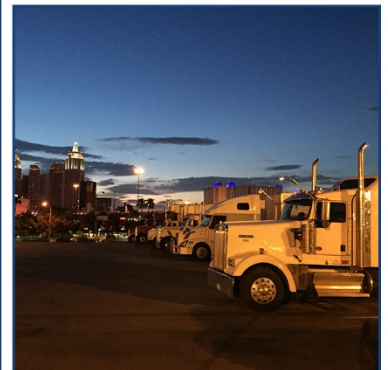


# Nevada Truck Parking Implementation Plan

## *Task 3: Data Collection –Literature Review*



*prepared for*  
Nevada Department  
of Transportation

*prepared by*  
Cambridge Systematics, Inc.  
*with*  
American Transportation Research Institute  
Horrocks Engineers  
Silver State Traffic Data Collection

September 13, 2018

DRAFT



*draft report*

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**September 13, 2018**

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## Acronyms and Abbreviations

AASHTO	American Association of State Highway and Transportation Officials
ATRI	American Transportation Research Institute
CMAQ	Congestion Mitigation and Air Quality Improvement Program
CMS	Changeable message sign
CMV	Commercial motor vehicle
DMS	Dynamic Message Sign
DOT	Department of Transportation
DPMS	Dynamic Parking Message Sign
FDOT	Florida Department of Transportation
FHWA	Federal Highway Administration
FMCSA	U.S. Federal Motor Carrier Safety Administration
HOS	Hours of service
ITS	Intelligent transportation system
KDOT	Kansas Department of Transportation
KTA	Kansas Turnpike Authority
MAASTO	Mid America Association of State Transportation Officials
MAP-21	Moving Ahead for Progress in the 21st Century
MnDOT	Minnesota Department of Transportation
MPO	Metropolitan Planning Organization
NCDOT	North Carolina Department of Transportation
NCHRP	National Cooperative Highway Research Program
NDOT	Nevada Department of Transportation
NHFP	National Highway Freight Program
NHPP	National Highway Performance Program
NHS	National Highway System
P3	Public-private partnership



RPO	Rural Planning Organization
TPIMS	Truck Parking Information Management System
UDOT	Utah Department of Transportation
VDOT	Virginia Department of Transportation
WIM	Weigh-in-motion
WSDOT	Washington State Department of Transportation



## 1.0 Introduction

Safe and sufficient truck parking has long been a need in the United States. Whether for a quick stop near an urban area to wait for congestion to clear or a business' delivery window to open, or an overnight break to sleep in the middle of a cross-country trip, truck parking is a key concern for:

- Commercial Motor Vehicle drivers;
- Industries that rely on efficient truck-deliveries;
- Consumers who increasingly order goods online and demand expedited delivery service; and
- Government agencies who regulate the industry, enforce statutes, pass zoning ordinances, and build and maintain highways and parking infrastructure.

In response to this need, the Nevada Department of Transportation (NDOT) is conducting The Nevada Truck Parking Implementation Plan which will develop a plan for expanding, improving, and integrating freight truck parking and truck parking communications systems in response to rising demand, changing hours of service requirements, and safety standards defined in Jason's Law. When implemented, these improvements will provide adequate and safe public truck parking where it's most needed, full-service private truck facilities, and real-time truck parking availability information.

This Implementation Plan consists of the following key tasks:

- Stakeholder Outreach and Coordination;
- Data Collection;
- Needs Assessment;
- Recommendations;
- Implementation Plan; and
- Final Report.

This document is the first part of the Data Collection task. It provides information on truck parking-related topics across a number of areas, including:

- **Section 1.1** – National Truck Parking Statutes;
- **Section 1.2** – Nevada Policies and Regulations;
- **Section 1.3** – Local Truck Parking Regulations;
- **Section 1.4** – Federal Truck Parking Studies;
- **Section 1.5** – Completed and On-Going State Truck Parking Studies;

- **Section 1.6** – Truck Parking-Related Studies in Nevada; and
- **Section 1.7** – Truck Parking Technology Overview.

## 2.0 Truck Parking Statutes – Federal

This section describes key federal policies that impact truck parking in Nevada and across the country.

### 2.1 Jason’s Law

Jason’s Law is included in the Moving Ahead for Progress in the 21<sup>st</sup> Century (MAP-21) transportation bill. Named after a truck driver who was killed at an abandoned gas station while waiting for a nearby delivery site to open, this bill addresses the shortage of long-term parking for commercial vehicles on the National Highway System (NHS) and seeks to improve safety for truck drivers nationwide. Jason’s Law requires states to evaluate their capability to provide adequate truck parking and rest facilities for safe parking of commercial motor vehicles (CMV), address the volume of CMV traffic in each state, and develop a method to measure the adequacy of CMV parking in each state.<sup>1</sup> However, there are no existing federal guidelines or standards that define what must be included to qualify a truck parking location as safe.

The Federal Highway Administration (FHWA) completed a survey of truck parking issues in August 2015 as directed by the Law. Nearly every state in the country, including Nevada, indicated a need for more truck parking. The statute also established eligibility for a range of facilities to provide truck parking that serves the NHS to improve safety for commercial motor vehicle operators, which benefits safety for the traveling public as a result of rested CMV drivers. Eligible activities include:

- Constructing safety rest areas with truck parking;
- Constructing public truck parking facilities adjacent to truck stops and travel plazas;
- Opening existing facilities such as inspection and weigh stations and park-and-ride facilities to accommodate truck parking;
- Promoting the availability of publicly or privately provided truck parking on the NHS using intelligent transportation systems (ITS) or other means;
- Constructing turnouts along the NHS for truck parking;
- Making capital improvements to seasonal public truck parking facilities to allow the facilities to remain open year-round; and
- Improving the geometric design of interchanges on the NHS to improve access to truck parking facilities.<sup>2</sup>

In addition, the law identified potential sources of formula funding, shown in Table 2.1 below.

<sup>1</sup> [https://ops.fhwa.dot.gov/freight/infrastructure/truck\\_parking/jasons\\_law/truckparkingsurvey/ch1.htm](https://ops.fhwa.dot.gov/freight/infrastructure/truck_parking/jasons_law/truckparkingsurvey/ch1.htm)

<sup>2</sup> For additional information on planning, design, and development of truck parking facilities, see: Commercial Driver Rest Area Requirements: Making Space for Safety, FHWA, 1996, available at: <https://www.fhwa.dot.gov/reports/append3.htm>. Also see: Guide for Development of Rest Areas of Major Arterials and Freeways Third Edition, AASHTO, 2001.

**Table 2.1 Jason’s Law Formula Funding Eligibility**

Funding Source	Requirements	Link to Additional Information
Surface Transportation Block Grants	Provides specific eligibility for the construction of truck parking on Federal-aid highways under 23 U.S.C. 133(b)(l)(E).	<a href="https://www.fhwa.dot.gov/specialfunding/stp/160307.cfm">https://www.fhwa.dot.gov/specialfunding/stp/160307.cfm</a>
National Highway Freight Program (NHFP)	The NHFP provides formula funds to States to improve the condition and performance of the National Highway Freight Network under 23 U.S.C. 167(i). Eligible activities include truck parking facilities and real-time traffic, roadway condition, and multimodal transportation information systems. The NHFP funds are eligible for use on the Primary Highway Freight System or National Highway Freight Network, as appropriate.	<a href="http://www.ops.fhwa.dot.gov/freight/pol_ping_financ_e/policy/fastact/s1116nhfp_guidance/">http://www.ops.fhwa.dot.gov/freight/pol_ping_financ_e/policy/fastact/s1116nhfp_guidance/</a>
Highway Safety Improvement Program	Truck parking facilities may be funded through this program, provided the need for truck parking is consistent with the State Strategic Highway Safety Plan developed under 23 U.S.C. 148 and corrects or improves a roadway feature that constitutes a hazard to road users or addresses a highway safety problem.	<a href="https://safety.fhwa.dot.gov/legislationandpolicy/fastq_anda.cfm">https://safety.fhwa.dot.gov/legislationandpolicy/fastq_anda.cfm</a>
National Highway Performance Program (NHPP)	NHPP funds may be obligated for a project on an eligible facility that supports progress toward the achievement of national performance goals for improving infrastructure condition, safety, congestion reduction, system reliability, or freight movement on the NHS. Eligible projects include highway safety improvements on the NHS, which may include truck parking per 23 U.S.C. 148.	<a href="https://www.fhwa.dot.gov/specialfunding/nhpp/160309.cfm">https://www.fhwa.dot.gov/specialfunding/nhpp/160309.cfm</a>
Congestion Mitigation and Air Quality Improvement Program (CMAQ)	While CMAQ funding is not eligible for construction of truck parking, truck stop electrification systems that reduce the need for trucks to idle may be eligible under 23 U.S.C. 149. Eligibility must be determined in consultation with the U.S. Environmental Protection Agency based upon the likelihood that the associated emissions reduction would benefit a nonattainment or maintenance area.	<a href="https://www.fhwa.dot.gov/fastact/factsheets/cmaqfs.cfm">https://www.fhwa.dot.gov/fastact/factsheets/cmaqfs.cfm</a> and <a href="https://www.fhwa.dot.gov/environment/air_quality/cmaq/">https://www.fhwa.dot.gov/environment/air_quality/cmaq/</a>

Source: [https://ops.fhwa.dot.gov/freight/infrastructure/truck\\_parking/title23funds/index.htm](https://ops.fhwa.dot.gov/freight/infrastructure/truck_parking/title23funds/index.htm)

## 2.2 Hours of Service

Commercial motor vehicle labor regulations are under the purview of the U.S. Federal Motor Carrier Safety Administration (FMCSA). FMCSA propagates rules in an effort to increase safety on the road. For CMVs, which are broadly defined as a vehicle that is used as part of a business, involved in interstate commerce, weighs 10,001 pounds or more, or transports certain commodities or passengers, the mandatory hours of service (HOS) regulations have the greatest impact on truck parking. The HOS regulations are outlined below<sup>3</sup>:

- **11-Hour Driving Limit:** Drivers may drive a maximum of 11 hours after 10 consecutive hours off duty. All time spent at the driving controls of a CMV in operation is considered driving time. Exceptions to this rule exist, including for adverse driving conditions, retail store deliveries during peak December holiday

<sup>3</sup> Summary of Hours of Service Regulations. FMCSA. Available from: <https://www.fmcsa.dot.gov/regulations/hours-service/summary-hours-service-regulations>

season, and transport of agricultural commodities. The sleeper berth can be used to meet the 10 consecutive hours off duty requirement with a combination of sleeper berth and off duty time, but one option must be at least eight hours.

- **14-Hour Limit:** Property-carrying drivers may not drive beyond the 14<sup>th</sup> consecutive hour after coming on duty, following 10 consecutive hours off duty. Off-duty time does not extend the 14-hour period. Of those 14 hours, 11 may be spent driving. The 14-hour rule is often misunderstood to mean that a driver must be released from all work after 14 hours. However, these rules just regulate driving, not working, and drivers may do non-driving work after that point. Exceptions to this rule exist, including for adverse driving conditions, retail store deliveries during peak December holiday season, and transport of agricultural commodities.
- **Rest breaks:** Drivers may drive only if 8 hours or less have passed since the end of the driver's last off-duty or sleeper berth period of at least 30 minutes. Exceptions to this rule exist for certain short-haul operators.
- **60/70-Hour Limit:** Drivers may not drive after 60/70 hours on duty in 7/8 consecutive dates. A driver may restart a 7/8 consecutive day period after taking 34 or more consecutive hours off duty. The regulation prohibits a driver from driving after having been on duty for 70 hours in any eight consecutive days. A driver can do non-driving work after reaching the limit and not be in violation, but those hours must be added to the total.
- **Sleep berth provision:** Drivers using the sleeper berth provision must take at least 8 consecutive hours in the sleeper berth, plus a separate 2 consecutive hours either in the sleeper berth, off duty, or any combination of the two.
- **34-Hour restart:** A driver of a property-carrying vehicle may “restart” a 7/8-consecutive-day period after taking 34 or more consecutive hours off duty. After the 34-hour period, the on-duty hours worked before that 34-hour period started no longer have to be considered when calculating the driver's 60/70-hour limit.

Although the intention of the HOS rules are to increase safety, drivers noted two particular changes in the rules in 2013 that have contributed the most to truck parking challenges across the industry. This includes (1) the requirement for a continuous off-duty window as part of the “34-hour restart” to include two consecutive late-night periods of 1:00 AM to 5:00 AM, and (2) the requirement for drivers to take a 30-minute rest break during the first 8 hours of a shift. Although the late-night period parking rule is no longer being enforced<sup>4</sup>, the remaining regulations require drivers to carefully time deliveries and schedule adequate rest, making sufficient parking critical on their routes and deliveries.<sup>5</sup>

HOS regulations are strongly enforced by state agencies, and penalties can be high; trucking companies that exceed driving limits by more than three hours could be fined up to \$11,000 per offense, and the driver could

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<sup>4</sup> Suspended by the Consolidated and Further Continuing Appropriations Act of 2015. See: <https://www.fmcsa.dot.gov/regulations/hours-service/summary-hours-service-regulations>

<sup>5</sup> “Jason’s Law Truck Parking Survey Results and Comparative Analysis”. [http://www.ops.fhwa.dot.gov/freight/infrastructure/truck\\_parking/jasons\\_law/truckparkingsurvey/ch1.htm](http://www.ops.fhwa.dot.gov/freight/infrastructure/truck_parking/jasons_law/truckparkingsurvey/ch1.htm)



be responsible for additional penalties of up to \$2,750 for each offense.<sup>6</sup> To avoid these steep fines, drivers are under pressure to find parking as quickly and efficiently as possible to avoid violating HOS regulations while trying to make pick-ups/deliveries as efficiently as possible. In addition, regulations in effect as of December 2017 require drivers to track their hours of service with an electronic logging device (ELD). This regulation was part of the MAP-21 legislation in 2012, potentially allowing for closer enforcement of existing hours of service regulations which makes finding parking within allowable time limits even more critical.<sup>7</sup>

### 2.3 Interstate Rest Areas – Commercial Use Restrictions

According to Section 753.5 (g) of Title 23 in the Code of Federal Regulations, “No charge to the public may be made for goods and services at safety rest areas except for telephone and articles dispensed by vending machines.” Passed in 1956, this prohibition on commercializing Interstate right-of-ways applies to all non-tolled Interstates in the United States, including all Interstate segments in Nevada. Food (beyond vending machines), gasoline, lodging, and other services cannot be offered at these safety rest areas, requiring trucks to leave the Interstate.<sup>8</sup> Sale of items that promote tourism, tickets for events or attractions that are historic or tourism-related, and installation and operation of lottery machines are allowed.

While this restriction allows for more private-sector competition between truck-service oriented businesses, there are a number of drawbacks. The prohibition increases vehicle miles traveled, as trucks must exit the Interstate, drive some distance to reach services, then return to the Interstate. This creates additional wear on (often local) road infrastructure. It also introduces a land-use issue. Many local municipalities, especially in more urban areas, may object to truck parking related businesses and create restrictions in zoning and land use codes to prohibit truck-related services from locating in an area.



<sup>6</sup> <https://www.fmcsa.dot.gov/newsroom/new-hours-service-safety-regulations-reduce-truck-driver-fatigue-begin-today>

<sup>7</sup> FMCSA. 2017. *Electronic Logging Devices*. <https://www.fmcsa.dot.gov/hours-service/elds/electronic-logging-devices>

<sup>8</sup> <https://www.fhwa.dot.gov/interstate/faq.cfm#question31>



Advances in technology since the 1950s caused FHWA to seek comments in 2016 on a number of questions, including:

- What defines a “vending machine”?
- What types of “media” should be considered as promoting tourism?
- Should local agricultural products be considered media that promotes tourism?
- Are there other commercial activities that are consistent with existing law that should be allowed?
- Is there a need for additional guidance on commercial activities in Interstate rest areas?<sup>9</sup>

## 2.4 Parking of Trucks Transporting Hazardous Materials

Trucks carrying hazardous materials such as explosives, radioactive material, and various gases and flammable liquids<sup>10</sup> are subject to additional parking regulations as defined in Part 397.7 in Section 49 of the Code of Federal Regulations. Motor vehicles containing hazardous materials in Division 1.1 (Mass Explosive Hazard), Division 1.2 (Projection Hazard) or Division 1.3 (Mass Fire Hazard) may not be parked on or within five feet of the traveled portion of a public street or highway. They are also not permitted on private property (including private truck stops) at any time without consent from the property owner or manager and are restricted from parking within 300 feet of bridges, tunnels, residential dwellings, offices, or other areas where people assemble.

Anecdotal evidence suggests that the majority of drivers transporting hazardous material do not face parking issues beyond those common to all drivers. These vehicles are often regular customers and many carry supplies such as fuel that are necessary to operations at the truck stop.

## 2.5 Clean Air Act

The 1990 Clean Air Act regulates air pollution in the United States. The transportation sector as a whole is a major contributor to air pollution, responsible for more than half of the carbon monoxide and nitrogen oxide and nearly a quarter of the hydrocarbons emitted in 2013.<sup>11</sup> Heavy truck diesel engines are a prime emission source, and the U.S. Environmental Protection Agency has routinely pushed for tighter engine emissions standards for these vehicles.<sup>12</sup>

Specific to parking, trucks that are idling their engines in order to provide temperature control or power are a source of air pollution. To counter this, alternative fuels such as plug-in electric vehicles, propane, and liquid nitrogen are available for trucks, but typically have higher costs and fewer fueling options which can be an issue for drivers who do not have a set daily route or routinely return to a depot. Although recent indications

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<sup>9</sup> <https://www.federalregister.gov/documents/2016/09/27/2016-23269/commercial-activities-on-interstate-rest-areas>

<sup>10</sup> <https://www.fmcsa.dot.gov/regulations/hazardous-materials/how-comply-federal-hazardous-materials-regulations>

<sup>11</sup> <https://www.ucsusa.org/clean-vehicles/vehicles-air-pollution-and-human-health/cars-trucks-air-pollution#.WqBNf2rwZyw>

<sup>12</sup> <https://www.epa.gov/sites/production/files/2015-08/documents/peg.pdf>

at the federal level suggest a less restrictive environment for fuel, Nevada's location and trade ties with California may drive fleets to adapt California's more stringent standards.<sup>13</sup> Truck stops may also introduce electrification to provide vehicles with electricity without the need to run their engines. An example of this amenity is shown in Figure 2.1 below. However, as of 2014 Nevada did not have any facilities with electrification.<sup>14</sup>

**Figure 2.1 Truck Stop Electrification – Knoxville, TN**



Source: <https://www.fhwa.dot.gov/publications/publicroads/05mar/02.cfm>

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<sup>13</sup> <https://www.trucks.com/2017/03/17/alternative-fuel-trucks-work-truck-show/>

<sup>14</sup> [https://www.afdc.energy.gov/conservation/idle\\_reduction\\_electrification.html](https://www.afdc.energy.gov/conservation/idle_reduction_electrification.html)

## 3.0 Nevada Policies and Regulations Affecting Truck Parking

Nevada has a couple of specific regulations that impact where trucks can park that are different from other states. Specifically, policies relating to rest area usage and oversize/overweight permitted loads are briefly discussed.

### 3.1 State Parking Regulations

Nevada does not prohibit parking on the shoulder or ramp of a highway in general statute. However,

“The Department of Transportation with respect to highways under its jurisdiction may place official traffic-control devices prohibiting or restricting the stopping, standing or parking of vehicles on any such highway where, in its opinion, such stopping, standing or parking is dangerous to those using the highway or where the stopping, standing or parking of vehicles would unduly interfere with the free movement of traffic thereon. It is unlawful for any person to stop, stand or park any vehicle in violation of the restrictions stated on those devices.”<sup>15</sup>.

This language allows NDOT to post signs prohibiting parking to protect safety and mobility. However, it is unclear if NDOT routinely includes “Emergency Parking Only” or “No Parking” signage as part of a typical ramp deployment package. Anecdotal evidence gathered during the truck parking supply task indicates that such signage is rare, at least on I-15 and I-80.

### 3.2 Rest Areas or Welcome Centers

Some states place limits on the amount of time or time periods when trucks may park in public rest areas or welcome centers. For example, California limits parking for all drivers to 8 hours in any 24 hour period.<sup>16</sup> Nevada allows overnight parking and has a 24 hour stay limit, meaning trucks can utilize available public rest areas to meet the long-term parking needs.<sup>17</sup> A map of these facilities is shown in Figure 3.1 below. The Mesquite and West Wendover Welcome Stations, and the Hawthorne, Wilson Canyon, Mt. Rose, and Salmon Falls Creek sites are noted as having no truck parking available.

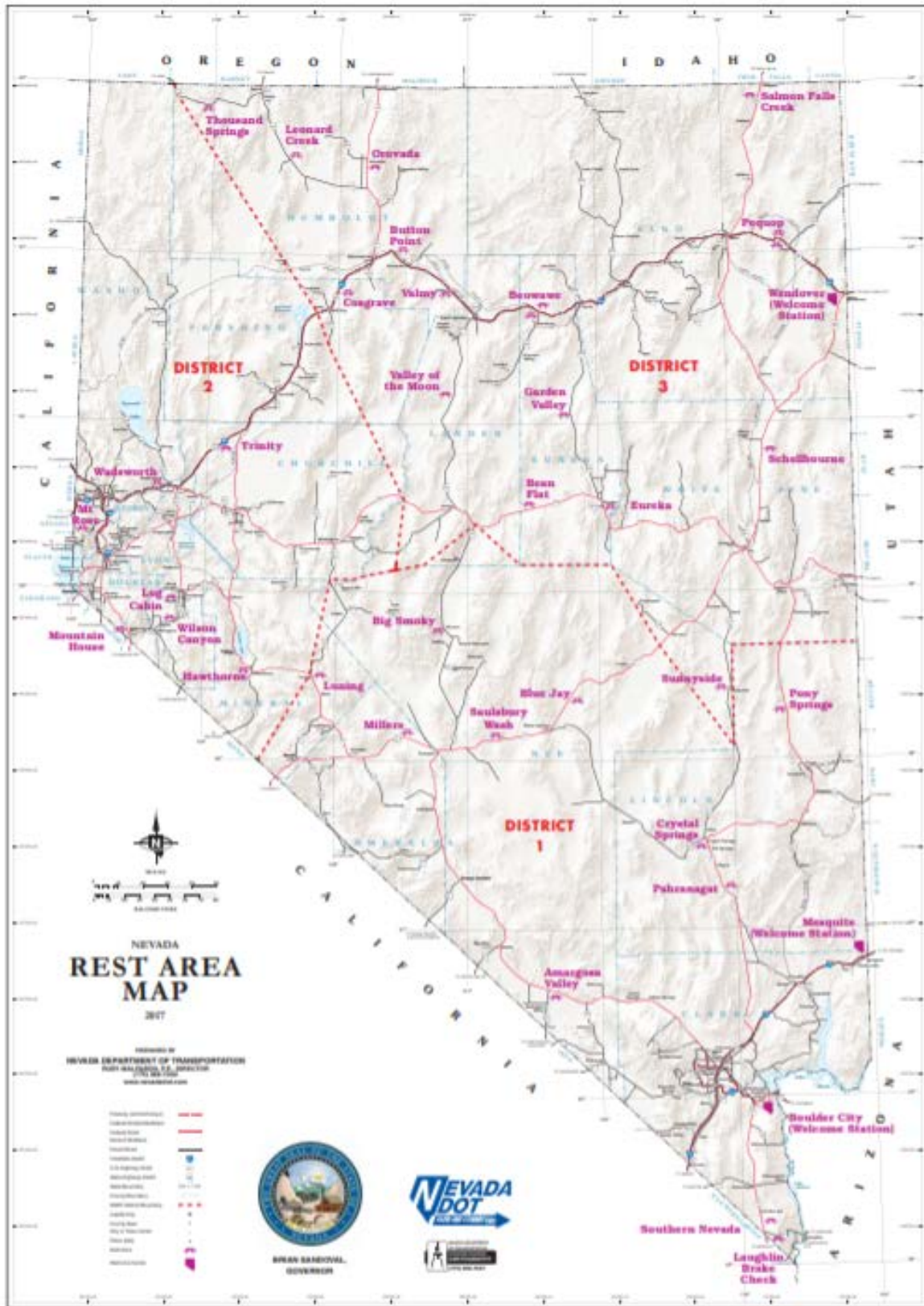
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<sup>15</sup> Nevada Revised Statutes 2015. 484B.457.4

<sup>16</sup> <http://www.dot.ca.gov/hq/maint/ra/policy.htm>

<sup>17</sup> <https://www.careersingear.com/blog/states-ban-sleeping-overnight-rest-areas-10210>

Figure 3.1 Nevada Public Rest Areas and Welcome Centers



Source: NDOT.

### 3.3 Oversize/Overweight Permits and Vehicle Movements

Not every shipment can fit in a regular truck. Power generators, wind turbine blades, steel and concrete beams for construction work, and other similar items that are too large and/or too heavy to ship as a normal load must obtain a permit. NDOT requires a permit for non-reducible loads that:

- Exceed 80,000 pounds gross weight; or
- Exceed 8 feet, 6 inches in width; or
- Exceed 14 feet in height; or
- Exceed 10 feet of front or rear overhang; or
- Exceed 70 feet in length.



Non-reducible loads are those that cannot be broken down into smaller or lighter pieces without compromising the load. Reducible loads (e.g. gravel, sand, vegetables<sup>18</sup>) can also apply for permits, depending on the vehicle length. If the truck exceeds 80,000 pounds gross weight but is 70 feet or less in length, it can apply for a Shorter Overweight Vehicle permit. If the vehicle is over 70 feet in length, it can apply for a Longer Combination Vehicle permit.<sup>19</sup>

Size and weight limits and the regulations that govern the movement of permitted loads vary in the states surrounding Nevada. For example, shipments that are more than 12 feet wide, 15 feet high, and 110 feet long may only travel in Nevada between one-half hour before sunrise to one-half hour after sunset.<sup>20</sup> In California, a shipment up to 17 feet tall or up to 135 feet in length is not restricted to day-time movement.<sup>21</sup>

This can have a number of impacts on truck parking. First, the mismatch in permitting requirements could cause delays if all of the necessary permits are not obtained ahead of time. Trucks may need to park at a state border to wait for permits to be issued. Even if permits are obtained, delays while waiting for escorts, or waiting to comply with other restrictions such as time-of-day can force a vehicle to wait. In addition, some vehicles may not fit in or be able to access regularly available parking, further limiting the parking options.

<sup>18</sup> For a list of “Commodity” loads eligible for a permit, see: <https://www.leg.state.nv.us/NAC/NAC-484D.html#NAC484Dsec510>

<sup>19</sup> <https://www.nevadadot.com/doing-business/commercial-vehicles/commercial-vehicle-permits/general-permit-information>

<sup>20</sup> <http://www.heavyhaul.net/nevada-permits/>

<sup>21</sup> <http://www.heavyhaul.net/california-permits/>

## 4.0 Local Truck Parking Regulations

At the local level, communities can impose additional regulations on commercial truck parking within their jurisdictions. The below is a list of those regulations:

- **Battle Mountain:** It is unlawful to park overnight any truck/trailer, loaded or unloaded, with or without a trailer on any street or highway in the town of Battle Mountain except as set forth within ordinance.<sup>22</sup>
- **Boulder City:** Parking or standing a commercial vehicle with a gross weight of 15,000 pounds or more or any truck tractor in a residentially zoned area is prohibited except for use during the normal course of business for loading, unloading, or deliveries.<sup>23</sup>
- **Clark County:** Commercial vehicles cannot park overnight on a residential street. A residential area is defined, per CC 12.46.060 as the entire right-of-way width of a public highway, road or alley, and shall also include the entire right-of-way width of a public highway, road or alley bounding a residential or apartment zoning district. Again, this restriction does not apply to loading, unloading, or parking for services, repair, construction, etc.<sup>24</sup>

In addition, parking by any vehicle on an unimproved or landscaped area is prohibited. All parking areas must be paved and striped unless otherwise specified.<sup>25</sup>

- **Fallon:** It is unlawful for the driver of any vehicle having a gross weight in excess of sixteen thousand pounds or of any vehicle or vehicle and trailer or semi-trailer having an overall length in excess of forty feet to stand or park the same at any time on any street, highway or alley in a residential area except for local delivery or by permission issued by the chief of police.<sup>26</sup>
- **Fernley:** It is unlawful to park or leave running any truck or commercial vehicle on any residential street except for loading, unloading, or if the vehicle is used in conjunction with the performance of a service, repair, construction or similar use. It is also unlawful for a commercial trailer or semi-trailer not attached to a tractor or other motor vehicle to be parked on a public street, highway, alley, parking lot or park within a residential area.<sup>27</sup>
- **Las Vegas:** Commercial vehicles over 24 feet or with an unladen weight in excess of 8,000 pounds cannot stand or park “upon any street adjacent to a residence district, public school or public park.” A residence district is defined as the territory contiguous to a street, not comprising a business district, in which the parcels abutting such street for a distance of three hundred feet or more are mainly dwellings or buildings in use for residence.<sup>28</sup> This restriction does not apply if the vehicle is loading or unloading or

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<sup>22</sup> Battle Mountain Code of Ordinances, 10.12.050. For a list of roads where trucks/trailers are allowed, see 10.12.030.

<sup>23</sup> Boulder City Municipal Code, 10-6-6 (H).

<sup>24</sup> <http://www.clarkcountynv.gov/public-works/traffic-mgmt/Forms/Commercial%20Vehicles.120428.pdf>

<sup>25</sup> <http://www.clarkcountynv.gov/comprehensive-planning/zoning/Documents/3060.pdf> Section 30.60.020 (c, d, and e).

<sup>26</sup> Fallon Code of Ordinances, 10.24.060.

<sup>27</sup> Fernley Municipal Code. 7.04.10 (B). <http://www.cityoffernley.org/DocumentCenter/View/18940>

<sup>28</sup> Las Vegas Municipal Code, 11.52.310

being used in the performance of a service, repair, construction, or other similar essential use within the neighborhood.

- **North Las Vegas:** Oversized vehicles (including commercial trailers) cannot park in residential areas for more than 48 hours.<sup>29</sup>
- **Sparks:** Trucks or commercial vehicles in excess of four thousand pounds per axle unladen weight to 12,000 pounds unladen weight may not park in any residential district, with exceptions for loading, unloading, and service, repair, construction or similar uses.<sup>30</sup> A separate restriction applies to vehicles or vehicle/trailer/semitrailer combinations carrying more than 2,000 gallons of gasoline. Drivers of these vehicles may not stand or park the vehicle, trailer, or semitrailer on any street, highway, or alley for any purpose except to avoid conflict with other traffic or comply with directions of a police officer or traffic control signal.<sup>31</sup>
- **Winnemucca:** It is unlawful for the driver of any vehicle, vehicle and trailer, or semitrailer having an overall length of more than twenty-one feet to stand or park the same within any area bounded by signs placed by order of the city council and designated as "No Truck Parking. In addition, the city council may by resolution, designate areas of the city where it shall be unlawful to park a truck, semitrailer, or trailer with an operating device emitting noises used for the purpose of cooling, ventilation, or heating, during certain hours of the day or night, such times to be designated by resolution of the city council.<sup>32</sup>

An initial scan of local ordinances and municipal codes in the following municipalities did not discover any specific restrictions on truck parking:

- Carson City
- Elko
- Henderson
- Lovelock
- Mesquite
- Reno
- Wells
- West Wendover

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<sup>29</sup> <https://www.reviewjournal.com/local/north-las-vegas/north-las-vegas-limits-oversized-vehicle-parking/>

<sup>30</sup> Sparks Municipal Code, 10.48.035

<sup>31</sup> Sparks Municipal Code, 10.48.040

<sup>32</sup> Winnemucca Code of Ordinances, 10.24.050 and 10.24.090

## 5.0 Federal Truck Parking Studies

Since the early 2000s, there have been a handful of truck parking studies conducted at the federal level. The following sections will summarize each of the four studies.

### 5.1 Study of Adequacy of Commercial Truck Parking Facilities – Technical Report, FHWA

FHWA conducted the “Study of Adequacy of Commercial Truck Parking Facilities” in 2002 in response to the Transportation Equity Act for the 21<sup>st</sup> Century, Section 4027. This legislation required an investigation into the location and quantity of commercial truck stop parking facilities, travel plazas, and public rest areas. It also required an analysis of shortages, as well as a plan to address the parking shortages. FHWA engaged a number of state-level private- and public-sector stakeholders throughout the study, and provided technical guidance throughout the research and documentation process. The Rest Area Forum, which was hosted in Atlanta, Georgia in June 1999, was the major stakeholder outreach event hosted by FHWA for the purpose of this study. At the Forum, more than 70 State Departments of Transportation (DOT) and enforcement officials, industry representatives, truck stop operators, and other interested parties attended and participated.

The full report involved four major sections: (1) estimation of parking demand using a modeling approach, (2) inventory of public and commercial truck spaces, (3), identification of deficiencies, supply, and demand, and (4) recommendations. The major recommendations to address any current or future problems were identified in six major categories:

- **Expand or improve public rest areas.** 15 states had firm plans to provide additional spaces, and 11 of these states provided a specific number (1,600 over the next five years). Improving the geometric design of public rest areas would increase driver convenience.
- **Expand or improve commercial truck stops and travel plazas.** Increase yearly truck registration fees to help states pursue initiatives related to truck parking issues. Implement a program to allow states to close rest areas in locations that are already well-served by private rest areas.<sup>33</sup> Eliminate cost-prohibitive road improvement requirements imposed by state DOTs upon developers attempting to open new facilities.
- **Encourage the formation of public-private partnerships (P3s).** Provide low-interest loans or grants to commercial truck stops to help increase capacity. Construct state-owned lots adjacent to commercial truck stops and plazas, and enter into agreements for owners to lease or maintain lots. Work with owners of commercial truck stops to help promote availability of parking.<sup>34</sup>

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<sup>33</sup> Florida, Michigan, Ohio, and South Dakota have all closed rest areas in the recent past due to decreased use and the cost to maintain existing facilities. <http://www.pewtrusts.org/en/research-and-analysis/blogs/stateline/2017/03/31/old-fashioned-rest-stops-disappearing-in-some-states>

<sup>34</sup> Section 1305 of SAFETEA-LU established a pilot program to address truck parking on the NHS. Approximately \$30 million was made available between 2005 and 2012. Nevada applied for more than \$16 million in grants, but was not awarded any funding. The program was not continued under MAP-21. See: [https://ops.fhwa.dot.gov/freight/safetea\\_lu/1305\\_tpf.htm](https://ops.fhwa.dot.gov/freight/safetea_lu/1305_tpf.htm)



- **Educate or inform drivers about available spaces.** Develop ITS deployments to provide drivers with real-time information on location and availability of truck parking spaces. Publish and distribute a “trucker’s map” that pinpoints parking facilities for drivers, including lot capacity and space availability.
- **Change parking enforcement rules.** Implement stricter enforcement of parking rules to remove vehicles from dangerous locations, such as interchange ramps. Change parking limits to permit trucks more time to park at public rest areas. Encourage local government and business support for truck stop and travel plaza facilities near industrial and business parks via zoning.
- **Conduct additional studies.** Refine study results to develop a more detailed assessment of strategies of specific highway locations. Establish a multi-state committee to evaluate alternatives and recommend solution to addressing truck staging and just-in-time deliveries. Conduct additional research to improve the truck parking demand model.

## 5.2 Dealing with Truck Parking Demands, NCHRP Synthesis 317

“Dealing with Truck Parking Demands” was a result of National Cooperative Highway Research Program (NCHRP) Synthesis 317, which provided funding to assist transportation agency administrators in identifying solutions to manage increasing demand for commercial vehicle parking. The research plan involved distributing a comprehensive survey to highway maintenance engineers in all fifty states, District of Columbia, and Puerto Rico, and synthesizing the results. The outreach determined that legislative authority plays a significant role in managing commercial vehicle parking, and the development of parking spaces in the United States paralleled the development of the Interstate Highway System. However, as the motor vehicle carrier industry grew, the parking capacity at public rest areas has not been able to accommodate increase demand. At the time of the survey, a number of states of varying sizes and populations were experiencing extreme shortages of roadside commercial vehicle parking.

Although states have implemented a number of alternative approaches to manage the demand for commercial vehicle parking, no single entity is responsible for providing parking facilities. Nationwide, the study found a shortage of more than 100 percent in public parking places but an overabundance of private truck parking availability. In Nevada, the pattern was similar, and overall there was a surplus of total parking spaces in the public and private markets, as shown in Table 5.1. While relevant at the time, truck volumes in Nevada have increased substantially since this report.

**Table 5.1 Demand/Supply Ratio along Interstate and NHS Routes Carrying more Than 1,000 Truck per Day in Nevada (2003)**

Facility	Demand/Supply Ratio <sup>35</sup>	Total No. Parking Facilities	Total No. Parking Spaces	Shortage, Sufficient, or Surplus Parking
Public	2.62	36	260	Shortage
Private	0.46	35	4,980	Surplus
<b>Total</b>	<b>0.57</b>	<b>71</b>	<b>5,240</b>	<b>Surplus</b>

<sup>35</sup> Note: A demand/supply ratio of less than 0.9 indicates a surplus of spaces (available parking spaces is likely to exceed peak demand), a ratio between 0.9 and 1.1 indicates sufficient parking space utilization (peak demand and supply of parking spaces is nearly the same), and a ratio more than 1.1 indicates a shortage of spaces (overcrowding is likely).

### 5.3 Commercial Motor Vehicle Parking Shortage, FHWA

FHWA authored the “Commercial Motor Vehicle Parking Shortage” after the Consolidated and Further Continuing Appropriations Act of 2012, which requested that FHWA study commercial motor vehicle parking shortages as it related to compliance with federal safety requirements. This report, which was produced after “Study of Adequacy of Commercial Truck Parking Facilities”, continued on these findings and provided updates on estimates and forecasts of long-distance trucking activity, information from the Truck Parking Pilot Grant Program, as well as observations from safety enforcement officers.

The data collected was largely anecdotal, but the study concluded that truck parking shortages remain widespread, particularly in certain geographic areas. Unless utilization of and investment in parking capacity is improved, shortages were expected to increase with growth in demand for the trucking industry. FHWA recommended that strategies from its prior report, such as creating P3s, are still relevant and necessary to provide additional parking capacity where needed.

### 5.4 National Coalition on Truck Parking: Activity Report (2015-2016)

To address truck parking problems across the country, the U.S. DOT convened the National Coalition on Truck Parking in August 2015. Stakeholders including the trucking industry, commercial vehicle safety officials, State Departments of Transportation, and the truck stop industry came together to conduct regional meetings to share ideas for improving truck parking through increased parking capacity, technology and data, funding, finance and regulations, and government coordination.

Meetings were led by FHWA with participation by FMCSA and the Maritime Administration. There were five core Coalition partners:

- American Association of State Highway and Transportation Officials (AASHTO);
- American Trucking Associations;
- Owner-Operator Independent Driver Association;
- National Association of Truck Stop Operators; and
- Commercial Vehicle Safety Alliance.

Meetings were held in Maryland, Missouri, Utah, and Texas. Each meeting had between 20-50 participants and included breakout groups to develop approaches to the truck parking issues categories noted above. Key themes, heard at each of the meetings, are shown below in Figure 5.1. These largely echo themes found in the 2002 “Study of Adequacy of Commercial Truck Parking Facilities,” indicating that the same issues are still facing the trucking industry today.

During the meeting in Utah, a Nevada project was identified as an example of public-private collaboration on truck parking. NDOT entered into an agreement with Flying J at a truck stop in Fernley, NV to build additional parking adjacent to the private facility with the truck stop providing litter control and basic maintenance.

**Figure 5.1 Key Themes from National Coalition on Truck Parking Regional Meetings**

Parking Capacity Expansion	Technology and Data	Funding, Finance, and Regulations	State, Regional, and Local Government Coordination
<ul style="list-style-type: none"> <li>• Use public land within highway right-of-way to develop additional truck parking capacity</li> <li>• Update the national standard for parking facilities, considering the needs of oversized trucks, security and lighting, and maximizing the capacity of a rest area</li> <li>• Integrate shippers/receivers into the conversation to address truck parking needs at industrial sites</li> <li>• Address truck parking needs in the context of improving efficiency of the entire supply chain</li> </ul>	<ul style="list-style-type: none"> <li>• Disseminate real-time information about parking availability at highway rest areas and private truck stops</li> <li>• Establish connectivity to existing technology commonly available to drivers, such as smartphones</li> <li>• Use connected vehicle and vehicle-to-infrastructure technology to guide drivers to available parking</li> </ul>	<ul style="list-style-type: none"> <li>• Provide a dedicated funding source for capital and maintenance funds for public rest areas and truck parking facilities on the national highway network</li> <li>• Promote "industrial park co-operatives" or industrial tax districts for pooled parking in areas with heavy concentrations of terminals, distribution centers and other industrial sites</li> <li>• Establish P3s to develop new and expanded parking facilities</li> <li>• Implement truck parking fees to provide a source of capital and operating revenue for truck parking facilities</li> </ul>	<ul style="list-style-type: none"> <li>• Conduct outreach through MPOs, regional councils, economic development authorities and national industry organizations to educate the public and elected officials, and promote creative solutions to meet truck parking and staging needs</li> <li>• Involve trucking and truck stop industries in State and MPO advisory committees to address truck parking needs</li> <li>• Encourage States and MPOs to address truck parking and similar issues in State and regional freight plans</li> <li>• Educate the public and elected officials about the importance of truck parking in freight transportation and industrial development</li> </ul>

Source: National Coalition on Truck Parking, 2017.

## 6.0 Truck Parking Studies Outside Nevada

This section provides a brief review of completed and on-going truck parking studies since 2010. The focus is on state studies and plans, but corridor and federal/synthesis reports are also included.<sup>36</sup>

**Table 6.1 Truck Parking Studies Reviewed**

Study Title	Sponsor/Author	Date	Survey	Supply/ Demand Analysis	Corridor Identification	Recommendations
North Carolina Truck Parking Study	North Carolina Department of Transportation (NCDOT)	Jan 2017	✓	✓	✓	✓
Washington State Truck Parking Study	Washington State Department of Transportation (WSDOT)	Dec 2016	✓		✓	✓
Kansas Statewide Freight Network Truck Parking Plan	Kansas Department of Transportation (KDOT) and Kansas Turnpike Authority (KTA)	Feb 2016	✓	✓	✓	✓
Virginia Truck Parking Study	Virginia Department of Transportation (VDOT)	Jul 2015	✓	✓	✓	✓
Utah Interstate 15 Truck Parking Study	Utah Department of Transportation (UDOT)	August 2012 (DRAFT)	✓	✓		✓
Commercial Motor Vehicle Parking Trends at Rest Areas and Weigh Stations	Florida Department of Transportation (FDOT)	Dec 2012	✓	✓	✓	
Gateway Cities Technology Plan for Goods Movement	Gateway Cities Council of Governments	May 2012	✓			✓
MnDOT Truck Parking Study: Phase 2	Minnesota Department of Transportation (MnDOT)	Nov 2010			✓	✓
Arizona Truck Parking Study	Arizona Department of Transportation	On-Going				
Texas Statewide Truck Parking Study	Texas Department of Transportation	Starting Spring 2018				

<sup>36</sup> Much of this information was drawn from a prior Cambridge Systematics literature review as part of the North Carolina Statewide Freight Plan – Truck Parking Study. It has been updated to include new studies and modified as needed to reflect data relevant to Nevada.

## 6.1 North Carolina Statewide Multimodal Freight Plan – Truck Parking Study



### North Carolina Statewide Multimodal Freight Plan

Truck Parking Study



January 2017

prepared for  
North Carolina  
Department of Transportation  
prepared by  
Cambridge Systematics, Inc.  
with  
American Transportation  
Research Institute

As part of the North Carolina Statewide Freight Plan, the North Carolina Truck Parking Study was developed to conduct an analysis of the adequacy of off-road truck parking in North Carolina and provide truck parking solutions to better serve freight transporters and create a safer environment for the traveling public in North Carolina.

The study found that the nearly 4,800 parking spaces in the state currently (both public and private) are not sufficient to meet current demand, and the problem is likely to grow in the near future based on freight flows projected by the U.S. DOT. Parking at the major interstate highway corridors in the state—I-26, I-77, I-85, and I-95—are at capacity based on stakeholder outreach, truck GPS data from the American Transportation Research Institute (ATRI), and utilization counts. This lack of space pushes drivers onto highway shoulders and ramps which increases safety risks for both drivers and the public.

Public opposition to new parking locations and a tight fiscal environment where maintenance of assets such as bridges and pavement are prioritized over parking add to the difficulty.

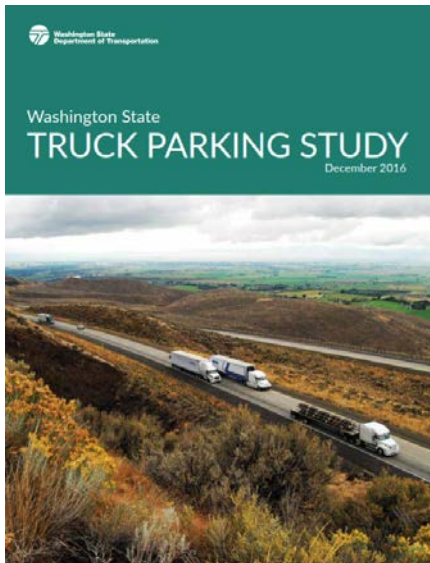
The study identified a number of opportunities and made recommendations for the future to improve the truck parking situation in the State. Key among those are to:

- **Partner with Truck Travel Centers seeking to expand facilities.** Since the private sector controls 85 percent of the truck parking supply in the state, the private sector should be part of the truck parking solution. In addition to coordinating site plan considerations, there may be opportunities to coordinate truck parking signage and availability across public and private facilities, since improved parking information would benefit truck drivers.
- **Employ technology solutions.** Technology solutions to ensure that truck drivers are aware of the location of truck facilities and parking availability, and can easily plan rest periods ahead of time and while in transit are rapidly advancing. Communication systems (signage, smartphone and web-based applications) and detection systems should be thoroughly evaluated and deployed as practical.
- **Explore trial truck parking at selected weigh stations.** Some new weigh stations have room for overnight truck parking. These locations have back lots for queuing that could be striped for tractor-trailer truck parking. Funding would be required for striping, signage, new technology and expanded trash collection. The advantages to this option would be the relatively low cost of implementation to provide some additional truck parking. Disadvantages include disrupting weigh station activities with entering and exiting trucks, increased maintenance and potential confusion over where trucks should park.
- **Explore retrofitting selected abandoned rest areas.** Four abandoned rest areas, including one with approximately 12 acres of space, are potential sites for retrofitting.
- **Use weigh station technology to communicate truck parking.** Should weigh stations be established as acceptable for overnight truck parking, technology could play a role in communicating truck parking

availability and in expanding weigh stations for truck parking. At these locations, the Dynamic Message Signs (DMS) could also serve the dual purpose of communicating whether or not the weigh station is open for commercial vehicle inspections.

- **Conduct truck parking notification system pilot.** Many states are exploring truck parking communication and detection systems, and some states have implemented pilot programs. Public and private facilities in North Carolina could become engaged in an expansion of these pilot programs.
- **Coordinate with Metropolitan Planning Organizations (MPOs) and Rural Planning Organizations (RPOs) to develop guidelines and mitigation strategies aimed at easing public opposition to private truck parking facilities.** MPOs and RPOs can help to mitigate public opposition to truck parking. They can also assist with truck parking implementation because they are familiar with the impacts of truck parking on surrounding communities.
- **Convene a Standing Truck Parking Committee.** A standing statewide Truck Parking Committee, could help oversee the implementation of study recommendations and provide regular updates to the NCDOT Board of Transportation on progress.

## 6.2 Washington State Truck Parking Study, WSDOT



The Washington State Department of Transportation (WSDOT) conducted a truck parking study to help address truck parking issues in the state. The study identified key industry stakeholders, best practices from other states, factors influencing truck parking supply and capacity, key parking issues and concerns, and opportunities for improvements and next steps. A key component of the study was an 18-question survey to better understand the truck parking attitude and concerns of truck drivers and other stakeholders in Washington State. WSDOT developed the survey with help from FHWA, Washington Trucking Association partners, and other trucking industry participants to ensure clarity and completeness. The survey received over 1,110 responses, and 84 percent of the responses came from truck drivers. Safety issues, both due to security and from driver fatigue, and the lack of parking in urban areas, at border crossings, and at mountain passes were key takeaways from the report. Generally, drivers prefer private truck stops (which typically have amenities such as food,

showers, and laundry) for short-term and overnight breaks but the majority of respondents (58 percent) do not support any kind of trucking fee to ensure safe and consistent parking availability.

The study identified a number of opportunities for WSDOT to both improve communication and knowledge of parking through ITS applications and to expand truck parking supply, including making long-term parking at weigh stations legal, allowing trucks to use chain-up areas to park when chain-up laws are not in effect, expanding access at commuter park and ride lots, and utilizing vacant WSDOT right-of-way to expand existing rest areas or other facilities or build new facilities.<sup>37</sup>

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<sup>37</sup> <https://www.wsdot.wa.gov/NR/rdonlyres/A72C532D-B825-4757-B4BE-F00ABF93A6D6/0/TruckParkingStudyFinal.pdf>

## 6.3 Kansas Statewide Freight Network Truck Parking Plan, KDOT

KTA/KDOT

Truck Parking



### KANSAS STATEWIDE FREIGHT NETWORK TRUCK PARKING PLAN

The Kansas Department of Transportation (KDOT) and the Kansas Turnpike Authority (KTA) sponsored the Kansas Statewide Freight Network Truck Parking Plan in 2015 to develop strategies for improving the network's safety, efficiency, and competitiveness along primary and secondary freight corridors. The study focused most heavily on I-70, I-35, and the Kansas Turnpike. KDOT and KTA completed three primary tasks as part of this study, including developing an inventory of public/private truck parking locations and current capacity, assessing any physical barriers, regulations, and policies affecting truck parking, and identifying opportunities for improving parking capacity. Data collection method included an inventory assessment, literature review, stakeholder interviews, surveys, and trend analysis.

The project team gathered a vast amount of information from stakeholders about the current conditions. Key insights from the study include:

February 2016

- Peak truck parking times are between 12 a.m. and 4 a.m.
- Trucks will park anywhere that can accommodate them to stay within their hours of service requirements. This includes parking lots, side roads, shoulders or ramps.
- Parking decisions are made based on service time, lot amenities and target destination.
- Most large legal parking facilities are at or over capacity regularly, especially near urban areas or the intersections of major highway-to-highway connections.
- Drivers average 30 minutes of search time to locate available parking.
- A significant number of drivers report parking in illegal locations that can be unsafe, particularly outside urban areas.
- Peer state and federal studies indicate that the need for expanded truck parking far exceeds available funding, which is unlikely to grow significantly in the future.
- Affordable truck parking strategies exist, and include expanding or improving parking at public rest areas, commercial truck stops and travel plazas; encouraging creation of P3s solutions to share costs and information for parking; informing drivers about available spaces through technology and other means; and changing parking enforcement rules.
- Kansas has the opportunity to gain a "first mover" advantage by undertaking its truck parking decision-making in a regional context wherever possible. Drivers are more likely to make routing decisions favorable to Kansas in terms of efficient use of its parking assets and economic impact if they can take better advantage of regional consistency in travel costs, business process, trip-time predictability and driver services availability.

The project team used the information acquired to come up with four major recommendations and corresponding implementation strategies, which are detailed in Figure 6.1.

**Figure 6.1 Study Recommendations and Implementation Strategies, Kansas Statewide Freight Network Truck Parking Plan**

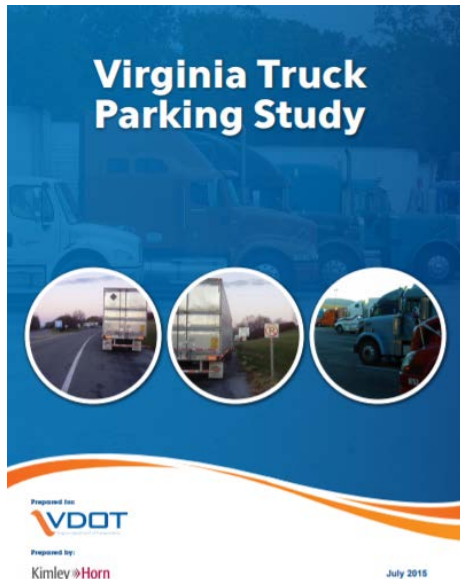
Improve parking information and sharing	Add or improve parking assets	Explore creating parking improvement partnerships	Examine pro-parking policies for freight trucks
<ul style="list-style-type: none"> <li>• Post parking information via static signage</li> <li>• Deploy a dynamic TPIMS</li> </ul>	<ul style="list-style-type: none"> <li>• Expand parking lot numbers and capacity</li> <li>• Use excess right of way for parking</li> <li>• Improve geometrics for better parking</li> </ul>	<ul style="list-style-type: none"> <li>• Identify intra-agency opportunities to work with agencies to expand parking</li> <li>• Investigate benefits of creating multistate, regional truck parking policies</li> <li>• Secure marketplace guidance as to the viability of expanding parking via P3s</li> </ul>	<ul style="list-style-type: none"> <li>• Develop pro-freight truck tax policies</li> <li>• Develop integrated local parking policies</li> <li>• Explore opportunities for coordinating delivery policies to expand parking</li> </ul>

The last phase of the study recommendations included a robust benefit cost analysis, which helps prioritize each strategy based on how well they are expected to improve Kansas freight truck parking and provide other benefits versus the cost of implementation. Tier 1 included the most highly recommended infrastructure investments, and included projects such as static and dynamic parking information signs on the eastern and western segments of the primary freight network and adding parking capacity at select locations where demand is greatest. Tier 2 included strategies that have a good benefit-cost ratio but are not critical, such as static and dynamic parking information signs on the central segments of the primary freight network and adding parking capacity where other parking alternatives do not exist. Finally, Tier 3 included investments with the lowest benefit-cost ratio that is still desirable, including static/dynamic parking information signs on segments with lower parking demand, adding parking capacity at some locations, and create parking partnerships with public- and private-sector entities.<sup>38</sup>

<sup>38</sup> [https://www.ksdot.org/Assets/wwwksdotorg/bureaus/burRail/Rail/Documents/Kansas\\_Statewide\\_Freight\\_Network\\_Truck\\_Parking\\_Plan\\_2015\\_2016.pdf](https://www.ksdot.org/Assets/wwwksdotorg/bureaus/burRail/Rail/Documents/Kansas_Statewide_Freight_Network_Truck_Parking_Plan_2015_2016.pdf)



## 6.4 Virginia Truck Parking Study, VDOT



The Virginia Department of Transportation (VDOT) released the Virginia Truck Parking Study in July 2015. The purpose of this study was twofold: (1) identify the frequency of truck parking along ramps near interchanges, rest areas, and welcome centers along key freight corridors, and (2) determine where additional truck parking is needed. The 2015 Study acknowledges the persistent problem of truck parking, and collaborated with stakeholders from the public sector, private sector, advocacy groups, truck stop owners/operators, state police, and other key players in the industry during the study.

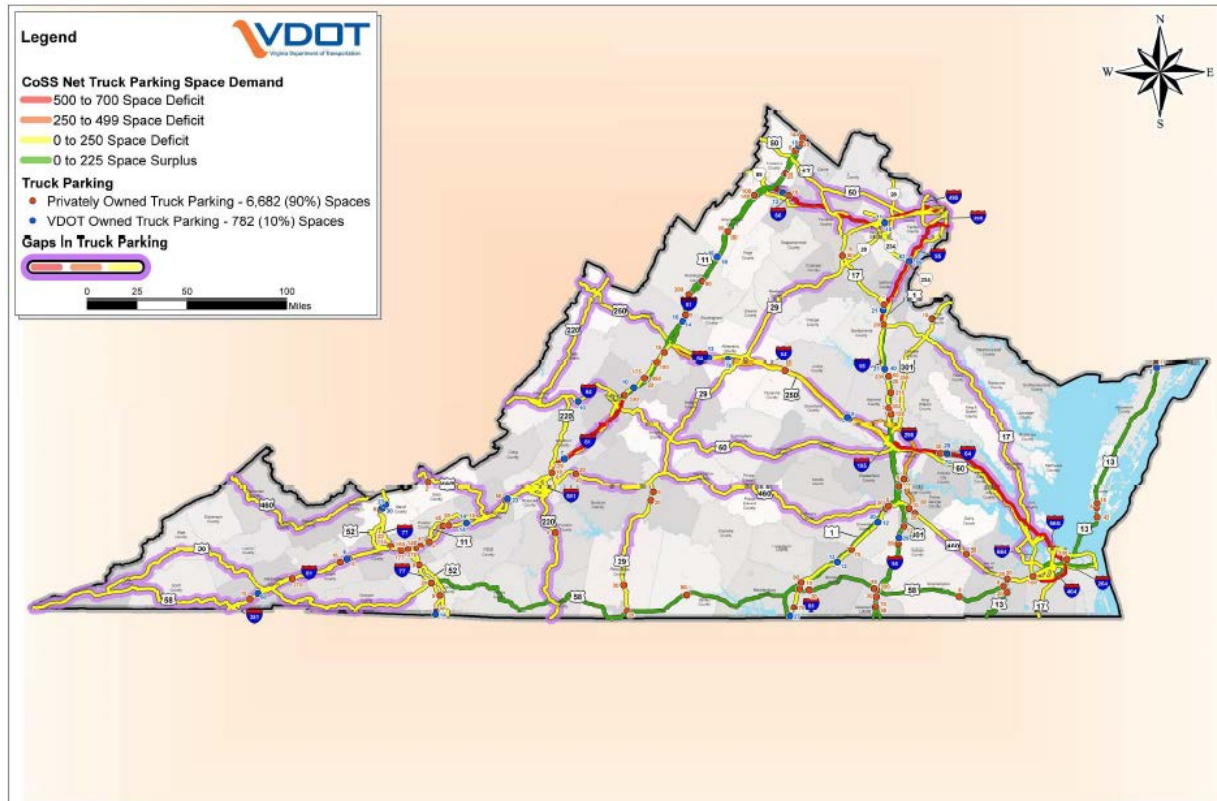
As part of the demand estimate, this study built on the methodology employed in the FHWA 2002 “Study of Adequacy of Commercial Truck Parking Facilities – Technical Report” and modified in the 2007 Pennsylvania State Transportation Advisory Committee “Truck Parking in Pennsylvania – Final Report”. The Virginia study adopted the Pennsylvania study’s values for peak parking demand, average parking duration, and average parking duration per hour of travel. All of these factors influence the demand for long-term parking. This study also adopted a different split of long-haul to short-haul trips on the interstates and did not include a 15% “buffer” to account for changes in average truck traffic that was used in the federal study.

The study determined several regional truck parking challenges as identified by stakeholders in Virginia. These challenges included:

- Vehicles parked on mainline and ramp shoulders pose a significant safety risk to the public, and create maintenance challenges for VDOT and truck stop operators.
- There is a shortage of truck parking supply in Virginia, information about parking is limited, and shippers/receivers have scheduled delivery and pick-up times that inflexible and do not allow on-site parking. Locations with the highest gap between available supply and demand for truck parking are shown in Figure 6.2 and include:
  - I-64 between New Kent and Norfolk
  - I-66 between Strasburg and Washington D.C.
  - I-81 between Roanoke and Lexington
  - I-95 between Fredericksburg and Washington D.C.
- Overnight parking is a personal safety concern, and truckers noted that the HOS regulation changes require an increase in the frequency of their rest stops, which is difficult to plan.

- There are also several regional challenges contributing to the problem, including geographic characteristics, regional freight characteristics, shortage of truck parking spaces, transportation congestion, high land acquisition costs, and diverse truck parking needs.

Figure 6.2 Truck Parking Gaps on Study Corridors, Virginia



Source: Virginia Truck Parking Study, VDOT (2015)

In light of the federal HOS requirements and existing truck parking inventory, the study produced three recommendations for VDOT to better address issues surrounding truck parking in Virginia:

- **Partner with private industry and local governments to increase capacity and related improvements.** In addition to identifying and prioritizing truck parking improvements, VDOT can act as an agent to connect stakeholders, encourage local action, and identify funding sources to assist with the effort.
- **Provide accurate and real-time information about truck parking supply and availability in Virginia.** VDOT can increase the amount of data pertaining to truck parking by collecting facility information for rest areas, weigh stations, port facilities, and other truck and enforcement locations. The agency can also expand technological resources for truckers to find out where truck stop are located, amenities at the facility, and number of available spaces.
- **Improve the safety, effectiveness, and supply of truck parking spaces at State-owned facilities.** VDOT can investigate options to increase truck parking availability, convert abandoned areas to official

truck parking or staging areas, prioritize expansion in critical areas, increase security, and other actions to expand capacity and increase safety of parking areas.<sup>39</sup>

## 6.5 Utah I-15 Truck Parking Study (Draft), UDOT

### UTAH INTERSTATE 15 TRUCK PARKING STUDY (DRAFT August 7, 2012)



UDOT completed a draft truck parking analysis of the I-15 corridor in August 2012. Unlike the other studies surveyed in this section, this study focused on a single corridor rather than truck parking throughout a state.

The study included a survey of drivers to understand their view of parking in the corridor, desires on truck stop amenities, and preferences for real-time parking information. The study also included focus group sessions with drivers and commercial rest stop operators.

To identify supply and demand of truck parking, the study compiled a list of all public and private parking facilities in the corridor, shown in Figure 6.3. To estimate demand, truck AADT was calculated and used as input for the FHWA truck parking demand calculations. Instead of using the default split between long-haul and short-haul trips, the model used FAF3 data specific to Utah to assign the total

truck volume to a distinct trip type. The analysis also included volume on I-80 in Salt Lake County since both routes share truck parking demand in the region. Overall, truck parking demand in the corridor is highest in the segment stretching from the Arizona border to Utah County (1,310-1,500 trucks in 2007), with decreasing demand further north to Ogden (840-950 trucks) and from Ogden to the Idaho border (280-330 trucks). One key factor to consider is that the FHWA model is based in large part on corridor distance and average speed—the longer the corridor, the higher the demand for truck parking because the greater likelihood that a truck will need to stop in the segment to meet HOS requirements. The longer length of the southern segment therefore is a key driver of the higher demand for truck parking.

The study identified a number of potential solutions to reduce the truck parking issues along the corridor, although not all were deemed feasible. For example, working with private warehouses to allow trucks to park in their lots overnight was deemed unfeasible due to liability, security, maintenance, and competitiveness issues. The UDOT Traffic Operations Center also developed a smartphone application that drivers can download which allows access to road conditions and traffic information, with plans to include additional information on truck stops and public rest areas in the state.<sup>40</sup>

<sup>39</sup> [http://www.virginiadot.org/projects/resources/VirginiaTruckParkingStudy\\_FinalReport\\_July2015.pdf](http://www.virginiadot.org/projects/resources/VirginiaTruckParkingStudy_FinalReport_July2015.pdf)

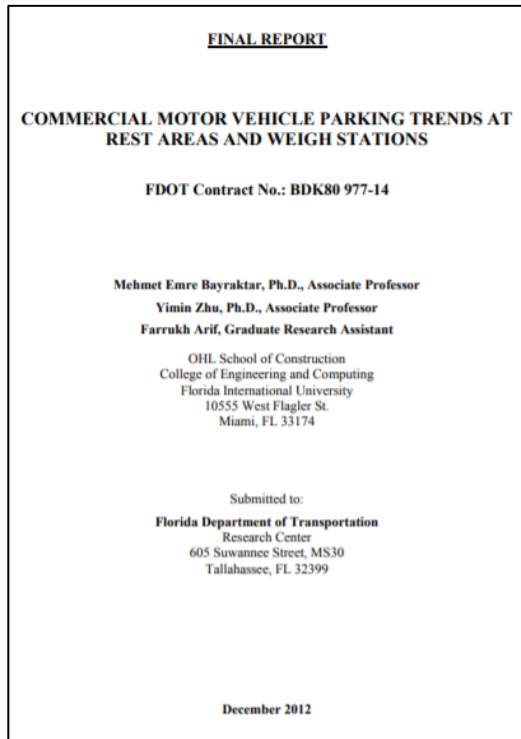
<sup>40</sup> <https://www.udot.utah.gov/main/uconowner.gf?n=32244108655911819>

Figure 6.3 Utah I-15 Truck Parking Supply



Source: Utah IU-15 Truck Parking Study (Draft)

## 6.6 Commercial Motor Vehicle Parking Trends at Rest Areas and Weigh Stations, FDOT



FDOT sponsored the development of the report “Commercial Motor Vehicle Parking Trends at Rest Areas and Weigh Stations” in 2012, which documented the demand for truck parking at public rest areas on interstate highways in Florida. The primary objectives of this research were to be addressed in phases: phase 1 would determine trends, and phase 2 would develop a suitable smart parking management system for commercial motor vehicles and conduct a pilot project to test the system. The details of each phase are as follows:

- **Phase 1:** The research team collected field data at public rest areas along I-10, I-75, and I-95 corridors to determine the number of truck parking spaces and record total truck parking utilization. They also interviewed a number of on-site personnel, including county sheriffs, state troopers, security officers, and other staff. These data collection efforts led the team to determine levels of truck parking capacity problems at each rest area on a low-to-high scale. Figure 6.4 shows a map of all of the categorized rest areas along I-95.

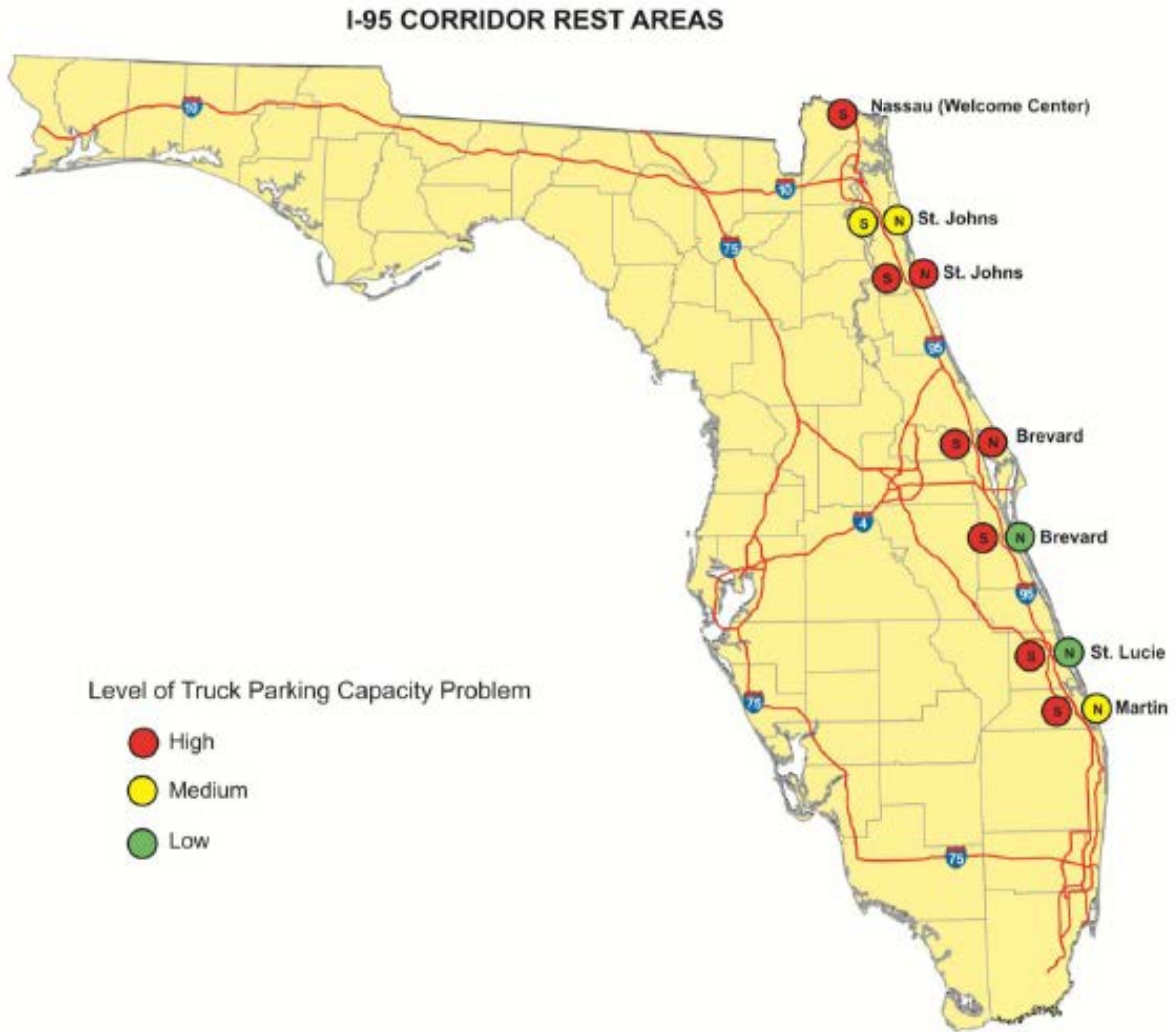
- **Phase 2:** The research team conducted an assessment of

the available technology that could be used to improve truck parking management at rest areas in Florida, and ultimately test implementation. Ultimately, wireless ground sensors, which detect the presence of a vehicle above the device, was selected to install and test at several rest areas. Various software tools were developed to complement other wireless vehicle detection systems. The team also developed an occupancy prediction model to predict available parking spaces at a date and time specified by the user.

The research team completed both phases of the study. The data collected through field observation and through the wireless ground sensors helped establish the existing conditions of truck parking facilities in Florida, and the occupancy prediction model helped forecast parking space availability for a given date and time. The study concluded with three recommendations for future research, including better utilization of weigh stations for nighttime truck parking, a pilot study to develop a comprehensive truck stop database in Florida, and an evaluation of P3 opportunities for Florida’s rest areas and truck stops.<sup>41</sup>

<sup>41</sup> [http://www.fdot.gov/research/completed\\_proj/summary\\_te/fdot-bdk80-977-14-rpt.pdf](http://www.fdot.gov/research/completed_proj/summary_te/fdot-bdk80-977-14-rpt.pdf)

Figure 6.4 Capacity Assessment for I-95 Corridor in Florida



Source: "Commercial Motor Vehicle Parking Trends at Rest Areas and Weigh Stations", FDOT (2012)

## 6.7 Gateway Cities Technology Plan for Goods Movement

This study, completed in 2012, developed a technology plan to help improve goods movement in the Los Angeles-Long Beach area of California. Truck parking was one issue examined in the region. The report includes a review of relevant truck parking regulations and initiatives and a brief literature review of parking technology deployment projects. It also includes information gathered through interviews and a survey of drivers.

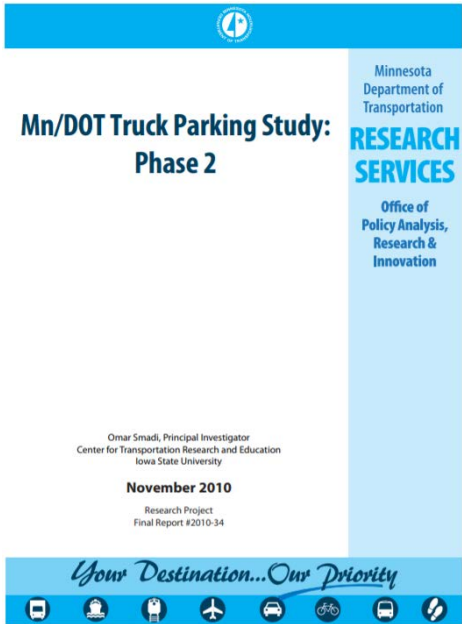
This study is unique in that it focused on staging—parking for shorter periods of time while waiting for a pickup or delivery window at one of the ports—as well as long-term parking. Due to congestion and delays in the area, and the national distribution networks these ports serve, many drivers in the region require both types of parking. Additional opportunities to be explored in later stages include:

- Public/Private partnerships to provide travel services;
- Legislative review/peal to the current limitations on public sites;
- Further inquiry into the concessionaire agreement between the ports and local dray operators to better understand the (perceived) influence on economic disparity created through provision of parking to medium and long-haul carriers; and
- Staging areas and services development plans.



Source: Gateway Cities Technology Plan for Goods Movement. Project Overview. Presented to: Mid-Continent Transportation Research Forum. Cambridge Systematics.

## 6.8 MnDOT Truck Parking Study: Phase 2, MNDOT



The Minnesota Department of Transportation (MnDOT) completed a two-phase “Minnesota Interstate Truck Parking Study” in 2010<sup>42</sup> to help develop the information necessary to support decisions regarding future approaches to truck parking issues in Minnesota. Phase I of the study, completed in 2008, specifically examined public and private commercial vehicle parking demand along three major interstate corridors – I-90, I-35, and I-94 – in three primary tasks:

- Development of an inventory of the state’s interstate truck parking supply using aerial photographs, Google Earth, national truck stop directories, and through discussions with truck stop operators.
- Analysis of truck parking demand through field observation and data collection for both private and public facilities. With this information, the team was able to identify facilities that were overcapacity 15, 25, and 50 percent of the time (see Table 6.2). 20 facilities were identified as having significant capacity issues during peak hours.

**Table 6.2 Rest Areas at or Over Capacity at least 50% of the Time, Minnesota**

Site Name	Trunk Highway	Mile Post	Truck Stalls	Max # Trucks In Site	Avg. Trucks In Site	Total # Days Open	# of Days at or Over Capacity	% of Weekdays at or Over Capacity	% Days at or Over Capacity
Burgen Lake (W.B.)	I94	105	12	413	8.2	2331	1663	71.3%	59.5%
Marion (W.B.)	I90	222	20	330	17.1	1999	1579	79.0%	64.9%
Albert Lea TIC (NB)	I35	1	29	213	9.5	1933	1370	70.9%	58.0%
St. Croix T.I.C. (W.B.)	I94	256	35	536	24.7	2220	1363	61.4%	50.8%
Elm Creek (E.B.)	I94	215	10	136	8.6	2177	1801	82.7%	65.2%

Source: Minnesota Interstate Truck Parking Study, MnDOT (2008)

- Survey results of trucking company practices and attitudes regarding truck parking. The study team conducted interviews to get a sense of truck parking availability, and distributed surveys to carriers by telephone, fax, US mail, or email to determine the reasons for parking selection. The survey also showed that over 70 percent of carriers stated that there was no policy about where drivers should park.

The follow-up to the 2008 MnDOT study, “MnDOT Truck Parking Study: Phase 2”, was completed in 2010. The second phase of the project focused on determining opportunities for expanding truck parking in critical areas throughout Minnesota. Although it was clear that interstate and intercity truck parking may be limited, the areas with the biggest need were in urban areas, specifically the Twin Cities and outstate Minnesota.

This phase of the truck parking study was conducted in five tasks, outlined below:

<sup>42</sup> <https://www.lrrb.org/pdf/201034.pdf>



- Task 1: Investigate lower cost marginal improvements to truck parking capacity along Minnesota’s interstate highway system.
- Task 2: Investigate the development of urban truck parking in other metropolitan areas around the U.S.
- Task 3: Investigate truck parking demand derived from major truck traffic generators in the Twin Cities metropolitan area to better understand spatial relationships between locations generating truck traffic and truck parking needs.
- Task 4: Coordinate with internal MnDOT stakeholders to review the research results and potential solutions to Minnesota’s truck parking shortage.
- Task 5: Communicate with external stakeholders.

The research team used a combination of interviews and spatial analysis to better understand which of the State’s corridors needed improvements. After conducting both the quantitative and qualitative aspects of the analysis, a series of short- and long-term recommendations were suggested for each corridor, as shown in Table 6.3. These recommendations were developed to help address concerns with safety, HOS requirements, and staging area needs in Minnesota’s urban areas.

**Table 6.3 Recommendations by Corridor, MnDOT Truck Parking Study Phase 2**

Corridor	Recommendations
I-94 East	<ul style="list-style-type: none"> <li>• Capacity enhancement of St. Croix rest area facility by 5-10 spaces (short-term)</li> <li>• Improved information regarding truck parking availability (short-term)</li> <li>• Coordination with WisDOT in providing parking information and spaces (short-term)</li> </ul>
I-94 West	<ul style="list-style-type: none"> <li>• Capacity enhancement of Elm Creek and Burgen Lake rest area facilities by 15-23 spaces (short-term)</li> <li>• Improved information regarding parking availability (long-term)</li> <li>• Capacity enhancement of Fuller Lake rest area facility by 5-10 spaces (long-term)</li> </ul>
I-90 East	<ul style="list-style-type: none"> <li>• Improved information regarding parking availability (short-term)</li> <li>• Capacity enhancement of High Forest and Oakland Woods facilities by 10-20 spaces (long-term)</li> </ul>
I-90 West	<ul style="list-style-type: none"> <li>• Improved information regarding parking availability (long-term)</li> <li>• Capacity enhancement of Clear Lake facility by 5-7 spaces (long-term)</li> </ul>
I-35 South	<ul style="list-style-type: none"> <li>• Utilization of abandoned weigh station(s) south of Straight River facilities (short-term)</li> <li>• Possible truck-only designation of Straight River northbound facility (short-term)</li> <li>• Capacity enhancement of Albert Lea and Health Creek facilities by 9-25 spaces (short-term)</li> <li>• Improved information regarding parking availability (long-term)</li> <li>• Private truck stop facility south of the Twin Cities near New Market facility (long-term)</li> <li>• Possibly utilize wide median south of Heath Creek (long-term)</li> </ul>
I-35 North	<ul style="list-style-type: none"> <li>• Improved information regarding truck parking availability (long-term)</li> </ul>

Source: MnDOT Truck Parking Study: Phase 2

## 6.9 On-Going Truck Parking Studies

This section briefly reviews two known truck parking studies that are currently on-going or about to begin.

### 6.9.1 Arizona DOT Truck Parking Study

The Arizona DOT is conducting a study of truck parking in Arizona. The need to provide safe, secure parking opportunities for commercial drivers was acknowledged in the State Freight Plan completed in 2017. Specifically, the lack of parking in the I-17 corridor between Phoenix and Flagstaff and the I-10 corridor between Tucson and Blythe, CA were highlighted. \$10 million in National Highway Freight Program funding has been set aside to implement the recommendations from the truck parking study.<sup>43</sup>

As of January 2018, the parking study was requesting feedback from commercial drivers through an online survey. A timeline for completion of the study is not currently known.

### 6.9.2 Texas DOT Truck Parking Study

The Texas Department of Transportation is initiating a Statewide Truck Parking Study that will assess the current state of truck parking availability and make recommendations to address current and future truck parking needs. The study will include an assessment of the state of the practice as well as a review of laws and regulations related to truck parking to characterize the planning and policy environment in Texas. The study will assess the public and private sector supply of truck parking and the demand for truck parking for various driver needs. Truck parking hotspots will be identified based on freight origins and destinations, and safety needs will be identified through crash analysis. Analysis of the trends and needs identified throughout this study will result in strategy recommendations, including the development of concepts of operations for various contexts in the state and steps for their implementation.

This study is due to begin in the spring of 2018.

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<sup>43</sup> <https://www.azdot.gov/docs/default-source/planning/State-Freight-Plan/arizona-state-freight-plan-110917.pdf?sfvrsn=4>

## 7.0 Truck Parking-Related Studies in Nevada

This section identifies studies in Nevada that examine issues that influence truck parking including commercial vehicle enforcement, alternative fueling infrastructure, and state and regional freight plans.

### 7.1 Investigation of Stakeholder Perspectives on the Efficacy of Commercial Vehicle Safety, and Size and Weight Regulation and Enforcement in Nevada

NDOT is conducting a study to assess the efficacy of commercial vehicle safety, size and weight regulation and enforcement in Nevada. The study will include a review of contracting processes and requirements for various data sources and infrastructure that support CVE, as well as regulations, fine structures, and permitting. In coordination with other agencies such as the Nevada Highway Patrol (NHP) and Department of Agriculture, the study will also evaluate current and future opportunities to construct enforcement infrastructure (both fixed and mobile assets) and develop a prioritized list of investments. The study is anticipated to conclude in the fall of 2019.

### 7.2 Nevada Electric Highway

Nevada is a leader in the deployment of alternative fuels and electric vehicle infrastructure. The Nevada Electric Highway on US 95 between Reno and Las Vegas launched in 2015 with a partnership between the Governor's Office of Energy and Nevada's electric utilities. Five stations with a direct current fast charger and two Level 2 chargers are planned, with three complete as of February 2018. These stations on US 95 are free to use for the first five years. Phase II of the initiative will include additional sites on US 93, an initial station in Panaca on US 93 with expansion to the I-15, I-80, and US 50 corridors in the future.<sup>44</sup> None of these locations are currently designed to charge large electric commercial vehicles.

Gov. Sandoval is a leading proponent of electric vehicle infrastructure regionally. In December 2016, the governor joined Colorado and Utah to announce complementary plans to build an EV network across key highway corridors in each state: I-70, I-76, and I-26 in Colorado, I-70, I-80, and I-15 in Utah, and I-80 and I-15 in Nevada.<sup>45</sup>

Truck fleets, especially those conducting long-haul transportation for which hours of service regulations have the most impact, do not typically rely on alternative fuel or electric vehicles at this time. Delivery vehicles that serve a similar route every day or return periodically to a home base are better able to utilize the limited re-fueling infrastructure, as their routes are consistent and often planned in detail in advance. For trucks traveling hundreds or thousands of miles between origin and destination, the lack of infrastructure combined with higher initial purchase costs for vehicles is still a significant hurdle. Expanding electrification and availability of other alternative fuels through regional partnerships, especially along the critical corridors between California's ports and Reno and Las Vegas may help advance the adoption of this technology. The

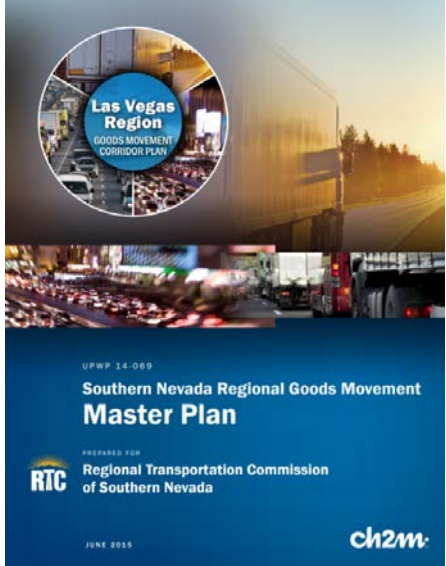
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<sup>44</sup><http://energy.nv.gov/uploadedFiles/energynvgov/content/Programs/Nevada%20Electric%20Highway%20Fact%20Sheet%20Feb%202018.pdf>

<sup>45</sup>[http://energy.nv.gov/Media/Press\\_Releases/2017/Phase\\_II\\_of\\_Nevada\\_Electric\\_Highway\\_Kicked-off/](http://energy.nv.gov/Media/Press_Releases/2017/Phase_II_of_Nevada_Electric_Highway_Kicked-off/)

existing electrification efforts on US 95 would then allow both Reno and Las Vegas to be multi-directional EV crossroads, in keeping with the goals of the Nevada State Freight Plan.

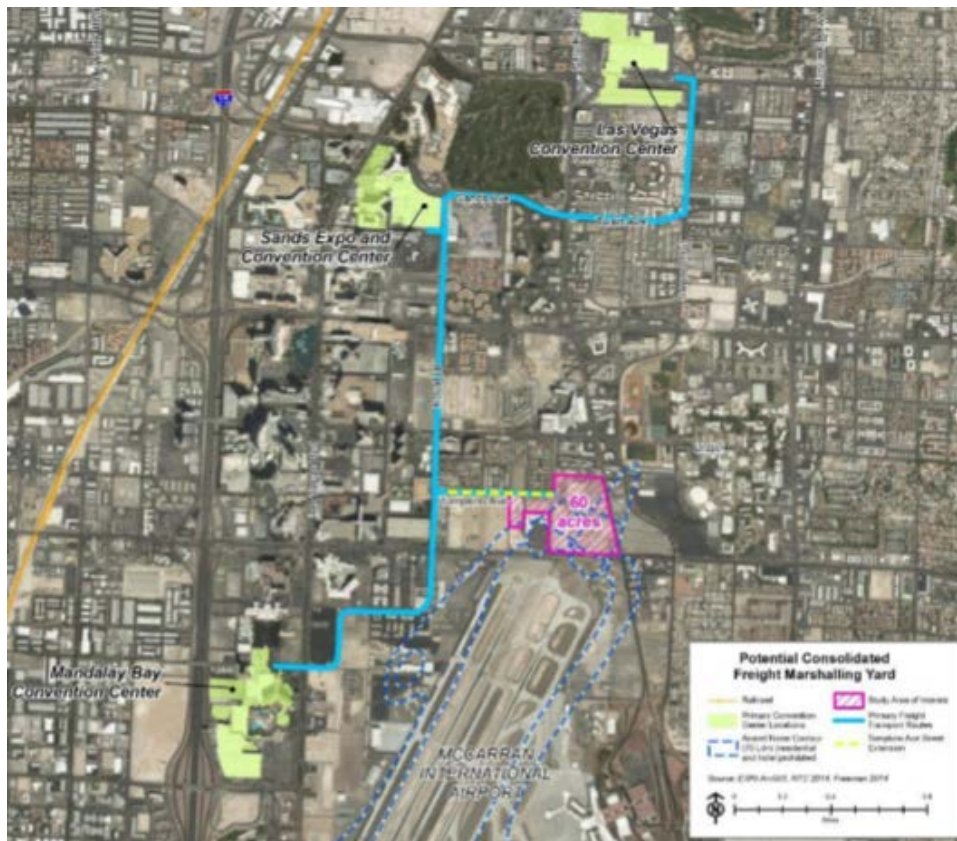
### 7.3 Southern Nevada Regional Goods Movement Plan



Completed in June 2015, this study provides a snapshot of the region’s transportation systems, forecasts future freight demand, and provides recommendations to address regional freight deficiencies. One of the focus areas for the study was freight access for conventions. Conventions are a major economic sector in Las Vegas, but can generate large amounts of truck traffic over short periods of time that must operate on tight schedules.

The study identified a potential location for a consolidated freight marshalling facility that could stage trucks for multiple events. This location is shown in Figure 7.1. This consolidated location could replace the multiple small consolidation yards throughout the “Resort Corridor”. These multiple locations require trucks to take many different routes to reach convention centers, many of which are at or near capacity.<sup>46</sup>

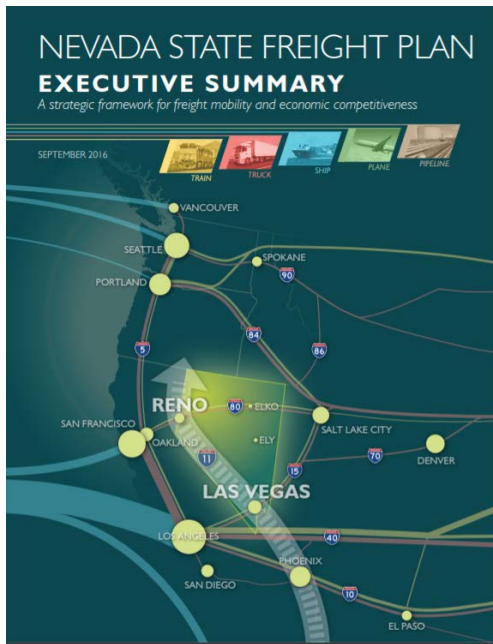
**Figure 7.1 Potential Consolidated Freight Marshalling Yard – Las Vegas**



<sup>46</sup> [http://www.rtcnv.com/wp-content/uploads/2012/06/SoNVGoodsMovement\\_FinalReport\\_WithAppx.pdf](http://www.rtcnv.com/wp-content/uploads/2012/06/SoNVGoodsMovement_FinalReport_WithAppx.pdf)

Source: [http://www.rtcnv.com/wp-content/uploads/2012/06/SoNVGoodsMovement\\_FinalReport\\_WithAppx.pdf](http://www.rtcnv.com/wp-content/uploads/2012/06/SoNVGoodsMovement_FinalReport_WithAppx.pdf)

## 7.4 Nevada State Freight Plan



The Nevada State Freight Plan, completed in September 2016 identified a number of recommendations that would improve the state’s freight infrastructure and distribution capabilities with the goal of creating a competitive advantage for Nevada that will result in a growing and diversifying economy.

The Plan identifies the need to improve the capacity and performance of the freight system and to shift Nevada from a “stop along corridors” (I-80 and I-15) to a “crossroads”. Providing adequate and safe locations for trucks to park is part of supporting the growing logistics and distribution industry in Nevada and maintaining freight mobility in the region.<sup>47</sup> One of the strategies identified in the Plan is to “Increase the number of truck parking spaces and facilities, along with supportive ITS improvements.” US 93 between Las Vegas and Ely is specifically identified as a potential location due to the lack of any parking with amenities between these cities (a 3.5 hour drive).

### Strategic Goals of the Freight Plan

 <p><b>Economic Competitiveness</b> Improve the contribution of the freight transportation system to economic efficiency, productivity, and competitiveness.</p>	 <p><b>Mobility &amp; Reliability</b> Provide an efficient and reliable multimodal freight transportation system for shippers and receivers across the state.</p>
 <p><b>Safety</b> Improve the safety of the freight transportation system.</p>	 <p><b>Infrastructure Preservation</b> Maintain and improve essential multimodal infrastructure within the state.</p>
 <p><b>Advanced Innovative Technology</b> Use advanced technology, innovation, competition, and accountability in operating and maintaining the freight transportation system.</p>	 <p><b>Environmental Sustainability &amp; Livability</b> Reduce adverse environmental and community impacts of the freight transportation system.</p>
 <p><b>Sustainable Funding</b> Fully fund the operations, maintenance, renewal, and expansion of the freight transportation system.</p>	 <p><b>Collaboration, Land Use, and Community Values</b> Establish an ongoing freight planning process to coordinate the freight transportation system and ensure consistency with local land use decisions and community values.</p>

<sup>47</sup> <https://www.nevadadot.com/home/showdocument?id=5326>

## 8.0 Truck Parking Technology Overview

Intelligent Transportation Systems (ITS) technology directed at providing information about truck parking availability is increasingly finding support and applications across the country. Current systems generally serve one or more of the following purposes:

- Estimate truck parking availability;
- Communicate availability to drivers; or
- Allow drivers to reserve parking spaces in advance of arrival.

The following sections provide an overview of each of these categories, specific technology options within each, and a breakdown of each system’s strengths and weaknesses. This section begins with an overview of studies or projects that involve a truck parking ITS component.

### 8.1 Truck Parking ITS Studies and Deployments

Table 8.1 contains a summary of recently completed truck parking ITS studies or current deployments of truck parking technology.

**Table 8.1 Truck Parking ITS Studies and Deployments**

Study Title	Sponsor/Author	Date	Cost Estimates	Deployment?
I-15 Dynamic Mobility Project	I-15 Mobility Alliance	On-going		✓
Mid America Association of State Transportation Officials (MAASTO) Truck Parking Information Management Systems	MAASTO, MAFC, ATRI, OOIDA, NATSO	On-going		✓
Colorado Truck Parking Information Management System	Colorado DOT	Apr 2016	✓	✓
Truck Parking Management Systems: A Synthesis of Projects, Research, and Resources	Mid-America Freight Coalition and National Center for Freight & Infrastructure Research & Education	Jun 2015	✓	
I-95 Corridor Coalition Truck Parking Initiative	I-95 Corridor Coalition	Feb 2015		✓
I-94 Truck Parking Information and Management System	Michigan DOT	Dec 2014		✓
I-5 Smart Truck Parking in California	Caltrans	Dec 2012		✓

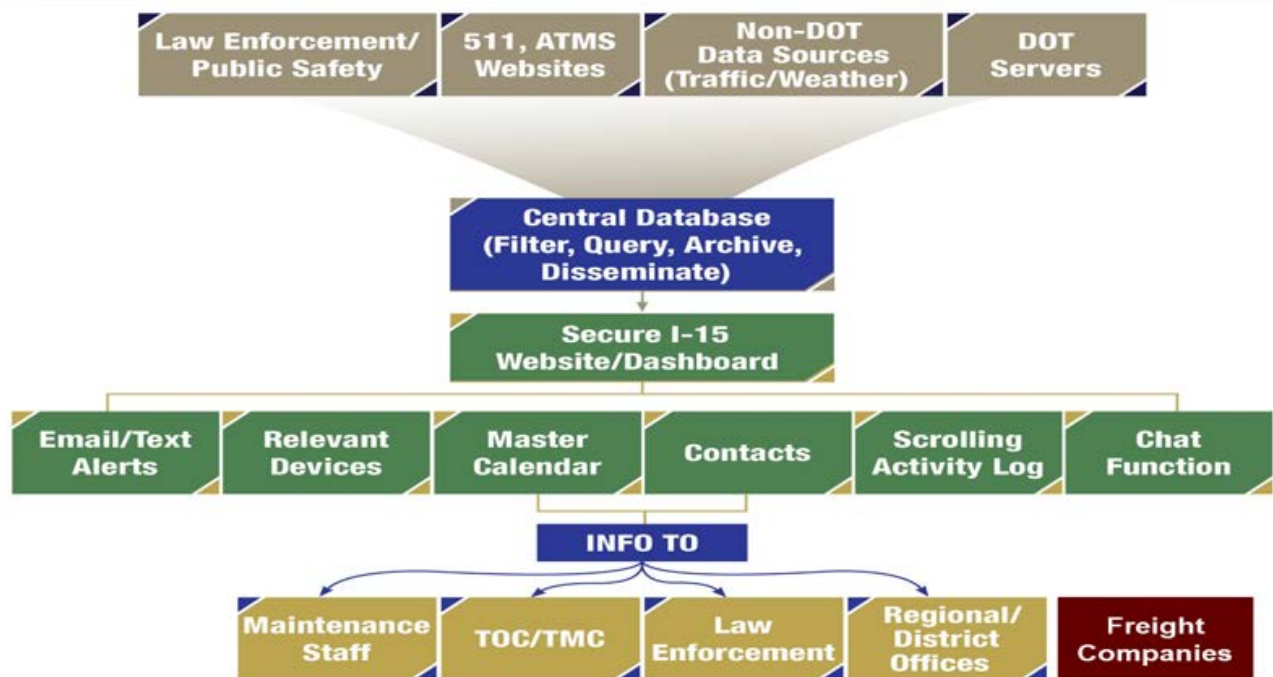
### 8.1.1 I-15 Dynamic Mobility Project

The I-15 Dynamic Mobility Project is seeking to provide a real-time information on a number of topics (truck parking, road closures, weigh station operations, delays, etc.) through multiple channels to a wide range of public and private-sector stakeholders along the corridor in California, Nevada, Arizona, and Utah (see Figure 8.1, a depiction of data inputs and outputs). The freight component of this project includes identifying and testing outreach methods to truck drivers with a number of pieces of information including:

- Real-time truck parking occupancy;
- Emergency weather bulletins and advance predictions;
- Improved OS/OW data (permits);
- Real-time traffic delays (location, anticipated duration, reason);
- Planning data, peak traffic periods, and major planned events in the corridor; and
- Real-time information about weigh station operations.

California utilizes virtual changeable message signs (CMS) as one outreach tool. This information is available through public data feeds but are not physically roadside. UDOT is looking into displaying parking availability on CMS, though they have found the most efficient and effective way to communicate with truckers is through social media (mainly Twitter). The next phase of the project will include a pilot test with carriers to develop a user protocol for information sharing.

**Figure 8.1 Data Input and Output for I-15 Dynamic Mobility Project**

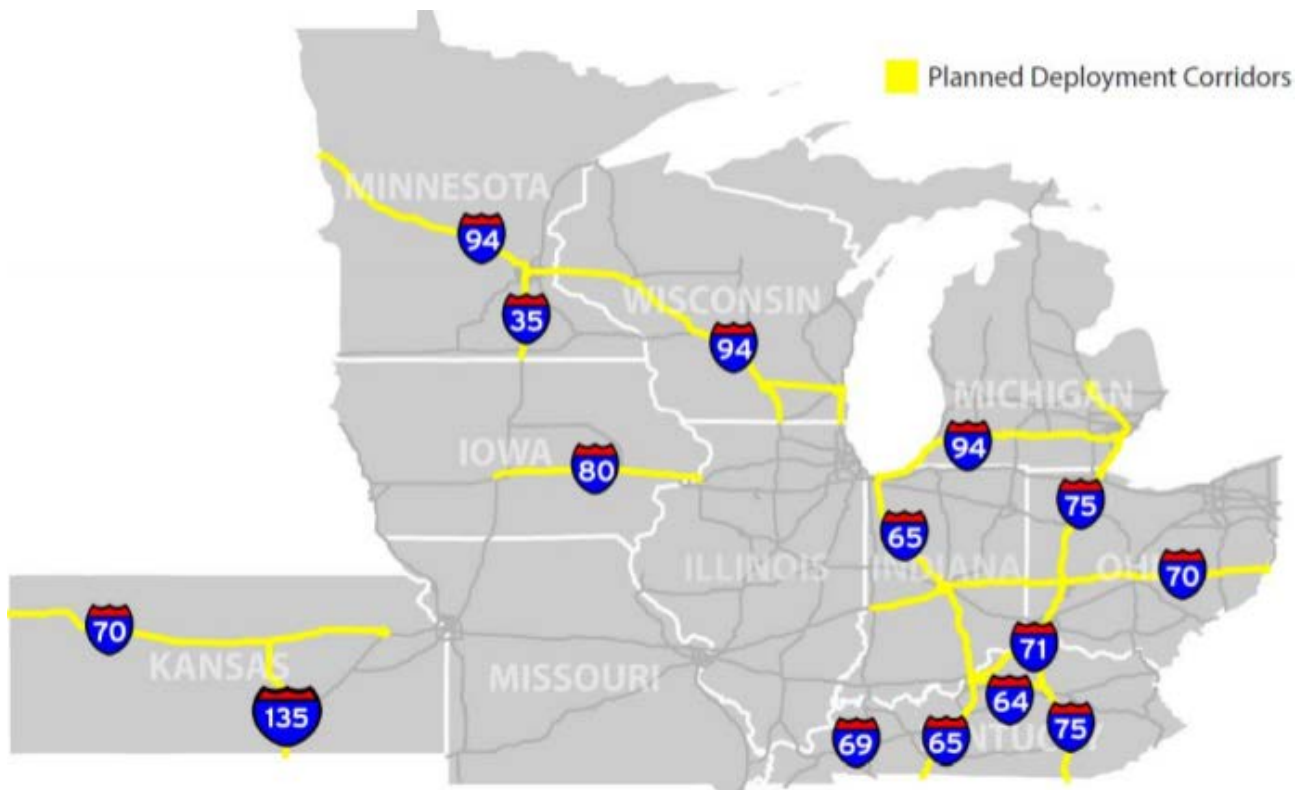


Source: I-15 Dynamic Mobility Project. Freight Information Dissemination Pilot.

### 8.1.2 Mid America Association of State Transportation Officials (MAASTO) Truck Parking Information Management Systems

The MAASTO deployment of a Truck Parking Information Management System (TPIMS) is scheduled for completion in 2019.<sup>48</sup> This project will be deployed in Minnesota, Wisconsin, Iowa, Kansas, Michigan, Indiana, Ohio, and Kentucky along a number of key interstate corridors, shown in Figure 8.2. Information on parking availability will be available to drivers through dynamic message signs, mobile device applications, and traveler information websites. Each state is developing their own utilization collection method, though it must conform to overall deployment standards and performance measures. Phase 1 of the project which includes 30% design is complete. Final design plans and construction is still pending, though all states have concluded their TPIMS-related procurements.

**Figure 8.2 MAASTO TPIMS Corridors for Deployment**



Source: [https://www.dot.state.oh.us/Divisions/Planning/Conference/Documents/2016Presentations/2-B/Comer\\_2B\\_2016OPC.pdf](https://www.dot.state.oh.us/Divisions/Planning/Conference/Documents/2016Presentations/2-B/Comer_2B_2016OPC.pdf)

<sup>48</sup> <https://trucksparkhere.com/>



### 8.1.3 Colorado Truck Parking Information Management System

Colorado operates approximately 3,500 truck parking spaces along I-25, I-70, and I-76, split between public rest areas (operated by Colorado Department of Transportation) and privately-owned and maintained facilities. Colorado Department of Transportation is also implementing a TPIMS to provide truck drivers with real-time information on parking availability and roadway conditions in the state. The TPIMS project will use static cameras and sensors to provide real-time data to truckers about parking availability.

Colorado Department of Transportation applied for but did not receive a 2016 FASTLANE Grant for the project. Despite this, the project is advancing and the initial set of six parking areas were due to go online in 2017.<sup>49</sup>



### 8.1.4 Mid-America Freight Coalition Truck Parking Management Systems

The Mid-America Freight Coalition produced the “Truck Parking Management Systems: A Synthesis of Projects, Research, and Resources” in 2015 along with the National Center for Freight & Infrastructure Research & Education. The report summarizes recent research on truck parking and pilot programs developed and implemented to address truck parking systems.

This report featured a summary of truck parking detection systems and data management opportunities that are relevant to states seeking the better manage truck parking practices. There are a number of ITS opportunities for truck parking, which refers to systems to estimate the occupancy of a truck parking site in a given area. ITS for truck parking includes the following three categories: in-pavement systems (includes induction sensors, magnetic sensors, and infrared sensors), video (features video cameras installed around a parking area), and light and laser detection (panels installed at entry/exit lanes). In-pavement systems are generally preferred due to ease of installation and data processing. However, installation and maintenance require the closure of a truck parking location, and in-pavement systems are not as reliable when monitoring a wide range of vehicles, such as pickups and tractor-trailers. Video systems have several benefits, but have issues in rough weather and create privacy concerns. Light/laser detection also has benefits, but is capital-intensive and vulnerable to vandalism.

Additionally, the report included a summary of communication technologies as well as data management, modeling, and spot management techniques to help convey information and predict future truck parking demands on key corridors. The five opportunities include: modeling with floating vehicle data, telematics controlled parking, variable message signs, smartphone applications, and websites. Websites, smartphone applications, and variable message signs are generally preferred for the low cost and ease of

<sup>49</sup> <https://www.codot.gov/programs/roadx/projects-in-motion#connection>

implementation, while floating vehicle data and telematics controlled parking are relatively new technology solutions with practical and cost limitations.<sup>50</sup>

### 8.1.5 I-95 Corridor Coalition Truck Parking Initiative

The I-95 Corridor Coalition is a partnership of transportation agencies, toll authorities, and related organizations, including public safety, port, transit and rail organizations – from the State of Maine to the State of Florida – working together to improve long distance travel for passengers and freight. Originally created to harmonize tolling along the I-95 Corridor, the coalition today comprises 17 Departments of Transportation, 17 transportation agencies, and six Federal agencies. After receiving a grant from FHWA, the Coalition launched a Truck Parking Availability System to provide over-the-road truck drivers with real-time truck parking information. The study was able to analyze the severity of the truck parking issue along the I-95 corridor by depicting the capacity and utilization of truck parking locations between North Carolina and Massachusetts.

The pilot uses a space-by-space monitoring approach to track truck parking spaces using in-ground sensors. Parking data will be made available via three resources: a truck parking website, an automated telephone system, and a continuously generated external data feed. The technology was tested at two truck parking locations – the Ladysmith Rest Area in Caroline County, Virginia, and the Welcome Center in Laurel, Maryland – and will be tested at more rest areas with more trucker participation in the next phases of the project. At the conclusion of the 4-year project timeline, the entire program will be assessed, and a sustainability and marketing plan will be developed to help replicate the truck parking program in other areas.<sup>51</sup>

### 8.1.6 I-94 Truck Parking Information and Management System

I-94 is a critical freight corridor in Michigan, with trucks accounting for up to 30 percent of all vehicles. Parking in the corridor was a key concern, with overflow parking along ramps identified as a serious issue. The I-94 deployment project installed a TPIMS system along 129 miles of the corridor.

Data is collected through sensors and video cameras deployed at private and public parking facilities in the corridor. That information is provided to drivers through dynamic message signs, a dedicated website, and a smart phone application.<sup>52</sup>

### 8.1.7 I-5 Smart Truck Parking in California

This project developed a smart parking application using a private provider—Parking Carma. The mobile application features are shown in Figure 8.3. This system is being deployed at two test facilities in California, the first is a logistics terminal in Lathrop, CA and the second is a FlyingJ in Lodi, CA. Phase 2 will expand this deployment to six additional sites, and Phase 3 will evaluate system performance and determine economic sustainability. The Lathrop facility is comparing a sensor at the single entry/exit point to a “human

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<sup>50</sup> [http://midamericafreight.org/wp-content/uploads/MAFC\\_TPMS\\_Synthesis\\_07012015.pdf](http://midamericafreight.org/wp-content/uploads/MAFC_TPMS_Synthesis_07012015.pdf)

<sup>51</sup> <http://i95coalition.org/wp-content/uploads/2015/02/I-95-Truck-Parking-Final-Proposal-Only.pdf?x70560> and <http://i95coalition.org/wp-content/uploads/2015/02/Truck-Parking-Work-Plan-1-16-09.pdf?x70560>

<sup>52</sup> <http://ontruck.org/mi-unveils-truck-parking-information-management-system-for-i-94/>

record” of parking availability determined through a video feed. The FlyingJ is testing multiple parking identification systems including in road loops, RFID, still image processing, and video camera sensing.

Figure 8.3 Smart Truck Parking Mobile Application Requirements

# Smart Truck Parking Mobile Application



Source: I-5 Smart Truck Parking in California. Presentation to Los Angeles Metro Gateway Cities Vendor Showcase. April 4, 2012.

## 8.2 Truck Parking Availability Detection

There are three main types of ITS systems deployed for identifying the availability of truck parking. They are:

- In-Pavement Sensor Systems
- Video Detection Systems
- Light and Laser Detection Systems

Table 8.2 provides an overview of these systems, with more specific information provided below.

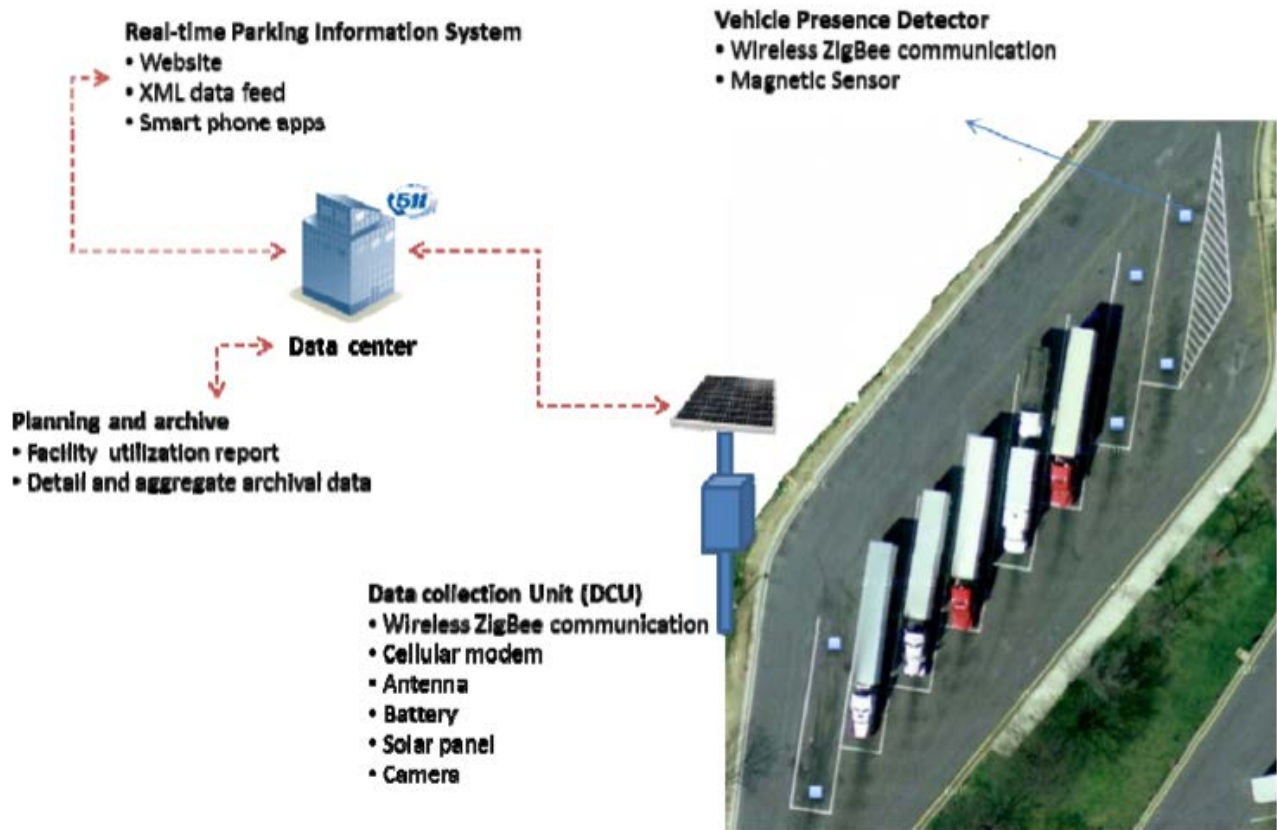
**Table 8.2 Truck Parking Availability Detection Systems Overview**

System Name	Strengths	Weaknesses
In-Pavement Sensors	<ul style="list-style-type: none"> <li>Widely tested and deployed</li> <li>Relatively low cost</li> </ul>	<ul style="list-style-type: none"> <li>Accuracy concerns</li> <li>Requires facility closure for installation and maintenance</li> </ul>
Video-Detection	<ul style="list-style-type: none"> <li>Flexible</li> <li>Easy to configure or reprogram remotely</li> <li>Low installation and maintenance costs</li> </ul>	<ul style="list-style-type: none"> <li>Accuracy issues in inclement weather (snow, rain) and vulnerable to the elements (wind, sun, etc.)</li> <li>Privacy concerns</li> <li>Require interpretation to be effective</li> </ul>
Light and Laser Detection	<ul style="list-style-type: none"> <li>Highly accurate</li> </ul>	<ul style="list-style-type: none"> <li>Do not classify vehicle types</li> <li>High cost to install and maintain</li> <li>Vandalism and theft concerns</li> <li>Require controlled entry/exit points for the parking area</li> </ul>

Source: North Carolina Statewide Multimodal Freight Plan – Truck Parking Study (2017).

In-pavement systems can take many forms including inductive loop detectors, magnetic sensors, piezoelectric sensors, and pneumatic road tubes. Pneumatic road tubes are the cheapest option but lack accuracy and the higher rate of wear from truck tires. Inductive loop detectors consist of insulated wires buried in the road that detect a vehicle by means of the electric signals induced when a vehicle passes over or stops within the loop. The technology is widely deployed for various highway uses and is relatively low-cost, but does require more intrusive installation and higher maintenance costs. Piezoelectric sensors are more commonly used in weigh-in-motion applications tied to commercial vehicle enforcement, but can be used to detect trucks for parking utilization. An electrostatic charge is generated when a vehicle passes over the system, with the charge proportional to the input force or weight of the vehicle. These systems are highly accurate and can provide more detailed information than just parking utilization, but can be expensive, require a considerable amount of calibration, and are subject to maintenance concerns. Finally, magnetic sensors use magnetic waves to detect vehicles parked above them. The Maryland State Highway Administration deployed a magnetic, wireless sensor network for a pilot test in 2013. Figure 8.4 shows an overview of that system.

**Figure 8.4 Maryland In-Pavement Truck Parking Detection Deployment**



Source: [http://www.roads.maryland.gov/OPR\\_Research/MD-13-SP209B4M\\_TRUCK-PARKING\\_Report.pdf](http://www.roads.maryland.gov/OPR_Research/MD-13-SP209B4M_TRUCK-PARKING_Report.pdf)

Florida DOT also took this approach in 2012 as described in their “Commercial Motor Vehicle Parking Trends at Rest Areas & Weigh Stations” study. This study implemented wireless ground sensors in select truck parking areas. The wireless ground sensors that they selected used differential magnetic induction measurement with a built-in infrared sensor, which were capable of determining whether the vehicle was a high-clearance truck chassis as opposed to a normal vehicle. It also included detection nodes and relay nodes to detect vehicle presence and relay the information to a data collector for processing. The equipment was able to collect information to determine average occupancy, time/week variations, turnover, occupancy details and predications. Overall, the wireless vehicle detection system was deemed to have significantly lower capital and maintenance costs compared to other technologies, improved accuracy, and increased reliability.

A more recent Florida DOT study compared three types of in-pavement sensors. SENSIT used magnetic and infrared sensors, while Sensys and CivicSmart used microwave radar sensors. Data from the sensor system was compared with video feeds of the parking locations during the trial period, and all three systems were found to have accuracy rates above 95% for both ingress/egress event cataloguing and continuous parking occupancy status.<sup>53</sup>

<sup>53</sup> [http://www.fdot.gov/research/Completed\\_Proj/Summary\\_TE/FDOT-BDV31-977-56-rpt.pdf](http://www.fdot.gov/research/Completed_Proj/Summary_TE/FDOT-BDV31-977-56-rpt.pdf)

Camera-based systems are widely available and have been deployed in a number of locations.<sup>54</sup> They offer a cost-effective and easily re-programmable approach to identifying truck parking capacity. However, camera systems can have accuracy issues in inclement weather (both visually from the camera and being able to identify parking spaces). In addition, drivers have raised privacy concerns due to the constant monitoring. Finally, and tied to the issue of privacy, the camera feed may require interpretation in order to provide accurate information. The actual image of the parking area could be made public and drivers would need to interpret the number of available spaces or someone would need to view the image and input the number of available spaces to database or display system to provide that information to drivers. An alternative developed in Minnesota used a multi-camera view approach to develop a 3D computer model of the parking areas which allowed a computer program to monitor utilization and automatically send updates to the various communication systems being tested with an overall 98 percent accuracy rate.<sup>55</sup>

Laser and light detection systems are deployed at the entrance and exits to truck parking facilities. They detect vehicles as they enter and exit, providing an accurate count of the number of vehicles currently at the facility. However, these systems are vulnerable to inclement weather and vandalism, and can only be deployed in locations with well-defined entrance and exit points, such as a highway rest stop. They are also more expensive than comparable systems, both for initial installation and for maintenance of overhead gantries to support detection equipment at facility entrance and exit points.

### 8.3 Communication

Communicating the availability of truck parking to drivers can take many forms. Some are push methods, in that data is displayed to drivers whether they search for it or not; others require drivers to actively pull information from a database.

Dynamic Message Signs (DMS) are a common push communication method that can address a myriad of needs. DMS are commonly used to relay traffic information, special event instructions, or other data or messages that change frequently. Since messages can be tailored, the signs are useful for a wide-range of purposes. However, the lack of a dedicated use means that truck parking information would compete with other messages for space.

Dynamic Parking Message Signs (DPMS) signs specific to truck parking, as shown in Figure 8.5 below, must be linked with a truck TPIMS in order to receive parking information for display. The TPIMS can draw data from any of the detection systems described above. These signs are typically limited to displaying parking availability, rather than a full suite of messages possible through traditional DMS. DPMS tend to have a higher capital and operation cost compared to static signage but a lower cost compared to a full DMS. However, despite the added costs, the Kansas Plan found this strategy to be best for maximizing utilization. A Michigan DOT study finished in 2016, "Evaluation of MDOT Truck Parking Information and Management System" also found that drivers on the I-94 corridor showed a preference for DPMS over other information display systems.<sup>56</sup>

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<sup>54</sup> See Cambridge Systematics, Port of Oakland GoPort! Freight Intelligent Transportation Systems Project for details on current vendors and models.

<sup>55</sup> <http://www.dot.state.mn.us/ofrw/PDF/assessing-truck-parking.pdf>

<sup>56</sup> [https://www.michigan.gov/documents/mdot/MDOT\\_Truck\\_Parking\\_Project\\_Report\\_528340\\_7.pdf](https://www.michigan.gov/documents/mdot/MDOT_Truck_Parking_Project_Report_528340_7.pdf)

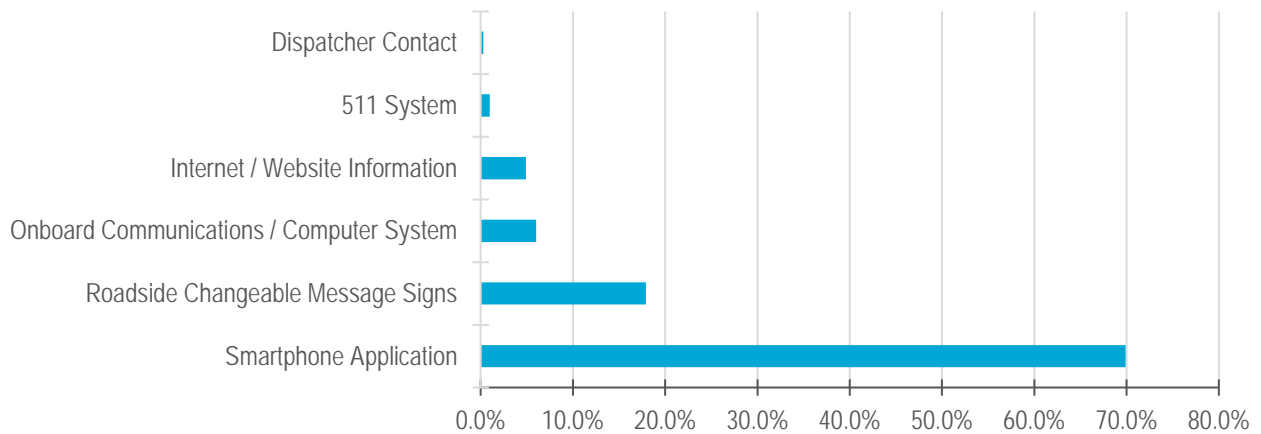
**Figure 8.5 TPIMS Monitoring Equipment (left) and Dynamic Real-Time Message Sign (right)**



Source: Kansas Statewide Freight Network Truck Parking Plan; photo from Michigan DOT.

Web-based and smartphone applications are examples of pull information systems which require some amount of active participation by the driver. A recent survey of 761 drivers by ATRI noted a preference for information available through a smartphone application, shown in Figure 8.6.

**Figure 8.6 Preferred Method of Receiving Real-Time Parking Information**



Source: North Carolina Truck Parking Survey, NCDOT, and ATRI

One example of a popular app is Trucker Path, which launched in 2013. Trucker Path offers crowd-sourced trip planning information for truck drivers with over 600,000 downloads. The app allows drivers to find and report truck parking availability; leave reviews on truck stops, report weigh station status, and identify truck wash facilities. A similar app is Roadbreakers, which collects crowdsourced data identifying areas for overnight truck parking locations. In addition to identifying locations, it allows users to comment on the quality of the parking location and report any problems with the area.

One of the advantages of developing smart phone apps is the low capital cost. Mid-America Freight Coalition's (MAFC) "Low Cost Strategies for Short Term Parking on Interstate Highways of the MVFC" (2015) found that a Michigan pilot project could develop a suitable smart phone app for roughly the same as two variable message signs. Once the app has been developed, the marginal cost of each additional user is significantly less than acquiring more signage.

Websites that are accessible from a smart phone or laptop can also play a supporting role in planning for truck parking. Mid-America Freight Coalition's 2015 Study notes that while drivers do most of the planning for truck parking while on the road, well-designed websites can help drivers identify parking options ahead of time, particularly in new areas. Not only is it inexpensive to develop a website, but it is also accessible to anyone with an Internet connection, with or without a smart phone. Other inexpensive options to communicate with truck drivers include radio broadcasts and 511 services, though it is difficult to convey relevant information for truckers in all parts of the state at any given time.

## 8.4 Reservation Systems

Reservation systems that allow truck drivers to pay for and hold a spot in a specific lot have a growing presence in the truck parking world. Although a number of surveys and studies<sup>57</sup> have indicated that truckers generally have a limited desire to pay for parking, the systems do provide a sense of certainty, especially for drivers who operate over a known, regular route with a limited amount of variability in travel times where scheduling a stopping place in advance is possible. Interviews with truck stops in Nevada that offer reservations reveal that they sell out during winter storm events or other times when parking is in high demand—otherwise parking is rarely reserved

One of the first tests of this concept was the FMCSA SmartPark demonstration. This project provided real-time parking information to drivers stored and matched with location/routing data and pushed out to drivers via multiple avenues including phone, wireless device, web site, and on-board computers. Two technology models were explored in detail:

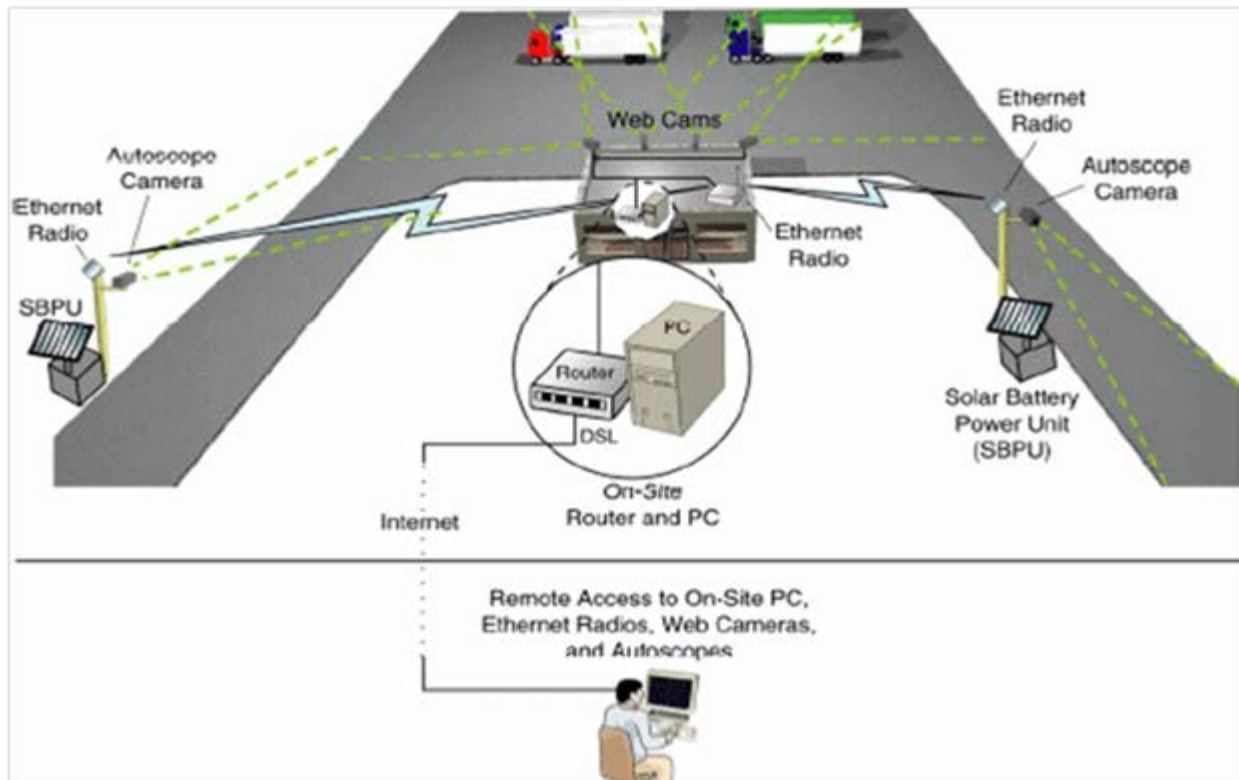
- A Foster-Miller, Inc. test of a vehicle imaging technology-based smart-truck parking system applied to public rest stops (see Figure 8.7); and
- A Vehicle Sense, Inc. test of a magnetometer technology-based smart-truck parking system applied to private truck stops.

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<sup>57</sup> A recent example is WSDOT's Truck Parking Study, found here: <http://www.wsdot.wa.gov/NR/rdonlyres/A72C532D-B825-4757-B4BE-F00ABF93A6D6/0/TruckParkingStudyFinal.pdf>



**Figure 8.7 Foster-Miller Concept for U.S. DOT Smart Park Testing**



Source: FRATIS Concepts of Operations. 2012.

Multiple models exist on the private sector front. First, some truck stop operators run a reservation system for their own lots. For example, Pilot FlyingJ offers “Prime Parking” at approximately 390 locations nationwide, 2 of which are in Nevada (one in Fernley, one in Winnemucca).<sup>58</sup> Travel Centers of America also operates a similar program through the TruckSmart smartphone application using “Reserve-It!”<sup>59</sup>. Reservations can be made up to 30 days in advance. There are five locations offering this service in Nevada—TA Sparks, TA Mill City, Petro Wells, TA Las Vegas, and TA North Las Vegas. Holdingpen.com has developed a similar system in the Fontana, CA area. HoldingPen.com’s facility was developed in response to strict local ordinances in the Inland Empire region forbidding commercial vehicles from parking on the street. The new facility uses license plate recognition technology to capture plate data at the entry gate. The system transmits the information to a server, which then exports the information to automated billing and other back office systems, reducing the paperwork requirements for drivers and ensuring they only pay for space they use.<sup>60</sup>

Newer services aggregate parking across multiple operators, including those that do not operate as truck stops. TruckPark<sup>61</sup> is an example of this approach currently operating in the Chicago, IL region. Lots in this reservation system typically do not have the amenities available at the commercial truck stops, but do offer

<sup>58</sup> <https://pilotflyingj.com/prime-parking/>

<sup>59</sup> <https://www.ta-petro.com/amenities/reserve-it-parking>

<sup>60</sup> <http://www.holdingpen.com/Fontana.htm>

<sup>61</sup> <http://www.truckpark.com/>

large, safe, secure lots with camera surveillance. Some locations have a parking lot attendant on-site. Truck Specialized Parking Services is offering similar capabilities along the I-94 corridor in Michigan, with plans to expand to additional corridors.<sup>62</sup>

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<sup>62</sup> <http://tsps.io/>