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FINAL

Freight Task Force, Year 2

Task 4 – Research Advanced Notice of Truck Parking Availability

Prepared for:

North/West Passage Pooled Fund

Prepared by:

CPCS Transcom Inc.

Solutions for growing economies

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MnDOT North/West Passage – Project 10.4: Freight Task Force, Year 2

The objective of Year 2 activities of the North/West Passage (NWP) Freight Task Force is to continue the momentum of the Year 1 work. Specifically, to 1) support the active engagement of NWP Members, 2) conduct best practice (and practical) research on project funding opportunities, and 3) to help refine the truck parking concept so that it best fits NWP needs. Each of these activities is aimed at getting the coalition closer to project implementation.

Working Paper

This Working Paper represents the Task 4 deliverable. The aim of Task 4 is to conduct best practice research and provide guidance on implementation of a truck parking information system in the NWP Corridor.

Acknowledgments

The CPCS Team acknowledges and is thankful for the input of those consulted in the development of this Working Paper, as well as the guidance and input of representatives from NWP Freight Task Force.

Opinions

Unless otherwise indicated, the opinions herein are those of the authors and do not necessarily reflect the views of the NWP Freight Task Force.

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Cover image source: CPCS

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Acronyms / Abbreviations

ATA	American Trucking Associations
ATRI	American Transportation Research Institute
CB	Citizens Band Radio
CCTV	Closed-Circuit Television
DMS	Dynamic Message Sign
DOT	Department of Transportation
FAF	Freight Analysis Framework
FASTLANE	Fostering Advancements in Shipping and Transportation for the Long-term Achievement of National Efficiencies
FDOT	Florida Department of Transportation
FHWA	Federal Highway Administration
FMCSA	Federal Motor Carrier Safety Administration
GPS	Global Positioning System
HOS	Hours of Service
ITS	Intelligent Transportation System
KDOT	Kansas Department of Transportation
LTL	Less Than Truckload
MAASTO	Mid America Association of State Transportation Officials
MnDOT	Minnesota Department of Transportation
MPO	Metropolitan Planning Organization
NWP	North/West Passage
OOIDA	Owner Operator and Independent Drivers Association
OTR	Over The Road
NWP	North/West Passage
TIGER	Transportation Investments Generating Economic Recovery
TPAS	Truck Parking Availability System
TPIMS	Truck Parking Information and Management System
TSPS	Truck Smart Parking Services
US	United States
VMS	Variable Message Sign
VMT	Vehicle Miles Traveled
WYDOT	Wyoming Department of Transportation

Executive Summary

About Truck Parking and the Need for Information

The majority of freight tonnage on the transportation system is carried by trucks – over 18 billion tons of freight in 2015, with an expected increase of 27% in the next 20 years. This increase in truck tonnage will translate into an increased number of trucks on the road – each requiring safe and convenient places to pull off the road to eat, rest, comply with HOS requirements, wait out traffic, wait until their delivery window, and for other purposes.

Providing adequate parking, information on parking options, and insight into whether or not parking is available is important for the safety of truck drivers and the overall transportation system. This is most clearly illustrated by the tragic loss of life by a truck driver who parked in unsafe conditions and prompted development of Jason's Law. This law requires USDOT/FHWA to evaluate the capability of each state to provide adequate parking and rest facilities for trucks (among other objectives), and has resulted in the quantification of the most troublesome areas for parking in the US – including for the North/West Passage (NWP) member states.

Per the USDOT/FHWA report the NWP states as a whole do not have an acute shortage of truck parking space. Washington ranks as the NWP state with the least available truck parking spaces/100,000 vehicle miles traveled, but it is the only NWP state in the bottom half of national ranking. Montana ranks 1st for parking availability nationally, and Wyoming and Idaho rank 3rd and 6th, respectively. In all cases, nationally and within the NWP, the majority of truck parking spaces are provided by the private sector.

ATRI conducted a study to also assess parking challenges from the driver perspective. Drivers noted they "gave up" an average of 56 minutes of available drive time per day by choosing to park early rather than risk not being able to find parking down the road. It was estimated that the daily forfeit of this hour of driving due to parking concerns reduces an individual driver's productivity by 9,300 revenue-earning miles annually – which equates to lost wages of $4,600 annually, or about 10% of a driver's wages.

Truck Parking Information Systems and Lessons Learned from Implementation

Truck parking information systems use a variety of detection and communications technologies to provide information to truckers in advance of when parking is needed so they can make informed decisions. Truck parking information systems are in development/deployment stages throughout the US – including a NWP member state (Minnesota) – and the experiences of those advancing systems today, provide key lessons for the NWP as they consider next steps for the corridor. Best practices for the NWP to consider include:

- To achieve optimum outcomes in meeting and smoothing parking demand, broad coverage across a long corridor is desired. This may require multiple states to cooperate.

- For multistate projects, designating a single project manager will simplify administrative processes and make collaboration easier.
- Designing a consistent system-wide user interface (signs, websites, applications) while allowing individual states to select their own data collection technology can make parking systems collaboration more attractive to DOT administration.
- Parking information systems are most suitable in areas where parking demand approaches, but does not exceed parking capacity; they may be less effective in urban areas where demand is higher than capacity.

Truck parking information systems are not a one-size-fits-all solution. Each geography must consider the appropriate application based on identified needs. As part of developing this working paper, stakeholder perspectives were considered to complement USDOT/FHWA and ATRI research to uncover any nuances the NWP region may experience.

NWP Stakeholder Perspectives

Both public and private sector stakeholders were engaged to understand the perspectives and the need for truck parking and information from those who conduct business in the NWP on a daily basis. Eighteen stakeholders were consulted representing a mix of trucking roles and geographies within the region. Figure ES-1 shows locations of stakeholders consulted and portions of the corridor with identified parking problems.

Figure ES-1: Stakeholders, Cities, and Noted Parking Issues

Source: CPCS based on stakeholder consultations

The map shows how parking problems were most frequently mentioned in relation to the metropolitan areas of Seattle and the Twin Cities. Occasional problems were noted in three

main areas: 1) I-90 in Idaho and eastern Montana, 2) I-90 in southwestern Montana, Wyoming, and western South Dakota, and 3) I-94 from Fargo to central Minnesota. Problems around Ellensburg, WA were associated will "spill over" parking congestion in the Seattle region.

The problem associated with metropolitan areas was a consistent lack of parking, while problems associated with more rural areas were congested parking in select areas (like western South Dakota and eastern Wyoming), long distances between parking, and temporary parking shortages associated with winter storm road closures.

Additionally, the consultation found that parking information systems were a commonly suggested improvement for metropolitan Seattle and the Twin Cities, with the caveat that more parking spaces were needed overall. Two-thirds of stakeholders do not believe there are parking problems in non-urban areas of the NWP region. And, information improvements could be important for all portions of the NWP, but the type of information varies.

Conclusions and Next Steps

While the NWP region does not have the widespread truck parking challenges found in other parts of the US, there are three key areas of need:

- Additional truck parking (primarily in Seattle and Twin Cities, and select rural areas),
- Information on truck parking facility locations and amenities throughout the NWP region, and
- Information on truck parking availability (primarily in Seattle and Twin Cities).

Each state, urban or rural area in the NWP has the ability to take steps on their own to address these needs. However, building on concepts used by an eight-state Midwest Truck Parking Information Management System (TPIMS) initiative, which has roots in the early efforts led by MnDOT, it is recommended that the next steps for NWP states are incremental and are done in partnership with each other. The incremental steps include:

1. Establish a project champion,
2. Inventory truck parking facility location and amenity information and develop a map,
3. Provide a website that houses truck parking facility location and amenity information by adapting the existing NWP traveler information site,
4. Confirm the need for truck parking availability information and agree on future partnership,
5. Conduct follow-up studies, and
6. Continue to track on-going TPIMS deployments to gather best practices.

Each of these steps is described more fully in the working paper. These steps are not necessarily listed sequentially and do not need to occur independent of each other – they are synergistic and can occur in parallel, as staff and funding resources allow.

1 Introduction

1.1 Background

The North/West Passage (NWP) is a multi-state operations-focused partnership between the states of Idaho, Minnesota, Montana, North Dakota, South Dakota, Washington, and Wyoming initiated with the leadership of MnDOT in 2002. These states share similar challenges with Interstates 90 and 94 serving as major passenger and commercial vehicle highway corridors, and both subject to operational challenges due in part to extreme weather conditions. Many of the operational issues are exacerbated for commercial vehicles and are related to truck parking management, traveler information, truck permitting and other operational issues.

The Freight Task Force (Task Force) was established in 2014 to help realize the NWP Corridor's vision of…

…developing effective methods for sharing, coordinating, and integrating traveler information and operational activities across state and provincial borders.

1.2 Objectives

Year 2 activities of the Task Force are being pursued to continue the momentum of the Year 1 work. Specifically the activities are designed to

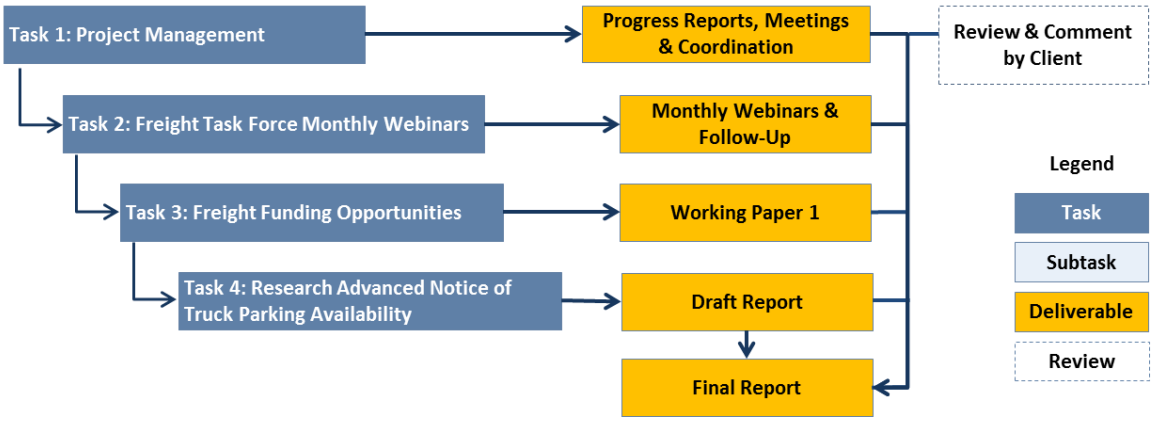
- Support the active engagement of Task Force members,
- Conduct best practice (and practical) research on project funding opportunities, and
- Help refine the truck parking concept so that it best fits NWP needs.

Each of these activities is aimed at getting the coalition closer to implementation of those projects that are most important to the seven NWP member states.

1.3 Project Structure

The project was conducted in 4 phases, as set out in Figure 1-1. The present working paper is the output of Task 4.

Figure 1-1: Project Management Task Organization



1.4 Purpose of this Working Paper

The aim of Task 4 is to conduct best practice research for the Task Force and provide guidance on implementation of a truck parking information system in the NWP. Specifically, Task 4 seeks to address the following questions:

- What truck parking information systems are available and what are their strengths/weaknesses?
- What are key public and private sector stakeholder perspectives on truck parking information?
- What components of truck parking information systems should be implemented in the NWP and how can this most productively and affordably be done?
- How can truck parking availability be incorporated in the NWP website for disseminating information?

This Working Paper has been developed to answer these key questions. Revisions to this Working Paper will be reflected in the Draft Final Report.

1.5 Methodology

This Working Paper was prepared using input from two processes: 1) a review of literature on truck parking trends and technology, and 2) consultations with eighteen (18) truck-related stakeholders in the NWP member states.

The literature review helped place the NWP in a national context and enabled a status update on truck parking projects underway (See Appendix A). Phone consultations identified specific parking issues in the region as well as potential solutions to identified issues (See Appendix B).

1.6 Limitations

Some of the findings in this report are based on the analysis of third party data. While CPCS makes efforts to validate data, CPCS cannot warrant the accuracy of third party data.

2 About Truck Parking and the Need for Information

Key Chapter Takeaways

The majority of freight tonnage on the transportation system is carried by trucks – over 18 billion tons of freight in 2015, with an expected increase of 27% in the next 20 years. This increase in truck tonnage will translate into an increased number of trucks on the road.

Providing adequate parking, information on parking options, and insight into whether or not parking is available or full is important for the safety of truck drivers and the overall transportation system. This is most clearly illustrated by the tragic loss of life by a truck driver who parked in unsafe conditions and prompted development of Jason's Law. This law requires USDOT/FHWA to evaluate the capability of each state to provide adequate parking and rest facilities for trucks (among other objectives), and has resulted in the quantification of the most troublesome areas for parking in the US – including for the NWP member states.

Per the USDOT/FHWA report the NWP states as a whole do not have an acute shortage of truck parking space. Washington ranks as the NWP state with the least available truck parking spaces/100,000 VMT, but, it is the only NWP state in the bottom half of national ranking. Montana ranks 1st for parking availability nationally, and Wyoming and Idaho rank 3rd and 6th, respectively. In all cases, nationally and within the NWP, the majority of truck parking spaces are provided by the private sector.

ATRI conducted study to also assess parking challenges from the driver perspective. Drivers noted they "gave up" an average of 56 minutes of available drive time per day by choosing to park early rather than risk not being able to find parking down the road – equating to $4,600 annually, or about 10% of a driver's wages. The study also found that unsafe or unauthorized parking behavior is common, particularly in areas with higher truck volumes.

2.1 Increasing Demand for Truck Parking

Trucks carried over 18 billion tons of freight in 2015, or 64% of total US freight by tonnage. The amount of freight carried by trucks increased 6.5% between 2012 and 2015, and is expected to keep growing.[1] The US Department of Transportation (DOT) predicts that truck tonnage will increase 27% in the next 20 years.[2] As truck volumes increase, demand for truck parking has exceeded supply in some regions.

[1] 2016 Freight Quick Facts Report, Federal Highway Administration, 2016
[2] CPCS analysis of Freight Analysis Framework, Federal Highway Administration, 2017

Problems related to truck parking availability are unevenly spread across the nation, some states and cities have greater problems than others, as documented in several studies. One such study is the Federal Highway Administration's (FHWA) Jason's Law report. The American Transportation Research Institute (ATRI, the research arm of the American Trucking Associations) also conducted a survey of industry to identify where truck parking posed the greatest problem.

2.2 Jason's Law Truck Parking Survey and Report

In 2015, the FHWA released the results of the Jason's Law Truck Parking Survey.[3] The survey examined each state's capability to provide adequate parking and rest facilities, assessed truck volumes in each state, and developed metrics to measure parking (see box for more information on Jason's Law and Federal requirements). The survey's results are available state-by-state.

What is Jason's Law?

"Jason's Law" is named in honor of Jason Rivenburg. In March 2009, Jason stopped overnight in between deliveries; while only 12 miles from his next delivery, he needed to find a place to rest as his delivery point was not yet open. There was not a designated truck parking lot nearby, but he had learned from truckers familiar with the area that an abandoned gas station was a safe location to park. While at that gas station Jason was attacked and murdered while he slept, with his killer taking his life and the $7.00 in his wallet.

Jason's Law was formalized as part of MAP-21 to provide a "national priority on addressing the shortage of long-term parking for commercial motor vehicles on the National Highway System to improve the safety of motorized and non-motorized users and for commercial motor vehicle operators." Specifically, Jason's Law requires USDOT to conduct a survey and comparative assessment to generally:

- Evaluate the capability of each state to provide adequate parking and rest facilities for trucks,
- Assess the volume of truck traffic in each state, and
- Develop a system of metrics to measure the adequacy of trucks parking facilities in each state.

This assessment is conducted in coordination with State motor carrier representatives. USDOT is required to periodically update the survey and make the results publicly available.

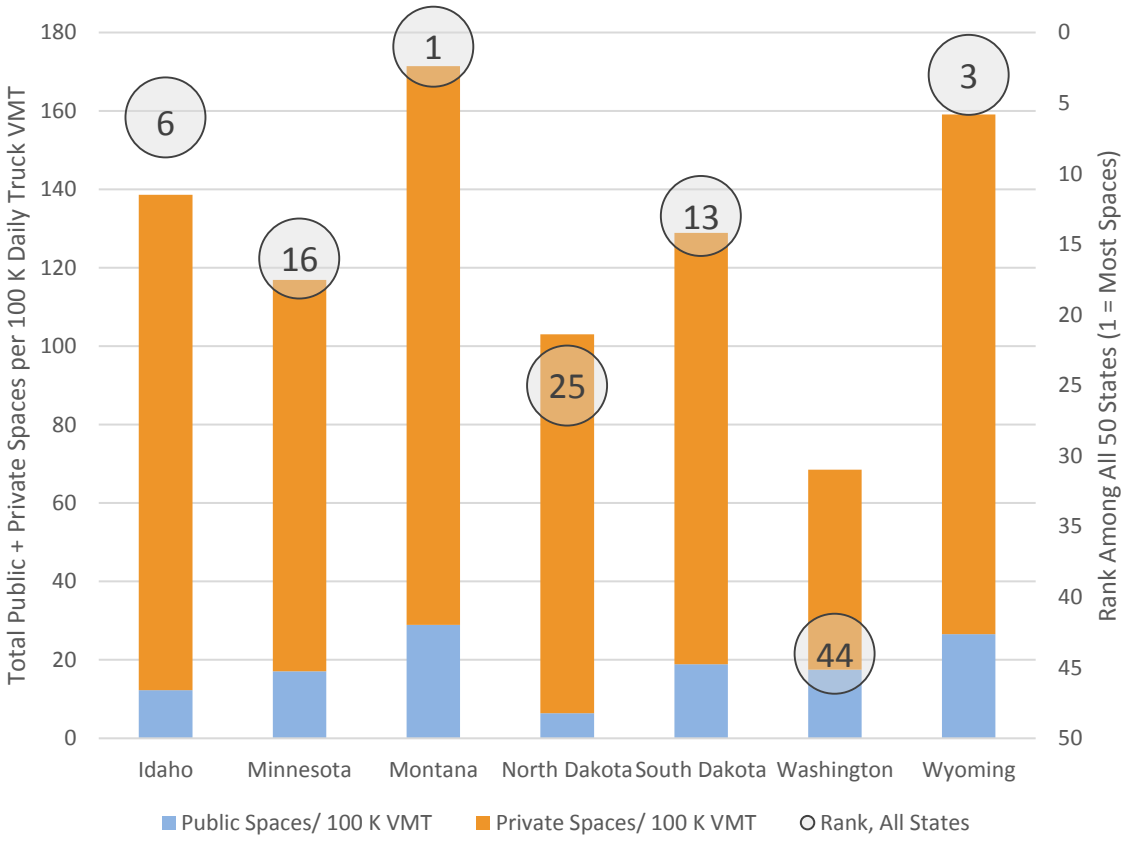
Source: Jason's Law Truck Parking Survey Results and Comparative Analysis, Federal Highway Administration, 2015

[3] Jason's Law Truck Parking Survey Results and Comparative Analysis, Federal Highway Administration, 2015

Per the FHWA report and as shown in Figure 2-1, NWP states as a whole do not have an acute shortage of truck parking spaces (i.e., the **supply** portion of the performance metric developed by FHWA to assess the adequacy of truck parking facilities in each US state) relative to truck traffic (i.e., the **demand** portion of the FHWA performance metric, in terms of per 100,000 vehicle miles traveled (VMT)).

Although Washington ranks lowest for available spaces, 44th among all states with 68.5 truck parking spaces per 100,000 truck vehicle-miles traveled (VMT), it is the only NWP state in the bottom half of national ranking. North Dakota, ranked 25th, is the next lowest at 102.9 spaces/100,000 VMT. Montana ranks 1st for parking availability nationally, and Wyoming and Idaho rank 3rd and 6th, respectively.

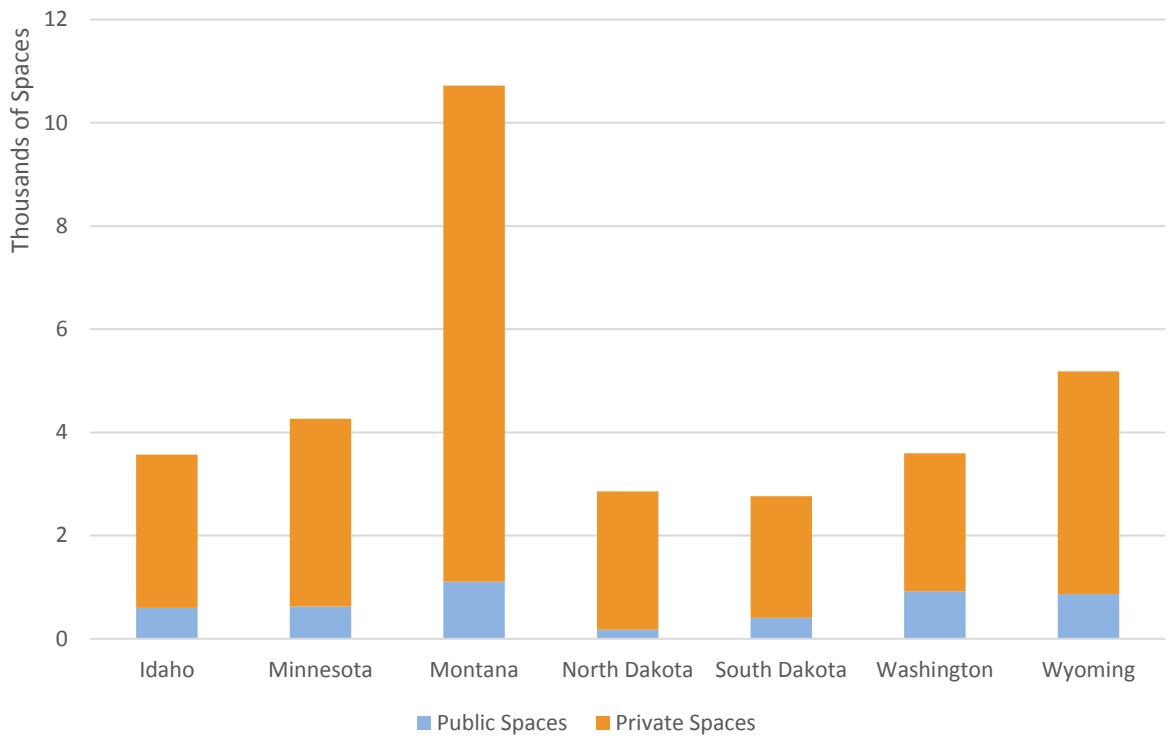
Figure 2-1: Public and Private Truck Spaces per 100,000 VMT



Source: Jason's Law Truck Parking Survey Results and Comparative Analysis, Federal Highway Administration, 2015

Figure 2-2 provides an illustration of how the majority of truck parking spaces in NWP states are provided by the private sector. The Jason's Law survey found that in the NWP states, the majority of truck parking is provided by 18,639 parking stalls at 477 private truck stops. These resources are complemented by 342 public facilities providing 3,595 stalls. Wyoming had the most parking spaces, with 5,181, and South Dakota had the least, with 2,765.

Figure 2-2: Public and Private Spaces in Each State



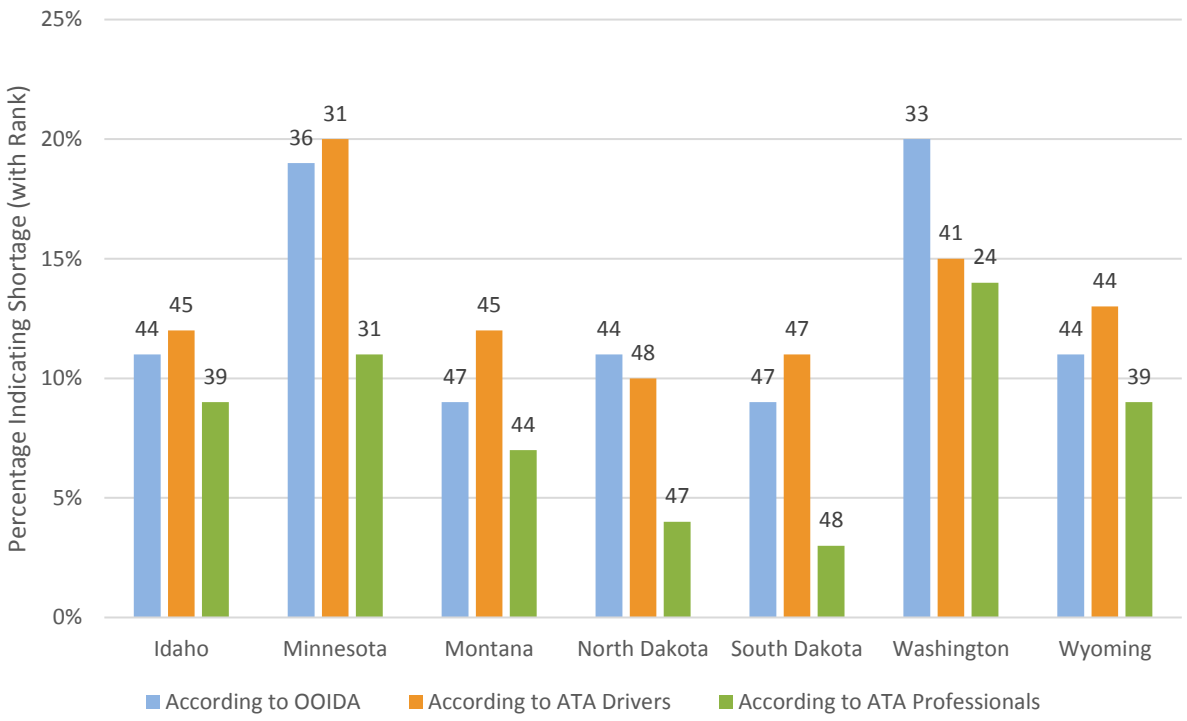
Source: Jason's Law Truck Parking Survey Results and Comparative Analysis, Federal Highway Administration, 2015

The FHWA report also investigated the extent to which states have a shortage of truck parking by conducting surveys with several stakeholder groups:

- 7,333 independent drivers from the Owner Operator Independent Drivers Association (OOIDA),
- 820 truck drivers reached via the American Trucking Associations (ATA), and
- 249 dispatchers also consulted via the ATA.

Figure 2-3 shows, for each state, the percentage of survey respondents indicating a shortage of truck parking in the given state. Provided in the labels above the bars is the rank among all 50 states, where 1 represents the state with the greatest perceived shortage. The figure shows that survey respondents did not report significant truck parking shortages in most NWP states. The greatest perceived shortages were in Washington and Minnesota, although these states ranked in the bottom half (i.e., the half of all states with lower perceived shortages) of the nation. The only exception is Washington's rank from the ATA's professional (such as dispatchers), who rated the state 24th worst for perceived parking shortages. The states least frequently mentioned for shortages were North Dakota, South Dakota, and Montana.

Figure 2-3: Truck Parking Shortage: Percentage of Respondents Indicating Shortage and Rank



Source: Jason's Law Truck Parking Survey Results and Comparative Analysis, Federal Highway Administration, 2015

Note: value above the bars indicates rank among all 50 states (1 = greatest perceived shortage)

2.3 ATRI Truck Parking Survey and Report

The American Transportation Research Institute (ATRI, the research arm of the American Trucking Associations) conducted their own independent outreach on truck parking in 2016[4] and confirmed the results of the Jason's Law survey. ATRI's research included surveys with drivers and representatives from trucking firms, as well as an analysis of 148 parking "diaries" written by drivers.

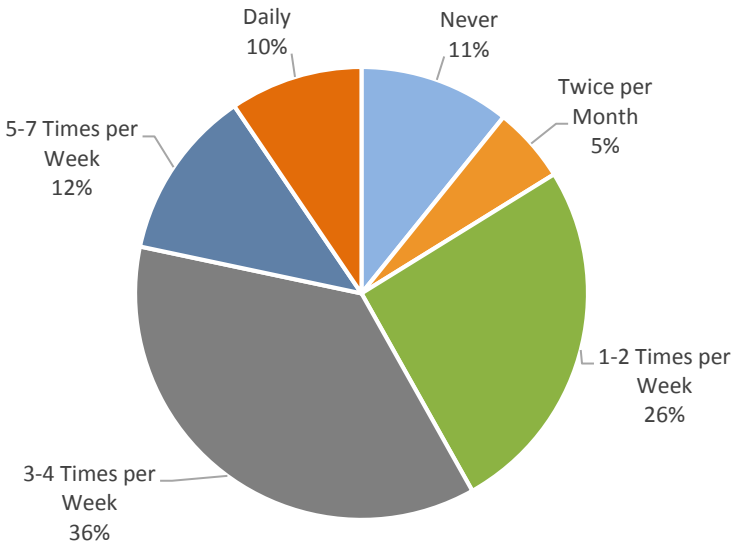
One of the study's most important findings was an estimate of the cost of parking problems. ATRI's driver respondents "gave up" an average of 56 minutes of available drive time per day by choosing to park early rather than risk not being able to find parking down the road. It was estimated that the daily forfeit of this hour of driving due to parking concerns reduces an individual driver's productivity by 9,300 revenue-earning miles annually – which equates to lost wages of $4,600 annually, or about 10% of a driver's wages.

The study also found that unsafe or unauthorized parking behavior is common, particularly in areas with higher truck volumes. More than 83% of truckers surveyed parked in unauthorized

[4] Managing Critical Truck Parking Case Study – Real World Insights from Truck Parking Diaries, American Transportation Research Institute, 2016

or undesignated areas at least one or two times per week, and Figure 2-4 provides an in-depth look at these parking frequencies.

Figure 2-4: Unauthorized or Undesignated Parking Frequency



Source: Managing Critical Truck Parking Case Study – Real World Insights from Truck Parking Diaries, American Transportation Research Institute, 2016

2.4 Consequences of Parking Shortages

ATRI's results illuminate one of the biggest public problems associated with truck parking shortages: unauthorized or undesignated parking, which creates safety hazards and increases costs imposed on truckers, governments, and the general public. Unauthorized parking, such as parking on highway shoulders and ramps is dangerous because stationary trucks create a collision hazard. Additionally, parked trucks may damage unreinforced shoulders and ramps not meant to accommodate a parked truck.

Undesignated parking, such as parking at vacant or abandoned lots, or on local streets exposes drivers to potential crime, like theft. Local communities may also suffer from unsafe parking and its associated problems, but these are most acute near large metropolitan centers that have a deficit of parking spaces. However, unsafe parking is also observed in areas with relatively high truck

Figure 2-5: Pavement Damage at a Truck Pull Out

Source: Washington State DOT

volumes and adequate parking. In these areas, a lack of information about parking availability contributes to unsafe parking practices.

Once a driver decides to park, they must spend time looking for spots. Because of parking shortages, and inadequate information about parking, over 75% of drivers report experiencing difficulty finding a safe place to park each week.[5] If a trucker cannot easily find parking, or if they believe nearby parking areas are full, they may decide to park in unauthorized or undesignated areas, or drive beyond legal Hours of Service (HOS) limits.

[5] Jason's Law Truck Parking Survey Results and Comparative Analysis, Federal Highway Administration, 2015

3 Truck Parking Information Systems and Lessons Learned from Implementation

Key Chapter Takeaway

Truck parking information systems use a variety of detection and communications technologies to provide information to truckers in advance of when parking is needed so they can make informed decisions. Truck parking information systems are in development/deployment stages throughout the US – including a NWP member state (Minnesota) – and the experiences of those advancing systems today, provide key lessons for the NWP as they consider next steps for the corridor. Best practices for the NWP to consider include:

- To achieve optimum outcomes in meeting and smoothing parking demand, broad coverage across a long corridor is desired. This may require multiple states to cooperate.
- For multistate projects, designating a single project manager will simplify administrative processes and make collaboration easier.
- Designing a consistent system-wide user interface (signs, websites, applications) while allowing individual states to select their own data collection technology can make parking systems collaboration more attractive to DOT administration.
- Parking information systems are most suitable in areas where parking demand approaches, but does not exceed parking capacity; they may be less effective in urban areas where demand is higher than capacity.
- And last, truck parking information systems are not a one-size-fits-all solution. Each geography must consider the appropriate application based on identified needs.

3.1 About Truck Parking Information Systems

Truck parking information systems are solutions aimed to help truckers more easily find available parking. The need for information on truck parking availability has been known for a long time. A 2002 FHWA study found that 84% of drivers would like to receive real-time

information about parking facilities along their routes.[6] In response to this need, some states, technology vendors and other interested stakeholders initiated development of systems to begin collecting and communicating real-time truck parking availability information to truckers. Truck parking information systems use technology to provide information to truckers in advance of when parking is needed so they can make decisions in real-time. Information may include where safe parking is available and the number of spaces open, if parking is not available where the next closest spots are, and if onsite amenities including electricity or showers are on-site. In corridors where there are an adequate overall number of parking spots – but where select facilities fill more quickly than others – use of these parking systems may be able to "smooth" demand across the corridor, filling parking lots more evenly and minimizing potentially hazardous (e.g., shoulder) parking when there are available safe spots within a short distance.

Truck Parking "Smoothing"

A potential benefit of implementing a corridor-wide truck parking system is the "smoothing" of parking demand. For example, a 100-mile corridor may have 200 parking spots, and a nightly demand for 180 spots. Since demand is close to supply, some parking areas may fill up completely. As demonstrated by the 2016 ATRI Managing Critical Truck Parking Case Study, drivers unaware of downstream parking availability may stop early to secure a spot, leaving downstream areas underutilized. If these drivers had information about availability further along the corridor, they may choose to drive further to maximize their Hours of Service (HOS), thereby distributing parking demand more evenly across the corridor. At the same time, drivers with no remaining HOS arriving at full areas will be forced to park in unauthorized and potentially hazardous areas. If these late-parkers had advance notice that lots ahead were filling/full, they may have elected to park at an earlier facility, sooner. This "smoothing" effect has yet to be shown, however future evaluation of systems in Florida and the Midwest will provide insight into the efficacy of parking information for decision making.

Parking systems require two separate sub-systems to function: Detection systems to observe or calculate the available parking spots at a parking area, and Communication systems to transmit parking information to drivers and dispatchers. These systems are each further described below.

Detection and Counting Technologies

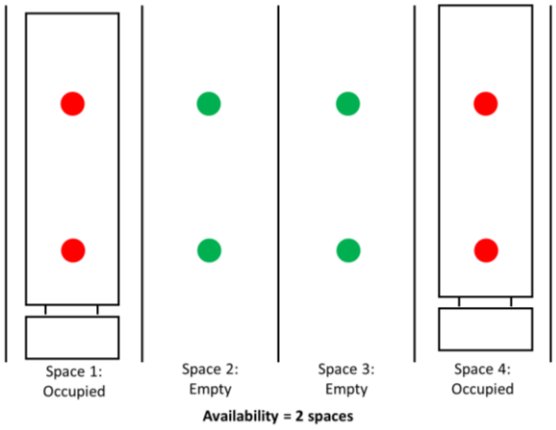
Two types of sensors used for US truck parking systems: in-pavement sensors and video detectors. In-pavement sensors work by detecting changes in magnetic fields or infra-red light,

[6] Study of Adequacy of Commercial Truck Parking Facilities – Technical Report, Federal Highway Administration, 2002

and can be placed in individual parking stalls, or at the entrances and exits to parking lots. Complexity varies, from stand-alone battery-powered "pucks" placed in parking stalls, to more complex induction loops at lot entrances and exits. In-pavement systems have the advantage of being a relatively mature technology with low bandwidth requirements and simple installation. Their chief disadvantages are potential damage from exposure to temperature and traffic, as well as requiring re-installation when lots are repaved. In some areas, like the open lots found at truck stops, these systems are inappropriate, because their fixed placement means they cannot cope with irregular parking or traffic flow patterns. Figure 3-1 demonstrates potential in-pavement installations.

Figure 3-1: In-Pavement Systems

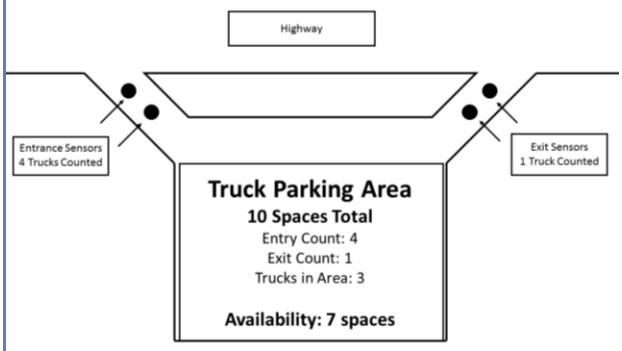
Type 1: In-Stall Sensors



Multiple sensors in each parking stall detect presence of a vehicle based on changes in magnetic field, or infrared light, and communicate spot availability to central computer at parking area.

Example: Sensors embedded in truck parking spots at a Florida rest area.

Type 2: Entrance and Exit Sensors



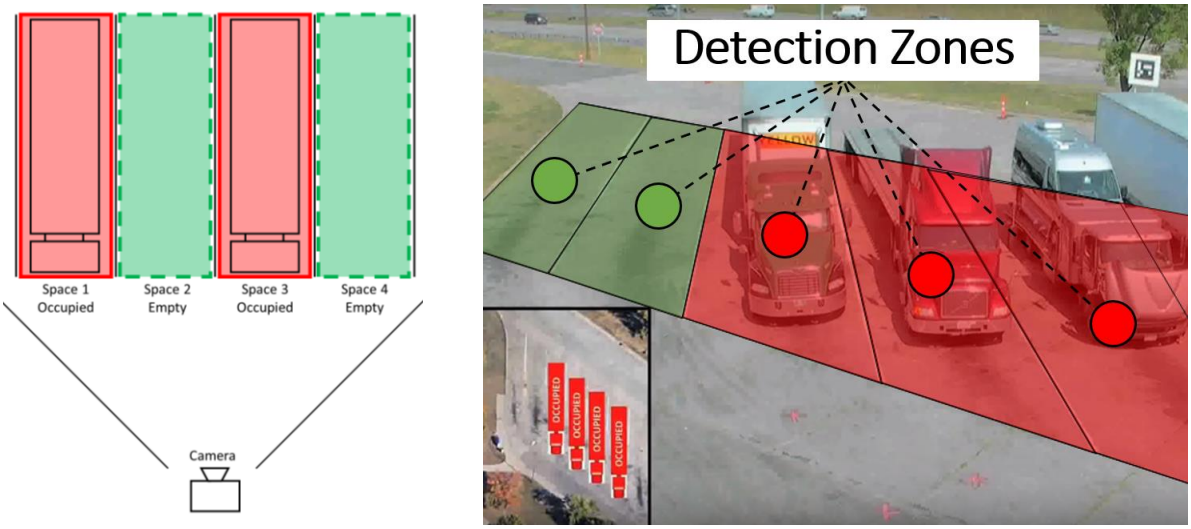
Sensors at entrances and exits count vehicles as they pass. A central system calculates parking availability by taking the difference between entrance counts, exit counts, and the total capacity of the parking area.

Example: induction loops installed in a roadway alongside weigh-in-motion sensors.

Sources: SmartPark Truck Parking Availability System: Magnetometer Technology Field Operational Test Results, Federal Motor Carrier Safety Administration, 2011; "Florida's Truck Parking Research Project," SunGuide Disseminator, Paul Clark, Florida DOT, June 2012; Literature Review of Weigh-in-Motion Systems, Federal Highway Administration, 2017

Video detection relies on cameras to capture and analyze images of parking lots. Parking stalls are marked in each camera feed, and software is programmed to detect whether designated areas of the image are empty or occupied. Software analysis of the video feed can be done on-site, or at a central location, depending on bandwidth requirements. The advantages of video systems are their flexibility – they can easily be reprogrammed to accommodate new parking patterns, and one unit can cover multiple parking stalls. The downsides of using video detection are possible underperformance in rain and snow, and the need to mount cameras high enough to view parking areas. Figure 3-2 shows the video feed from a parking system demonstration project in Minnesota, with an example of parking stalls marked within a video feed, and the presence of trucks detected based on changes within stalls.[7] A video on how this detection system works is available online.[8]

Figure 3-2: Video Detection Systems



Source: "Truck Parking Availability Demonstration Project," Minnesota DOT Research, August 26, 2014, https://youtu.be/h-x0mv0cr1I

A disadvantage common to both in-pavement and video systems is error propagation; these technologies may not accurately count or calculate available spaces. These counting errors can compound over time, making parking availability reports increasingly inaccurate. To reduce error, frequent corrections to counts must be made manually. These corrections can be done remotely using existing CCTV feeds at lots. Systems estimating parking capacity by counting traffic entering and leaving a lot are most vulnerable to error propagation because accurate counts must be maintained for both entrances and exits.[9]

[7] "Truck Parking Availability Demonstration Project," University of Minnesota – Center for Transportation Studies, http://www.cts.umn.edu/research/featured/truckparking

[8] "Truck Parking Availability Demonstration Project," Minnesota DOT Research, August 26, 2014, https://youtu.be/h-x0mv0cr1I

[9] Truck Parking Management Systems: A Synthesis of Projects, Research, and Resources for MAASTO Decision Makers, Mid America Freight Coalition, 2015

Communication Technologies

Three technologies are commonly used to communicate real-time parking availability information to truckers: 1) variable message signs (VMS) which include dynamic messaging/notifications, 2) mobile device applications (including in-cab signals), and 3) websites. Truckers often do not make parking decisions until they are on the road, so VMS are a safe (e.g., hands free) and easily understood means of communicating parking availability without distracting drivers. In some cases, parking information may be posted on its own custom-built VMS, shown in Figure 3-3. The main disadvantage of VMS is a relatively high cost to construct, maintain, and modify physical signs.

Figure 3-3: Existing Truck Parking VMS Sign in Michigan on I-94

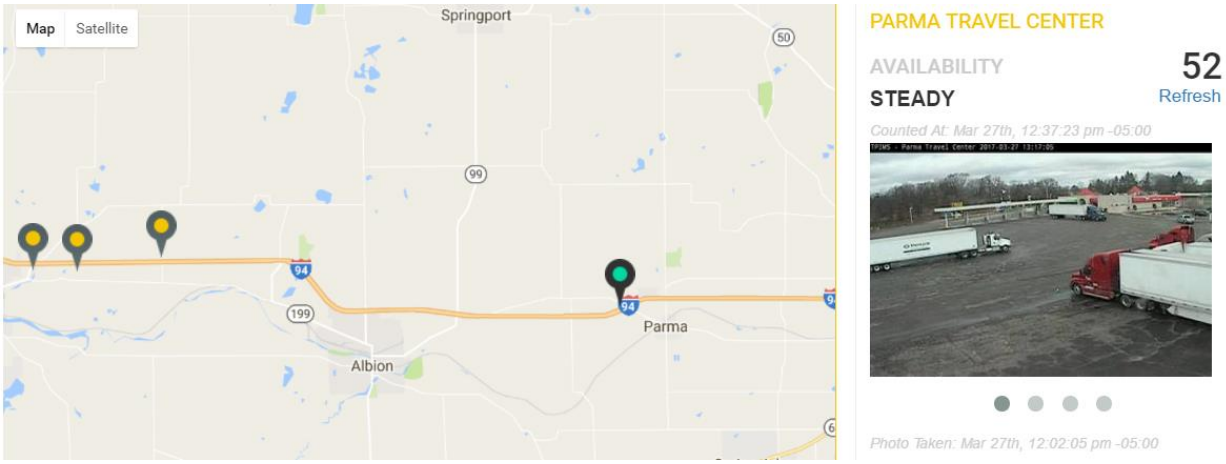
Source: Regional Truck Parking Information and Management System (TPIMS) Tiger Proposal, Kansas DOT on behalf of the eight Mid-America Association of State Transportation Officials (MAASTO) partner states, 2015

Mobile device applications are intended to provide information similar to that provided by truck parking VMS, but allow that information to be customized based on trucker preferences. Advantages of mobile applications include their relatively low cost of development and maintenance compared to a physical sign, and their ability to be easily modified to reflect changing parking infrastructure. The main downside of mobile applications is their potential to encourage distracted driving.

Websites accessed through web browsers like Microsoft Internet Explorer and Google Chrome, like the example in Figure 3-4 can provide the most information of the three technologies. However, these websites only provide information when a trucker interacts with them, and makes a specific request for some information. In short, truckers can “pull” more information from a website, but interacting with the website requires a trucker to divert their attention from the task of driving. By contrast, a mobile application can automatically “push” relevant information to a trucker (for example, automatically broadcasting a message about parking availability at an upcoming exit) without the trucker’s specific input, but the range of information that can be “pushed” may be more limited.

Previous research has shown that truckers do not find parking until they are underway, and a website will either be unusable or cause distracted driving. Websites are potentially useful for truckers who plan ahead of time, as well as companies that dispatch/direct drivers, who can communicate information to their drivers directly. For example, one NWP stakeholder consulted for this project said they would like to post parking information from a corridor-wide website on their company Facebook page.

Figure 3-4: Truck Parking Availability Website

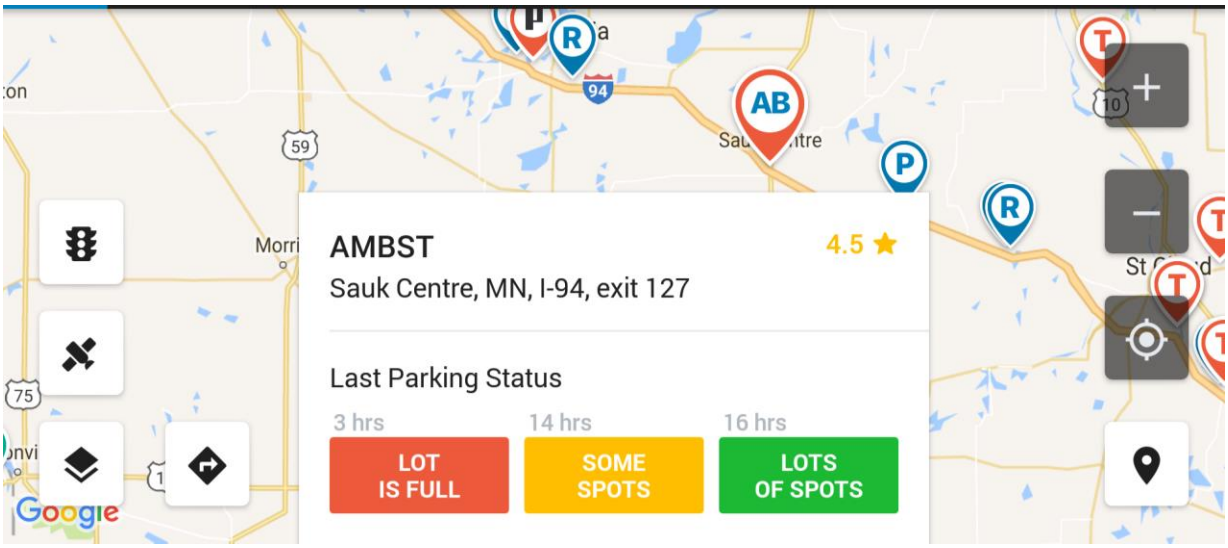


Source: Truck Smart Parking Services

There are additional detection and communication technologies available, and their creation and application is being driven by the private sector. For example, some trucking applications for mobile devices enable truckers to report on parking availability, and that information is provided to other application users. Figure 3-5 shows trucker-generated parking information provided by Trucker Path,[10] an application used by two NWP stakeholders consulted for this working paper.

[10] Trucker Path, https://truckerpath.com/

Figure 3-5: Mobile Parking Availability Application



Source: Trucker Path

3.2 Examples of Truck Parking System Deployments

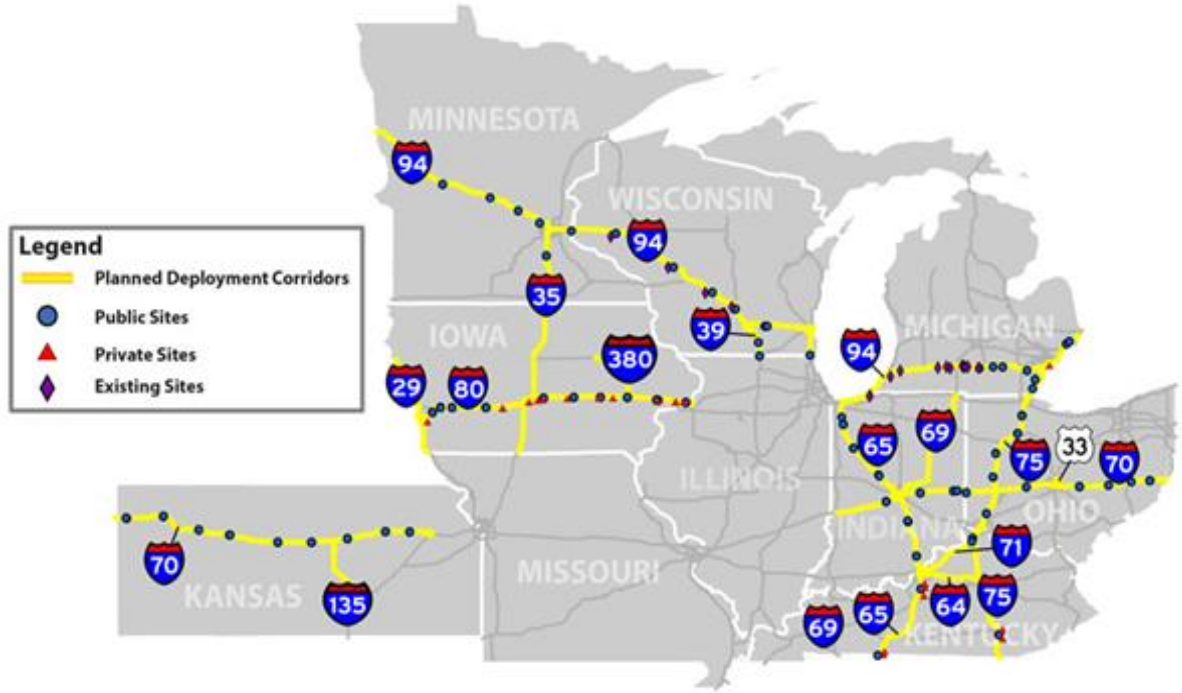
Truck parking systems are in development and deployment stages throughout the US, including in NWP member states. The following provides snapshots of some of those initiatives.

Midwest Regional Truck Parking Information and Management System

The Midwest Regional Truck Parking Information and Management System (TPIMS) is being developed by the eight (of ten) Mid America Association of State Transportation Officials (MAASTO) states of Indiana, Iowa, Kansas, Kentucky, Michigan, Minnesota, Ohio, and Wisconsin. These states received a $25 million Transportation Improvements Generating Economic Recovery Grant (TIGER) award to create a consistent system of communicating parking availability across major corridors in the region. Figure 3-6 shows the corridors and types of stops included in the system, and specific information can be found on the project website: Trucks Park Here.[11]

[11] Trucks Park Here, www.trucksparkhere.com

Figure 3-6: MAASTO TPIMS Deployment Corridors



Source: Trucks Park Here, www.trucksparkhere.com

The MAASTO TPIMS is regional in nature, and is the best example of a multistate, corridor-wide deployment accomplished by a regional organization similar to the NWP. One key to the success of the project thus far has been its organization, and the leadership role assumed by Kansas. Kansas DOT (KSDOT) has served as the lead and project manager for both the grant application and for the ongoing project. After the TIGER grant was awarded KDOT accepted receipt of the grant, distributed money to other states, and established the project timeline. KDOT also handles much of the legal and administrative work associated with the project. Regional benefits are estimated to be $403 million for the life of the project, and include more efficient movement of goods, less fuel consumption, reduced emissions, and fewer repairs of highway ramps and shoulders damaged by illegal parking.[12]

A key to the MAASTO TPIMS' success will be its combination of standardized communications with local choice in infrastructure. The states are cooperating on designing a common data architecture to collect and broadcast parking information, a website, and a common style of dynamic message signage to report parking availability. Third party websites and mobile applications will also be able to access the aggregated parking information collected by the states. This aggregated data will also be used to measure the performance of the system, which is a condition of the TIGER grant. While data aggregation and reporting is standardized, states are free to choose their own infrastructure for data collection. The MAASTO TPIMS is expected to be operational in September 2018.

[12] "Project Details," Trucks Park Here, www.trucksparkhere.com

Minnesota

The Minnesota DOT (MnDOT) began studying truck parking over a decade ago, with a research effort focused on providing guidance for the design and maintenance of transportation facilities around truck generators in the Twin Cities (Minneapolis/St. Paul).[13] Since then, MnDOT has led or participated in at least 6 additional efforts that have further explored truck parking problems and demonstrated and implemented truck parking solutions (see Appendix C for more information). As previously noted, one of these efforts is on-going partnership with the MAASTO TPIMS project. Other noteworthy Minnesota-specific research includes the following initiatives:

Truck Parking Availability Demonstration Project

Figure 3-7: Minnesota Parking System Display

Source: University of Minnesota Center for Transportation Studies

Building upon previous years of research, MnDOT partnered with the University of Minnesota and ATRI to deploy a camera-based parking system.[14] The system operated between 2012 and 2015 at three rest areas on I-94 northwest of the Twin Cities. Parking spots were detected and counted by video cameras and machine vision software. Parking availability information was then communicated to truckers via dynamic message signs (seen in Figure 3-7), in-cab messaging, and a website. The system cost $2.4 million to implement, demonstrated truck parking system "proof of concept," and set the stage for future work on the MAASTO TPIMS.[15]

Using GPS Data to Inform Truck Parking Opportunity

A 2016 ATRI study used truck counts derived from a GPS point database and MnDOT and Freight Analysis Framework (FAF) truck traffic data to estimate the number of trucks at select rest areas. These estimates were calculated hourly, and compared against the designed parking limit for select rest areas. Using these estimates, researchers were able to determine times and days when rest areas were over capacity. Figure 3-8 and Figure 3-9 show how many times during October 15 the Goose Creek Rest Area on I-94 was overcapacity. The authors believe that the daytime overcapacity shown in Source: Managing Critical Truck Parking Tech Memo #2:

[13] Trucks and Twin Cities Traffic Management, Minnesota DOT, 2005

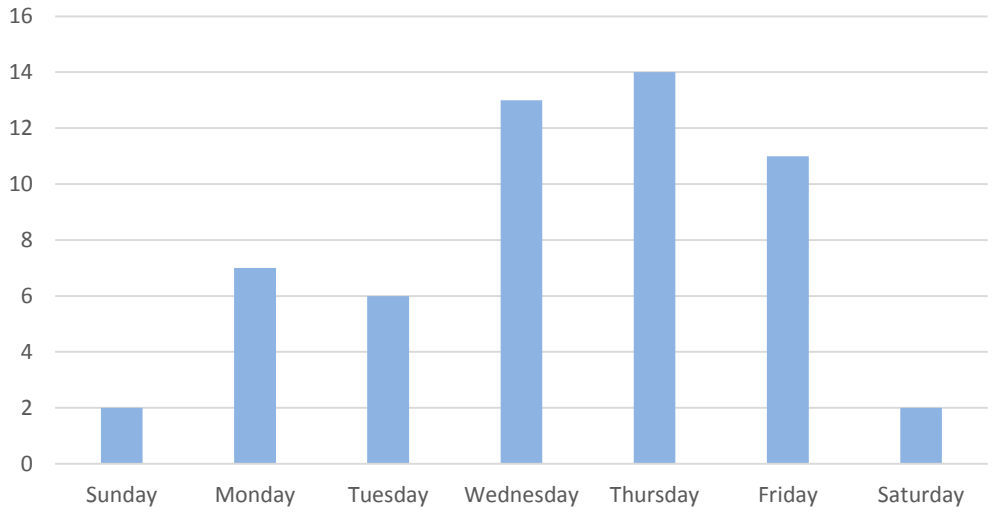
[14] "Truck Parking Availability Demonstration Project," University of Minnesota – Center for Transportation Studies, http://www.cts.umn.edu/research/featured/truckparking

[15] Truck Parking Management Systems: A Synthesis of Projects, Research, and Resources for MAASTO Decision Makers, Mid America Freight Coalition, 2016

Minnesota Case Study – Utilizing Truck GPS Data to Assess Parking Supply and Demand, ATRI, March 2017

Figure 3-9Figure 3-9 suggests that overcapacity is the result of drivers stopping for their HOS rest breaks. From this exercise, ATRI concluded that parking capacity assessments can be developed using truck GPS data.[16] However, the report does not describe further applications of GPS point data for real-time parking decision making, or how information would be communicated to drivers.

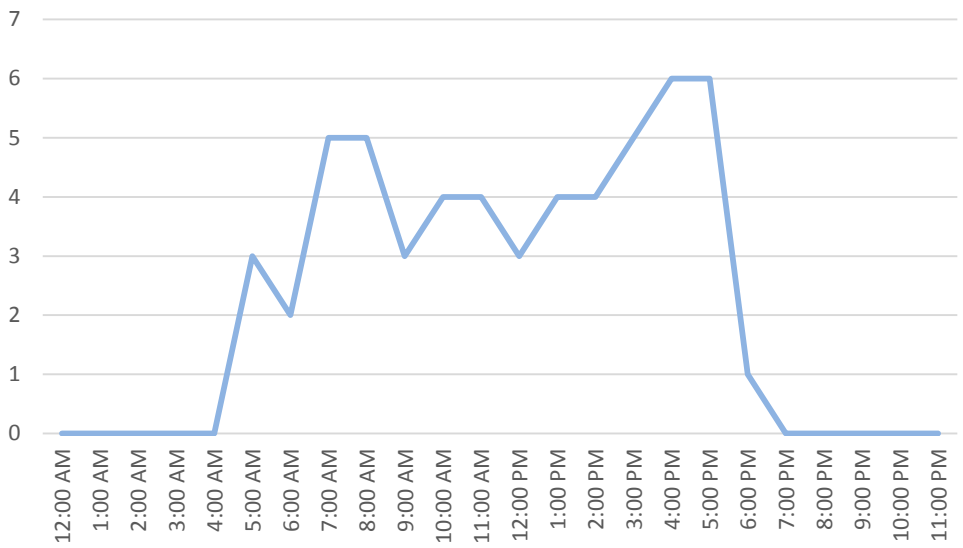
Figure 3-8: Overcapacity by Day-of-Week, Goose Creek Rest Area



Source: Managing Critical Truck Parking Tech Memo #2: Minnesota Case Study – Utilizing Truck GPS Data to Assess Parking Supply and Demand, ATRI, March 2017

[16] Managing Critical Truck Parking Tech Memo #2: Minnesota Case Study – Utilizing Truck GPS Data to Assess Parking Supply and Demand, ATRI, March 2017

Figure 3-9: Overcapacity by Time of Day, Goose Creek Rest Area



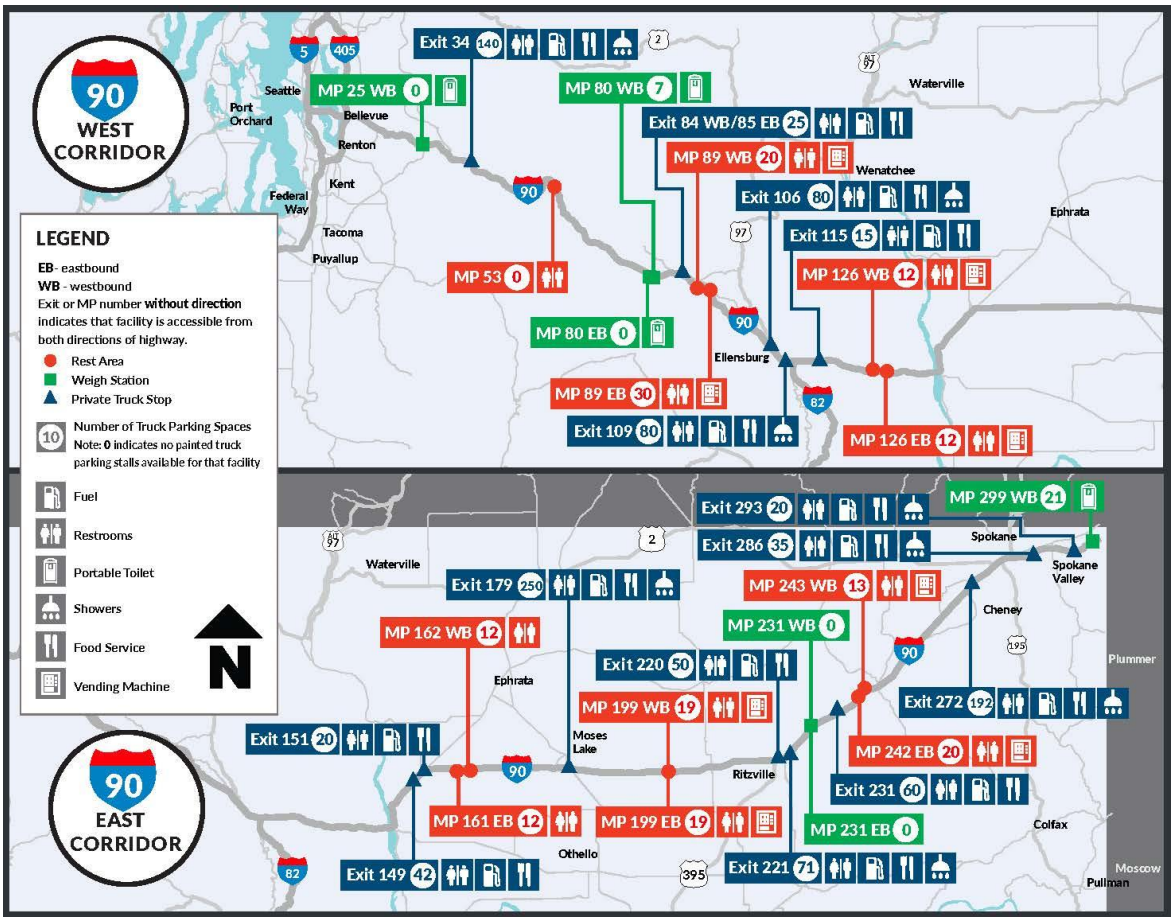
Source: Managing Critical Truck Parking Tech Memo #2: Minnesota Case Study – Utilizing Truck GPS Data to Assess Parking Supply and Demand, ATRI, March 2017

Washington

Washington State DOT (WSDOT) recently completed its Truck Parking Study,[17] a study that examines multiple types of parking needs including day rest breaks, overnight breaks, parking at port gates, and local delivery parking. The study includes a survey of truck drivers and stakeholders, which received 1,118 responses. The survey found that interstate highway routes, including I-90 had the greatest truck parking shortages, and that the Seattle area was most commonly mentioned as an area for shortages. These shortages reduced productivity and increased fatigued driving: 60% of respondents said they spent on average over 60 minutes looking for overnight parking, and 61% said that the parking shortage lead to fatigued driving at least 3-5 days per week.[18] The findings of this study – particularly the fact that Seattle has a shortage of parking – are confirmed by many of the stakeholder consultations in Section 4. The study also led to the creation of truck parking maps. A preliminary map of truck parking facilities on I-90 is shown in Figure 3-10.

[17] Washington State Truck Parking Study, Washington State DOT, 2016, www.wsdot.wa.gov/freight/truckparking.htm.
[18] WSDOT Truck Parking Survey Summary, Washington State DOT, August 2016

Figure 3-10: Washington State Truck Parking Map



Source: Washington State DOT, 2017

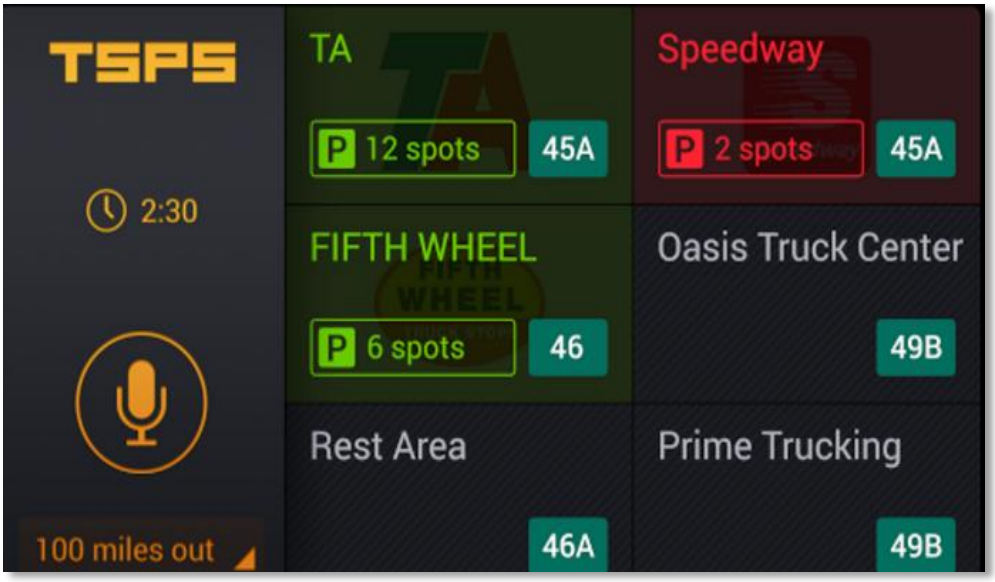
Michigan

In 2014, Michigan DOT (MDOT) created a parking system for five public rest areas and five private truck stops along I-94. At public sites, parking data is collected by magnetic sensors embedded in the pavement of parking stalls. At private stops, which have less organized parking areas, data is collected by digital cameras and analyzed by machine vision software. The system is operated jointly by MDOT, who operates the system at public rest areas and by Truck Smart Parking Services (TSPS),[19] who operates the system at private truck stops. Truck parking information is communicated to drivers by variable message signs, MDOT's MiDrive website,[20] and by an application created by TSPS, shown in Figure 3-11. The 10 site system cost $4.4 million to create, and MDOT estimates that annual operational costs are about $260,000.[21] While not directly attributable to this 10 site system, a study focused on all Michigan rest areas found that

[19] Truck Smart Parking Services, www.trucksmartparkingservices.com
[20] MiDrive, Michigan DOT, www.mdotnetpublic.state.mi.us/drive
[21] Truck Parking Management Systems: A Synthesis of Projects, Research, and Resources for MAASTO Decision Makers, Mid America Freight Coalition, 2016

each rest area reduced fatigued-related crashes within a 20-mile radius on the route by 3.37 crashes per year.[22]

Figure 3-11: Truck Smart Parking Services App for Michigan



Source: Truck Smart Parking Services

Florida

Florida DOT (FDOT) is in the process of creating its Truck Parking Availability System (TPAS), which will serve 74 public locations including rest stops, weigh stations, and welcome centers when complete. TPAS will utilize in-ground sensors to count vehicles, and information will be available on FDOT's website, mobile application, variable message signs, and through third parties. The first phase of the project was completed in 2016, with remaining sites expected to be completed in 2017.[23]

Other States

Truck parking information management systems are being tested in a growing number of states. Since 2014, California has experimented with data collection and communications technology at three public rest areas. In 2015, Tennessee cooperated with the Federal Motor Carrier Safety Administration (FMCSA) to evaluate different detection technologies at two public rest areas. The I-95 Corridor Coalition states of Virginia and Maryland also established a parking system at two public sites. Prior to award of the MAASTO TPIMS grant, Wisconsin DOT began creation of its own system with Minnesota's assistance, which was completed in 2016 and serves four

[22] Evaluating the Appropriate Level of Service for Michigan Rest Areas and Welcome Centers Considering Safety and Economic Factors, Michigan DOT Office of Research and Best Practices, April 30, 2012
[23] "FDOT Launches Truck Parking Availability System," SunGuide Disseminator, Marie Tucker, Jeff Frost, and Craig Toth, FDOT, May 2016

public rest areas on I-94.[24] Finally, Colorado is considering creation of a parking system compatible with the MAASTO TPIMS.[25]

3.3 Lessons Learned from Other States / Best Practices

The experiences of the truck parking information system projects noted provide lessons and best practices for the NWP to consider. First, systems need to have relatively long coverage along a corridor; equipping only one or two parking areas with a system will likely not have much effect on parking behavior. For example, Michigan's system covers about 140 miles of I-94, Wisconsin's covers 200 miles of I-94, and Minnesota's demonstration project covered about 60 miles of I-94. Since truck parking systems are a relatively new technology, and implementation of systems has been limited to select states, there is not an established best practice for the maximum or minimum length of corridor, or number of parking areas a system should cover.

Second, given the need for long corridor coverage, many systems may need to cross borders to be effective. A multistate, collaborative approach may be beneficial because it allows for greater geographic scope, the costs of system development can be defrayed across states, and truckers receive a uniform "user experience" when using the system. In this approach, designating a single entity (a state DOT) as project manager can improve collaboration because it can simplify administrative tasks. A small core support team can serve as "go to" staff for information about the project.

Third, giving states flexibility in what technology they use (cameras or in-ground sensors), while establishing a region-wide user interface (same signs, websites, and mobile applications) can help DOT's maintain some decision making autonomy while still contributing to a regionally-oriented project. It may also be a mechanism to persuade DOT administrators to agree to participate in a multi-state endeavor.

Fourth, truck parking systems are not a magic bullet for parking problems. They cannot reach their full potential benefits in areas where there is a severe shortage of parking ("It'll tell me what I already know – everything is full"). While previous research and surveys suggest that improved information can improve truckers' parking decision-making, and "smooth" demand for parking across corridors, parking systems' effectiveness in improving parking behavior has not been evaluated. The MAASTO TPIMS will undergo performance evaluation once it is complete, but data collection for evaluation will take multiple years.

And last, truck parking systems are not a one-size-fits-all solution. The results of the stakeholder consultations (Section 4) suggest that while parking systems will be beneficial close to congested urban areas like Seattle and the Twin Cities, they may be unnecessary for the majority of the NWP region.

[24] Trucks Park Here, www.trucksparkhere.com
[25] Colorado Truck Parking Information Management System (2016 FASTLANE Grant Application), Colorado DOT, April 14, 2016

4 NWP Stakeholder Perspectives

Key Chapter Takeaway

Both public and private sector stakeholders were engaged to understand the perspectives and the need for truck parking and information from those who conduct business in the NWP on a daily basis. Eighteen stakeholders were consulted representing a mix of trucking roles and geographies within the NWP region. The consultation finding show that:

- Parking problems (parking shortage and need for information) are concentrated in metropolitan Seattle and the Twin Cities.
- Two-thirds of stakeholders do not believe there are parking problems in non-urban areas of the NWP region.
- Most stakeholders said parking information was not a concern, but this was largely due to their on-going familiarity with the corridor.
- Information improvements could be important for all portions of the NWP, but the type of information varies.

4.1 About Consultations

While much good information on truck parking systems and general parking needs is available nationally, it is important to understand the perspective of those who conduct business in the NWP on a daily basis. The intent of consultations was to obtain qualitative information that can be used to guide the implementation of a corridor-wide truck parking availability and information system in the NWP Corridor.

Both public and private sector stakeholders were engaged, using a discussion guide developed to focus each consultation. The guide (Appendix B) included questions regarding stakeholder operations, parking needs and other major issues such as congestion or safety related to specific corridors, and how they prefer to obtain information.

Eighteen stakeholders were interviewed for this purpose, including representatives from six state trucking associations, ten trucking companies, one MPO, and one representative from ATRI. At least one stakeholder from each NWP member state was consulted. Figure 4-1 lists the organizations consulted for this working paper, and their operations.

Figure 4-1: Organizations Consulted

Agency/Organization	Description / Operations on NWP Corridor
American Transportation Research Institute (ATRI)	Trucking research organization
California Overland Limited, Minnesota	Refrigerated truckloads westbound on I-90
Diversified Transfer and Storage, Montana	LTL food in OTR moves on I-90
Dixon Brothers Incorporated, Wyoming	Truckload tank services on I-90 in MT, WY, and SD
Fortune Transportation, Minnesota	Refrigerated truckloads westbound on I-90
Idaho Trucking Association	State trucking association
IEDS Logistics, Washington	Truckload steel, forestry, food, mineral products between Missoula and Seattle.
Kootenai Metropolitan Planning Organization	Coeur d'Alene, ID MPO. Familiar with trucking issues on I-90 in the Idaho panhandle and eastern Washington.
K and J Trucking, South Dakota	Refrigerated service on I-90
Litehouse Foods, Idaho	Truckload foods to Seattle and Midwest on I-90, I-94
Minnesota Trucking Association	State trucking association
Midwest Motor Express, North Dakota	LTL service on I-94 between Twin Cities and Seattle
Motor Carriers Association of Montana	State trucking association
South Dakota Trucking Association	State trucking association
Thompson Brothers Incorporated, South Dakota	General and refrigerated goods on I-90 and I-94
Walmart Transportation, Wyoming	Truckload consumer goods on I-90 in WY and MT
Washington Trucking Association	State trucking association
Wyoming Trucking Association	State trucking association

4.2 Findings

Figure 4-2 shows locations of stakeholders consulted and portions of the corridor with identified parking problems. The map shows how parking problems were most frequently mentioned in relation to the metropolitan areas of Seattle and the Twin Cities. Occasional problems were noted in three main areas: 1) I-90 in Idaho and eastern Montana, 2) I-90 in southwestern

Montana, Wyoming, and western South Dakota, and 3) I-94 from Fargo to central Minnesota. Problems around Ellensburg, WA were associated with "spill over" parking congestion in the Seattle region.

Figure 4-2: Stakeholders, Cities, and Noted Parking Issues

Source: CPCS based on stakeholder consultations

The problem associated with metropolitan areas was a consistent lack of parking, while problems associated with more rural areas were congested parking in select areas (like western South Dakota and eastern Wyoming), long distances between parking, and temporary parking shortages associated with winter storm road closures. Figure 4-3 shows how these metropolitan and rural parking concerns differed, and how the different causes of these problems required different information and solutions.

Figure 4-3: Results of Outreach

	Urban (Seattle and Twin Cities)	Small Cities and Rural
Parking Issues Identified	• Parking shortages • Few parking areas	• Congested parking at common stops • Long distance between parking facilities • Weather-induced shortages
Suggested Causes	• Relatively high demand, low supply • Concentration of O/D points • Scheduled delivery times, need for staging • Higher land values near metro areas • Local restrictions on parking	• Distance between towns or facilities • Inclement weather
Information Needed	• Real-time parking availability • Local rules and regulations	• Location of parking facilities • Amenities available at facilities • Weather shutdowns • Local parking rules and regulations
Suggested Solutions	• Public-Private Partnerships with truck stops to create more parking • TPIMS to communicate availability	• P3s to create more parking • Create more parking in remote areas • Signs with basic parking info • Info on website, maps, apps

Source: CPCS based on stakeholder consultations

Truck Parking Issues, General and Specific

Lack of Available Parking

The most frequently mentioned and most severe truck parking problem was a lack of available parking in the metropolitan areas surrounding Seattle and Twin Cities. Five stakeholders specifically mentioned these areas as problems, and another two noted their parking problems occurred in large urban areas, without naming these cities specifically. Stakeholders attributed the parking shortage in these areas to four factors:

- An insufficient number of truck stops or rest areas relative to truck volumes.
- On-time deliveries and pickups, which require trucks to park and wait for scheduled delivery times.
- Local ordinances or rules banning truck parking near delivery locations, or shippers and receivers who would not allow parking at their sites.
- The implementation of electronic driver logs, which eliminated a driver's "wiggle room" to spend time finding parking as they approach their Hours of Service limits.

Truck parking in rural areas and smaller cities of the NWP was not a concern for most stakeholders. About two-thirds of consultees specifically stated that rural parking was not a problem, especially when compared to metro areas. However, some stakeholders did identify parking issues in rural areas and smaller cities.

Long Distances between Parking Facilities

One of the two most common rural concerns is longer distances between truck parking facilities. This was specifically noted by four stakeholders.

Long distances between towns and parking facilities can create parking congestion because the few parking areas available may be more likely to fill up. For example, two trucking companies from Minnesota noted that finding parking in western South Dakota and eastern Wyoming could be difficult because those areas are a one day drive from Minnesota, making the relatively few truck stops and rest areas there a common stopping point for many truckers traveling west from the Midwest. I-90 between Coeur D'Alene, Idaho and St. Regis, Montana was another potential shortage area, as mountainous terrain creates a 100-mile zone with limited truck parking.

Relatively long distances between facilities also present a challenge for truckers who seek parking between towns. This group includes truckers who prefer to maximize their driving time by stopping in remote areas rather than stop earlier in a town, and drivers in search of short term parking for rest, meals, and bathroom breaks. Both types of truckers indicated the lack of basic parking facilities in remote areas was a potential area for improvement.

Weather Related Parking Shortages

The second of two most common rural concerns is temporary parking shortages created by road closures during inclement weather. This concern was also specifically noted by four stakeholders.

Insufficient information about upcoming road closures means that truckers are likely to stop only when they encounter a closure. This means that towns and facilities closest to a major road closure will experience temporary and severe parking shortages when highways are closed. Some stakeholders suggested examining WYDOT's work for managing closures on I-80 as a best practice source.

The Role of Truck Parking Information

About 80% of truckers and trucking associations consulted said their parking information came from personal experience or word-of-mouth. The reason for reliance on personal experience varied between carriers. Some drove on fixed routes, so their experience with the corridor and its parking patterns was stronger. Others relied on truck stops in their fueling network for parking, and some companies notes they did not provide additional parking information resources to their drivers. The remaining sources of information mentioned by stakeholders were CB radio, onboard navigation systems, advice from dispatchers, and mobile device applications.

Twelve stakeholders said that truck parking availability information was not a concern. Two noted they had moderate concerns about the availability of information, and the remaining three stakeholders did not have any comment. Regardless of their level of concern about the existing state of parking information, almost all consultees provided advice on how to improve communications with truckers.

Parking information needs varied between urban and rural settings. Seven stakeholders said real-time information about parking availability at specific locations was most critical, and needed in urban areas. In rural areas, another seven stakeholders said information about parking locations and amenities was most important. One stakeholder said further information on parking regulations was critical, and another said weather information was essential for parking decisions. Given the different geographies associated with these critical items of information, suggestions on improvements varied as well.

Many carriers and associations believed that improving availability information would have little benefit in the rural parts of the NWP corridor. The biggest theorized benefit to improved information, particularly about parking availability, was the ability to make real-time decisions in congested parking areas rather than spending driving time looking for parking, or stopping before HOS had run out. This idea is supported by ATRI's findings that the average trucker stops with 56 minutes of driving time remaining.[26] However, some companies that were consulted during the NWP stakeholder interviews believe that improved information may not be beneficial because 1) a severe shortage of parking spots in urban areas would not be overcome without construction of more spaces, 2) there were ample spots, *or* very limited parking options in rural areas, 3) their drivers traveled the same corridors repeatedly, and scheduled their day to begin early and end early when parking was available, 4) HOS regulations, not parking shortages were inhibiting flexibility, or 5) their operations focused on getting drivers home each day.

Solutions to Identified Issues

Stakeholders were asked to suggest potential solutions to their truck parking issues. Solutions fell into two major categories: 1) parking expansion and 2) improved communications. Seven stakeholders provided solutions related to parking expansion, and 11 stakeholders provided solutions related to information and communication with truckers.

Parking expansion suggestions varied by geography. In remote rural areas, carriers suggested creation of basic paved turnoffs with minimal restroom facilities. In more urban areas, or areas with existing truck stops or rest areas, expansion of existing facilities was recommended. For example, three stakeholders suggested using Public-Private Partnerships to acquire land and expand truck parking surfaces at existing truck stops. Expansion of parking was recommended more frequently when discussing solutions for parking in Seattle and the Twin Cities.

Suggested information improvements also varied by geography. In urban areas, or rural areas where frequent parking problems were observed, stakeholders had identified that parking availability information was most critical. Therefore, they suggested the creation of systems to collect and broadcast real-time parking availability information to truckers. Three stakeholders (two associations, and one trucking company) specifically mentioned the MAASTO or Florida parking systems as the inspiration for their suggestion. Intelligent Transportation System (ITS) parking solutions that use various technologies to collect information and communicate are

[26] Managing Critical Truck Parking Case Study – Real World Insights from Truck Parking Diaries, American Transportation Research Institute, 2016

best suited to Washington and Minnesota, who have large metropolitan centers with well-known truck parking shortages.

In rural areas, carriers and associations suggested that basic information on the location and amenities should be provided to drivers. Two suggested solutions for communications were addition of truck-specific amenity information to highway exit signs, and publication of corridor truck parking maps like those produced by Wyoming DOT (see Figure 4-4), WSDOT (see Figure 3-10), and Utah DOT.

Figure 4-4: Wyoming Truck Parking Map for I-90

Source: Wyoming Department of Transportation

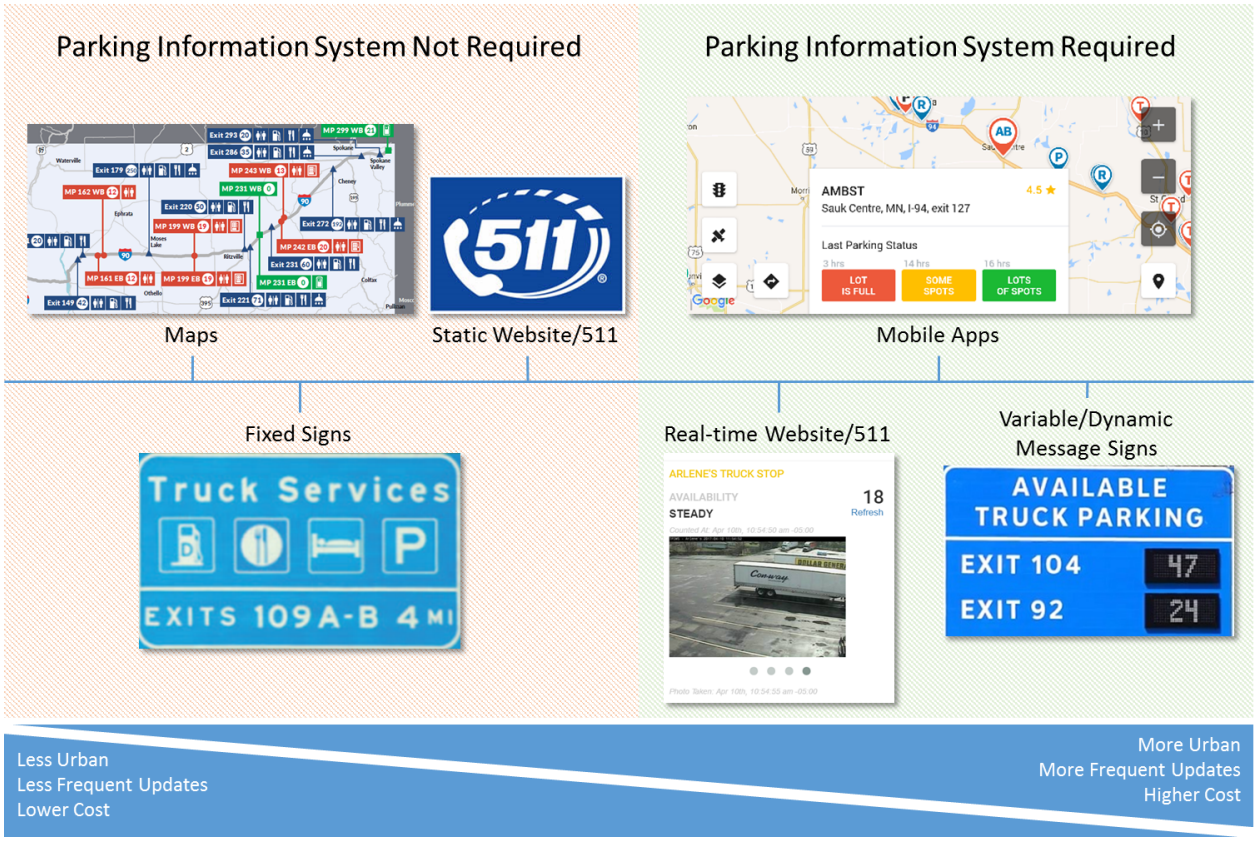
Solutions such as static signs and maps may be more suitable for states including Montana, Wyoming, and the Dakotas that do not have truck parking shortages, but have long distances between parking facilities. Figure 4-5 shows what information was desired for rural and urban areas, and what systems stakeholders recommended could provide that information.

Figure 4-5: Information Solutions

	Rural (no parking shortages)	Urban (parking shortages observed)
Needed Information	Location of parking Amenities at parking locations Weather conditions Distance to next parking facility	Real-time parking availability Local parking regulations / rules
Communication Solutions	Fixed signs at exits Printed maps and visor cards Website with reference info 511 service Mobile applications	Parking Systems: • Variable signs • Mobile applications • Website • 511 service Reservation services GPS
Relative Cost	Low, basic or no infrastructure required	Moderate, ITS infrastructure required

Figure 4-6 was created to help NWP states understand what parking solutions may align with rural or urban geographies, and provide examples of existing parking information sources in service. This figure is not intended to prescribe a specific solution, as every corridor has unique needs and circumstances.

Figure 4-6: Continuum of Parking Solutions



Source: CPCS

Potential solutions are arranged from left to right generally based on a combination of the environment they may be most effective in (rural or urban), how frequently their information can easily be updated, and their relative cost (low to high). These solutions should also be seen as a base upon which more advanced parking information systems can be built. Low-cost, low update, rural potential solutions include:

- **Printed maps** that can be posted in rest areas or distributed to drivers. Wyoming DOT has already created maps, and WS DOT is in the process of completing their own set of maps, a sample of which are shown in the figure.
- **Fixed signs** that inform truckers about what kinds of facilities are available at an exit. This was suggested in rural areas like Wyoming, where truck services like diesel fuel or parking may be miles away from an interstate exit, and drivers do not have time to drive into town to look for available services.

- A **static parking website**, or 511 telephone hotline service with parking maps and amenity information listed or sorted by exit.

Solutions that require TPIMS are listed on the right side of the figure, and generally cost more, but provide more frequent updates and may be more suited to urban areas. These solutions should be seen as a complement to the basic solutions on the left side of the figure. These parking information system solutions include:

- **Websites** and 511 services with real-time parking information, like Truck Smart Parking Service's map for Michigan.
- **Mobile device applications** like Trucker Path and Truck Smart Parking Services applications, and in-cab signals. These mobile device-based services can automatically provide information to truckers, reducing the potential for distracted driving.
- **Variable and dynamic message signs** that display parking availability, such as those installed for the Michigan TPIMS project. These systems are considered to be most expensive because they require physical signage to be installed and maintained. However, relative to mobile applications, and websites, signs have a very low potential for inducing distracted driving.

The previous figure provides an indication of lower vs. higher cost solutions. As each implementation is unique it is difficult to pinpoint what each system component will cost in a potential future NWP deployment. Figure 4-7 provides cost information for reference, as it relates to the implementation of several of the systems noted earlier in this working paper.

Figure 4-7: Cost of Implementation

Project	Description	Cost ($M)
MAASTO TPIMS	• To be constructed in late 2017. • Over 150 sites on nine corridors in eight states. • Communication via website, mobile applications, and dynamic signs.	$28.6
Michigan TPIMS	• Constructed in 2014. • Five public and five private parking areas on I-94. • Communication via mobile application, website, dynamic signs, and onboard equipment.	$4.4
Minnesota Pilot	• Constructed in 2012. • Three sites on I-94, northwest of Minneapolis / St. Paul. • Communication via website, in-cab signals, and variable signs.	$2.0
I-95 Corridor	• Constructed in 2015. • Two public rest areas on I-95 in Virginia and Maryland. • Communication via website and phone.	$4.9

Source: Truck Parking Management Systems: A Synthesis of Projects, Research, and Resources for MAASTO Decision Makers, Mid America Freight Coalition, 2015

5 Conclusions and Next Steps

Key Chapter Takeaway

While the NWP region does not have the widespread truck parking challenges found in other parts of the US, there are three key areas of need:

- Additional truck parking (primarily in Seattle and Twin Cities, with select rural areas also identified),
- Information on truck parking facility locations and amenities throughout the NWP region, and
- Information on truck parking availability (primarily in Seattle and Twin Cities).

Each state, urban or rural area in the NWP has the ability to take steps on their own to address these needs. However, building on concepts used by the Midwest TPIMS program, which has roots in the early efforts led by MnDOT, it is recommended that the next steps for NWP states are incremental and are done in partnership with each other.

5.1 Conclusions

In large part the NWP region is free of many of the truck parking challenges that are present in much of the US. Concentrated parking shortages do exist in and around the Seattle and Twin Cities metro areas, but two-thirds of stakeholders consulted did not think there were parking problems in the remainder of the region. Additional truck parking is needed in those two urban metro areas, and additional parking in select rural areas may be beneficial for certain drivers (e.g., long distance), as well.

Eighty percent of stakeholders consulted received their parking information from personal experience, and word-of-mouth, and over 65% said that the availability of information was not a concern. However, all stakeholders provided suggestions on how information resources could be developed or improved. For rural areas or areas without parking shortages, stakeholders recommended creation of signs and maps with truck-specific amenities. Stakeholders recommended implementing truck parking systems in areas where parking is more difficult to find, such as Seattle, and the Twin Cities.

Creation and evaluation of parking systems is underway in a number of areas including Florida and the Midwest. A Midwest-focused system (the MAASTO TPIMS) is being developed by eight states, and their experiences in building and managing a multi-state TPIMS will be especially relevant to the NWP as a regional organization. The Midwest-focused TPIMS has shown marks of success already, due in part to delegating project administration work to a single project manager state, the creation of a common data architecture and user interface across the region,

and the flexibility given to member states in choosing how they will build the system within their own borders.

The advancement of a truck parking information system in the NWP region should not be seen as a one-size fits all solution. First, based on the research presented in this working paper, a truck parking information system is not a necessary investment for much of the region. Feedback from stakeholders complemented by FHWA and ATRI studies suggests that parking is not a concern for most of I-90 and 94 in the NWP. And, in areas where parking demand exceeds supply, a parking information system will be ineffective. Furthermore, parking information system effectiveness is not yet proven. Previous research on truckers' information preferences and decision-making suggests that a system will improve parking patterns in some areas, but this theory has yet to be tested. Evaluation of the Midwest and Florida systems in the coming years will help determine the potential value of systems across larger areas.

For the NWP, parking systems are worth considering for two areas: Seattle and the Twin Cities (which is already in the process of system implementation as part of the eight-state Midwest initiative). Since there is value in receiving parking information in advance of reaching a metropolitan area, a parking information system may be necessary in rural areas surrounding these metropolitan centers. Another corridor, I-90 between Rapid City, SD and Billings, MT may benefit from a parking information system as well; some stakeholders in Minnesota identified the corridor as a common stopping point for trucks from the Midwest, where parking filled up more quickly. However, the majority of NWP stakeholders did not believe there were parking problems in the rural areas of the NWP. Outside of these 2-3 areas, states can improve parking information by simply publishing parking maps or creating highway signs with truck-specific amenity information. Figure 5-1 shows what needs and information sources may be relevant to different portions of the NWP region.

Figure 5-1: Illustration of Potential Deployment by NWP Geography

	I-90: Seattle to Ellensburg, WA	I-90: Coeur d'Alene to St. Regis, MT	I-90: Billings, MT to Rapid City, SD	I-94: West-Central MN to WI border	I-90 and 94: all other sections
Area Type	Urban and Rural	Rural	Rural	Urban and Rural	Rural
Need Additional Truck Parking	Yes	Possibly, further study needed	Possibly, further study needed	Yes	No
Need Additional Information on Truck Parking Options	Yes	Maybe	Maybe	Yes	No
Need Truck Parking Availability Information	Yes	Maybe	Maybe	Yes	No
Deployment	Full TPIMS	Truck Parking Map, Website	Truck Parking Map, Website	Full TPIMS	Truck Parking Map, Website

5.2 Next Steps

As this working paper has illustrated, while truck parking facility and availability information needs vary across the NWP region, trucking stakeholders can benefit from even small system enhancements. Each state in the NWP has the ability to take steps on their own to enhance how information is provided to truck drivers within their borders. However, building on concepts used by the Midwest TPIMS program, which has roots in the early efforts led by MnDOT, it is recommended that the next steps for NWP states are incremental and are done in partnership with each other. The incremental steps include:

1. Establish a project champion,
2. Inventory truck parking facility location and amenity information and develop a map,
3. Provide a website that houses truck parking facility location and amenity information by adapting the existing NWP traveler information site,
4. Confirm the need for truck parking availability information and agree on future partnership,
5. Conduct follow-up studies, and
6. Continue to track on-going TPIMS deployments to gather best practices.

These steps are not necessarily listed sequentially and do not need to occur independent of each other – they are synergistic and can occur in parallel, as desired.

First, it is recommend that a **project champion** be established to lead and follow through with recommendations. As the NWP Task Force already has a formal structure that designates state and staff leads for various topics, it is recommended that this structure be followed and a lead for future truck parking and information activities be formally designated.

Second, as it was determined that truck drivers could benefit from better parking facility location information across the corridor, it is recommended that the NWP Task Force **inventory and publish truck parking facility location and amenity information** for the entire NWP corridor. The NWP Task Force should lead an initiative to collect, synthesize and publish this information as a future Task Force activity on behalf of NWP member states. Washington, Wyoming and Minnesota have already done some legwork to understand assets within their borders, so this effort would include a combination of collecting already existing information, filling in gaps with new data collection where facilities have not been inventoried, and synthesizing all results in a single place (static map). A static map will enable truck drivers to be better aware of existing facilities and some of the perceived parking shortages (e.g., between Rapid City, SD and Billings, MT) may be quelled. However, development of this resource may also confirm to NWP member states where truck parking shortages do, in fact, exist.

Third, the static, printed map could be provided to state trucking associates to distribute to their members, or posted at key truck stops in the NWP. However, a cost effective way to best manage updates and information dissemination is to **publish on the web** the truck parking

facility location and amenity information. The NWP Task Force already has a traveler information website (www.roadtosafediscovery.com) that could serve as a repository for individual state truck parking maps, or a synthesized, NWP truck parking facility map. Individual state trucking associations and DOTs can direct truckers to this NWP website (e.g., via a link from their web-based truck permit sites); the NWP can provide links to member state information in-kind. Initially this facility information can be provided in static form, but as additional information is available (e.g., parking availability) this website maybe enhanced to enable truckers to query and/or have information pushed to them directly, as they request.

Fourth, while the need for, and potential level of deployment of, truck parking availability information has been generally identified (i.e., qualitatively) in this working paper, the NWP Task Force should **work with member states to consider and confirm these findings and agree on future partnership** (Figure 5-1). While the need for truck parking availability information has been determined to be centered in the urban areas of Seattle and the Twin Cities, it should not be assumed that states where information needs have not been identified are not interested in continued partnership on related activities. As the NWP is focused on corridor-wide operations, all states have a potential role in collecting and disseminating information to system users.

Fifth, there are several **next-step exploratory activities** the Task Force should consider to further refine the direction the NWP takes related to truck parking and availability information. These next steps are generally geographically focused and include:

- Washington – conduct a study of the feasibility of TPIMS in and around Seattle. This step could be best led by WSDOT, as compared to the NWP Task Force.
- Minnesota – ensure that the system being deployed as part of the Midwest initiative is inclusive of/provides sufficient information for trucks transiting to/from points west of the state.
- All NWP States – study possibility/feasibility of creating parking in remote or underserved areas (the inventory developed in Step 2 will inform where these may be needed).

And last, the NWP should continue to **track on-going TPIMS deployments** in the Midwest, Florida and other localities to gather best practices that may be applied to a future NWP TPIMS. This could include 1) approach to developing a corridor-wide "brand" for truck parking information that encapsulates messaging both online and in the field (e.g., common logo/name, roadside signage, etc.), 2) approach to maintaining a multi-state partnership, 3) approach to deploying in an ever-evolving technology environment, and 4) system performance and effectiveness tracking.

Appendix A: Helpful Truck Parking Links and Information

Web Link	Description
ATRI Truck Parking	A site with links to ATRI's research on truck parking, including their truck parking diaries, and study of using GPS data to determine parking utilization.
Colorado TPIMS Grant Application	A FASTLANE Grant application for creation of a truck parking system similar to the MAASTO TPIMS.
FDOT Launches Truck Parking Availability System	A Florida DOT newsletter article on the state's new truck parking system.
Intelligent and Secure Truck Parking Deployment Guideline	A reference document with information on how European nations are deploying truck parking systems.
Jason's Law Truck Parking Survey Results	Web-version of FHWA's report on the Jason's Law Truck Parking Survey. Contains information on parking availability in each state, and truckers' perceptions of parking issues in each state.
MiDrive	Michigan DOT's traffic map website, with truck parking information.
SmartPark Truck Parking Availability System: Magnetometer Technology Field Operational Test Results	A 2011 report on research into truck parking detection technologies for the Federal Motor Carrier Safety Association. This report discusses the strengths and weaknesses of technologies that rely on magnetic detection to count parked trucks.
SmartPark Truck Parking Availability System: Video Technology Field Operations Test	A 2011 report on research on video-based truck parking technologies.
Study of Adequacy of Commercial Truck Parking Facilities	A 2002 FHWA report on parking problems, this report can be thought of as a predecessor to the Jason's Law Report.
Truck N' Park	Website for the I-95 Corridor Coalition's 2-site truck parking system.
Truck Parking Availability Study: Demonstration Project	The project website for Minnesota's pilot truck parking system.
Truck Parking Management Systems	A research report on truck parking trends, needs, and technologies conducted by the Mid-America Freight Coalition prior to award of the MAASTO TPIMS grant. This report has a large works cited and suggested reading list of previous academic research on parking technology and truckers' habits.
Truck Smart Parking Services (TSPS)	Operator of the Michigan TPIMS system at private rest areas. TSPS also publishes a mobile application and a real-time web map with parking availability and amenities.

Web Link	Description
Trucker Path	A mobile application with user-generated reports of parking availability. Some NWP stakeholders mentioned this application as a potential source of parking information.
Trucks Park Here	Project site for the Midwest Regional Truck Parking Information and Management System (TPIMS) being developed by the eight Mid America Association of State Transportation Officials (MAASTO) states of Indiana, Iowa, Kansas, Kentucky, Michigan, Minnesota, Ohio, and Wisconsin.
Utah Truck Parking Maps	Another example of state DOT-produced truck parking maps.
WSDOT Truck Parking Study	A webpage with links to WSDOT's Truck Parking Study and related materials like parking maps.
Wyoming Truck Parking Map	PDF copies of Wyoming DOT's truck parking maps.

Appendix B: Consultation Guide

A Consultation Guide was used to focus the meetings with trucking industry stakeholders, and is shown below

Consultation Guide – North/West Passage Truck Parking Research

Item	Details
Date Conducted	
Name and Title of Interviewee	
Contact Info	
CPCS Interviewer	
Other (Confidentiality?)	

For Carriers, Industry Groups, etc.

1. Background (Please describe your operations in the NWP study area – size and scope, commodities, equipment, origins-destinations, key corridors)
2. General truck parking issues (what are the key issues you face with regard to truck parking?)
    a. For example: safety (can't find safe place, available parking isn't safe), lack of information, insufficient parking (overall, in the right locations), quality (lack of amenities, etc.)
3. Specific truck parking issues (particular state, corridor, time of day, time of year)?
    a. Geographically, to what extent are truck parking issues urban versus rural in nature?
4. What truck parking solutions would you recommend be investigated?
5. How significant an issue is availability of truck parking **information**?
6. Which resources do you presently use to gain advance information on truck parking availability and how could these be improved?
    a. Would housing truck parking information on the corridor website be practical and superior to present methods of disseminating/receiving truck parking info?
7. When accessing truck parking information, what features/information are most critical?
    a. For example: data up-to-date vs. precise? Only number of available spaces, or other information as well?
8. How would better truck parking information availability help you operationally?

CPCS 1

Page 2

For States

1. Describe the truck parking systems you have in place?
2. How is information on truck parking availability provided to truckers?
3. What are the benefits and shortcomings of these systems?
4. What lessons can be drawn from your experience for interstate cooperation on truck parking availability or information sharing?
5. What future needs or initiatives do you anticipate regarding truck parking information?

(note: these interviews may be more customized to discuss specific projects or studies)

Appendix C: North/West Passage Web Meeting on Truck Parking

Year 2 activities of the NWP Freight Task Force included conducting regular web meetings on relevant topics to NWP member states. On October 18, 2016 a 1 ½ hour session focused on truck parking was held that highlighted the work underway on the eight state MAASTO Truck Parking Information Management System (TPIMS) effort. This project received a $25 million TIGER grant and is currently under development/deployment.

Topics presented during the webinar included the TPIMS project technology solution, partner collaboration, challenges and next steps. Co-presenters included:

- Davonna Moore, KDOT – TPIMS Project Manager
- John Maddox, KDOT – TPIMS Deputy PM and branding lead
- Dan Murray, ATRI – private sector research lead
- John Tompkins, MnDOT – Minnesota truck parking pilot and overlap between TPIMS, MnDOT and NWP efforts.

The following contains the PowerPoint presentation from that session.

North/West Passage Freight Task Force, Year 2

Web Meeting #4 – Truck Parking

October 18, 2016

About This Web Meeting

- ~60 Minutes for presentation
- 30 Minutes for questions and discussion
  - Type comments in the chat box
  - Share your perspectives at prompted discussion points throughout the meeting
- *Please mute your phone when not speaking*

The benefits of the meeting increase with your active participation

2

Introductions

- Name
- Organization
- Is your organization active in any truck parking initiatives?

Idaho	Montana	Washington
Minnesota	North Dakota	Wyoming
	South Dakota	

3

Today's Presenters

Davonna Moore, Kansas DOT
785-296-0346
davonna@ksdot.org

John Tompkins, Minnesota DOT
651-366-3724
john.tompkins@state.mn.us

Dan Murray, ATRI
651-641-6162
dmurray@trucking.org

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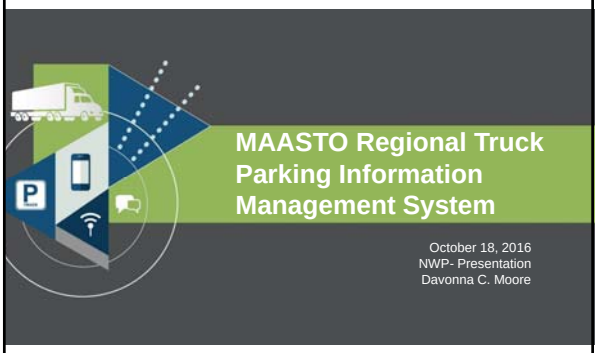
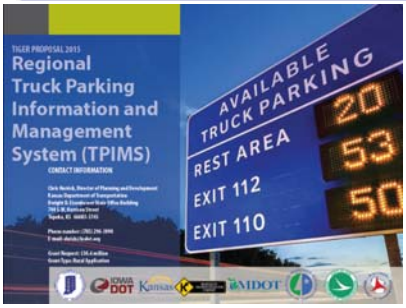


MAASTO Regional Truck Parking Information Management System

October 18, 2016
NWP- Presentation
Davonna C. Moore

The MAASTO TPIMS project



What is TPIMS?

Truck Parking Information Management System:

A regional network of safe, convenient parking areas with the ability to collect and broadcast real-time availability to drivers through a variety of media outlets including dynamic signs, smart phone applications and traveler information websites. This will enable drivers to proactively plan their routes and make safer, smarter parking decisions.

The vision

"MAASTO TPIMS Partner States will strengthen America's freight network by helping commercial truckers make safer, more efficient parking decisions through a user-focused information service that consistently provides timely, reliable parking availability information."

Goals and success measures

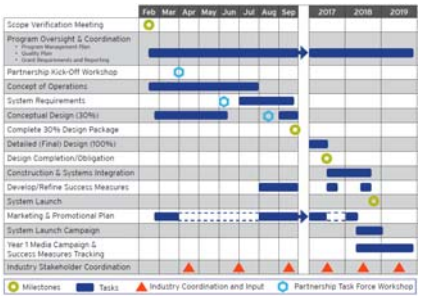
- Enhance highway safety and efficiency by providing timely and reliable truck parking information
- Provide a sustainable and scalable truck parking solution
- Provide a secure solution that protects user privacy and data
- Maximize user acceptance of the system for truck parking decisions

Key elements

Project Concept

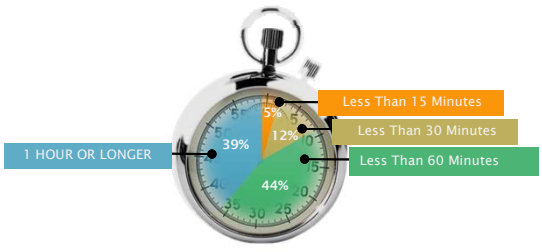
- Focus on parking availability on key freight corridors
- Collect real-time parking availability data at public and private sites
- Aggregate and analyze data
- Share parking availability data for dissemination to users
- Measure impact on parking usage, truck-related safety

Schedule for deployment



Why is TPIMS needed now?

HOW LONG DOES IT TAKE TO FIND TRUCK PARKING?



Survey materials courtesy of PowerPoint by Desiree Wood, Andrew Warcaba Associates and Hope Rivenburg

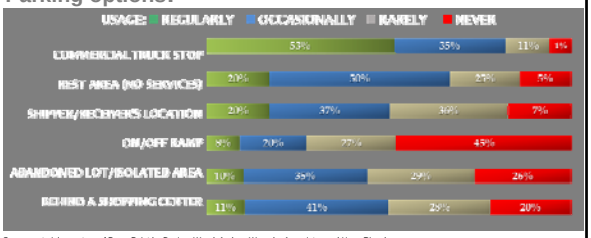
The impact is widespread

Parking issues affect most truck drivers:

- 90% perceive moderate to severe parking shortages
- 80% report regular difficulty finding safe truck parking
- 50% of states report illegal truck parking problems
- 95% of those who park illegally do not have information on available parking

The need for action

Parking options:



Survey materials courtesy of PowerPoint by Desiree Wood, Andrew Warcaba Associates and Hope Rivenburg

Core TPIMS concepts

- **Data Collection**
  - Entrance and exit or individual space counts
- **Data Aggregation**
  - Integrated with ATMS or separate
  - Local or cloud
- **Information Dissemination**
  - Types of signs
  - Types of apps
  - Types of websites

Performance measures

- **Parking Utilization**
  - Are drivers utilizing TPIMS to inform their parking decisions?
  - Have driver-perceived parking shortages declined?
- **Safety and Security**
  - Is there a reduction in illegal or informal parking?
  - Is there a reduction in fatigue-related crashes?
- **System Accuracy**
  - Is the system working properly?
  - Is the system accurate and reliable

Where do you collect data?

Public versus private sites

- **Public sites**
  - Owned, maintained and operated by state agencies
  - Rest areas, weigh stations
  - Direct access
- **Private sites** (Iowa, Kentucky and Michigan)
  - Private truck stops
  - Need to identify who will participate
  - Coordination with National Association of Truck Stop Operators (NATSO)

NATSO Guiding Principles

The guiding principles will be included within the agreement language executed between any MAASTO TPIMS Partnership state or its selected third party contractor(s) with any truck stop operator.

The principles will cover three categories:

- Use of Data
- Privacy
- Removal of Equipment

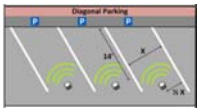
What technology is used to collect data?

Entrance and Exit Counts

- In-pavement magnetometer
- Video cameras
- Laser technology
- Radar

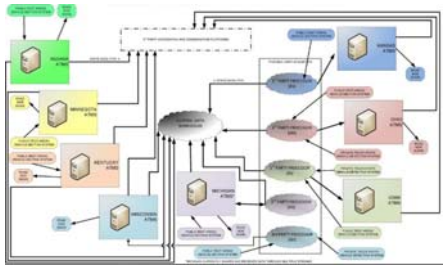
Space Occupancy Counts

- Infrared/magnetometers
- Microwave/magnetometers
- Video cameras



How do you share the data?

TPIMS Central Data Warehouse



How do users get data?

MUTCD sign input

What are the next steps?

8-State Partnership Task Force Coordination

- Project coordination - grant reporting and oversight
- Regional consistency
- Marketing and promotional campaign and branding

Outreach with Trucking Industry Stakeholders

- ATRI baseline surveys for reporting
- Engagement with ATRI, OOIDA, Mid America Freight Coalition, Highway Patrol, NATSO and Private Truck Stop Operators

Design, Procurement and Deployment

- Pilot projects (Kansas, Minnesota, Indiana)
- Final design-bid-build or design-build - PS&E approval by 6/30/17
- Construction – substantial completion by 9/30/18
- Performance measures monitoring – 5 years

The TPIMS vision

Freight network users and supporters will experience:

Regional Consistency for Trucking Industry

- Seamless regional look and feel for trucking industry users
- Flexibility for state-specific concepts

Safety, Productivity & Economic Competitiveness

- Safer for truck drivers and general public roadway users
- Drivers & carriers more efficient and profitable
- New economic opportunities attracted to regional corridors

National Model for Deployment

- Consistent concepts, messaging and technologies
- Expand pilot project to other NHS corridors and states

TPIMS questions?

www.TrucksParkHere.com

info@TrucksParkHere.com

TPIMS Project Manager

Davonna C. Moore
Assistant Bureau Chief-Transportation Planning
Kansas Department of Transportation
(785) 296-0346
davonna@ksdot.org

Questions?

Idaho
Minnesota

Montana
North Dakota
South Dakota

Washington
Wyoming

Truck Parking Issues & Opportunities

Dan Murray
American Transportation Research Institute

ATRI

Trucking industry's NFP research organization

- Safety
- Mobility
- Economic Analysis
- Technology
- Environment

www.atri-online.org

Board of Directors

Research Advisory Committee

2015 Top Research Priorities

Managing Critical Truck Parking - Underway

Onboard Safety Systems (OSS) Analysis

Phase 1 – Truck Crash Costs by Severity – Underway

Phase 2 – Deployment of OSS, Lives Saved, Injuries Avoided

Getting Younger Drivers in the Driver's Seat

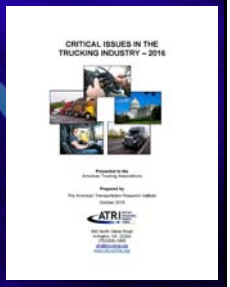
Younger Driver Assessment Tool – Underway

Fixing the 12% – Underway

Baseline Class 8 Truck MPG – Underway

2016 Top Industry Issues

1. ELD Mandate
2. Hours-of-Service
3. Cumulative Economic Impact of Trucking Regulations
4. Truck Parking
5. Economy
6. CSA
7. Driver Shortage
8. Driver Retention
9. Transportation Infrastructure/ Congestion/ Funding
10. Driver Distraction



Top Issues Drivers vs. Carriers

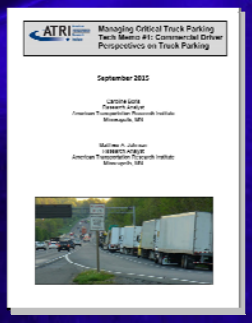
Commercial Drivers

1. ELD Mandate
2. Hours-of-Service
3. Truck Parking
4. Cumulative Economic Impact of Trucking Regulations
5. Economy
6. CSA
7. Driver Retention
8. Sleep Apnea Rulemaking
9. FMCSA Mission
10. Driver Health/Wellness

Motor Carrier Execs

1. Driver Shortage
2. ELD Mandate
3. Cumulative Economic Impact of Trucking Regulations
4. Economy
5. Hours-of-Service
6. Driver Retention
7. CSA
8. Transportation Infrastructure/ Congestion/ Funding
9. Federal Preemption of State Regulation of Interstate Trucking (F4A)
10. Driver Distraction

Managing Critical Truck Parking



- Top RAC priority for 2015
- Research tasks include:
  - Driver data collection – yielded over 1,400 driver surveys
  - Utilizing truck GPS data to assess parking supply and demand
  - Benefit-cost analysis of truck parking reservation systems – impacts on productivity and safety
  - Impacts of lost capacity

Managing Critical Truck Parking

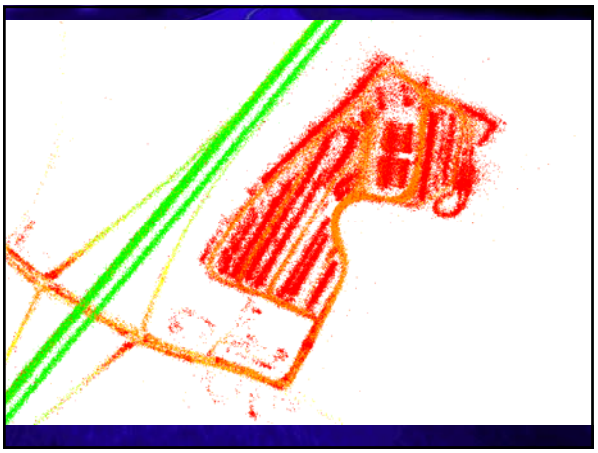
- Truck Parking Diaries – launched March 21st
- Drivers to keep 14 days of parking activity
- Includes when, where, how long to find a spot, how many spots occupied by non-CMVs, lost productivity

Managing Critical Truck Parking

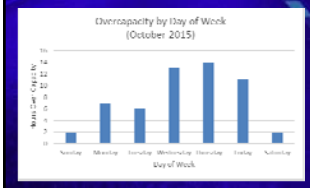
- Prequalifying surveys submitted by drivers = 628
- Drivers qualified = 553
- Drivers confirmed = 283
- Diaries shipped = 271
- Diaries returned = 194

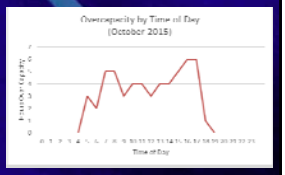
Assessing Truck Parking Supply / Demand

- Assess supply / demand utilizing ATRI truck GPS data
- Proof of concept with MnDOT
  - Analysis to include 5 rest areas
  - Goose Creek Rest Area analysis complete
- Created methodology to examine truck parking demand at public rest stops
- Findings can inform investment decisions



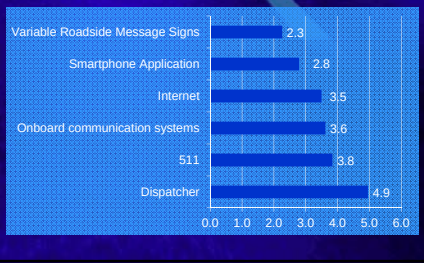
Managing Critical Truck Parking





ATRI Truck Parking Survey Analysis

How would you like to receive truck parking information?



Survey Synthesis

- Methodology
  - 15 commercial driver parking surveys
  - 11 General Surveys
  - 4 relating to reservation systems; business models; technology solutions
  - Surveys conducted 1996 – 2015
  - Eight surveys done in last six years
  - Matrix categorized & cross-tabulated responses.

Survey Synthesis

- Jason's Law…
  - Parking shortages worst in northeast & southeast
  - 50% of states reported "problems with unauthorized truck parking…."
  - 80% of drivers reported daily/weekly difficulty finding safe truck parking
  - Identified challenging time periods
  - Attempted (failed?) to quantify spaces at public/private facilities

Survey Synthesis

- General Findings
  - 90% perceive a moderate to severe truck parking shortage (1996!)
  - 75%+ prefer private truck stops for longer stops
  - Approx. 50%-60% prefer/use public rest stops for shorter stops
  - "Unauthorized Parking":
    - 95% due to capacity/availability
    - 50% b/c of rest restrictions…

Survey Synthesis

- General Findings
  - 50% of drivers spend 30-60 minutes looking for parking
  - 30% spend 60≤ minutes
  - Reasons for parking:
    1. HOS Compliance
    2. Fatigue Management
    3. Staging
    4. Other

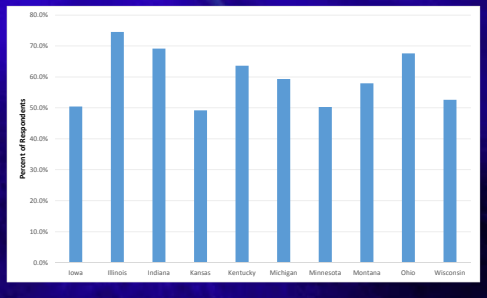
Other Activities

- **Jason's Law Report analysis**
- **Ongoing Analysis of Parking Reservation System Business Models**
- **MAASTO Tiger Grant**
- **NATSO/ATRI Truck Parking App**

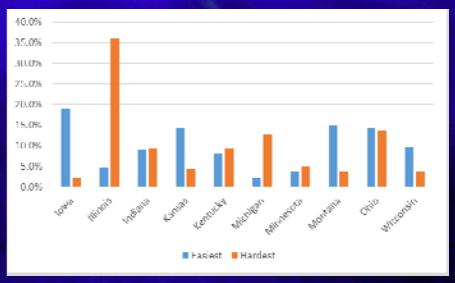
Survey Demographics

- 2,658 Responses
- Segment and Sector
  - 89% For-hire
    - 61% Truckload
    - 20.6% Specialized
    - 11.5% Other
    - 6% LTL
  - 8.9% Private
- Occupation
  - 49.1% OO/IC
  - 26.2% Employee Driver
  - 23.1% OO with own authority
  - 1.7% Other
- Average Haul Length
  - 78.3% 500+ miles per trip
  - 20.8% 100-500 miles per trip
  - 1% < 100 miles per trip
- Age
  - 72% 45-65 years old
  - 14.1% 26-44 years old
  - 13.7% 65+
  - < 1% 25 or younger
- Gender
  - 92.1% Male
  - 7.9% Female
- Drives OS/OW
  - 78.6% Rarely/Never
  - 11.6% Sometimes
  - 9.7% Always/Often
- Average of 60.5% of all miles traveled are in the MAATSO Region

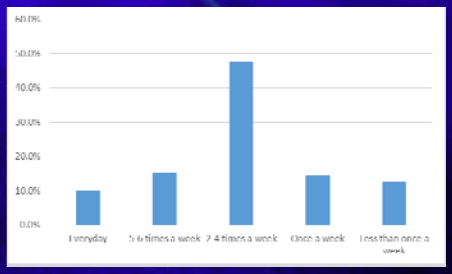
Where is Truck Parking Most Important



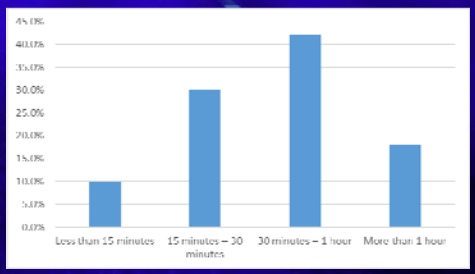
Difficulty in Finding Truck Parking



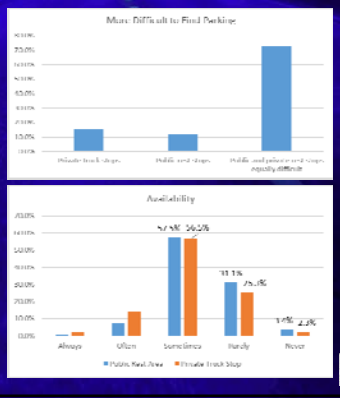
How Often is Truck Parking Needed in the MAATSO Region



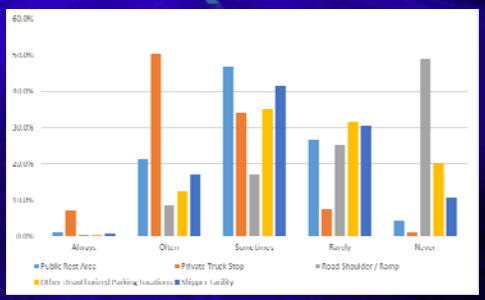
Average Time Spent Looking for Truck Parking



Public vs. Private



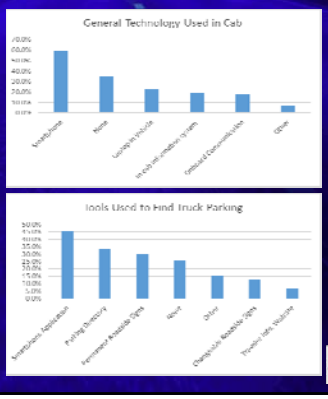
Where are Trucks Parking?



Parking Issues

Issues	Always/Often	Sometimes	Rarely/Never
Parking only available on ramps or shoulders	30.1%	32.6%	37.3%
Parking only available in unsafe locations	29.8%	38.4%	31.7%
No parking available for oversize vehicle configurations	27.8%	20.3%	51.9%
Rest area time limit restrictions	15.6%	38.4%	46.0%
Truck vandalism or theft	3.1%	16.3%	80.6%

Technologies and Tools Used



Desired Characteristics of Real-Time System

Characteristics	Percent Ranked First
Reliable – the system provides information at any time, day or night.	62.8%
Accuracy – if the system indicates parking is available, parking will be still available after the driver travels from the location of the sign to the parking area.	60.1%
Precision – the system specifies the exact number and location of available parking spots.	46.8%
Seamless – the system has consistent messaging and branding of parking availability information across state lines.	44.0%

Questions?

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Questions?

Idaho	Montana	Washington
Minnesota	North Dakota	Wyoming
	South Dakota	

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Regional Truck Parking Information Management System (TPIMS)

Marketing and Promotion Plan

John Maddox, CPM – Kansas Department of Transportation

TPIMS Branding

Product branding will be used to raise awareness of system users and convey a consistent message throughout the eight TPIMS member states.

- TrucksParkHere.com logo included on all print material
- Graphic standards – colors, text, writing style
- Consistent layout standards – promotional materials, advertising, etc.
- Consistent highway signage – based on approval of the FHWA committee on MUTCD

TPIMS Marketing and Promotion Plan Implementation

The TPIMS Marketing and Promotion plan will be implemented over the next two years in coordination with project milestones

- Project Solution Stage: Fall 2016 – Mid 2017
  - What to Expect/Coming Soon
- Project Construction Stage: Mid 2017 – Mid 2018
  - Construction/Breaking Ground
- Project Implementation Stage: Mid 2018 – End of 2018
  - Project Launch/Using TPIMS

TPIMS Marketing and Promotion Plan Implementation

- Project Solution Stage: Fall 2016 – Mid 2017
  - Project details, project development and implementation plan, anticipated industry benefits and impacts
- Project Construction Stage: Mid 2017 – Mid 2018
  - Project progress, continued focus on anticipated industry benefits and impacts
- Project Implementation Stage: Mid 2018 – End of 2018
  - Driver awareness, instruction for system users

Communications Products To Date

Several communications products in support of TPIMS have already been produced

- TrucksParkHere.com – public identity of the system
- DOT leadership briefing handouts
- Presentations and supporting materials for stakeholder engagement
- TPIMS video

Drivers and dispatchers can use TPIMS to more easily find safe, convenient and accessible parking while traveling or when making routing decisions.

TPIMS End Users

Marketing and promotional efforts will focus on regional and national audiences

- Dispatchers
- Employee drivers
- Owner-Operators (with own authority and as contractor)
- Fleet executives/managers
- Private convenience stores/businesses

TPIMS Media Relations and Advertising

Media relations and advertising efforts will encompass the following:

- Press releases to industry publications
- Press interviews
- State DOT websites
- State DOT traveler websites
- State DOT permitting and routing websites
- Social media
- Online paid advertising (electronic industry publications)
- Paid advertising in industry publications
- Industry newsletters
- Email blasts
- Sirius XM Radio (trucking industry specific channel)

Regional Truck Parking Information Management System (TPIMS)

John Maddox, CPM – Kansas Department of Transportation
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Questions?

Idaho
Minnesota

Montana
North Dakota
South Dakota

Washington
Wyoming

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Truck Parking Efforts in Minnesota

Northwest Passage Group

John Tompkins, Freight Project Manager
Minnesota Department of Transportation

October 18, 2016

We all have a stake in A⇔B

Background – National Perspective

- ISTEA landmark legislation "to develop a National Intermodal Transportation System that is economically efficient, environmentally sound, provides the foundation for the Nation to compete in the global economy and move people and goods in an efficient manner."
  - Mid-1990's, truck parking was identified as a potential nationwide problem in the U.S.. Congress requested the issue to be examined by the U.S. DOT.
    - Intelligent Transportation System (ITS)
    - Federal Motor Carrier Safety Administration – SmartPark Program
- Every national transportation legislation to the current has addressed the truck parking issues.

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Minnesota's Truck Parking Journey

1998 – Minnesota established Minnesota Freight Advisory Committee
2005 – Truck in the Twin Cities Studies
2007 – Oasis Program Task Force
2008 – Truck Haven & Truck Parking Public / Private Partnerships
2008 – Minnesota Interstate Truck Parking Study
2010 – Minnesota Interstate Truck Parking Study II
2012 – Truck Parking Availability Study
2015 – Truck Parking Information and Management System (TPMIS)
2015 – FAST Act funding used to expand truck parking

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Truck in the Twin Cities Study – 2005

Identified Strategies that would reduce congestion for truck traveling within and through the Twin Cities:

- Guidance for planning, design, specifying, and maintaining transportation facilities around heavy truck traffic generators.
- Achievement of increases in commercial vehicle parking supplies on the urban fringe.
  - Increase Traffic Safety
  - Reduce logistics cost
  - Improve the ability to meet JIT window
  - Reduction of trucks parking in unwanted location

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Interstate Oasis Designation in the Logo Sign Program

In October 2006, FHWA issues a policy for an Interstate Oasis program, allowing states to designate certain facilities as Interstate Oasis if the facilities can accommodate truck parking and meet certain criteria.
Top amenities: Fuel, Food, Restrooms (showers), Safety.

- MnDOT Oasis task force was develop to discuss whether and how an Oasis program could be implemented in Minnesota.
  - General conclusion – the private sector truck stops were best suited to meet the needs of the trucking community.
  - Public sector was best at providing safety and restrooms.
  - Consensus was not met for signing or multi-state harmonization.

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Truck Haven & Truck Parking Public/Private Partnerships – 2008

The Project investigated innovative ways to create motorist facilities that enhance highway safety and improve commercial freight movement through exploring and developing various Public Private Partnership (P3) business models to address the shortage of:

- Long-term parking on rural Interstate highways.
- Short-term truck parking on metro fringe Interstate highways.
- Rest areas for all motorists at the effective spacing intervals on Interstate highways as a countermeasure to drowsy driving.
- Nine models were developed.

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Minnesota Interstate Parking Study I – 2008

Develop information, supply and demand, to support decision regarding future approaches to the truck parking issues in MN (I-35, I-90, I-94).

- State's role in providing provision of truck parking.
- Provision support the long term best support the economy.
- What action will have the greatest impact to traffic safety, while maximizing technology and available federal programs.
- Data gathered from MnDOT's Truck Parking Capacity Usage Database. (***Data gathered at 7a.m., 9 p.m. or 11 p.m.)***

** 2008 – State legislation was enacted to allow commercial vehicles to park for a period of up to 10 hours at MnDOT safety rest areas.*

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Minnesota Interstate Parking Study II – 2010

Determined opportunities for expanding truck parking where needed across Minnesota on primary the I-35, I-90, I-94.

*The previous study concluded that future research was needed to identify potential remedies to improve truck parking into the future.

- Study identified short-term and long-term recommendations on where to expand truck parking.
  - Capacity increase at east and west fringe of Twin Cities (TC) on I-94.
  - Capacity increase at south fringe of TC on I-35.
  - Utilization of abandon weigh station(s).
  - Coordination with WisDOT in providing parking information and capacity.
  - Improve information regarding parking availability along I-94 corridor east of the TC

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Minnesota Truck Parking Availability Study

* U of M Partnership Award

Proof of Concept Research Project, MnDOT, U of M, ATRI and Peoplenet

- Deploy automated camera-based parking detection and measurement system at (3) Interstate rest areas on I-94.
- Develop a data management and data distribution system.
- Develop systems to provide parking availability information to roadside Changeable Message Signs, in-cab communication devices, and Web.
- Conduct testing under variety of conditions.
- Evaluate system performance (accuracy, reliability, driver acceptance).
- Non-intrusive.

* MnDOT and WisDOT have entered into an agreement to test U of M software at a Wisconsin rest area.

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FAST ACT Funding – Expanding Truck Parking

Freight Provision in the FAST ACT expanded truck parking eligibility projects beyond MAP -21, incorporating Jason's Law; Minnesota will fund through NHFP:

2017- 12 truck spaces at St. Croix Rest Area (Metro fringe), $1M.

2018 – Geometric improvement WB -67 at Goose Creek (Metro fringe), $200K.

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Questions?

Idaho	Montana	Washington
Minnesota	North Dakota	Wyoming
	South Dakota	

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Thank You

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Upcoming Web Meeting

Webinar 5: Connected Trucks / November 1st

This session will focus on the I-80- connected trucks pilot that Wyoming DOT is leading – with emphasis on the infrastructure to vehicle (i2v) aspects of the project. Presenters/topics include:

- **Vince Garcia** (WYDOT) will provide a general description of the project and the issues/challenges it is aimed at addressing.
- **Tony English** (TriHydro) will describe the technology being used to address the issues/challenges and the standards that need to be considered in developing system applications.

Please send any questions in advance of the presentation so presenters can customize their remarks for your interest.

Share this information with your colleagues!