounding states were also extracted to account for parking in facilities adjacent to the state borders.

Figure 2: Oregon Study Corridors



The dataset consisted of 16 weeks of truck GPS data over the course of a year, specifically the following time periods:

- September 9, 2018 – September 29, 2018
- November 25, 2018 – December 22, 2018
- February 3, 2019 – February 23, 2019
- May 12, 2019 – May 25, 2019
- June 9, 2019 – July 6, 2019

The dataset included records for trucks traveling slower than 25mph. The data were joined to the facility inventory shapefile by a unique identification number representing each parking location.

2.2.3 Extraction of GPS Demand for Designated Parking

The following steps were undertaken to convert the raw GPS records to parking demand at designated facilities:

1. Drew polygons in GIS encircling the truck parking facilities identified in the facilities inventory.
2. Traversed the GPS data observing when trucks entered and exited each of the facility polygons.
3. For each observed truck stop, recorded duration as difference between entry and exit times.
4. Excluded truck stops lasting less than 30 minutes (made an insignificant difference on estimated demand).
5. Totaled the number of trucks parked at each facility at 1-hour intervals during the dates for which GPS data were available.

2.2.4 Extraction of GPS Demand for Undesignated Parking

The following steps were undertaken to convert the raw GPS records to parking demand at undesignated locations:

1. Created latitude-longitude grid with each cell measuring approximately 56 feet by 56 feet.
2. Snapped each GPS record to closest intersection on the grid.
3. Defined a stopped truck as the time spent at a single grid intersection without moving (this controls for noise in the GPS data).
4. Excluded parking at designated facilities and commercial/industrial establishments.
5. Excluded stops lasting less than 5 minutes.
6. Performed cluster analysis to identify areas along the corridor with a high frequency of undesignated truck parking.
7. Added areas identified by ODOT and other stakeholders where undesignated truck parking is common.
8. Drew polygons around the areas identified in (6) and (7).
9. Totaled parking demand in undesignated parking clusters.

2.3 Observations

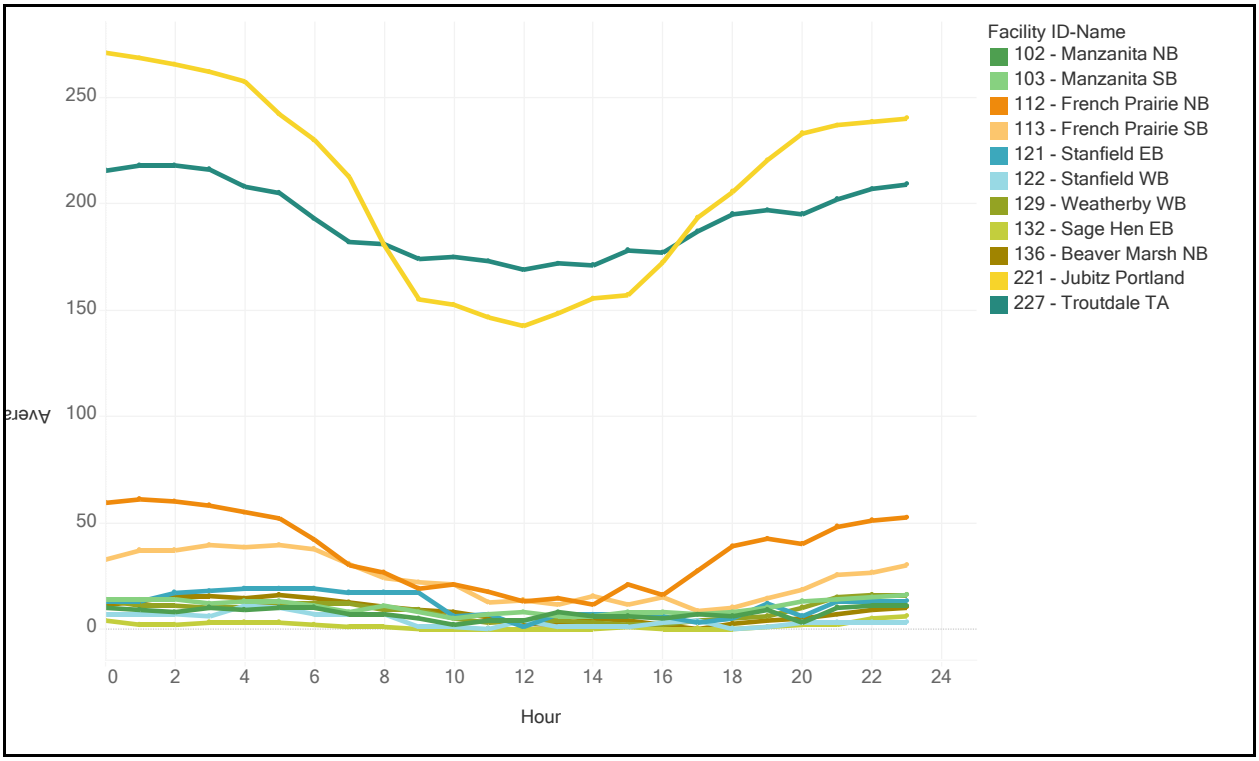
2.3.1 Video

Nine rest areas and two truck stops were monitored by video to observe truck parking occupancy during specific days in May and June of 2019, which fall within the most recent periods in the ATRI data set. Table 2 describes which facilities were monitored. Most facilities were monitored by taking birds-eye-view snapshots every hour and counting the number of parking spaces taken by trucks, while a few required counts to be taken at entry/exit locations because the lot was too large or was shaped in a configuration that would have required a large number of cameras. The recording and processing of the videos was conducted by a professional traffic count firm in Oregon. Figure 3 shows the average occupancy observed in this data.

Table 2: Video Observations

No.	Stop Name	Nearby City	Location	Size (Striped + Unstriped)	Duration	Start of Recording	Type of Count
1	Rest Area - French Prairie (Baldock), north bound	near Wilsonville	I-5 (281.63)	57+9	48 hrs.	6/12 (Wed)	In/Out counts
2	Rest Area - French Prairie (Baldock), south bound	near Wilsonville	I-5 (281.63)	57+4	48 hrs.	6/12 (Wed)	In/Out counts
3	Rest Area - Stanfield, east bound	near Stanfield	I-84 (186.49)	22+17	24 hrs.	6/28 (Fri)	Hourly Snapshot
4	Rest Area - Stanfield, east bound	near Stanfield	I-84 (186.49)	22+17	24 hrs.	6/28 (Fri)	Hourly Snapshot
5	Rest Area - Weatherby, west bound	near Weatherby	I-84 (335.97)	31+9	24 hrs.	5/22 (Wed)	Hourly Snapshot
6	Rest Area - Beaver Marsh, northbound	near Chemult	US97 (206.50)	25+5	48 hrs.	6/25 (Tue)	Hourly Snapshot
7	Jubitz Truck Stop	Portland	I-5 (MP306.7)	335 spaces	48 hrs.	5/16 (Thu)	In/Out counts
8	TA Travel Center	Troutdale/Outside Portland	I-84 (MP17)	240 spaces	24 hrs.	6/19 (Wed)	In/Out counts
9	Sage Hen, eastbound	Hines, OR	US20 (114.11)	27	24 hrs.	6/24 (Mon)	Hourly Snapshot
10	Manzanita, north bound	near Grants Pass	I-5 (MP62.7)	22	24 hrs.	6/18 (Tue)	Hourly Snapshot
11	Manzanita, south bound	near Grants Pass	I-5 (MP62.7)	15	24 hrs.	6/18 (Tue)	Hourly Snapshot

Figure 3: Average Occupancy of Video Observations



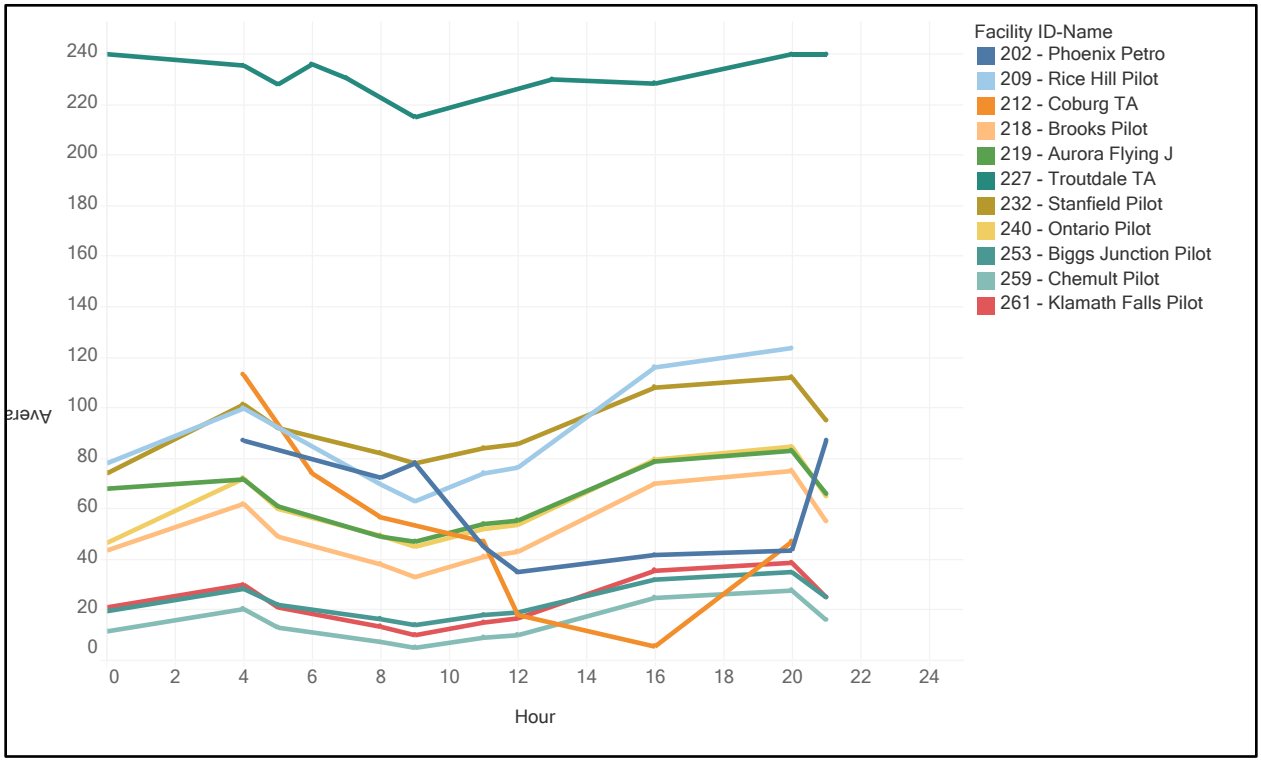
2.4 Park My Truck Application

To complement the video observations, which focused on public rest areas, the Park My Truck application was queried from June 28, 2019 to July 6 2019 to observe the occupancy reported by truck stops to this application. These dates correspond to the latest period in the ATRI set. Occupancy data were available for:

- Aurora Flying J
- Biggs Junction Pilot
- Brooks Pilot
- Chemult Pilot
- Coburg TA
- Klamath Falls Pilot
- Ontario Pilot
- Phoenix Petro
- Rice Hill Pilot
- Stanfield Pilot
- Troutdale TA

It is important to note that the data reported in the Park My Truck application are collected manually (each facility does a manual count at fixed time periods) and therefore could be affected by human error. Figure 4 shows the average occupancy observed in this data.

Figure 4: Average Occupancy of Parking Application Observations

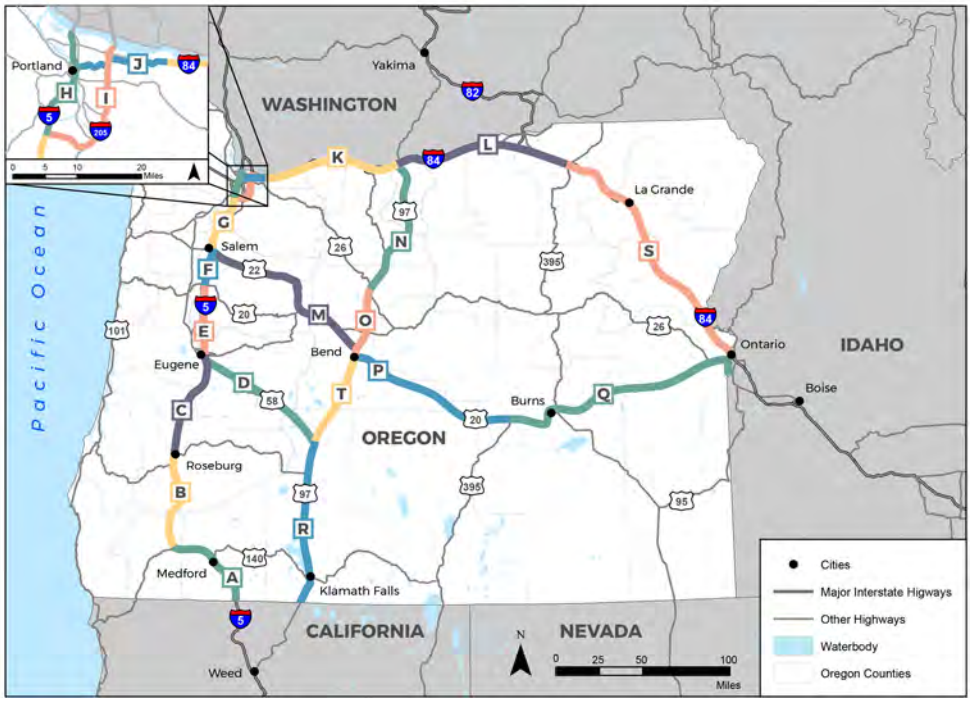


2.5 Network Segmentation

The study corridors were divided into the following analysis segments:

- Segment A (I-5 between California border and Grants Pass)
- Segment B (I-5 between Grants Pass and Roseburg)
- Segment C (I-5 between Roseburg and Eugene)
- Segment E (I-5 between Eugene and Albany)
- Segment F (I-5 between Albany and Salem)
- Segment G (I-5 between Salem and Portland/I-205)
- Segment H (I-5 between Portland/I-205 and Vancouver)
- Segment I (I-205 between Portland/I-5 and Washington border)
- Segment J (I-84 between Portland/I-5 and Troutdale)
- Segment K (I-84 between Troutdale and US97)
- Segment L (I-84 between US97 and Pendleton)
- Segment S (I-84 between Pendleton and Idaho border)
- Segment M (OR22/US20 between Salem and Bend)
- Segment P (US20 between US97 and US395)
- Segment Q (US20 between US395 and Idaho border)
- Segment D (OR58 between Eugene and US97)
- Segment N (US97 between I-84 and Madras)
- Segment O (US97 between Madras and Bend)
- Segment T (US97 between Bend and OR58)
- Segment R (US97 between OR58 and California border)

Figure 5: Study Segments

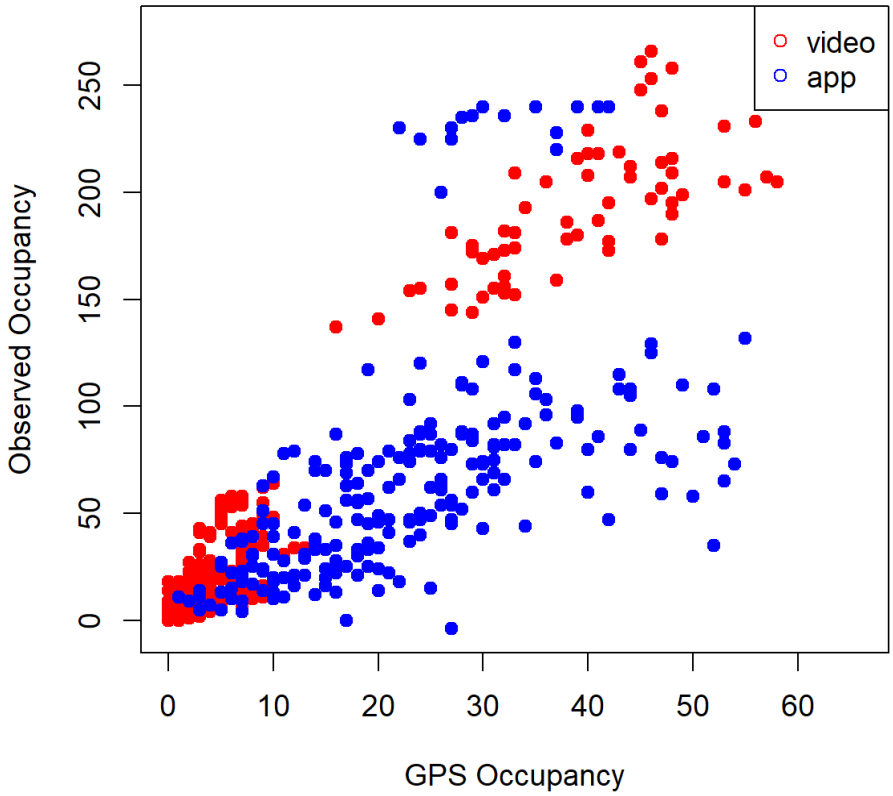


3. GPS EXPANSION MODEL

GPS data represents the best source of information available to describe truck parking patterns. However, the GPS data available for this study - like all other GPS datasets - only captures a fraction of all trucking activity. ATRI has estimated that this fraction can range from 10 percent to 40 percent depending on the geography. It would be ideal for truck parking occupancy to be monitored at all public and private facilities in the state 24/7; however, implementing such a system would be costly and cumbersome. The best alternative at the moment is to analyze truck GPS data to infer when, where, and how long trucks are parking, and then expand these estimates to the entire population of truck activity using a limited number of ground observations.

A GPS Expansion Model was developed to estimate total parking demand as a function of the GPS data. This model was estimated by comparing the hourly occupancy of the GPS data to the occupancy observed from the videos and application for the same days. To our knowledge, this represents the first effort to expand GPS parking data with concurrent ground-level observations. As expected, there exists a strong relationship between GPS occupancy and observed occupancy, as shown in Figure 6.

Figure 6: Scatter Plot of Observed Occupancy and GPS Occupancy at the same Locations and Times



Different models were tested to capture this relationship, so that truck parking can be predicted using the GPS data in facilities where no observations were obtained. Three different types of model structure were tested:

- **Ordinary least squares linear regression:** Simple model that finds the expansion factors that lead the model to replicate the observations most closely. In its simplest formulation, it is equivalent to calculating the expansion factors as the ratio of the population average to the sample average (more on this below). This was the model structure ultimately used in this study because it produced the most realistic results.
- **Generalized least squares with temporal autocorrelation:** An enhanced version of the linear regression model that accounts for correlations in demand across time (e.g. the demand at 3pm is related to the demand at 2pm). This model structure did not prove useful primarily because the observational data came from different sources (video and application) and each of them reported occupancy at a different frequency, causing autocorrelation patterns to vary throughout the sample.
- **Gradient Boosting Machine (GBM):** Machine learning model that produces predictions based on an ensemble of decision tree models. This model structure has been shown to be effective with regression problems, producing better predictions than regular regressions in most cases. While GBM fit the video and application data better, predictions were less stable and not as realistic as the simple regressions. The machine learning technique was over-fitting the data, and therefore was ultimately not used for this study. Over-fitting occurs when the model fits very closely the observations it is being compared against, yet is a poor predictor of new observations because it was fitting mostly noise.

The ordinary least model structure was adopted for this study because of its simplicity and ability to produce predictions that matched well observations and our understanding from the literature review of truck parking patterns. The remainder of this section explores the variables that should be included in this model for the purposes of this study. The ordinary least squares model was specified as

$$N_i = \alpha R_i + \varepsilon \quad (1)$$

where i represents distinct observations (different time periods and different facilities), N_i represents the occupancy observations from video and application data, R_i represents the number of GPS parking occupancy, α is the parameter estimated by the model (the expansion factor), and ε represents the error of the model. Covariates could be included in this model, such as the size of the parking facility or the truck volume on the road: however, none were found to produce a fit superior to just focusing on the information in the GPS records.

Instead, different expansion factors were calculated for different types of facilities (e.g. rest area vs. truck stop). This was done by defining a vector $\mathbf{R_i}$ that contained the GPS occupancy data segmented by different attributes of interest, so all cells are zero except for the cell of the attribute corresponding to i. Therefore, the linear regression model estimates a vector of

expansion factors $\boldsymbol{\alpha}$ of the same length of $\mathbf{R_i}$ that minimizes the squared errors of the model. More formally, this can be described as

$$N_i = \boldsymbol{\alpha} \boldsymbol{R_i} + \varepsilon \quad (2)$$

Table 3 through Table 5 show the sets of expansion factors that best fit the data given different segmentation schemes. Only the ordinary least square regression models were estimated because of the reasons listed above. The first set of expansion factors (shown in Table 3) centered around size and type of parking facilities. All of the expansion factors were found to be statistically significant, which indicates that enough data were collected to observe the relationships regressed. The standard errors used to determine significance were adjusted to consider autocorrelation, which occurs because observations are being made across time. No constant term was used so that the predicted demand is always a multiple of the GPS records, which aids in the interpretation of the results. The adequacy of regressions was judged according to:

- **Adjusted R^2:** A measure of the proportion of the variation in the observed data that is captured by the model (higher is better).
- **Akaike information criterion (AIC):** A measure of the relative quality of a model given the data (lower is better).

Table 3: Regression Estimates – Facility Type and Size

Model	Estimates
Constant	0
GPS Occupancy – Truck Stops w/ 200+ Spaces	4.72544 (0.3578)***
GPS Occupancy – Truck Stops w/ 100-199 Spaces	2.72913 (0.0452)***
GPS Occupancy – Truck Stops w/ 50-99 Spaces	2.79892 (0.4297)***
GPS Occupancy – Truck Stops w/ 0-49 Spaces	2.01630 (0.0941)***
GPS Occupancy – Rest Areas	4.06515 (4.0602)***
Adjusted R^2	0.9185
AIC	3,955
Number of Observations	604

****Statistically significant at 99.9% level*
Notes: Standard errors, shown in parenthesis, were computed through heteroskedasticity and autocorrelation consistent (HAC) covariance matrix (Newey & West, 1978).

Results show that, on average, each truck in the GPS data represents 4.7 trucks in reality when stopping at a truck stop facility with more than 200 spaces. The number of parking spaces used for this segmentation includes both striped spaces and unstriped spaces (estimated from aerial imagery). This analysis shows that the GPS data represents a different fraction of truck activity at facilities of different sizes. For truck stops, as the size of the facility decreases, the share of GPS-reporting trucks increases. This could be caused by a variety of reasons, including the largest facilities being located near Portland, which is likely to attract a greater share of short-haul trucks, which are less represented in the GPS data.

A regression was also run to estimate whether expansion factors vary by facility ownership. Because of confidentiality restrictions in using the GPS data, the names of the truck stop owners were anonymized (top 3 and other). As can be seen in Table 4, GPS-instrumented trucks are much more likely to park at some than others, either because motor carriers have agreements with certain truck stop operators, or simply because of the preferences of drivers. Capturing these differences is important to ensure that the demand estimates are representative.

Table 4: Regression Estimates – Facility Owner

Model Type	Estimates
Constant	0
GPS Occupancy – Truck Parking Firm A	4.27284 (0.2577)***
GPS Occupancy – Truck Parking Firm B	5.27335 (0.6847)***
GPS Occupancy – Truck Parking Firm C	2.82203 (0.2152)***
GPS Occupancy – Truck Parking Firm D	4.06015 (0.6584)***
Adjusted R^2	0.910
AIC	4,013
Number of Observations	604

****Statistically significant at 99.9% level*
Notes: Standard errors, shown in parenthesis, were computed through heteroskedasticity and autocorrelation consistent (HAC) covariance matrix (Newey & West, 1978).

A regression was also run to see how the expansion factors varied by location in the state (see Table 5). On average, the GPS-instrumented trucks represent a smaller share of all trucks in the Portland area, which was treated separately because the characteristics of freight users might differ. This led the expansion factors for the Portland Area to be much higher, possibly because there is a greater share of short-haul trucking on this corridor, which are known to be underrepresented in the ATRI GPS data (for example, see how straight trucks are underrepresented in Table 1). Expansion factors were found to be lower on I-5, US97 and I-84,

and the lowest for truck parking facilities elsewhere (OR22 and US20), likely because of the higher fraction of long-haul trucking.

The expansion factors estimated by the model by location (Table 5) were used to predict parking demand for this study. This regression was found to have an R^2 higher than the two previous ones, at 0.92, which indicates that the model explains more of the variation observed in the video and application data. The AIC measure was also smaller, which indicates a better fitting regression model.

Appendix C contains a series of plots that demonstrate how well the final regression by facility location (Table 5) replicated the occupancy observed in the videos and truck parking application. The model produced better results for some facilities than others, and in a few cases predicted demand that exceeded the capacity of the facility. In these cases, a greater proportion of GPS-instrumented trucks used the facility than typical, causing the expansion factor to predict much higher demand than observed on that particular day. This is understandable given the likely day-to-day fluctuations in the representativeness of the GPS-instrumented trucks. However, the GPS Expansion Model is not designed to make predictions for a single day, but instead to predict the average over the 16 weeks of GPS data being analyzed. Over the course of that period, days with lower demand than modeled will balance out days with higher demand than modeled, leading to an average demand that is comparable to that predicted by the model. The objective of the model is to predict the average demand over the analysis period, not replicate day to day fluctuations.

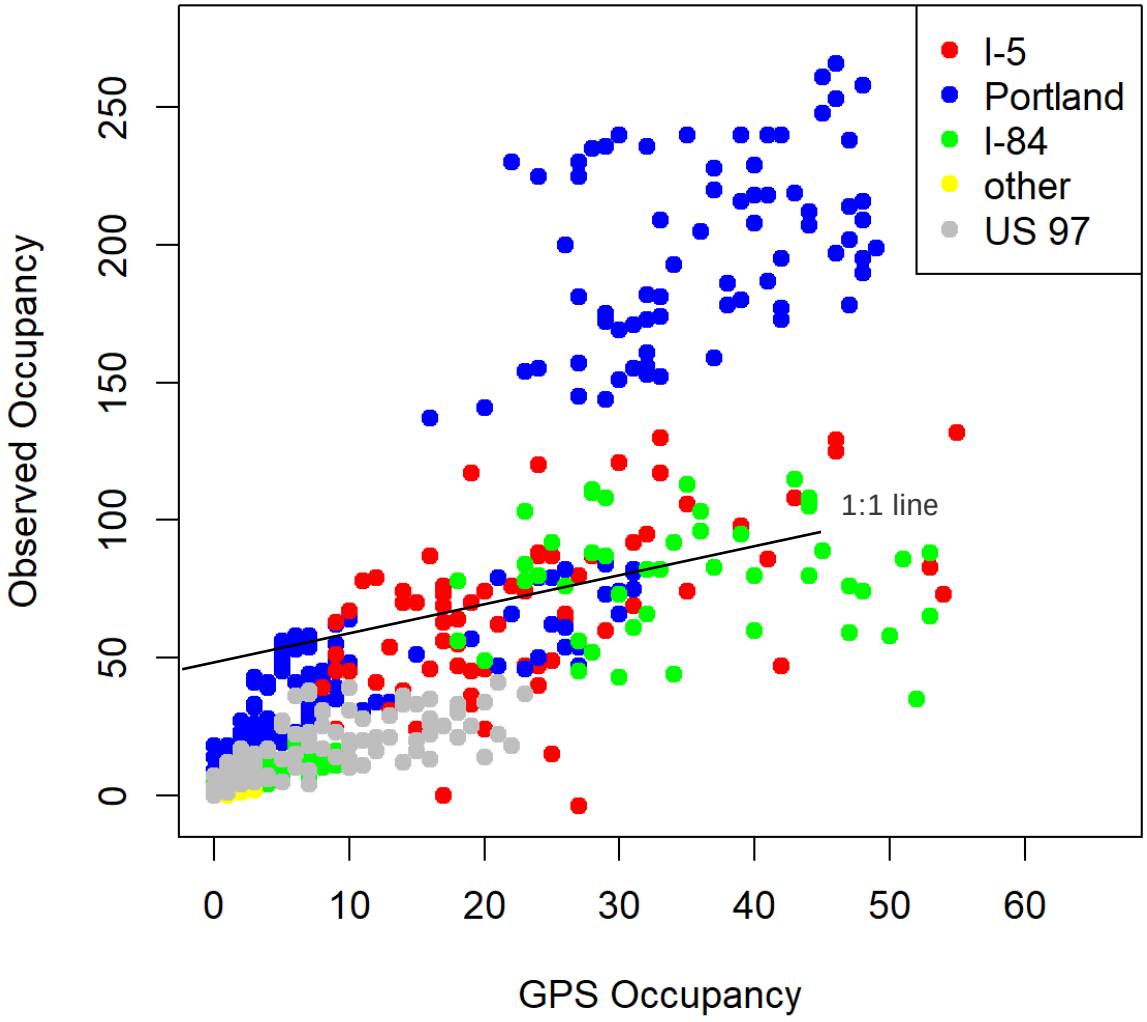
Table 5: Regression Estimates – Facility Location

Model Type	Estimates
Constant	0
GPS Occupancy – Portland Area	4.66988 (0.3331)***
GPS Occupancy – US97	2.07135 (0.1157)***
GPS Occupancy – I-5	2.95636 (0.1312)***
GPS Occupancy – I-84	2.44204 (0.1285)***
GPS Occupancy – Other	1.25333 (0.0479)***
Adjusted R^2	0.92
AIC	3,947
Number of Observations	604

****Statistically significant at 99.9% level*
Notes: Standard errors, shown in parenthesis, were computed through heteroskedasticity and autocorrelation consistent (HAC) covariance matrix (Newey & West, 1978).

The importance of location in the GPS Expansion Model can be visualized through a scatter plot of the GPS occupancy versus the observation from video or the application, as seen in Figure 7. In this figure, the x-axis represents the independent variable in the model and the y-axis represents the dependent variable that the model is trying to fit. As seen in Figure 7, the data clusters by location. Parking facilities in and around Portland (shown in blue) have higher levels of observed occupancy per GPS occupancy. Parking facilities on I-5 (shown in red) and I-84 (shown in green) are clustered just below, showing slightly lower levels of observed occupancy.

Figure 7: Scatter Plot of GPS Records vs. Observations by Location

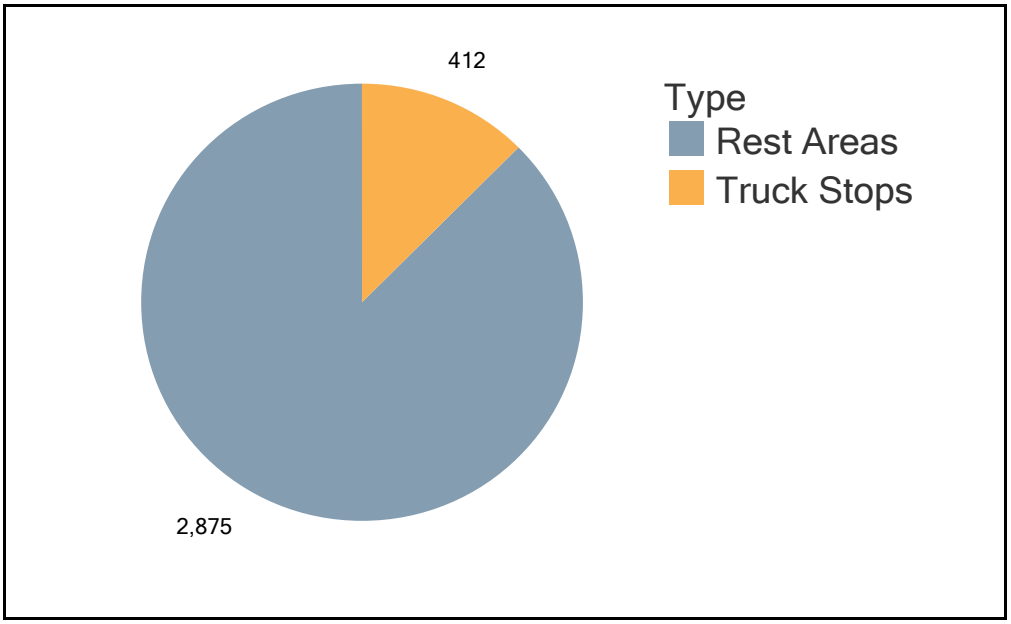


4. RESULTS – DESIGNATED PARKING

4.1 Demand

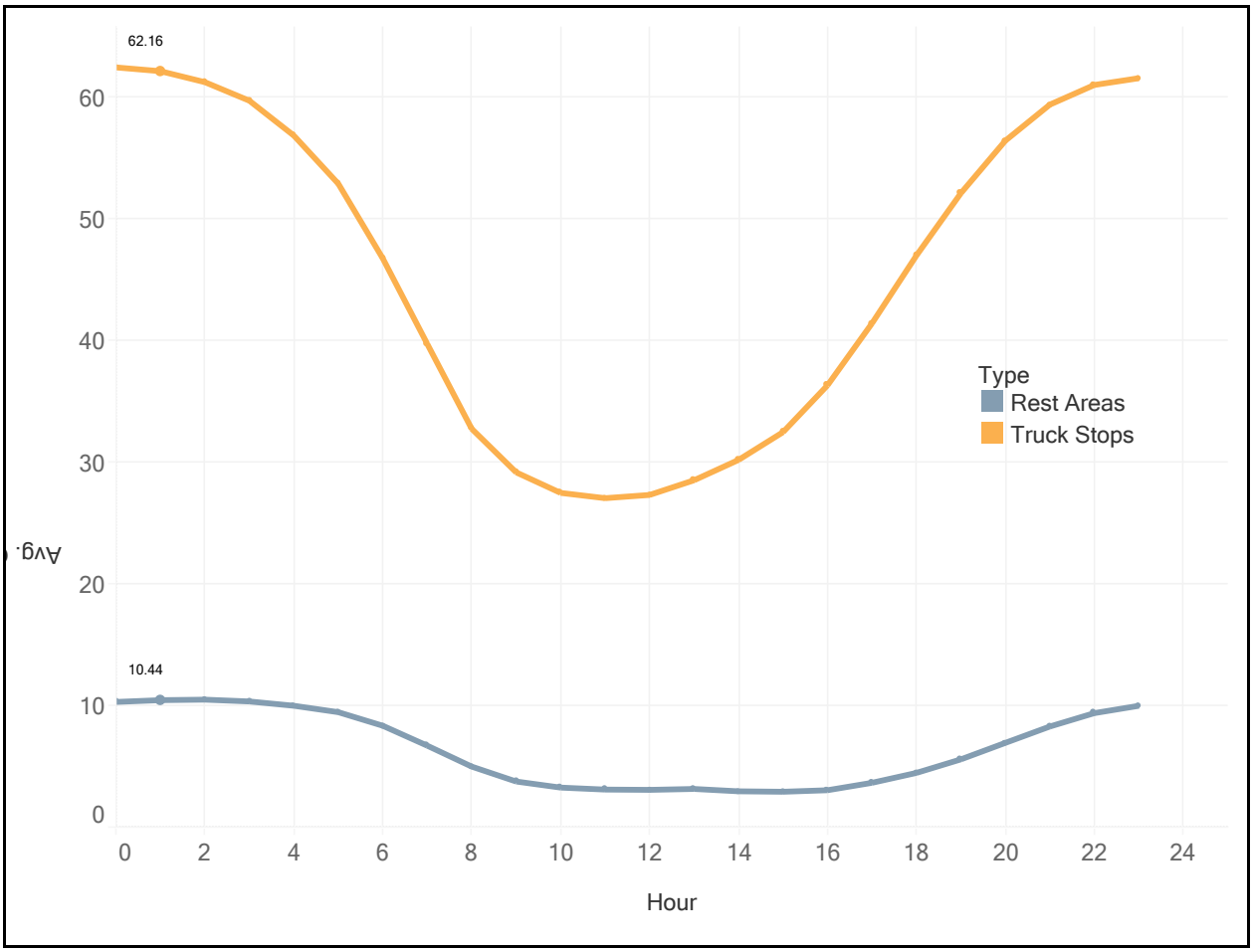
The GPS Expansion Model using location as the primary factor described in Table 5 was used to estimate how truck parking demand varies throughout Oregon, and across time. As can be seen in Figure 8, in an average weekday at midnight (roughly when demand peaks), there are 2,875 trucks parked at truck stops and 412 trucks parked in public rest areas, accommodating for 87 percent and 13 percent of designated parking demand, respectively.

Figure 8: Total Weekday Midnight Occupancy in Oregon



As expected, demand for truck parking peaks from 11pm to 1am (see Figure 9). Demand for the average truck stop reaches a maximum of 62 parking spaces during this time, and decreases to 27 during the day time, from 11am to 12pm. The average rest area was found to have a maximum demand of 10 parking spaces at midnight and decrease to 3 at 2 pm.

Figure 9: Average Occupancy per Facility throughout the Day



Parking demand was also found to vary considerably throughout the week, as can be seen in Figure 10. Demand peaks Wednesday, for both rest areas and truck stops, and is the lowest during the weekend. Of weekdays, Mondays have the lowest demand. On average, truck stops see a midnight demand on Monday that is 87 percent of what they see on Wednesday, while rest areas see a midnight demand on Monday that is 63 percent of what they see on Wednesday. Parking demand at rest areas fluctuates more during the week than at truck stops.

Figure 10: Average Midnight Occupancy per Facility throughout Week

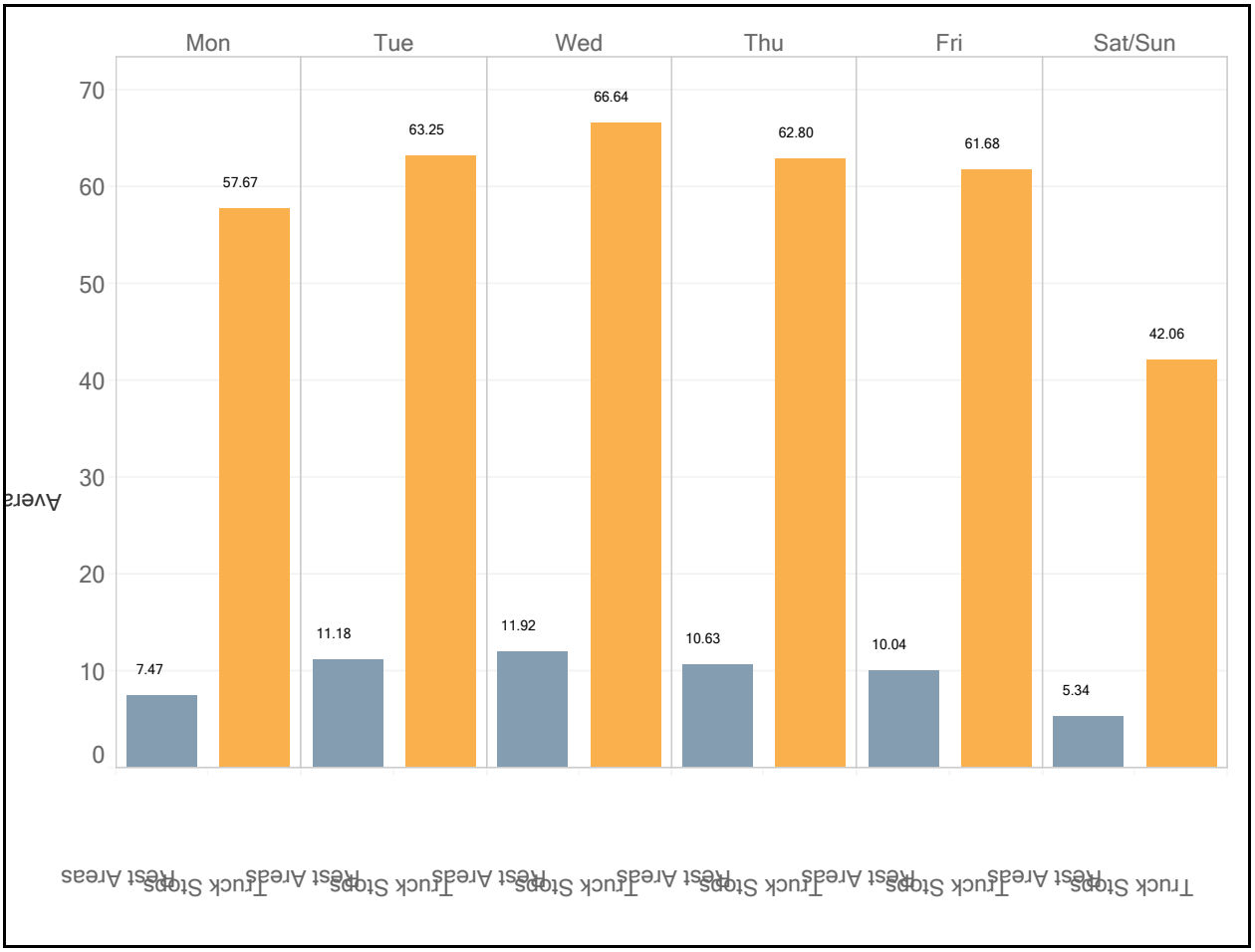
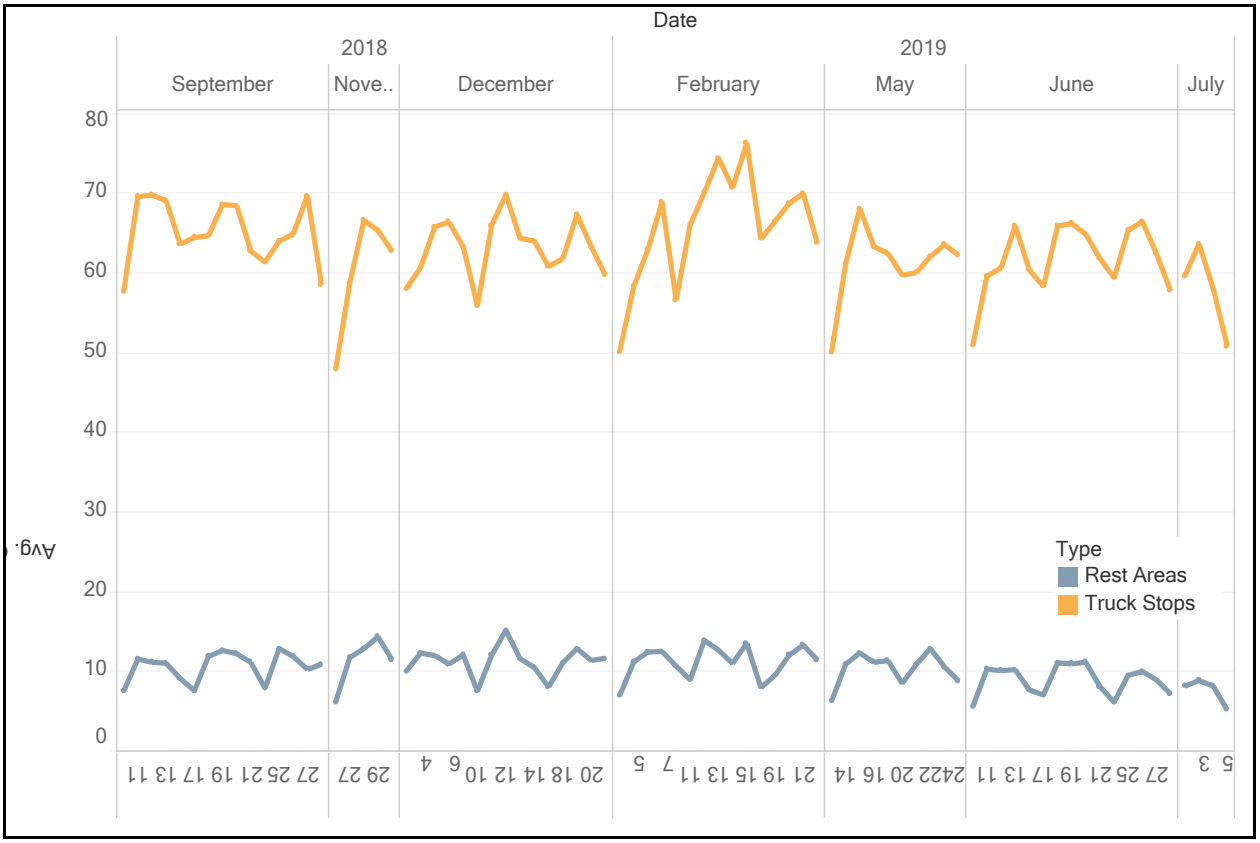


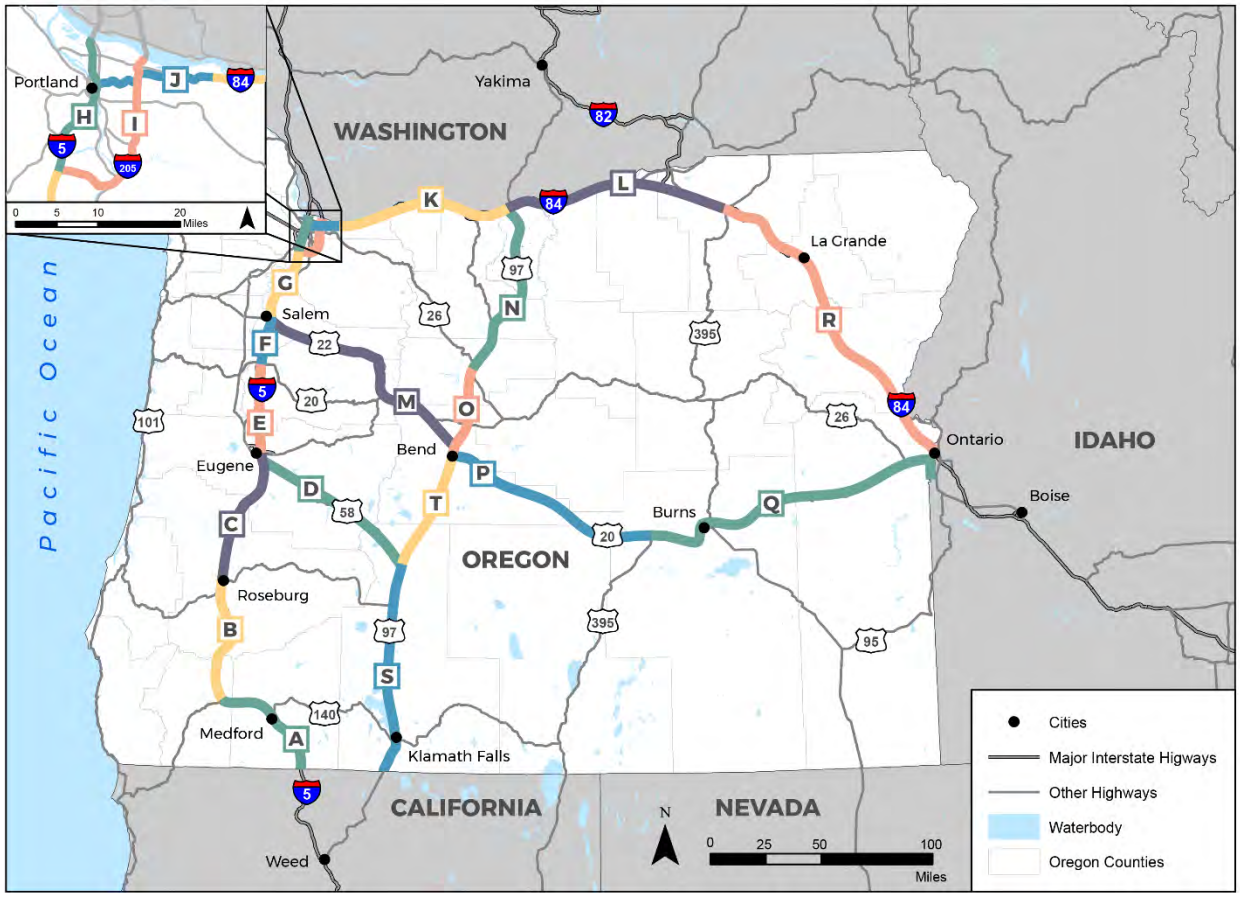
Figure 11 shows how the demand varies for the 16-week period when GPS data were analyzed. Demand is lowest in the early summer and increases in September. It is observed to peak leading up to or following holidays and decreases on the holidays themselves, in several cases.

Figure 11: Average Midnight Occupancy per Facility through GPS Data Period



Demand for truck parking is concentrated unevenly throughout the state (corridor segments are shown in Figure 12). Figure 13 breaks down the demand into 18 segments along the study corridors. Segments D and I were not included in the following discussion because no parking facilities were identified on these corridors.

Figure 12: Study Segments



As expected, the segment with the highest average midnight demand is segment G, which spans between Salem and Portland on I-5. Truck stops on this segment on average accommodate 481 trucks, and rest areas accommodate 96. In addition to calculating average demand, the 80th percentile demand was also calculated in Figure 14 to quantify how high demand reaches 1 out of 5 days (only considering weekdays). On segment G, demand can reach 117 in rest areas and 534 in truck stops on occasion.

The other segments rounding out the top 4 in terms of demand are: segment S between the Idaho border and Pendleton in I-84; segment L between US97 and Pendleton on I-84; and segment J from Portland to Troutdale on I-84. Some of these segments with high demand are on this list because they are much longer than others. To control for this, later in this report we normalized parking demand by segment distance.

Figure 13: Average Weekday Midnight Occupancy per Segment

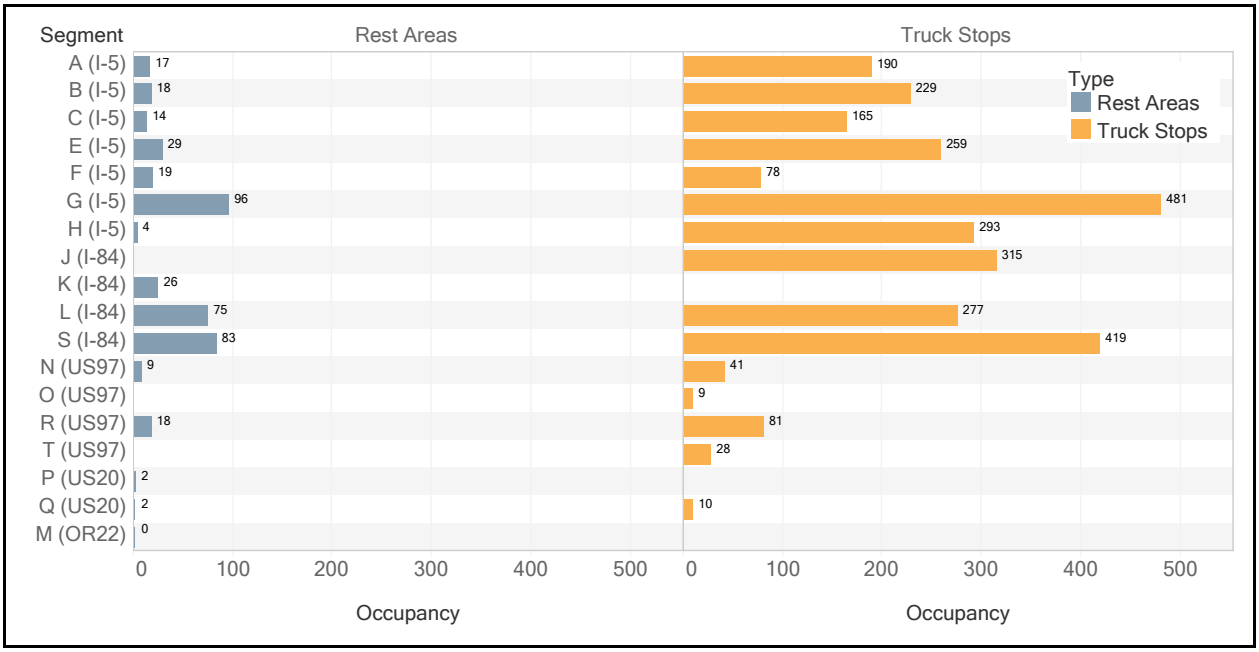
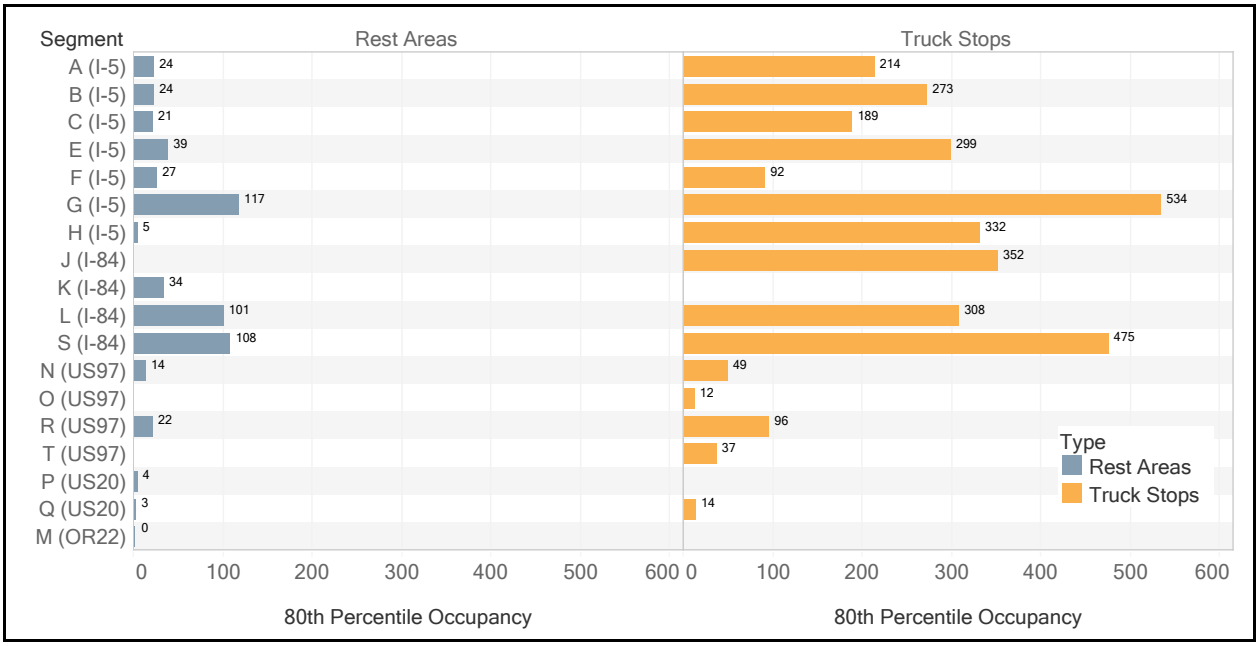


Figure 14: 80th Percentile Weekday Midnight Occupancy per Segment



Truck parking demand is often expressed in terms of Vehicle Hours of Parking (VHP) accrued over a typical day, and it is often compared to the Vehicle Hours of Travel (VHT) on the roads. Some previous models of truck parking demand have assumed ratios between these two variables to estimate truck parking needs as a function of truck volumes. Table 6 shows estimates for these two variables for our analysis segments.

Truck volumes were obtained from the Highway Performance Monitoring System maintained by the Federal Highway Administration. These volumes were converted to VHT by assuming that trucks travel at 40 mph[2]. For the whole state, it was estimated that VHP represents 44% of VHT. In other words, for every hour that trucks spend on the road, they spend 26 minutes in a rest area or truck stop. The VHP over VHT ratio found for Oregon was similar to that calculated in Pecheux et al. (2002) for specific corridors.

A key insight of Table 6 is that parking demand does not necessarily accrue to the segments with the highest truck activity. The ratio of VHP/VHT varies considerably from segment to segment, from zero in segment M to 205% in segment J. Some segments, such as segment J, which is located right outside of Portland, have a high density of truck parking spaces. Truck parking demand correlates more strongly with the places where truck trips are most likely to end, not with where trucks are driving through.

Table 6: Truck Activity vs. Parking Demand

Segment	Segment Length (mi)	Truck AADT	Vehicles Hours of Travel per Day (VHT)	Vehicle Hours of Parking per Day (VHP)	VHP/VHT %
A (I-5)	56	6,216	8,702	3,484	40%
B (I-5)	68	7,945	13,507	4,050	30%
C (I-5)	64	8,856	14,170	2,886	20%
E (I-5)	45	10,028	11,282	4,643	41%
F (I-5)	21	12,114	6,360	1,700	27%
G (I-5)	35	16,131	14,115	9,825	70%
H (I-5)	20	11,551	5,776	5,388	93%
J (I-84)	16	7,504	3,002	6,146	205%
K (I-84)	86	6,131	13,182	392	3%
L (I-84)	105	4,616	12,117	6,071	50%
S (I-84)	169	4,140	17,492	8,559	49%
M (OR22)	126	1,291	4,067	1	0%
N (US97)	93	1,180	2,744	928	34%
O (US97)	42	3,124	3,280	138	4%
R (US97)	96	1,881	4,514	1,601	35%
T (US97)	58	1,592	2,308	414	18%
P (US97)	104	556	1,446	32	2%
Q (US97)	160	713	2,852	161	6%
Total	*1,364*	*4,132*	*140,912*	*56,419*	*40%*

*VHT calculated assuming an average speed of 40mph

[2] ATRI, 2018. Analysis of the Operational Costs of Trucking: 2018 Update.

Data were received from ODOT that showed the weather conditions on roads around the state for the period of time that GPS data was available. This was intended to study whether severe snow or ice conditions could drive demand for parking, particularly in undesignated locations. However, no conclusions could be drawn from these data. Very few designated or undesignated parking facilities were identified on the mountain passes in the study corridors, making it difficult to generalize. Moreover, the GPS data were only acquired for part of December and part of February, which did not provide enough severe weather conditions to observe the effect on parking.

4.2 Supply-Demand Balance

The demand for truck parking was compared against the supply of spaces at rest areas and truck stops in the state. The results of this analysis are summarized in Table 7 and the results of this analysis normalized by distance are summarized in Table 8. The supply of parking spaces was obtained from the facility inventory conducted earlier in this study. The supply reported in this table includes both designated striped and unstriped spots. Parking spaces at ports of entry were recoded as rest areas. The limited truck parking at the Woodburn Port of Entry was not included in the analysis because initially no parking spaces were identified.

In addition to the 18 corridor segments in Oregon, this table also includes 3 segments just outside the state, where significant truck parking is available. These are segment X along I-5 just over the border with Washington, segment Y along I-84 just over the border with Idaho, and segment Z along I-5 just over the border with California.

There are 4,589 truck parking spaces along the 1,365 miles of roadway analyzed. Of these spaces, 3,658 are striped. On a typical weekday at midnight, it is estimated that there are 3,268 trucks parked in these spaces. This table also shows the 80th percentile demand for each segment, which is considered to be the “worst-case” in this analysis. Totals are not calculated for 80th percentile demand because these values are not additive: it is extremely unlikely that all segments face demand at the 80th percentile level at the same time. Therefore, the 80th percentile demand for the state will be lower than the summation of the 80th percentile demands for each segment.

This table also shows the availability, which is defined as the total supply of stripped and unstripped spaces minus the average demand at midnight during a weekday. Negative availability implies a shortfall of spaces. The lower the availability, the higher the likelihood that capacity is outstripped by demand. Looking at the totals in Table 7, statewide there are approximately 1,303 parking spaces more than the demand.

Some segments, such as T, F, E, C, S, and G are at capacity if only striped spaces are considered. However, in these segments there exists a significant amount of unstriped parking spaces, either in large paved lots or unpaved areas, that increase the overall capacity beyond current demand.

Table 7: Parking Supply-Demand by Segment at Midnight during Weekdays

Segment	Segment Length (mi)	Supply of Parking Spaces (striped only)	Supply of Parking Spaces (striped and unstriped)	Demand - Avg. Occupancy	Demand - 80th PCT Occupancy	Avg. Availability (Supply - Demand)	Worst Case Availability (Supply - 80th PCT Demand)
A (I-5)	55.7	258	258	207	237	51	21
B (I-5)	68.4	282	310	247	290	63	20
C (I-5)	64.2	175	200	179	207	21	-7
E (I-5)	44.9	162	385	288	335	97	50
F (I-5)	20.6	95	127	98	113	29	14
G (I-5)	34.6	569	582	577	639	5	-57
H (I-5)	19.9	337	337	297	333	40	4
J (I-84)	15.9	333	333	315	352	19	-19
K (I-84)	85.9	41	56	26	34	30	22
L (I-84)	105	435	595	352	390	243	205
S (I-84)	168.6	515	693	503	574	190	119
M (OR22)	126.4	10	15	0	0	15	15
N (US97)	92.8	131	139	50	59	89	80
O (US97)	41.9	0	20	9	12	11	8
R (US97)	96.1	169	226	98	119	128	107
T (US97)	58.3	52	202	28	37	174	165
P (US20)	104.3	7	7	2	4	5	3
Q (US20)	160.5	87	104	12	16	92	88
Total	*1,364*	*3,658*	*4,589*	*3,286*	-	*1,303*	-

** Total is not calculated for 80th percentile demand because it is not additive.*

Table 8: Parking Supply-Demand per Mile by Segment at Midnight during Weekdays

Segment	Segment Length (mi)	Supply of Parking Spaces (striped Only) / mi	Supply of Parking Spaces (striped and unstriped) / mi	Demand - Avg. Occupancy / mi	Demand - 80th PCT Occupancy / mi	Avg. Availability (Supply - Demand) / mi	Worst Case Availability (Supply - 80th PCT Demand) / mi
A (I-5)	55.7	4.63	4.63	3.71	4.25	0.92	0.38
B (I-5)	68.4	4.12	4.53	3.61	4.24	0.92	0.29
C (I-5)	64.2	2.73	3.12	2.78	3.23	0.33	-0.11
E (I-5)	44.9	3.61	8.57	6.41	7.47	2.16	1.11
F (I-5)	20.6	4.61	6.17	4.74	5.49	1.43	0.68
G (I-5)	34.6	16.45	16.82	16.67	18.46	0.15	-1.64
H (I-5)	19.9	16.93	16.93	14.93	16.73	2.01	0.20
J (I-84)	15.9	20.94	20.94	19.78	22.13	1.16	-1.18
K (I-84)	85.9	0.48	0.65	0.30	0.40	0.35	0.26
L (I-84)	105	4.14	5.67	3.35	3.72	2.32	1.95
S (I-84)	168.6	3.05	4.11	2.98	3.41	1.13	0.70
M (OR22)	126.4	0.08	0.12	0.00	0.00	0.12	0.12
N (US97)	92.8	1.41	1.50	0.54	0.64	0.96	0.86
O (US97)	41.9	0.00	0.48	0.22	0.29	0.26	0.19
R (US97)	96.1	1.76	2.35	1.02	1.24	1.33	1.11
T (US97)	58.3	0.89	3.46	0.48	0.63	2.98	2.83
P (US20)	104.3	0.07	0.07	0.02	0.04	0.04	0.03
Q (US20)	160.5	0.54	0.65	0.07	0.10	0.58	0.55
Total	*1,364*	*2.68*	*3.36*	*2.41*	-	*0.96*	-

** Total is not calculated for 80th percentile demand because it is not additive.*

Figure 15 visualizes the availability for the segments analyzed. From this map, it is clear that the segments with the least availability are Segment G on I-5, Segment C on I-5, and Segment J on I-84. Other segments also show low levels of availability, such as Segment P on US97, Segment O on US97, or Segment M on OR22, however this is mostly because there are very few truck parking facilities on these segments and demand also is low. In interpreting these results, it is helpful to understand that a significant proportion of the supply of parking (rest areas and truck stops) are located in and around intersections of major corridors or urban areas, which in this analysis were used as the starting point or ending point of segments. This analysis simply assigned the rest areas and truck stops to the closest segment, as done in similar studies conducted in other states. While a common assumption, this could oversimply the demand-supply balance of spaces in places where there are multiple segments within a few miles of a rest area or truck stop. This issue will be explored in the following memo (recommendations and strategies) where needs are summarized and solutions are developed.

Figure 15: Space Availability at Midnight (Supply Minus Average Demand)

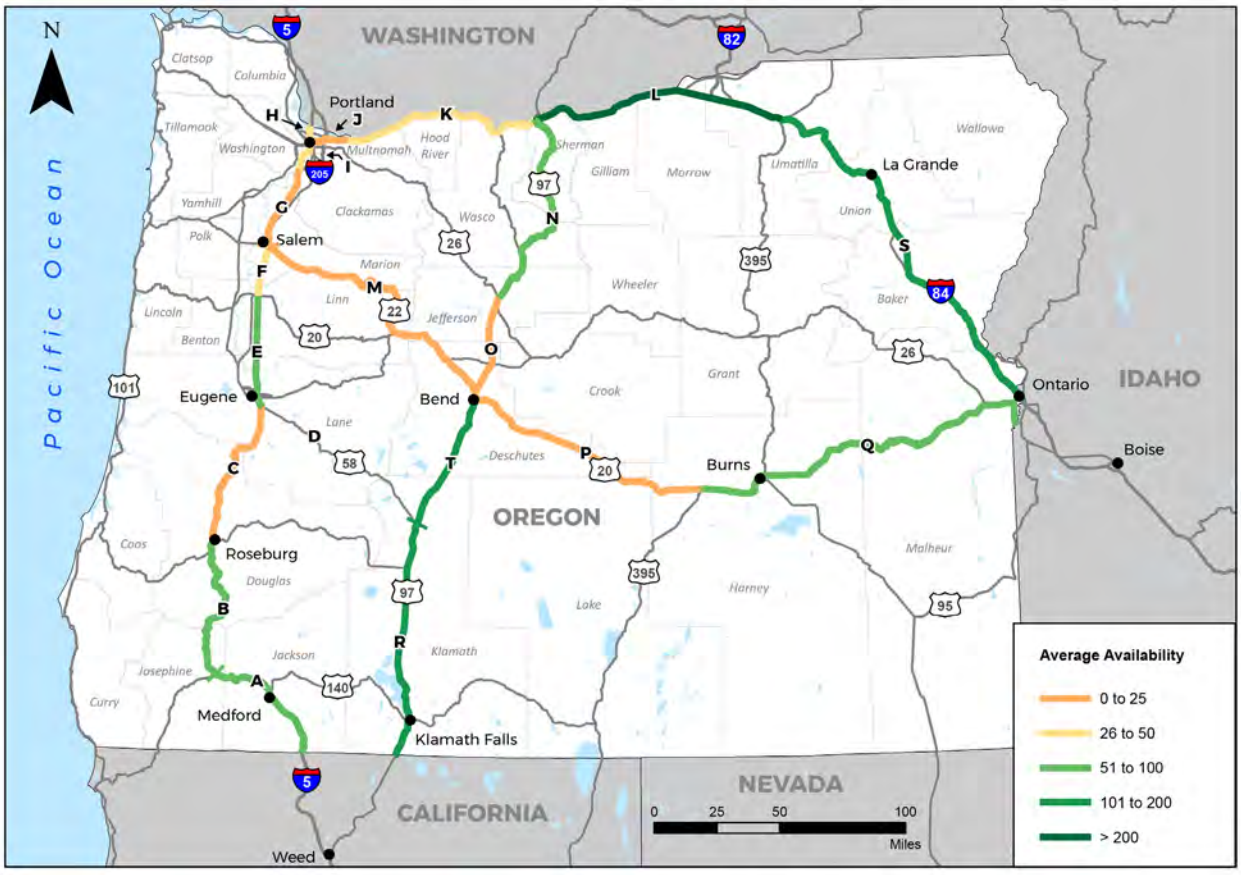


Figure 16 shows the worst-case availability of spaces, which is calculated using the 80th percentile demand. This analysis shows that every 1 out of 5 weekdays capacity is reached at Segments J, H and C, depicted as a negative availability.

Figure 16: Worst-Case Space Availability at Midnight (Supply Minus 80th Percentile Demand)

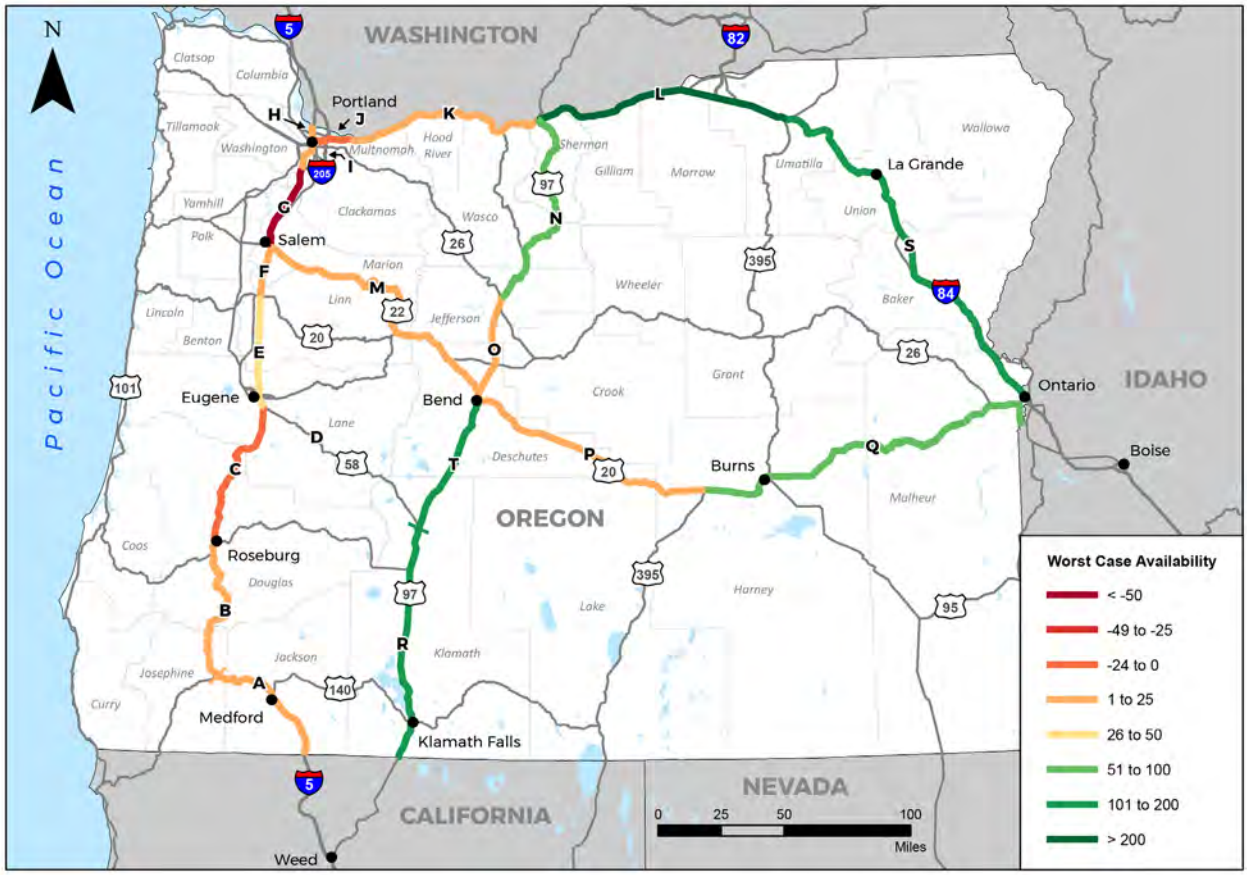


Figure 17 shows the average demand shortfall normalized per mile. The per mile average results follow a similar pattern to the segment average in Figure 8.

Figure 17: Space Availability at Midnight (Supply Minus Average Demand) Per Mile

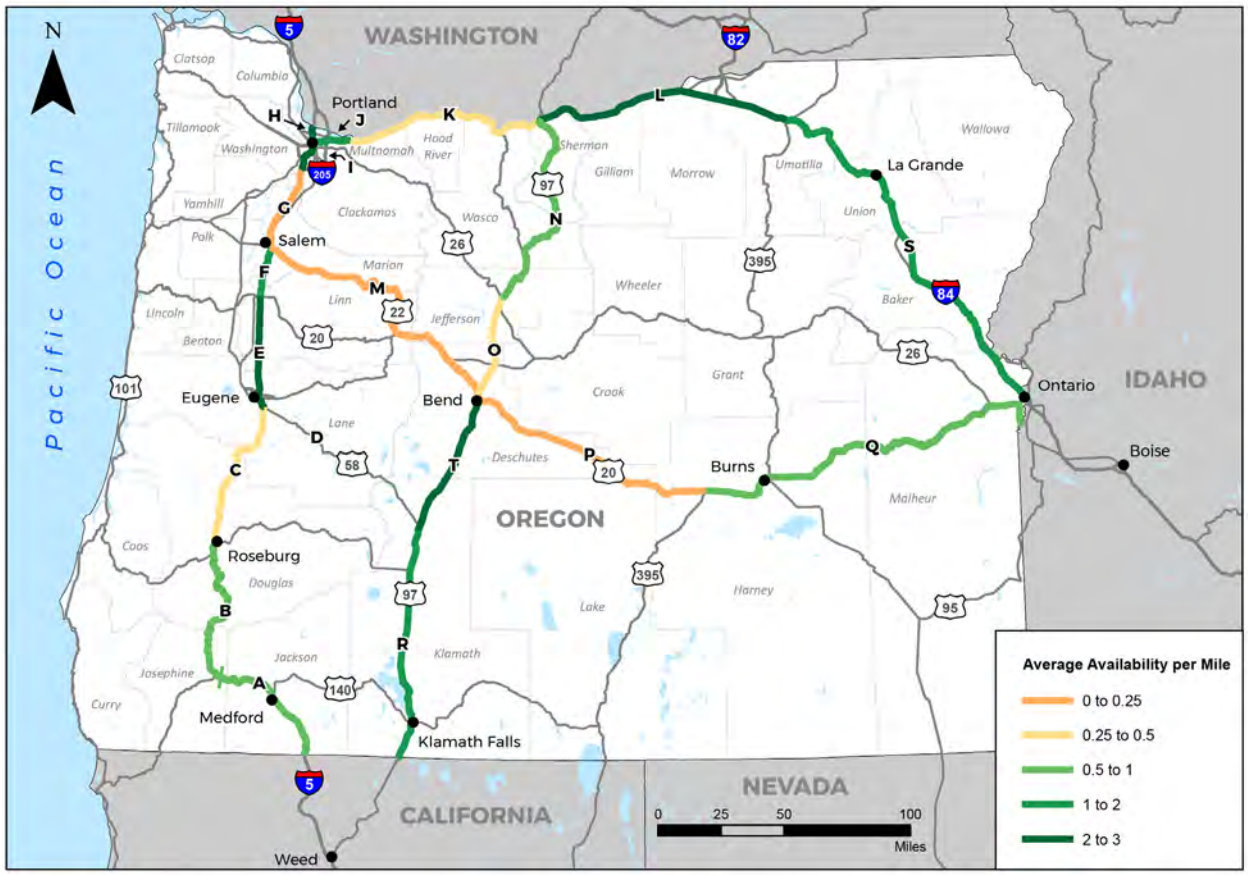
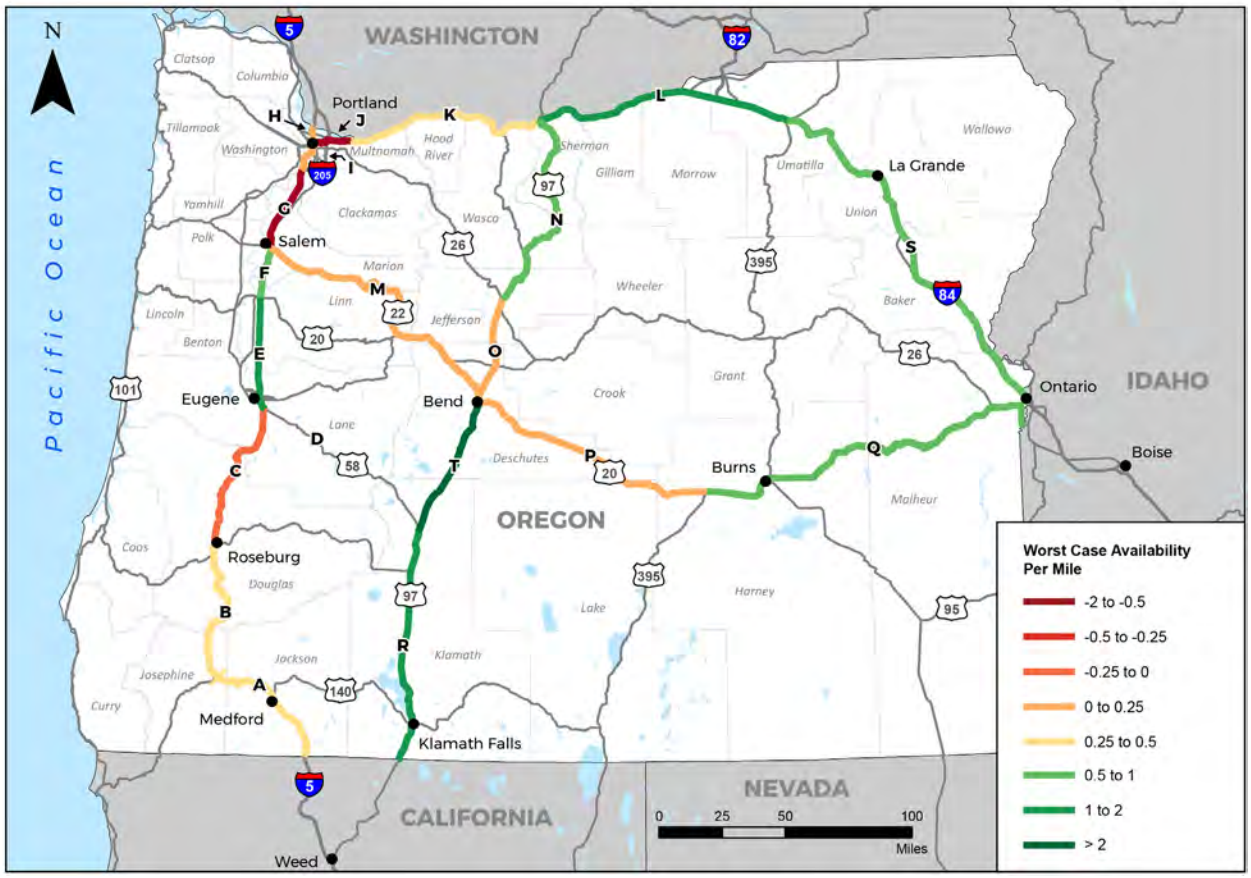


Figure 18 shows the worst-case availability normalized by mile. These per mile results follow a similar, but more extreme, pattern to the average in Figure 11. This perspective shows the segments approaching Portland (segments J and G) to have a high shortage of spaces per mile.

Figure 18: Worst-case Space Availability at Midnight (Supply Minus 80th Percentile Demand) per Mile



4.3 Uncertainty

A confidence interval was estimated using the standard errors of the expansion factors. These standard errors (shown in parenthesis in Table 5) describe the distribution of the estimates, which is a function of the size and noise in the sample. Higher standard errors indicate that there is greater uncertainty in the estimated expansion factors. The confidence interval (CI) for the expansion factor in location j (Portland, I-5, I-84, US97, and other) with a level of significance of 75 percent can be calculating by

$$CI_j = \hat{\alpha}_j \pm 1.15\, \widehat{se}_j \quad (3)$$

where $\hat{\alpha}_j$ is the estimated expansion factor, $\widehat{se}_j$ is the estimated standard error, and 1.15 is the value of the t-statistic with two degrees of freedom (required for calculation of confidence interval for average parameter estimates).

The results of this uncertainty quantification are shown in Table 9. The second to last column shows the demand (occupancy) at truck stops and public rest areas on an average weekday at midnight. The range provided corresponds to a 75% confidence interval, representing the range of values that the demand estimate could take if the model was estimated with a different sample of the same data. The confidence interval is wider for some segments because they have more parking facilities with expansion factors that were estimated with a greater standard error. The confidence interval for availability shows that it is possible for the true expansion factor to be higher so that several segments are actually at capacity. This occurs at Segment G, and to a lesser extent, at Segment J.

Table 9: Confidence Interval of Supply-Demand Balance at Midnight on Weekdays

Segment	Segment Length (mi)	Supply of Parking Spaces (striped Only)	Supply of Parking Spaces (striped and unstriped)	Demand – Occupancy Confidence Interval	Availability Confidence Interval (Supply - Demand)
A (I-5)	55.7	258	258	196 to 217	62 to 41
B (I-5)	68.4	282	310	234 to 259	76 to 51
C (I-5)	64.2	175	200	169 to 187	31 to 13
E (I-5)	44.9	162	385	273 to 302	112 to 83
F (I-5)	20.6	95	127	92 to 102	35 to 25
G (I-5)	34.6	569	582	532 to 622	51 to -40
H (I-5)	19.9	337	337	273 to 321	65 to 16
J (I-84)	15.9	333	333	289 to 340	44 to -7
K (I-84)	85.9	41	56	24 to 27	32 to 29
L (I-84)	105	435	595	331 to 373	264 to 222
S (I-84)	168.6	515	693	473 to 534	220 to 159
M (OR22)	126.4	10	15	0 to 0	15 to 15
N (US97)	92.8	131	139	47 to 54	92 to 85
O (US97)	41.9	0	20	9 to 10	11 to 10
R (US97)	96.1	169	226	93 to 105	133 to 121
T (US97)	58.3	52	202	26 to 30	176 to 172
P (US97)	104.3	7	7	2 to 3	5 to 5
Q (US97)	160.5	87	104	11 to 12	93 to 92
Total	***1,364***	***3,658***	***4,589***	***3,073 to 3,499***	***1,517 to 1,091***

5. RESULTS – UNDESIGNATED PARKING

As detailed in the Methodology Technical Memo, undesignated parking can occur at:

- Highway shoulders
- Interchange on/off ramps
- Pullouts
- Weigh Stations (some weigh stations don't allow overnight parking)
- Chain-up areas
- Vista points
- Shoulders of access roads to rest areas

Locations of undesignated truck parking were identified from three sources of information: feedback provided by ODOT, the survey responses of stakeholders, and a cluster analysis of GPS data. The cluster analysis involved manually reviewing the study corridors and identifying places with some truck parking activity in the GPS data. If a location was included in any of three sources of information, it was reported as a potential area for undesignated parking. A total of 108 areas were identified throughout the state along the study corridors. Truck parking related to commercial or industrial establishments was excluded to focus on locations where parking is truly undesignated.

The frequency and duration of truck parking at these locations was estimated using the processed GPS data (as described in Section 2.2.4). The GPS counts were expanded using the same factors used in the designated parking analysis (see Table 5). It is estimated that in an average weekday 594 trucks park at the undesignated areas identified, accumulating 1,080 hours of parking a day.

Figure 19 shows the amount of undesignated truck parking per segment on an average weekday based on hours and number of trucks parked. Stops lasting less than 5 minutes were excluded from the analysis to prevent traffic congestion to be interpreted as stops.

The segment with the most undesignated parking is segment S along I-84. Each day, 145 different trucks park along this segment in the undesignated locations, accumulating 228.9 hours of parking time. Two other segments of I-84 (K and L) placed second and third in terms of undesignated parking. This represents all of I-84, except the small Segment J next to Portland, which did not contain any undesignated parking locations.

A second part of the network where undesignated parking was prevalent was the southern section of I-5, represented by segments A and B. This is likely because these two segments are located roughly between San Francisco and Portland, providing a logical stopping ground for trucks traveling between these two cities.

The segments with the greatest prevalence of undesignated parking (most of I-84 and segments A and B on I-5) were not generally the segments with the least availability (around Portland and on some parts of I-5), suggesting that there are likely other factors at play. Undesignated parking may be occurring because the available designated parking facilities do not meet the needs of truck drivers, either because they are unsafe, out of the way, or hard to

maneuver. Long haul trucks with cabs are self-sufficient in many ways, leading parking in undesignated locations to be less undesirable than would be expected. If the facilities lack amenities that are valued by drivers, it could make stopping at them less desirable.

More fundamentally, it is also likely that undesignated parking occurs where it is safer and less disruptive, in rural areas with ample space on the side of the road. Undesignated parking in urban or suburban areas, where availability was found to be most limited, is more dangerous because of the higher traffic volumes and lack of unused surface areas. Having said this, availability does appear to be one of the causes of undesignated parking, particularly on Segment K on I-84, approaching Portland. This segment ranked the second highest in terms of undesignated parking (highest on a per-mile basis), and also had a low availability of spaces on average.

Figure 19: Average Undesignated Parking by Segment for Weekday

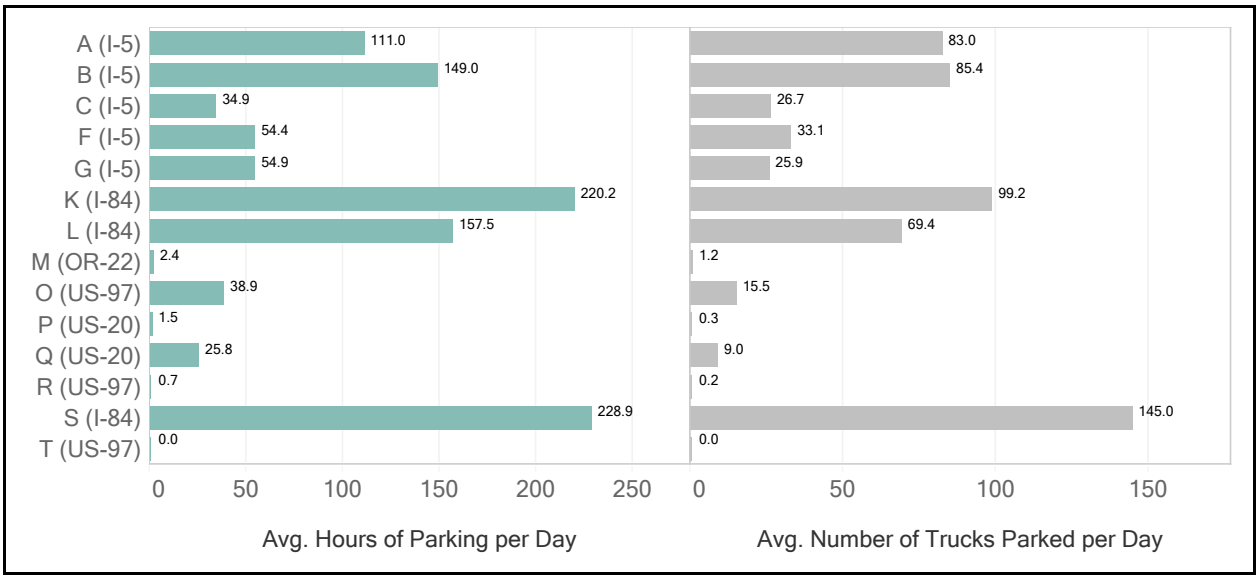
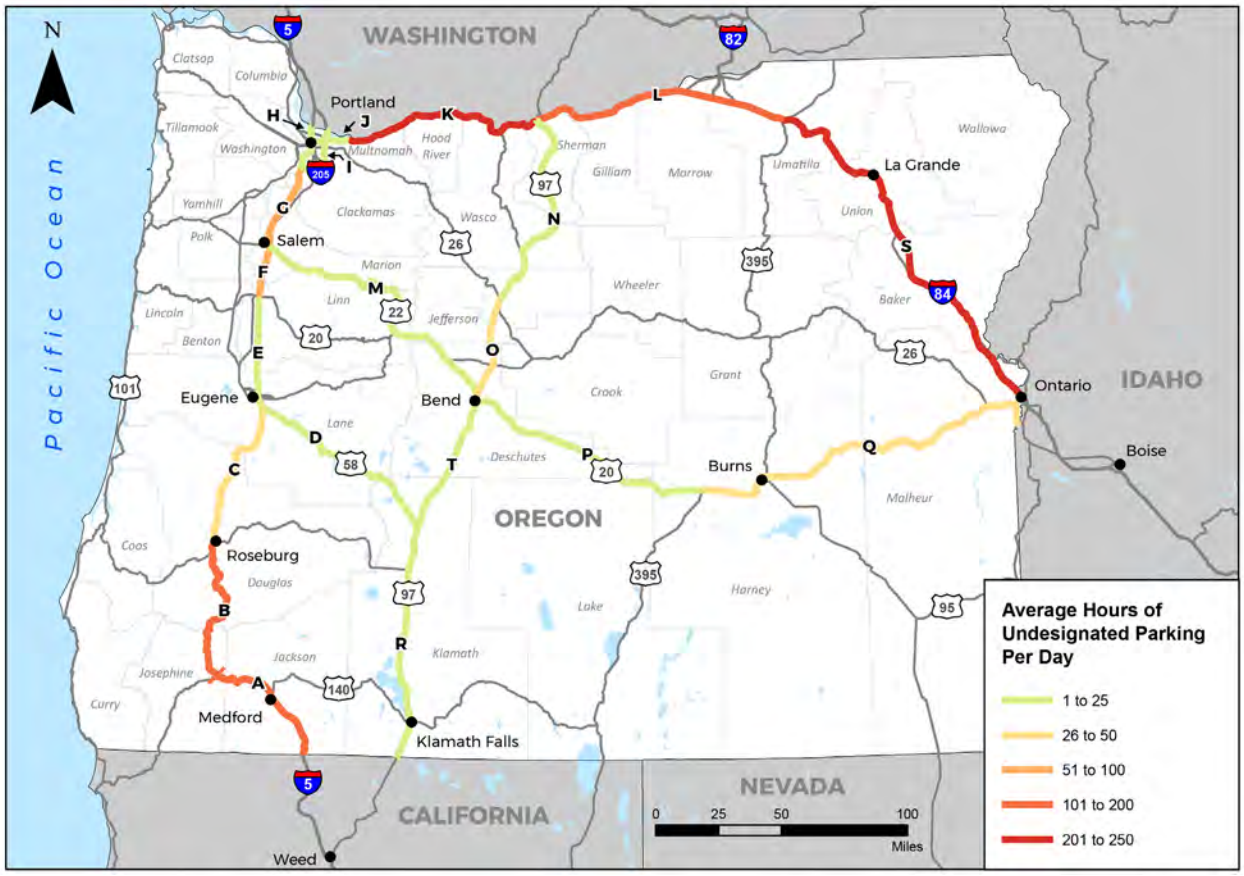


Figure 20 visualizes the average hours of undesignated parking per segment during weekdays.

Figure 20: Hours of Undesignated Parking by Segment



Of the undesignated areas identified, 41% of the parking hours accrued at ramp shoulders, 30% on mainline shoulders, 11% at viewpoints, 9% at unpaved areas, and 9% at weigh stations. The demand estimates for weigh stations do not distinguish between trucks being weighed and trucks parking for rest breaks, which likely overstates true number of hours of undesignated parking.

Table 10 lists the top undesignated parking locations identified, and Figure 21 maps these locations. A full list of locations is included in Appendix B.

Table 10: Top 20 Undesignated Truck Parking Locations

Rank	Road	Name	Category	ID	Lat	Long	Ave. Hours of Parking per Day (stops longer than 5min)	Ave. Number of Trucks Parking per Day (stops longer than 5min)
1	I-5	Ashland Hill Park	Mainline shoulder	1004	42.06072	-122.60691	100.6	77.3
2	I-5	Manzanita Ramps	Ramp shoulder	1012	42.51579	-123.36271	86.6	42.8
3	I-84	Corbett Viewpoint	Viewpoint	1038	45.54250	-122.27554	58.7	19.9
4	I-5	Wide Santiam	Mainline shoulder	1029	44.74450	-123.05241	50.4	29
5	I-84	Arlington Viewpoint	Viewpoint	1061	45.71705	-120.23400	40.5	16.2
6	I-84	Stanfield Ramps	Ramp shoulder	1065	45.77104	-119.25142	40.1	9.6
7	I-84	Boardman Ramps	Ramp shoulder	1063	45.83221	-119.76826	34.9	11.1
8	I-5	Azalea	Unpaved area	1014	42.77863	-123.27659	32.9	11
9	I-84	Deadman Lookout EB	Viewpoint	1069	45.58185	-118.64399	28.8	10.9
10	I-84	MP 329.7 EB	Mainline shoulder	1087	44.56267	-117.43075	26.6	12.4
11	US97	Madras Lot NW Maple St	Unpaved area	1107	44.63878	-121.13094	25	5.5
12	I-84	Memaloose WB Ramps	Ramp shoulder	1053	45.69547	-121.33832	25	9.3
13	I-84	MP 227 Weigh Station	Weigh station	1073	45.59091	-118.54677	24.3	22.6
14	I-84	MP 54.3 Weigh Station	Weigh station	1046	45.68772	-121.70337	22.5	9.9
15	I-84	MP 76.9	Ramp shoulder	1054	45.67617	-121.27687	21.4	10
16	I-84	MP 49 EB	Mainline shoulder	1045	45.69579	-121.79925	21.4	10.7
17	I-84	C Reynolds EB Ramps	Ramp shoulder	1081	45.23277	-118.01352	21	4.9
18	I-84	MP 92.4 EB	Mainline shoulder	1056	45.64725	-121.05229	19.7	11.7
19	I-84	MP 354.4 EB	Mainline shoulder	1088	44.27467	-117.20643	19.5	14.2
20	I-5	Wooburn POE NB Shoulder	Ramp shoulder	1032	45.17537	-122.85503	19.3	12.5

Figure 21: Top 20 Undesignated Parking Locations

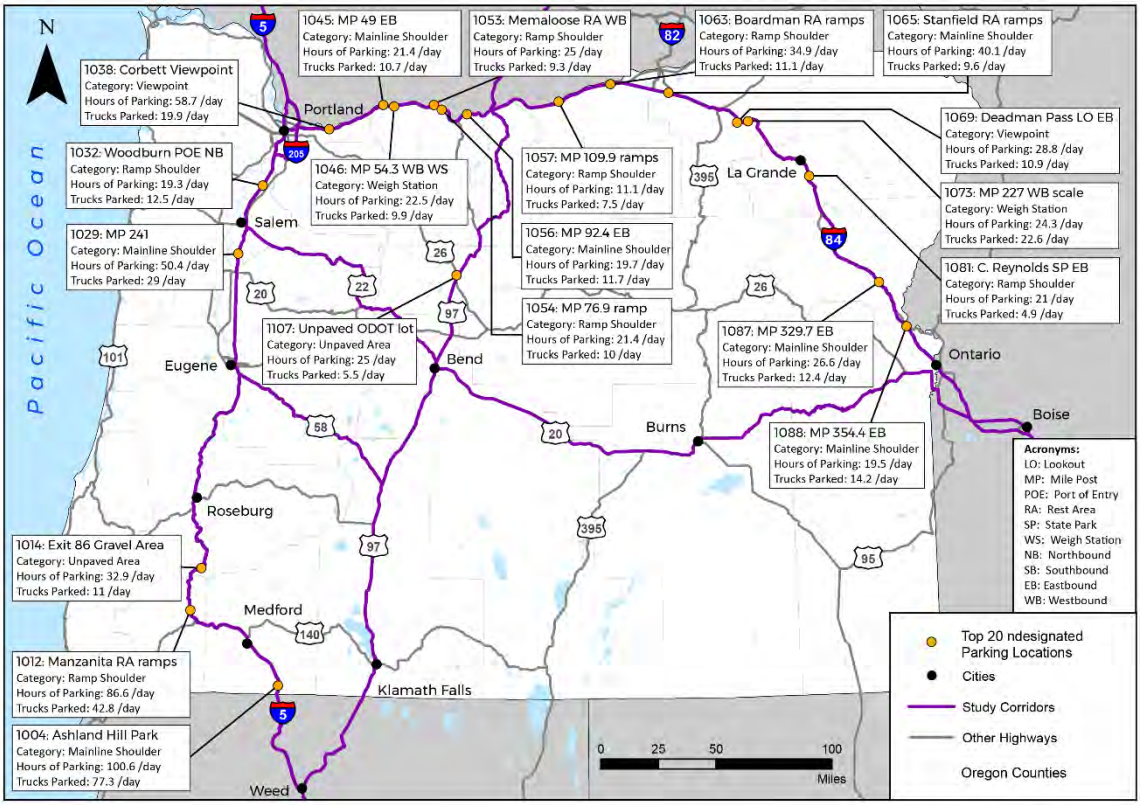


Figure 22 shows the undesignated parking locations in Central Oregon averaging more than 5 hours of parking per weekday. This threshold was selected to only display the locations that are seeing significant undesignated parking on a daily basis.

Figure 22: Undesignated Parking Locations – Central Oregon

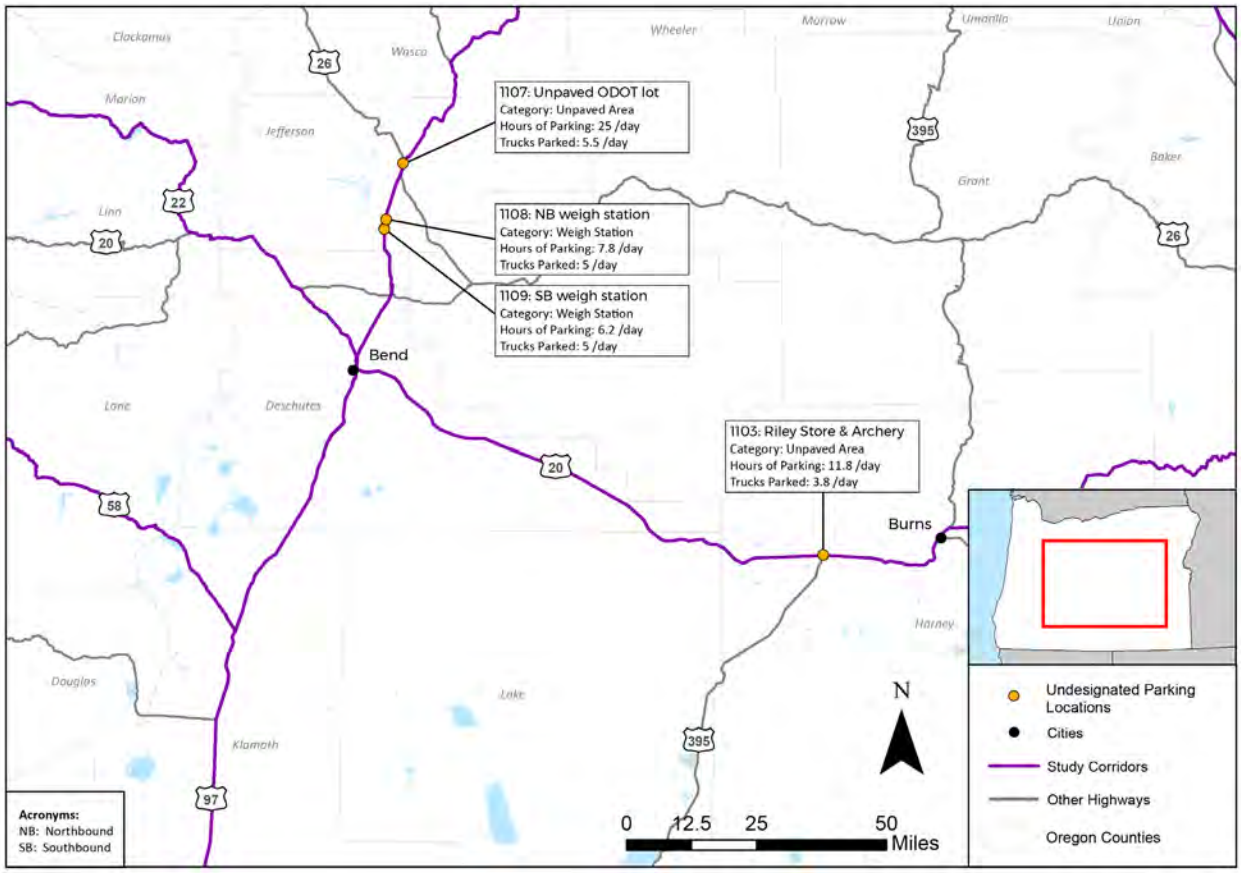


Figure 23 shows the undesignated parking locations in North Central Oregon averaging more than 5 hours of parking per weekday.

Figure 23: Undesignated Parking Locations – North Central Oregon

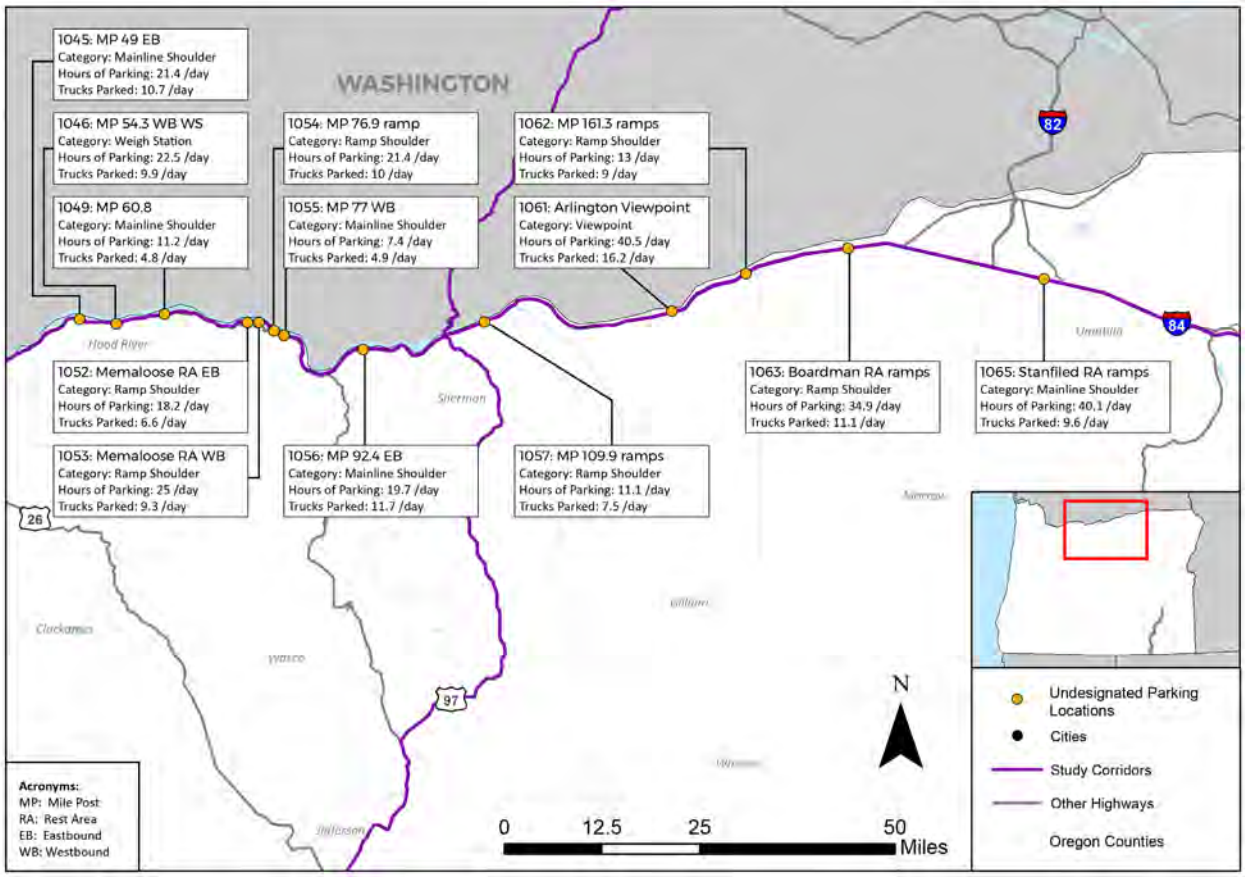


Figure 24 shows the undesignated parking locations in Northeast Oregon averaging more than 5 hours of parking per weekday.

Figure 24: Undesignated Parking Locations – Northeast Oregon

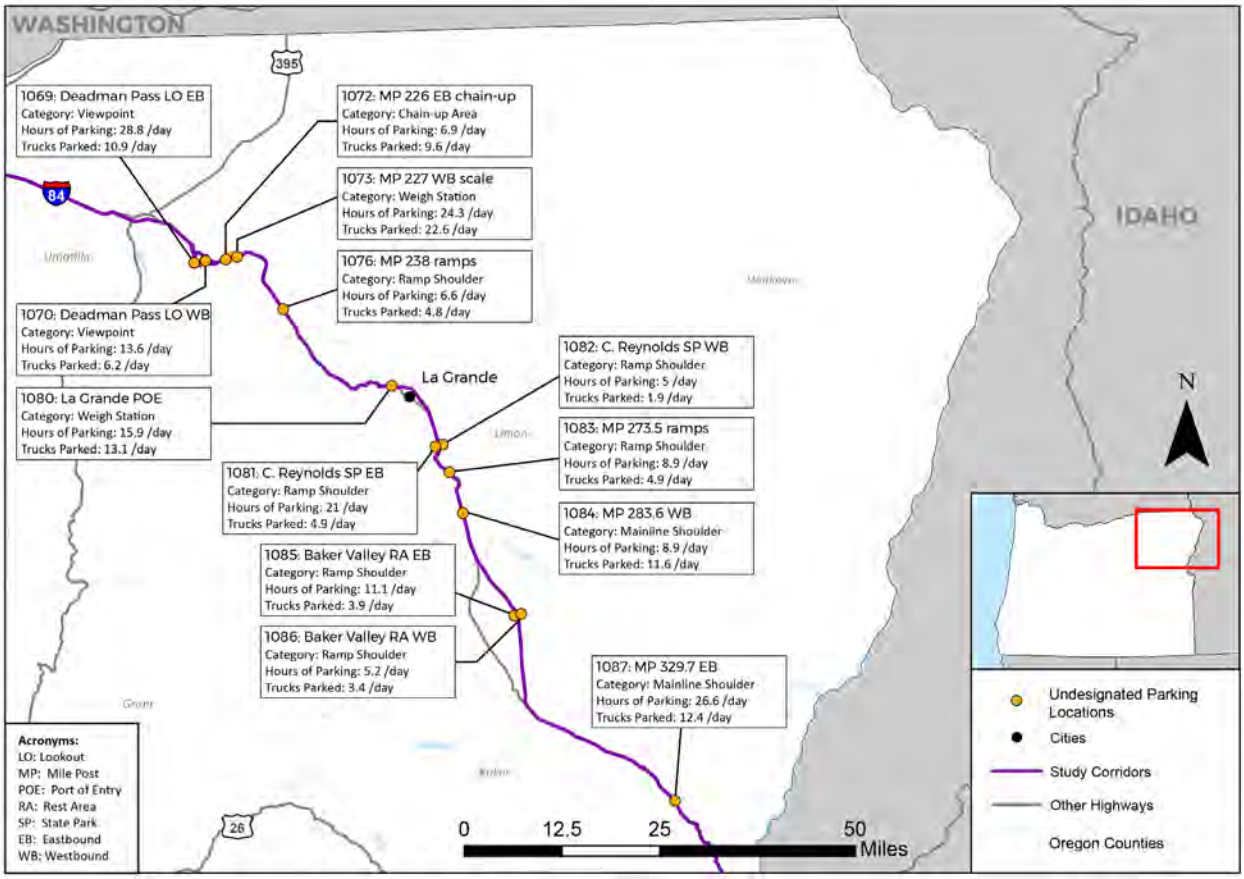


Figure 25 shows the undesignated parking locations in Northwest Oregon averaging more than 5 hours of parking per weekday.

Figure 25: Undesignated Parking Locations – Northwest Oregon

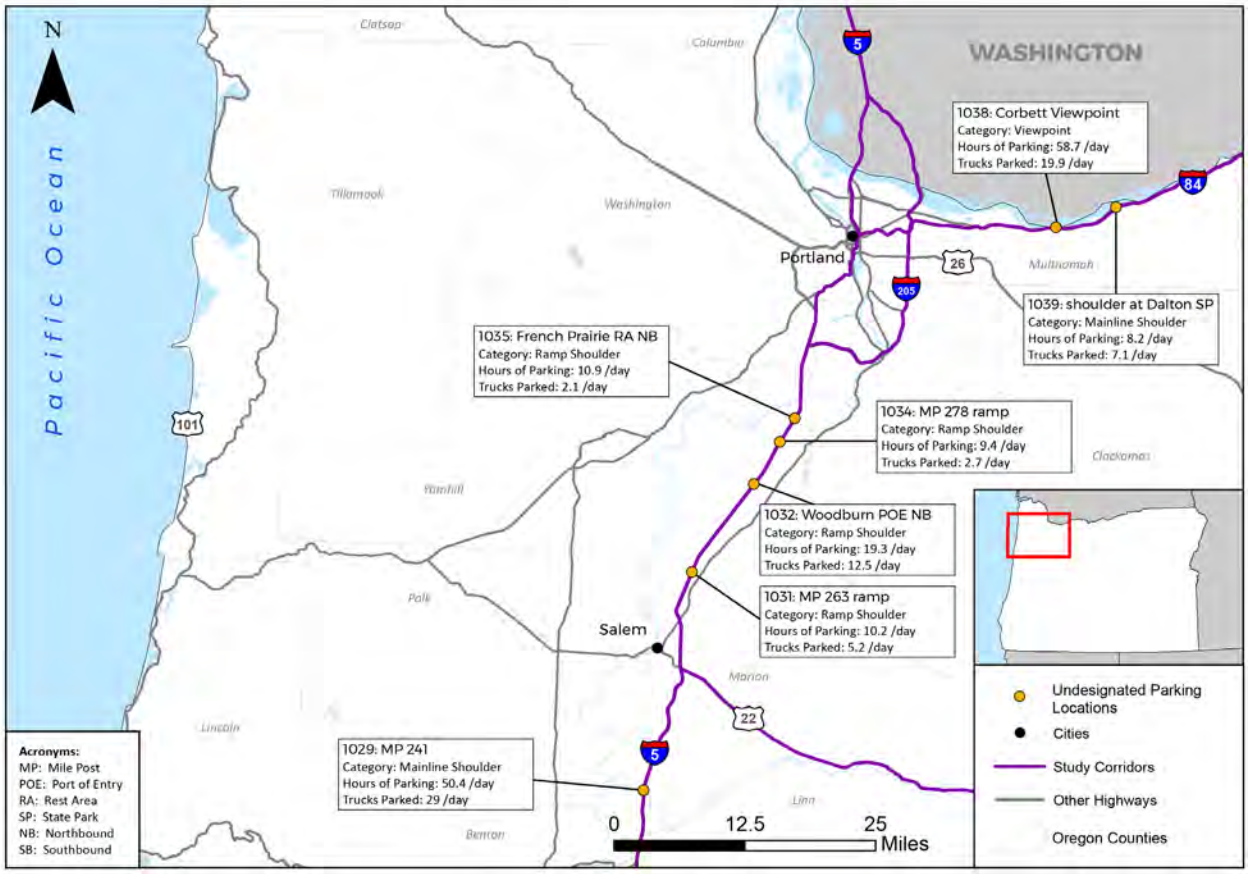


Figure 26 shows the undesignated parking locations in Southeast Oregon averaging more than 5 hours of parking per weekday.

Figure 26: Undesignated Parking Locations – Southeast Oregon

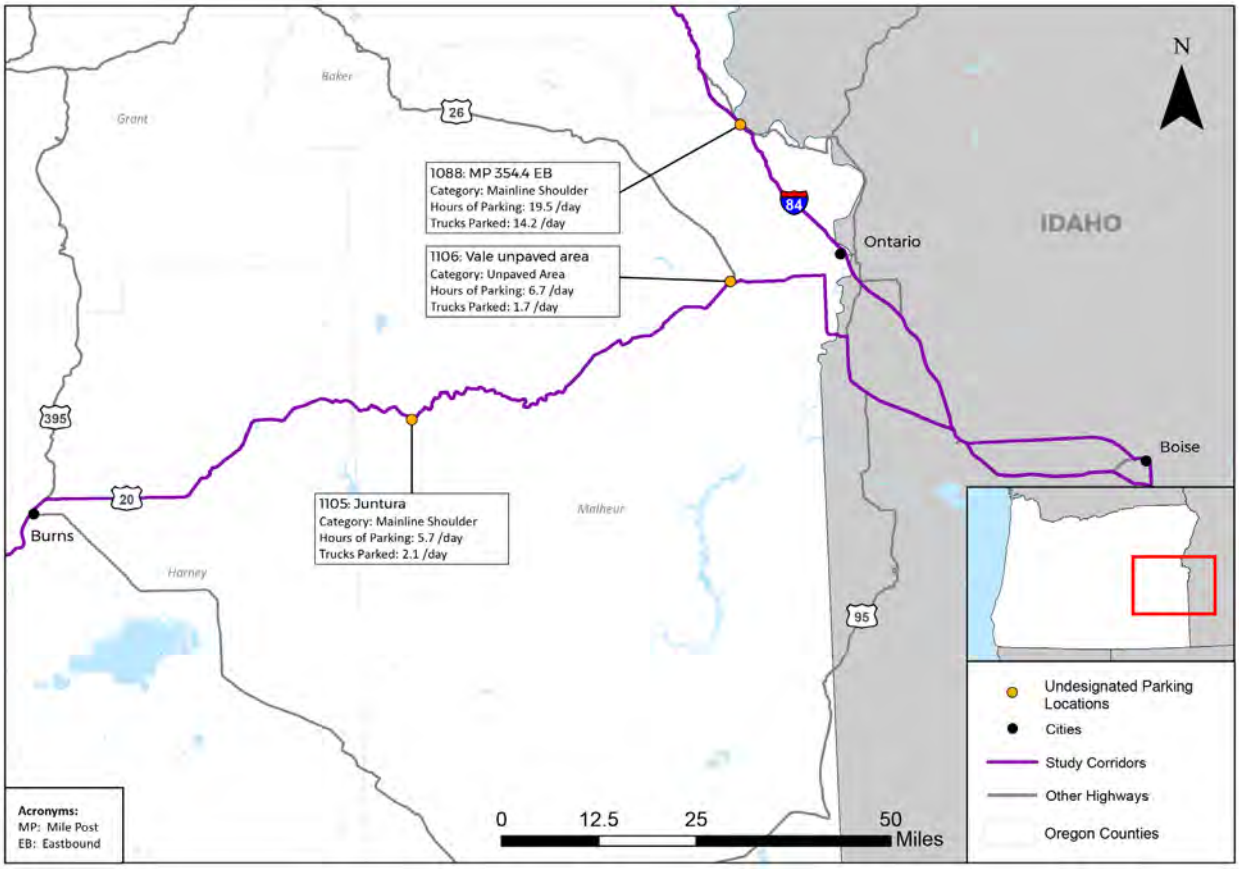
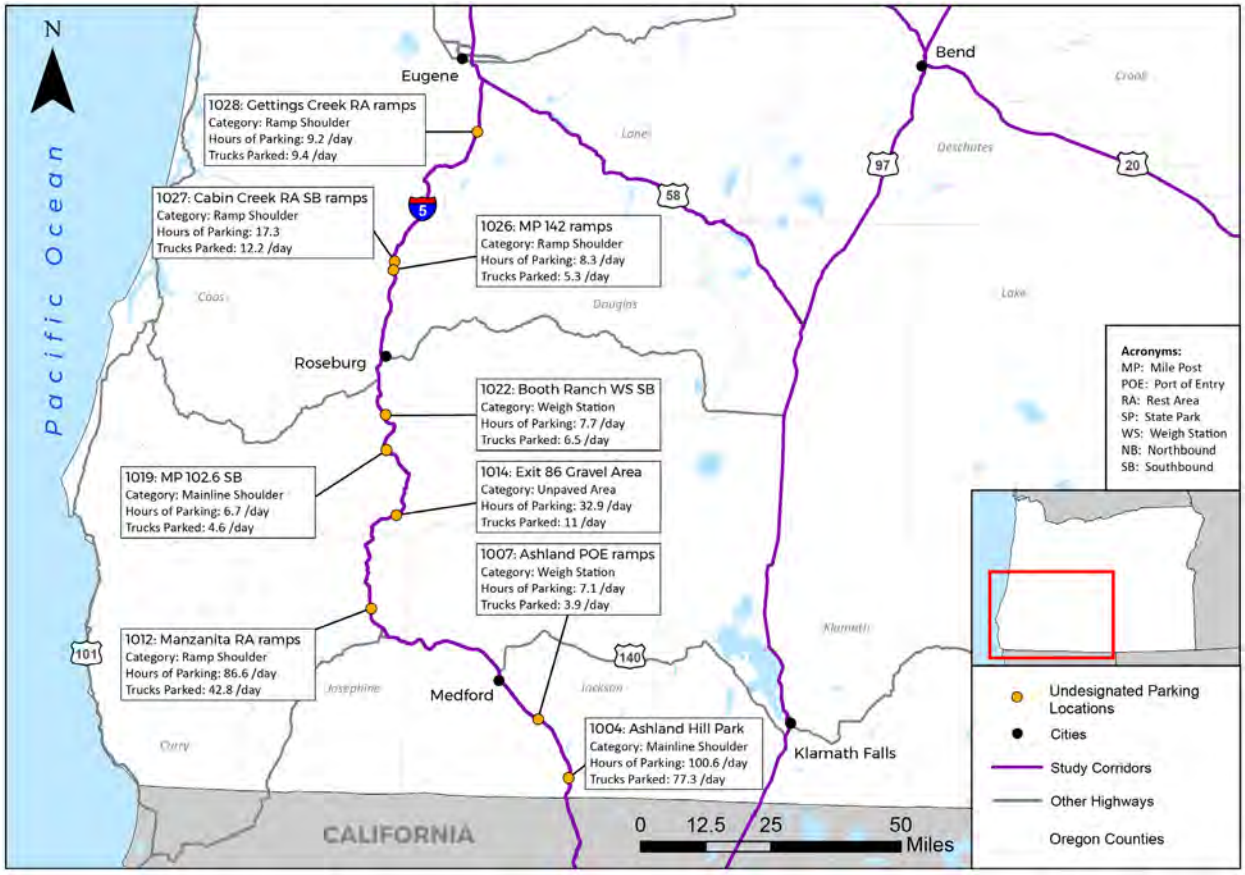


Figure 27 shows the undesignated parking locations in Southwest Oregon averaging more than 5 hours of parking per weekday.

Figure 27: Undesignated Parking Locations – Southwest Oregon



6. CONCLUSION

An innovative approach was developed to estimate truck parking demand throughout Oregon. Given that no centralized database exists that reports the occupancy of public and private truck parking facilities in the state, GPS data was queried to understand truck parking patterns. A GPS Expansion Model was estimated to expand the GPS data to represent all trucking activity. Undesignated parking locations were identified from information from ODOT, stakeholders, and a cluster analysis of the GPS data.

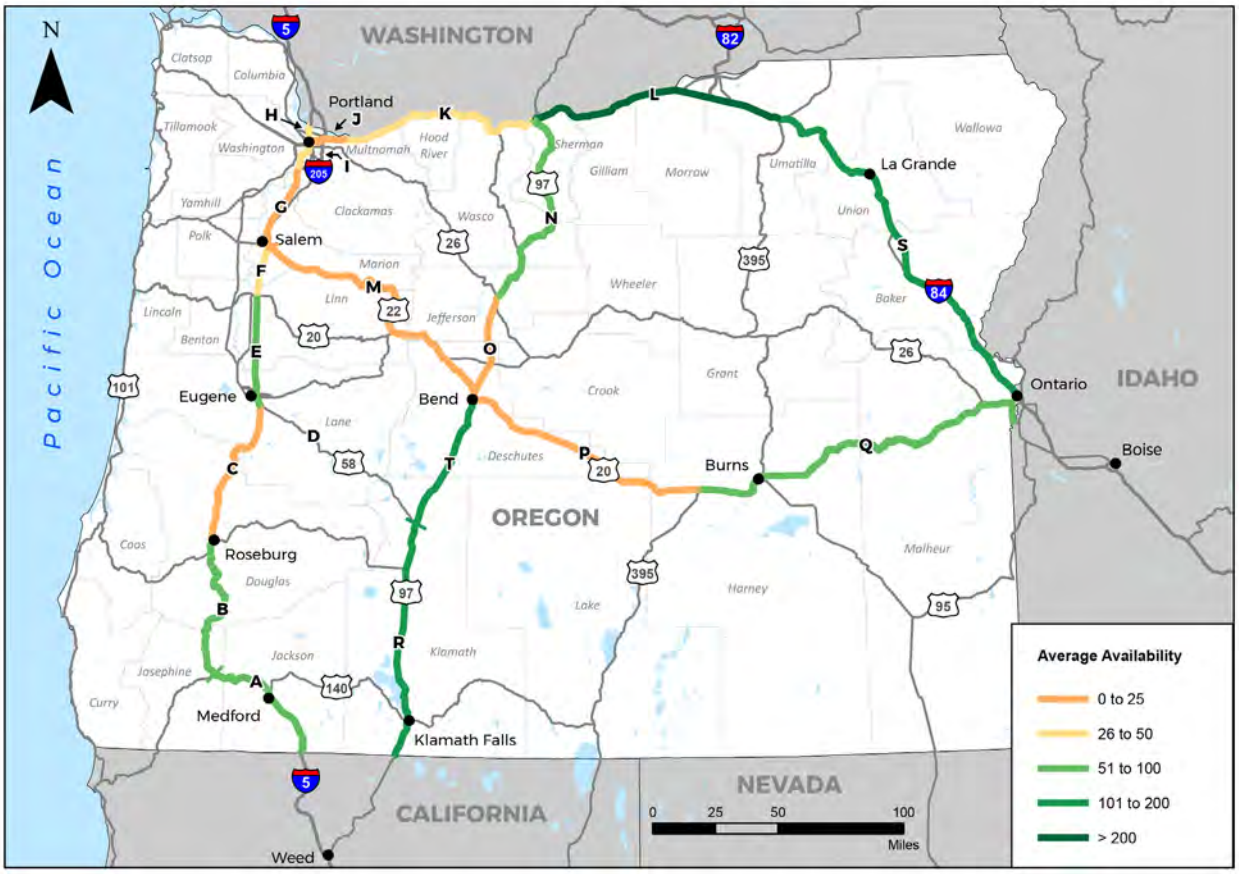
The current supply of truck parking in the state of Oregon is reaching capacity in several parts of the state. Depending on the time of day and day of week, it can be difficult to find adequate parking with the desired amenities in some locations. This problem is documented in the stakeholder survey that was conducted earlier this year (see Feedback Summary).

The main findings of this analysis are (see Figure 28 below):

- On an average weekday at midnight there are 2,875 (±30 @ 75% CI) trucks parked at truck stops and 412 (±23 @ 75% CI) trucks parked in public rest areas on the study corridors.
- The heavily used segments with the lowest availability (approaching capacity) are the approach to Portland on I-5 (Segment G) and the approach to Portland on I-84 (segment J). Further away from Portland on these highways, the following two segments in terms of lowest availability are Segment C on I-5 and Segment K on I-84. Several non-interstate roads were also found to have limited availability (Segment P along US20, Segment O along US97, Segment M along OR22), however this is primarily because both demand and capacity are low on these segments. Segment I along I-205 providing a bypass to Portland, and Segment D along OR 58 between Eugene and US97 do not have any trucks stops or rest areas.
- The segments with the highest average occupancy of designated parking spaces are: Segment G along I-5 and Segment S along I-84, each accommodating over 500 parked trucks at midnight.
- There appears to be ample parking availability on Segments L, S, T and R, each having more than 100 spaces open on average. Much of this excess capacity is available in unstriped lots, often unpaved, adjacent to truck stops or rest areas.
- Through feedback provided by ODOT, interviews of stakeholders, and a cluster analysis of GPS data, 106 areas were identified along the study corridors were undesignated parking occurs. In an average weekday, 594 trucks park in these areas, accumulating 1,080 hours of parking. Of these areas, 49 areas were identified as places where undesignated parking is common (more than 5 hours of parking per day). The level of undesignated truck parking cannot be compared to the level of designated parking because they were calculated using different metrics.
- The segments with the highest level of undesignated parking are S, K, and L corresponding to the majority of I-84, and B and A where I-5 connects to the California border. The

segments with the most undesignated parking were not always those with the least availability of designated parking. This suggests that availability of designated parking is one of many factors involved in undesignated parking. Other factors could include: cost, convenience, lack of amenities at rest areas, and, perhaps most importantly, the availability of larger roadside areas that are considered as safer, which is more common in rural areas than urban or suburban areas.

Figure 28: Space Availability at Midnight (Supply Minus Average Demand)



The next technical memorandum will estimate the future demand by segment based on projected truck traffic growth. That information will then be used to assess the long-term parking supply shortfall throughout the state and develop solutions in later memos.

7. REFERENCES

Pécheux, K.K., K.J. Chen, J. Farbry, and S.A. Fleger. 2002. Model Development For National Assessment of Commercial Vehicle Parking. FHWA-RD-01-159. McLean, Virginia.

8. APPENDIX A: DESIGNATED PARKING SUPPLY-DEMAND BALANCE

Segment	Name	ID	Supply of Parking Spaces (striped Only)	Supply of Parking Spaces (striped and unstriped)	Demand - Avg. Occupancy	Demand - 80th PCT Occupancy	Avg. Availability (Demand - Supply)	Worst Case Availability (80th PCT Demand - Supply)
A (I-5)	Ashland POE	301	28	28	10	15	18	13
A (I-5)	Central Point Pilot	204	93	93	87	99	6	-6
A (I-5)	Phoenix Petro	202	87	87	93	106	-6	-19
A (I-5)	Suncrest SB	101	10	10	7	9	3	1
A (I-5)	Talent Gordy's	201	40	40	10	15	30	25
B (I-5)	Canyonville Seven Feathers	206	178	178	138	166	40	12
B (I-5)	Manzanita NB	102	15	22	7	12	15	10
B (I-5)	Manzanita SB	103	13	15	10	15	5	0
B (I-5)	Myrtle Creek Chevron	207	0	11	9	15	2	-4
B (I-5)	Roseburg Love's	208	76	76	78	89	-2	-13
B (I-5)	Wolf Creek Truck N' Travel	205	0	8	5	9	3	-1
C (I-5)	Cabin Creek NB	104	9	12	3	6	9	6
C (I-5)	Cabin Creek SB	105	5	7	2	3	5	4
C (I-5)	Chevron Cottage Grove	210	0	19	11	15	8	4
C (I-5)	Gettings Creek NB	106	10	11	4	6	7	5
C (I-5)	Gettings Creek SB	107	10	10	5	9	5	1
C (I-5)	Rice Hill Pilot	209	141	141	154	177	-13	-36
E (I-5)	Albany Jacks	216	0	15	4	6	11	9
E (I-5)	Albany Virk	215	0	36	43	53	-7	-17
E (I-5)	Coburg Fuel N Go	211	30	30	2	3	28	27
E (I-5)	Coburg TA	212	86	135	122	143	13	-8
E (I-5)	Halsey Mobil	213	0	12	7	9	5	3
E (I-5)	Halsey Pioneer Villa	214	0	93	82	95	11	-2
E (I-5)	Oak Grove NB	108	23	32	14	21	18	11
E (I-5)	Oak Grove SB	109	23	32	15	21	17	11
F (I-5)	Albany Love's	217	72	72	78	92	-6	-20
F (I-5)	Santiam River NB	110	12	23	10	15	14	8
F (I-5)	Santiam River SB	111	11	32	10	15	22	17
G (I-5)	Aurora Flying J	219	93	93	115	133	-22	-40
G (I-5)	Aurora TA Travel	220	275	275	298	336	-23	-61
G (I-5)	Brooks Pilot	218	87	87	67	78	20	9
G (I-5)	French Prairie NB	112	57	66	50	65	16	1
G (I-5)	French Prairie SB	113	57	61	46	61	15	0
H (I-5)	Jubitz Portland	221	330	330	293	332	37	-2
H (I-5)	Portland Bridge Registration Office	303	7	7	4	5	3	2
J (I-84)	Troutdale Love's	228	93	93	109	126	-16	-33
J (I-84)	Troutdale TA	227	240	240	206	239	34	1
K (I-84)	Cascade Locks	305	19	19	6	10	13	9
K (I-84)	Memaloose EB	117	14	19	12	15	7	4
K (I-84)	Memaloose WB	118	8	18	8	12	10	6
L (I-84)	Boardman EB	119	12	25	9	15	16	10
L (I-84)	Boardman Love's	229	95	95	94	107	2	-12
L (I-84)	Boardman WB	120	10	23	8	12	15	11
L (I-84)	Hermiston Space Age	231	122	122	54	66	68	56
L (I-84)	Hermiston Western Express	230	0	100	12	16	88	84
L (I-84)	Stanfield EB	121	22	39	12	18	28	21
L (I-84)	Stanfield Pilot	232	122	122	117	132	5	-10
L (I-84)	Stanfield WB	122	22	39	13	18	26	21
L (I-84)	Umatilla POE	306	30	30	33	49	-3	-19
M (OR22)	The Maples EB	139	10	15	0	0	15	15
N (US97)	Biggs Junction Pilot	253	41	41	32	37	9	4

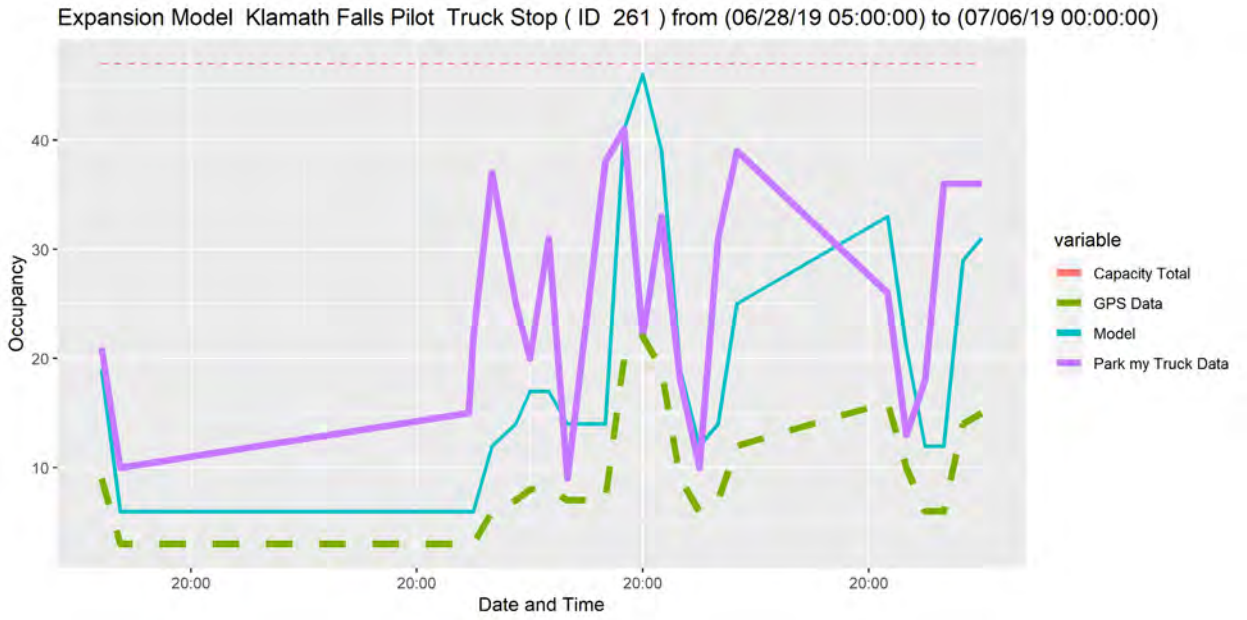
Segment	Name	ID	Supply of Parking Spaces (striped Only)	Supply of Parking Spaces (striped and unstriped)	Demand - Avg. Occupancy	Demand - 80th PCT Occupancy	Avg. Availability (Demand - Supply)	Worst Case Availability (80th PCT Demand - Supply)
N (US97)	Cow Canyon SB	134	16	24	9	14	15	10
N (US97)	Madras Safeway	255	4	4	0	0	4	4
N (US97)	Plateau Travel Plaza	254	70	70	9	12	61	58
O (US97)	Madras J&L	257	0	20	9	12	11	8
P (US97)	Brothers Oasis WB	131	7	7	2	4	5	3
Q (US97)	Hines Chevron	251	10	10	0	1	10	9
Q (US97)	Hines Eddie's	250	50	50	7	10	43	40
Q (US97)	Hines/Burns Leathers	252	0	17	3	4	14	13
Q (US97)	Sage Hen EB	132	27	27	2	3	25	24
R (US97)	Beaver Marsh NB	136	25	30	5	8	25	22
R (US97)	Beaver Marsh SB	137	13	17	4	6	13	11
R (US97)	Chemult Pilot	259	34	34	25	31	10	3
R (US97)	Chiloquin Crater Lake Junction	260	17	42	16	23	26	19
R (US97)	Klamath Falls Pilot	261	47	47	36	43	11	4
R (US97)	Klamath Falls POE	308	8	8	0	0	8	8
R (US97)	Midland NB	138	25	28	8	12	20	16
R (US97)	Worden Truck Stop	262	0	20	4	6	16	14
S (I-84)	Baker City Chevron	236	20	20	6	10	14	10
S (I-84)	Baker Truck Corral	238	0	77	44	56	33	21
S (I-84)	Baker Valley EB	127	24	30	13	18	17	12
S (I-84)	Baker Valley WB	128	9	15	6	10	9	5
S (I-84)	Charles Reynolds EB	125	10	26	9	12	17	14
S (I-84)	Charles Reynolds WB	126	12	25	9	12	16	13
S (I-84)	Chevron La Grande	234	0	0	2	5	-2	-5
S (I-84)	Deadman Pass EB	123	13	18	7	10	11	8
S (I-84)	Deadman Pass WB	124	11	17	7	10	10	7
S (I-84)	Farewell Bend POE	307	32	32	2	5	30	27
S (I-84)	Jacksons Baker	237	22	22	14	20	8	2
S (I-84)	La Grande Flying J	235	45	45	61	71	-16	-26
S (I-84)	Ontario Loves	239	49	89	76	91	14	-2
S (I-84)	Ontario Pilot	240	96	96	121	150	-25	-54
S (I-84)	Ontario WB	130	24	24	10	13	15	11
S (I-84)	Pendleton Arrowhead	233	117	117	96	115	21	2
S (I-84)	Weatherby WB	129	31	40	20	27	20	13
T (US97)	La Pine Gordy's	258	52	202	28	37	174	165
X (I-5 in WA)	Kalama Rebel	226	11	26	40	51	-14	-25
X (I-5 in WA)	Paradise Quick Stop	225	10	10	17	23	-7	-13
X (I-5 in WA)	Ridgefield POE	304	32	32	4	1	28	31
Y (I-84 in ID)	Caldwell Flying J	244	102	102	72	86	30	16
Y (I-84 in ID)	Caldwell Stinker	242	7	35	21	27	15	8
Y (I-84 in ID)	Fruitland Hammer	241	26	26	12	17	14	9
Y (I-84 in ID)	Jacksons Caldwell	243	7	7	2	5	5	2
Y (I-84 in ID)	Jacksons Nampa	245	77	77	20	27	57	50
Z (I-5 in CA)	Grenada Three Js	223	75	75	42	54	33	21
Z (I-5 in CA)	Hornbrook Chevron	224	0	48	6	9	42	39

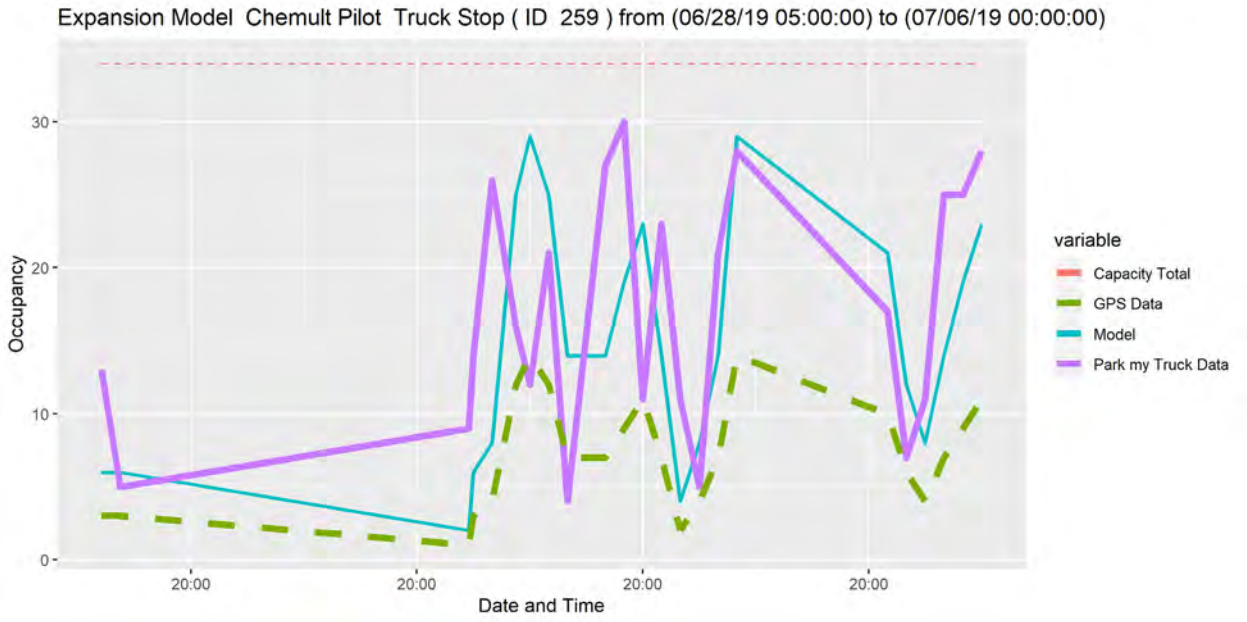
9. APPENDIX B: TOP UNDESIGNATED PARKING LOCATIONS

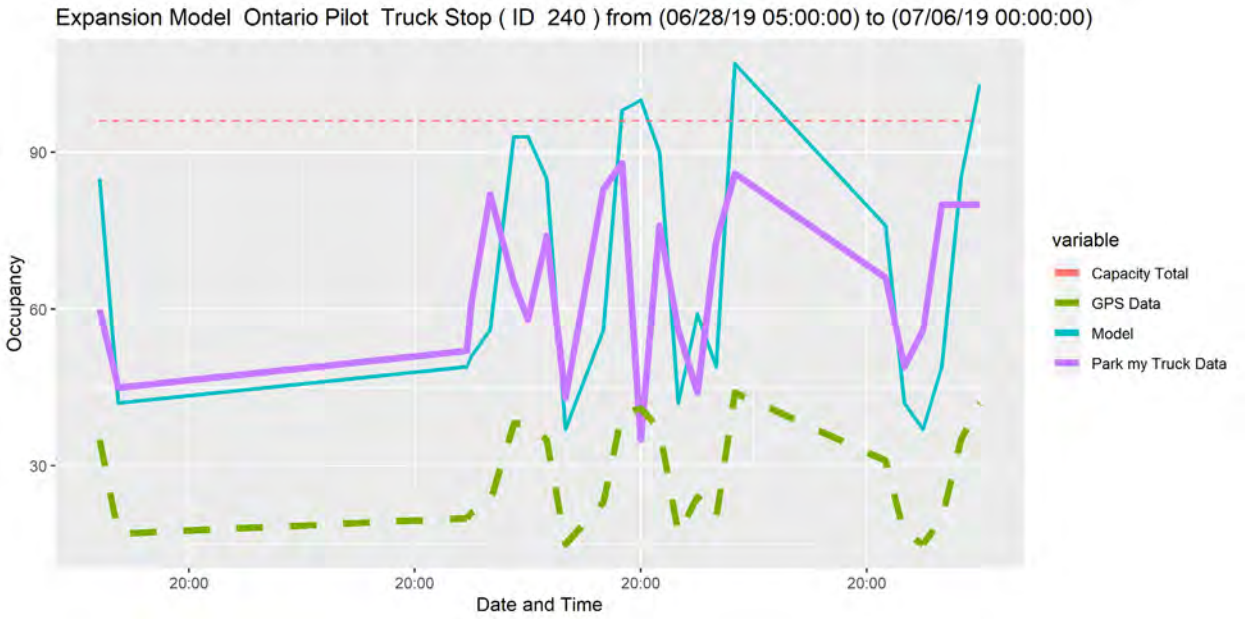
Rank	Road	Name	Category	ID	Lat	Long	Avg. Hours of Parking per Day (stops longer than 5min)	Avg. Number of Trucks Parking per Day (stops longer than 5min)
1	I-5	Ashland Hill Park	Mainline shoulder	1004	42.06072	-122.60691	100.6	77.3
2	I-5	Manzanita Ramps	Ramp shoulder	1012	42.51579	-123.36271	86.6	42.8
3	I-84	Corbett Viewpoint	Viewpoint	1038	45.54250	-122.27554	58.7	19.9
4	I-5	Santiam access roads	Mainline shoulder	1029	44.74450	-123.05241	50.4	29
5	I-84	Arlington Viewpoint	Viewpoint	1061	45.71705	-120.23400	40.5	16.2
6	I-84	Stanfield Ramps	Ramp shoulder	1065	45.77104	-119.25142	40.1	9.6
7	I-84	Boardman Ramps	Ramp shoulder	1063	45.83221	-119.76826	34.9	11.1
8	I-5	Azalea	Unpaved area	1014	42.77863	-123.27659	32.9	11
9	I-84	Deadman Lookout EB	Viewpoint	1069	45.58185	-118.64399	28.8	10.9
10	I-84	MP 329.7 EB	Mainline shoulder	1087	44.56267	-117.43075	26.6	12.4
11	US97	Madras Lot NW Maple St	Unpaved area	1107	44.63878	-121.13094	25	5.5
12	I-84	Memaloose WB Ramps	Ramp shoulder	1053	45.69547	-121.33832	25	9.3
13	I-84	MP 227	Weigh station	1073	45.59091	-118.54677	24.3	22.6
14	I-84	MP 54.3	Weigh station	1046	45.68772	-121.70337	22.5	9.9
15	I-84	MP 76.9	Ramp shoulder	1054	45.67617	-121.27687	21.4	10
16	I-84	MP 49 EB	Mainline shoulder	1045	45.69579	-121.79925	21.4	10.7
17	I-84	C Reynolds EB Ramps	Ramp shoulder	1081	45.23277	-118.01352	21	4.9
18	I-84	MP 92.4 EB	Mainline shoulder	1056	45.64725	-121.05229	19.7	11.7
19	I-84	MP 354.4 EB	Mainline shoulder	1088	44.27467	-117.20643	19.5	14.2
20	I-5	Wooburn POE NB	Ramp shoulder	1032	45.17537	-122.85503	19.3	12.5
21	I-84	Memaloose EB Ramps	Ramp shoulder	1052	45.69498	-121.34004	18.2	6.6
22	I-5	Cabin Creek SB Ramps	Ramp shoulder	1027	43.47557	-123.31909	17.3	12.2
23	I-84	La Grande POE	Weigh station	1080	45.34466	-118.13213	15.9	13.1
24	I-84	Deadman Lookout WB	Viewpoint	1070	45.58436	-118.62090	13.6	6.2
25	I-84	Baker Valley EB	Ramp shoulder	1085	44.91616	-117.82146	13.5	4.8

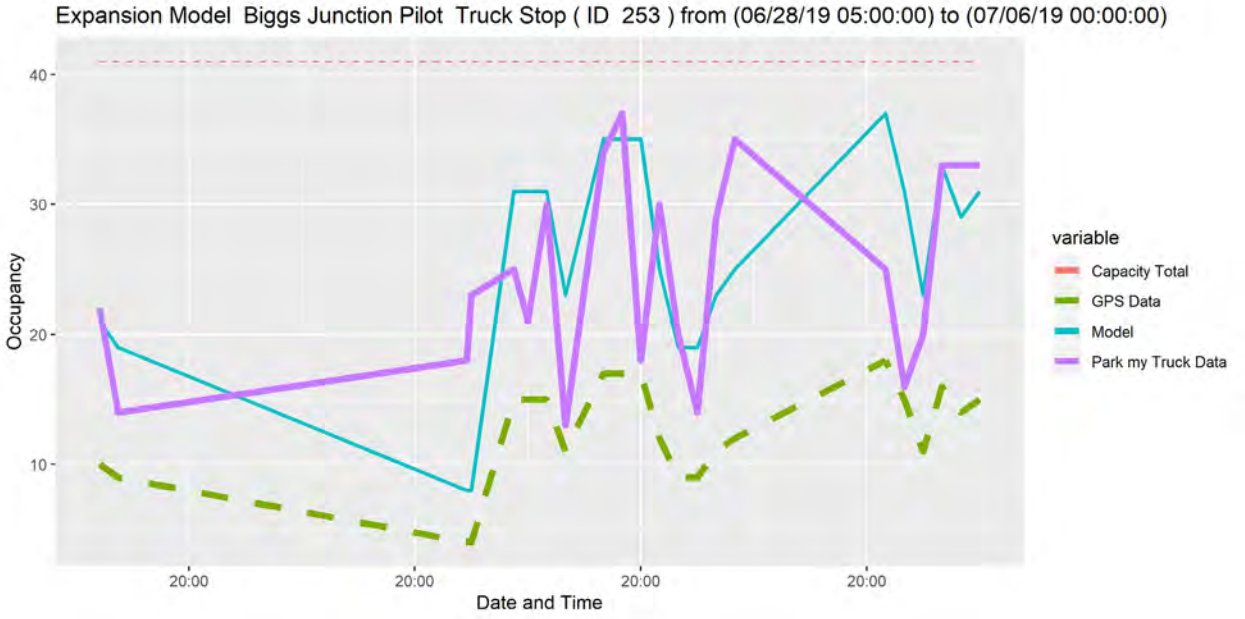
Rank	Road	Name	Category	ID	Lat	Long	Avg. Hours of Parking per Day (stops longer than 5min)	Avg. Number of Trucks Parking per Day (stops longer than 5min)
26	I-84	Heppner Ramps	Ramp shoulder	1062	45.78709	-120.03900	13	9
27	US97	Riley Store	Unpaved area	1103	43.54174	-119.50473	11.8	3.8
28	I-84	MP 60.8	Mainline shoulder	1049	45.70720	-121.57880	11.2	4.8
29	I-84	Ramps MP 109.9	Ramp shoulder	1057	45.69789	-120.73031	11.1	7.5
30	I-5	French NB Ramps	Ramp shoulder	1035	45.27267	-122.77515	10.9	2.1
31	I-5	Brooks Ramps	Ramp shoulder	1031	45.04953	-122.97235	10.2	5.2
32	I-5	Donald Aurora	Ramp shoulder	1034	45.23440	-122.80688	9.4	2.7
33	I-5	Gettings Ramps	Ramp shoulder	1028	43.84978	-123.02104	9.2	9.4
34	I-84	MP 273.5 Ramps	Ramp shoulder	1083	45.18291	-117.98653	8.9	4.9
35	I-84	MP 283.6 WB Shoulder	Mainline shoulder	1084	45.10608	-117.95600	8.9	11.6
36	I-5	Mertz Ramps	Ramp shoulder	1026	43.46131	-123.32176	8.3	5.3
37	I-84	Dalton SP and WB shoulder	Mainline shoulder	1039	45.57199	-122.15741	8.2	7.1
38	US97	NB Weigh Station	Weigh station	1108	44.47686	-121.19362	7.8	5
39	I-5	Booth Ranch SB	Weigh station	1022	43.05489	-123.33422	7.7	6.5
40	I-84	WB MP 77	Mainline shoulder	1055	45.67460	-121.27174	7.4	4.9
41	I-5	Ashland POE SB	Weigh station	1007	42.22206	-122.72573	7.1	3.9
42	I-84	MP 226.4 EB Chain	Chain-up Area	1072	45.58924	-118.55401	6.9	9.6
43	I-5	MP 102.6 SB	Mainline shoulder	1019	42.95813	-123.32556	6.7	4.6
44	US97	Smith St NW	Unpaved area	1106	43.98268	-117.24846	6.7	1.7
45	I-84	Meacham Ramps	Ramp shoulder	1076	45.49296	-118.41359	6.6	4.8
46	US97	SB Weigh Station	Weigh station	1109	44.45636	-121.19986	6.2	5
47	US97	Juntura	Mainline shoulder	1105	43.74596	-118.08145	5.7	2.1
48	I-84	Baker Valley WB	Ramp shoulder	1086	44.91600	-117.82019	5.2	3.4
49	I-84	C Reynolds WB Ramps	Ramp shoulder	1082	45.23759	-118.01436	5	1.9

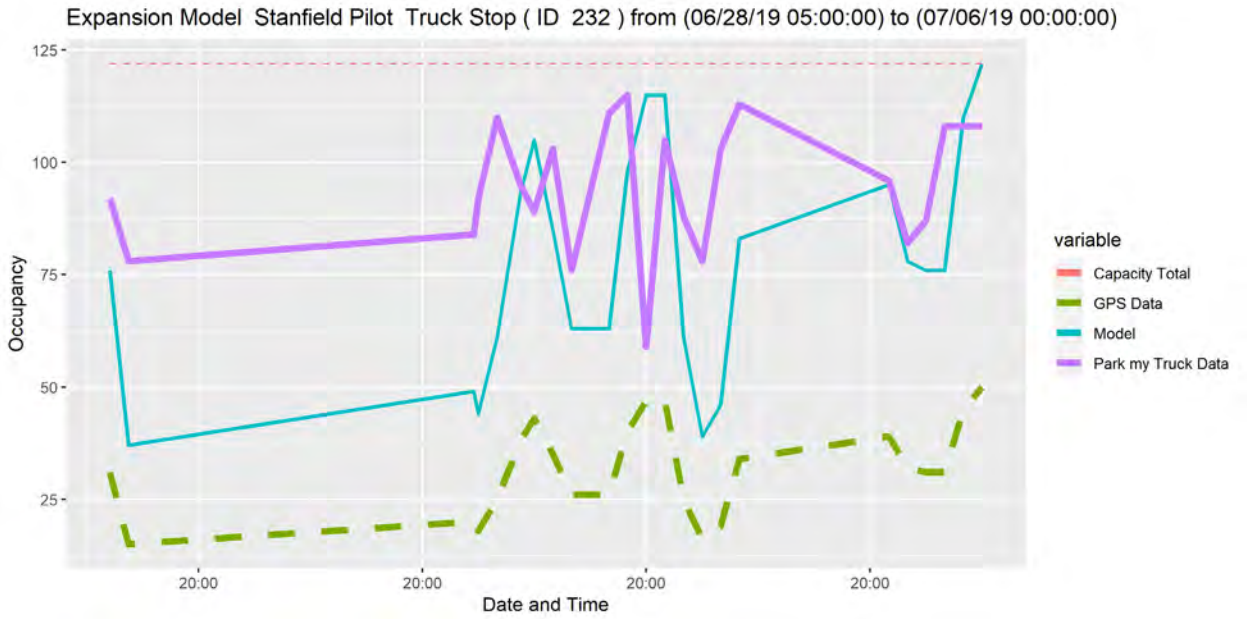
10. APPENDIX C: MODEL VS. OBSERVATIONS BY FACILITY

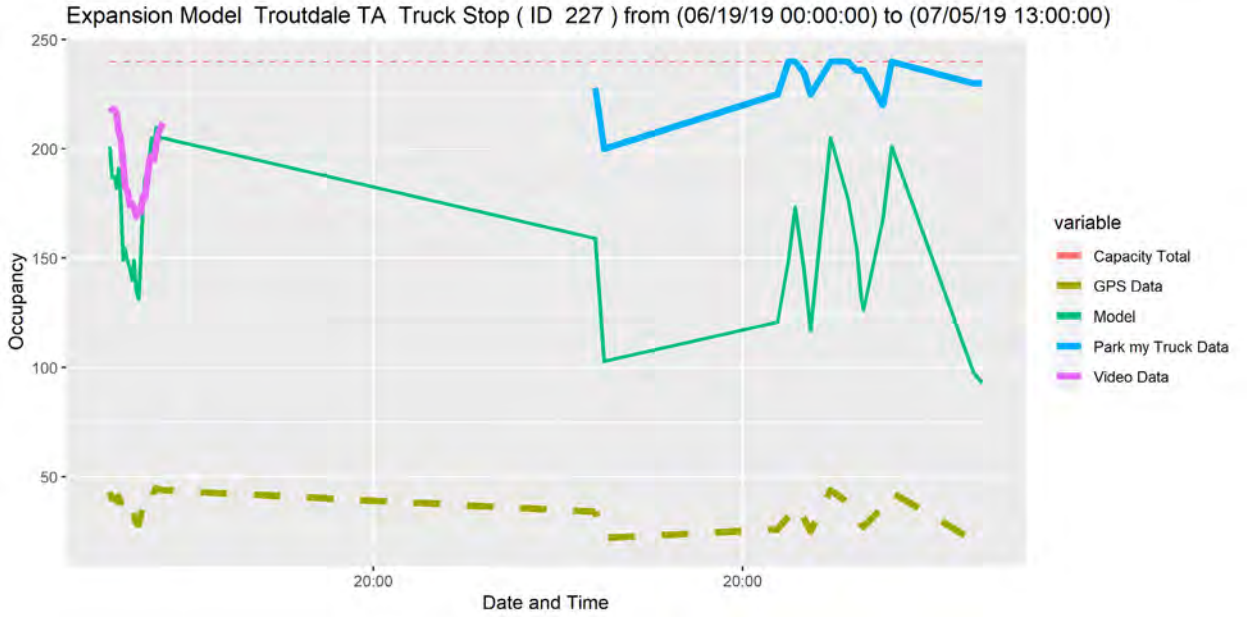


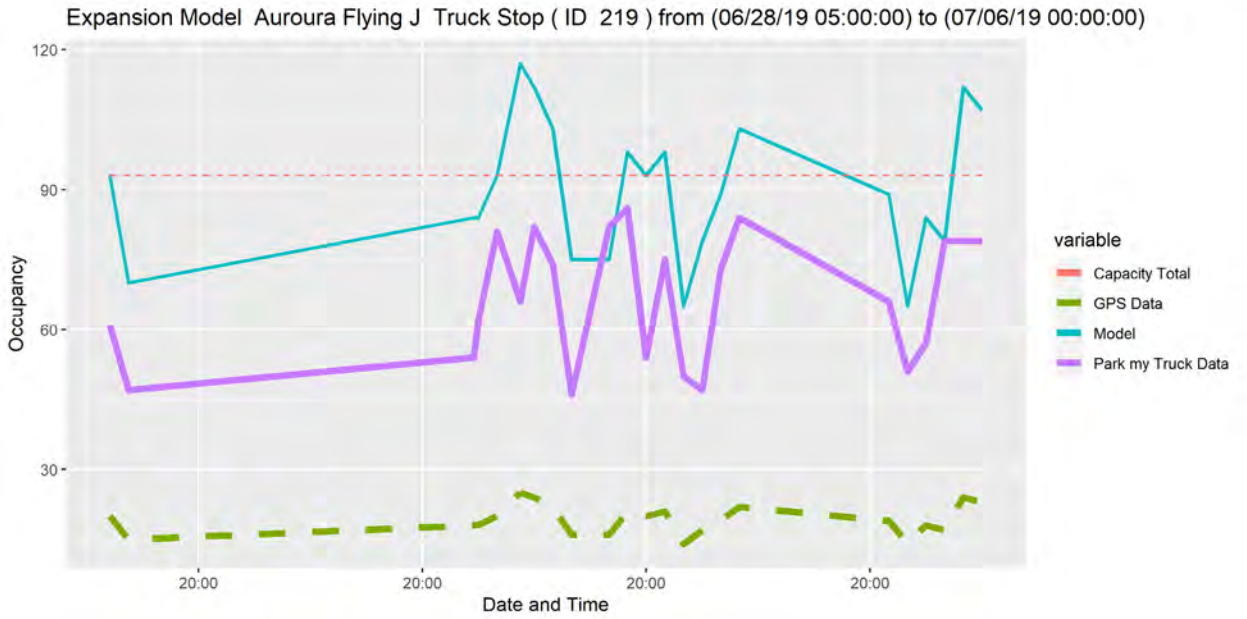


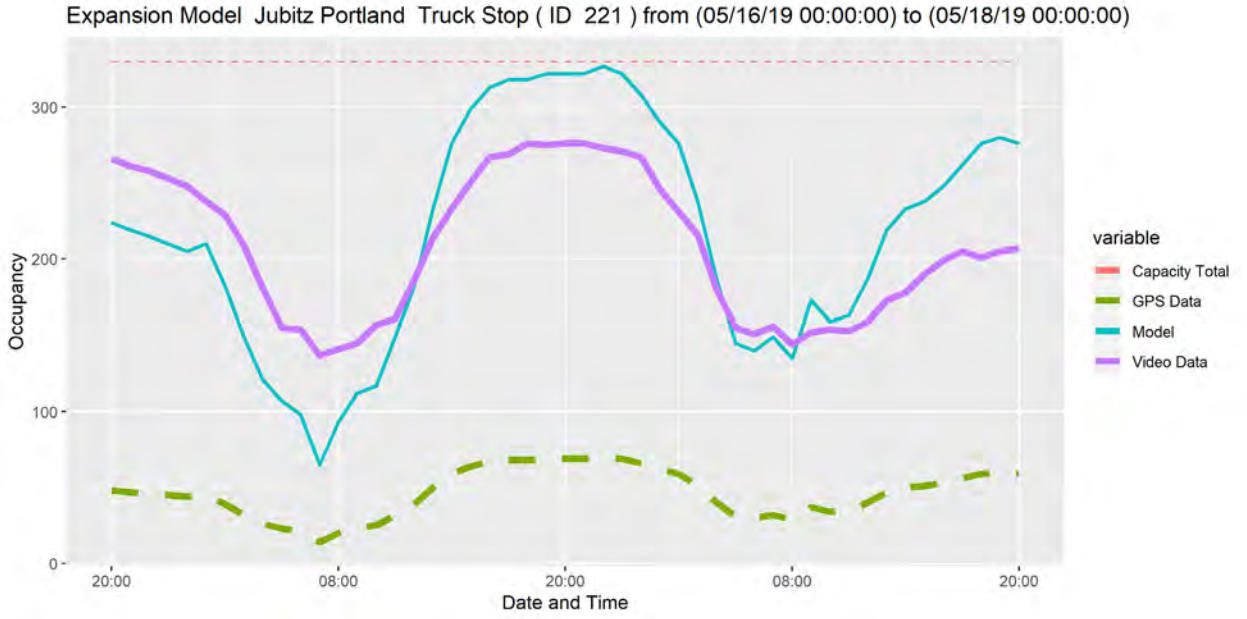

Expansion Model Ontario Pilot Truck Stop (ID 240) from (06/28/19 05:00:00) to (07/06/19 00:00:00)
Occupancy
90
60
30
20:00
20:00
20:00
20:00
Date and Time
variable
Capacity Total
GPS Data
Model
Park my Truck Data

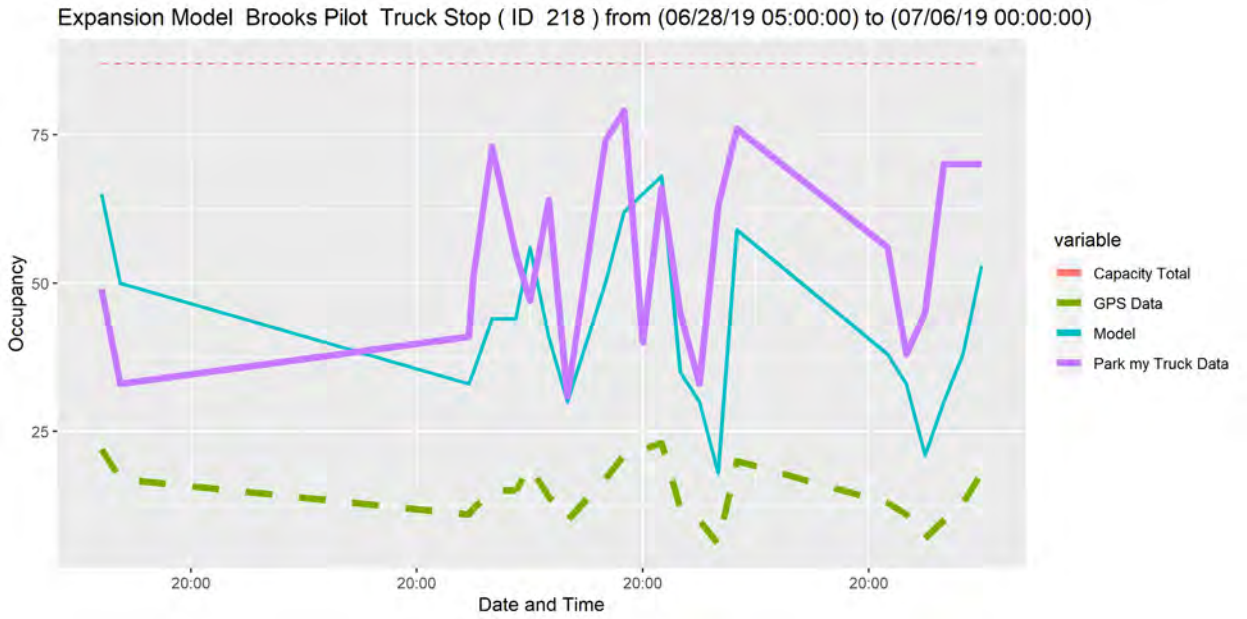

Expansion Model Biggs Junction Pilot Truck Stop (ID 253) from (06/28/19 05:00:00) to (07/06/19 00:00:00)
Occupancy
40
30
20
10
20:00
20:00
20:00
20:00
Date and Time
variable
Capacity Total
GPS Data
Model
Park my Truck Data

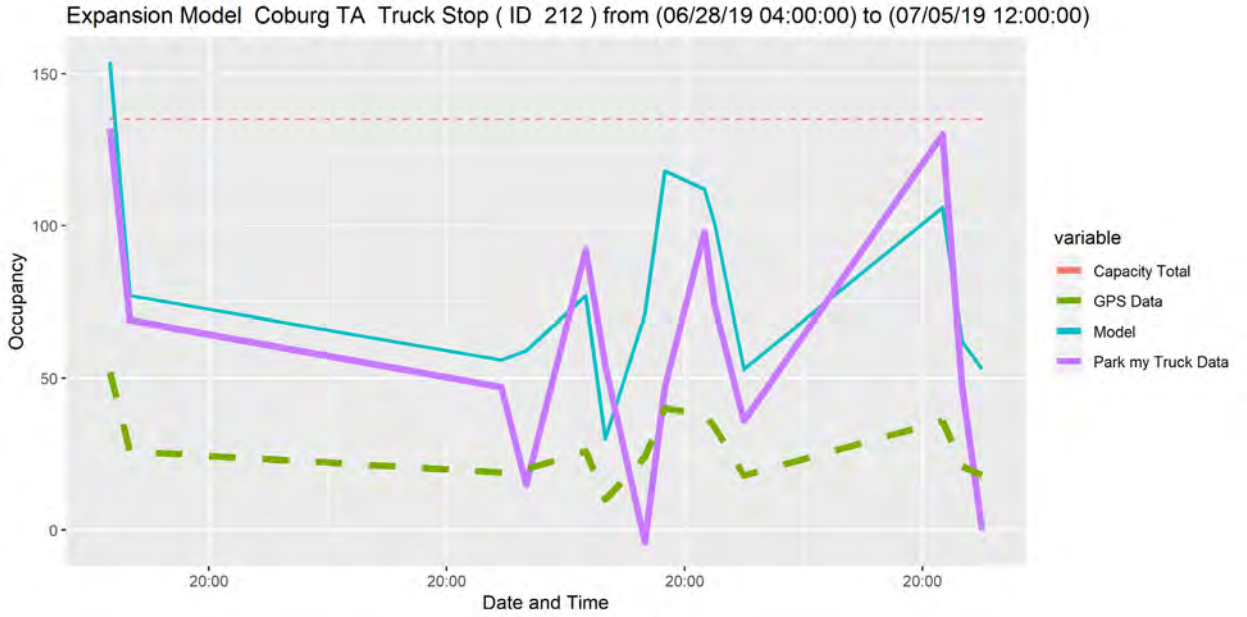

Expansion Model Stanfield Pilot Truck Stop (ID 232) from (06/28/19 05:00:00) to (07/06/19 00:00:00)
Occupancy
125
100
75
50
25
20:00
20:00
20:00
20:00
Date and Time
variable
Capacity Total
GPS Data
Model
Park my Truck Data

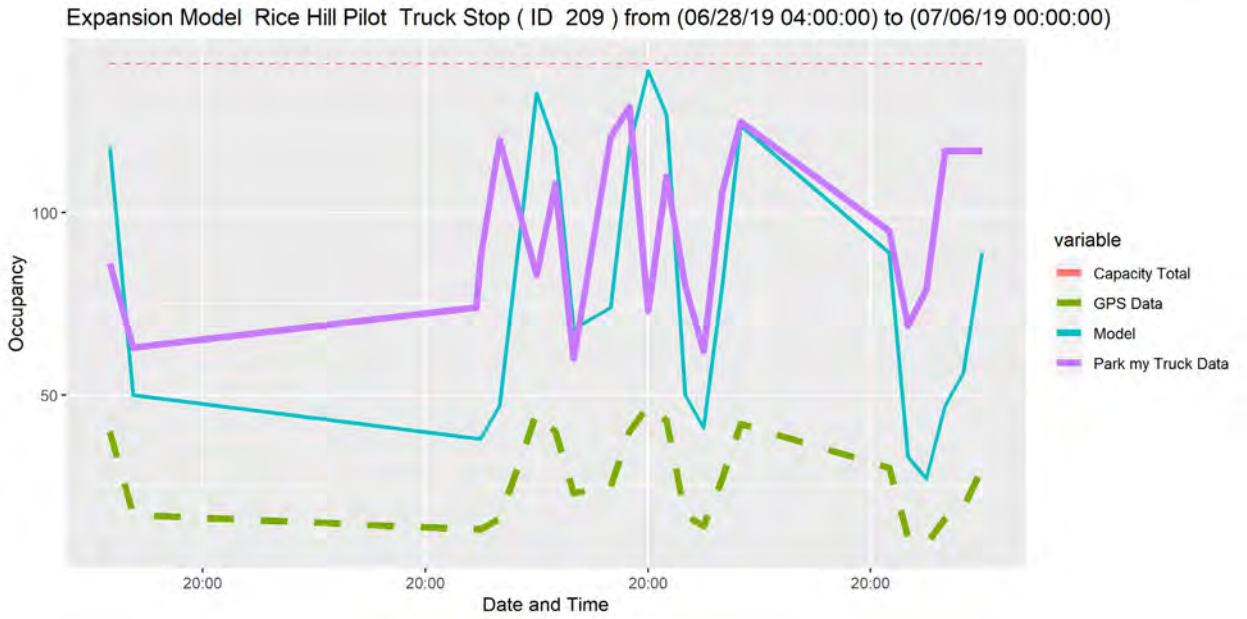

Expansion Model Troutdale TA Truck Stop (ID 227) from (06/19/19 00:00:00) to (07/05/19 13:00:00)
Occupancy
250
200
150
100
50
20:00
20:00
Date and Time
variable
Capacity Total
GPS Data
Model
Park my Truck Data
Video Data

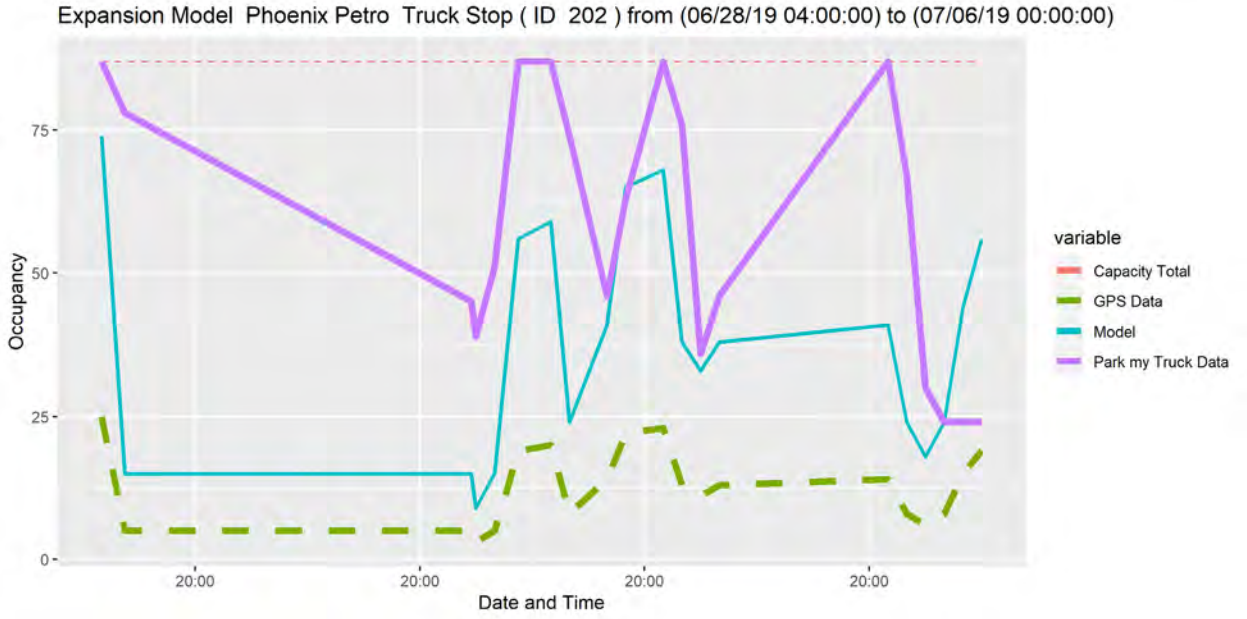

Expansion Model Auroura Flying J Truck Stop (ID 219) from (06/28/19 05:00:00) to (07/06/19 00:00:00)
Occupancy
120
90
60
30
20:00
20:00
20:00
20:00
Date and Time
variable
Capacity Total
GPS Data
Model
Park my Truck Data

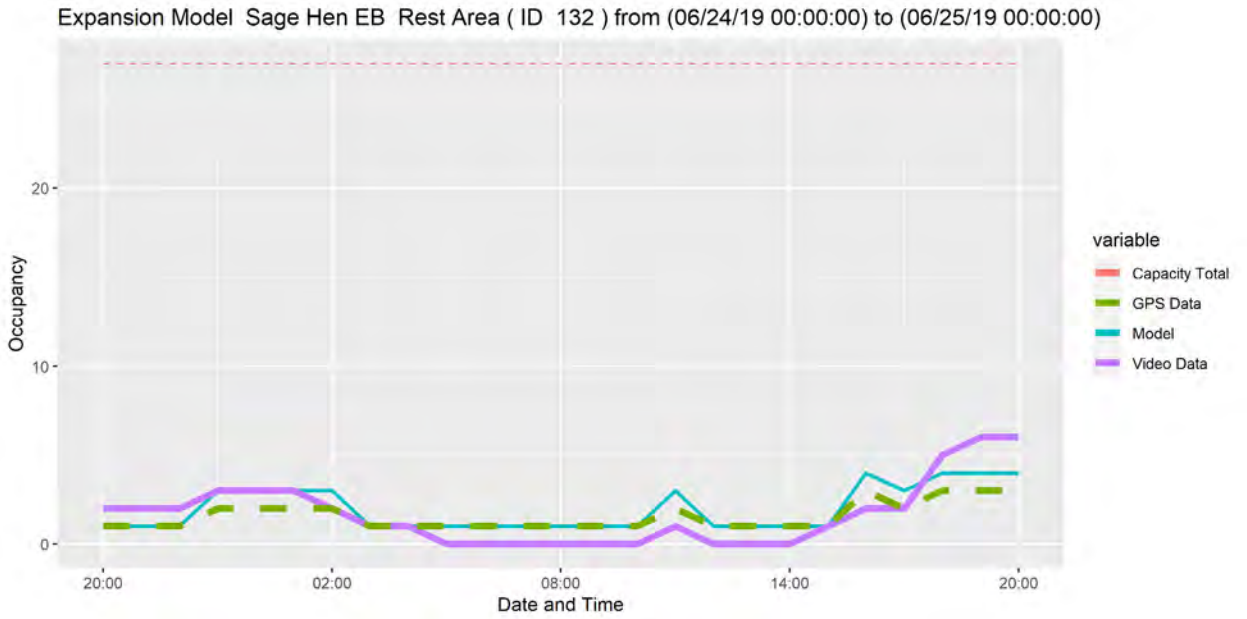

Expansion Model Jubitz Portland Truck Stop (ID 221) from (05/16/19 00:00:00) to (05/18/19 00:00:00)
Occupancy
300
200
100
0
20:00
08:00
20:00
08:00
20:00
Date and Time
variable
Capacity Total
GPS Data
Model
Video Data

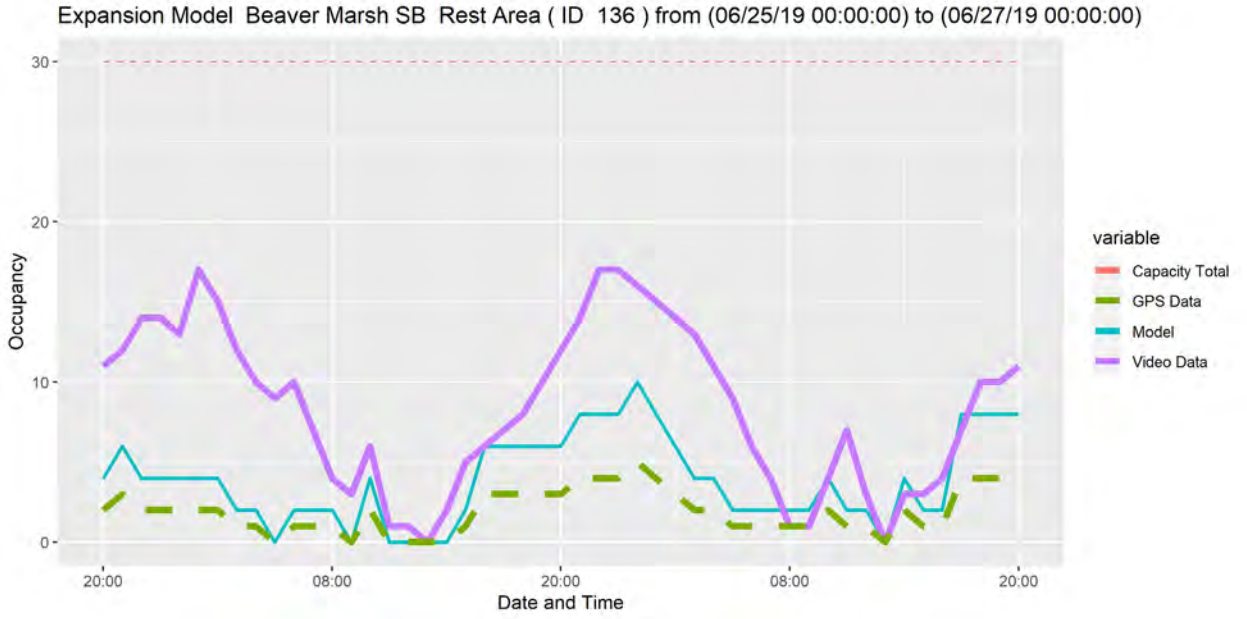

Expansion Model Brooks Pilot Truck Stop (ID 218) from (06/28/19 05:00:00) to (07/06/19 00:00:00)
Occupancy
75
50
25
20:00
20:00
20:00
20:00
Date and Time
variable
Capacity Total
GPS Data
Model
Park my Truck Data

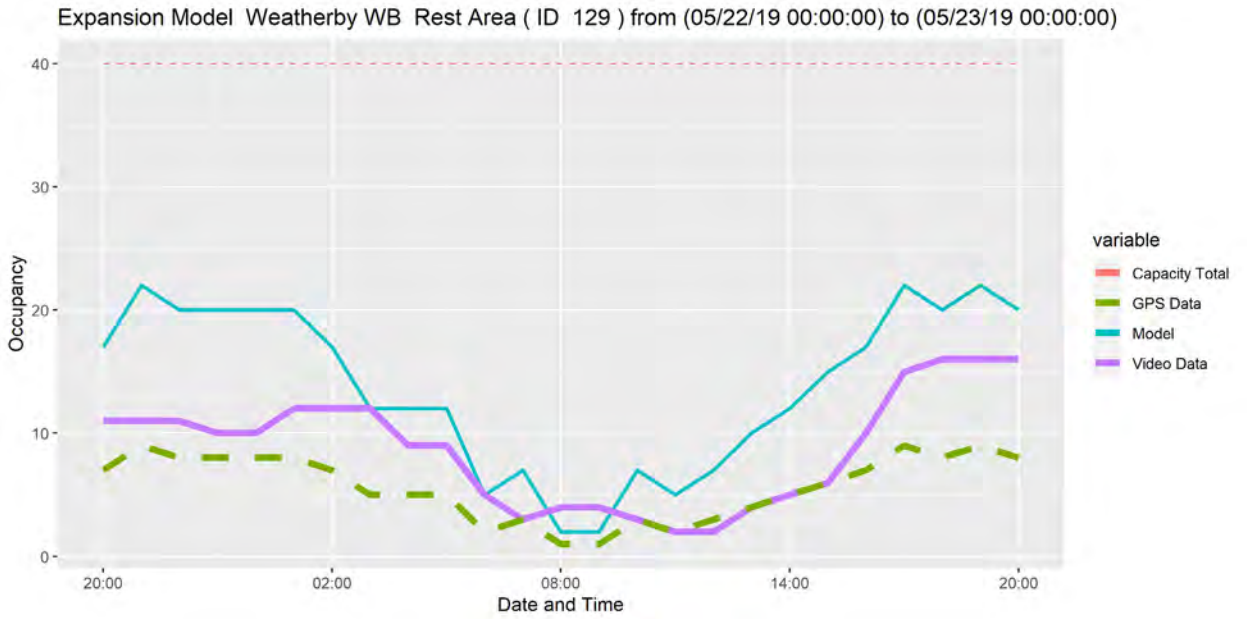

Expansion Model Coburg TA Truck Stop (ID 212) from (06/28/19 04:00:00) to (07/05/19 12:00:00)
Occupancy
150
100
50
0
20:00
20:00
20:00
20:00
Date and Time
variable
Capacity Total
GPS Data
Model
Park my Truck Data

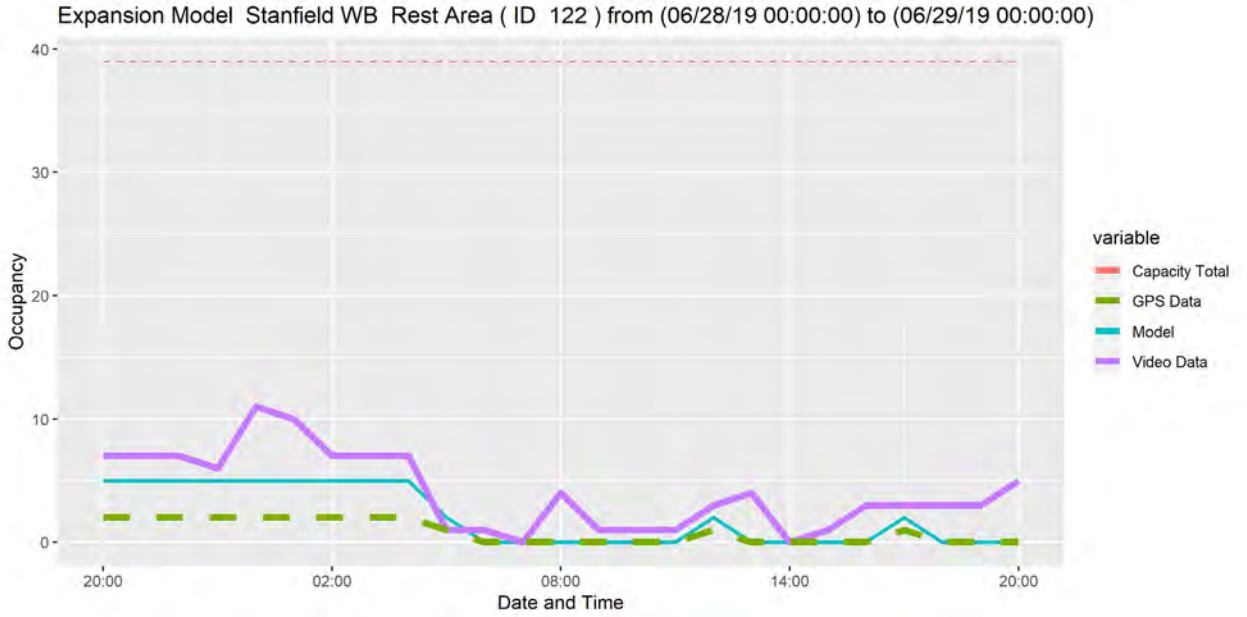

Expansion Model Rice Hill Pilot Truck Stop (ID 209) from (06/28/19 04:00:00) to (07/06/19 00:00:00)
Occupancy
100
50
20:00
20:00
20:00
20:00
Date and Time
variable
Capacity Total
GPS Data
Model
Park my Truck Data

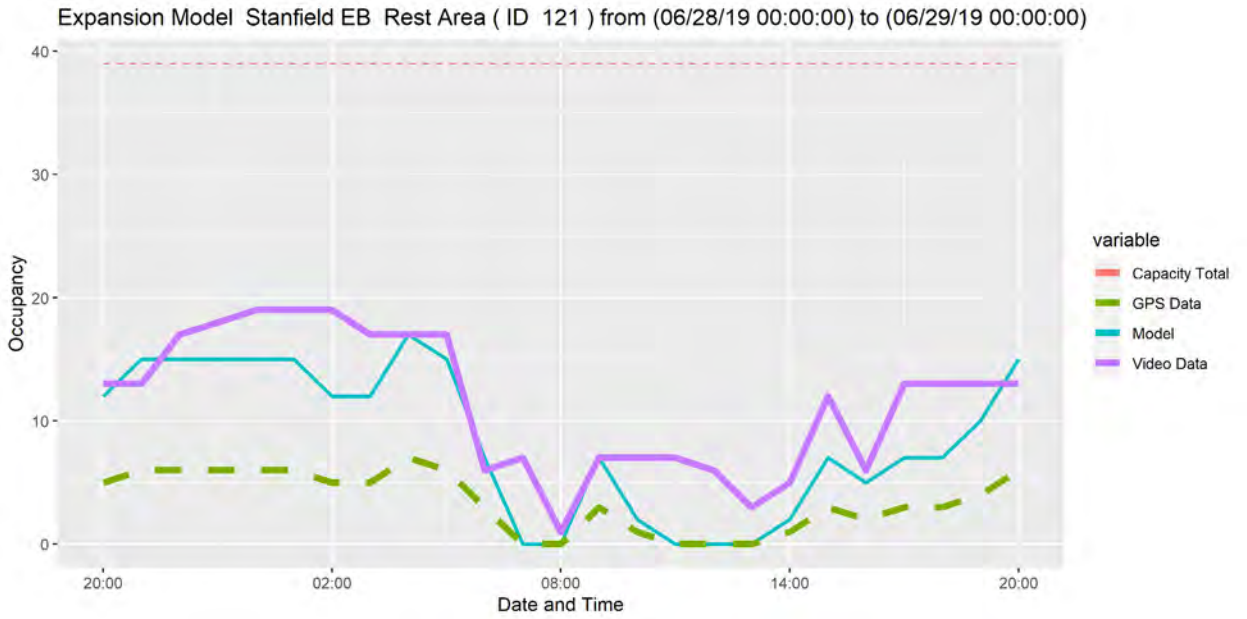

Expansion Model Phoenix Petro Truck Stop (ID 202) from (06/28/19 04:00:00) to (07/06/19 00:00:00)
Occupancy
75
50
25
0
20:00
20:00
20:00
20:00
Date and Time
variable
Capacity Total
GPS Data
Model
Park my Truck Data

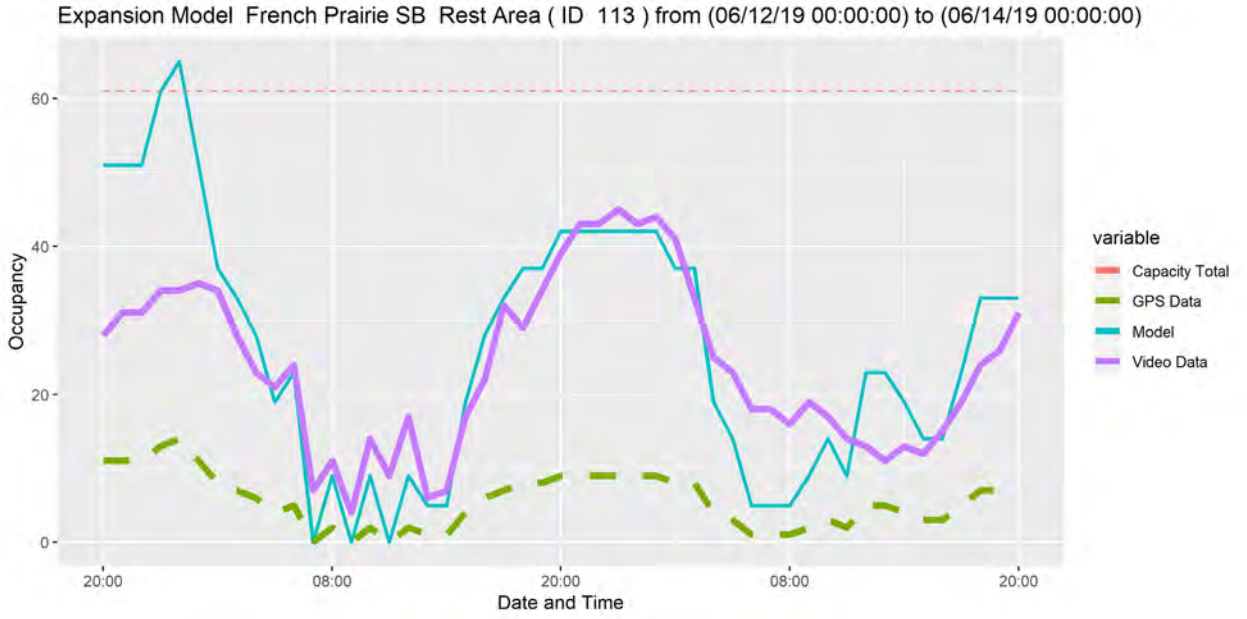

Expansion Model Sage Hen EB Rest Area (ID 132) from (06/24/19 00:00:00) to (06/25/19 00:00:00)
Occupancy
20
10
0
20:00
02:00
08:00
14:00
20:00
Date and Time
variable
Capacity Total
GPS Data
Model
Video Data

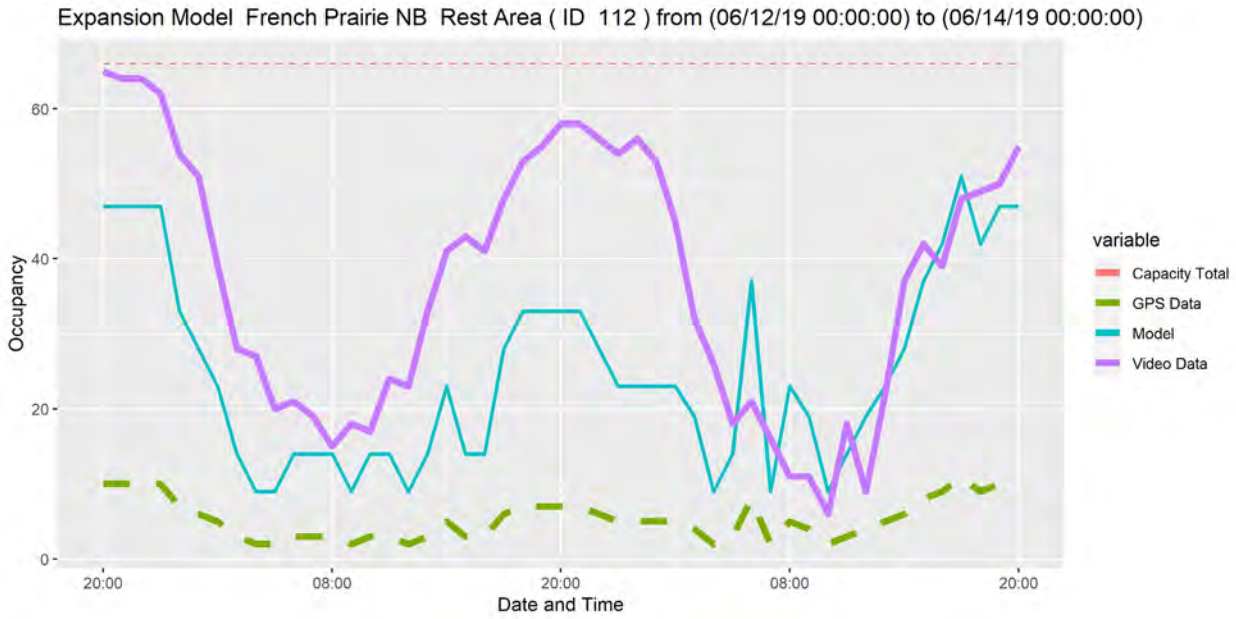

Expansion Model Beaver Marsh SB Rest Area (ID 136) from (06/25/19 00:00:00) to (06/27/19 00:00:00)
Occupancy
30
20
10
0
20:00
08:00
20:00
08:00
20:00
Date and Time
variable
Capacity Total
GPS Data
Model
Video Data

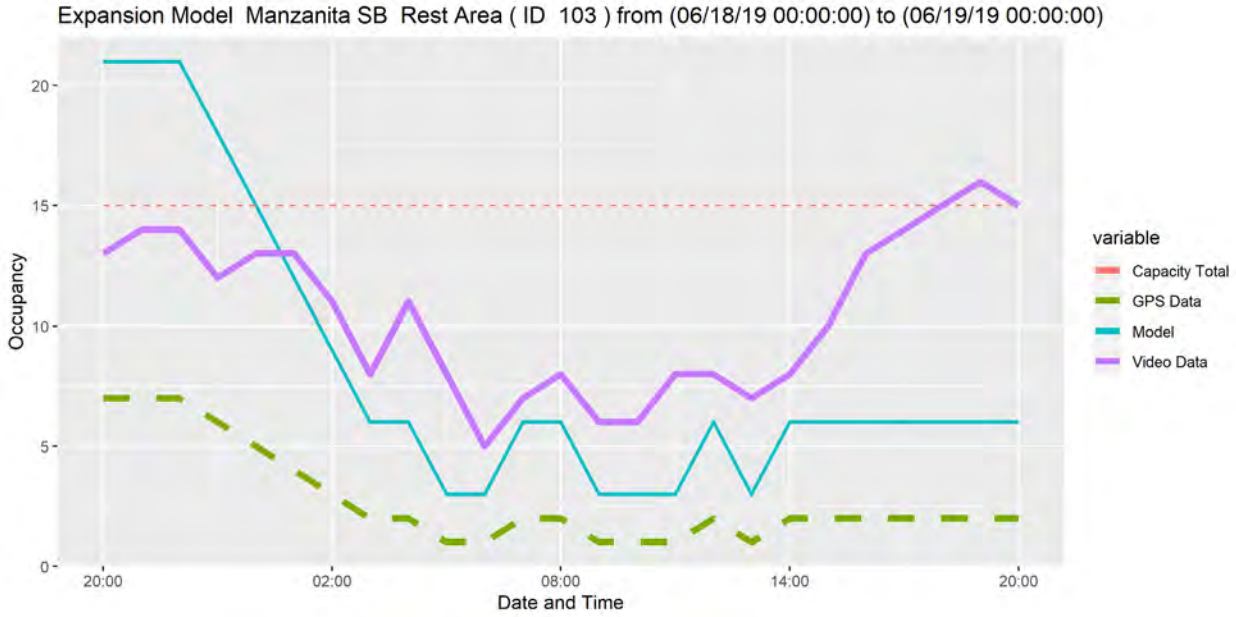

Expansion Model Weatherby WB Rest Area (ID 129) from (05/22/19 00:00:00) to (05/23/19 00:00:00)
Occupancy
40
30
20
10
0
20:00
02:00
08:00
14:00
20:00
Date and Time
variable
Capacity Total
GPS Data
Model
Video Data

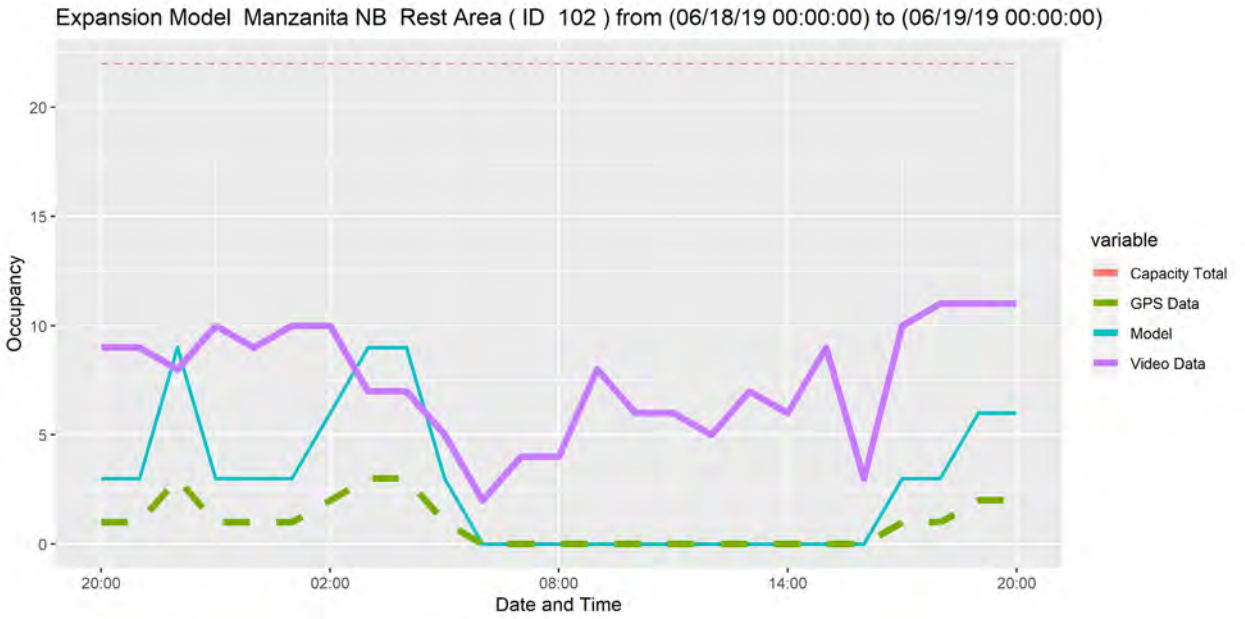

Expansion Model Stanfield WB Rest Area (ID 122) from (06/28/19 00:00:00) to (06/29/19 00:00:00)
Occupancy
40
30
20
10
0
20:00
02:00
08:00
14:00
20:00
Date and Time
variable
Capacity Total
GPS Data
Model
Video Data


Expansion Model Stanfield EB Rest Area (ID 121) from (06/28/19 00:00:00) to (06/29/19 00:00:00)
Occupancy
40
30
20
10
0
20:00
02:00
08:00
14:00
20:00
Date and Time
variable
Capacity Total
GPS Data
Model
Video Data


Expansion Model French Prairie SB Rest Area (ID 113) from (06/12/19 00:00:00) to (06/14/19 00:00:00)
Occupancy
60
40
20
0
20:00
08:00
20:00
08:00
20:00
Date and Time
variable
Capacity Total
GPS Data
Model
Video Data

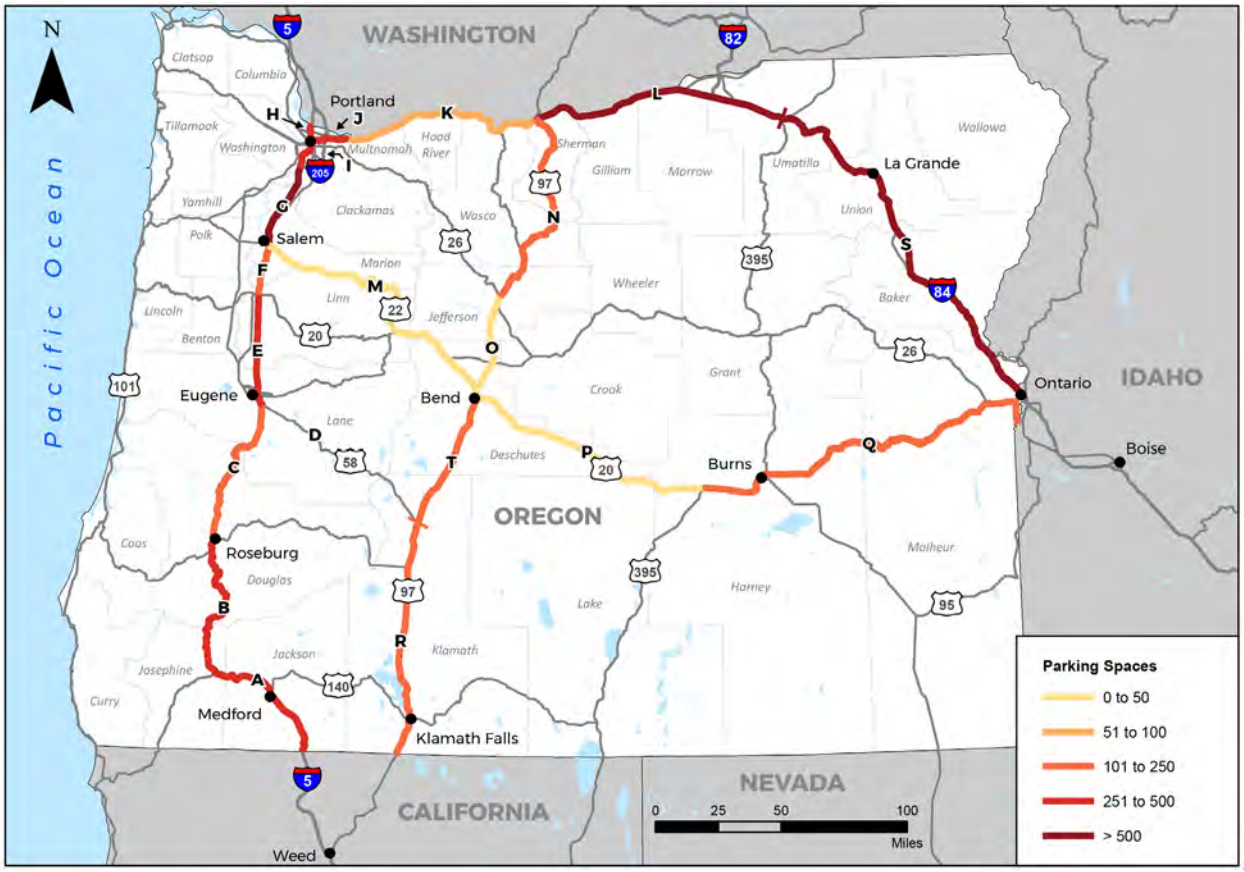

Expansion Model French Prairie NB Rest Area (ID 112) from (06/12/19 00:00:00) to (06/14/19 00:00:00)
Occupancy
60
40
20
0
20:00
08:00
20:00
08:00
20:00
Date and Time
variable
Capacity Total
GPS Data
Model
Video Data


Expansion Model Manzanita SB Rest Area (ID 103) from (06/18/19 00:00:00) to (06/19/19 00:00:00)
Occupancy
20
15
10
5
0
20:00
02:00
08:00
14:00
20:00
Date and Time
variable
Capacity Total
GPS Data
Model
Video Data

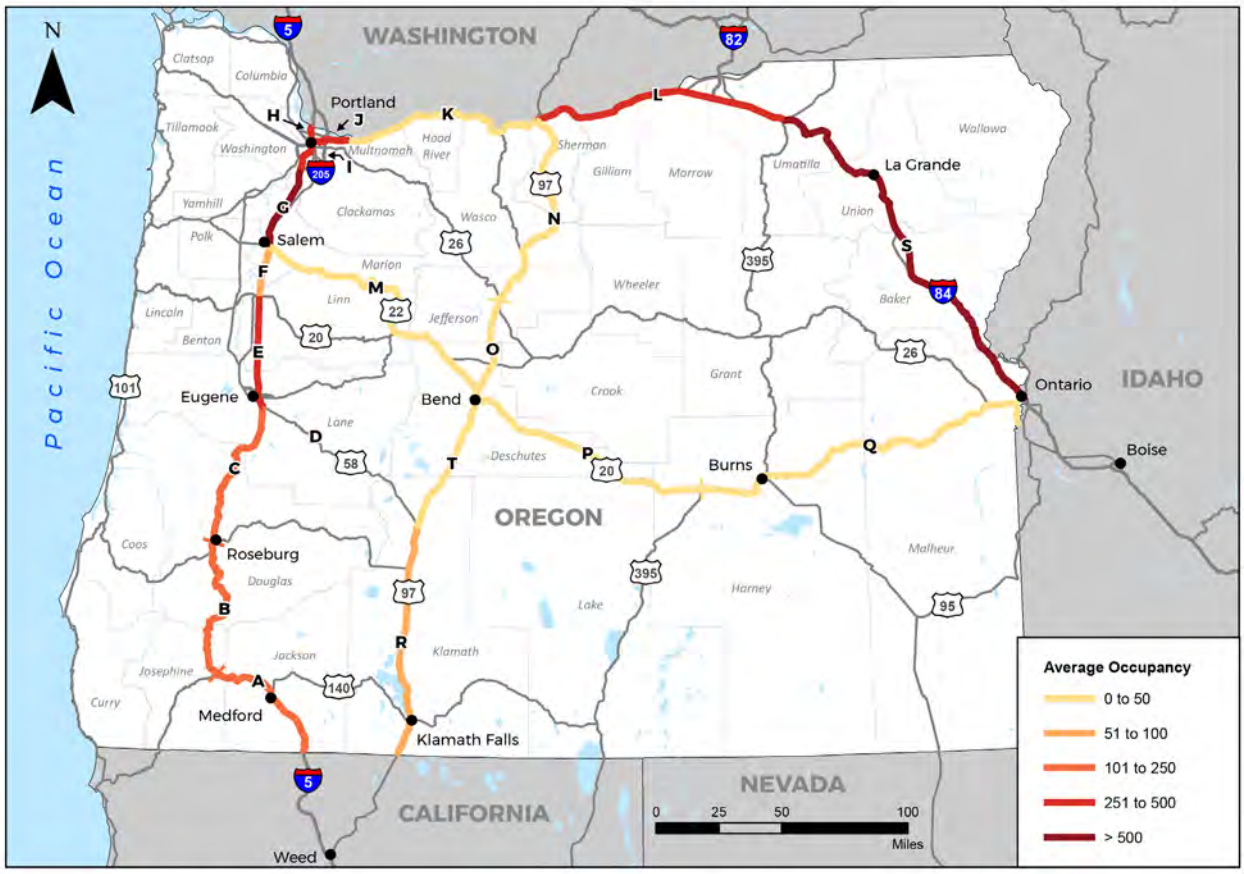

Expansion Model Manzanita NB Rest Area (ID 102) from (06/18/19 00:00:00) to (06/19/19 00:00:00)
Occupancy
20
15
10
5
0
20:00
02:00
08:00
14:00
20:00
Date and Time
variable
Capacity Total
GPS Data
Model
Video Data

11. APPENDIX D: ADDITIONAL SUPPLY AND DEMAND MAPS

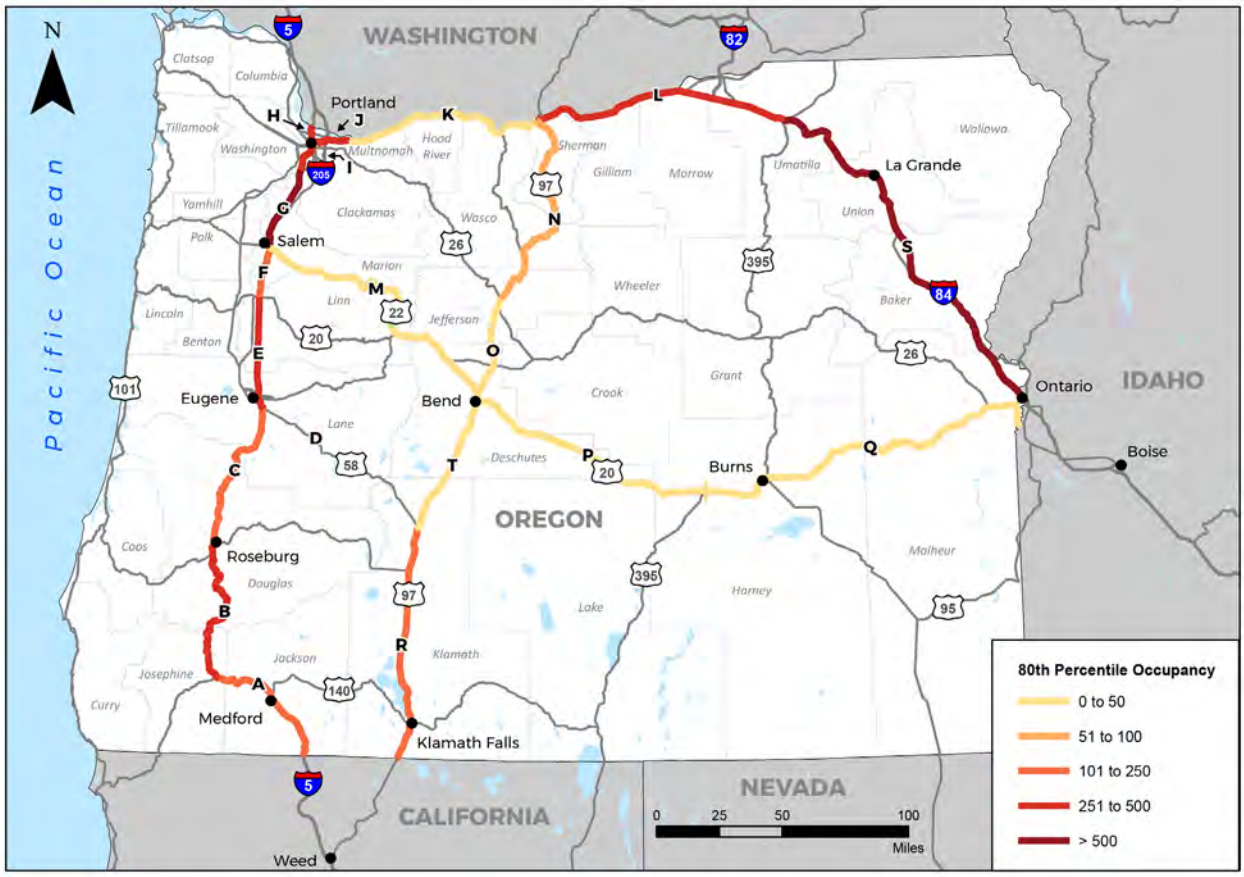
Supply of Designated Parking Spaces per Segment



Average Occupancy Midnight on Weekdays



Worst Case (80h percentile) Occupancy Midnight on Weekdays



APPENDIX G

FUTURE PARKING DEMAND ANALYSIS TECHNICAL MEMORANDUM

OREGON COMMERCIAL TRUCK PARKING STUDY

Date: December 18, 2019

Subject: Future Parking Demand Analysis - Technical Memorandum #6

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1. INTRODUCTION

The purpose of this Memorandum is to estimate truck parking demand in 2040 using the baseline results described in the Current Demand Analysis Technical Memorandum. This memo first describes the forecasting methodology, which is based on growth rates from the Oregon Department of Transportation (ODOT) Statewide Integrated Model (SWIM). The future demand results are then presented and an assessed against the current supply. Only designated parking demand, which considers parking at rest areas or truck stops, is forecasted. Parking in undesignated locations, such as on shoulders and adjacent lots, was not considered in this analysis.

The current supply of parking was used because there are no plans to increase parking at ODOT's rest stops and there is no information from the truck stop owners on how many additional parking spaces they would be adding. The results provide an indication of the number of parking spaces that need to be added to the corridors to avoid significant shortfalls. This memorandum concludes with a discussion of the factors that might cause parking demand in 2040 to be different from the values predicted.

2. METHODOLOGY

Truck parking demand was forecasted by escalating current parking demand by the growth rate in the Oregon Statewide Integrated Model (SWIM)[1]. This model translates economic forecasts by industry into inbound and outbound commodity flows, and then assigns these flows to the network based on transportation costs faced by users, such as travel time and operating costs. As a result, the model simulates how truck volumes will evolve year-over-year along Oregon's highways.

The Oregon Department of Transportation ran SWIM out to year 2040—the analysis horizon for this study—and forecast truck traffic volumes for the analysis segments. A linear growth rate for years 2019-2040 was then calculated for each corridor segment, summarizing the percentage growth in truck activity forecasted by the model. These growth rates are shown Figure 1.

The fastest growth is expected in Segment O on US 97 and Segment Q on US 20. The smallest growth rates are expected along I-5. The linear growth rates were then applied to the current average truck volumes per segment, as reported in the Highway Performance Monitoring System (HPMS), to obtain the average truck volumes in 2040. The forecast results can be found in Table 1.

The future truck parking demand was estimated by assuming that it grows proportionately to truck volumes. For example, a 20 percent increase in truck volumes on a particular segment was assumed to increase truck parking demand on that segment by 20 percent. It is assumed that growth rates from SWIM are representative of the trucks that use parking facilities. As described in the literature review memo, other similar studies have made this assumption. The truck volume in SWIM includes both long haul and short haul trucks, so it is possible that one of these types of trucking grows faster than the other. However, there is no information available to anticipate these shifts.

[1] https://www.oregon.gov/ODOT/Planning/Documents/Statewide-Integrated-Model-Vers2-5.pdf

Figure 1: SWIM Truck Volume Annual Linear Growth Rate – 2019 to 2040

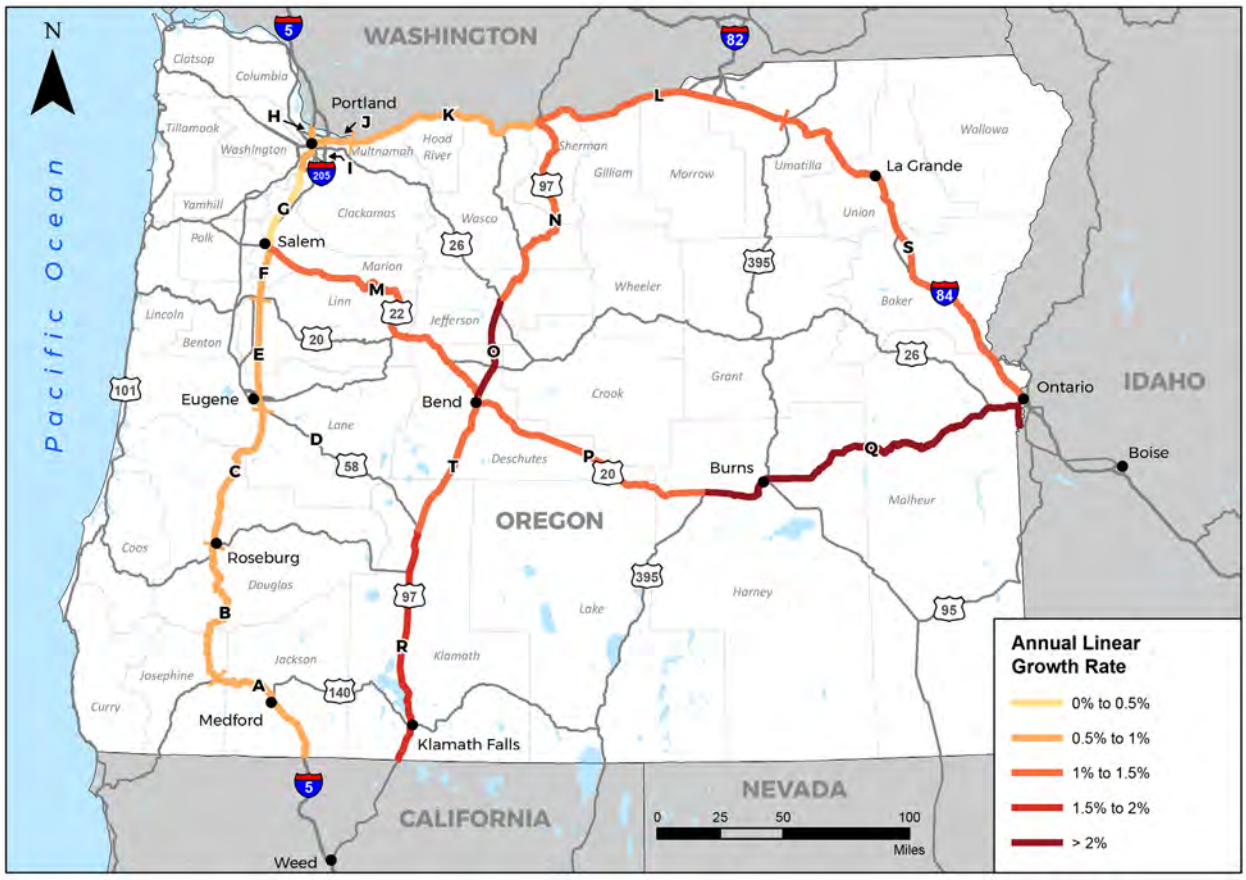


Table 1: Truck Volume Forecasts by Corridor

Segment	Segment Length	Truck AADT 2017	Estimated Truck AADT 2040	Annual Forecast Growth Rate	% Growth 2017 to 2040
A (I-5)	56	6,216	7,162	0.66%	15.22%
B (I-5)	68	7,945	9,132	0.65%	14.94%
C (I-5)	64	8,856	10,345	0.73%	16.81%
E (I-5)	45	10,028	11,307	0.55%	12.76%
F (I-5)	21	12,114	13,597	0.53%	12.24%
G (I-5)	35	16,131	17,515	0.37%	8.58%
H (I-5)	20	11,551	13,015	0.55%	12.67%
J (I-84)	16	7,504	8,440	0.54%	12.47%
K (I-84)	86	6,131	7,280	0.81%	18.74%
L (I-84)	105	4,616	5,756	1.07%	24.70%
S (I-84)	169	4,140	5,330	1.25%	28.74%
M (OR 22)	126	1,291	1,622	1.11%	25.60%
N (US 97)	93	1,180	1,481	1.11%	25.54%
O (US 97)	42	3,124	5,038	2.66%	61.28%
R (US 97)	96	1,881	2,727	1.96%	44.97%
T (US 97)	58	1,592	2,060	1.28%	29.42%
P (US 20)	104	556	720	1.28%	29.44%
Q (US 20)	160	713	1,162	2.74%	62.92%
Total	*1,364*	*4,132*	*4,995*	*1.01%*	*20.89%*

** Segments D and I are not included because those highways do not have any parking facilities.*

3. Results and Conclusions

As can be seen in Figure 2, Segment S along I-84 will see the largest growth in parking demand between 2019 and 2040, which will result in an additional 144 trucks parked on weekdays during midnight. Segment L, also along I-84, will see the second highest additional parked trucks, at 87. Segment G on US 97 will see the third highest increase in parking demand, a total of 49 trucks needing parking by 2040.

Note that the segments that are expected to see the fastest percentage growth in truck volumes, such as O, P and Q, are not expected to see significant increases in the number of trucks parked because the baseline (2019) truck volumes are very small at present. Despite having slower percentage growth rates, all of the segments along I-5 are expected to see significant increases in demand, because they are starting from a high base. Figure 3 on page 6 visualizes this.

Figure 2: Increase in Truck Parking Demand (2019 to 2040) on Weekdays at Midnight

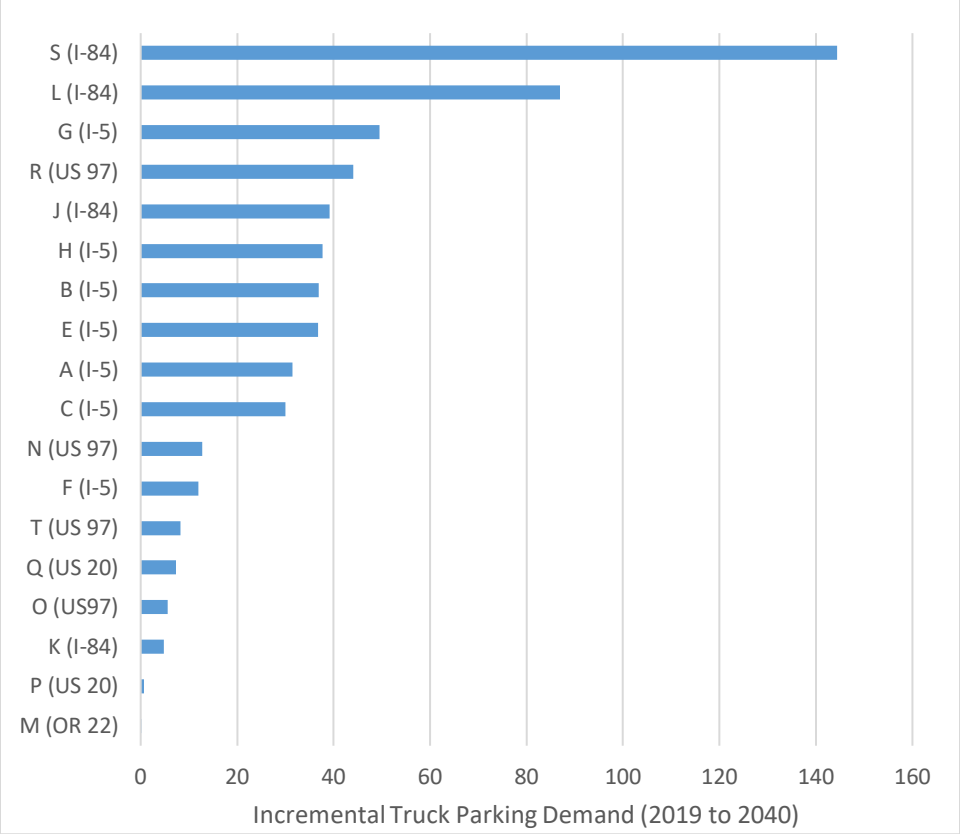
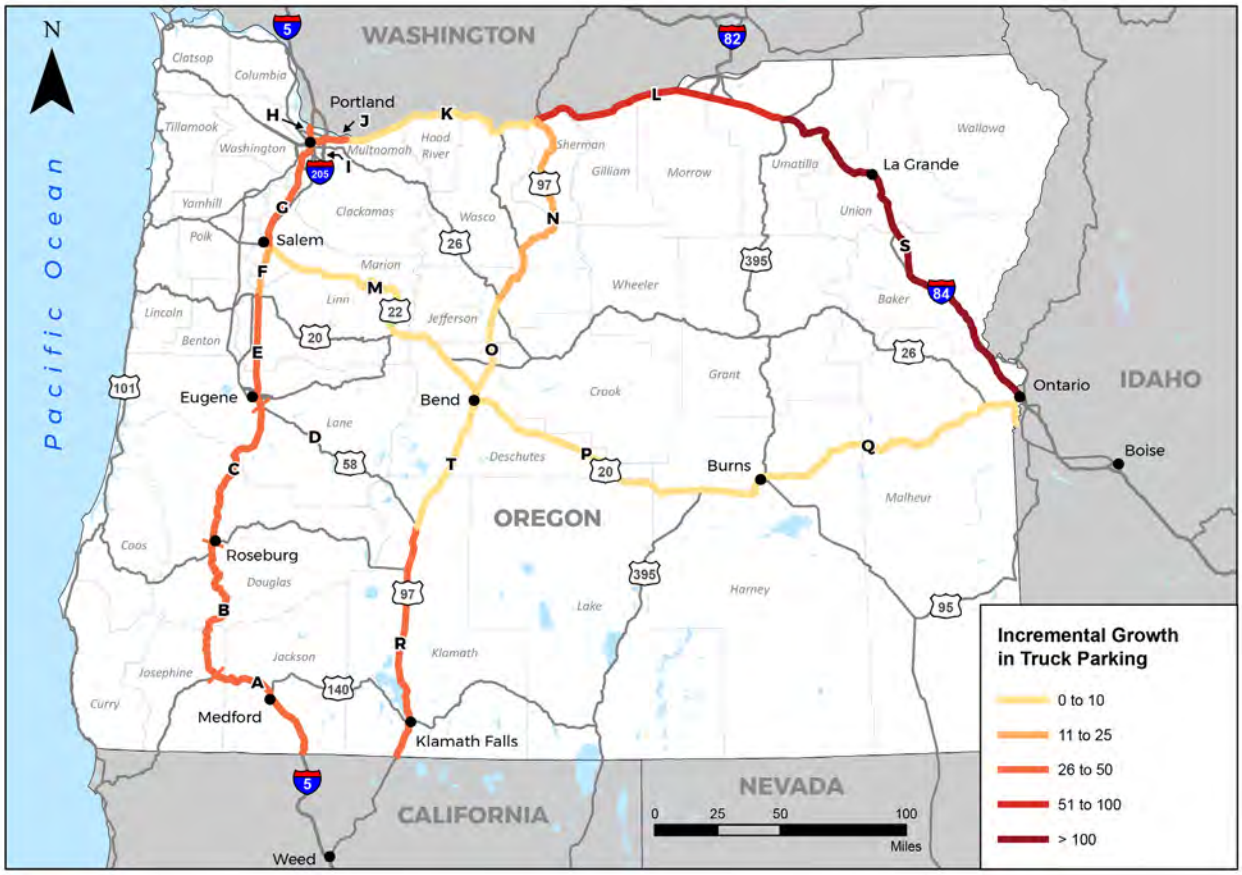


Figure 3: Average Increase in Truck Parking Demand (2019 to 2040) on Weekdays at Midnight



The increase in truck parking demand to 2040 is expected to overcome the supply of parking on average in segments G, J, and C (see Table 2), which are the three segments identified in the Current Demand Analysis Technical Memorandum as having limited availability in 2019. It is also forecasted that Segment H will reach capacity during this time period.

Looking at availability in worst case conditions—defined as having 80th percentile demand—several other segments are expected to reach capacity by 2040. This includes segments A, B, and S. And, as would be expected, in worst case conditions the shortfall of spaces predicted in segments G, J, and C is expected to be even bigger.

Table 2: 2040 Parking Supply-Demand Balance Weekdays at Midnight

Segment	Segment Length (mi)	Supply of Parking Spaces (striped Only)	Supply of Parking Spaces (striped and unstriped)	Number of Spaces Needed in 2040 (Avg. Demand)	Number of Spaces Needed to meet 80th Percentile Demand	Availability in 2040 (Supply Minus Avg. Demand)	Worst Case Availability in 2040 (Supply Minus 80th Percentile Demand)
A (I-5)	55.7	258	258	238	273	20	-15
B (I-5)	68.4	282	310	284	333	26	-23
C (I-5)	64.2	175	200	209	242	-9	-42
E (I-5)	44.9	162	385	325	378	60	7
F (I-5)	20.6	95	127	110	127	17	0
G (I-5)	34.6	569	582	626	693	-44	-111
H (I-5)	19.9	337	337	335	375	2	-38
J (I-84)	15.9	333	333	354	396	-21	-63
K (I-84)	85.9	41	56	31	40	25	16
L (I-84)	105	435	595	439	487	156	108
S (I-84)	168.6	515	693	647	739	46	-46
M (OR 22)	126.4	10	15	0	0	15	15
N (US 97)	92.8	131	139	63	74	76	65
O (US 97)	41.9	0	20	15	19	5	1
R (US 97)	96.1	169	226	142	173	84	53
T (US 97)	58.3	52	202	36	48	166	154
P (US 20)	104.3	7	7	3	5	4	2
Q (US 20)	160.5	87	104	19	26	85	78
Total	***1,364***	***3,658***	***4,589***	***3,875***	***4,748***	***714***	***159***

Figure 4: 2040 Average Availability of Truck Parking (Supply minus Demand) Weekdays at Midnight

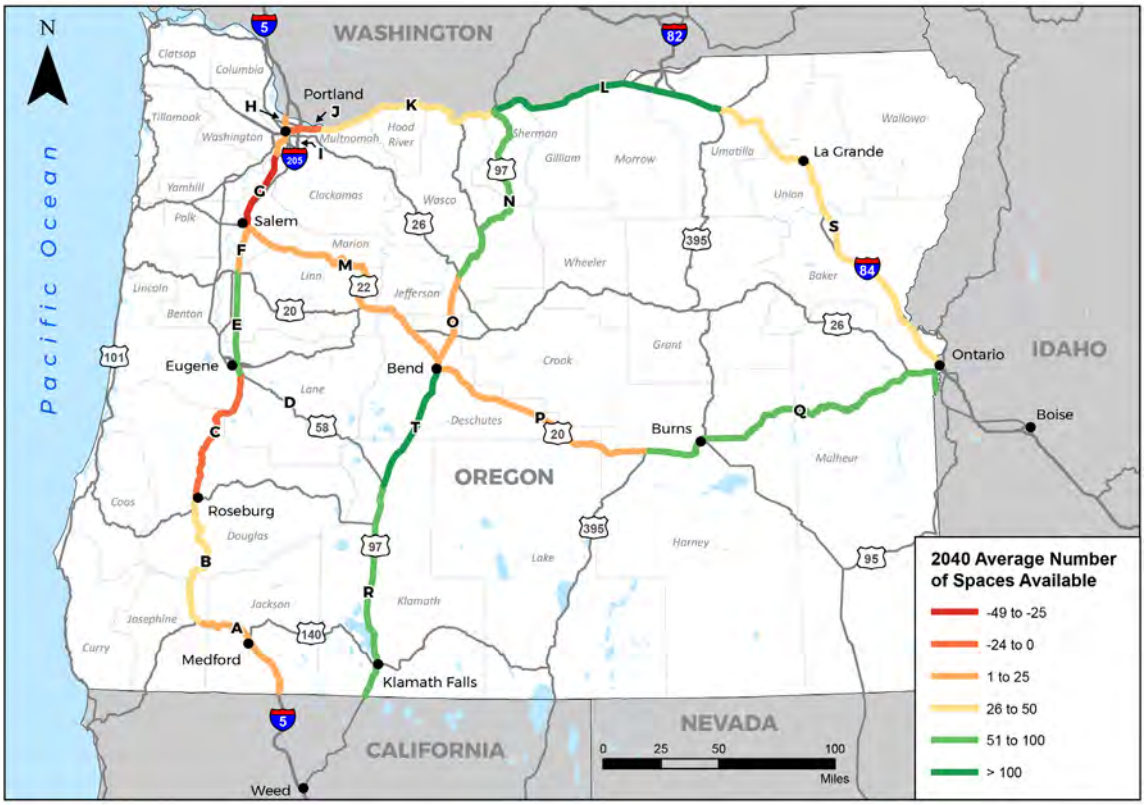


Figure 5: 2040 Worst Case Shortfall (Supply minus 80th Percentile Demand) Weekdays at Midnight

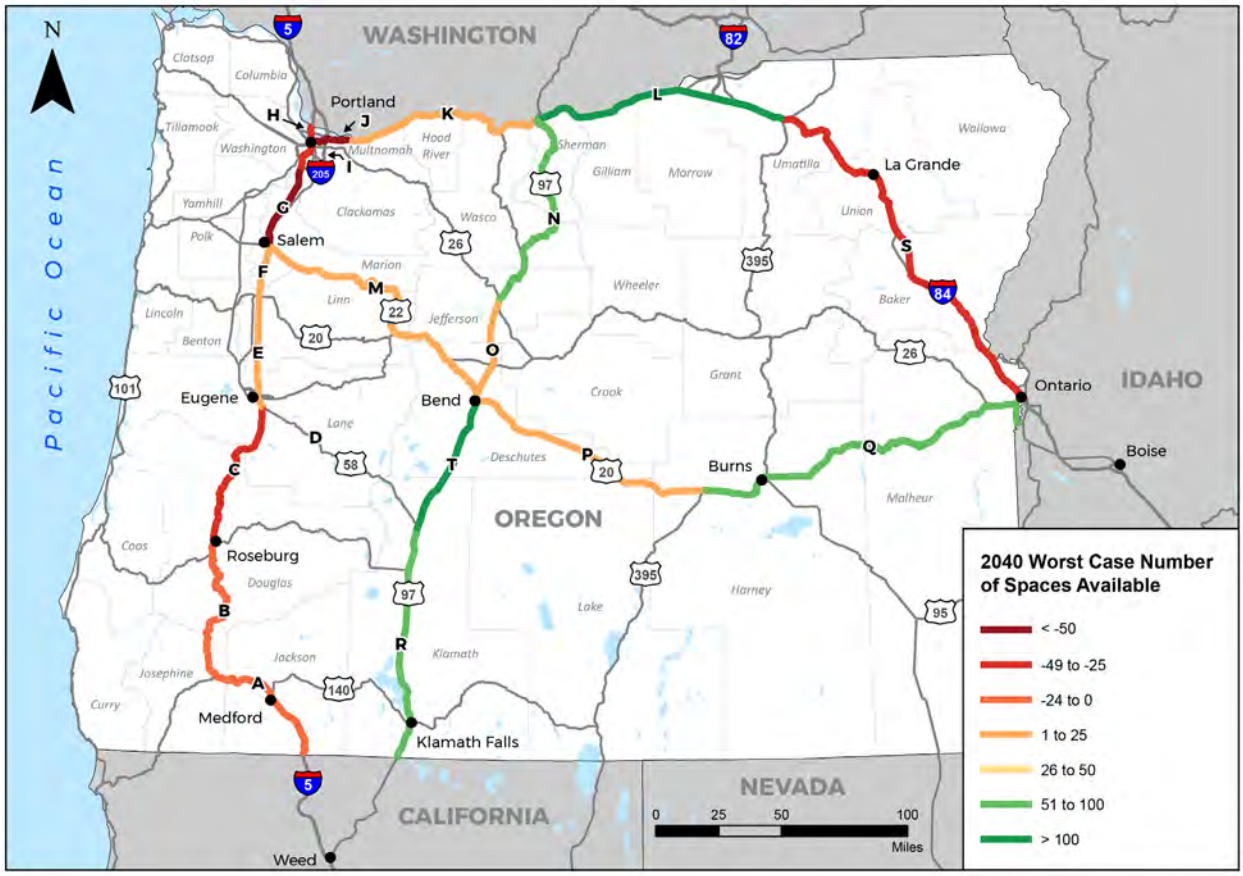


Table 3 shows the results normalized by segment distance. For example, if a segment is 10 miles long and is short 20 parking spaces, then it would need 2 parking spaces per mile. The numbers in red indicate a shortfall in the average demand in 2040.

Table 3: 2040 Parking Supply-Demand Balance Per Mile Weekdays at Midnight

Segment	Segment Length (mi)	Supply of Parking Spaces (striped Only) / mi	Supply of Parking Spaces (striped and unstriped) / mi	Number of Spaces Needed in 2040 (Avg. Demand) / mi	Number of Spaces Needed to meet 80th Percentile Demand / mi	Availability in 2040 (Supply Minus Avg. Demand) / mi	Worst Case Availability in 2040 (Supply Minus 80th Percentile Demand) / mi
A (I-5)	55.7	4.63	4.63	4.28	4.90	0.35	-0.27
B (I-5)	68.4	4.12	4.53	4.15	4.87	0.38	-0.34
C (I-5)	64.2	2.73	3.12	3.25	3.77	-0.14	-0.65
E (I-5)	44.9	3.61	8.57	7.23	8.42	1.34	0.16
F (I-5)	20.6	4.61	6.17	5.32	6.16	0.85	0.01
G (I-5)	34.6	16.45	16.82	18.10	20.04	-1.28	-3.22
H (I-5)	19.9	16.93	16.93	16.82	18.85	0.11	-1.92
J (I-84)	15.9	20.94	20.94	22.25	24.88	-1.30	-3.94
K (I-84)	85.9	0.48	0.65	0.36	0.47	0.30	0.18
L (I-84)	105	4.14	5.67	4.18	4.63	1.49	1.03
S (I-84)	168.6	3.05	4.11	3.84	4.39	0.27	-0.28
M (OR 22)	126.4	0.08	0.12	0.00	0.00	0.12	0.12
N (US 97)	92.8	1.41	1.50	0.68	0.80	0.82	0.70
O (US 97)	41.9	0.00	0.48	0.35	0.46	0.12	0.02
R (US97)	96.1	1.76	2.35	1.48	1.80	0.87	0.55
T (US 97)	58.3	0.89	3.46	0.62	0.82	2.84	2.64
P (US 20)	104.3	0.07	0.07	0.03	0.05	0.04	0.02
Q (US 20)	160.5	0.54	0.65	0.12	0.16	0.53	0.49
Total	***1364***	***2.68***	***3.36***	***2.84***	***3.48***	***0.52***	***0.12***

3.1 Truck Stop Expansion Plans

It is likely more parking spaces will be constructed by the private sector in the following two decades. We interviewed a number of truck, rest stop and ports of entry owners and operators as a supplement to the stakeholder survey. The survey and interview findings generally support the findings that there is a notable parking shortage in certain areas of the state on a regular basis – particularly around the Portland Metropolitan area.

While acknowledging the need for additional parking in many areas, however, the majority of owners or operators interviewed do not have expansion plans. In some cases, there is no room to expand at their location. The Oregon Department of Transportation which owns rest areas

and Ports of Entry, does not have current expansion plans. Port of Entry and weigh stations focus on regulation and enforcement rather than providing parking, in any case.

Most interviewees support new or expanded truck parking, particularly by the private sector, as one tool to mitigate the truck parking shortage. And a few private truck stop operators do have expansion plans. However, private truck stop operators and their associations noted the difficulty in siting and constructing new or expanded parking facilities. Challenges include land use/zoning issues, community acceptance, and costs. Most private truck stops don't charge for parking and currently make their money through gasoline and food services. A few companies indicated plans to start charging for parking by reservation, with the goal of funding needing parking infrastructure.

Thus, while there is acknowledgement of the need for increase truck parking, interviewees cited a number of obstacles. Given the land use, zoning and community acceptance issues, in addition to a mismatch between cost and payment structures, it is unlikely that the private sector will be able to fully address all of the needs on its own in the near future. See last bullet in the Conclusions section about a likely increase in truck parking in undesignated areas. More details on the survey and interview responses can be found in the *Oregon Commercial Truck Parking Study, Survey Summary*.

4. UNCERTAINTIES

Forecasting truck parking demand is challenging because the need for parking depends on multiple variables. Below is a discussion of the key ones:

4.1 Model Accuracy

All models have errors, because they are simplifications of phenomena that cannot be measured directly (either because it hasn't happened yet, as in forecasts, or because it would be too costly to measure). As such, it is possible that the model used to estimate truck parking demand has biases that cause the estimates to over-represent or underrepresent existing and future parking demand. While the model was estimated using an adequate amount of data (achieving statistically significant estimates), unobserved factors could have caused the model to be inaccurate in some segments or parking facility, particularly where no on-the-ground observations were available. However, the model controlled for this by relying on GPS data, which was observed at all of the parking facilities considered. As long as the representativeness of the GPS data does not vary substantially outside of the observed factors of the model, which is likely, the results should be reliable.

Caution should be taken when interpreting the 80th percentile demand estimates, as the GPS Expansion model was estimated to represent the average conditions observed in the observed data, not the tails of the distribution. Other factors could be affecting the 80th percentile estimates, such as the representativeness of the GPS data. In other words, if a higher number of GPS instrumented trucks parked in a facility on a given day, this might just mean that the share of the GPS instrumented trucks is higher on that day, not that the total demand is higher by the same proportion. Additionally, there is a lot of variation in truck parking demand depending on the day of the week, season and other factors. Thus, there is a lot of variation between the average and the worst-case. Because the model was estimated on the average and the variations between the average and the worst-case, we suggest future planning focus on the average rather than the worst-case results.

To quantify the inherent statistical uncertainty in the model used to calculate the expansion factors, a 75 percent confidence interval was estimated for demand by segment in Table 4. This interval indicates that there is a 75 percent chance that the expansion factors fall within the values listed, given the size and noise of the data. Assuming the high estimate of this range leads several segments to observe significant shortfall in spaces in 2040 (these findings differ slightly than comparing the average demand because some segment estimates have more uncertainty than others). The highest would be segment G, followed by segment J and H. These three segments are located in and around Portland. Segment C could also see a significant shortfall in spaces (even though this ranked as one of the top three with most limited availability, it ranks forth by the confidence range because there is less statistical uncertainty about the estimates of this segment than others). There are several other segments that approach capacity, with less than 15 spaces available predicted. This includes segments A, B, F, S, O, and P (where O and P have limited demand and capacity to start with). Note that these

confidence ranges only account for the uncertainty in the model used to estimate the expansion factors. Other sources of uncertainty, particularly regarding the activity forecasts, could worsen availability.

Table 4: Truck Parking Supply/Demand Confidence Range (Average Weekdays at Midnight)

Segment	Segment Length (mi)	Supply of Parking Spaces (striped Only)	Supply of Parking Spaces (striped and unstriped)	Demand in 2040 Confidence Interval	Availability in 2040 Confidence Interval (Supply - Demand)
A (I-5)	55.7	258	258	225 to 250	8 to 33
B (I-5)	68.4	282	310	269 to 298	12 to 41
C (I-5)	64.2	175	200	198 to 219	-19 to 2
E (I-5)	44.9	162	385	307 to 341	44 to 78
F (I-5)	20.6	95	127	103 to 115	12 to 24
G (I-5)	34.6	569	582	577 to 675	-93 to 5
H (I-5)	19.9	337	337	307 to 362	-25 to 30
J (I-84)	15.9	333	333	325 to 383	-50 to 8
K (I-84)	85.9	41	56	29 to 32	24 to 27
L (I-84)	105	435	595	412 to 465	130 to 183
S (I-84)	168.6	515	693	609 to 687	6 to 84
M (OR 22)	126.4	10	15	0 to 0	15 to 15
N (US 97)	92.8	131	139	59 to 68	71 to 80
O (US 97)	41.9	0	20	14 to 16	4 to 6
R (US 97)	96.1	169	226	134 to 153	73 to 92
T (US 97)	58.3	52	202	34 to 39	163 to 168
P (US 20)	104.3	7	7	3 to 3	4 to 4
Q (US 20)	160.5	87	104	18 to 20	84 to 86
Total	***1,364***	***3,658***	***4,589***	***3,624 to 4,124***	465 to 965

4.2 Truck Activity

The amount of freight that needs to be moved in the future has a direct impact on the amount of trucks on the roads and the number of parking spaces needed. Oregon's SWIM model estimated truck activity, growing at an average of 1% per year for the study corridors. This growth rate is smaller but close to the national growth rate for truck tonnage from the Freight Analysis Framework, which is 1.2% compounded annually[2]. Therefore, the growth rate assumed by SWIM falls in line with other estimates.

[2] https://ops.fhwa.dot.gov/publications/fhwahop16083/fhwahop16083.pdf

However, it is possible that truck activity might grow at a different rate over the next 20 years because of changes in consumption and production patterns. The economy could shift in ways that are not anticipated by the model. Nonetheless, SWIM is based on the official Oregon Revenue Forecast produced by the Office of Economic Analysis of the Department of Administrative Services, and therefore it represents the consensus view of long-term changes in the state's economy.

Moreover, the tons that each truck carry may change, impacting the number of trucks on the roads. For example, heavier or longer trucks could become commonplace, requiring fewer vehicles, or the economics of motor carriers could favor smaller trucks providing greater frequency, which would increase truck volumes. The latter is possible if smaller electric trucks become common, or if e-commerce deliveries, which are made in smaller trucks, continue growing at their current pace. E-commerce could also change warehousing and distribution decisions, which in-turn could also affect where long-haul trucks travel to. Increased congestion on the major highways could slow the movement of goods which could mean that more trucks will be needed to deliver or pick up the amount of goods carried by the existing number of trucks. This would also change parking needs.

4.3 Regulations and Policy

The demand forecasts implicitly assume that truck drivers need to stop at the same intervals as they do today. Rest requirements today are regulated by the Federal Hours-of-Service regulations, which could be changed in the future. In fact, the federal government is currently reviewing making changes to these policies to give drivers more flexibility. Additionally, changes in enforcement can affect truck parking. In the recent past, hours of service enforcement changed from manual logs to electronic devices, which affected when and where trucks need to park. With manual reporting, truck drivers had the ability to make slight adjustments to their logged hours in order to complete shipments, while now they are forced to stop, even if they are a short distance from their destination. Although it is not anticipated that enforcement will change in the future, relaxing or tightening these compliance mechanisms could lead to different truck parking patterns.

4.4 Connected and Autonomous Technologies

In the medium term and long term, connected and autonomous technologies could affect truck paring needs. For one, the Hours-of-Service regulations could be changed in response to the deployment of technologies that make driving trucks less tiring or safer. Technologies might be developed that gauge how tired drivers are and force rests when certain driver specific criteria are met.

In the long term, connected vehicle technologies could enable truck platoons to have a single driver is responsible for multiple trailers. It is not clear whether deployment of these technologies would increase or decrease parking requirements, given that the driver might be

more stressed overseeing the movement of more freight. However, the longer vehicle might require less surface area for parking than if the freight were carried in traditional trucks.

While there is significant interest in autonomous truck technologies, it is unlikely that these technologies will be allowed to completely replace drivers by 2040. The challenges in navigating large vehicles, particularly in non-standard conditions such as rain, snow, fog, or when roadway construction is present, makes it very difficult for computer systems to reliably replace the driver. Public acceptance is also an issue. For these reasons, it is unlikely that autonomous technologies will decrease truck parking requirements over the analysis horizon of this project.

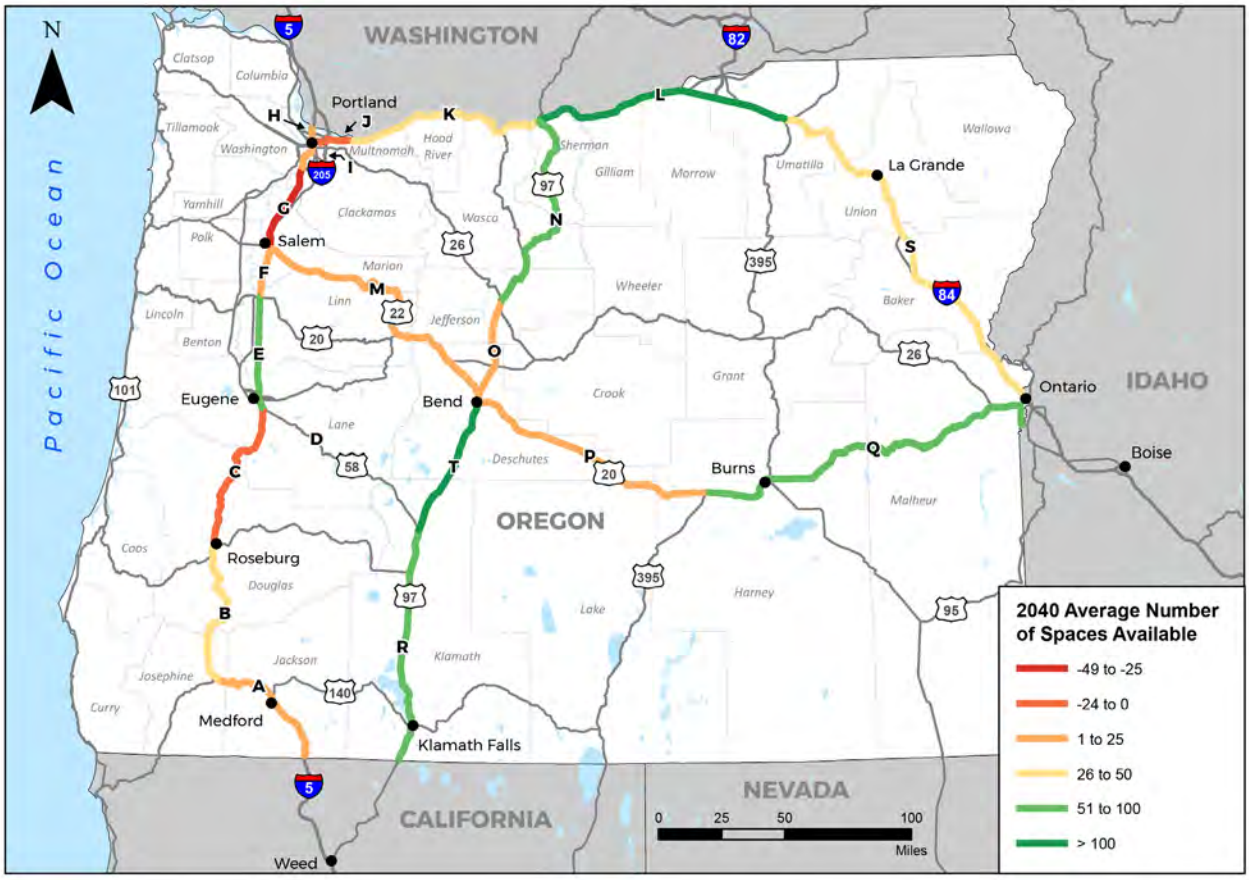
5. CONCLUSIONS

The current supply of truck parking discussed earlier in this study is reaching capacity in several parts of the state. Depending on the time of day and day of week, it can be difficult to find adequate parking with the desired amenities in some locations. Unfortunately, the future (year 2040) demand for parking shows the problem will be worse. The following conclusions can be drawn about the future demand for truck parking on the study corridors:

- Given the data and model limitations, future planning should focus on the average, rather than the worst-case projections.
- The segments that are expected to see the most increase in truck parking demand from 2019 to 2040, on average, are: S, L, and G (see Figure 6).
- Comparing the average demand for truck parking in 2040 against the existing supply of parking spaces leads to a significant shortfall of spaces in the following segments:
  - 44 spaces on Segment G (±49 spaces @ 75% confidence)
  - 21 spaces on Segment J (±29 spaces @ 75% confidence)
  - 9 spaces on Segment C (±11 spaces @ 75% confidence)
- Segment H is also forecasted to reach capacity, and could have a shortfall of spaces given the uncertainty of the model.
- The segments with ample space availability in 2040 are: T, L, R, Q, N, and S (each of which has over 50 spaces available).

As mentioned earlier in this report, this analysis did not take into consideration undesignated parking which is primarily truck parking on highway ramps, shoulders, access roads, closed weigh stations, viewpoints and other informal locations. With the increase in parking demand over the next 20 years, it is expected that more trucks will be parking at these undesignated locations.

Figure 6: 2040 Average Availability (Supply minus Demand) Weekdays at Midnight



APPENDIX H

STRATEGY AND RECOMMENDATIONS TECHNICAL MEMORANDUM

OREGON COMMERCIAL TRUCK PARKING STUDY

Date: May 18, 2020

Subject: Strategy and Recommendations – Technical Memorandum #9

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1. INTRODUCTION

Jason's Law requires an inventory and assessment of truck parking facilities in every state. The Oregon Commercial Truck Parking Study (OCTPS) explores truck parking issues within seven key freight corridors in Oregon and aims to address commercial parking needs along these corridors with innovative and cost-effective strategies. The study also aims to develop the data and tools necessary to support decisions regarding future approaches to truck parking issues in Oregon, including determination of the State's role in the provision of truck parking.

This technical memorandum summarizes the truck parking needs that have been identified in previous memos and identifies and prioritizes solutions that help achieve the State's goals. These recommendations focus on low-cost strategies that effectively address the identified needs, on a segment by segment basis and statewide.

This technical memorandum outlines truck parking needs across the state, as well as the process of identifying and prioritizing recommendations that match those needs. The memorandum draws from various memoranda completed as part of this study:

- **Literature Review Technical Memorandum –** The literature review of state, regional and federal truck parking plans completed in 2019 is the primary source for the list of recommendations and potential solutions evaluated as part of this memorandum. Table 2 lists the recommendations compiled from the literature review that provide the basis for identifying truck parking solutions for Oregon.
- **OCTPS Feedback Summary -** A survey of truckers in the Oregon region and other relevant ODOT stakeholders was completed to obtain input about truck parking issues and driver concerns within the state. The study sought feedback particularly from truck drivers on truck parking issues within key freight corridors of the State, including I-5, I-205, I-84, US97, OR 22, US 20/26, and OR 58. The results of this survey were used to confirm truck parking needs and goals and prioritize potential solutions for Oregon. Section 2.2 lists the key truck parking goals identified for Oregon.
- **Truck Parking Inventory Technical Memorandum and Current Demand Analysis Technical Memorandum –** An analysis of the supply and demand of truck parking spaces in Oregon was completed as the first step to developing an understanding of truck parking imbalances within the state and to identify specific locations or corridors with high need for capacity expansion or other improvements. Segment-specific or statewide truck parking needs identified as part of the demand analysis will ultimately be matched with the tools evaluated as part of this memorandum. The Methodology and Data Assessment Technical Memorandum detailed the methodology used to complete this truck parking need analysis.

2. APPROACH AND METHODOLOGY

2.1 Role of the State

In general, the primary role of the State Department of Transportation (DOT) is to support the safe and efficient use of the highway system and the economic competitiveness of the state. Regarding truck parking, this includes minimizing the time spent looking for a parking spot, ensuring the safety of the truck driver and passengers of other vehicles, and promoting compliance with hours of service requirements. This not only benefits motor carriers and the broader transportation sector, but also other vehicles on the roads and the community at large.

2.2 Truck Parking Goals

Through a combination of input from ODOT stakeholders via Technical Advisory Committee (TAC) meetings and interviews, a survey of truckers in Oregon, as well as a review of overall study goals, a number of state priorities were identified that are affected by truck parking needs in Oregon. These priorities are categorized into six primary goals:

1. Improve safety and security of driver and cargo at parking facilities and on the road.
2. Improve roadway safety by reducing the likelihood of crashes involving trucks parked in undesignated locations.
3. Improve safety by reducing the likelihood of crashes involving trucks at rest areas
4. Maintain the competitiveness of Oregon's economy by increasing the utilization of and/or expanding the number of truck parking spaces in high-demand areas.
5. Reduce the time required to find safe and legal parking space (public and private)
6. Provide truck drivers access to real-time and accurate information about the availability of safe, legal parking places (public and private)

Truck parking recommendations and solutions identified in other tasks and described in this memorandum will be used as potential tools for achieving one or more of the six goals identified above.

2.3 Identification and Prioritization of Need

The results of the truck parking demand analysis are used to identify locations where there is insufficient capacity to accommodate forecasted truck parking demand. Needs identified at the segment level will focus on categories of demand, such as parking availability with basic amenities (lighting / bathrooms / security), parking with comprehensive amenities (fuel, restaurant, showers, etc.), and parking with services (retail, mechanics, etc.). The results of the demand analysis are compared with the results of the survey, noting areas of agreement,

rendering an assessment of needs across the various segments of the network. Areas of high need are then described and prioritized.

2.4 Toolbox of Truck Parking Solutions

The literature review from Technical Memorandum #1 is used to populate a toolbox of truck parking solutions and best practices for truck parking management in North America. The table is categorized into:

- Data and Technology Deployment
- Creative use of ROW / Public Capacity Expansion
- Expansion using public-private partnerships
- Policy and Regulations
- Coalitions and Institutional Oversight
- Public and Private Outreach

2.5 Inventory of Potential Strategies

Based on their intended purpose, these tools were then categorized according to the one or more of the truck parking goals identified in Section 2.2 that it was intended to achieve. An evaluation framework using qualitative elements (and quantitative where available) was then developed to prioritize the truck parking solutions. The evaluation framework consists of the following criteria:

- Effectiveness at addressing identified needs
- Cost
- Private resource utilization
- Ease of implementation/previous success

Points are awarded to each strategy along these categories with a high, medium or low score. Strategies that score the highest were then identified as solutions for a given type of need and corridor. A detailed methodology for this evaluation is presented in Section 5.1.

3. NEEDS ANALYSIS

A number of needs were identified based on stakeholder feedback and the demand and supply analysis. Major needs fall into four categories: truck parking capacity, tackling undesignated parking, safety and security and amenities and services. While these needs were identified in general for the state, they were focused in particular areas as detailed in the following sections.

3.1 Summary of Segment Needs

The objective of this section is to interpret the results of previous analyses to identify the truck parking needs on specific segments. One of the key analyses was the comparison of parking supply to existing and forecasted parking demand. Figure 1 and Figure 2 show the results of this analysis, showing the average availability in 2019 and 2040, respectively.

In 2019, several segments were found to operate at capacity with only 0 to 25 spaces available on average, although these need to be categorized into whether they are high volume segments or low volume segments. In high volume segments, which typically are located along interstate highways, lack of parking availability stems from high demand, while in low volume segments the lack of availability stems from low supply (few, if any rest areas or truck stops available).

As highlighted in Figure 1 on page 6:

- The segments with the highest average occupancy of designated parking spots are:
  - Segment G (I-5 between Salem and Portland/I-205)
  - Segment E (I-5 between Eugene and Albany)
  - Segment B (I-5 between Grants Pass and Roseburg)
  - Segment J (I-84 between Portland/I-5 and Troutdale)
- The whole I-5 corridor, from the California Border to Portland, is approaching or above capacity for truck parking. Finding parking is the hardest in Segment G (I-5 between Salem and I-205 in Portland).
- 108 areas were identified around the state where undesignated parking is common (more than 5 hours of parking per day). In an average weekday, 733 trucks park in these areas, accumulating 1,435 hours of parking.
- The segments with the highest level of undesignated parking are (see Figure 3 for top 20 undesignated parking locations):
  - Segment A (I-5 between California border and Grants Pass)
  - Segment B (I-5 between Grants Pass and Roseburg)
  - Segment K (I-84 between Troutdale and US97)
  - Segment S (I-84 between Pendleton and Idaho border)

- There appears to be adequate parking capacity in: Segment L (I-84 between US97 and Pendleton); Segment S (I-84 between Pendleton and Idaho border); and Segment T (US97 between Bend and OR58).

In 2040, the segments that are expected to see the most increase in truck parking from 2019, on average, are Segments S, L, and G (see Figure 2). Comparing the average demand for truck parking in 2040 against the existing supply of parking spaces leads to a significant shortfall of spaces in the following segments:

- Segment G - 44 spaces
- Segment J - 21 spaces
- Segment C - 9 spaces

Figure 1: Parking Space Availability in 2019

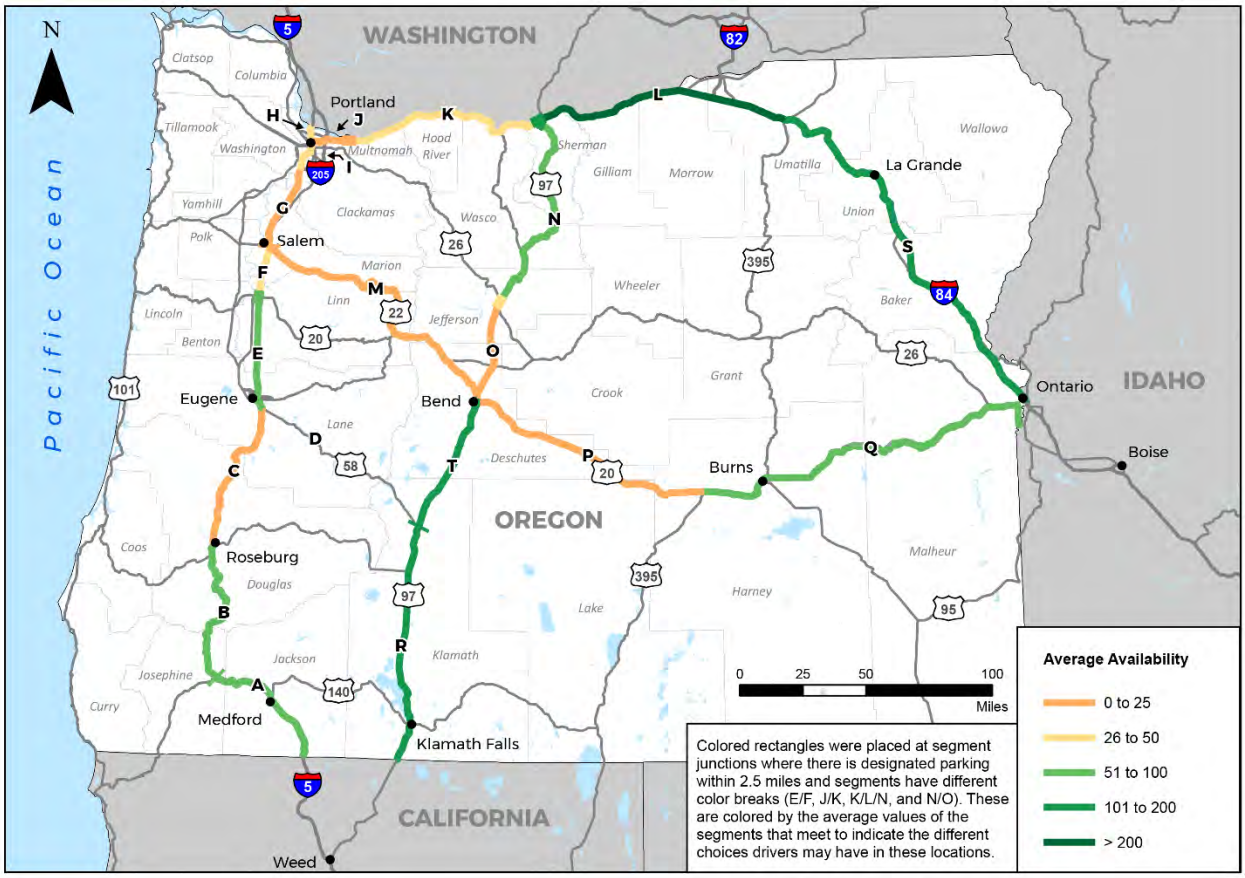
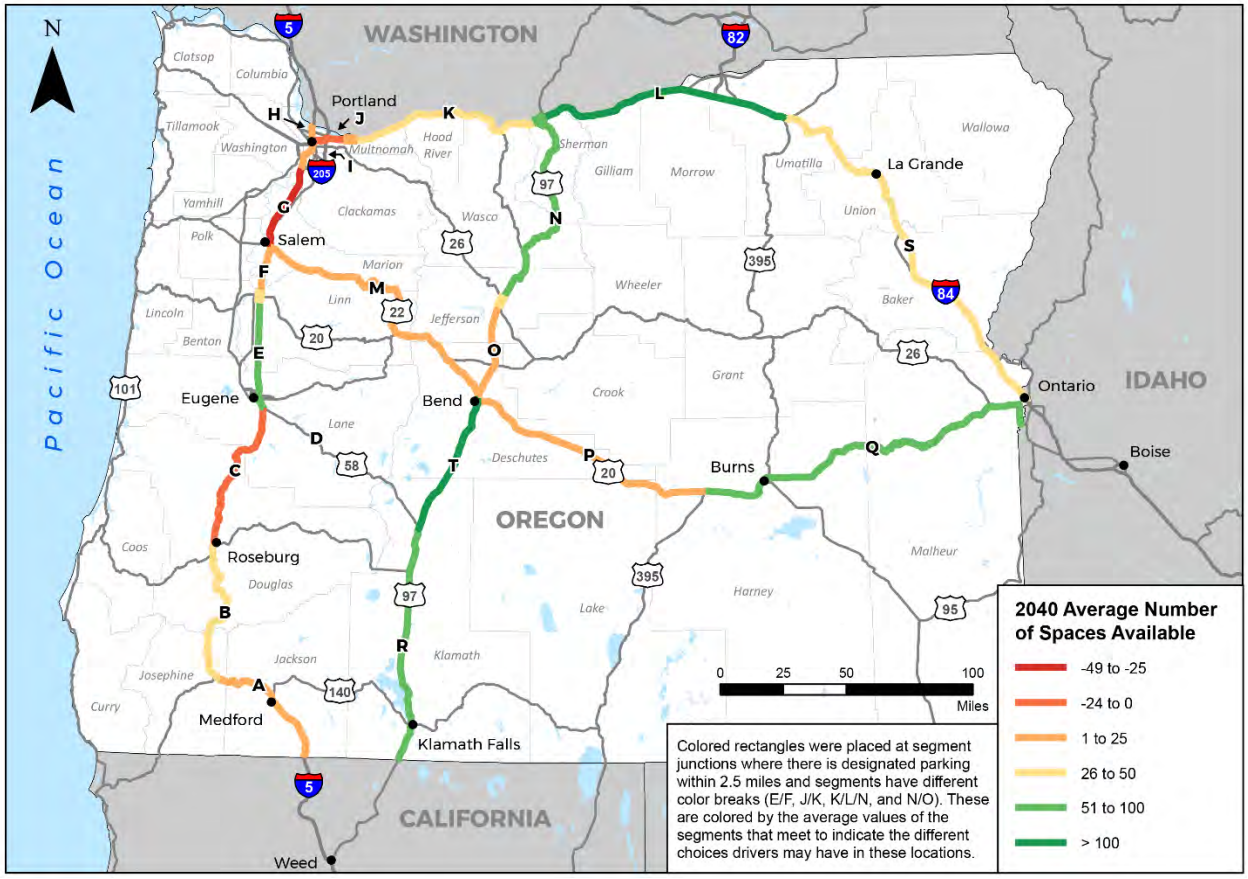
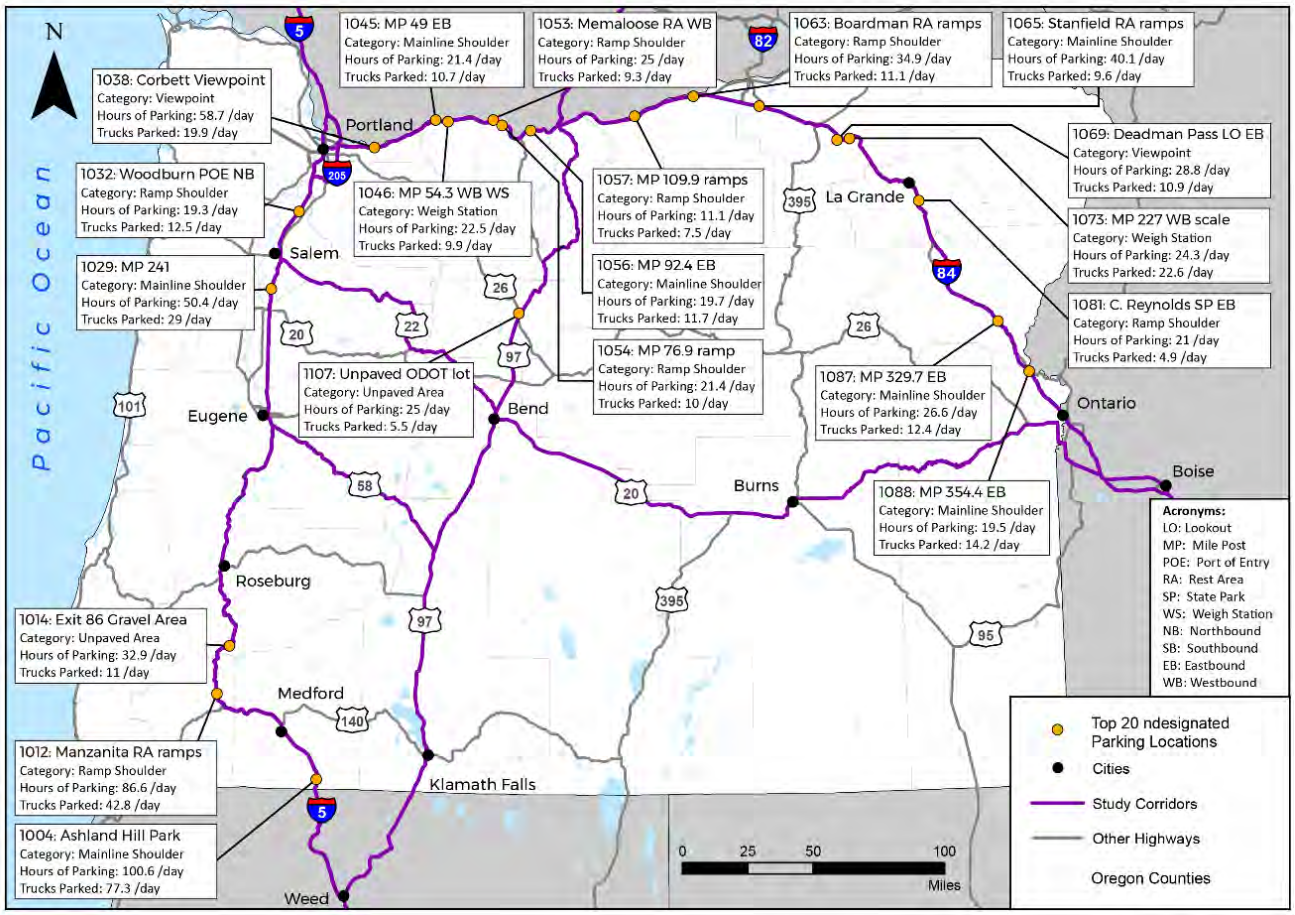


Figure 2: Parking Space Availability in 2040



As part of the Current Demand Analysis Technical Memorandum, locations of undesignated parking were identified from three sources of information: feedback provided by ODOT, the survey responses of stakeholders, and a cluster analysis of GPS data. A total of 108 areas were identified throughout the state along the study corridors. Truck parking related to commercial or industrial establishments was excluded to focus on locations where parking is truly undesignated. Figure 3 maps the top 20 undesignated parking locations identified.

Figure 3: Top 20 Undesignated Parking Locations



The specific needs identified by segment depend not only on the results of the supply-demand analysis, but also the context of the segment (urban/rural segment, relationship to Portland, number/type of facilities etc.). The results of the survey and interviews, as well as input from stakeholders, were also considered when defining segment needs. The four areas of need are identified as capacity, undesignated parking, safety and security, and amenities and services were identified. These needs were categorized as Primary, Secondary, and Tertiary, in relation to the priority in which these needs must be addressed.

- **Primary:** Primary needs stand out as exceptional compared to the rest of the study segments and require ODOTs attention. These could represent capacity shortfalls, accumulating more than 100 hours of undesignated parking per day, having one of the top 3 undesignated parking locations, or ranking exceptionally poorly in any of the key survey questions (availability of amenities, safety and security, time to find parking, etc.). Note that these thresholds represent general guidance for prioritizing needs, however the specific context and conditions of a segment could lead to different prioritization. Primary needs tend to be confirmed from multiple sources of information or analysis.
- **Secondary:** Secondary needs are important and should be addressed after Primary needs are resolved. These could represent being at or near capacity in 2040 (0-25 availability),

accumulating more than 100 hours of undesignated parking per day, having one of the top 10 undesignated parking locations, ranking poorly in any of the key survey questions (availability of amenities, safety and security, time to find parking, etc.).

- **Tertiary:** Tertiary needs represent potential needs that have been identified from analysis. However additional study is required before strategies or solutions should be recommended.

Table 1, below, summarizes these Primary, Secondary and Tertiary needs for each roadway segment.

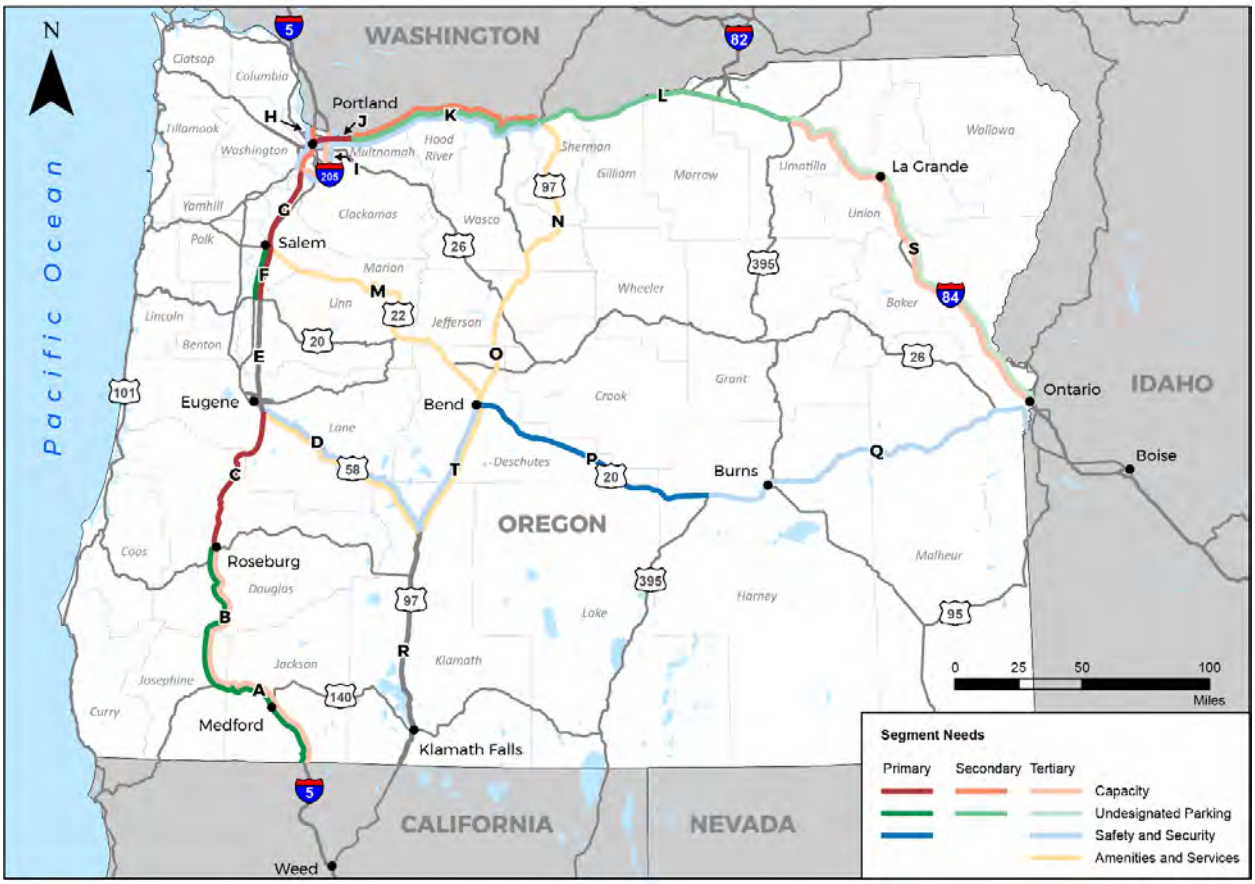
Table 1: Summary of Segment Needs*

Segment	Capacity	Undesignated Parking	Safety and Security	Amenities and Services
Segment A (I-5 between California border and Grants Pass)	3	1		
Segment B (I-5 between Grants Pass and Roseburg)	3	1		
Segment C (I-5 between Roseburg and Eugene)	1			
Segment D (OR58 between Eugene and US97)			3	3
Segment E (I-5 between Eugene and Albany)				
Segment F (I-5 between Albany and Salem)	1	1		
Segment G (I-5 between Salem and Portland/I-205)	1			
Segment H (I-5 between Portland/I-205 and Vancouver)	2		3	
Segment I (I-205 between Portland/I-5 and Washington border)	3		3	
Segment J (I-84 between Portland/I-5 and Troutdale)	1		3	
Segment K (I-84 between Troutdale and US97)	2	2	3	
Segment L (I-84 between US97 and Pendleton)		2		
Segment M (OR22/US20 between Salem and Bend)				3
Segment P (US20 between US97 and US395)			1	
Segment Q (US20 between US395 and Idaho border)			3	
Segment N (US97 between I-84 and Madras)				3
Segment O (US97 between Madras and Bend)				3
Segment T (US97 between Bend and OR58)			3	3
Segment S (I-84 between Pendleton and Idaho border)	3	3		
Segment R (US97 between OR58 and California border)				

***1 = Primary; 2 = Secondary; 3 = Tertiary**

Figure 4 displays the different levels and types of segment needs geographically throughout the state.

Figure 4: Segment Needs



The next section provides a more detailed description of the needs for each segment.

3.2 Detailed Needs by Corridor Segment

Segment A

Segment A consists of a 56-mile portion of I-5 between the California border and Grants Pass. This segment has 3 truck stops, 1 rest area, and 1 port of entry. (All segment locations can be seen in Figure 2 on page 7.

- **Primary Need:** The most heavily utilized undesignated parking location was identified in this segment at Ashland Hill Park on the shoulders (see Figure 3 for top 20 undesignated parking locations). This is located at Siskiyou Summit, with steep grades downstream and upstream. Approximately 77 trucks park at this location each day, accumulating on average 100 hours of parking per day. Given the availability of parking spaces at nearby parking facilities, it is reasonable to assume that undesignated parking at that location is not caused by lack of designated parking capacity. Drivers have reported that one reason trucks may be parking at this location is that it is convenient to stop at Ashland Hill park at the top of a long incline and check their brakes before descending. Seasonal weather conditions and closures over the Siskiyou Mountains may also be a factor. It may be advisable to consider

adding designated parking at this location given the clear preference for trucks parking there.

- **Secondary Need:** None.
- **Tertiary Need:** There exists moderate availability of parking spaces on this segment, with 51 spaces available in 2019 and 20 spaces projected to be available in 2040. However, the majority of spaces are concentrated at the Talent Gordy's truck stop, while other truck stops and rest areas (located in Medford and Phoenix) are near capacity. The truck parking inventory map developed as part of the Truck Parking Inventory Technical Memorandum illustrates the location of truck parking stops and rest areas throughout the state. The survey showed that 25% of respondents routinely take more than 1 hour to find parking at this segment, indicating that there could be recurring capacity constraints. Nonetheless, more information would be required to conclude that additional capacity is required. Parking availability should be tracked at this segment to as it has the potential to become capacity constrained in the coming years.

Segment B

Segment B consists of a 68-mile portion of I-5 between Grants Pass and Roseburg. This segment has 4 truck stops and 2 rest areas.

- **Primary Need:** This segment experienced the fourth highest hours of undesignated parking, primarily because of parking at two locations. The first of these locations, which accumulated 86.6 hours of undesignated parking per day and ranked the 2nd highest in the state, encompasses the entrance and exit ramps of the Manzanita Rest Area. This rest area is estimated to have moderate availability, therefore it is unlikely that this undesignated parking is caused by capacity constraints. However, it is possible that some drivers do not like the configuration of the rest area, as it requires trucks to pull through spaces, which raises the chances of collisions (an issue that came up in the interviews and stakeholder feedback). Steps should be taken to mitigate safety risks at this location, and alternative designs for the designated truck parking should be explored to make it more attractive for drivers.

  The second highest undesignated parking location on this segment, which accumulates 32.9 hours of parking per day, is a gravel lot on Exit 86 of I-5. This location is north of the Wolf Creek Truck N' Travel truck stop, which is of smaller capacity. As such, the reason for this undesignated parking location is likely due to capacity constraints, which should be addressed.

- **Secondary Need:** None.
- **Tertiary Need:** There is moderate availability of parking spaces, with 63 spaces available in 2019 and 26 spaces projected to be available in 2040. Parking availability should be tracked at this segment to as it has the potential to become capacity constrained in the coming years.

Segment C

Segment C consists of a 64-mile portion of I-5 between Eugene and Roseburg. This segment has 4 truck stops and 2 rest areas.

- **Primary Need:** This segment has few parking spaces, with 21 spaces available in 2019 and a shortfall of 9 spaces projected in 2040. Most of the supply of parking spaces is currently concentrated at the Rice Hill Pilot, however this facility is estimated to operate close to capacity. Steps should be taken to increase the capacity of this segment.
- **Secondary Need:** None.
- **Tertiary Need:** None.

Segment D

Segment D consists of a 86-mile portion of OR 58 between I-5 and US 97. There are no rest areas or truck stops on this segment, and this segment experiences low truck volumes.

- **Primary Need:** None.
- **Secondary Need:** None.
- **Tertiary Need:** Approximately 70% of respondents indicated that services are inadequate on this segment, which is unsurprising given that it has no designated parking facilities. Also, approximately 40% of respondents indicated that this segment is not safe or secure. These results suggest that drivers would likely benefit from having at least one parking facility on this segment, that offered basic services and amenities. This could be particularly useful when the road is adversely affected by winter weather. While not a significant number of trucks would benefit as this is not a high-volume corridor, more investigation is required to determine if a public rest area is required on this segment. Inclusion of a rest area that is open to all drivers (commercial or otherwise) may be beneficial for the state as this is the only segment in the state which is over 80 miles long and lacks any public facilities.

Segment E

Segment E consists of a 45-mile portion of I-5 between Albany and Eugene. This segment has 6 truck stops and 2 rest areas.

- **Primary Need:** None.
- **Secondary Need:** None.
- **Tertiary Need:** None.

Segment F

Segment F consists of a 21-mile portion of I-5 between Albany and Salem. This segment has 1 truck stop and 2 rest areas.

- **Primary Need:** The 4th most significant undesignated truck parking location is at the ramps and shoulders that provide access to the Santiam River Rest Area. On average, 29 trucks park at these ramps and shoulders each day, accumulating 50.4 hours of parking per day. Given the limited availability at the rest area, and at the nearby Albany Love's Truck Stop,

one possible reason is the difficulty in finding parking spaces. Another possibility is that parking spots at this location have been reported to be pretty tight from a design standpoint. Trucks often park along the long access road, which is tree lined.

There is moderate to limited availability of parking spaces in this segment, with 29 spaces available in 2019 and 17 spaces projected to be available in 2040. This is caused by the Albany Love's Truck Stop being close to capacity, as it more than likely serves the bulk of capacity on the segment. The Santiam River Rest Area, which is located 3 miles north of the truck stop, is also at capacity when considering paved parking spaces.
Additional truck parking capacity in this segment would ensure future growth in trucking can be accommodated and is likely to resolve some of the undesignated parking.

- **Secondary Need:** None.
- **Tertiary Need:** None.

Segment G

Segment G consists of a 35-mile portion of I-5 between Salem and the I-205 interchange in Portland. This segment has 3 truck stops and 2 rest areas.

- **Primary Need:** This segment sees the highest truck parking demand in the state, which leads this segment to be at capacity currently (5 spaces available on average). In addition, it is projected to have a shortfall of 44 spaces in 2040. The two truck stops in Aurora (Aurora Flying J and Aurora TA) are at or over capacity, and there are not many other spaces available at the French Prairie Rest Area. Additional truck parking capacity is needed in this segment, to meet the needs to trucks heading into the Portland metro area and further north. In general, parking facilities in segments that are just outside the Portland metro area see outsized demand from trucks driving to/from Portland, as these facilities have greater availability of parking while still being close enough to the Portland metro area to allow drivers to pre-position for pick-ups and deliveries. As such, any solutions devised must consider that segment demand may not be representative of O/D traffic in that segment.
- **Secondary Need:** None.
- **Tertiary Need:** None.

Segment H

Segment H consists of a 20-mile portion of I-5 between the I-205 interchange in Portland and Vancouver. This segment has the Jubitz Truck Stop, which is the largest truck parking facility in the state, and a small parking lot at the ODOT Portland Bridge Registration Office.

- **Primary Need:** None.
- **Secondary Need:** This segment has moderate to limited availability, with 40 spaces available on average in 2019 and capacity expected to be reached in 2040. In addition, the truck park along I-5 just north of Portland in Washington State are near capacity during peak today and expected to be over capacity in 2040. Approximately 50% of respondents indicated that parking spaces are never available, and 30% of respondents indicated that they routinely spend more than 1 hour looking for parking. The results of the survey

combined with the availability analysis suggests that additional capacity could be needed in this segment.

- **Tertiary Need:** Approximately 40% of respondents indicated that truck parking was not safe or secure. The nature of these concerns should be investigated.

Segment I

Segment I consists of a 28-mile portion of I-205 between I-5 and the border with Washington. This segment does not have any rest areas or truck stops.

- **Primary Need:** None.
- **Secondary Need:** None.
- **Tertiary Need:** The lack of a rest area or truck stop was the main reason why more than 50% of respondents indicated that parking spaces are never available, and approximately 40% of respondents indicated that truck parking was not safe or secure. While it is not clear based on the demand analysis if there exists sufficient parking demand on this segment, surrounding segments such as Segments G, H, and J face significant capacity issues. In addition, the truck park along I-5 just north of Portland in Washington State are near capacity during peak. The majority of parking demand concentrates on I-5 and I-84, which are the main entry points for trucks entering and exiting the Portland region. Because I-205 is used primarily by trucks seeking to bypass the region, through-traffic may be more likely to park in segments with greater availability that are farther north or south of Portland. However, this corridor also provides access to Portland International Airport, and industrial areas in Gresham and Columbia corridor. This issue should be explored further.

Segment J

Segment J consists of a 16-mile portion of I-84 between the I-5 interchange in Portland and Troutdale. This segment has two large truck stops.

- **Primary Need:** This segment operates virtually at capacity, with only 19 spaces available on an average night in 2019. By 2040, it is expected that this segment will have a shortfall of 21 spaces on average, as this is the main entry point to Portland from the east. Similar results were found in the survey, as 40% of respondents indicated that parking spaces are never available, and 35% of respondents indicated that they routinely spend more than 1 hour looking for parking when wanting to park in this segment. Additional parking capacity needs to be added to this segment in order to keep up with demand. The two existing truck stops operate in a constrained footprint, leading expansion opportunities to be limited.
- **Secondary Need:** None.
- **Tertiary Need:** Approximately 40% of respondents indicated that truck parking was not safe or secure in this segment. However, given that the two facilities in this segment are private truck stops, it is unclear what steps could be taken to improve this perception.

Segment K

Segment K consists of a 86-mile portion of I-84 between Troutdale and US97. This segment has a rest area and truck parking adjacent to a weigh station.

- **Primary Need:** None.
- **Secondary Need:** There is moderate to limited availability in this segment, with 30 spaces available in 2019 and 25 spaces projected to be available in 2040. This coincides with this segment's ranking the second highest in terms of hours of undesignated parking (220hr/day). The most used undesignated parking location on this segment is the Corbett View Point, with trucks parking at the view point area and on the shoulders of the access road. Approximately 20 trucks stop at this location on an average day, accumulating 58.7 hours of undesignated parking. Steps should be taken to mitigate safety risks at this location caused by undesignated parking.
- **Tertiary Need:** Approximately 40% of respondents indicated that truck parking was not safe or secure, however additional investigation is required to define the nature of these concerns. One cause may be high winds, which are especially a problem in and near the gorge. Drivers with empty trucks often pull over rather than fight to contend the wind. Trucks serving retailers such as Walmart in the area have a higher likelihood of returning empty and are susceptible to the wind issues noted here.

Segment L

Segment L consists of a 105-mile portion of I-84 between US97 and Pendleton. This segment has two rest areas, 4 large truck stops, and one port of entry with truck parking.

- **Primary Need:** None.
- **Secondary Need:** This segment accumulates the third highest hours of undesignated parking, at 158hr/day. This occurs at the following three locations: Arlington Viewpoint (40.5hr/day), adjacent to the Stanfield Rest Area Ramps (40.1hr/day), and adjacent to the Boardman Rest Area (34.9hr/day). However, it is possible that the values estimated for the two rest areas might over-represent undesignated parking because GPS records might not be accurate enough to differentiate against the designated parking available nearby. This segment has the largest availability of designated parking spaces of all the segments studied, with 243 spaces available currently and 156 spaces available in 2040, therefore lack of spaces is not the cause of undesignated parking. The main issue projected to be in this segment is the need to address undesignated parking at the Arlington Viewpoint location.
- **Tertiary Need:** None.

Segment S

Segment S consists of a 169-mile portion of I-84 between Pendleton and the Idaho border. This segment has 5 rest areas, 8 truck stops, and one port of entry with truck parking.

- **Primary Need:** None.
- **Secondary Need:** None.
- **Tertiary Need:** This segment accumulated the most hours of undesignated parking, at 229hr/day. However, this undesignated parking occurred at many small locations throughout the corridor, and no single location accumulated for a bulk of undesignated parking. Some of the largest locations were: the Deadman Lookout, the mainline shoulder

at MP 329.7, the scale at MP 227, and the ramp shoulder on the Reynolds Rest Area. These undesignated parking issues could be addressed, however, trucks are not parking there because of insufficient availability at designated locations on an average basis. This segment has the second largest availability of parking spaces of all the segments studied, with 190 spaces available. This availability is expected to decrease by approximately 46 spaces by 2040 because significant truck traffic growth is expected in this segment. TAC members have noted that there is seasonal weather that causes road closures and need for emergency parking during winter storms. Thus, at these specific times, the designated parking may not be sufficient when or where needed which may be leading to undesignated parking on this segment. From the data collected in this study, it is not possible to confirm that this is the primary cause, nonetheless, mitigating safety risks at the top locations is warranted.

Segment M

Segment M consists of a 126-mile portion of OR22/US20 between Salem and Bend. This segment only has one small rest area.

- **Primary Need:** None.
- **Secondary Need:** None.
- **Tertiary Need:** This segment has just 1 rest area (The Maples rest area) with 15 parking spaces even though it is one of the longest segments in the study. This is the reason why 35% of respondents indicated that they routinely spend more than 1 hourly looking for parking. However, this segment carries very low truck volumes, and did not register any meaningful overnight designated parking demand during the study period. It is possible that these 15 parking spaces are used primarily for daytime parking. Additional investigation would be required to determine whether parking needs are met in this segment.

Segment P

Segment P includes a 104-mile portion of US20 between US97 (at Bend) and US395. This segment only has 1 small rest area.

- **Primary Need:** Approximately 60% of respondents indicated that truck parking was not safe or secure, one of the highest responses to this question obtained in the survey. This is a rural segment that carries a small volume of trucks, with only one small rest area in over 100 miles (Brothers Oasis). Safety issues at this rest area should be investigated, and steps should be taken to make improvements.
- **Secondary Need:** None.
- **Tertiary Need:** None.

Segment Q

Segment Q consists of a 160-mile portion of US20 between US395 and the Idaho border. This segment has 3 truck stops and 1 rest area.

- **Primary Need:** None.

- **Secondary Need:** None.
- **Tertiary Need: T**his represents a low truck volume segment, with a few parking facilities showing ample availability. However, 35% of respondents indicated that they routinely spend more than 1 hour looking for parking. This could be caused by the low number of parking facilities in the middle of this segment, which leads trucks to drive a long distance to reach the next available facility. Given the information collected by this study, it is unclear whether this represents an issue that needs to be addressed.

Just like in adjacent segment P (US20), many respondents (40%) indicated that parking was not safe or secure on this segment, however not as many as did for segment P. This could be indicative to safety concerns along the US20 corridor. Additional investigation is required to identify the nature of these concerns.

Segment N

Segment N consists of a 93-mile portion of US97 between I-84 and Madras. This segment has 3 truck stops and 1 rest area. Most of these are located in Madras, so they provide parking capacity not just for segment N, but also for segment O.

- **Primary Need:** None.
- **Secondary Need:** None.
- **Tertiary Need:** Approximately 60% of respondents indicated that services are inadequate on this segment, however additional study is required to identify the specific deficiencies.

Segment O

Segment O includes a 42-mile portion of US97 between Madras and Bend. This segment only has one small truck stop located just south of Madras, however there are several other truck stops in Madras (technically on segment N), that also provide parking capacity to trucks traveling on segment O.

- **Primary Need:** None.
- **Secondary Need:** None.
- **Tertiary Need:** Approximately 60% of respondents indicated that services are inadequate on this segment. However, it is unclear from the data collected by this study which services are specifically missing. Additional investigation is required to identify if this represents a need.

Segment T

Segment T includes a 58-mile portion of US97 between bend and OR58. This segment only has one truck stop.

- **Primary Need:** None.
- **Secondary Need:** None.
- **Tertiary Need:** Approximately 70% of respondents indicated that services are inadequate on this segment, which was one of the highest responses we received in the survey. However, the only truck stop in this segment, the La Pine Gordy's facility, offers a complete

array of services and has ample availability. Therefore, it is not clear exactly which services respondents thought were missing. Another issue raised by respondents is that 40% indicated that parking was not safe or secure. There may be concerns about limited truck parking options in this segment.

Segment R

Segment R includes a 96.1-mile portion of US97 between OR58 and California border. This segment has 3 rest areas, 4 truck stops, and one port of entry with truck parking.

- **Primary Need:** None.
- **Secondary Need:** None.
- **Tertiary Need:** None.

3.3 Statewide Needs

Statewide needs were identified primarily from the feedback received in the survey, interviews and input from the TAC. They can be summarized as:

Primary Needs:

- **Difficulty finding truck parking/Lack of availability.** In addition to the specific needs identified at the segment level in the previous section, the study found that the lack of truck parking availability was a major problem for truck drivers operating in Oregon. Close to 60% of respondents indicated that availability was poor or very poor. Interview participants also rated parking availability negatively.

  While this could be partially addressed with increasing capacity at the segments highlighted in the previous section, survey and interview respondents rated most segments poor in terms of availability, pointing to a systematic challenge in finding safe parking throughout the state, even when parking spaces are available.
  This challenge is not specific to Oregon, as truck parking often ranks high on national lists of problems faced by truck drivers. Solutions are required in Oregon that improve real-time information about truck parking availability—better matching supply with demand—in ways that are easy for drivers to use and reduce their anxiety and uncertainty about finding parking, to meet hours of service regulations, particularly overnight.

Secondary Needs:

- **Inadequate Amenities:** Approximately 80% of respondents ranked amenities as a top criterion for choosing parking. Having access to food, showers, restrooms, and WI-FI availability as important for stopping at a specific location. However, a common complaint in both the interviews and survey was that amenities are inadequate or lacking in terms of restrooms, showers, and meal service. Rest areas lack certain amenities because of restrictions on commercial activities in public facilities, leading many drivers to prefer truck stops instead.

- **Unaccommodating rest areas and truck stops:** Respondents indicated that many rest areas in the state are difficult to use. Large 18-wheeler trucks often have difficulty navigating the geometrics at these facilities, leading to a high risk (or the perception of a high risk) of collision, with a fixed object or other trucks. Parallel parking that requires trucks to pull-through is often seen as a risk as it's easy for inexperienced drivers to sideswipe neighboring trucks. These and other design considerations should be reviewed and compared with practices at private truck stops. Low-cost improvements, such as restriping, could be helpful.
- **Undesignated parking:** Undesignated parking occurs for many reasons, and therefore it is difficult to address comprehensively with any single strategy. However, there was some degree of undesignated parking on all highway segments analyzed. Some of the undesignated parking may pose a safety risk to the truck drivers and passengers of other vehicles. The undesignated parking needs to be managed in a way that would increase the safety and security of parking in these locations. This could also include low cost solutions for converting certain locations of undesignated parking into designated parking, if appropriate.

4. TOOLBOX OF TRUCK PARKING SOLUTIONS

A breakdown of recommendations from the federal, state and regional truck parking plans reviewed is presented in Table 2 on page 20. Six key strategies encompass and summarize these recommendations:

1. Data and Technology Deployment
    - Primarily utilized to provide real-time communication to truckers on availability and location of truck stops and rest areas.
    - Includes sensing technologies such as in-pavement sensors, entry-exit gates, radar, camera systems to determine utilization and availability of parking spaces and communication media such as dynamic message signs, smartphone and web apps and in-cab navigation to disseminate the information to truckers in real time.
    - An associated parking reservation system further assists truck drivers in planning their trips in advance and ensures predictability.
    - For a lower cost solution, some states also recommend installing static truck parking signage on highways and distributing visor card trucking maps to truckers at trucking conferences and other meets.
    - Interoperability with neighboring states should be considered in development of specific solutions in this area.
2. Creative use of ROW for public truck parking capacity expansion
    - This would be primarily focused on expanding truck parking spaces on interstate or other roads with significant parking needs.
    - Use of publicly-owned excess ROW at existing parking lots, weigh stations, service areas and other locations on interstates, as well as improving geometrics at existing locations are also recommended.
    - GIS analyses may be completed on urban land parcels to determine viability of conversion into truck parking areas.
3. Capacity expansion through public-private partnerships
    - Where ROW for capacity expansion is lacking or when excess ROW is available, partnering with private businesses and truck stops to expand parking facilities and coordinate signage is recommended, since improved parking spaces and information was found to be important to drivers.
    - Where public funding is insufficient, cost-sharing agreements for construction and maintenance of parking areas with private partner may be useful. Private partners may also be allowed to set up convenience and food stalls at such facilities to provide revenue incentives for engaging truck parking expansion.

- Partnering with businesses that are served by freight to explore warehouse and distribution center parking may provide an opportunity to allow for parking required by drivers.

4. Policy and Regulations
   - Review local, state, and regional policies on truck parking and staging requirements to confirm whether parking expansion is being hampered by regulations.
5. Coalitions and Institutional Oversight
   - Designate truck parking champions and/or establish truck parking committees within the agency to champion truck parking goals and oversee implementation of truck parking plans and objectives.
   - Participate in a cohesive regional multi-state truck parking coalition with a goal to matching supply and demand, increase roadway safety and policy conformity reduces the time required by drivers to find safe parking spaces.
6. Public and Private Outreach
   - To counteract public perception that leads communities to restrict truck parking, coordinate with MPOs and local governments to develop guidelines and mitigation strategies aimed at easing such public opposition.

These solutions are evaluated and prioritized to specific truck parking needs in Section 5.

Table 2: Recommendations/solutions to advance truck parking solutions

Strategy type	Recommendation/Solution	Intended Purpose of Solution in Reviewed Plan	State / Region	Year of Study	Status/Notes1
Data and Technology Deployment	Truck Parking Information Management System (TPIMS) Implementation	Improve communication of location and availability of truck parking spaces	MAASTO	2016	Sensing technology (sensors, cameras, entry-exit gates) and real-time communication (DMS, smartphone apps, in-cab nav. And traveler 5-1-1 websites) implementation and launch in project member states in Jan 2019. (KS, KY, IN, IA, MN, WI, OH, MI) Example - MN - $1.2M cost, camera systems at six rest areas, DMS displayed on I-35 and I-94, system live in Jan 2019, general early feedback from truckers positive Member states provide parking availability data feeds online at truckparkhere.com. Several private mobile apps and websites utilize or will utilize these feeds to provide smartphone and web apps for truckers with real-time information. ATRI undertook a driver survey in Nov/Dec 2019 to gather feedback on TPIMS benefits and implementation. Report not public yet.
	TPIMS proof-of-concept and pilot at various locations	Improve communication of location and availability of truck parking spaces	Arizona	2019	Currently in Phase 1 looking to develop a proof-of-concept to assess pros/cons of various technologies used to implement TPIMS
	In-pavement systems, video systems, and light laser detection systems to estimate truck parking availability in a given truck parking or rest area	Increase utilization at existing truck parking spaces Improve communication about location and availability of truck parking spaces	North Carolina	2017	
	Utilize dynamic message signs to communicate availability of truck parking at weigh stations	Improve communication of location and availability of truck parking spaces	North Carolina	2017	
	GIS Analysis of vacant parcels on land in urban areas for conversion into truck parking areas	Capacity expansion	MAASTO	2017	
	Improve Parking Information and Sharing via static signage and/or TPIMS tool	Improve communication of location and availability of truck parking spaces	Kansas	2016	
	Real-time parking availability communication utilizing dynamic message signs, websites, smartphone apps etc.	Improve communication of location and availability of truck parking spaces	Washington	2016	
	Real-time parking availability estimates using count-in/count-out technologies, light and laser systems, wireless magnetometers etc.	Increase utilization at existing truck parking spaces Improve communication about location and availability of truck parking spaces	Washington	2016	
	Utilize Freight Advances Traveler Information System (FRATIS) to communicate truck parking availability	Improve communication of location and availability of truck parking spaces	Washington	2016	Can also utilize FRATIS to optimize truck parking demand by spreading out truck arrivals at intermodal terminal throughout the day

[1] Status is based on limited internet searches and is not comprehensive.

Strategy type	Recommendation/Solution	Intended Purpose of Solution in Reviewed Plan	State / Region	Year of Study	Status/Notes1
	Investigate idle reduction technologies such as auxiliary power units (APUs) and truck electrified parking (TEP). I-5 has been nominated as a National Alternative Fuel Corridor	Improve environmental sustainability of truck parking stops and rest areas	Washington	2016	
	Increased static signage along freeways and highways	Improve communication of location and availability of truck parking spaces	Utah	2012	N/A
	UDOT Traffic Operations Center smartphone application indicating long-term parking locations and availability of truck stops at those locations	Improve communication of location and availability of truck parking spaces	Utah	2012	Does not seem to be included in UDOT smartphone app. Interactive truck parking/rest area maps available on website, as well as printable version. Truck parking does not appear to be included in UDOT smartphone app.
	Visor card indicating long-term parking locations	Improve communication of location and availability of truck parking spaces	Utah	2012	10,000 maps printed and distributed at trucking conferences and conventions. Available on website. Did not find studies on effectiveness such as follow-on trucker surveys.
	Examine causes and locations of truck crashes and determine the extent to which truck parking could mitigate the issue	Improve roadway safety	North Carolina	2017	
	Develop inventory of truck parking assets, analyze demand for truck parking along important corridors within state, identify corridors where truck parking demand exceeds supply	Capacity expansion Increase utilization of parking spaces	Virginia, Florida, Minnesota, Washington	Various	
	Interstate Oasis Program with nearby truck stops	Goal to increase safety and adequacy of existing truck stops	Arizona	2019	
	Expansion of rest areas at various locations	Capacity expansion	Arizona	2019	
Creative use of ROW / Public Capacity Expansion	Determine feasibility of truck turnouts as truck stops	Capacity expansion via creative use of ROW	Arizona	2019	
	Explore study of truck parking at selected weigh stations	Capacity expansion	North Carolina	2017	Focus is on Goal to increase low-cost capacity expansions of truck parking stops. Different states have different policies on legality of truck parking at weigh stations.
	Improved/expanded truck parking areas using excess ROW at parking lots, service areas and other locations on interstates such as interchanges, improved geometrics and capacity expansion	Capacity expansion via creative use of ROW	Kansas	2016	
	Opening public rest areas that have been closed, and either operated by public agency or by private partner	Capacity expansion	Utah	2012	Some public rest areas at the end of their lifespans have been converted to public-private rest stops. UDOT puts up road signs to advertise these stops, rest areas open 24/7.
	Develop design standards for truck stops and identify alternate truck parking locations such as roadside table tops, brake check areas and safety pullouts	Improve safety and security at parking facilities Capacity expansion via creative use of ROW	Arizona	2019	
	Explore warehouse parking, vacant urban land and weigh stations for truck parking and rest areas	Capacity expansion	MAASTO	2017	

Strategy type	Recommendation/Solution	Intended Purpose of Solution in Reviewed Plan	State / Region	Year of Study	Status/Notes1
Expansion via public-private partnership (P3)	Truck parking supply expansion via P3s and addition of parking supply at safety rest areas and weigh stations	Capacity expansion via public private partnerships	Washington	2016	
	Investigate expanding parking via P3s - utilizing excess ROW owned by state near private facilities and entering cost-sharing agreements for construction and maintenance of parking areas.	Capacity expansion via creative use of ROW Capacity expansion via P3s	Kansas	2016	
Policy and Regulations	Utilize safety rest area funding, TIGER/INFRA/DERA grants to fund truck parking expansion opportunities	Funding source/mechanism to implement truck parking projects and studies	Washington	2016	
	Utilize FMCSA'S Innovative Technology Deployment (ITD) program to fund truck parking improvement/expansion	Funding source/mechanism to implement truck parking projects and studies	North Carolina	2017	
	Modify Truck Parking Ordinances to include short-term truck parking staging requirements	Policy modification to enable capacity expansion	North Central Texas COG	2018	
	Utilize zoning laws to help locate freight facilities closer to more efficient truck routes and/or require industrial/warehousing uses to build staging truck parking	Capacity expansion	Nevada	2019	
Coalitions and Institutional Oversight	Convene a Truck Parking Committee to oversee implementation of truck parking solutions and regulations	Championing truck parking goals and objectives and oversight of implementation of recommendations	North Carolina	2017	Addition of truck parking in urban areas or near communities has been known to face strong public opposition
	Establish competitive loan or grant program to provide funding for public and private truck parking expansion to respond to future changes in demand	Funding source/mechanism to implement truck parking projects and studies	Nevada	2019	
	Investigate creation of a Regional Freight Coalition and benefits of regional (multi-state) truck parking policies and regulations, such as those for designated LCV and overweight vehicles.	Develop cohesive regional truck parking plan/inventory with a goal to matching supply and demand, increase roadway safety and reduce the time required to find safe parking spaces	Kansas	2016	Inconsistency in these regulations affects transportation costs of shippers who may choose to route heavier loads on longer routes through other states and corridors.
	Identify a truck parking champion to implement truck parking recommendations	Championing truck parking goals and objectives and oversight of implementation of recommendations	Arizona	2019	The truck parking champion will be the primary leader and point-of-contact for implementing recommendations from the truck parking study. Goal to ensure implementation plan stays on track.
	Establishment of Highway Rest Facility Committee to oversee development and implementation of a formal Highway Rest Facility Program	Championing truck parking goals and objectives and oversight of implementation of recommendations	Utah	2012	
	Coordinate with MPOs and RPOs to develop guidelines and mitigations strategies aimed at easing public opposition to private sector parking facilities	Public outreach to allay private parking concerns	North Carolina	2017	
	Promote truck parking partnerships to expand supply of truck parking	Outreach to local agencies and/or private partners to promote capacity expansion via P3s	Arizona	2019	Assist cities and local govts as well as private entities in truck parking awareness as well as data and guidance on methods to advance opportunities for P3s.
Public and Private Outreach	Partner with private truck travel centers seeking to expand truck parking facilities	Outreach to local agencies and/or private partners to promote capacity expansion via P3s	North Carolina	2017	Private sector controls 85% of truck parking supply in state

5. PRIORITIZATION AND INVENTORY OF POTENTIAL STRATEGIES

5.1 Prioritization Methodology

The strategies and tools listed in Table 2 were first categorized as follows:

- Site-specific solutions – These solutions are implemented at specific locations and facilities where supply or utilization is low or where the technology is feasible. Examples include creative use of ROW such as truck turnouts or excess ROW at certain parking lots and weigh stations. The costs and resultant benefits are limited to the location where the solution is implemented.
- Statewide solutions – These solutions are either implemented at the state level or corridor level and have costs and resultant benefits that impact truck parking across the entire state or corridor. Examples include installing dynamic message signs across entire corridors or developing a statewide truck parking availability mobile application.

Based on their intended purpose, these tools were then categorized according to the one or more of the six truck parking goals identified in Section 2.2 that it was intended to achieve.

As documented in Section 2.5, these strategies were evaluated using four criteria on a high, medium and low scale them. The four criteria are:

- Effectiveness at addressing identified goal(s)
- Cost
- Private resource utilization
- Ease of implementation/previous success

The evaluation framework used for scoring against these criteria is presented in Table 3.

Table 3: Evaluation framework for prioritizing truck parking strategies

Criterion	Low	Medium	High
Effectiveness in achieving goal	Generic solution that aims to address broader need, but with low accuracy and typically low costs	Solutions that address a specific aspect of the broader need with good accuracy (or) medium/high accuracy solution with limited scope (or) detailed analysis resulting in identification of targeted solutions	Targeted solution designed to meet specific need with high accuracy and ease-of-use (and) may be expanded to other sites easily
Cost	Conceptual cost estimate <$500k (or) Solution judged to be low-cost (if costs unknown)	$500k < Conceptual cost estimate <$2M (or) Solution judged to be medium-cost (if costs unknown)	Conceptual cost estimate >$2M (or) Solution judged to be high-cost (if costs unknown)
Private resource utilization	Little or no private partner/resource	Private partner used only in the engineering/development phase – e.g. Private partner used for technology development or deployment	Private partner with significant stake in solution – e.g. Private partner to own/operate truck parking facility
Ease of implementation	Multi-phase tiered approach necessary, with high costs and resource utilization		Relatively quick, low-resource implementation and/or with evidence of successful use by other states

Points are then awarded to each strategy based on their high, medium and low evaluation for each of the four criteria:

Table 4: Points matrix for high, medium and low evaluations

Score	Effectiveness in achieving goal	Cost	Private resource utilization	Ease of implementation
Low	3	9	3	3
Medium	6	6	6	6
High	9	3	9	9

5.2 Evaluation of Statewide Solutions for Truck Parking

Statewide solutions and their evaluation scores are presented in Table 5 below:

Table 5: Inventory of Possible Strategies - Statewide solutions

Strategy type	Tool / Solution	Oregon goal(s)	Effective in addressing Oregon goal	Cost	Private resource utilization	Ease of implementation	Solution score
Data and Technology Deployment	Real-time parking availability communication utilizing dynamic message signs	Provide truck drivers access to real-time and accurate information about the availability of safe, legal parking places (public and private)	High	Medium	Low	Medium	24
	Real-time parking availability communication utilizing web or smartphone app - ODOT to develop smartphone or web app, with potential to reserve parking spots at truck stops and rest areas.	Provide truck drivers access to real-time and accurate information about the availability of safe, legal parking places (public and private)	High	Medium	Low	High	27
	Real-time parking availability communication utilizing web or smartphone app - ODOT to push availability data to private apps such as Park My Truck, with potential to reserve parking spots at truck stops and rest areas.	Provide truck drivers access to real-time and accurate information about the availability of safe, legal parking places (public and private)	High	Low	High	High	36
	Utilize Freight Advances Traveler Information System (FRATIS) to communicate truck parking availability	Provide truck drivers access to real-time and accurate information about the availability of safe, legal parking places (public and private)	High	Medium	Low	High	27
	Visor card indicating long-term parking locations	Reduce the time required to find safe and legal parking space (public and private)	Low	Low	Low	High	24
Creative use of ROW	Develop revised design standards for rest areas	Improve roadway safety by reducing the likelihood of crashes involving trucks parked in undesignated locations. Improve safety by reducing the likelihood of crashes involving trucks at rest areas	High	Low	Low	High	30
	Identify alternate truck parking locations such as waysides, closed weigh stations, chain-up areas, excess shoulders and safety pullouts	Improve roadway safety by reducing the likelihood of crashes involving trucks parked in undesignated locations. Improve safety by reducing the likelihood of crashes involving trucks at rest areas	High	Low	Low	High	30
Policy and Regulations	Utilize safety rest area funding, TIGER/INFRA/DERA grants to fund truck parking expansion opportunities	Improve safety by reducing the likelihood of crashes involving trucks at rest areas Maintain the competitiveness of Oregon's economy by increasing the utilization of and/or expanding the number of truck parking spaces in high-demand areas.	High	Low	Low	Low	24
	Modify local Truck Parking Ordinances to include short-term truck parking staging requirements for private warehouses and public on-street parking	Reduce the time required to find safe and legal parking space (public and private)	Medium	Low	Low	Low	21
	Formally enact legislation at the state level to prohibit parking in certain undesignated areas.	Improve safety by reducing the likelihood of crashes involving trucks at rest areas	High	Low	Low	Low	24
	Review and modify state land use laws to allow for truck parking capacity expansion outside urban growth areas	Reduce the time required to find safe and legal parking space (public and private)	High	Low	Low	Low	24

Strategy type	Tool / Solution	Oregon goal(s)	Effective in addressing Oregon goal	Cost	Private resource utilization	Ease of implementation	Solution score
Coalitions and Institutional Oversight	Identify truck parking champion to implement truck parking recommendations	All Oregon goals	Medium	Low	Low	High	27
	Establishment of Highway Rest Facility Committee/Truck Parking Committee to oversee development and implementation of a formal Highway Rest Facility Program/truck parking goals and regulations	All Oregon goals	Medium	Low	Low	High	27
	Establish competitive loan or grant program to provide funding for public and private truck parking expansion to respond to future changes in demand	All Oregon goals	Medium	Low	Low	High	27
Public and Private Outreach	Coordinate with MPOs and local governments to develop guidelines and mitigations strategies aimed at easing public opposition to private sector parking facilities	Maintain the competitiveness of Oregon's economy by increasing the utilization of and/or expanding the number of truck parking spaces in high-demand areas Reduce the time required to find safe and legal parking space (public and private)	Medium	Low	Medium	High	30

5.3 Evaluation of Site-Specific Solutions

Table 6: Inventory of Possible Strategies - Site Specific solutions

Strategy type	Tool / Solution	Oregon goal(s)	Effective in addressing Oregon goal	Cost	Private resource utilization	Ease of implementation	Solution score
Data and Technology Deployment	Increased static signage along freeways and highways	Reduce the time required to find safe and legal parking space (public and private)	Low	Low	Low	High	24
	In-pavement sensors to determine parking space usage	Provide truck drivers access to real-time and accurate information about the availability of safe, legal parking places (public and private)	High	Medium	Medium	Medium	27
	Camera sensors to determine parking space usage	Provide truck drivers access to real-time and accurate information about the availability of safe, legal parking places (public and private)	High	Low	Medium	High	33
	Surveillance cameras, improved lighting and/or night-time surveillance patrol by Oregon State Police to enhance security onsite at public rest areas	Improve security and safety of driver and cargo at parking facilities.	High	Medium	Medium	High	30
Public Capacity Expansion	Explore study of truck parking at selected weigh stations	Maintain the competitiveness of Oregon's economy by increasing the utilization of and/or expanding the number of truck parking spaces in high-demand areas Reduce the time required to find safe and legal parking space (public and private)	Medium	Low	Low	High	27
	Improved/expanded truck parking areas using excess ROW, rest areas and other locations on interstates, improved geometrics and capacity expansion	Maintain the competitiveness of Oregon's economy by increasing the utilization of and/or expanding the number of truck parking spaces in high-demand areas Improve safety by reducing the likelihood of crashes involving trucks at rest areas	High	Low	Low	High	30
	Opening public rest areas that have been closed	Maintain the competitiveness of Oregon's economy by increasing the utilization of and/or expanding the number of truck parking spaces in high-demand areas	Medium	Low	Low	High	27
Expansion via private partnerships	Explore warehouse parking partnerships and/or requirements with private vendors for end-of-trip parking and staging	Maintain the competitiveness of Oregon's economy by increasing the utilization of and/or expanding the number of truck parking spaces in high-demand areas. Reduce the time required to find safe and legal parking space (public and private)	High	Low	High	Medium	33
	Investigate expanding parking via public private partnerships - utilizing excess ROW owned by state near private facilities and entering cost-sharing agreements for construction and maintenance of parking areas.	Maintain the competitiveness of Oregon's economy by increasing the utilization of and/or expanding the number of truck parking spaces in high-demand areas. Reduce the time required to find safe and legal parking space (public and private)	High	Low	High	Low	30
	Explore purchase of private vacant urban land for conversion to truck parking and rest areas. Partner with private facility for construction and maintenance of parking areas	Maintain the competitiveness of Oregon's economy by increasing the utilization of and/or expanding the number of truck parking spaces in high-demand areas. Reduce the time required to find safe and legal parking space (public and private)	High	High	High	Low	24

5.4 Recommended Solutions for Oregon

A number of prioritized tools and solutions were described in the prior sections that play a role in addressing state trucking parking goals and priorities. Solutions that focused on creative use of ROW or deployment of low-cost technology tended to score the best based on the evaluation framework set out in section 5.1. These top solutions have been summarized below and are considered the best alternatives for each identified state truck parking goal.

Table 7: Summary of top solutions for Truck Parking

Tool / Solution	Oregon goal(s)	Effective in addressing Oregon goal	Cost	Private resource utilization	Ease of implementation	Solution score
Real-time parking availability communication utilizing web or smartphone app - ODOT to push availability data to private apps such as Park My Truck	Provide truck drivers access to real-time and accurate information about the availability of safe, legal parking places (public and private)	High	Low	High	High	36
Camera sensors to determine parking space usage	Provide truck drivers access to real-time and accurate information about the availability of safe, legal parking places (public and private)	High	Low	Medium	High	33
Explore warehouse parking partnerships and/or requirements with private vendors for end-of-trip parking and staging	Maintain the competitiveness of Oregon's economy by increasing the utilization of and/or expanding the number of truck parking spaces in high-demand areas. Reduce the time required to find safe and legal parking space (public and private)	High	Low	High	Medium	33
Develop revised design standards for rest areas	Improve roadway safety by reducing the likelihood of crashes involving trucks parked in undesignated locations. Improve safety by reducing the likelihood of crashes involving trucks at rest areas	High	Low	Low	High	30
Identify alternate truck parking locations such as waysides, closed weigh stations, chain-up areas, excess shoulders and safety pullouts	Maintain the competitiveness of Oregon's economy by increasing the utilization of and/or expanding the number of truck parking spaces in high-demand areas.	High	Low	Low	High	30
Improved/expanded truck parking areas using excess ROW, rest areas and other locations on interstates, improved geometrics and capacity expansion	Maintain the competitiveness of Oregon's economy by increasing the utilization of and/or expanding the number of truck parking spaces in high-demand areas Improve safety by reducing the likelihood of crashes involving trucks at rest areas	High	Low	Low	High	30
Investigate expanding parking via public private partnerships - utilizing excess ROW owned by state near private facilities and entering cost-sharing agreements for construction and maintenance of parking areas.	Maintain the competitiveness of Oregon's economy by increasing the utilization of and/or expanding the number of truck parking spaces in high-demand areas. Reduce the time required to find safe and legal parking space (public and private)	High	Low	High	Low	30
Surveillance cameras, improved lighting and/or night-time surveillance patrol by Oregon State Police to enhance security onsite	Improve security and safety of driver and cargo at parking facilities.	High	Medium	Medium	High	30
Coordinate with MPOs and RPOs to develop guidelines and mitigations strategies aimed at easing public opposition to private sector parking facilities	Maintain the competitiveness of Oregon's economy by increasing the utilization of and/or expanding the number of truck parking spaces in high-demand areas Reduce the time required to find safe and legal parking space (public and private)	Medium	Low	Medium	High	30

6. FUNDING

Funding will be essential to the ability to implement many of the recommended truck parking solutions. This chapter discusses various federal and state sources as well as public private partnership strategies. It draws from the work of the National Truck Parking Coalition as well as efforts in other states.

6.1 Federal Funding Sources

6.1.1 Formula Programs

Truck parking is eligible under the following federal programs that provide funding by formula to states[2]:

- Surface Transportation Block Grant – for the construction of truck parking on Federal-aid highways.
- National Highway Freight Program - truck parking facilities and real-time traffic, parking, roadway condition, and multimodal transportation information systems are all eligible activities. Must be on the national highway freight network
- Highway Safety Improvement Program – truck parking can be funded under this program if it is consistent with the State Strategic Highway Safety Plan
- National Highway Performance Program – highway safety, including truck parking, is eligible if it supports meeting national performance goals.
- Congestion Mitigation and Air Quality Improvement Program (CMAQ) – truck stop electrification systems are eligible under the federal guidelines if they primarily benefit a non-attainment or maintenance area. This use is not eligible under Oregon state guidelines, so would necessitate an exception.

6.1.2 Discretionary Grants

Truck parking is eligible under the following federal competitive grant programs:

- **Infrastructure for Rebuilding America (INFRA) Grants** cover up to 60 percent of total project costs for critical freight and highway projects. Highway freight projects on the National Highway freight Network, highway projects on the NHS and other specified intermodal projects. In 2016, the state of Colorado received a $9 million grant under the predecessor program (Fast Lane) for a Truck Parking Information Management System (TPIMS).
- **Better Utilizing Investments to Leverage Development (BUILD) Grant** funds are intended to support innovative projects that generate economic development and improve

[2] Eligibility of Title 23 Federal Funds for Commercial Motor Vehicle Parking, USDOT Memorandum from Martin C. Knopp, October 18, 2018.

access to reliable, safe and affordable transportation. Under the predecessor program (TIGER), MAASTO obtained a $25 million grant for its TPIM system.

- **Diesel Emissions Reduction Act (DERA) program** makes funds available for diesel emissions reduction, including installing emission reduction systems (See 42 U.S.C 16132). Seventy percent of the DERA appropriation is used for national competitive grants and rebates that use certified diesel emission reduction technologies. Thirty percent of the appropriation is allocated to States to fund programs for clean diesel projects.[3]

  CMAQ and DERA-eligible truck idle reduction project types include:

  - Verified Onboard Idle Reduction Technologies
  - Truck Stop Electrification (TSE) and Electrified Parking Spaces (EPS)

  For more information on emission reduction grant programs and examples of their successful application to idle reduction technologies see the Emissions Reduction Grant Program Fact Sheet.[4]

6.2 State Funding

State gas tax and other state sources could potentially fund truck parking projects. However, projects would need to be eligible under the various programs and would need to compete with numerous other priorities.

6.3 Public Private Partnerships

Since most of the truck parking in Oregon is located in private truck stops, working with the private sector will be a necessary to address the truck parking problem. The private sector also represents a key potential funding source. Some examples are provided below:

- Under a collaborative venture in Fernley, Nevada that could serve as a model for this type of relationship, the Nevada Department of Transportation has entered into an agreement to build a new truck parking lot adjacent to a Flying J truck stop off I-80, with the truck stop providing litter control and basic maintenance of the site[5].
- In another P3, the Brainerd Lakes Area Welcome Center in Minnesota Figure 4 is sited in the middle of a highway right of way. The site, which is operated as a rest area includes 30 truck parking spaces, bathrooms and vending machines. A gift shop helps support the operating costs of the facility.[6]

[3] Emissions Reduction Grant Program Fact Sheet, National Coalition on Truck parking, 2018, p 1.
[4] Emissions Reduction Grant Program Fact Sheet, National Coalition on truck parking, 2018.
[5] Activity Report, National Coalition on Truck Parking, 2015-2016, p. 18.
[6] Final Report, I-95 Corridor Coalition National Coalition on Truck Parking Synthesis, April 2019.

Figure 5: The Brainherd Lakes Area Welcome Center

- Virginia DOT invited the private sector to sponsor any of the 43 Virginia rest areas and welcome centers to defray the costs of operation. Florida DOT pursued a similar sponsorship program for its TPAS message signs.[7]
- The Interstate Oasis Program created under SAFETEA-LU allows states to partner with private operators who provide basic rest area services in exchange for online highway signing and official designation near an Interstate highway but not within the right-of-way. Oases exist in Connecticut, Illinois, Idaho, Pennsylvania, Ohio, and Utah.[8]

[7] Final Report, I-95 Corridor Coalition National Coalition on Truck Parking Synthesis, April 2019.
[8] Ibid.

CONCLUSION

6.4 Recommended Actions

In order to develop more specific actions, the top recommended solutions for Oregon from section 5.4 were matched up against the primary, secondary and tertiary needs from Chapter 3. The results are presented in this section. The preliminary draft was reviewed by ODOT staff on the PMT and by the Technical Advisory Committee at its third meeting. Comments from both groups have been incorporated. The truck parking inventory map has been appended at the end of this section for reference.

Recommended Actions - Statewide

1. Place high importance on interoperability with other states when implementing improvements that will disseminate real-time information about parking availability.
2. An associated parking reservation system further assists truck drivers in planning their trips in advance and ensures predictability. Many truck drivers spend over an hour looking for a spot and/or park earlier to ensure they get a spot. This hurts efficiency and as such many trucks try to stay east of Portland.
3. Encourage Metropolitan Planning Organizations (MPO) and cities to address truck parking in MPO freight plans and Transportation System Plans.
4. Develop materials to educate the public and elected officials about the importance of truck parking in freight transportation and industrial development.
5. Consider developing policies and regulations that could limit or prohibit truck parking in certain areas on ODOT ROW.
6. Consider development of a coalition with neighboring states in order to address truck parking issues on I-5.
7. Develop a Truck Parking Information Management System (TPIMS) to better address commercial vehicle parking needs throughout the state.

Table 8: Recommended Actions for I-5

Segment	Segment Needs	Issues	Suggested Solutions
H (I-5) from I-205 to WA border (20 miles long)	**Primary**: None **Secondary**: Capacity **Tertiary**: Safety & Security	**Secondary**: Limited parking availability in this segment – 50% of survey respondents indicated parking spaces are never available. Limited availability of parking in the Portland metro area may mean that truck's park just outside of the Portland metropolitan area where parking availability is perceived to be greater. This may mean that the demand analysis underestimates truck parking needs in this segment. **Tertiary**: Approximately 40% of respondents indicated that truck parking was not safe or secure in this segment.	• Work with the Jubitz truck stop to determine if real-time parking info needs to be more accessible. If so, determine what type of assistance ODOT can provide. • Work with WA state to provide real-time parking information for the truck stops on I-5 in the Vancouver/Portland area. • Investigate public private partnerships to see how the state can help businesses that operate and develop private truck parking facilities. • Investigate perception of unsafe conditions at stops in this segment and determine whether installation of surveillance cameras/improved lighting/fencing/signage is feasible and/or addresses the problem.
G I-5 from I-205 to Salem (35 miles long)	**Primary**: Capacity **Secondary**: None **Tertiary**: None	**Primary**: This segment sees the highest truck parking demand in the state, is running at capacity, and is projected to have a shortfall of spaces in 2040. Because truck parking in the Portland metro area is so limited, this segment and others just outside of the Portland metropolitan area may see outsize demand compared to the number of origins and destinations.	• Investigate possibility of expanding the French Prairie Rest Area (utilizing excess ROW, restriping, improved geometrics). • Investigate the provision of real-time parking information for the rest area using dynamic message signs, smartphone apps or websites. • Investigate creation of a public-private partnership to work with Aurora Flying J and Aurora TA truck stops to see how ODOT can help with parking demand. • Work with Aurora Flying J and Aurora TA truck stops to determine if real-time parking info needs to be more accessible. If so, determine what type of assistance ODOT can provide.

Segment	Segment Needs	Issues	Suggested Solutions
F I-5 from Salem to Albany (21 miles long)	**Primary**: Undesignated Parking Capacity **Secondary**: None **Tertiary**: None	**Primary**: Undesignated parking at the Santiam Rest area and the highway shoulders may partly be due to insufficient spaces at the rest area and Albany's Love truck stop. However, safety and convenience could be other reasons for undesignated parking.	• Increase truck parking capacity through expansion and other improvements to the Santiam River rest area (utilizing excess ROW, restriping, improved geometrics), if this can be done safely. • Consider managing and improving the undesignated truck parking in and around the rest areas. Consider expanding the undesignated parking using excess ROW, if available, and making it into designated parking. • Investigate the provision of real-time parking information for the rest area using dynamic message signs, smartphone apps or websites. • Investigate creation of a public-private partnership with Albany's Love truck stop to see how ODOT can help with parking demand. • Work with Albany's Love truck stop to determine if real-time parking info needs to be more accessible. If so, determine what type of assistance ODOT can provide.
E I-5 from Albany to Eugene (45 miles long)	**Primary**: None **Secondary**: None **Tertiary**: None		

Segment	Segment Needs	Issues	Suggested Solutions
C I-5 from Eugene to Roseburg (64 miles long)	**Primary**: Capacity **Secondary**: None **Tertiary**: None	**Primary**: Most spaces in this segment are at the Rice Hill Pilot which is estimated to operate close to capacity. There are two rest areas, Gettings Creek and Cabin Creek in the segment.	• Work with the Rice Hill Pilot truck stop to determine if real-time parking info needs to be more accessible. If so, determine what type of assistance ODOT can provide. • Investigate potential to expand truck parking capacity at/near Rice Hill Pilot using excess ROW or identify alternate truck parking locations using public private partnerships or other means. • Increase truck parking capacity in the two rest areas if they are not usually full during peak hours utilizing excess ROW, restriping, improved geometrics).
B I-5 from Roseburg to Grants Pass (68 miles long)	**Primary**: Undesignated Parking **Secondary**: None **Tertiary**: Capacity	**Primary**: Undesignated parking at Manzanita Rest Area is the primary concern in this segment even though, on average, there are 63 spaces available at 4 truck stops and the rest area. Undesignated parking may be occurring due to several reasons including safety and convenience. **Tertiary**: Only 26 spaces are projected to be available in this segment in 2040. Parking availability should be tracked as there is potential for capacity constraints in the future.	• Manage and/or increase undesignated truck parking in the rest area utilizing excess ROW. Determine if restriping and improving access to rest area will reduce the likelihood of collisions and sideswipes. • Review access and parking design issues at rest area, develop and implement revised design standards, if warranted. • Investigate the provision of real-time parking information for the rest area using dynamic message signs, smartphone apps or websites. • Work with the truck stops to determine if real-time parking info needs to be more accessible. If so, determine what type of assistance ODOT can provide. • Track availability trends at rest areas/truck stops in this segment to ascertain likelihood of adding capacity in the future. • Review infrastructure improvements required at closed rest area at milepost 82 as well as the closed weigh station near Roseburg to investigate potential for reopening them as a cost-effective method for expanding parking capacity.

Segment	Segment Needs	Issues	Suggested Solutions
A I-5 from Grants Pass to CA border (56 miles long)	**Primary**: Undesignated Parking **Secondary**: None **Tertiary**: Capacity	**Primary**: Undesignated parking at Ashland Hill park is the primary concern even though on average there are 51 spaces available at 3 truck stops and one small rest area. Most utilized undesignated parking location in the state. Parking is primarily on the NB direction along a wide paved shoulder after a long steep upgrade. Many truck drivers stop here to rest and check their brakes. Further, there may be seasonal weather-related parking needs in this segment as closures over the Siskiyou would be expected to affect parking demand. **Tertiary**: Parking demand may exceed capacity in the future. More than 25% of respondents take more than 1 hour to find parking in this segment.	• Consider managing and/or increasing undesignated truck parking in the area near Ashland Hill park utilizing excess ROW. • Work with the truck stops to determine if real-time parking info needs to be more accessible. If so, determine what type of assistance ODOT can provide. • Work with CA state to help provide real-time parking information for rest areas/truck stops in this corridor. Track availability trends at rest area/truck stops in Medford and Phoenix to ascertain likelihood of requiring additional capacity in the future.

Table 9: Recommended Actions for I-84

Segment	Segment Needs	Issues	Suggested Solutions
J I-84 from I-5 to Troutdale (16 miles long)	**Primary**: Capacity **Secondary**: None **Tertiary**: Safety & Security	**Primary**: This segment is the primary connection to Portland from the east. As such there is limited parking availability in this segment – 40% of respondents indicated parking spaces are never available. **Tertiary**: Approximately 40% of respondents indicated that truck parking was not safe or secure in this segment.	• Work with the Jubitz truck stop to determine if real-time parking info needs to be more accessible. If so, determine what type of assistance ODOT can provide. • Investigate a truck parking reservation system for truck parking facilities in or near the Portland metro area in order to increase the predictability of truck parking and improve driver efficiency. This could be done in conjunction with private truck stops or at rest areas. Investigate creation of a public-private partnership to work with the truck stops to see how ODOT can help with parking demand. • Existing truck stops operate in a constrained footprint, therefore consider use excess ODOT ROW to identify alternate parking locations near existing stops. • Investigate the possibility of better managing or providing real-time parking info at the Cascade Locks POE at MP45 as they have 19 spaces. • Investigate public private partnerships with warehouse or distribution centers near the segment. • Work with truck stops to determine if installation of surveillance cameras/improved lighting, signage is feasible and/or solves the problem.

Segment	Segment Needs	Issues	Suggested Solutions
K I-84 from Troutdale to US97 (86 miles long)	**Primary**: None **Secondary**: Undesignated Parking, Capacity **Tertiary**: Safety & Security	**Secondary**: This segment has no truck stops and ranks second in terms of undesignated parking hours, with Corbett Viewpoint being the most used location. Trucks park at the viewpoint area and on the shoulders of the access road. The segment also has capacity constraints with only 25 designated spaces available on average in 2040. Per TAC, drivers often park in this segment to pre-position for the trips into and out of the Portland metro area in this segment. **Tertiary**: Approximately 40% of respondents indicated that truck parking was not safe or secure in this segment. High winds are a problem, especially with empty trucks	• Provide or improve real-time parking information for rest area and truck stops in this segment to improve utilization. • Investigate if capacity constraints at the Memaloose Rest area are a major cause of undesignated parking in this area (currently can only fit 10 trucks in westbound direction). If there are capacity constraints, then consider expanding the rest area using excess ROW if available. If the capacity constraints are not the issue, then manage and improve the undesignated truck parking in and around the rest area. Consider expanding the undesignated parking using excess ROW if available. • At viewpoint consider better managing the undesignated truck parking with signage, striping and lighting to increase safety. If warranted, investigate the possibility of providing e additional parking at or near the viewpoint using excess ROW if available. • Investigate cause of safety concerns in this segment by working with the OSP, ODOT maintenance districts, OTA and others.
L I-84 from US97 to Pendleton (105 miles long)	**Primary**: None **Secondary**: Undesignated Parking **Tertiary**: None	**Secondary**: Undesignated parking at the Arlington Viewpoint, Stanfield and Boardman rest areas should be addressed. Lack of designated parking spaces does not seem to be main cause of undesignated parking. Could be occurring due to several reasons including safety and convenience. There may be weather-related issues that contribute to seasonal parking.	• Provide or improve real-time parking information for rest areas and truck stops in this segment to improve utilization. • Investigate the reasons for undesignated parking. If capacity constraints at the rest areas are a major cause of undesignated parking in this segment, consider expanding the rest areas using excess ROW if available. If capacity constraints are not the issue, then manage and improve the undesignated truck parking. Consider expanding the undesignated parking using excess ROW, if available.

Segment	Segment Needs	Issues	Suggested Solutions
S I-84 from Pendleton to Idaho border (169 miles long)	**Primary**: None **Secondary**: None **Tertiary**: Undesignated Parking, Capacity	**Tertiary**: Significant undesignated parking at rest areas such as Deadman Pass and Reynolds Rest Areas. Lack of current spaces at the truck stops and rest areas does not seem to be the main cause of undesignated parking. However, there may be seasonal weather-related parking needs in this segment. Projected decline in availability in the future due to significant expected traffic growth.	• Provide or improve real-time parking information for rest areas and truck stops in this segment to improve utilization. • Investigate the possibility of better managing or providing real-time parking info at the Farewell Bend POE at MP353 (36 spaces) and the weigh station at MP227. • Manage and/or increase undesignated truck parking in the rest area utilizing excess ROW if available. • Consider developing a winter truck parking strategy to provide parking for trucks that can't travel on the highway due to poor weather conditions.

Table 10: Recommended Actions for US 97

Segment	Segment Needs	Issues	Suggested Solutions
N US97 from I-84 to Madras (93 miles long)	**Primary**: None **Secondary**: None **Tertiary**: Amenities & Services	**Tertiary**: Approximately 60% of respondents indicated that services are inadequate. There are however some services in Shaniko, Grass Valley and Moro.	• Investigate the signage in this segment to determine if there needs to be additional signage indicating miles to towns or services. • Investigate which amenities and services are deficient at the Cow Canyon rest area and truck stops and how the state can help improve amenities
O US97 from Madras to Bend (42 miles long)	**Primary**: None **Secondary**: None **Tertiary**: Amenities & Services	**Tertiary**: Approximately 60% of respondents indicated that services are inadequate on this segment. There are however some services in Terrebonne and Redmond.	• Investigate the signage in this segment to determine if there needs to be additional signage indicating miles to towns or services. • Investigate which amenities and services are deficient at the Peter Skene Ogden State Park rest area and truck stops and how the state can help them with improving amenities.
T US97 from Bend to OR58 (58 miles long)	**Primary**: None **Secondary**: None **Tertiary**: Safety & Security, Amenities & Services	**Tertiary**: Approximately 70% of respondents indicated that services are inadequate on this segment and 40% indicated parking was not safe or secure.	• Investigate the signage in this segment to determine if there needs to be additional signage indicating miles to towns or services. • Investigate cause of safety concerns in this segment with the OSP, local law enforcement, OTA and ODOT maintenance districts • Work with the truck stop to see if installation of surveillance cameras/improved lighting is feasible and/or solves the problem.

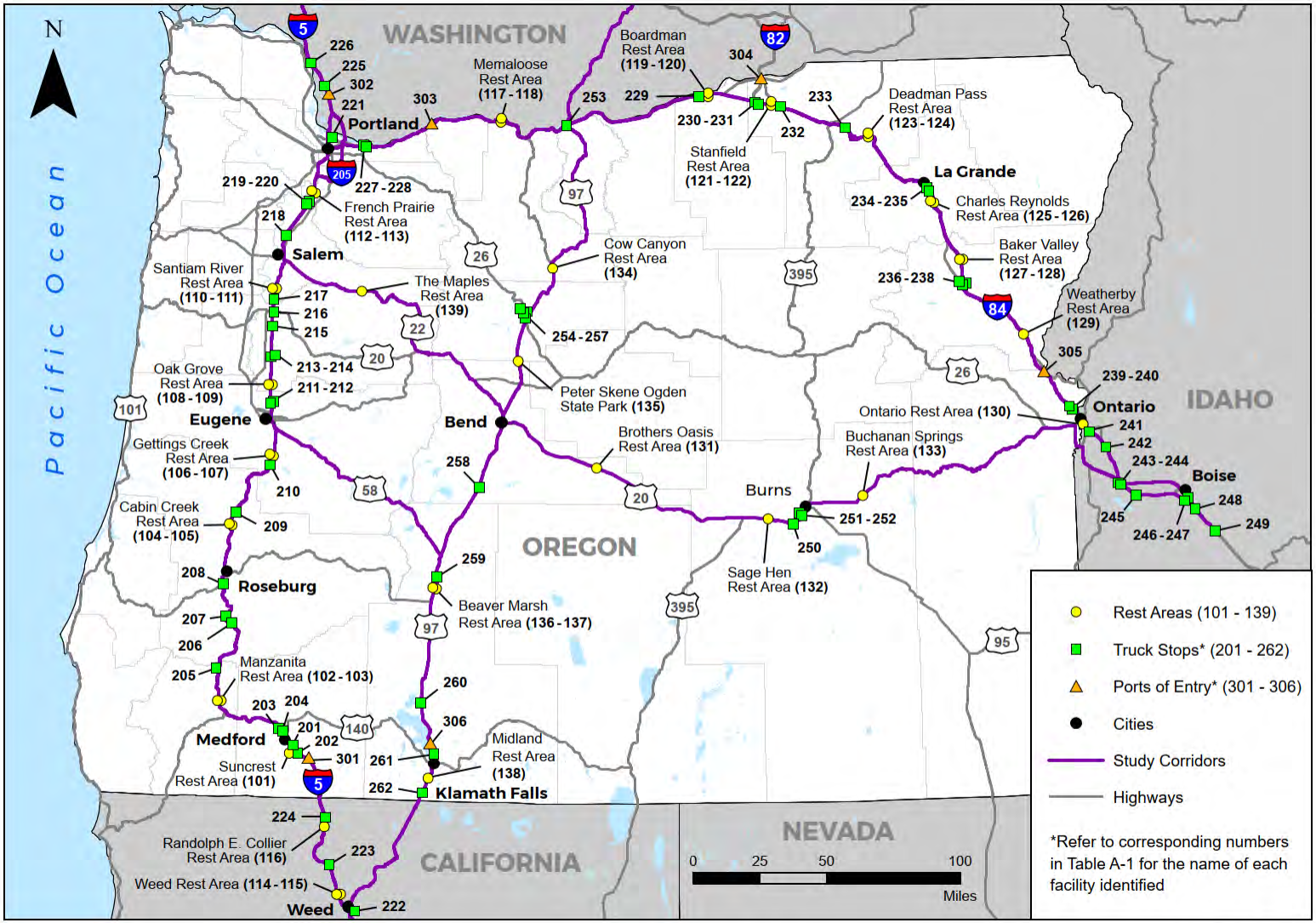
Segment	Segment Needs	Issues	Suggested Solutions
R US97 from OR58 to CA border (96 miles long)	**Primary**: None **Secondary**: None **Tertiary**: None		

Table 11: Recommended Actions for Segments not on I-5 I-84 or US 97

Segment	Segment Needs	Issues	Suggested Solutions
D OR58 from I-5 to US97 (86 miles long)	**Primary**: None **Secondary**: None **Tertiary**: Safety & Security, Amenities & Services	**Tertiary**: Approximately 70% of respondents indicated that services are inadequate on this segment and 40% indicated segment was not safe or secure. The main cause is likely the lack of any designated parking facility in this segment.	• The city of Oakridge has indicated a desire to provide more truck services in their city. Work with the city to determine if truck parking could be accommodated in the city. • Investigate cause of safety concerns in this segment with the OSP, local law enforcement, OTA and ODOT maintenance districts • Manage and/or increase undesignated truck parking in the segment utilizing excess ROW and provide lighting, striping, fencing to improve safety. Because there is currently no rest area in this segment, adding one would benefit truck drivers as well as drivers of passenger vehicles on this facility that provides one of these few connections between US 97 and I-5 and access to unique recreational areas.
I I-205 from I-5 to WA border (28 miles long)	**Primary**: None **Secondary**: None **Tertiary**: Capacity, Safety & Security	**Tertiary**: Approximately 50% of respondents indicated parking spaces are never available and 40% indicated segment was not safe or secure. The main cause is the lack of any designated or undesignated parking in this segment. Because I-205 is used primarily by trucks seeking to bypass the Portland area, through-traffic may be more likely to park at truck stops and rest areas just outside of the Portland metropolitan area in OR and WA. This may mask the true demand for parking within the metro area.	• Investigate public private partnerships to see how the state can help businesses that operate and develop private truck parking facilities. • Explore warehouse parking partnerships and/or requirements with private vendors for end-of-trip parking and staging. • Provide real-time parking information using dynamic message signs, smartphone apps or websites.to let truckers know where the parking and services are as they approach the metro area and improve parking utilization. • Work with WA state to develop a coordinated approach to addressing truck parking on the I-205 corridor.

Segment	Segment Needs	Issues	Suggested Solutions
M OR22/US20 from I-5 to US97 (126 miles long)	**Primary**: None **Secondary**: None **Tertiary**: Amenities & Services	**Tertiary**: This segment has low truck traffic volumes and only 1 rest area with 15 parking spaces even though it is one of the longest segments. 35% of respondents indicated that they routinely spend more than 1 hourly looking for parking.	• Provide real-time parking information using dynamic message signs, smartphone apps or websites.to let truckers know where the parking and services are as they approach the metro area and improve parking utilization. • Investigate the signage in this segment to determine if there needs to be additional signage indicating miles to towns or services.
P US20from US97 to US395 (104 miles long)	**Primary**: Safety & Security **Secondary**: None **Tertiary**: None	**Primary:** This is the only segment where safety & security was rated as a primary need. Approximately 60% of respondents indicated that truck parking was not safe or secure, one of the highest responses to this question in the survey. This is a rural segment that carries a small volume of trucks, with only one small rest area (Brothers Oasis) in over 100 miles.	• Investigate cause of safety concerns in this segment with the OSP, local law enforcement, OTA and ODOT maintenance districts. • Manage and/or increase undesignated truck parking in the segment utilizing excess ROW and provide lighting, signage, striping, fencing to improve safety.
Q US20 from US395 to ID border (160 miles long)	**Primary**: None **Secondary**: None **Tertiary**: Safety & Security	**Tertiary:** While this segment represents low truck volumes, the lack of parking facilities in the middle of this segment may be causing trucks to park in undesignated parking areas or drive a long distance to reach the next parking facility. 40% of respondents indicated that parking was not safe or secure on this segment.	• Investigate cause of safety concerns in this segment with the OSP, local law enforcement, OTA and ODOT maintenance districts. • Manage and/or increase undesignated truck parking in the segment utilizing excess ROW and provide lighting, signage, striping, fencing to improve safety. • Provide real-time parking information using dynamic message signs, smartphone apps or websites to let truckers know where the parking and services are as they approach the metro area and improve parking utilization.

Figure 6: Truck Parking Inventory Map



August 23, 2019

6.5 Next Steps

Next steps in the study involve a review of these prioritized solutions and needs with relevant ODOT stakeholders and at TAC meetings. Once priorities have been finalized, the study team will match solutions to areas of the particular needs. A preliminary list of recommended actions, drawn from the toolbox of prioritized solutions and matched to existing needs in each of the segments, is presented below. The State should then identify an action plan for implementation. In some cases, feasibility studies and proof-of-concept pilots may be appropriate to determine effectiveness, limitations and projected costs of implementing specific recommendations under consideration. Pilot programs for low-cost solutions, such as expanding rest areas with existing ROW, redesign/remarking of rest areas to better utilize existing footprint or increasing participation in existing truck parking web applications, could speed implementation.