Working Paper 3

Arizona Truck Parking Supply, Demand, and Needs Analysis

Working Paper 3: Truck Parking Supply, Demand, and Gaps

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Arizona Department of Transportation

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Trucker Path

Solutions for growing economies

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Opinions

Unless otherwise indicated, the opinions herein are those of the author and do not necessarily reflect the views of ADOT or the State of Arizona.

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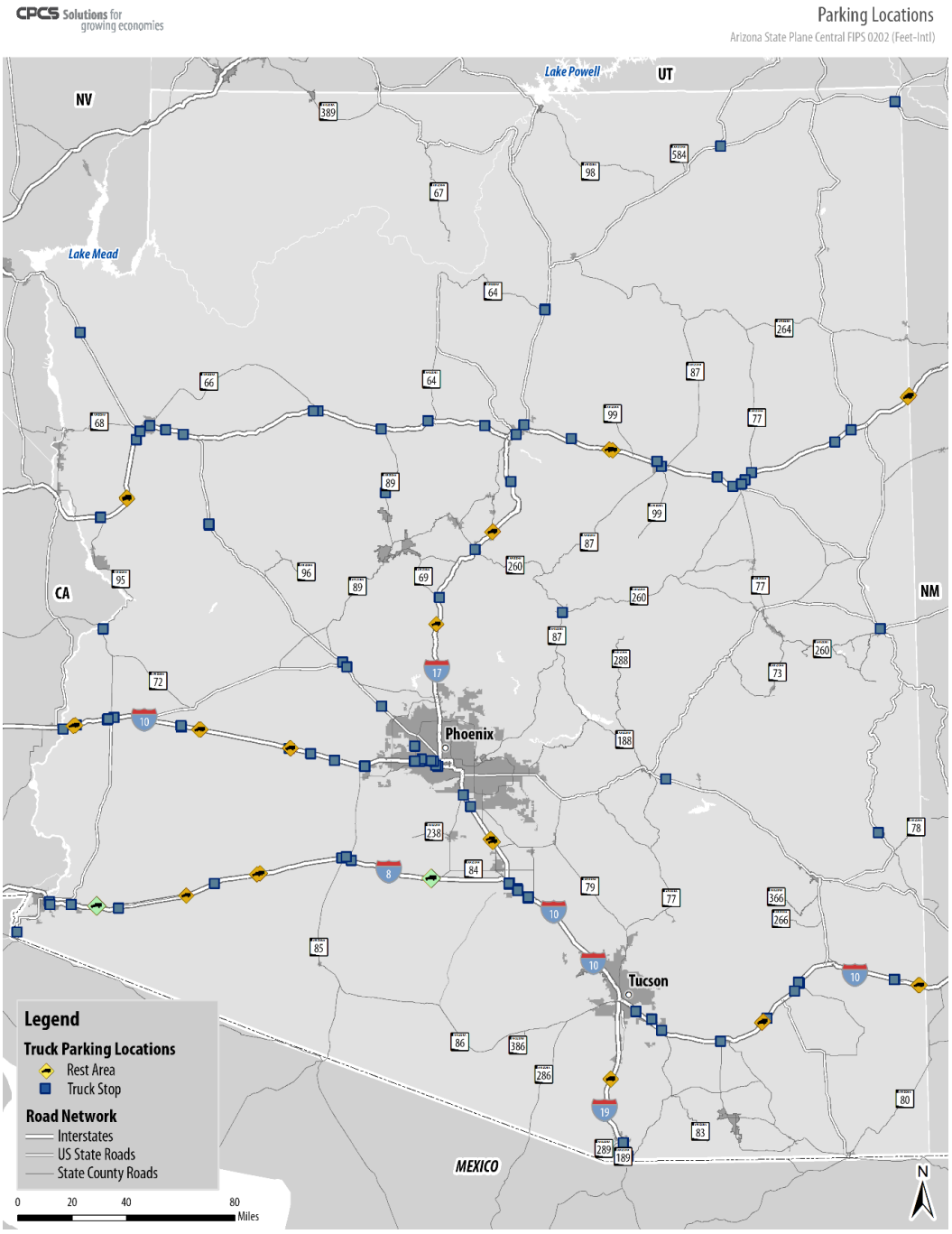
Acronyms / Abbreviations

ADOT	ARIZONA DEPARTMENT OF TRANSPORTATION
ATRI	AMERICAN TRANSPORTATION RESEARCH INSTITUTE
EB	EASTBOUND
ELD	ELECTRONIC LOGGING DEVICES
HOS	HOURS OF SERVICE
MAASTO	MID AMERICA ASSOCIATION OF STATE TRANSPORTATION OFFICIALS
MAP-21	MOVING AHEAD FOR PROGRESS IN THE 21ST CENTURY ACT
NB	NORTHBOUND
OOIDA	OWNER OPERATOR INDEPENDENT DRIVERS ASSOCIATION
ROW	RIGHT OF WAY
SB	SOUTHBOUND
STIP	STATE TRANSPORTATION IMPROVEMENT PROGRAM
TA	TRAVEL CENTERS OF AMERICA
TPIMS	TRUCK PARKING INFORMATION SYSTEM
VMS	VARIABLE MESSAGE SIGNS
WB	WESTBOUND

Executive Summary

Arizona has 98 truck parking locations providing over 7,030 truck parking spaces statewide (ES-1). Almost 93 percent of spaces are provided by the private sector, meaning there are over 12 truck parking spaces provided at private truck parking locations for each space provided by the Arizona Department of Transportation (ADOT).

ES-1: Truck Parking Locations In Arizona



Public Truck Parking Supply

ADOT provides 523 public truck parking spaces (over 7 percent) statewide, split between rest areas, overflow lots at rest areas, and parking only location that have no amenities (ES-2).

ES-2: ADOT Truck Parking Spaces by Type

Type of Truck Parking	Spaces	Proportion of Total
Rest Areas-Marked Spaces	454	86.8%
Rest Areas-Overflow Lots	47	9.0%
Parking Only	22	4.2%
Total	**523**	**100%**

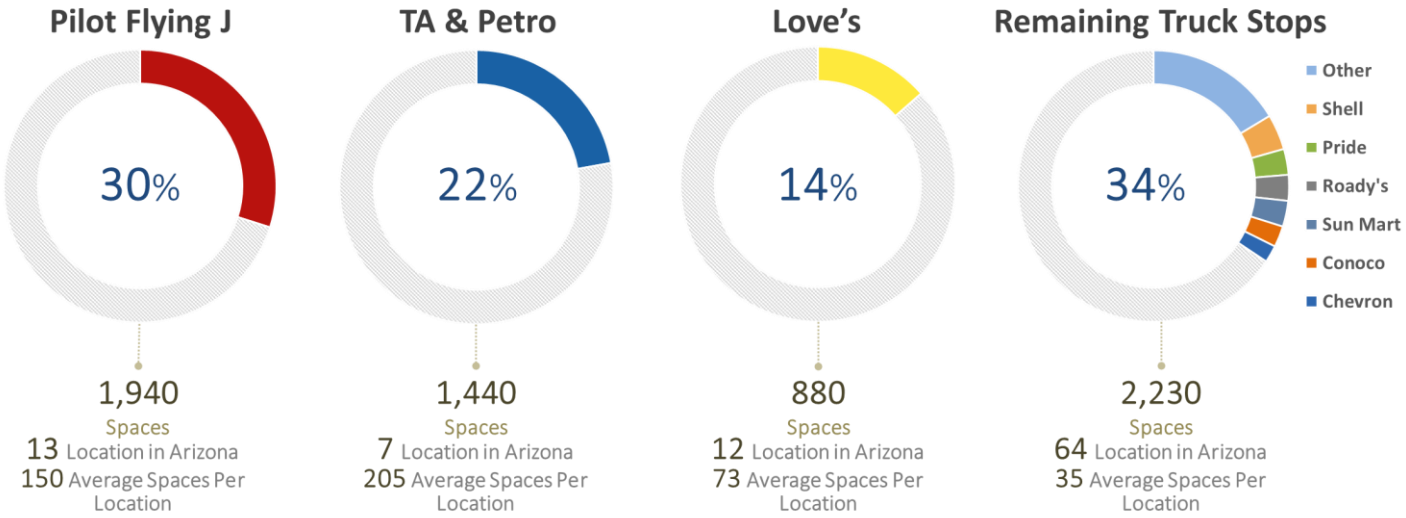
Source: CPCS

In addition to these designated truck parking locations, trucks park at brake check areas, closed rest areas, and other roadside facilities. These are examples of undesignated truck parking that are not included in the total number of truck parking spaces statewide.

Private Truck Parking Supply

Private truck stops provide 6,511 truck parking spaces. As shown in ES-3, Pilot Flying J, TA-Petro, and Loves provide almost 65 percent of private truck parking spaces, all of which are located near interstates. The concentration of 65 percent of private truck parking spaces at 32 locations displays the role of public and other smaller private truck parking locations, in providing truck parking in underserved portions of the state.

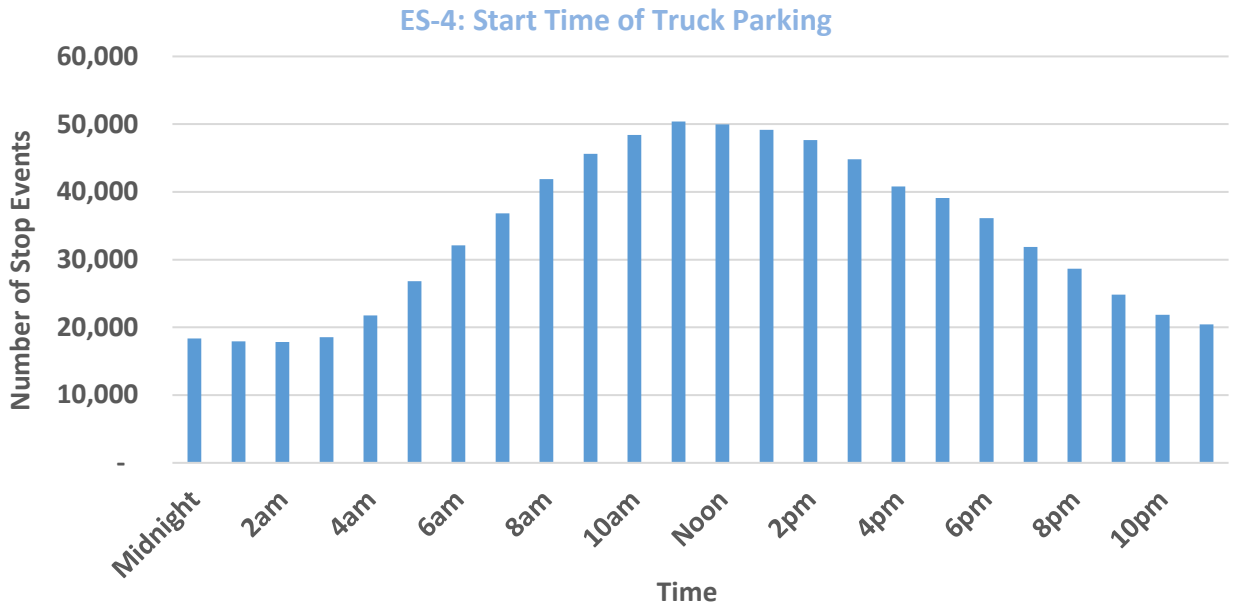
ES-3: Private Truck Parking Spaces by Company



Truck Parking Demand

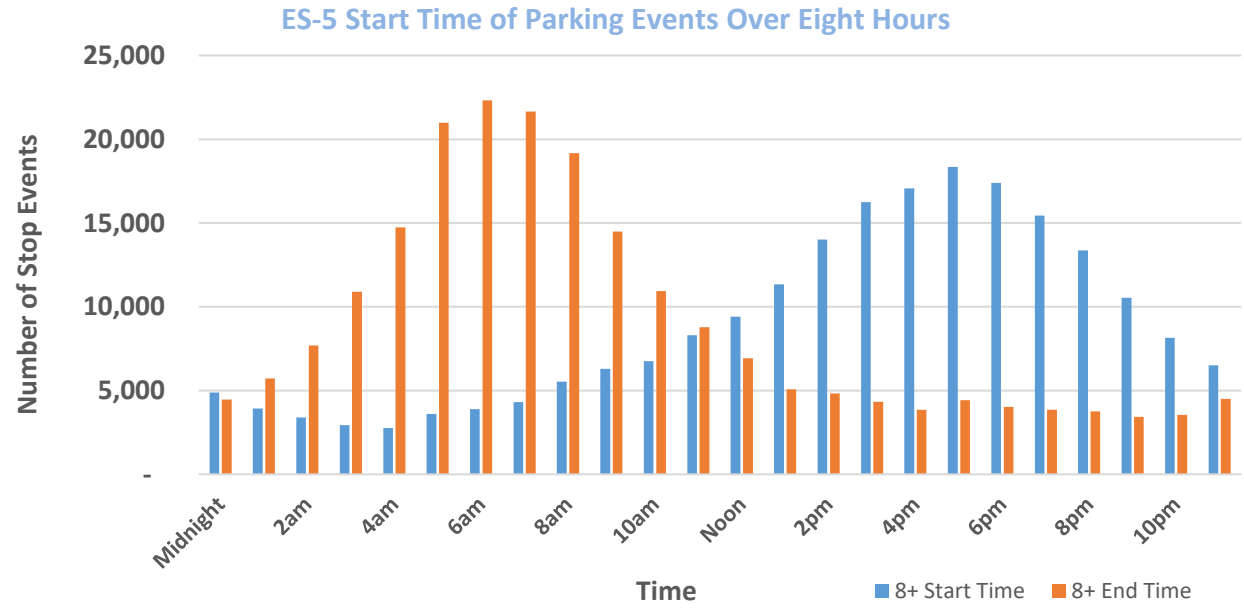
Truck parking demand varies depending on the reason a driver is stopping (regulatory compliance, staging, food/fuel, etc.). ES-4 displays the time of day trucks stopped in Arizona during an eight-week sample of truck GPS data. The graph is centered around noon which matches that over 65 percent of truck stops were less than three hours. A stop of three hours

or less is likely for a 30-minute break, food, fuel, or loading/unloading cargo. Many of these activities are likely associated with the operating hours of businesses serving these operations.



Source: CPCS Analysis of ATRI Truck GPS Data

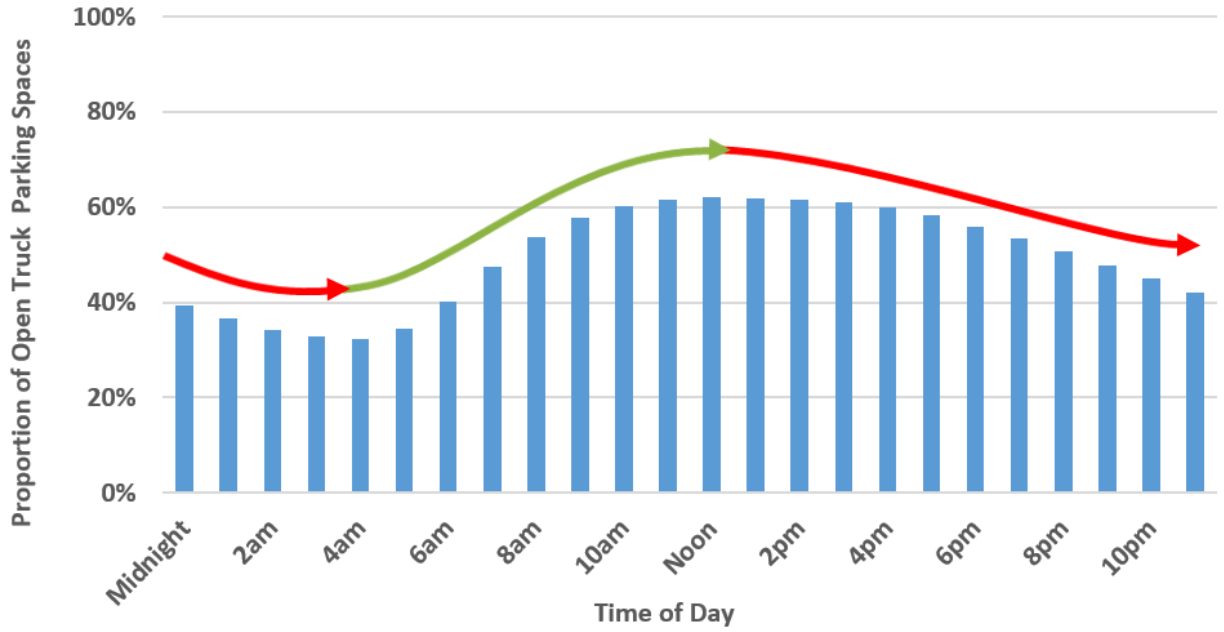
In contrast, ES-5 displays the start time and end time of parking events that are over eight hours. The start time for trucks parking over eight hours is centered around 5pm. The end time of a truck parking events over eight hours is centered around 6am, meaning trucks are parked overnight when demand for truck parking is highest.



Source: CPCS Analysis of ATRI Truck GPS Data

ES-6 displays the low point in truck parking availability occurs at 4am and suggests that Arizona has available truck parking even during the times when demand is highest. It is possible that available truck parking spaces are not known by some drivers or spaces could be located in areas with low truck parking demand.

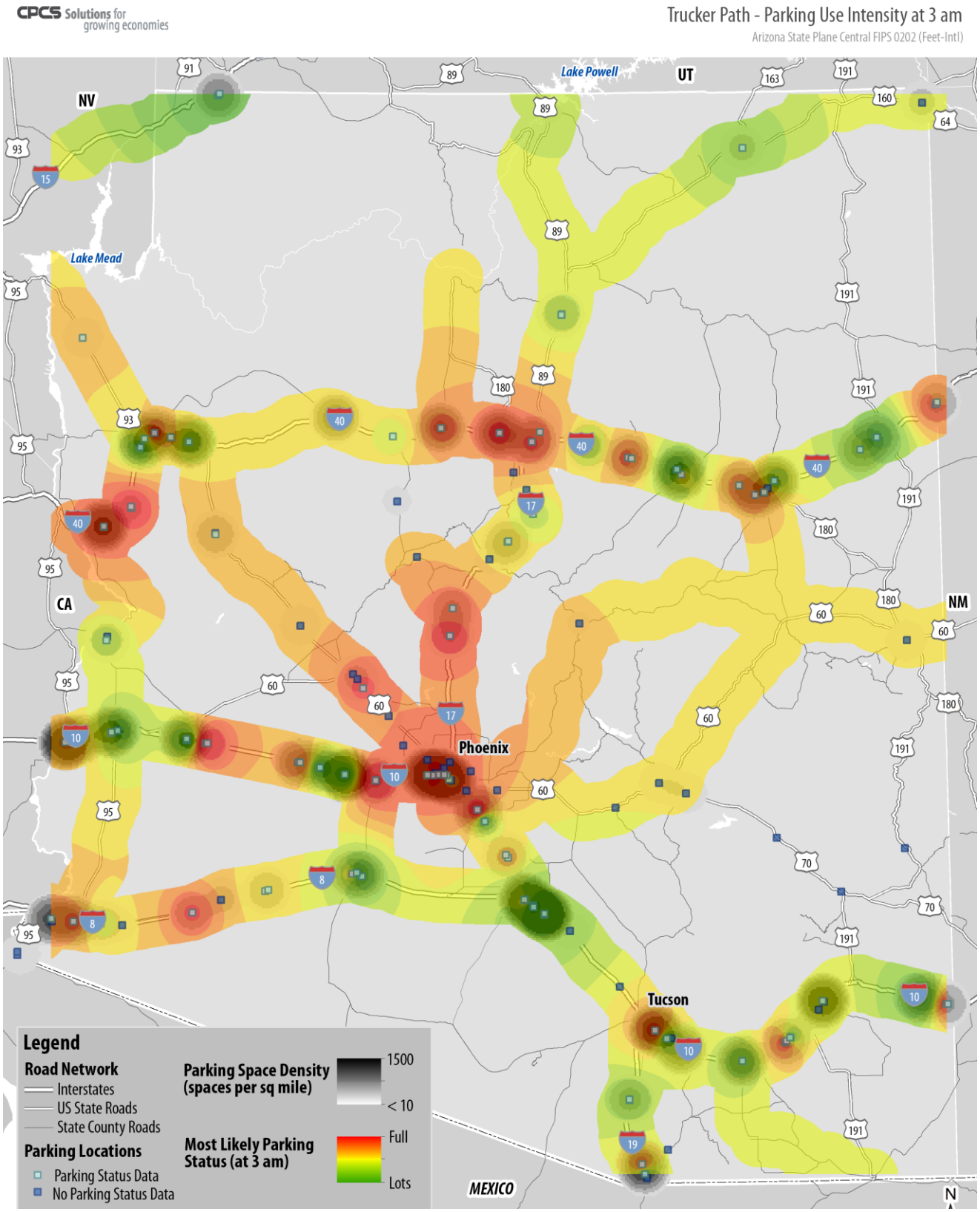
ES-6: Daily Truck Parking Availability



Source: CPCS Analysis of Trucker Path Data

ES-7 displays the availability of truck parking on Arizona's major roadways at 3am. Green indicates truck parking is available, yellow indicating there is some truck parking available, and red indicating that there is little to no available truck parking at a nearby facility. By 3am, the majority of the state is in red or yellow, with pockets of available truck parking in rural areas and locations with significant capacity, such as the area from Casa Grande to Elroy on I-10, which has over 1,000 truck parking spaces within ten miles.

ES-7: Truck Parking Demand at 3am



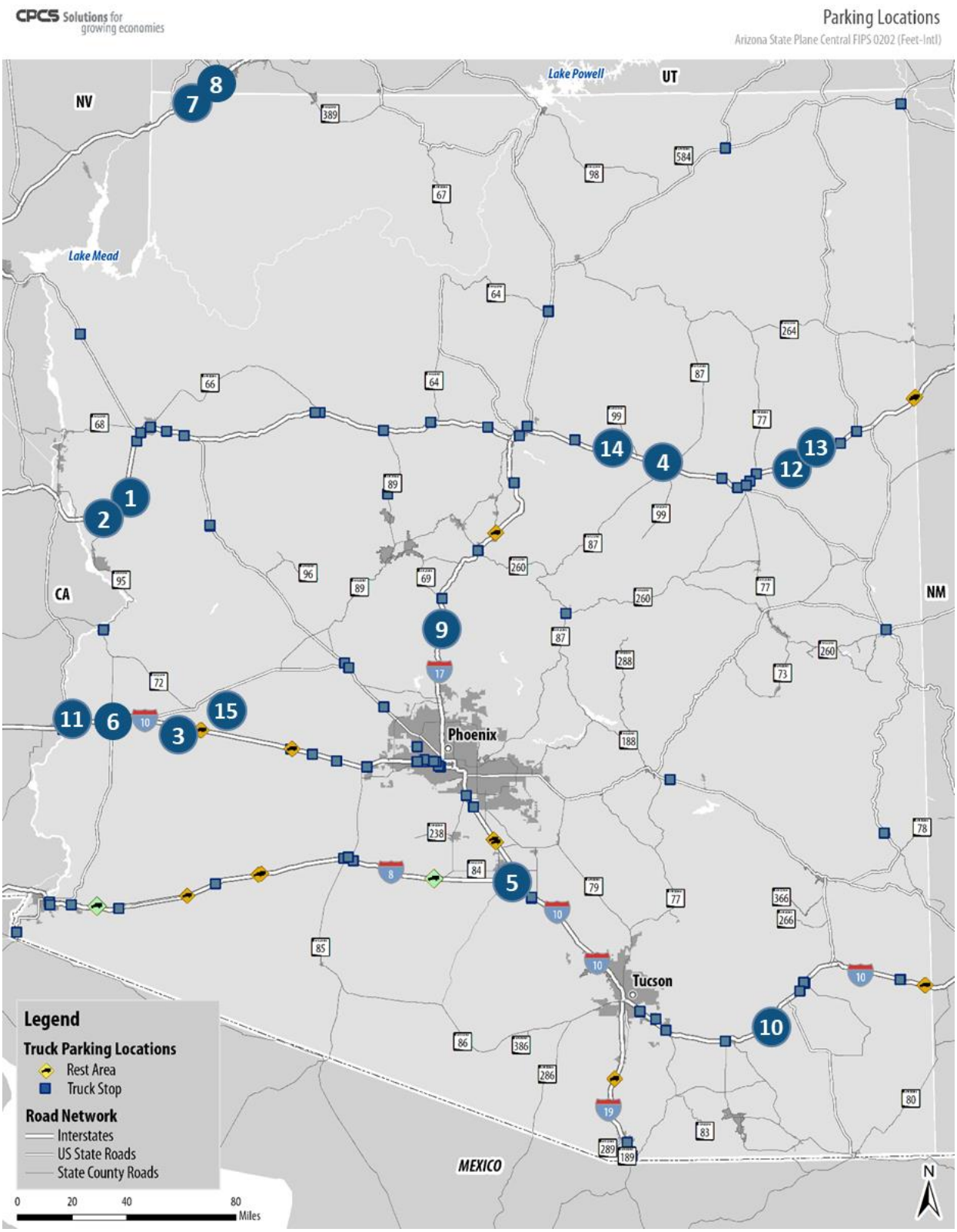
Undesignated Truck Parking

Eight weeks of truck GPS data were used to identify where, when, and how long trucks parked in Arizona. The project team identified over 100 clusters of undesignated truck parking. Using the cluster analysis of undesignated truck parking, the project team identified the following observations:

- Undesignated parking near designated truck parking –trucks parked around designated truck parking locations, such as the on/off ramps for rest areas, as well as gravel lots.
- Undesignated truck parking at gravel lots –Trucks parked at locations alongside major roadways, as well as near off ramps.
- Undesignated truck parking using on/off ramps at interchanges – Trucks using on and off ramps for truck parking locations throughout the state.
- Undesignated truck parking at closed or limited access facilities – Trucks parking at closed rest areas, weigh stations, brake areas, and emergency pull offs, among others. Most of the closed or limited access facilities do not have on or off ramps, making exiting or entering the traffic stream unsafe.

ES-8 displays the top 15 locations of undesignated truck parking based on the number of trucks observed parking in undesignated locations. Incorporating truck parking availability from ES-7 into the observed undesignated truck parking in ES-8 reveals locations, such as the area around numbers one and two, could benefit from an information system informing drivers about available parking near Kingman. Conversely, areas such as the Sunset Point Rest Area (number nine in ES-8), have limited capacity at all nearby truck parking locations, suggesting capacity is needed. Finally, undesignated truck parking at roadside facilities, such as roadside table tops or gravel lots (number eight in ES-8) present an opportunity to develop formalized truck parking locations. Overall, the findings of this working paper suggest that truck drivers traveling in Arizona would benefit from an information system about available parking capacity. That said, some corridors have insufficient capacity to meet demand, necessitating both information and capacity solutions to address truck parking needs in Arizona.

ES-8: Top 15 Undesignated Truck Parking Locations



1 Introduction

1.1 Background and Objectives

The Arizona State Freight Plan identified inadequate truck parking facilities as a major issue affecting the safety and efficiency of freight movement in Arizona, particularly on I-17 between Phoenix and Flagstaff, and on I-10 between Tucson and the California border. This issue was identified through consultations with truck drivers and trucking companies, as well as a growing body of state and national research on truck parking issues.

A lack of adequate truck parking often prompts truck drivers to park on highway shoulders, entrance or exit ramps, vacant property, or local surface streets. These parking behaviors can negatively impact highway safety, infrastructure condition, public safety, and quality of life. Existing truck parking shortages may be exacerbated by current trends and future changes to freight policies. For example, trucking industry executives in Arizona expect parking conditions to deteriorate in the future as Electronic Logging Devices (ELD) are fully implemented, and as the volume of truck traffic increases faster than the development of dedicated truck parking spaces.

The objective of this project is to provide an in-depth analysis of the truck parking issues identified in the Arizona State Freight Plan. The plan will provide the groundwork to enable the Arizona Department of Transportation (ADOT) and its stakeholders to develop strategies to address inadequate truck parking.

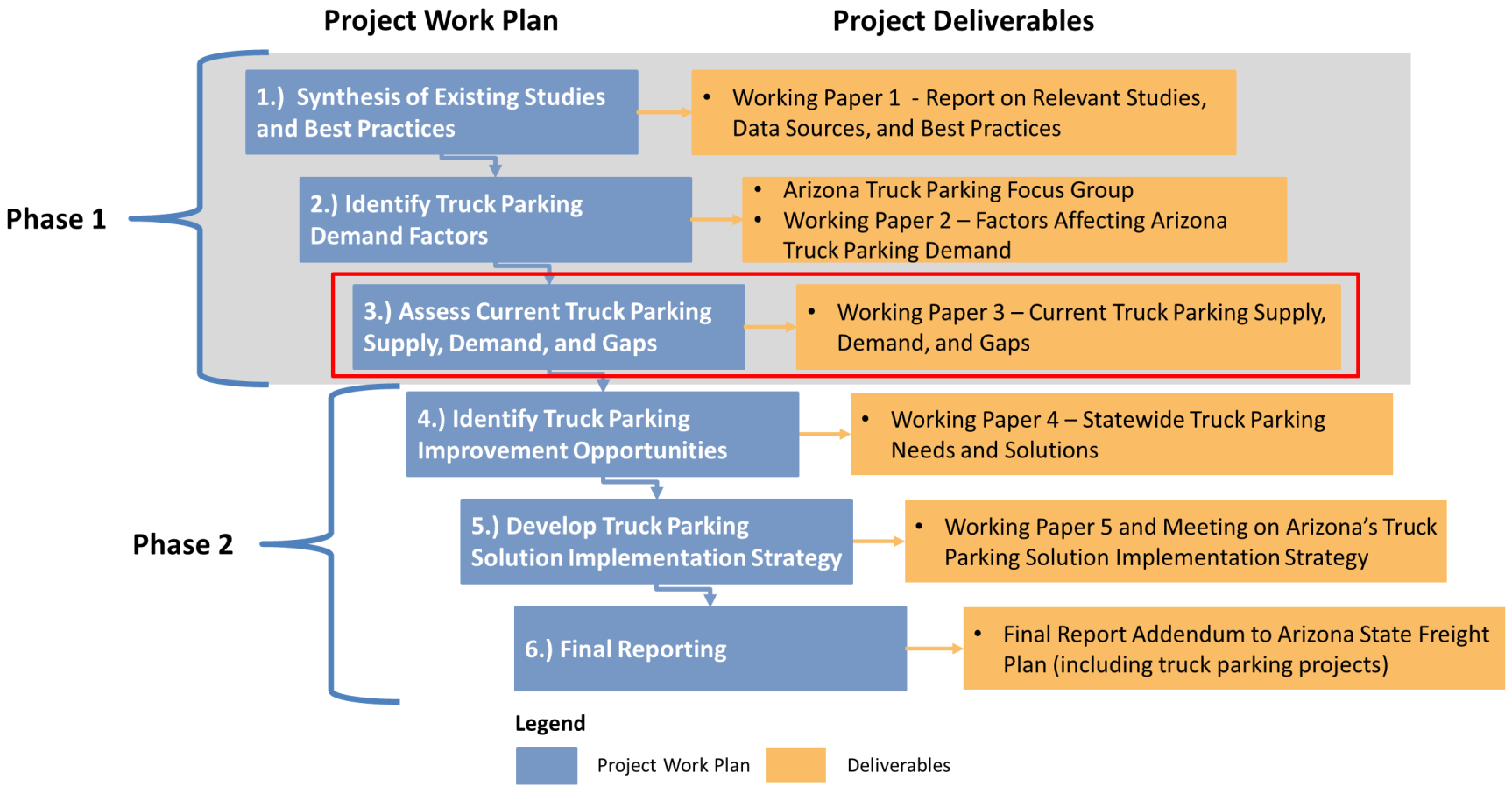
This study assesses current truck parking conditions and identifies gaps between truck parking supply and demand, defines infrastructure and policy needs, and proposes potential capacity and technology solutions.

Through the use of real-time truck parking data and consultations with the trucking industry, law enforcement, and truck stop operators, this study will identify where trucks are parking in Arizona and how the ELD mandate may impact Arizona. Ultimately, the study will identify the gap between the supply and demand for safe truck parking spaces, associated infrastructure and policy needs, and potential capacity and technology solutions to resolving them.

1.2 Project Structure

The Arizona Truck Parking Supply, Demand, and Needs Analysis will be developed in two broad phases, with six work tasks (Figure 1-1). The present Working Paper is part of Phase 1 and is the output of Task 3: Assess Current Truck Parking Supply, Demand, and Gaps.

Figure 1-1: Project Work Plan



1.3 Purpose of this Working Paper

The purpose of this Working Paper is to identify the supply, demand, and gaps in truck parking. In order to identify these factors, this Working Paper answers the following key questions:

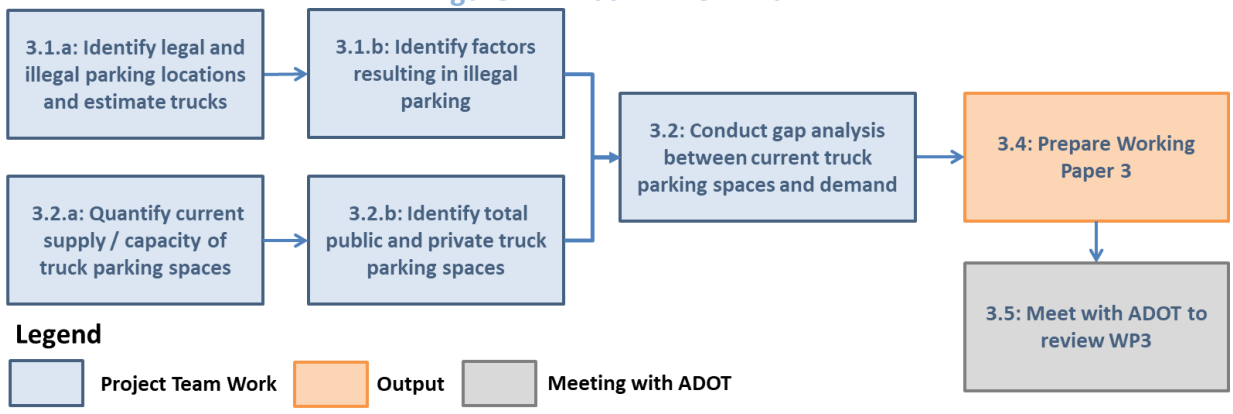
- What is the current capacity of truck parking in Arizona?
- Where are trucks currently parking in Arizona and are they parking legally or illegally (e.g. rest area on-ramp and off-ramp shoulder parking)?
- For legal parking, what is the magnitude of overcrowding at public truck parking locations, including rest areas?
- For illegal parking, what are the factors resulting in illegal parking (insufficient supply, lack of information, etc.)?
- What are the gaps between current truck parking supply and demand of safe and legal truck parking spaces?
- Where are the gaps most acute, by corridor and general location?
- What is the deficit of parking spaces statewide?

This Working Paper is also intended to provide ADOT with an overview of progress to date and to solicit comments and other feedback on the structure and content of this component part of what will become the final report.

1.4 Methodology

This working paper was prepared using consultations with trucking industry representatives, a survey of truck drivers, a literature review, and analyses of truck traffic and economic data. Key sources of information include an online survey and ADOT's truck traffic records. Figure 1-2 provides an overview of Task 2's workflow.

Figure 1-2: Task 2 Work Plan



1.5 Limitations

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

2 Arizona Truck Parking Capacity

2.1 Introduction

Consultations with trucking industry representatives and a survey of truck drivers operating in Arizona revealed that 67 percent of truck drivers reported parking in undesignated areas at least one time per week. Trucks parking in undesignated areas is an indication of a mismatch in the supply and demand for truck parking or the availability of information about the location and availability of truck parking. For example, trucks parking on interchanges could indicate a lack of available parking at nearby rest stops or truck stops.

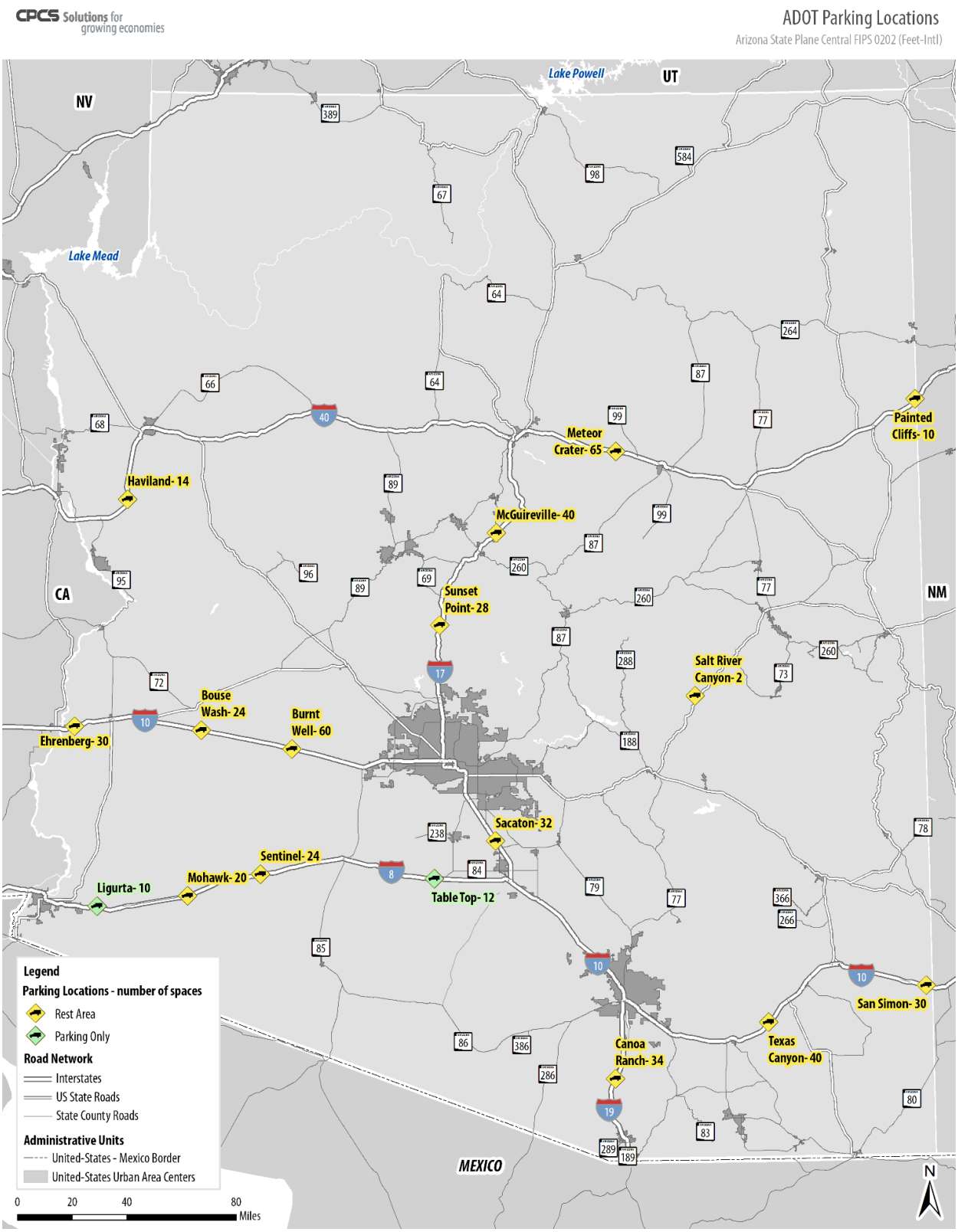
The difference between a "designated" and "undesignated" truck parking location is whether the public or private owner/operator allows truck drivers to use the location for parking. For example, a truck stop is a designated truck parking location, whereas the shoulder of a roadway is an undesignated truck parking location.

The research team's analysis of truck parking in Arizona also identified the need to differentiate types of designated and undesignated truck parking. Designated truck parking is broken into public and private based on ownership. Both public and private truck parking must be open to the public to be included in the scope of this research. Therefore, parking facilities reserved for a trucking company's vehicles are not included in this study (private-only truck parking). While private-only truck parking facilities are a portion of Arizona's total statewide truck parking spaces, the exclusive nature of private-only truck parking facilities limits their use as a publically available resource. The project team implemented these definitions to identify Arizona's public and private truck parking, as well as, where trucks are parking in undesignated areas. These initial steps lay the groundwork and provide context for our analysis of trucks parking in undesignated areas, the identification of issues, and the potential locations for solutions.

2.2 Public Truck Parking Locations

While there are public truck parking locations owned by local governments or other state agencies, the focus of this Working Paper is truck parking locations owned, operated, and maintained by ADOT. Figure 2-1 displays public truck parking locations in Arizona, differentiated by whether the location is a rest area or a parking only location. The primary difference between a rest area and "parking only" location is the availability of amenities, such as bathroom facilities.

Figure 2-1: Public Truck Parking Locations



2.2.1 Rest Areas in Arizona

As shown in Figure 2-2, ADOT has 27 discrete locations, some of which have facilities with truck parking, for a total of 454 designated truck parking spaces.

Figure 2-2: Truck Parking Spaces at Rest Areas by Corridor

Rest Area Name	Corridor	Milepost	Parking Spaces
Mohawk Rest Area EB	I-8	56	10
Mohawk Rest Area WB	I-8	56	10
Sentinel Rest Area EB	I-8	83	12
Sentinel Rest Area WB	I-8	83	12
Total			44
Ehrenberg Rest Area EB	I-10	5	15
Ehrenberg Rest Area WB	I-10	5	15
Bouse Wash Rest Area EB	I-10	53	12
Bouse Wash Rest Area WB	I-10	53	12
Burnt Well Rest Area EB	I-10	86	30
Burnt Well Rest Area WB	I-10	86	30
Sacaton Rest Area EB	I-10	182	17
Sacaton Rest Area WB	I-10	182	15
Texas Canyon Rest Area EB	I-10	320	21
Texas Canyon Rest Area WB	I-10	320	19
San Simon Rest Area EB	I-10	388	15
San Simon Rest Area WB	I-10	388	15
Total			216
Sunset Point Rest Area	I-17	252	28
McGuireville Rest Area NB	I-17	297	20
McGuireville Rest Area SB	I-17	297	20
Total			68
Canoa Ranch Rest Area SB	I-19	34	20
Canoa Ranch Rest Area NB	I-19	34	14
Total			34
Haviland Rest Area EB	I-40	23	7
Haviland Rest Area WB	I-40	23	7
Meteor Crater Rest Area EB	I-40	235	33
Meteor Crater Rest Area WB	I-40	235	32
Painted Cliffs Rest Area WB	I-40	358	11
Total			90
Salt River Canyon Rest Area	US 60	293	2
Total			2
Statewide Total Truck Parking			**454**

Source: CPCS

I-10 has the largest proportion of total truck parking spaces provided at rest stops with almost 48 percent. I-40 has the second highest proportion of public truck parking spaces at rest areas with almost 20 percent.

I-10 and I-40 also have some of the highest truck traffic counts, making truck parking spaces critical to the safety and operation of these corridors. Additionally, I-10 and I-40 serve as national freight corridors, providing connections with California, Texas, and a route to the Midwest. The role of I-10 and I-40 as national corridors means many trucks are traveling through the state and will require truck parking as they reach the end of their hours of service (HOS).

Rest Stop Overflow Lots

In addition to the 454 designated truck parking spaces, ADOT created overflow lots to supplement existing truck parking at Meteor Crater, Canoa Ranch, and Sentinel Rest Areas. Overflow lots consist of a mix of pavement millings, rock, and soil. These unpaved areas functionally expand truck parking, but are not designated as truck parking spaces by signage or space markings.

Figure 2-3 and Figure 2-4 display a satellite view of Meteor Crater Rest Areas on the Eastbound (EB) and Westbound (WB) sides of I-40, with overflow lots marked in red. Meteor Crater overflow lots can accommodate an additional ten trucks on both sides. Therefore, the Meteor Crater Rest Area (both directions) has 85 total truck parking spaces.

Figure 2-3: Meteor Crater Rest Area EB

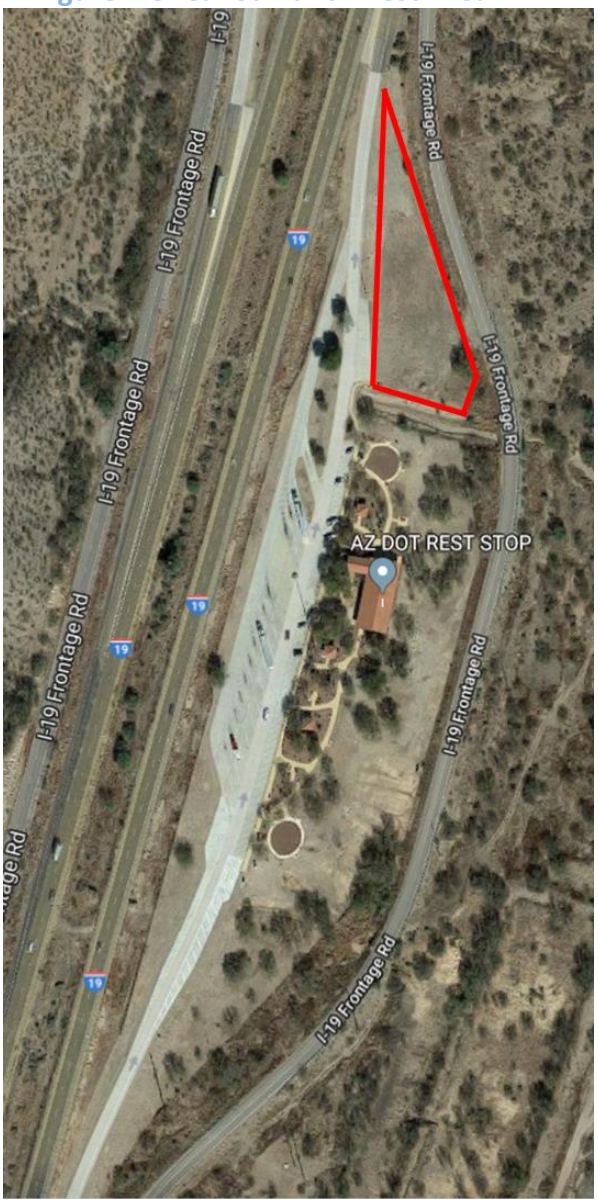
Source: Imagery ©2018 Google, Map data ©2018 Google

Figure 2-4: Meteor Crater Rest Area WB

Source: Imagery ©2018 Google, Map data ©2018 Google

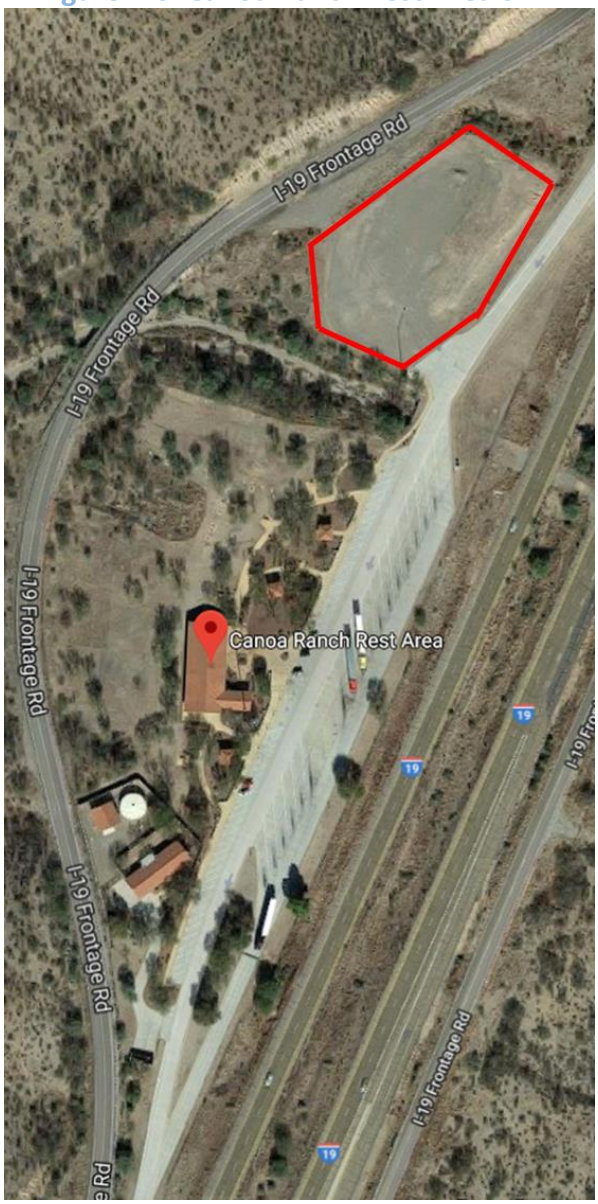
Similarly, Figure 2-5 and Figure 2-6 display the overflow lots on the Northbound (NB) and Southbound (SB) sides of I-19 at the Canoa Ranch Rest Area. The overflow lots can accommodate about six trucks at both of the rest areas, increasing the total truck parking spaces from 34 designated spaces to 46 spaces.

Figure 2-5: Canoa Ranch Rest Area NB



Source: Imagery ©2018 Google, Map data ©2018 Google

Figure 2-6: Canoa Ranch Rest Area SB



Source: Imagery ©2018 Google, Map data ©2018 Google

Lastly, Sentinel Rest Area has an overflow lot on the EB side of I-8 that is able to accommodate about 15 trucks (Figure 2-7). The addition of the overflow lot more than doubles the truck parking at Sentinel from 12 truck parking spaces to 27.

As shown in Figure 2-8, adding overflow lots to existing rest areas provides 47 additional truck parking spaces, bringing the total number of truck parking spaces at Arizona rest areas to 501 spaces.

Figure 2-7: Sentinel Rest Area EB

Source: Imagery ©2018 Google, Map data ©2018 Google

Figure 2-8: Overflow Lot Locations and Total Spaces

Rest Area	Number of Overflow Spaces
Meteor Crater EB and WB	20
Canoa Ranch NB and SB	12
Sentinel Rest Areas EB	15
Total Truck Parking Spaces at Overflow Lots	47

Arizona rest stops have an average of 17 truck parking spaces per location. Overflow lots are a cost-effective option for quickly adding truck parking spaces. To date, ADOT has added the equivalent of three rest areas worth of truck parking spaces through overflow lots.

While overflow lots provide a quick and cost-effective option to expanding truck parking, future projects could formalize the overflow lots to ensure truck drivers know the lots are available. Additionally, marking truck parking spaces could promote efficient use of the overflow lot.

2.2.2 Parking Only Locations

In addition to truck parking spaces at rest areas, ADOT owns, maintains, and manages two facilities that have truck parking, but provide no amenities on site. While these “parking only” locations offer little to no amenities, they are connected to roadways with appropriate infrastructure, such as on/off ramps. The connections to and from parking only locations are a critical component to trucks safely entering and exiting the traffic stream.

Two examples of ADOT owned, maintained, and managed parking only locations are the Ligurta Parking Area (milepost 22) and the Roadside Table Tops (milepost 22) on I-8. Figure 2-9 displays the EB and WB sides of the Ligurta Parking Areas on I-8. Ligurta has five designated truck parking spaces in both directions and only provides garbage cans for users of the parking area. Ligurta has long on/off ramps, enabling trucks to safely reduce their speed when entering the facility and accelerating when exiting the location. The project team identified 300 trucks parking at Ligurta during the eight-week truck GPS sample. About 41 percent of stops where a half-hour to one hour, 40 percent were from one to ten hours, and the remaining 19 percent of stops were over ten hours. It is noteworthy that the Ligurta Parking Area does not appear on ADOT's rest areas map, but is included in many truck parking applications and is signed as a parking area on I-8. Adding the Ligurta Parking Area to ADOT's rest areas map could increase its use as a truck parking location.

Truck GPS Data

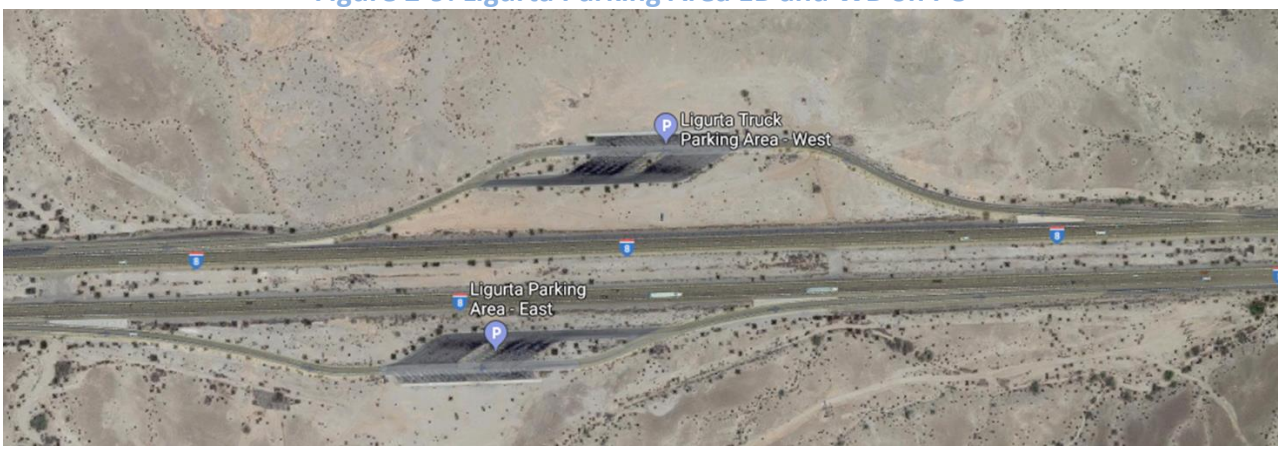
Truck GPS data from the American Transportation Research Institute (ATRI) was used to identify where, when, and how long trucks parked in Arizona. The project team identified the location and total duration of trucks stopping for over a half hour in Arizona during four separate two-week periods in 2017:

- January 28th to February 13th
- April 29th to May 15th
- July 29th to August 14th
- October 21st to November 6th

The project team identified almost 810,000 stops over a half hour in duration totaling almost five million hours of parking. The stops identified in the data set are a sample of trucks stopping in Arizona and include stops at rest stops, truck stops, warehousing and distribution centers, restaurants, and undesignated truck parking locations, among others.

Figure 2-10 and Figure 2-11 display the EB and WB Table Tops, respectively, on I-8. The Table Tops have about six truck parking spaces in both EB and WB directions depending on how trucks park. The Table Tops provide covered picnic tables and garbage cans on site. The project team identified 285 trucks using the Roadside Table Tops on I-8 during the eight-week period covered by the truck GPS data. Over 57 percent of stops at the Table Tops were from a half hour to an hour long and 33 percent were less than ten hours in duration. The Table Tops on I-8 are included on ADOT's rest areas map, but are signed as a picnic area on I-8.

Figure 2-9: Ligurta Parking Area EB and WB on I-8



Source: Imagery ©2018 Google, Map data ©2018 Google

Figure 2-10: Table Top EB on I-8

Source: Imagery ©2018 Google, Map data ©2018 Google

Figure 2-11: Table Top WB on I-8

Source: Imagery ©2018 Google, Map data ©2018 Google

The analysis of stops at Ligurta and the Table Tops on I-8 show they are used for short truck stops, staging, and long-term breaks. Ligurta was used more often for long rest breaks, while the Table Tops were used for short breaks, in line with the signage on I-8.

The project team reviewed other rest areas operated and maintained by ADOT or local agencies, but exploration of those sites revealed little to no space for truck parking, the locations often did not provide on/off ramps for trucks to safely enter and exit the location, and very few trucks were identified stopping at these locations in the truck GPS data. For example, ADOT also owns and maintains the Wikieup Table Top (milepost 122) on US 93. The Wikieup Table Top has very limited capacity to accommodate trucks, it is not marked for truck parking, and it does not have on/off ramps. Additionally, the project team identified only three trucks stopping at the Wikieup Table Top, all of which stopped for less than an hour.

Low or No Amenity Truck Parking

Other states such as Nebraska have embraced the development of low amenity truck parking spaces by developing truck parking where it had previously not existed or was not in service. Figure 2-12 displays a gravel lot occupying unused right of way (ROW) at the interchange of I-80 and US 138 in Nebraska. The gravel lot has no amenities beyond a couple of overhead lights. Additionally, the entrance to the location is located on the US 138, which has lower posted speed than I-80, requiring less entering and exiting infrastructure.

Figure 2-12: Low Cost Truck Parking Solution in Nebraska

Source: Imagery ©2018 Google, Map data ©2018 Google

2.2.3 Informal Truck Parking

In addition to rest areas and no amenity truck parking locations, Arizona has a series of informal truck parking locations. Informal truck parking locations are not listed on Arizona's Rest Area map and often do not have on/off ramps. Informal truck parking locations can take a variety of forms, including parking at brake check facilities, closed rest areas, and other roadside facilities. For example, even though the scenic view/brake check facility (milepost 313) shown in Figure 2-13 has limited space for truck parking and no officially marked spaces, the project team identified 343 trucks stopped at this location for time periods longer than a half hour, 55 of which parked longer than eight hours during the eight week GPS sample.

Figure 2-13: Scenic View Brake Check Area on I-17

Source: Imagery ©2018 Google, Map data ©2018 Google

Similarly, Figure 2-14 displays a safety pullout on I-40 (milepost 156) where the project team identified 358 trucks parked longer than a half hour, with almost 80 parked longer than two hours.

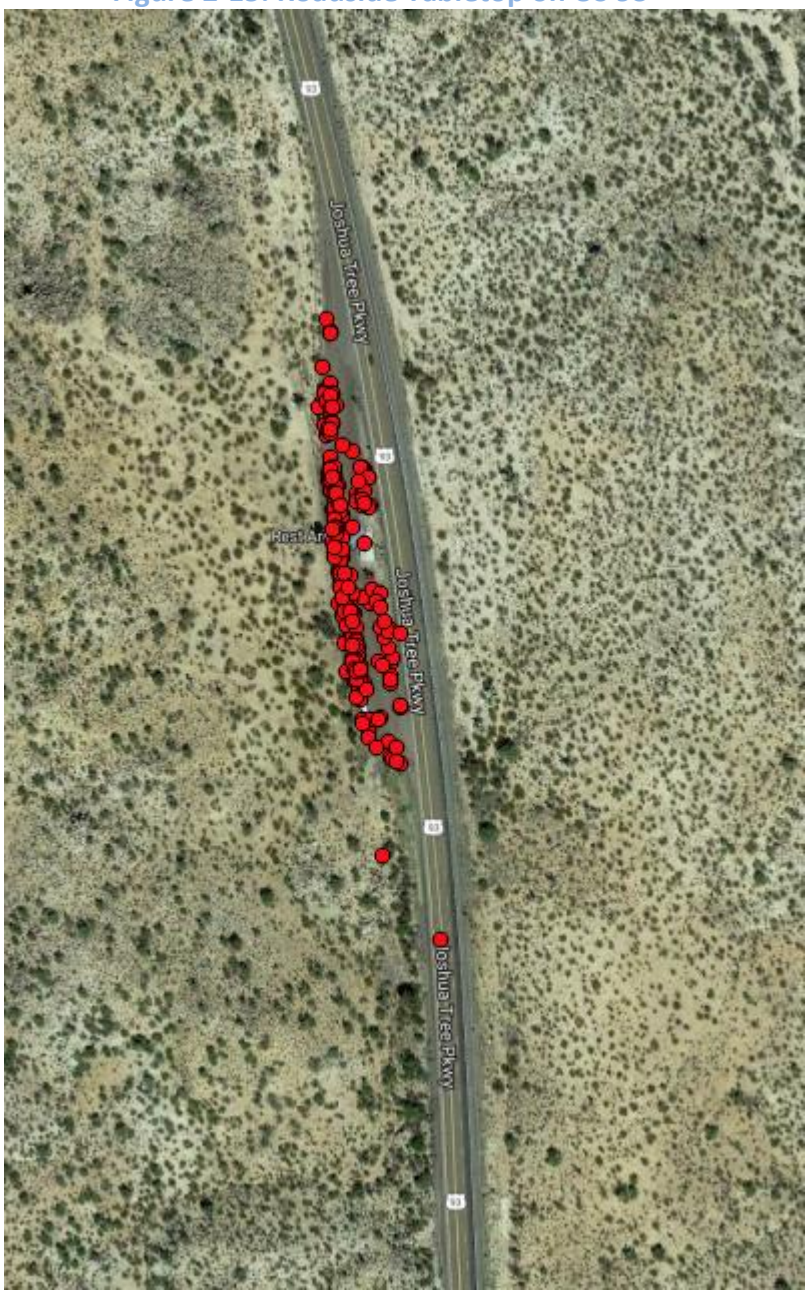
Figure 2-14: Safety Pullout on I-40

Source: CPCS Analysis of ATRI Data, Imagery ©2018 Google, Map data ©2018 Google

Figure 2-15 displays a Roadside Tabletop on US 93. The Tabletop is signed on US 93, but is not included on the ADOT Rest Areas Map and does not include on/off ramps. 217 trucks used the Tabletop during the eight week GPS sample, with 28 percent stopped for less than an hour, 32 percent parked for one to eight hours and 40 percent parked for over eight hours.

The examples of informal truck parking demonstrate truck drivers using roadway facilities to meet their truck parking needs. Informal truck parking is not included in the total number of statewide truck parking spaces summarized in this report, but identifying areas where informal truck parking is prevalent both identifies unmet truck parking demand, as well as the location where truck parking could be formalized.

Figure 2-15: Roadside Tabletop on US 93



Source: CPCS Analysis of ATRI Data, Imagery ©2018 Google, Map data ©2018 Google

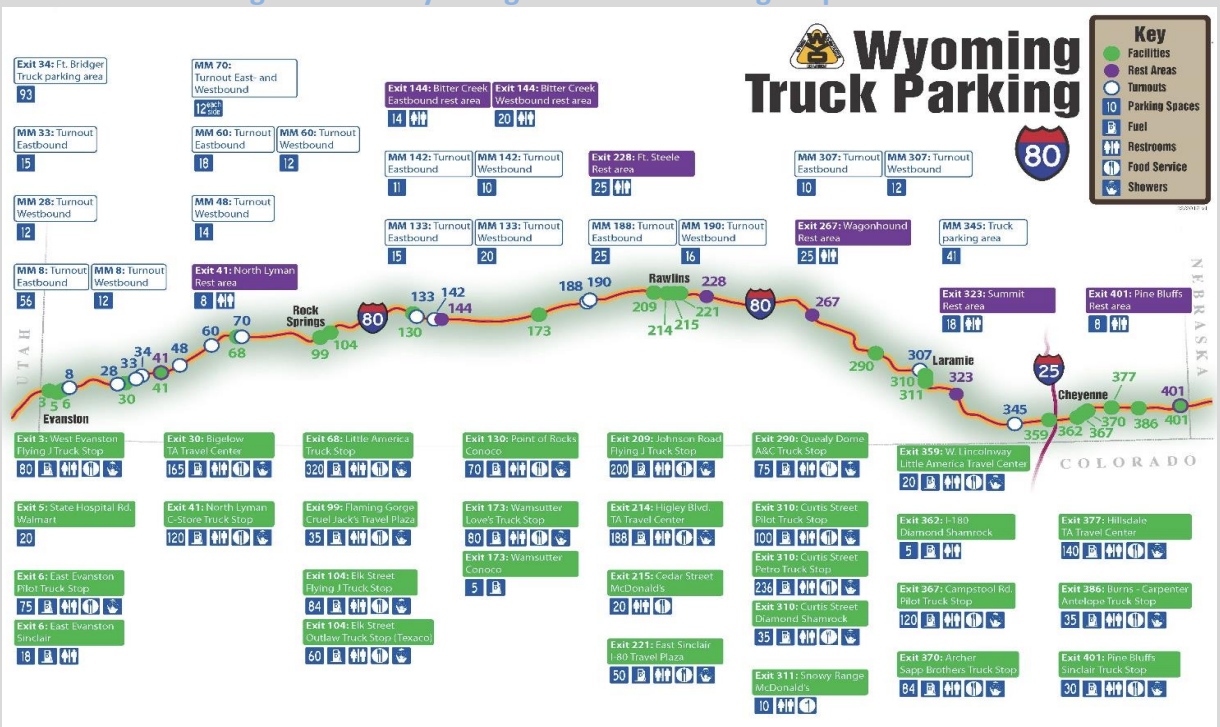
Wyoming's Approach to Providing Truck Parking without Amenities

The Wyoming DOT provides "turnouts" or parking only locations along major freight corridors. An example of a turnout on I-80 is included below, Wyoming provides 18 turnouts on I-80. Turnouts are a relatively low cost option to expanding truck parking and can be included in construction plan to further integrate their cost and development into a DOT's project development process.

Source: Imagery ©2018 Google, Map data ©2018 Google

The Wyoming DOT produces a truck parking map (map for I-80 included below) to help drivers find truck parking. Wyoming's map differentiates turnouts, rest areas, and private truck parking locations along I-80 and highlights the number of truck parking spaces and amenities at each location.

Figure 2-16: Wyoming DOT Truck Parking Map for I-80



Source: Wyoming Department of Transportation

ADOT could develop a guide to state truck parking facilities and include Ligurta as a location with truck parking, but no amenities. The current map shows all rest areas, without differentiating those with truck parking and does not include Ligurta on the map.

2.2.4 Closed Rest Areas

In addition to the rest areas listed in Figure 2-2, Arizona currently has three closed rest areas:

- Mazatzal (Closed in 2009) – The Mazatzal Rest Area is located at the junction of SR 188 and SR 87. When open, Mazatzal provided 11 truck parking spaces
- Parks EB and WB (Permanently Closed) – With rest areas on both EB and WB sides of I-40, the Parks Rest Area provided 30 total truck parking spaces.
- Christensen NB and SB (Permanently Closed) – Located on both sides of I-17, the Christensen Rest Area had about 22 total truck parking spaces.

While the three rest stops have been closed for many years and obstructions have been added to the on/off ramps to block access to the rest areas, Figure 2-17 and Figure 2-18 displays trucks using the infrastructure at Christensen and Parks Rest Areas to park. During the eight-week truck GPS sample, 30 and 106 trucks parked on the on/off ramps at the Christensen and Parks Rest Area, respectively. Over 70 percent of stops using the on/off ramps at the Christensen and Parks Rest Areas are less than two hours in duration, suggesting a mix of stops for the 30 minute HOS break and staging. Over 70 percent of stops at Parks are on the EB side of I-40, potentially staging for deliveries in Flagstaff. No trucks were observed using the Mazatzal Rest Area. Mazatzal does not have on/off ramps and the location of barricades at the site provides no location for trucks to park while it is closed.

The Future of the Mazatzal Rest Area

The Mazatzal Rest Area is the only rest area that is not currently listed as permanently closed. Additionally, Mazatzal is included in Arizona's 2018-2022 Five-Year Transportation Facilities Construction Program. Specifically, Mazatzal has funding programmed in fiscal years 2019 and 2020 for wastewater design and construction, but the Tentative 2019-2023 Five-Year Transportation Facilities Construction Program does not include funding for Mazatzal. Therefore, the wastewater projects programmed for Mazatzal will not be advanced unless a change is made to the Tentative Five-Year Transportation Facilities Construction Program.

Closed rest areas are not included in the total number of public truck parking, but are highlighted as assets that once supplied truck parking and are still used for undesignated truck parking spaces.

Converting Rest Areas to No Amenity Truck Parking Locations

The Missouri DOT converted 23 decommissioned rest areas and weigh stations to truck parking locations. The locations provide paved parking, vault toilets, lighting, and are signed as a location with truck parking, but with no services on site. Converting the locations to truck parking locations saved the DOT $16,000 per month in water, electricity, maintenance, and cleaning, enabling a 5.2 year payback on the conversion. Since the start of the conversions in 2002, Missouri has increased the number of truck parking spaces by over 94 percent, providing an additional 555 truck parking spaces (Source: 2017 Presentation by Cheryl Ball of the Missouri Department of Transportation).

Figure 2-17: Undesignated Truck Parking at the Christensen Rest Area

Source: CPCS analysis of ATRI Data, Imagery ©2018 Google, Map data ©2018 Google

Figure 2-18: Undesignated Truck Parking at the Parks Rest Area

Source: CPCS analysis of ATRI Data, Imagery ©2018 Google, Map data ©2018 Google

2.2.5 Summary of Public Parking Spaces

As shown in Figure 2-19, Arizona has approximately 523 public truck parking spaces. The majority of spaces (about 87 percent) are provided at rest stops with amenities and are supplemented by overflow lots at rest stops. Arizona's 523 publically provided truck parking spaces do not include parking occurring at brake check areas and other locations providing unmarked truck parking spaces, such as the Wikieup Table Top.

Figure 2-19: Total Truck Parking by Type

Type of Truck Parking	Spaces	Proportion of Total
Rest Areas-Marked Spaces	454	86.8%
Rest Areas-Overflow Lots	47	9.0%
Parking Only	22	4.2%
Total	**523**	**100%**

Source: CPCS

Figure 2-20 displays the proportion of public truck parking spaces by corridor, as well as the total length of each corridor. I-10 has the greatest proportion of truck parking spaces on a corridor and per-mile basis. While I-40 has the second largest number of truck parking spaces, it has the lowest number of spaces per mile of any interstate.

Figure 2-20: Public Truck Parking Locations by Corridor

Corridor	Miles	Truck Parking Spaces	Proportion of Total	Truck Parking Spaces per Mile
I-10	392	216	41.3%	0.55
I-40	359	110	21.0%	0.31
I-8	179	81	15.5%	0.45
I-17	146	68	13.0%	0.47
I-19	64	46	8.8%	0.72
US 60	356	2	0.4%	0.01
Total		**523**	**100.0%**	**0.35**

Source: CPCS

2.3 Private Truck Parking Locations

The project team identified private truck parking locations using a variety of sources, including Trucker Path, truck GPS data, truck stop websites, and desktop research. For the purposes of this study, the total number of private truck parking does not count the retail locations and informal truck parking in locations such as vacant lots. For example, Figure 2-21 displays a vacant lot where a truck stop previously operated. Trucks continued to park on site until January 2018, when city officials barricaded entrances to block trucks from using the vacant lot. Almost 4,000 trucks parked at the site displayed in Figure 2-21 (the site was open during the sample

period). Local businesses counted as many as 600 trucks using the facility on a Saturday, all of which will need to find a different truck parking location.[1]

Vacant lots present an opportunity for trucks to find additional truck parking, but their impact on local communities is a critical component to the success of a vacant or operating truck parking facility.

Figure 2-21: Truck Parking using a Vacant Lot in Winslow, Arizona

Source: CPCS analysis of ATRI Data, Imagery ©2018 Google, Map data ©2018 Google

The project team did not include retail locations in the count of truck parking facilities due to the variation and potential for changes in store policy concerning trucks parking and the potential for parking lots that are not marked for truck parking to overinflate the total number truck parking spaces. Retail locations would potentially include spaces available at some Wal-Mart stores, for example, and other retail facilities that allow trucks to park.

2.3.1 Arizona's Private Truck Parking Facilities

Similar to the findings of the 2015 Jason's Law Report, the research team found that the majority of truck parking is located at private truck parking locations. The research team identified over 6,500 private truck parking spaces at 98 different locations (Figure 2-22).

[1] L. Parsons, 2018. *City challenged by the high rate of transient crime*. The Tribune News. https://tribunenewsnow.com/city-challenged-by-the-high-rate-of-transient-crime/

Figure 2-22: Designated Truck Parking Location

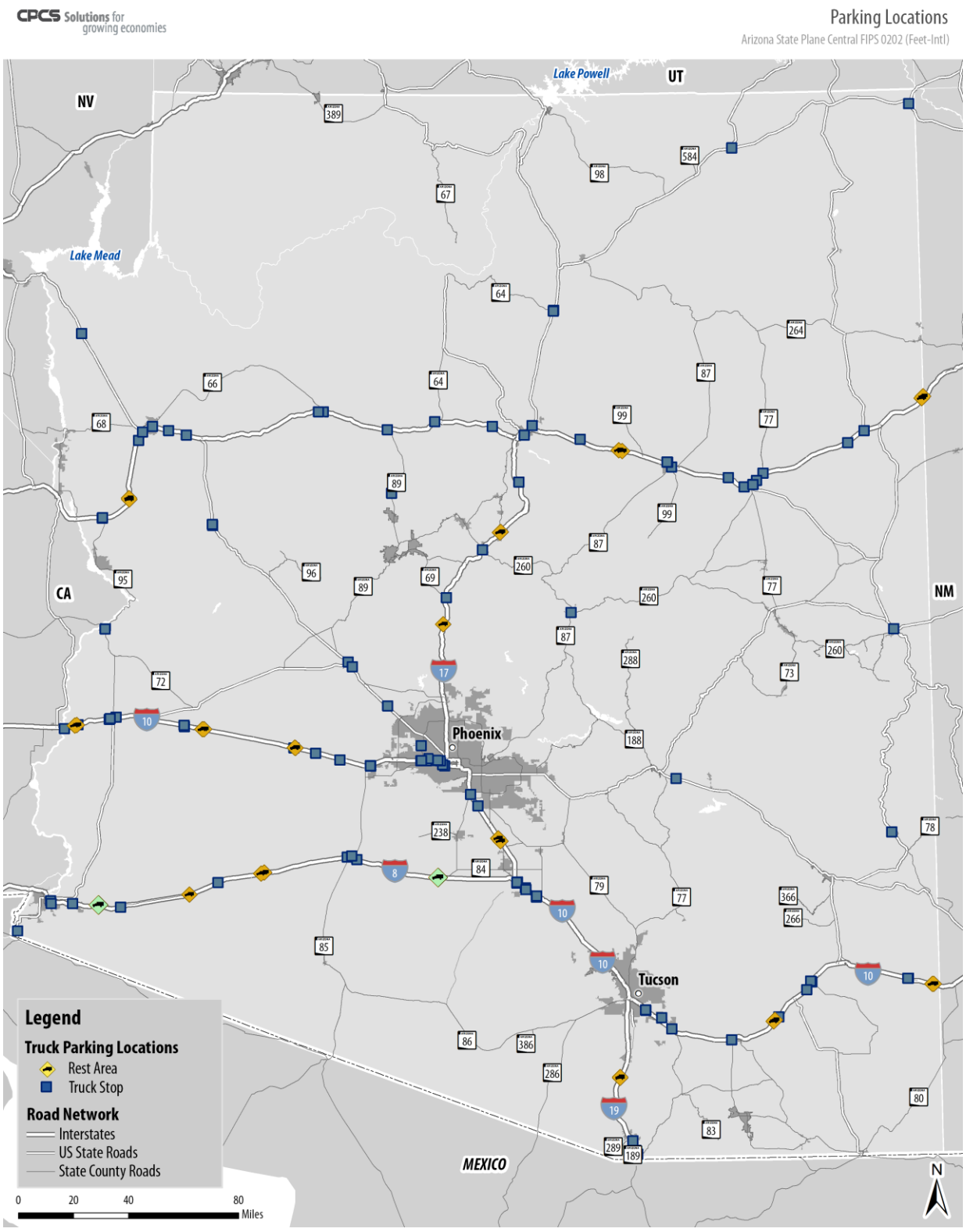


Figure 2-23 displays the distribution of private truck parking spaces by corridor. The data display a heavy concentration of spaces on interstates, particularly on I-10, which has over 59 percent of all private truck parking spaces. Spaces categorized as Phoenix are locations that are multiple city blocks from major interstates inside the city.

Figure 2-23: Private Truck Parking Spaces by Corridor

Corridor	Truck Parking Spaces	Proportion of Total Spaces
Interstates		
I-10	3,846	59.1%
I-40	1,723	26.5%
I-8	329	5.1%
I-19	140	2.2%
I-17	40	0.6%
Total	6,078	93.3%
Phoenix		
Phoenix	251	3.9%
Total	251	3.9%
US Highways		
US 89	37	0.6%
US 93	42	0.6%
US 160	30	0.5%
US 191	23	0.4%
US 60	10	0.2%
US 70	10	0.2%
US 95	10	0.2%
Total	162	2.5%
State Routes		
SR 89	5	0.1%
SR 95	15	0.2%
Total	20	0.3%
Total	**6,511**	**100.0%**

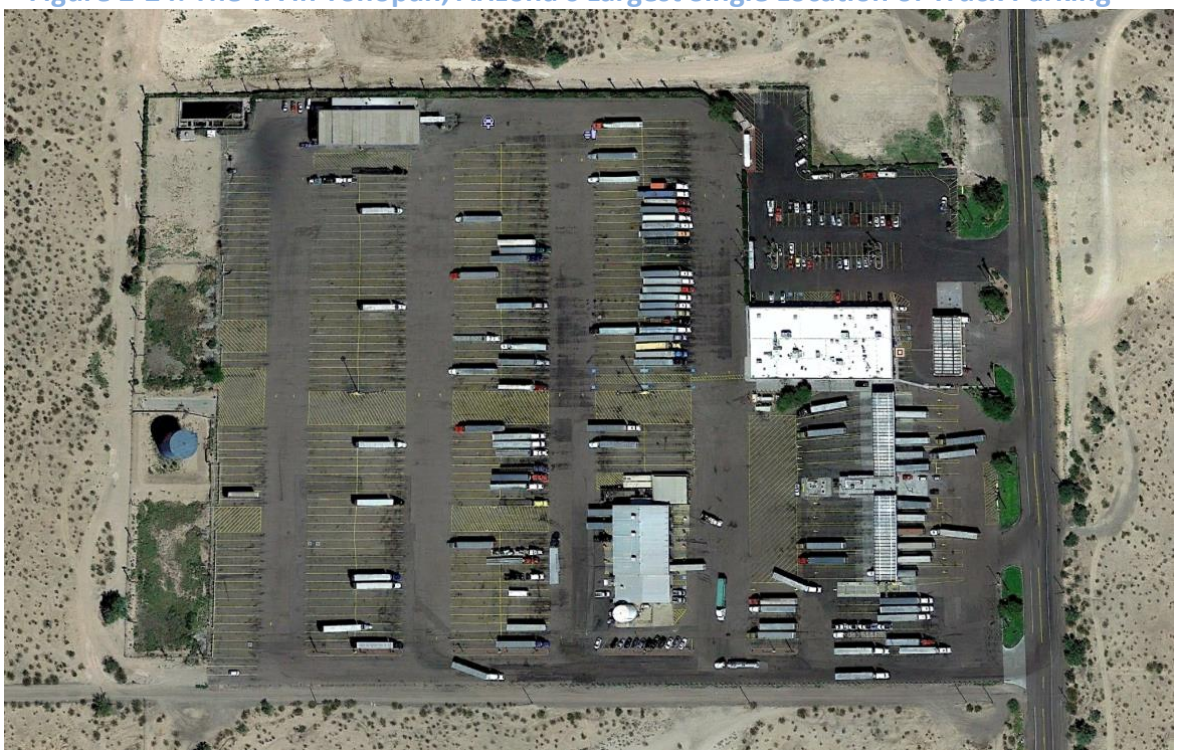
Source: CPCS

A comparison of the number of private and public truck parking spaces and locations illustrates the difference in size of the average public and private truck parking location.

The private sector provides over 12 truck parking spaces for each space provided by ADOT, even though there are only three private truck parking locations for each public location demonstrating the difference in the average size of a public and private truck parking facility in Arizona.

The Travel Centers of America (TA) in Tonopah (Figure 2-24) provides an extreme example of the size difference between public and private truck parking locations. Positioned to the west of Phoenix on I-10, the TA in Tonopah is 30 miles from a large cluster of warehouses and distribution centers in Tolleson. The TA in Tonopah is Arizona's largest single location of truck parking, with 407 truck parking spaces. For reference, the largest public truck parking location, the EB and WB sides of the Meteor Crater Rest Area, total 85 spaces–if the overflow lots are included. The ratio of public to private truck parking spaces and locations is in line with Arizona being in the highest quartile for the number of public facilities and the second lowest quartile for the number of public truck parking spaces in the 2015 Jason's Law Report. The 2015 Jason's Law Report suggests Arizona has a relatively small number of truck parking spaces at each rest stop relative to other states.

Figure 2-24: The TA in Tonopah, Arizona's Largest Single Location of Truck Parking

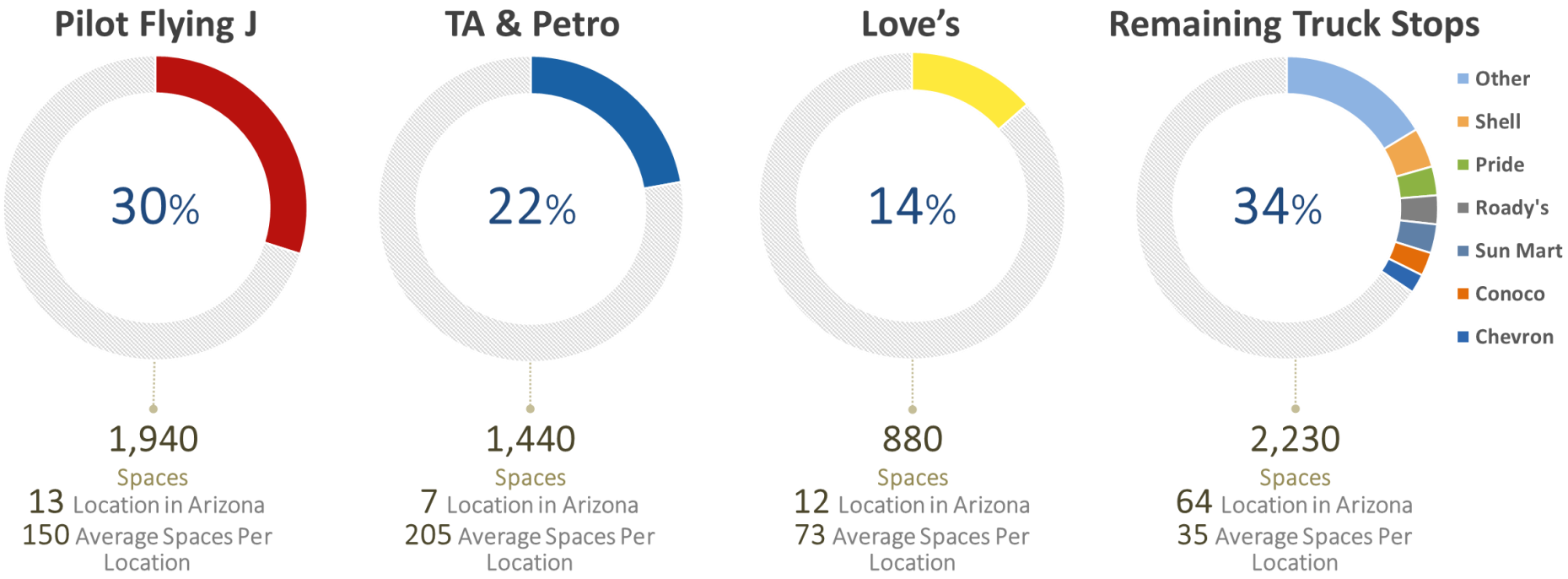


Source: Imagery ©2018 Google, Map data ©2018 Google

Figure 2-25 displays the largest providers of truck parking in Arizona by company. The combination of the two largest providers of truck parking, Pilot Flying J and TA-Petro, provide almost 52 percent of all private truck parking spaces in Arizona. The addition of Love's brings the total to over 65 percent of total private truck parking spaces. Many different companies provide the remaining 35 percent of truck parking spaces, with Shell being the next largest provider after Love's with a little over 4 percent of the state's private truck parking spaces.

While the top three companies provide over 65 percent of truck parking spaces, they only provide 33 percent of truck parking locations, meaning their average size is large, limiting their geographic coverage in Arizona. In fact, all 65 percent of the Pilot/Flying J, TA-Petro, and Love's locations are located near interstates, displaying the role of the other parking locations, including rest areas, in providing truck parking in underserved portions of the state.

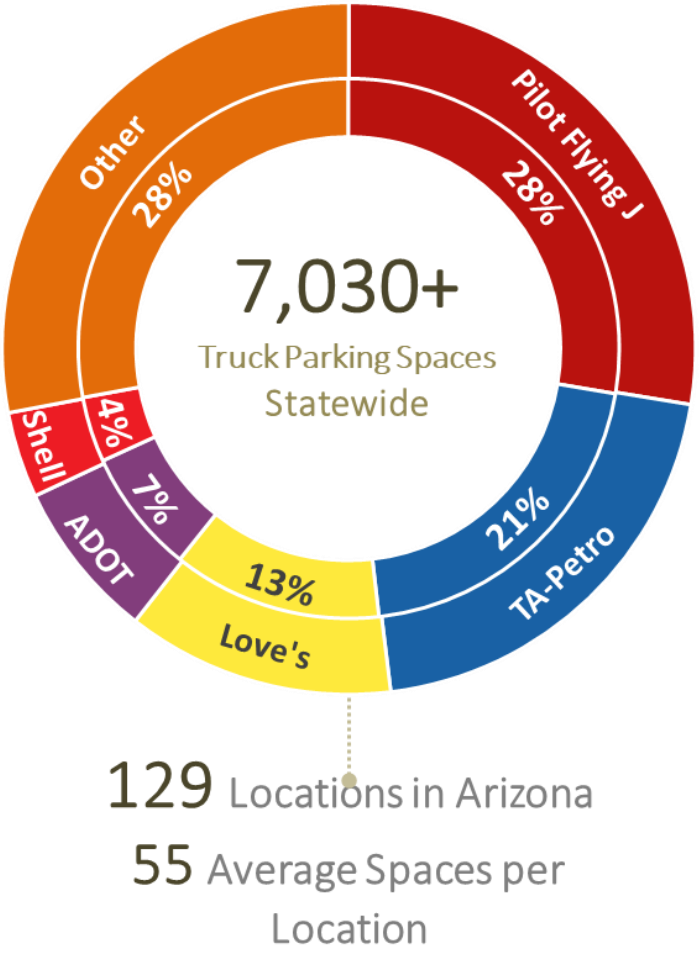
Figure 2-25: Private Truck Parking Spaces by Company



Source: CPCS

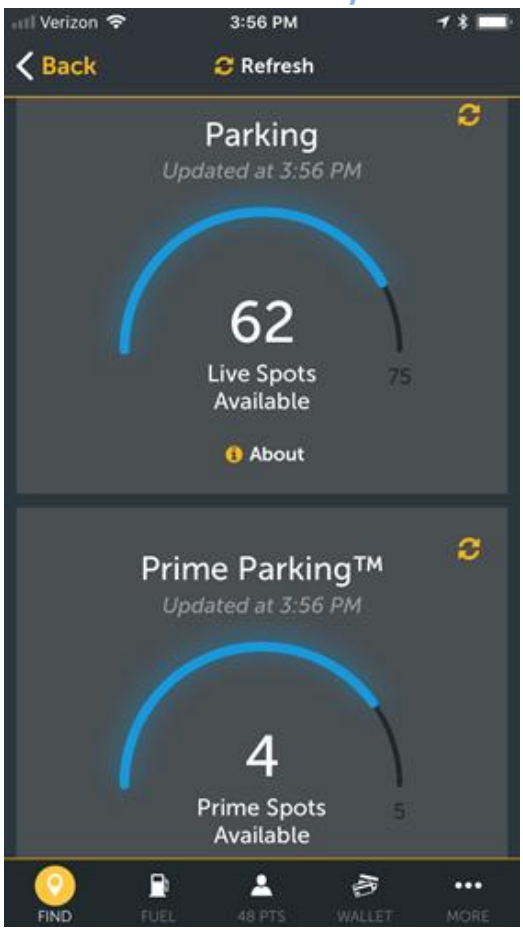
Figure 2-26 presents the public and private supply of truck parking spaces statewide and displays the proportion of statewide truck parking attributable to the company or ADOT. ADOT supplies about seven percent of all truck parking statewide, highlighting the need for partnership with the private sector to address truck parking issues. Additionally, the size and concentration of parking at a small number of locations, namely 20 locations covering over 50 percent of private truck parking spaces, highlights the potential for partnering with the private sector to instrument and provide data to truck drivers. Michigan, Ohio, Kentucky, and Iowa are partnering with private truck stops to install sensors at public and private truck stops on I-80 as part of Federally funded Mid America Association of State Transportation Officials (MAASTO) Truck Parking Information System (TPIMS).

Figure 2-26: Truck Parking Spaces by Operator



Source: CPCS

Figure 2-27: Pilot Flying J Parking Availability



Source: Pilot Flying J

Similarly, both Pilot Flying J and TA-Petro have truck parking availability and reservation systems for select locations. Figure 2-27 displays the Pilot Flying J application, showing the availability of free and reserved truck parking spaces at 30 locations. With the exception of one location in Tennessee, Pilot Flying J implemented parking availability systems at truck stops in California,

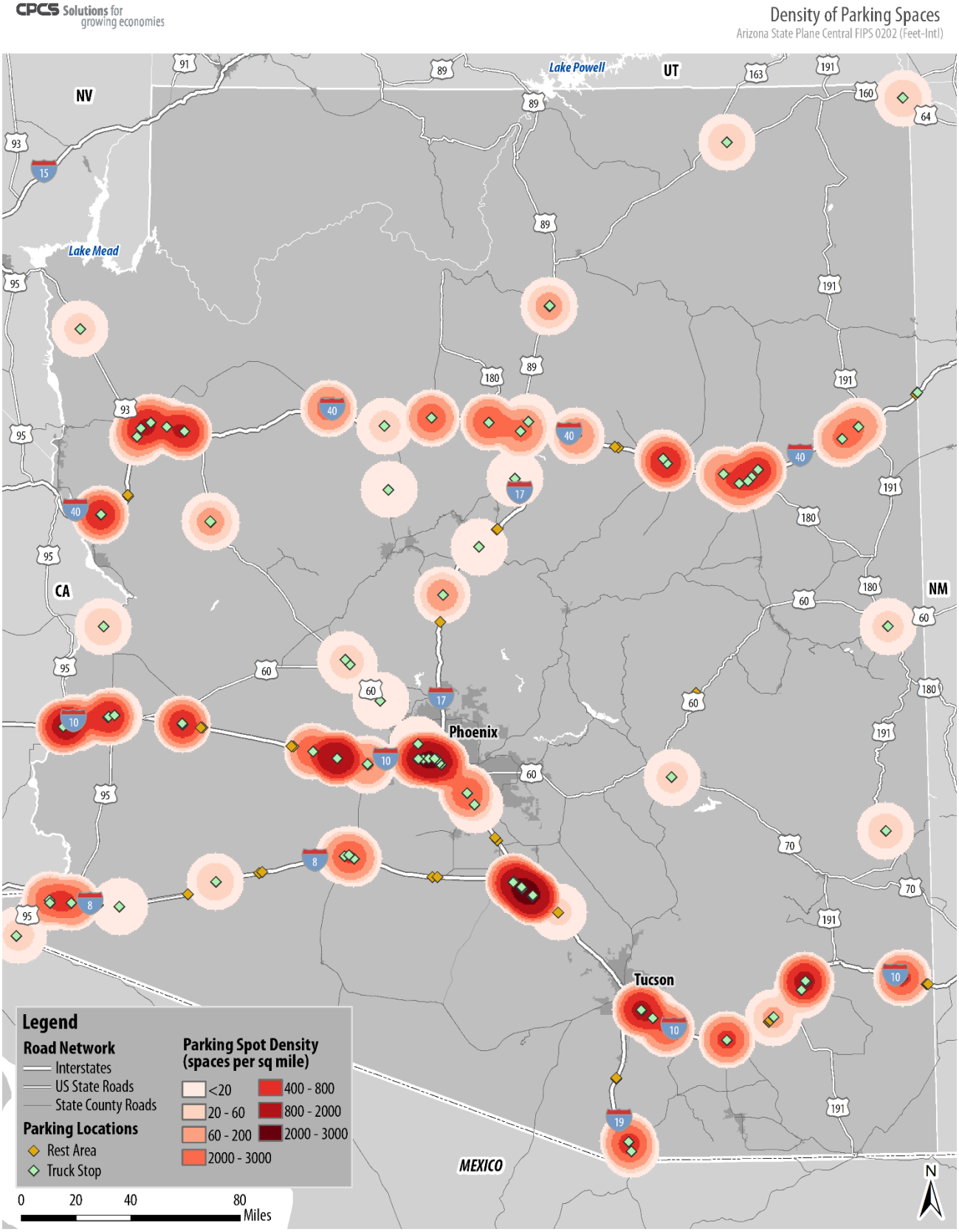
Oregon, and Washington.[2] Further expansion of Pilot Flying J's parking availability information would be focusing on the most congested areas, highlighting Chicago, Texas, and New England.[3]

Figure 2-28 displays the distribution of private truck parking spaces throughout the state. The majority of truck parking locations are located on interstates and are near population centers or are close to state borders. I-10 has the heaviest density of truck parking, especially near the Arizona/California border and in Buckeye, Tolleson, Casa Grande, Tucson, Willcox, and San Simon. Other concentrations of private truck parking spaces are along I-40 in Kingman, Flagstaff, and Holbrook and on I-19 near the Arizona/Mexico border.

[2] Pilot Flying J, 2017. *Parking Sensors Locations.* https://pilotflyingj.com/media/68439/parking-sensors-locations.pdf

[3] Straight, Brian, 2018. *How real is the parking problem?* FreightWaves. https://www.freightwaves.com/news/economics/solving-the-truck-parking-problem

Figure 2-28: Density of Private Truck Parking Spaces in Arizona



3 Truck Parking Demand

3.1 Introduction

Truck parking issues develop when there is an insufficient supply of truck parking to meet demand. Additionally, truck parking issues may arise when truck drivers are unaware of the location and availability of truck parking. This chapter analyzes the demand for truck parking using data provided by Trucker Path and Truck GPS data from ATRI. Demand is assessed by time of day and location to understand where and when truck parking demand is highest. A special focus is placed on public truck parking locations and the demand for parking at nearby private truck parking locations.

3.1.1 Crowdsourced Truck Parking Availability Data

The project team used data from Trucker Path, a truck parking application that crowdsources information about the availability of truck parking spaces and truck GPS data to identify truck parking demand. When asked how they prefer to receive information about truck parking, the project team found the top three sources of information were smartphone applications, variable message signs (VMS), and in-cab messaging systems. Using data from truck parking applications is a unique opportunity to identify truck parking demand in line with what a truck driver would see when they search for truck parking.

Trucker Path asks users if there is “lots”, “some”, or if the location is “full” when a user is close to a truck parking location. The project team cleaned and applied an algorithm to the truck parking updates in order to transform updates that occur at a single point in time to a data set covering a full year of data separated into 20-minute bins. Each bin could be assigned one of four statuses, “lots”, “some”, “full”, or “no value”, depending on when the last update was provided by a user. “No value” was assigned if more than three hours elapsed since the last update to truck parking availability. The data are limited by the locations included in Trucker Path and the frequency of updates to the truck parking status. Therefore, the project team was unable to identify the demand for truck parking at locations not included in the Trucker Path application and to locations with an insufficient number of truck parking availability updates.

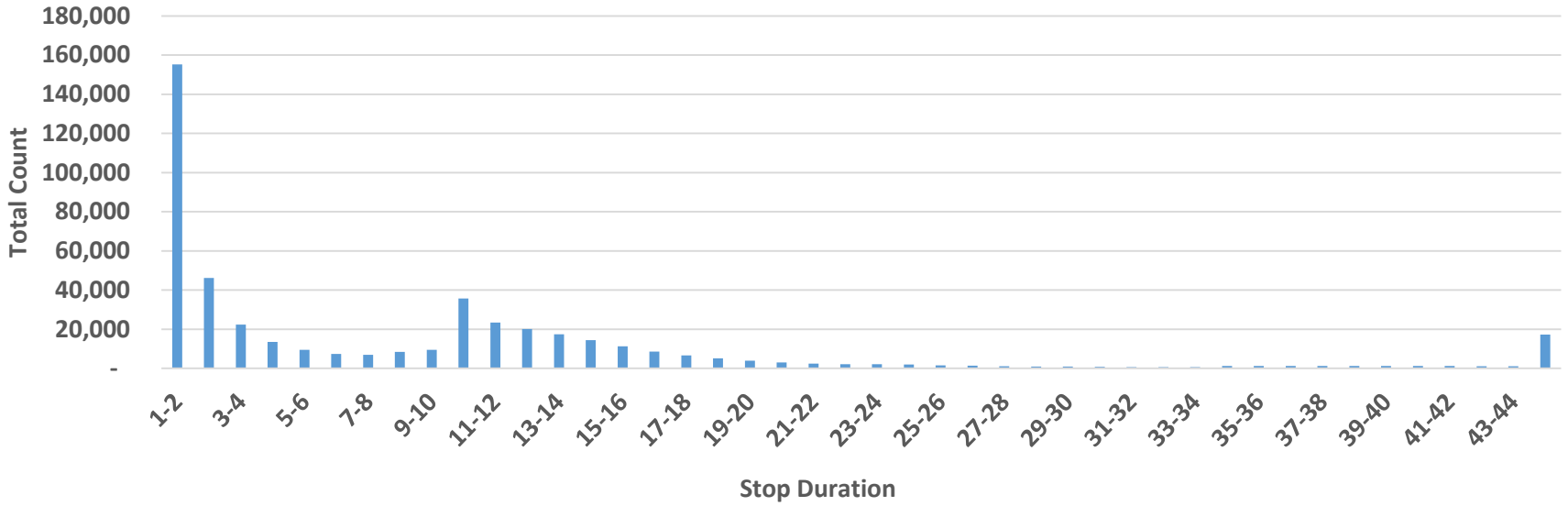
3.1 Truck Parking Demand by Time of Day

Truck GPS data and truck parking availability data provide insight into different aspects of truck parking. The truck GPS data provides insight into what time of day trucks park, when trucks end the parking event, and the duration of the parking event, as well as the ability to differentiate when trucks typically park for short, medium, and long breaks. Over 336,000 or 41 percent of truck parking events were for stops lasting for less than one hour, coinciding with the required 30-minute break, as well as stops for food or fuel. Figure 3-1 shows the number of truck parking stops over one hour by the duration of stop. The second peak in Figure 3-1 occurs at 10 to 11

hours stopped, which coincides with the HOS regulation that drivers must get at least ten consecutive hours off duty to be able to drive for 11-hours or be on duty for 14-hours.

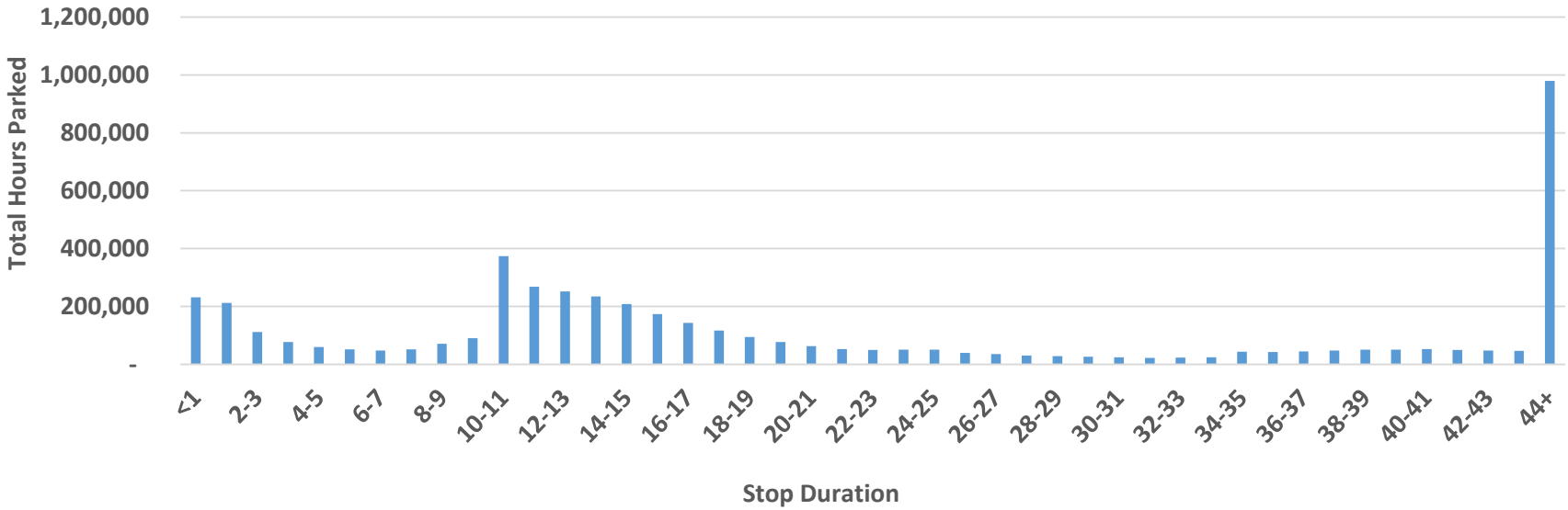
Figure 3-2 displays the total hours that trucks parked in the truck GPS sample, organized by the duration of stop. The peak at 10-11 hours displays the importance of truck parking for drivers to take their required rest. Additionally, truck drivers spend 61 percent more time taking a 10-11 hour break than a break that is less than an hour. The highest total duration of stops are those that are longer than 44 hours. These long stops typically occur over weekends, starting on Friday or Saturday. The prevalence of Friday and Saturday starting points for the 44+ hour stops suggests these stops may be time off rather than truck parking for HOS compliance.

Figure 3-1: Count of Truck Stops Over One Hour by Duration of Stop



Source: CPCS Analysis of ATRI Truck GPS Data

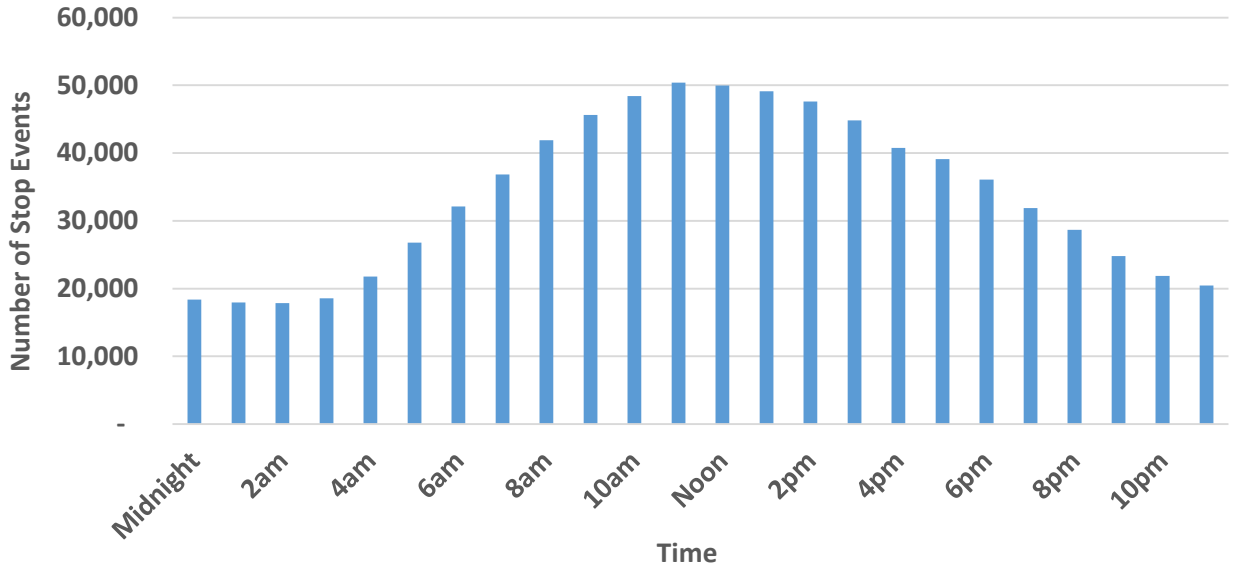
Figure 3-2: Total Hours Parked by Duration of Stop



Source: CPCS Analysis of ATRI Truck GPS Data

Figure 3-3 displays when truck drivers begin their truck parking. The graph is centered around noon which matches that over 65 percent of truck stops were less than three hours. A stop of three hours or less is likely for a 30-minute break, stops for food, fuel, or loading/unloading cargo. Many of these activities are likely associated with the operating hours of businesses serving these operations.

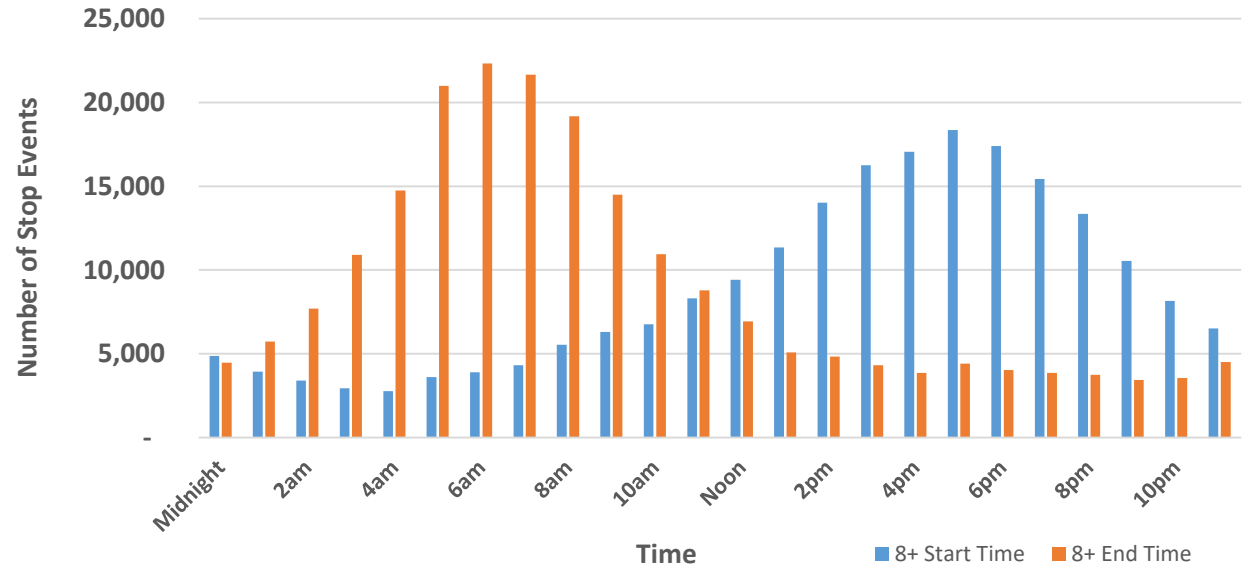
Figure 3-3: Start Time of Truck Parking



Source: CPCS Analysis of ATRI Truck GPS Data

In contrast, Figure 3-4 displays the start time and end time of parking events that are over eight hours. The start time for trucks parking over eight hours is centered around 5pm. The end time of a truck parking event is centered around 6am, meaning trucks are parked overnight when demand for truck parking is highest.

Figure 3-4: Start Time of Parking Events Over Eight Hours



Source: CPCS Analysis of ATRI Truck GPS Data

Figure 3-5 shows what time trucks typically start to park by how long they park (parking duration), differentiated by color gradation from green (low) to red (high) for column. Parking events less than five hours typically start from 7am to 2pm, with the highest values occurring from 10am to noon. Conversely, trucks parking from 5 to 12 plus hours are not clustered around a similar start time. Instead, the highest values increases as the parking duration increases, suggesting trucks are departing at similar times.

Figure 3-5: Start Time for Parking by Parking Duration

AZ Time	Parking Duration													
	<1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-11	11-12	12+	Total
Midnight	7,677	2,677	853	520	501	446	407	420	522	464	1,431	557	1,903	18,378
1am	7,701	3,024	996	631	519	423	378	332	366	327	1,043	421	1,771	17,932
2am	7,741	3,324	1,191	722	531	418	291	235	279	256	761	305	1,792	17,846
3am	8,189	3,928	1,444	795	490	334	243	202	222	152	548	288	1,720	18,555
4am	9,815	5,148	1,821	953	494	343	256	185	182	118	455	256	1,753	21,779
5am	11,385	6,673	2,379	1,145	664	421	300	217	209	151	445	336	2,471	26,796
6am	14,494	8,293	2,666	1,258	667	353	301	206	194	164	462	324	2,748	32,130
7am	16,965	9,545	3,018	1,331	743	446	249	223	205	288	530	280	3,007	36,830
8am	19,370	10,545	3,207	1,412	756	487	322	237	334	335	617	436	3,816	41,874
9am	21,486	11,112	3,379	1,489	765	454	290	363	283	227	658	431	4,699	45,636
10am	23,544	11,606	3,197	1,414	867	440	357	239	221	236	646	380	5,267	48,414
11am	23,919	11,703	3,348	1,408	781	464	272	214	244	197	670	518	6,674	50,412
Noon	23,465	11,024	3,127	1,362	712	437	261	185	210	218	743	547	7,689	49,980
1pm	21,921	10,108	2,929	1,338	631	393	283	199	192	331	786	640	9,389	49,140
2pm	19,799	8,874	2,545	1,105	564	337	212	184	322	252	957	849	11,630	47,630
3pm	16,682	7,634	1,950	911	520	331	201	337	297	277	1,286	1,355	13,042	44,823
4pm	14,367	5,748	1,490	763	437	298	330	291	249	323	1,716	1,718	13,056	40,786
5pm	12,609	4,716	1,288	669	461	450	333	232	324	468	2,522	2,476	12,565	39,113
6pm	11,494	4,138	1,085	612	503	397	260	225	336	565	3,334	2,786	10,371	36,106
7pm	10,140	3,605	948	560	390	290	254	269	441	873	3,778	2,605	7,741	31,894
8pm	9,348	3,295	896	498	304	291	286	389	710	924	3,926	2,324	5,473	28,664
9pm	8,559	2,997	790	456	347	307	306	503	717	868	3,502	1,631	3,828	24,811
10pm	8,043	2,711	763	468	380	343	446	540	638	787	2,770	1,130	2,830	21,849
11pm	7,897	2,783	812	549	422	509	492	481	669	624	2,060	796	2,353	20,447

Source: CPCS Analysis of ATRI data

Figure 3-6 displays the time that trucks start traveling again, following a stop event. If a truck parks for over five hours, it is likely targeting a 4am to 9am departure from the parking location, regardless of the total time stopped. The early morning departure from a parking event could be an effort to avoid peak traffic or to pick up or drop off their freight in the early morning, displaying the impact of external factors such as congestion and delivery windows on truck parking.

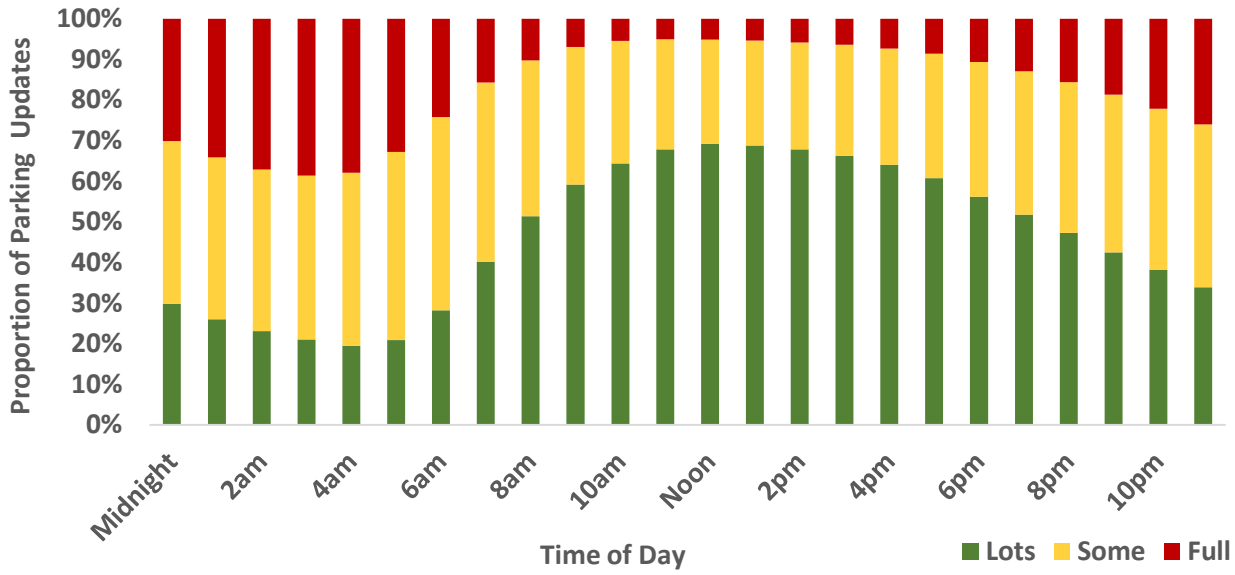
Figure 3-6: End Time for Parking by Parking Duration

AZ Time	Parking Duration													
	<1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-11	11-12	12+	Total
Midnight	7,914	2,790	745	477	325	350	254	245	252	252	849	579	2,526	17,558
1am	7,663	2,637	788	450	312	265	262	223	278	285	1,099	710	3,357	18,329
2am	7,620	2,835	812	513	364	292	256	235	326	382	1,492	1,099	4,400	20,626
3am	7,930	3,240	965	542	406	305	301	326	396	501	2,127	1,518	6,358	24,915
4am	8,303	3,591	1,028	538	449	412	320	376	474	607	2,776	2,054	8,827	29,755
5am	10,310	4,714	1,409	712	543	543	549	610	834	1,072	3,814	2,786	12,477	40,373
6am	12,287	5,980	1,600	779	505	409	428	513	669	831	3,855	2,804	14,171	44,831
7am	15,461	7,745	2,129	890	516	449	396	450	657	890	3,776	2,424	13,907	49,690
8am	17,762	9,185	2,641	1,017	503	360	327	367	617	707	3,207	2,032	12,607	51,332
9am	19,853	10,275	2,899	1,203	547	337	279	292	430	551	2,390	1,320	9,803	50,179
10am	22,028	10,783	3,095	1,345	709	351	225	204	308	369	1,668	893	7,699	49,677
11am	24,008	11,615	3,376	1,411	713	426	290	203	258	308	1,208	688	6,319	50,823
Noon	23,949	11,813	3,240	1,377	758	407	313	186	210	202	935	480	5,096	48,966
1pm	23,012	11,222	3,304	1,491	748	473	278	215	175	122	583	337	3,856	45,816
2pm	21,340	10,440	3,229	1,410	845	448	281	230	206	147	481	297	3,690	43,044
3pm	19,077	9,433	2,972	1,387	795	455	310	235	197	161	452	263	3,250	38,987
4pm	15,777	8,062	2,765	1,306	737	430	308	248	209	173	441	275	2,756	33,487
5pm	13,820	6,494	2,212	1,259	694	486	343	353	397	366	518	358	2,777	30,077
6pm	12,092	5,027	1,619	985	568	412	263	218	217	261	557	290	2,708	25,217
7pm	11,178	4,243	1,338	833	563	355	283	196	260	245	628	367	2,361	22,850
8pm	9,836	3,805	1,190	707	478	339	222	202	210	222	706	440	2,172	20,529
9pm	9,106	3,443	1,012	627	441	314	209	179	195	200	637	419	1,982	18,764
10pm	8,376	3,014	861	584	414	306	186	172	194	198	627	402	2,123	17,457
11pm	7,908	2,825	893	526	516	488	447	430	397	373	820	554	2,366	18,543

Source: CPCS Analysis of ATRI data

Figure 3-7 displays the availability of statewide truck parking by the time of day. The availability of truck parking is the lowest in the early morning, with 4am representing the low point in daily truck parking availability. After 4am, truck parking availability increases until noon, when locations begin to fill. Initially, the change in truck parking availability is modest, decreasing slowly from 1pm to 5pm. After 5pm the truck parking availability decreases quickly until 2am when the decrease in availability flattens. The departure of trucks in the early morning shown in Figure 3-6 is consistent with 4am being the low point in truck parking availability shown in Figure 3-7.

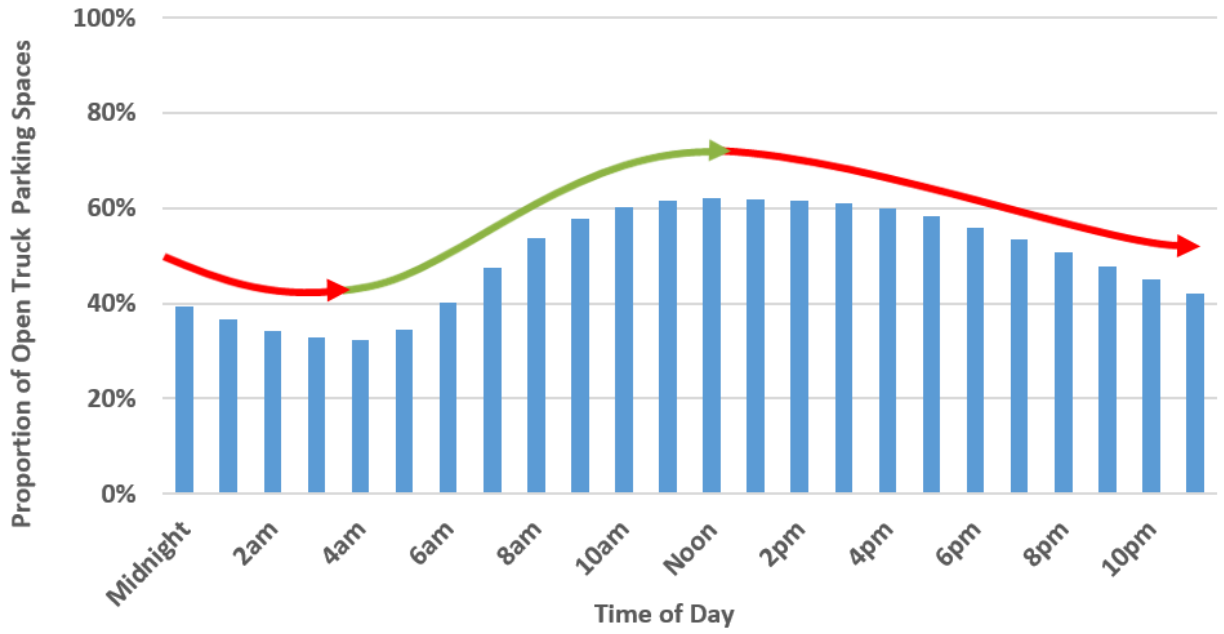
Figure 3-7: Statewide Truck Parking Availability



Source: CPCS analysis of Trucker Path Data

Truck parking locations in Arizona have as few as one truck parking space, and up to 407 spaces. Figure 3-8 analyzes truck parking availability according to the number of truck parking spaces at each location by weighting truck parking availability (lots, some, full) at each location. The overall trend shown in Figure 3-8 matches Figure 3-7, with the low point in availability occurring at 4am. Figure 3-8 suggests that Arizona has available truck parking even during the times when demand is highest, but these spaces may not be known by some drivers, or the spaces could be located in areas with low truck parking demand.

Figure 3-8: Proportion of Available Truck Parking Spaces Statewide



Source: CPCS analysis of Trucker Path Data

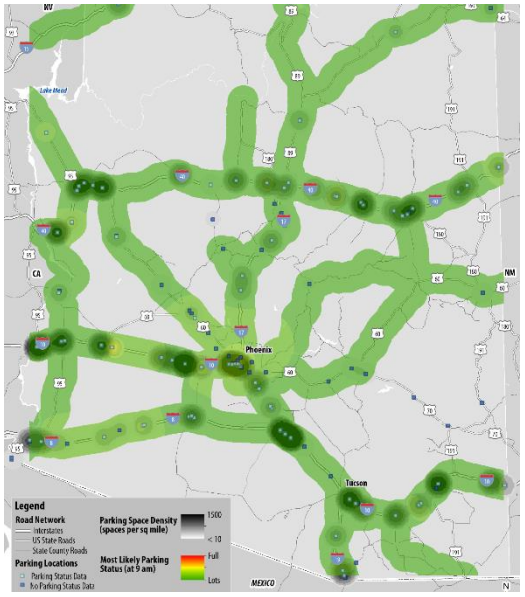
3.2 A Comparison of Truck Parking Supply, Demand, and Gaps

The location of truck parking facilities is as important as the number of spaces when identifying truck parking issues and solutions. In other cases, the availability of truck parking could be due to a lack of information about the location of open truck parking spaces, leading to open spaces and increased parking in undesignated truck parking. The project team assessed the availability of truck parking in 2017 at 3am, 9am, noon, 3pm, 9pm, and, midnight. The project team then overlaid the availability of truck parking onto major freight corridors in the state to identify areas close to available truck parking. The team also added density of truck parking spaces to the map to show areas with heavy concentrations of truck parking spaces. Figure 3-9 displays the outputs of this process.

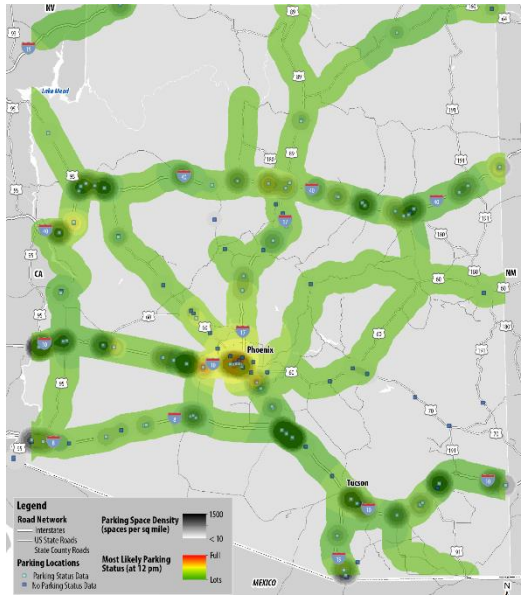
Areas in Figure 3-9 display the availability of truck parking at the nearest location, with green indicating available truck parking, yellow indicating there is some truck parking available, and red indicating that there is little to no available truck parking. The overall daily trend is consistent with other study findings—showing that some areas filling up quicker than others. Specifically, Phoenix, Flagstaff, and locations on I-40 near the Arizona/California border beginning to fill up by 9pm. By midnight, Phoenix and I-17 are nearing capacity and with Tucson and locations along I-40 starting to fill. Finally, by 3am the majority of the state is in red or yellow, with pockets of available truck parking in rural areas and locations with significant capacity, such as the area from Casa Grande to Elroy on I-10, which has over 1,000 truck parking spaces within ten miles.

Figure 3-9: Locations of Truck Parking Demand

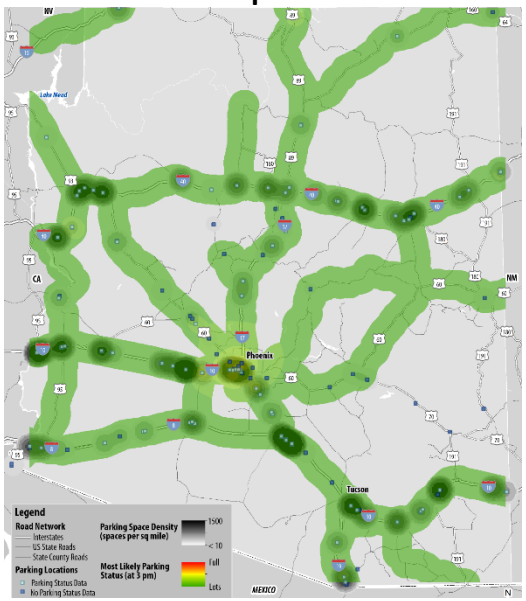
9am



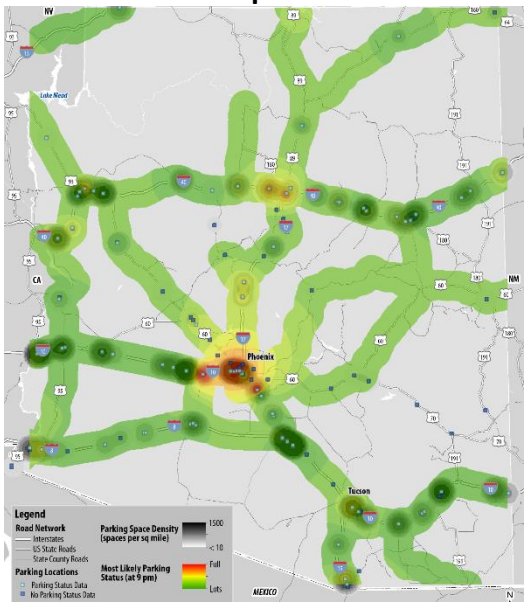
Noon



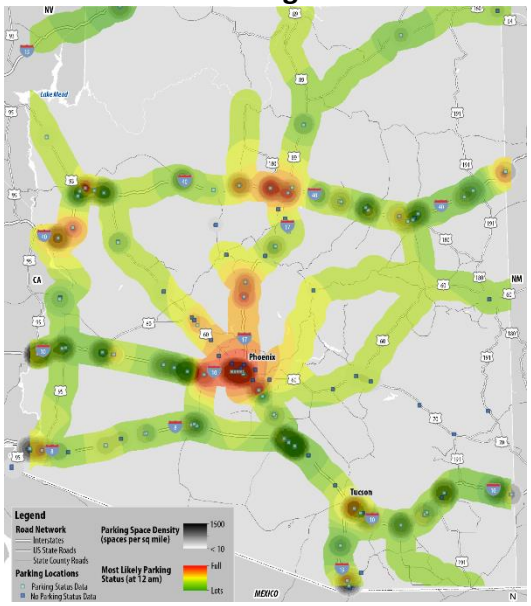
3pm



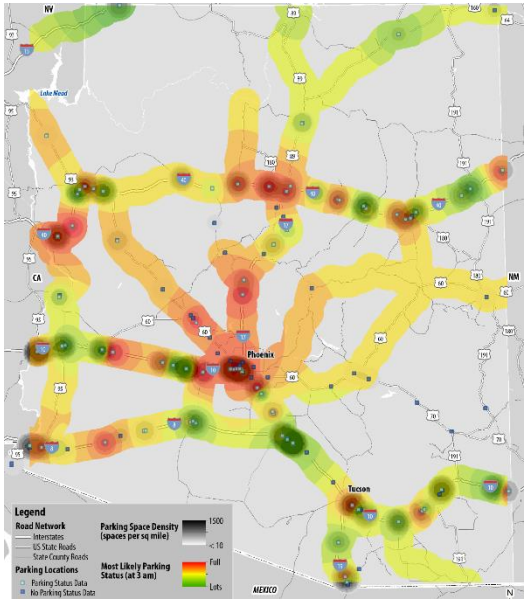
9pm



Midnight



3am

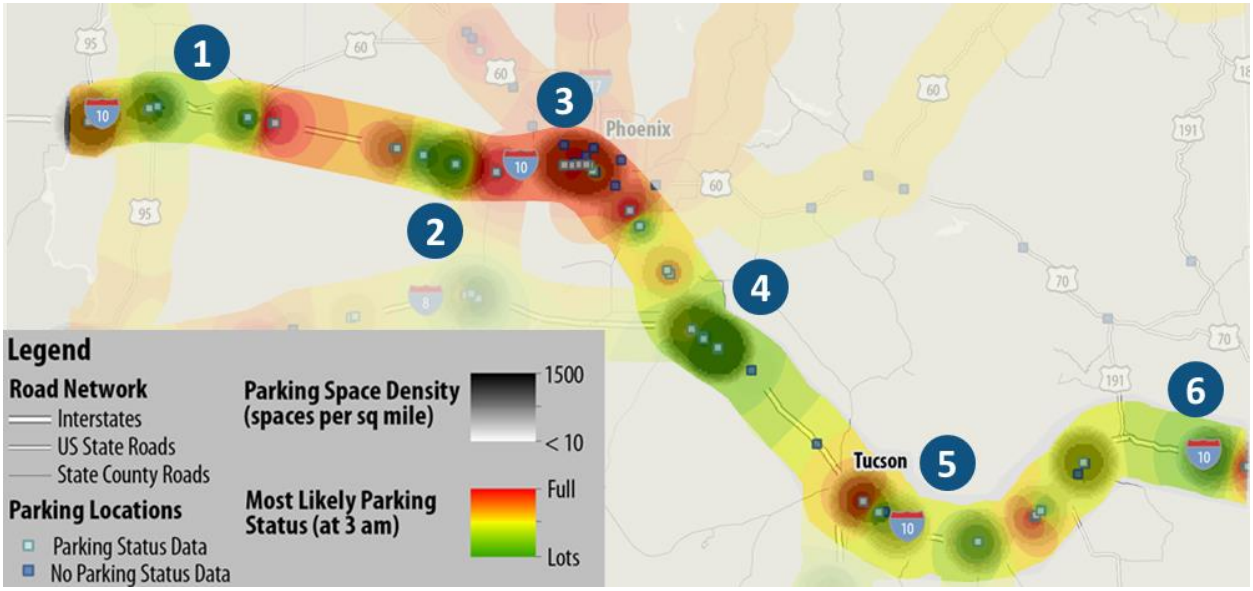


The project team analyzed major freight corridors with limited truck parking and mixed availabilities of truck parking in Arizona. The corridor analysis displays locations where there is a mismatch between truck parking supply and demand, as well as locations that are chronically full and are near other locations with available truck parking.

3.2.1 I-10

As shown in Figure 3-10, I-10 has five general areas that exhibit a mix of limited and available truck parking. The following outlines the drivers of the mixed parking availability for each area:

Figure 3-10: I-10 Truck Parking Availability at 3am



1	The green area near the Arizona/California border is a combination of five private truck parking locations (370+ spaces) with moderate availability at 3am in between locations with limited availability shown in red. To the west, the EB and WB Ehrenberg Rest Area (24 spaces) and two private truck parking locations (370+ spaces) have limited availability at 3am. EB Rest Area at Ehrenberg is particularly busy relative to the private locations. To the east are the Bouse Wash EB and WB Rest Areas (24 spaces), which have limited availability. Of the 11 parking locations, the Bouse Wash Rest Areas are the busiest.
2	The green area to the west of Phoenix includes two private locations, a Shell and TA (500+ spaces), that are rarely full at 3am. The size of these two truck parking locations and their availability at 3am suggests that the 85 trucks observed in the truck GPS data parked on the on and off ramps of the nearby Burnt Well Rest Area could be directed to stop earlier or continue to the Shell or TA.
3	The Phoenix urbanized area has over 760 private truck parking spaces. While over ten percent of truck parking is located in the Phoenix urbanized area, these locations have many of the highest use rates of any truck parking location statewide.
4	The green area with a high density of truck parking east of the I-8/I-10 traffic interchange has over 1,000 private truck parking locations within about 10 miles. To the west of this

concentration of truck parking are the two sides of the Sacaton Rest Area, which have limited availability during evening hours.

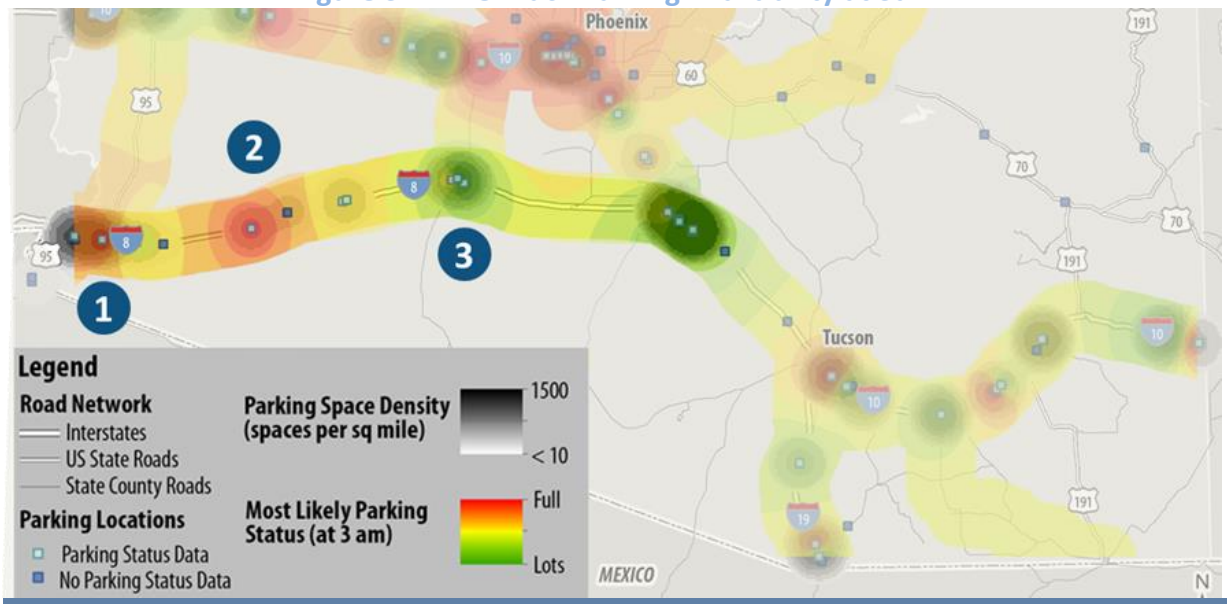
5 The mixed availability to the east of Tucson is a combination of two private rest areas with limited availability (250+ spaces) and a combination of one small truck parking location and a truck parking location at a restaurant on a frontage road with availability. Continuing west, the Love's in Benson (125 spaces) has available truck parking, but the Texas Canyon Rest Area (40 spaces) has limited availability 23 miles to the east. In fact, over 300 trucks were observed parking on the on and off ramps to Texas Canyon over the eight week GPS sample.

6 The final section of I-10 continues the trends of rest areas displaying limited availability and nearby private truck parking locations with available truck parking. In this case, the San Simon Rest Area (30 spaces) is about ten miles from two truck parking locations to the west (120 spaces). Additionally, there are three private truck parking locations with a total of almost 270 spaces.

3.2.1 I-8

As shown in Figure 3-11, I-8 has three areas that exhibit a mix of limited and available truck parking. The following outlines the drivers of the mixed parking availability:

Figure 3-11: I-8 Truck Parking Availability at 3am



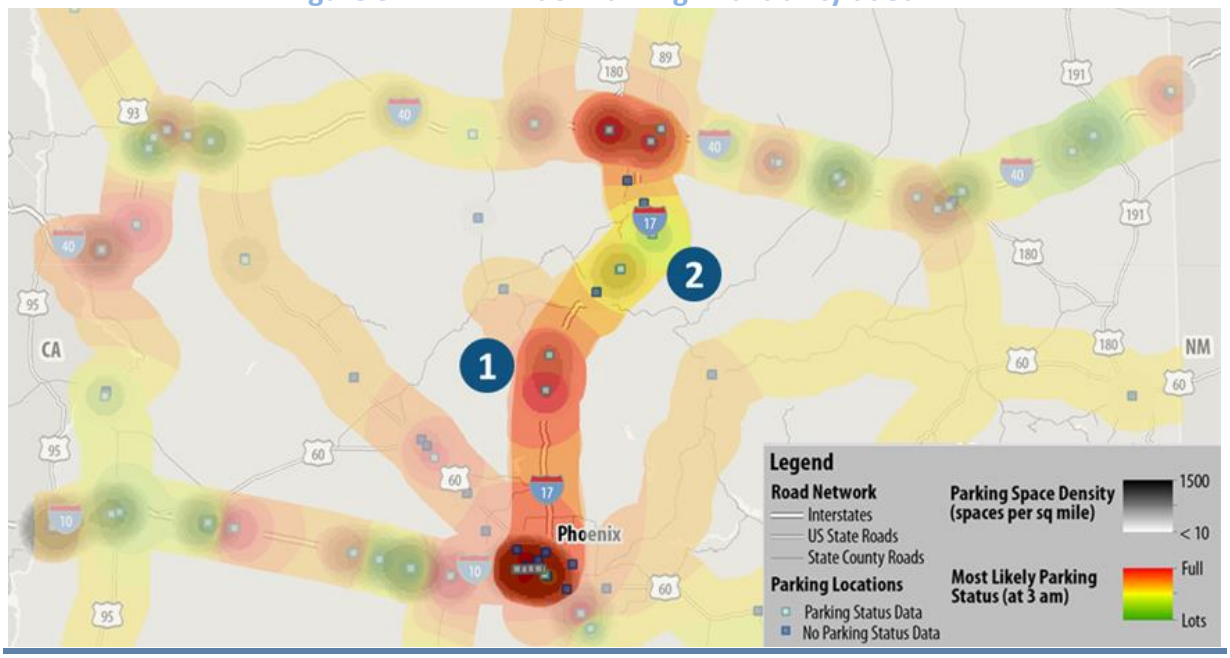
1 The red area near the Arizona/California border are two private truck parking locations with over 175 spaces that are heavily used, the location to the east are the EB and WB Ligurta parking only locations. Ligurta displays limited use in both truck parking availability data and less than ten trucks using the on/off ramps at during the eight-week truck GPS sample.

2	The limited truck parking availability is the EB and WB Mohawk Rest Area (20 spaces) with a small private location to the east and then the EB and WB Sentinel Rest Area, which has more availability than Mohawk.
3	The mix of yellow and green in Gila Bend are three private truck parking locations with only one having limited availability.

3.2.1 I-17

Figure 3-12 displays the locations with limited truck parking on I-17. In general, I-17 has very limited truck parking capacity during the evening hours.

Figure 3-12: I-17 Truck Parking Availability at 3am

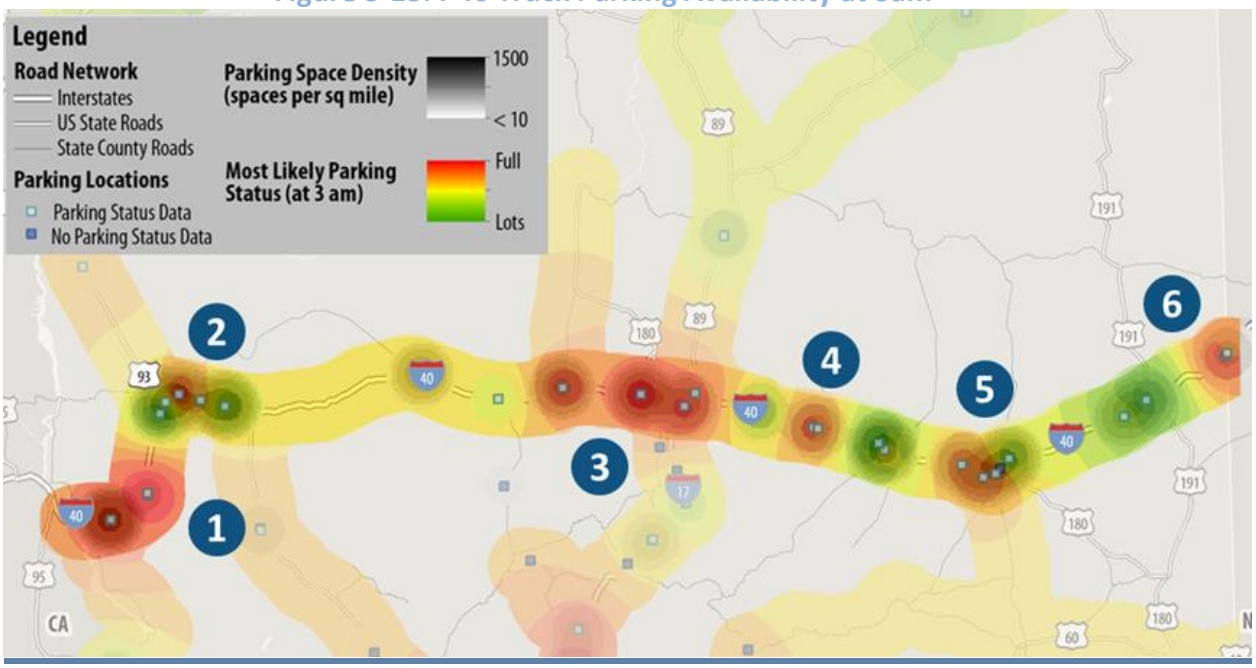


1	The first truck parking location on I-17 is about 35 miles north of Phoenix at the Sunset Point Rest Area. Sunset point has 28 parking spaces, is only in the SB direction, and displays very limited truck parking availability. The truck GPS data displays over 320 trucks parked on nearby on/off ramps and frontage roads. The private truck parking location (30 spaces) to the north of Sunset Point also has limited availability.
2	The forty truck parking spaces at the McGuireville Rest Area have moderate availability, with less than ten trucks parked on the rest area's on/off ramps during the eight-week sample period. The remainder of locations on I-17 are informal truck parking or had limited data on their use.

3.2.2 I-40

Figure 3-13 displays the availability of truck parking on I-40 at 3am and highlights areas with limited availability and areas with a mix of available truck parking and limited available truck parking.

Figure 3-13: I-40 Truck Parking Availability at 3am



1	The two private truck parking locations (185 spaces) at the Arizona/California border and the EB and WB Haviland Rest Area (14 spaces) all have very limited truck parking. The project teams identified over 1,000 trucks parked on the Haviland on/off ramps during the eight-week sample of truck GPS data.
2	Between 22 and 38 miles west of the Haviland Rest Area are five private truck parking with 515 spaces. The three private truck parking locations on the dual I-40/US 93 closest to Kingman (260 spaces) have the most limited availability of truck parking. The private truck parking locations furthest from Kingman in the east and west have the greatest availability (255 spaces) in the early morning.
3	Truck Parking availability decreases as trucks approach Flagstaff, starting 30 miles from Flagstaff in Williams, Arizona. The four parking locations around Flagstaff (260+ spaces) have limited truck parking availability.
4	The Twin Arrows Navajo Casino provides truck parking that is generally available to the east of Flagstaff. Followed by the EB and WB Meteor Crater Rest Area, which has limited truck parking availability and over 280 trucks using the on/off ramps during the eight-week truck GPS sample. Two private truck parking locations provide 200 truck parking spaces to the east of the Meteor Crater Rest Area in Winslow, Arizona. While one location has truck parking availability and the other has limited availability, Winslow has a vacant lot that supplied truck parking to over 660 trucks in the eight-week truck GPS sample.

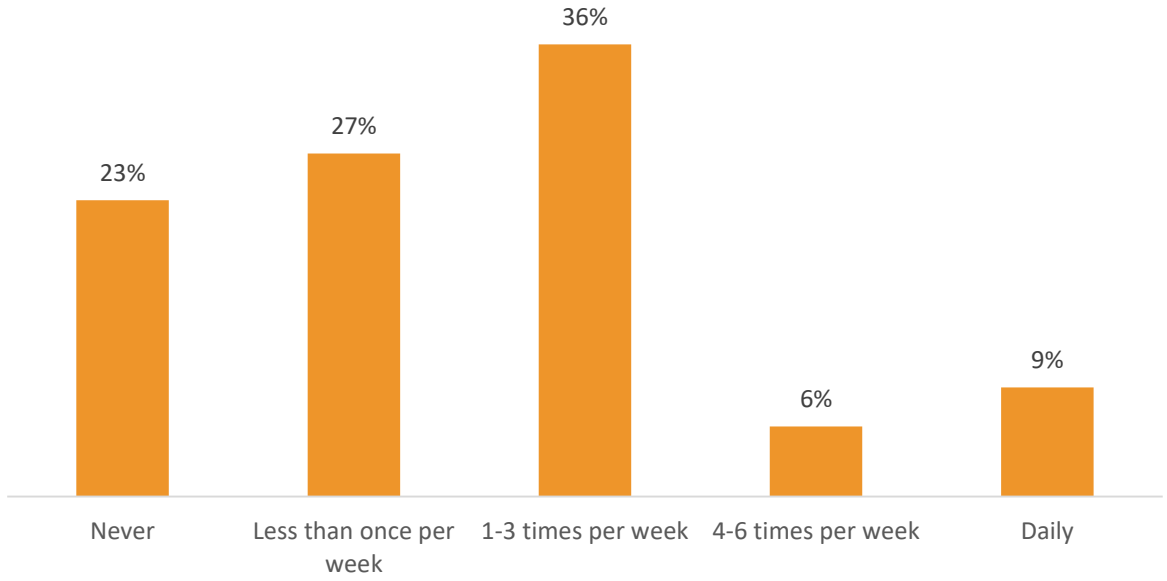
5 The mix of red and green is a combination of three private truck stops (130+ spaces) with limited truck parking availability and two private truck stops (150+ spaces) with availability.

6 The Painted Cliffs Rest Area WB (11 spaces) has very limited parking availability. In addition to having limited availability, over 300 trucks were identified using on/off ramps and nearby frontage roads for truck parking. The two private truck parking locations that are 30 miles to the west of the Painted Cliffs Rest Area (110 spaces) have availability.

3.3 Undesignated Truck Parking Locations

A central finding of the project team's survey of truck drivers who operate in Arizona was that 67 percent of drivers reported that they had difficulty finding parking in Arizona at least one to three times per week. Additionally, Figure 3-14 shows that 51 percent of drivers park in undesignated truck parking locations at least once a week.

Figure 3-14: Drivers Parking in Undesignated Truck Parking Locations



Source: CPCS

Undesignated truck parking includes roadside infrastructure such as brake check areas, geographic markers, gravel lots along roadways, roadway shoulders, and on/off ramps. Undesignated parking negatively affects safety, infrastructure condition, public safety, and quality of life. Many undesignated truck parking locations do not provide the on/off ramps needed for a truck to get up to speed before merging with traffic, presenting a potential safety hazard. The metropolitan areas of Phoenix and Tucson were not included in this analysis because the density of land use made the identification of illegal parking and the truck parking activity at private locations subject to multiple assumptions. For example, retail locations may allow truck parking on their property.

Using the cluster analysis of undesignated truck parking, the project team identified the following observations:

- Additional truck parking locations – The project team started with known truck parking locations collected from desktop research and Trucker Path. Additional truck parking locations were added as the project team validated the clusters of truck parking locations.
- Truck parking supplied by hotels and motels – The project team identified many clusters in hotels and motels parking lots. Truck parking resource, AllStays, identified over 50 hotels and motels with truck parking in Arizona. Similar to retail, hotels and motels were not included in the total number of truck parking locations in Arizona.[4]
- Undesignated parking near designated truck parking – The project team identified trucks parked around designated truck parking locations, such as the on/off ramps for rest areas, as well as gravel lots near truck stops.
- Undesignated truck parking at gravel lots – The project team identified truck parking clusters at locations alongside major roadways, as well as near off ramps.
- Undesignated truck parking using on/off ramps at interchanges – The project team identified trucks using on and off ramps for truck parking locations throughout the state.
- Undesignated truck parking at closed or limited access facilities – The project team identified trucks parking at closed rest areas, weigh stations, brake areas, emergency pull offs, among others. Most of the closed or limited access facilities do not have on or off ramps, making exiting or entering the traffic stream unsafe.

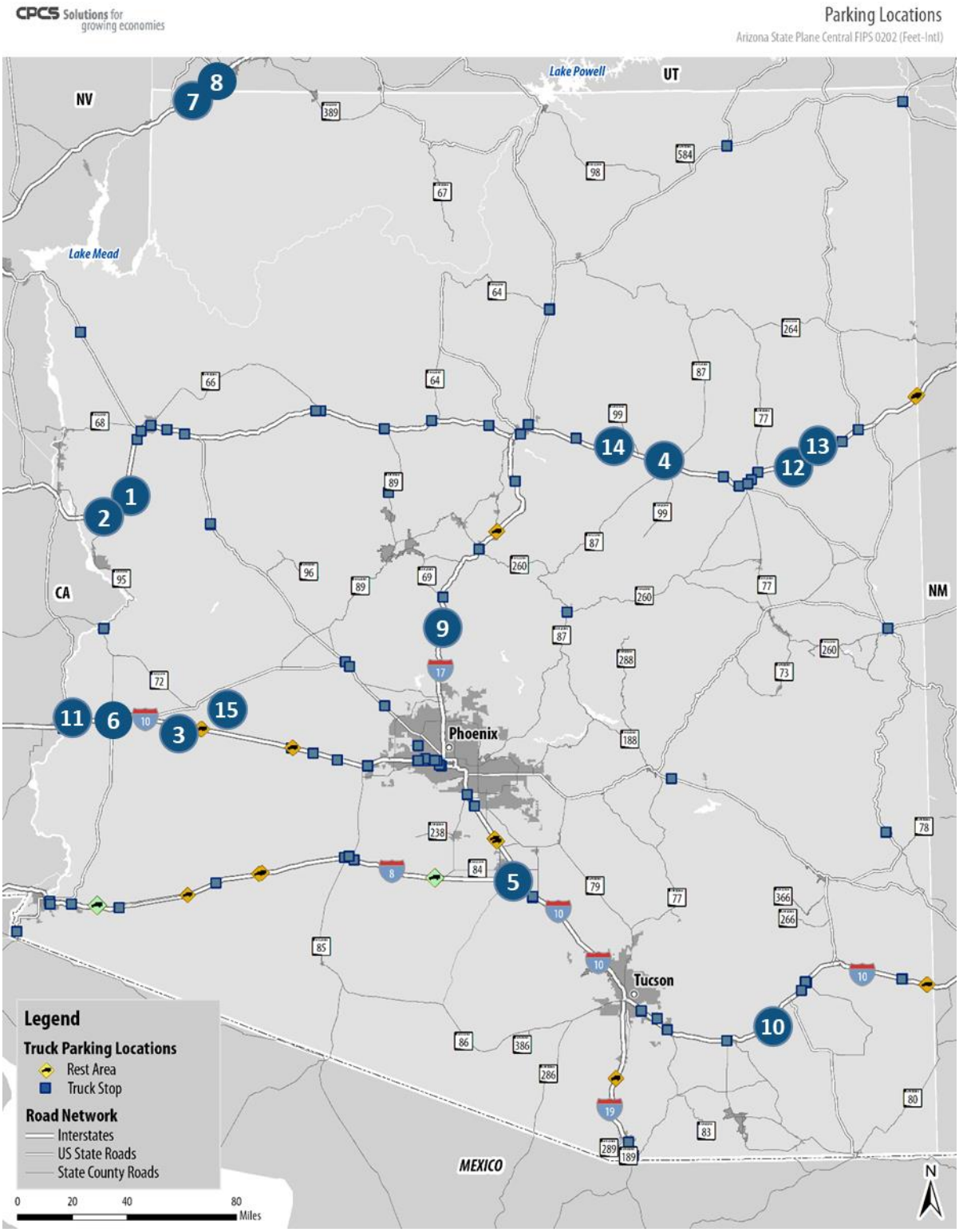
3.4 Cluster Analysis of Parked Trucks

The project team identified over 100 clusters of undesignated truck parking. Figure 3-15 displays the top 15 locations of undesignated truck parking based on the number of trucks observed parking in undesignated locations. Figure 3-15 displays sections of interstate that have particularly acute “undesignated” truck parking issues, primarily:

- I-10 west of Phoenix
- I-40 near the Arizona/California border
- I-40 east of Flagstaff
- I-15 near the Arizona/Utah border
- I-17 north of Phoenix

[4]MAP OF ARIZONA MOTELS WITH TRUCK PARKING. AllStays. https://www.allstays.com/hotel-maps/Arizona-truck-motels.htm.

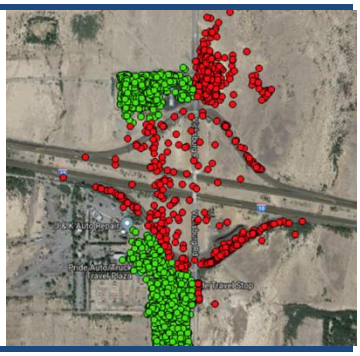
Figure 3-15: Top 15 Undesignated Truck Parking Locations



1 **I-40:** The Haviland Rest Area has the most undesignated truck parking observed in the eight-week sample, with over 1,000 trucks parked over a half hour. Most trucks parked along the on/off ramps and in areas not designated for trucks and some parked on the side of I-10. Of the over 1,000 undesignated truck parking events, 225 parked for over eight hours. As noted in the previous section, the truck parking is available in Kingman.

2 **I-40:** South of the Haviland Rest Area at the junction of I-40 and US 95 are a Loves and Pilot with 185 total truck parking spaces. While 95 percent of trucks, parked in designated parking spaces, leaving over 900 parking in vacant lots, the sides of the roadway, and on/off ramps. About 29 percent of trucks parked in undesignated locations parked for longer than eight hours.

3 **I-10:** West of the Bouse Wash Rest Area off Exit 45 are two truck parking locations with 170 truck spaces. The majority of truck parking events are in designated truck parking locations, but over 760 are in undesignated truck parking locations, about 200 of which are over eight hours. Over half of the undesignated truck parking occurs in a vacant lot across from a truck stop (parcel data suggest the lot is not owned by the truck stop).



4 **I-40:** Over 660 trucks parked in the parking lot of an abandoned mall in Winslow, AZ. This undesignated truck parking location, serves as a long-term rest stop for truck drivers. Almost 38 percent of trucks park over eight hours, another 38 percent park less than one hour.

5 **I-10:** Near the I-8/I-10 interchange is three truck parking locations with over 300 truck parking spaces. Over 550 trucks parked in undesignated truck parking locations, with almost 150 parking over eight hours.

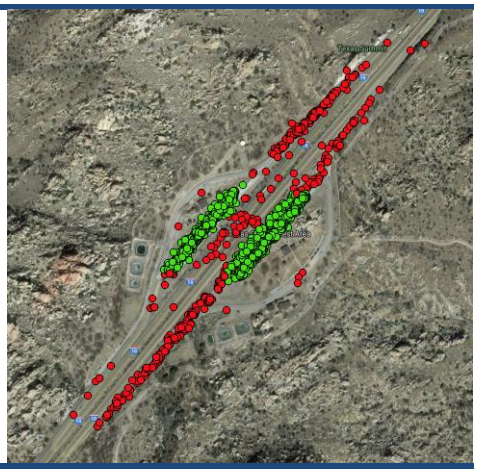
6 **I-10:** A cluster of undesignated parking was designated in Quartzsite, Arizona near a Love's and Pilot Truck Stops with over 180 truck parking spaces. Over 500 trucks were parked in undesignated locations, primarily on the EB side of I-10 using on/off ramps, vacant lots, and frontage roads. Almost half parked of the trucks parked in undesignated parking spaces were parked over eight hours.

7 **I-15:** Over 475 trucks used the on/off ramps and a vacant gravel lot near the interstate as a truck parking location. Over 53 percent of trucks parked over eight hours. Of the trucks parking, almost 69 percent parked in the vacant lot. As shown on the right, the trucks parking in the vacant lot are off the main roadway and no longer affecting roadway safety and operations. Alternatively, trucks using the on/off ramps are still exposed to vehicles traveling at high speeds and are affecting roadway safety and operations.

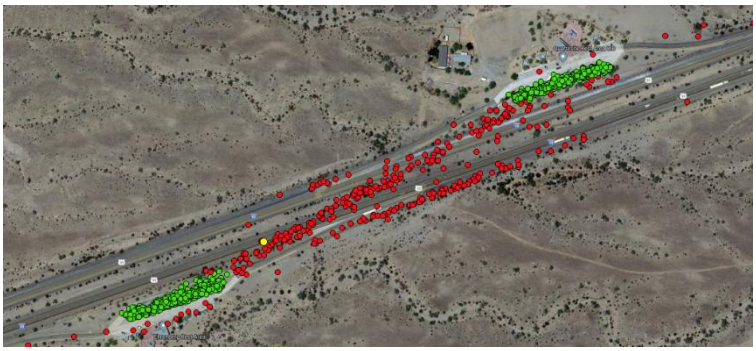
8 **I-15:** A roadside lot on the shoulder of I-15 (right) provides parking for over 360 trucks. The roadside lot is not designated and does not provide on or off ramps. Almost 130 of the 360 trucks were parked over eight hours at the roadside lot. Trucks entering or exiting are in the flow of traffic while slowing down to exit and accelerating to rejoin the traffic stream, creating the potential for a large speed differential and accidents.

9 **I-17:** The entrance and exit, as well as the on/off ramps from the Sunset Point Rest Area over 350 trucks parking in undesignated area. Over 21 percent of trucks parked longer than eight hours, 42 percent parked less than an hour, 13 percent parked one to two hours, and the remaining 24 percent is split evenly from over two hours to less than eight hours.

10 **I-10:** The Texas Canyon Rest Area had almost 340 trucks using the on/off ramps during the eight weeks of GPS data. Of the trucks parking in undesignated portions of the rest area, 96 (23 percent) of trucks parked over eight hours. The Texas Canyon Rest Area is within 20 miles of over 400 truck parking spaces. To the East there is a Shell (20 spaces) 2.2 miles away, a Chevron (30 spaces) 17 miles away, and another Chevron and TA (239 spaces) 19 miles away. To the West is a Loves in Benson (125 spaces) 19 miles away. All 400+ spaces near Texas Canyon have availability.



11 **I-10:** The Ehrenberg Rest Area (30 spaces) had 330 trucks parked in undesignated locations during the eight week GPS sample, more than half of which were parked longer than eight hours. There is one private truck stop (Flying J with 276 spaces) between the Ehrenberg Rest Area and the Arizona/California border, but it is often full in the evening. One mile to the East is a Sunmart (100 spaces) with some availability in the evening. The next truck stops are located over 22 miles from the Ehrenberg Rest Area in Quartzsite. One of three truck stops in Quartzsite has some availability (25 spaces). The other two locations are 5th highest concentration of undesignated truck parking.



12 **I-40:** The traffic interchange at Exit 300 for Goodwater Road had over 300 trucks parked on the on/off ramps, with the majority on the WB side. This location was primarily used for short breaks, HOS compliance, and some staging as evidence by 59 percent of trucks parked for less than an hour, 28 percent of trucks parked for one to three hours, and only six percent of the 300 trucks parked for over eight hours. Additionally, another 127 undesignated parking events occur about four miles to the East.

13 **I-40:** The traffic interchange at Exit 320 for Pinta Road had over 288 trucks parked on the on/off ramps. About six miles to the East is a private truck stop with 150 spaces and evening availability. Only 12 percent of stops were longer than eight hours, with almost 50 percent less than an hour and another 24 percent of stops lasting one to two hours.

14 **I-40:** Over 5,700 stop events where recorded during the eight week GPS sample and 95 percent were in designated locations. The remaining five percent or 289 stops were in undesignated locations. About 32 percent of undesignated stops were over eight hours, suggesting the **Meteor Crater Rest Area** is a critical location for long rest breaks. Over 38 percent of trucks stopped for less than a half hour and another 23 percent stopped for one to three hours. Additionally, Meteor Crater is within 14 miles of five interchanges that have an additional 671 undesignated parking events, but only nine percent of these stops were over eight hours.

15 **I-10:** Less than two miles away from the Bouse Wash Rest Area, 245 trucks parked used nearby vacant lots and the on/off ramps as truck parking. Only 15 percent of trucks were parked longer than eight hours, with 60 percent staying less than one hour. Similarly, the Bouse Wash Rest area has 242 undesignated truck parking events, further displaying the issues trucks encounter finding truck parking on western portions of I-10.

3.4.1 Other Undesignated Truck Parking Hot Spots

While I-8 has some parking undesignated truck parking using on/off ramps, in general I-8 has far fewer truck parking undesignated parking than other corridors in Arizona. For example, the largest concentration of illegal truck parking is located in Dateland, where 86 trucks are parked on the on/off ramps to I-8 (Figure 3-16), but only eight (9 percent) of which were parked for longer than eight hours. Another cluster is located near Gila Bend where about 70 trucks are parked in a vacant lot across from a Love's Travel and on the shoulder of roadways, 19 (27 percent) of which were parked longer than eight hours.

Figure 3-16: Undesignated Truck Parking Near Dateland Travel Center

Source: CPCS analysis of ATRI Data, Imagery ©2018 Google, Map data ©2018 Google

Figure 3-17 provides another example of undesignated truck parking near Page Arizona on US 89. In total, over 200 trucks were observed parking for more than a half hour at the location shown in Figure 3-17, with over 90 parking for over eight hours and almost 80 parking for less than an hour.

Figure 3-17: Undesignated Truck Parking Near Page, Arizona (US 89)

Source: Imagery ©2018 Google, Map data ©2018 Google, CPCS analysis of ATRI Data

Figure 3-18 displays 403 trucks parked in a vacant lot on the NB side of the roadway and using a wide shoulder on the SB side of US 93. Of the 403 trucks, 81 (20 percent) parked for longer than eight hours.

Figure 3-18: Undesignated Truck Parking On US 93

Source: Imagery ©2018 Google, Map data ©2018 Google, CPCS analysis of ATRI Data

4 Next Steps

Key Messages

The research team will use the information contained in this Working Paper and identify solutions to address shortages of truck parking and increase information on truck parking availability.

4.1 Next Steps

The next step of this research will identify the opportunities for truck parking improvements, match solutions to needs, and develop an implementation strategy to advance truck parking project in Arizona.