

# Truck Parking Assessment 

Colorado Department of Transportation

COLORADO
Department of
Transportation

# TRUCK PARKING ASSESSMENT 

## Colorado Department of Transportation

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## Truck Parking Assessment

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List of Acronyms
ATRI American Transportation Research Institute
CDOT Colorado Department of Transportation
DTD Division of Transportation Development
ELD Electronic Logging Device
FAC Freight Advisory Council
HOS Hours of Service
TPA Truck Parking Assessment

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## I. INTRODUCTION

## A. Background

The provision of adequate truck parking is vital to the efficient and safe transport of freight across the US, and current supply is strained to meet demand. Increased levels of freight traffic, closure of rest areas, and more stringent control of Hours of Service (HOS) using Electronic Logging Devices (ELD) are a few of numerous factors increasing pressures on truck parking. Recent national industry studies and surveys have identified truck parking limitations as a high concern, commercial drivers rating it as their $2^{\text {nd }}$ highest concern in the American Transportation Research Institute (ATRI) 2018 Top Industry Issues Report. Truck drivers who utilize Colorado's roadway network have mirrored national concerns, with many respondents indicating via survey that locating acceptable long term truck parking can require more than 1 hour, and fewer than 10 percent responded that finding long term truck parking in Colorado is "easy."

The Colorado Department of Transportation (CDOT) Division of Transportation Development (DTD) works closely with the trucking industry to collaboratively address issues surrounding freight transportation in the state, including truck parking. To contribute to these efforts and in view of the urgency of truck parking needs, DTD has completed the Truck Parking Assessment (TPA). The TPA examines eight critical freight corridors within Colorado to quantify the level of parking supply and demand and identify solutions with the potential to improve truck parking concerns. This assessment serves as a key component of CDOT's overall efforts in the truck parking arena, providing a data driven understanding of truck parking availability and needs. It is envisioned that the TPA will spawn additional future efforts to assess, develop, plan, implement and/ or construct truck parking improvements across the state.

## B. Purpose

The TPA is oriented to meet the following purposes for the eight corridors:

1. Update CDOT's inventory of official truck parking spaces and truck parking maps
2. Quantify current and future truck parking needs, both day-to-day and during closure events
3. Recommend truck parking solutions
4. Identify other issues of concern for CDOT and others to address in future years

The TPA is a starting point for additional future truck parking efforts to be undertaken by CDOT.

## C. Truck Parking Assessment Corridors

Eight corridors are included in the TPA per CDOT DTD Staff. The corridors are depicted graphically on Figure 1 and listed in Table 1. These interstate and state highway corridors connect the major freight origins and destinations within and outside of Colorado. The majority of truck parking spaces within Colorado are located along these corridors.

Figure 1. Truck Parking Assessment Corridors


Table 1. Truck Parking Assessment Corridors

| Roadway | TPA Limits |
| :--- | :--- |
| Interstate 25 | New Mexico Border to the Wyoming Border |
| Interstate 70 | Utah Border to Kansas Border |
| Interstate 76 | I-70 to Nebraska Border |
| US Highway 40 | Utah Border to I-70 J unction |
| US Highway 50 | I-25 J unction to Kansas Border |
| US Highway 160 | New Mexico Border to I-25 J unction |
| US Highway 287 | Oklahoma Border to I-70 J unction |
| State Highway 71 | I-70 Junction to Nebraska Border |

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## D. Truck Parking Assessment Process

The TPA effort consisted of four main tasks:

1. Data Collection: An inventory of truck parking supply was conducted using available data. A national literature review was conducted to provide context for Colorado's situation, and a truck parking survey was circulated among Colorado system users. Truck traffic counts were provided by CDOT to assist the project team in evaluating truck parking demand.
2. Analysis: Location data from GPS-equipped trucks were used to assess freight travel patterns and the level of demand for available truck parking along the corridors. Data were extracted from four 2-week time periods within 2017. The impact of corridor closures on truck parking demand was also analyzed by examining the truck parking impact of two particular corridor closures that occurred in recent years.
3. Project Governance and Coordination: The project was led and managed by CDOT's Division of Transportation Development, Freight and Planning Analysis Group. The TPA Oversight Team of multidisciplinary CDOT staff and freight stakeholders was assembled to provide additional input on project decisions and deliverables. Regular TPA updates were delivered to the Colorado Freight Advisory Council (FAC), a well-established trucking industry group comprised of agency and trucking company representatives.
4. Deliverables: This project report and appendices are provided as a summary of all TPA analyses and findings. Truck parking data, including the inventory and demand findings, are also provided in the form of a Geodatabase and accompanying spreadsheets. The project deliverables detail the data-driven steps taken to inform CDOT's strategic, effective investments in truck parking improvements-both accessibility to and available of truck parking statewide.

Work on the TPA began in the Fall of 2017 and reached completion in J anuary of 2019, requiring approximately 15 months to complete.

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## II. TRUCK PARKING SURVEY

## A. Synthesis/National Research

To broaden the base of understanding and provide an external reference for the TPA, the project team completed a synthesis of national truck driver survey results regarding truck parking issues and solutions. The synthesis is provided in Appendix A. Findings include the following:

- Truck drivers generally hold to the view that there is a shortage of truck parking and the issue has not improved in the 20 -plus years since first being documented in driver surveys. Finding truck parking takes time away from productive transport of payload.
- Unauthorized parking is often the result of no nearby parking facilities or full parking facilities.
- Drivers indicate that time-of-day impacts parking availability. Locating parking is the most difficult during late evening and early morning hours. Multiple surveys found that locating available truck parking is more difficult on weekdays than on weekends.
- Parking issues are most severe in metropolitan areas.
- Studies in Wisconsin and Washington State indicated that additional parking is needed at locations affected by inclement weather.
- Drivers generally prefer parking at private truck stops for long term breaks.


## B. Colorado Survey

To understand issues specific to Colorado, the project team completed a survey of drivers and industry members who traverse the state in early 2018. The 20 question survey netted 167 responses. The survey summary is provided in Appendix B. Findings included the following:

- Finding parking can be a hindrance to managing fatigue and meeting HOS requirements.
- Nearly 80 percent of respondents disagreed with the statement that it is relatively easy to find truck parking in Colorado.
- Private truck stops are the most common place to take breaks, followed by shipper/ receiver locations and public rest areas.
- More than 40 percent of respondents spent 1-plus hour searching for long term parking.
- The interstate corridors included in the TPA were consistently noted as the most difficult locations to find safe and legal parking, with I-70 west and I-25 north atop the list.

Respondents noted the following preferred solutions for truck parking problems:

- More parking facilities are needed. Specifically, new public rest areas and private truck stops should be opened and closed public rest areas should be reopened.
- Shippers and receivers should permit parking.
- Truck parking spaces should accommodate current vehicle configurations.
- Industrial locations should permit on street truck parking.

Open-ended question responses included the following feedback:

- Denver metro and I-70 west need more parking supply.
- Need more rest areas - keep existing rest areas open and add more with restrooms and trash.


## III. TRUCK PARKING INVENTORY

## A. Methodology

The inventory of truck parking spaces along TPA corridors is currently provided in the 2012 CDOT Truck Parking Guide. The TPA team updated the inventory by gathering information from aerial photographs, outreach to stakeholders, and coordination with CDOT staff. A complete field inventory was not conducted for the TPA. Data include the number of official parking spaces, amenities, accessibility, and other pertinent information. The inventory includes both public and private facilities.

## B. Summary of Findings

Table $\mathbf{2}$ provides a summary of truck parking spaces included in the inventory by corridor and type.
Table 2. Truck Parking Inventory Summary by Corridor

| Corridor | Length <br> (Miles) | Truck Parking Spaces by Type |  |  |  | Spaces/ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | Truck Stop | Other $^{\mathbf{1}}$ | Total | Mile |  |
| I-25 |  | 95 | 620 | 8 | 723 | 2.4 |
| I-70 | 450 | 68 | 1,798 | 87 | 1,953 | 4.3 |
| I-76 | 184 | 65 | 313 | 0 | 378 | 2.1 |
| US 40 | 258 | 10 | 35 | 27 | 72 | 0.3 |
| US 50 | 150 | 6 | 223 | 0 | 229 | 1.5 |
| US 160 | 305 | 13 | 171 | 6 | 190 | 0.6 |
| US 287 | 186 | 13 | 178 | 15 | 206 | 1.1 |
| SH 71 | 131 | 0 | 0 | 11 | 11 | 0.1 |
| Total | $\mathbf{1 , 9 6 3}$ | $\mathbf{2 7 0}$ | $\mathbf{3 , 3 3 8}$ | $\mathbf{1 5 4}$ | $\mathbf{3 , 7 6 2}$ | $\mathbf{1 . 9}$ |

${ }^{1}$ The "other" category includes truck parking areas not associated with larger sites/ amenities, such as pullouts or scenic overlooks where truck parking is allowed.

As shown, nearly 4,000 spaces are provided along the TPA corridors. The interstate corridors possess the most spaces per mile, consistent with their role as major commercial routes. Of the US and State Highways, US 50 and US 287 possess the most parking spaces.

The truck parking inventory is detailed in Appendix C.

## C. Truck Parking Maps

Truck parking maps have been developed for the TPA corridors to disseminate the inventory information for public use. These maps are provided in Appendix D.

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## IV. TRUCK TRAVEL PATTERNS

The American Transportation Research Institute (ATRI), a TPA team member, has constructed a database of anonymized continuous stream truck positioning using GPS units installed in approximately 700, 000 trucks throughout the US. The TPA team assembled location data from trucks equipped with GPS devices to gain additional understanding of typical freight movement patterns across and within Colorado. The proprietary dataset of GPS-equipped trucks captured approximately 35 percent of the total fleet of tractor-trailer semis on the road.

Additional detail regarding the nature and use of the GPS data is provided in Appendix E.
Figure 2 depicts the locations across the United States that trucks reach within 7 days of departing Denver. Primary metropolitan destinations include Dallas and Kansas City, and many routes traverse the plains of eastern Colorado and western Kansas. I-25 carries a significant volume.

Figure 2. 7-day Denver-Based truck flow map


The truck GPS data were also consulted to reveal truck origin/ destination information. Figure 3 (Origins) and Figure 4 (Destinations) depict a hierarchy of origins and destinations within and at the edges of the state, identified by census block group and extracted during a 2-week period in July of 2017. The analyses show expected OD (Origin/ Destination) concentrations surrounding Denver, and concentrations are noted surrounding Greeley and Limon. When departing Colorado to the south, truckers show similar preference levels for using I- 25 south and US 287. Additional travel pattern graphics are provided in Appendix F.

Figure 3. Truck Trip Origins by Census Block Group


Figure 4. Truck Trip Destinations by Census Block Group


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## V. TRUCK PARKING USAGE AND NEEDS

## A. Truck Parking Usage Analysis

Truck position data available from GPS devices were employed to quantify the level of parking facility usage along the TPA corridors. Usage quantities by GPS-equipped trucks were extracted from four separate two-week time periods in 2017, one in each quarter of the year. Because the usage data only covered trucks equipped with the ATRI GPS devices, the recorded totals were increased using an "expansion factor" calculated by comparing truck volume counts with recorded GPS trucks for various roadway segments across the state. Also of note, the data capture a snapshot of parking supply and demand during the year 2017. Truck parking can shift quickly when new parking lots are constructed or existing lots are closed. Changes that have occurred since 2017 are not reflected in this analysis.

As an example, Figure 5 depicts hourly parked truck information for the J ohnson's Corner private truck stop located along I-25 at approximately Milepoint 253. The plotted points represent the average number of trucks recorded within the parking lot for each hour. The number of parked trucks shown for each hour is averaged across all of the 14 days in the two week time period.

Figure 5. I-25 Johnson's Corner 24-hour Averages


As shown, this private truck stop showed heavy parking demand, particularly during the warmer months of the year. The site accommodates more parked trucks than the number of official spaces provided. Truck parking demand increased during the evening hours, a trend common among truck parking locations. The peak usage level of 228 parked trucks was achieved during the $6-7$ pm hour in July of 2017.

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Data similar to that represented on Figure $\mathbf{5}$ were compiled for official truck parking locations along all TPA corridors, and is represented by corridor in graphical summary form on the following pages. The below graphic is provided to assist in interpreting the corridor parking summaries:

## HOW TO READ THE CORRIDOR PARKING SUMMARIES

The top map on each page identifies all analyzed parking facilities with a circle. The size of the circle represents the number of parking spaces available at each location, and the color filling the circle represents the peak usage level for each location. The peak usage level is the highest average number of parked trucks calculated at the site during any one of the four quarters analyzed. Usage levels (the ratio of parked trucks to spaces provided) greater than or equal to 85 percent are shown in red, 60-84 percent are shown in yellow and less than 60 percent are shown in green.


The notes along the bottom edge of each page provide a summary of conditions by segment, characterizing the nature of truck parking needs and offering suggested strategies for expanding truck parking.

The plot in the middle of each page represents the parking usage levels calculated along each corridor. The plotted lines represent the number of spaces used/provided within a 30 -minute travel distance along the corridor. Portions of the plot that show a usage line exceeding parking supply indicate that a parking shortfall exists for a 30 -minute travel distance in either direction along the corridor. The color coded line along the bottom edge of each plot denotes the relative usage rating for individual segments along each TPA corridor. The usage rating is a ratio of peak occupied spaces to provided spaces. Heavy usage levels ( $85 \%$ or more) are highlighted in red, intermediate ( $60-85 \%$ ) in yellow and moderate ( $60 \%$ ) in green.

Summary of Conditions, Needs and Solutions
South I-25 (From New Mexico State Line to I-70)
2017 Truck Parking Usage by Location


2017 Truck Parking Usage along Corridor


Trinidad / Walsenburg

- Utilization varies in this segment, with shortfalls in the more rural areas south of Walsenburg.
- There is an existing cluster of truck parking facilities along I-25 in Raton, NM, within 10 miles of Colorado.
- An expansion of the existing CDOT El Moro Rest Area or a private investment in Trinidad would provide additional truck parking opportunities.

Colorado City / Pueblo

- This segment exhibits moderate usage with an identified shortfall around Colorado City.
- The existing Love's at Pueblo West was observed to be operating over capacity.
- Higher than average freight traffic growth is forecasted between Pueblo and Denver


## ado Springs / Monumen

- A shortfall of spaces was observed

A shortfall of spaces was observed
between Monument and Castle Rock.
A new Pilot facility op
2018

- Higher than average freight traffic growth is forecasted between Pueblo and Denver

Castle Rock / Denver
A shortfall of spaces was observed between And Denver.
The existing Pilot Travel Center at I-70
Steele Street closed in December 2017.

- A private investment in the Denver area could
provide additional truck parking opportunities forecasted betwage freight traffic growt

Summary of Conditions, Needs and Solutions North I-25 (From I-70 to Wyoming State Line)
2017 Truck Parking Usage by Location


2017 Truck Parking Usage along Corridor


Denver / Thornton

- A shortfall of spaces was observed on the north side of Denver.
- The existing Pilot Travel Center at I-70 / Steele Street closed in December 2017
- A private investment in the Denver area could provide additional truck parking
Higher than average freight traffic growth is forecasted from Longmont south.

Longmont / Berthoud / Windsor

- A shortfall of spaces was observed in this segment.
- A new Love's facility opened at the Berthoud interchange in Fall 2018. south


## Fort Collins and North

- This segment exhibits a substantial shortfall of spaces
- Opportunities for private investment appear to exist at Mountain Vista Drive (Wellington).
- Higher than average freight traffic growth is forecasted from Wellington north.

Summary of Conditions, Needs and Solutions
West I-70 (From Utah State Line to I-25)
2017 Truck Parking Usage by Location


2017 Truck Parking Usage along Corridor


Rifle / New Catle

A shortfall of spaces was observed in this
segment.

- CDOT's Rifle Rest Area was observed to be operating over capacity
operating over capacit
Higher than average freight traffic growth forecasted between Parachute and Denver.

Glenwood Springs / Edwards

- This segment generally provides
adequate spaces.
- Higher than average freight traffic growth is forecasted between Parachute and Denver

Avon / Silverthorne / Idaho Springs
Avol A substantial shortfall of spaces was observed in
this segment. area and Idaho Springs.
A facility near Empire J unction could provide additional truck parking opportunities.

- Higher than average freight traffic growth is forecasted between Parachute and Denver.


## Evergreen / Denver

- A shortfall of spaces was A shortfall of spaces was The existing Pilot Travel The existing Pilot Trave Center at Steele Street
cl osed in December 2017
- Higher than average freight traffic growth is forecasted between Parachute and Denver


## Summary of Conditions, Needs and Solutions

East I-70 (From I-25 to Kansas State Line)
2017 Truck Parking Usage by Location


2017 Truck Parking Usage along Corridor


Denver / Watkin
A shortfall of spaces was observed in this segment.

- The existing Pilot Travel Center closed in December 2017.
- A private investment in the Denver area could provide additional truck parking opportunities.
- Higher than average freight traffic growth is forecasted between Byers and Denver.

Bennett / Limon

- A shortfall of spaces was observed in this segment
- The existing Deer Trail rest area is closed. Reopening this facility would provide additional spaces.
- Opportunities for a new private facility appear to exist in
- Higher than average freight traffic growth is forecasted between Byers and Denver.

Arriba/ Flagler/Burlington reflect parking shortfalls.

# Summary of Conditions, Needs and Solutions 

I-76 (From I-70 to Nebraska State Line)

## 2017 Truck Parking Usage by Location



2017 Truck Parking Usage along Corridor


Denver / Keenesburg

- A shortfall of spaces was observed in this segment.
- The existing Pilot Travel Center at I-70 / Steele Street closed
in December 2017.
- A new facility opened in Brighton in Spring 2018, partially addressing observed shortfalls. Additional spaces would still be beneficial.
- Higher than average freight traffic growth is forecasted between Wiggins and Denver.

Wigains / Brush / Sterling

- This segment generally provides adequate spaces.
- A new facility opened in Brush in early 2018.

Sedgwick / Julesburg
A shortfall of spaces was observed in
this segment.

- Truck parking deficiencies could be addressed by additional spaces at the Julesburg private investment in J ulesburg


2017 Truck Parking Usage along Corridor


## Craig/ Hayde

- This segment exhibits a shortfall of spaces.
- This segment exhibits a shortfall of spaces.
- Truck parking deficiencies could be addressed through a private investment in Dinosaur
- This segment is expected to see the largest increases in freight traffic along US 40
- Recent private investments have added spaces in

Craig.

- Additional spaces could be added at CDOT's Hayden Rest Area.
- Additional truck parking could be provided through a Steamboat Spring Steamboat Springs.

Kremming

- There are no spaces in thi segment.
- Additional truck parking could be provided through an investment in Kremmling.

Granby

- This segment exhibits a shortfall of spaces.
- The existing facility in Granby could be formalized and private investment.

Berthoud Pass

- There are no spaces in this segment. A facility near Empire J unction could provide additional truck
parking spaces.


2017 Truck Parking Usage along Corridor


Avondale / Boone
This segment exhibits a hortfall of spaces

- The truck parking deficiencies could be addressed through a private investment in Avondale or Fowler.

Rocky Ford / La J unta / Lamar

- This segment generally provides adequate spaces
- A new facility opened in Lamar in 2018
- Higher than average freight traffic growth is forecasted between La J unta and Lamar


## Holly

- This segment exhibits
moderate usage.
Additional truck parking could be provided through a Holly Rest Area or private investment in Holly or Kansas.

US 160 (From New Mexico state line to Walsenburg)

## 2017 Truck Parking Usage by Location



2017 Ťruck Parking Usage along Corridor


Towaoc / Cortez / Mancos
This segment exhibits moderate usage

- Additional truck parking could be provided through an expansion of CDOT's Cortez Rest Area or through private investment in Cortez or Mancos.


## Durango / Bayfield

- This segment exhibits a shortfall of spaces
- Additional truck parking could be provided through a private investment in Durango, preferably along the US 160 / US 550 overlap.
- Higher than average freight traffic growth is forecasted between Durango and South Fork.

Pagosa Springs

- This segment exhibits moderate usage.
- Additional truck parking could be provided through an investment in Pagosa Springs.
- Higher than average freight traffic growth is forecasted between Durango and South Fork

South Fork / Monte Vista / Alamosa - This segment generally provides adequate spaces.

- The existing Alamosa Loaf \& Jug was no captured in the inventory. It provides additional truck parking in Alamosa

Blanca / La Veta / Walsenburg

- This segment exhibits moderate usage.
- There are no spaces along La Veta Pass.
- Several existing pull-offs could be improved to provide limited truck parking spaces if utilities could be provided.

Summary of Conditions, Needs and Solutions
US 287 (From Oklahoma state line to Lamar)
2017 Truck Parking Usage by Location



Gobbler's Knob / Lamar

- This segment generally provides adequate spaces.
- A new Pilot / FlyingJ facility opened in Lamar in early 2018
- A new Pilot / Flyingl facility opened in Lamar in early 2018. Oklahoma and Lamar.

2017 Truck Parking Usage by Location


Hugo / Limon

## Lamar / Eads / Kit Carson

- This segment generally provides adequate spaces.
- A new Love's facility opened in Eads in late 2016 and was not captured in the inventory
- A new Pilot / FlyingJ facility opened in Lamar in early 2018.
- This segment exhibits a shortfall of spaces between Limon and Hugo and provides adequate spaces south of Hugo.
- This segment of US 287 overlaps US 40 . private investment in Hugo.

Summary of Conditions, Needs and Solutions
SH 71 (From I-70 at Limon to the Nebraska state line)
2017 Truck Parking Usage by Location


2017 Truck Parking Usage along Corridor


## B. Truck Parking Needs

The information provided in the preceding summary sheets is summarized in Table 3. The current and future need for additional truck parking throughout the TPA corridors is denoted by symbols, and a series of potential solutions have been identified for further consideration along particular corridor segments.
Table 3. Summary of Needs by Corridor and Segment

| Corridor | Segment | Usage-based need |  | Potential Solutions |
| :---: | :---: | :---: | :---: | :---: |
|  |  | Current | Future |  |
| Interstate 25 | Trinidad / Walsenburg | - | - | A, C, D |
|  | Colorado City / Pueblo | $\bigcirc$ | - | D |
|  | Colorado Springs / Monument | - | - | A, B, C, D |
|  | Castle Rock / Denver | - | - | A, B, C, D |
|  | Denver / Thornton | - | - | A, C, D |
|  | Longmont / Berthoud / Windsor | - | - | A, B, C, D |
|  | Fort Collins and north | $\bigcirc$ | - | A, B, C, D |
| Interstate 70 | Grand Junction / Parachute | $\bigcirc$ | - | A, B, C, D |
|  | Rifle / New Castle | $\bigcirc$ | $\bigcirc$ | A, B, C, D |
|  | Glenwood Springs / Edwards | $\bigcirc$ | $\bigcirc$ | A, B, D |
|  | Avon / Silverthorne / Idaho Springs | - | - | A, C, D |
|  | Evergreen / Denver | $\bigcirc$ | - | A, B, C, D |
|  | Denver / Watkins | - | - | A, B, C, D |
|  | Bennett / Limon | $\bigcirc$ | - | A, B, C, D |
|  | Arriba / Flagler / Burlington | $\bigcirc$ | $\bigcirc$ | A, B, D |
| Interstate 76 | Denver / Keenesburg | $\bigcirc$ | $\bigcirc$ | A, B, C, D |
|  | Wiggins / Brush / Sterling | $\bigcirc$ | $\bigcirc$ | D |
|  | Sedgewick / J ulesburg | $\bigcirc$ | O | A, B, D |
| US Highway 40 | Dinosaur / Elk Springs | $\bigcirc$ | - | A, B, D, E |
|  | Craig / Hayden | $\bigcirc$ | $\bigcirc$ | A, B, D, E |
|  | Steamboat Springs | $\bigcirc$ | $\bigcirc$ | D |
|  | Kremmling | $\bigcirc$ | $\bigcirc$ | A, D, E |
|  | Granby | - | - | A, D, E |
|  | Berthoud Pass | $\bigcirc$ | $\bigcirc$ | A, D, E |


| Corridor | Segment | Usage-based need |  | Potential Solutions |
| :---: | :---: | :---: | :---: | :---: |
|  |  | Current | Future |  |
| US Highway 50 | Avondale / Boone | - | $\bigcirc$ | A, D, E |
|  | Rocky Ford / La Junta / Lamar | $\bigcirc$ | $\bigcirc$ | D |
|  | Holly | - | $\bigcirc$ | D |
| US Highway 160 | Towaoc / Cortez / Mancos | $\bigcirc$ | $\bigcirc$ | D |
|  | Durango / Bayfield | - | - | A, B, D, E |
|  | Pagosa Springs | $\bigcirc$ | - | A, B, D, E |
|  | South Fork / Monte Vista / Alamosa | $\bigcirc$ | $\bigcirc$ | D |
|  | Blanca / La Veta / Walsenburg | - | - | A, D, E |
| US Highway 287 | Campo / Springfield | $\bigcirc$ | - | A, B, D, E |
|  | Gobbler's Knob / Lamar | - | - | A, B, D |
|  | Lamar / Eads / Kit Carson | $\bigcirc$ | $\bigcirc$ | D |
|  | Hugo / Limon | - | - | A, C, D, E |
| State Highway 71 | Limon | - | - | A, B, D, E |
|  | Last Chance | - | - | A, D, E |
|  | Brush | $\bigcirc$ | $\bigcirc$ | D |
|  | Stoneham / Kimball (NE) | - | - | A, D, E |
| O Adequate parking available |  |  |  |  |
| = Moderate usage <br> = Shortfall in parking |  |  |  |  |
| = Substantial shortfall in parking |  |  |  |  |
| Truck Parking solutions: |  |  |  |  |
| A: Construct additional safety rest areas with truck parking |  |  |  |  |
| B: Construct public truck parking facilities adjacent to truck stops and travel plazas |  |  |  |  |
| C: Open existing facilities such as weigh stations and park-and-ride facilities to accommodate truck parking |  |  |  |  |
| D: Promote the availability of publicly or privately provided truck parking on the NHS using intelligent transportation systems (ITS) or other means |  |  |  |  |
| E: Construct turnouts along the NHS for truck parking |  |  |  |  |
| F: Making capital improvements to seasonal truck parking facilities to allow the facilities to remain open year-round. |  |  |  |  |

Figure 6 provides a summary map of current usage ratings along all TPA corridors. Anticipated future growth levels are not incorporated into this map.

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Figure 6. 2017 TPA Corridor Usage Levels


As shown in the individual corridor summaries and Figure 6, all of the TPA corridors and many segments within corridors demonstrate a need for additional truck parking spaces, both currently and in the future. All options for adding parking should be considered for these corridors, and several possible strategies for adding parking are identified in Table $\mathbf{3}$ for further consideration.

Of note, I-70 West possesses some current needs not fully captured in the usage analysis:: I-70 between Glenwood Springs and Copper Mountain shows mostly moderate and intermediate usage. This result is primarily caused by lower relative usage levels at the Iarger (48 spaces) Dotsero location. There are numerous smaller ( $10-20$ spaces) truck parking sites that experienced heavy usage levels. Field observations by CDOT personnel confirm that most available truck parking locations other than Dotsero are routinely filled overnight. A portion of I-70 east of the Eisenhower-J ohnson Memorial Tunnel shows "no parking available" segments, the only TPA interstate with such a condition. Additional truck parking spaces are needed in this corridor based on current conditions.

## C. Corridor Closure Parking Analysis

Two closure scenarios were analyzed in the TPA to gain insight into how truck parking needs are affected by rapid changes to corridor availability. The following two closure events were assessed:

1. December 12, 2017: A truck crashed along I-70 near Georgetown, and I-70 was closed in both directions for 4.5 hours, and eastbound remained closed for another 5 hours.

GPS data were consulted to identify particular locations where trucks stopped during the closure. These analyses indicate that truckers improvised to find parking during the closure, with many eastbound trucks staging well upstream away from Georgetown in the Frisco/ Dillon area. Figure 7 depicts truck travel speeds during the closure in the Frisco/ Lake Dillon area, with red dots indicating stopped or very slow traveling trucks and green indicating normal free-flow speeds. As shown, many trucks selected State Highway 9 in the Frisco area as a place to stop and park while awaiting reopening. This occurrence has been noted by observers in this area during various closures. The data indicate that additional emergency parking would be particularly helpful along I-70 through Summit County.

Figure 7. Truck speeds During l-70 Closure-Frisco Area

2. March 23, 2016: A Spring blizzard shut I-25 down between Castle Rock and Ft. Collins and I-70 was closed east of Denver. The I-70 closure lasted through the early morning of March 24, while the I-25 closure was shorter in duration. Truck GPS data were consulted to understand the resulting impacts to truck parking. The data show that as blizzard conditions worsened, trucks began to avoid the areas affected by the storm, likely rerouting out of the area or delaying travel. Trucks already traveling on the TPA corridors found parking spaces, generally adding to parking demand in comparison with conditions 1 week prior. Figure 8 provides a 24 -hour comparison of parked trucks between a day 1 week prior to the blizzard and the day of the blizzard. The comparison includes two truck stops: one along I-25 at Monument and the other along I-70 in Limon, both in the area of the storm.

Truck Parking Assessment

Figure 8. Blizzard Impact to Number of Parked Trucks


As shown, the number of parked trucks generally decreased during the initial hours of the storm, then increased as the storm continued. Further investigation of similar data from other locations indicated varying fluctuations-some locations experienced increased parking loads during the closures while others decreased. Based on usage data, the parking impact of storm-related closures appeared to be fairly well accommodated by the parking facilities along TPA corridors. It is possible that the advance knowledge of the storm helps to improve conditions, and drivers likely change travel plans, relieving the system of some demand. Providing additional emergency truck parking locations, particularly at locations proximate to closure gates, is recommended for further consideration.

Appendix G provides additional graphics depicting truck movement patterns during the closure scenarios.

Truck Parking Assessment

## VI. DETENTION AND STAGING PARKING

A significant portion of the demand for truck parking arises from staging needs. Staging is the exercise of final delivery of cargo to its given destination or pickup from its origin, and involves both the driver and shipper/ receiver site. Effective, timely staging depends upon numerous factors, including reliable travel times on the transportation network, good scheduling practices, efficient design of warehouse parking and circulation, and sound communication between drivers and shipper/ receivers. Factors that are beyond industry control, such as poor weather and traffic congestion, impact staging effectiveness.

The result of staging delays is driver detention, defined as time spent by drivers waiting to load or unload at a shipper/ receiver location. Detention has become a major issue in the trucking industry due to escalating costs. Another impact of detention is the need to park numerous trucks as drivers await service. While some shipper/ receiver locations allow and provide space for staged trucks to park, drivers are often left to find parking at locations that have not been designed for safe truck parking, such as city streets, businesses or undesignated open areas. Drivers are reluctant to move frequently out of concern for HOS compliance, so parking spaces are occasionally selected for convenience rather than legality of parking. These legally or illegally parked trucks can cause concerns for the part of local businesses and residents.

This national concern is also noted in Colorado, where the truck parking survey respondents noted that a minority of shipper/ receiver locations allow truck parking on site. The on-street presence of trucks has been noted in areas surrounding industrial sites in the Denver area, and it is likely that this condition occurs elsewhere.

This TPA has not been scoped to provide a detailed assessment of detention and staging parking issues and solutions at this time. However, the following potential actions are offered as a pathway toward addressing the issues.

Industry input: More discussion with Colorado industry partners is needed to help define the problem(s) and understand the types of solutions that could be feasible and effective. Discussions could include industry trade groups, city and county governments, law enforcement, shipper/ receivers, truck drivers, carriers, and owner-operators. Effective discussions will be pro-active and solution oriented.

More Parking: There is a need to provide additional safe truck parking surrounding and/ or within shipper/ receiver locations. More parking supply may be sought in the form of brownfield redevelopment or zoning changes.

Multi-pronged Strategy: A strategy involving multiple parties is needed to help address the challenges associated with detention and staging. An effective strategy will involve creative action on the part of schedulers, drivers, carriers, municipal governments, law enforcement agents, planners, and local land developers.

Truck Parking Assessment

## VII. IMPLEMENTATION PLAN

The TPA provides a data-driven basis for planning and action to improve truck parking conditions across Colorado. The following future actions are recommended as actions that can be pursued by CDOT:

## Monitoring the Truck Parking Network

- Truck parking supply and usage is dynamic. Continued monitoring of truck parking inventory is recommended to identify new or closed facilities, or changes in capacity or amenities of existing facilities.
- Conduct an annual demand assessment with appropriate datasets
- Enhance methodology to continually improve truck parking data and information
- Expand assessment to additional corridors as necessary


## Partnerships

- Partner with the CDOT FAC to prioritize truck parking initiatives and investments
- Develop resources to communicate with local and regional agencies about the importance of truck parking and resources to expand parking locally


## Communication

- Update truck parking brochures as needed to provide the most recent information
- Develop online tool to disseminate truck parking information through CoTrip and other platforms


## CDOT Multi-use Infrastructure

- Identify existing CDOT infrastructure that may be used as truck parking in addition to its primary purpose. Such infrastructure may include chain stations, rest areas, maintenance facilities, park-and-rides, and others.
- Address policies or procedures which prevent expanded use of such facilities


## Regulatory Challenges

- Identify state and local regulations which hinder development of truck parking


## Multi-use Infrastructure Owned by Others

- Identify private facilities that potentially provide parking solutions. Facilities may include grey fields, shipper facilities, municipal streets in industrial areas, and others
- Through discussions with private facility owners, identify what issues or challenges prevent parking at private facilities
- Prioritize the issues and challenges which CDOT could play a role to resolve


## Add Parking Spaces

Using the TPA findings as a guide, add truck parking spaces. Feedback from the industry and datadriven findings indicate that truck parking needs exist on all eight corridors and further needs will arise with future growth and consideration of additional corridors. Initial priority could be given to interstate corridors showing heavy usage conditions. Numerous strategies should be explored for adding parking spaces, including:

- Construct new CDOT facilities
- Expand existing CDOT facilities
- Play appropriate role(s) in development of new truck stop facilities by private entities
- Identify opportunities for expansion of existing private parking facilities through partnerships


# Colorado Truck Parking Literature Review 

Prepared by the

## American Transportation Research Institute

Arlington, VA


The American Transportation Research Institute (ATRI) was tasked by Felsburg Holt \& Ullevig (FHU) to synthesize the truck parking survey findings, at a metropolitan planning organization (MPO), state, regional, and/or national levels. Additionally, ATRI searched Transportation Research Information Service (TRIS) and department of transportation (DOT) websites of states surrounding Colorado. This report summarizes the findings of this truck parking literature review. Overall findings and recommendations are included in the summary section at the end of this report.

## 1. Commercial Driver Rest \& Parking Requirements: Making Space for Safety ${ }^{1}$

500 truck drivers responded to this survey. Significant findings included: most drivers (90\%) believe a truck parking shortage exists and over half of drivers reported the Northeast U.S. has the most severe truck parking shortage issues ( $56 \%$ ). On average, drivers parked in an unauthorized location due to no available parking four times per month. Unauthorized parking was most likely to occur between 10:00 p.m. and midnight. 68 percent of drivers preferred truck stops for long-term parking. Over half of drivers rated public rest areas as "only fair" or "poor" (54\%) for meeting their rest needs.

## 2. Highway Special Investigation Report - Truck Parking Areas ${ }^{2}$

This document reports the findings of truck driver surveys administered by the Owner Operators Independent Drivers Association (OOIDA) and the New York State DOT. The 1999 OOIDA survey found that a majority of drivers ( $90 \%$ ) have difficulty finding parking at least once per week and nearly 60 percent park on road shoulders or ramps when parking is unavailable (59\%). Finally, the results of a 1999 New York State survey of 303 drivers found most drivers (90\%) believed additional parking was needed in New York State.

## 3. Study of the Adequacy of Commercial Truck Parking Facilities - Technical Report ${ }^{3}$

The American Trucking Associations (ATA) Foundation surveyed over 2,000 truck drivers on parking preferences, solutions for parking shortages and why drivers park illegally. 90 percent of respondents indicated they "sometimes," "rarely," or "almost never" find available parking at rest areas, while two thirds reported that they "sometimes," "rarely," or "almost never" find available parking at truck stops. Drivers reported parking in unauthorized locations on ramps due to no empty spaces nearby ( $94 \%$ ), time restrictions at nearby facilities ( $50 \%$ ) and access to available spaces at nearby facilities were blocked (50\%). Free responses indicated that while drivers try to plan future parking stops, various circumstances often prevent them from parking where they originally intended, such as shipper delays, fatigue, or no available parking at preplanned stops. Drivers' primary recommendation for improving truck parking issues was to build more parking spaces.

[^0]
## 4. Final Report of ITS Center Project: Truck Stop Information ${ }^{4}$

The University of Virginia Center for Transportation Studies conducted a truck driver survey to calibrate a truck parking supply and demand model for Virginia. Drivers were asked a variety of questions related to truck parking, including, frequency of use, whether parking supply was adequate, and where drivers would park if their preferred location had no available parking. Over half of drivers indicated that parking supply was inadequate (60\%) in Virginia. Drivers indicated that time-of-day significantly impacted availability, with available parking being exhausted by late night or early morning. 20 percent of drivers indicated that if their initial choice was not available they would park on a roadway. Private truck stops were preferred for long breaks by 80 percent of drivers.

## 5. North Jersey Truck Rest Stop Study ${ }^{5}$

This report examined truck parking shortages and consequences of these shortages in the North Jersey Transportation Planning Authority Region, which is comprised of 13 counties in Northern New Jersey. 70 truck drivers were surveyed for this project. Drivers reported parking difficulties occurred due to inadequate parking at existing parking facilities (37\%) or that there were no nearby parking facilities (24\%). A majority of drivers preferred truck parking within three miles of the highway system (66\%).

## 6. Low Cost Strategies for Short Term Parking on Interstate Highways of the Mississippi Valley Freight Coalition ${ }^{6}$

This research, conducted by the National Center for Freight and Infrastructure Research and Education, sought to understand and analyze truck parking trends and issues in the member states of the Mississippi Valley Freight Coalition, which included Illinois, Indiana, Iowa, Kansas, Kentucky, Michigan, Minnesota, Missouri, Ohio, and Wisconsin. ${ }^{7}$ Specifically, the research investigated where additional capacity was needed, operational issues resulting in truck parking issues and low cost solutions for truck parking problems. This data collection effort was unique in that the online survey tool collected respondent location data to connect reported parking issues to specific locations. Metropolitan and surrounding areas were found to have the most severe parking issues. Truck drivers indicated the primary parking issue was inadequate capacity at parking locations, which peaked between 9 p.m. and 5 a.m. The most common method of locating parking was truck stop guides, followed by CB radio, word of mouth and prior experience. Drivers indicated fuel, restrooms, food, security and proximity to destination were factors considered when planning where to park. Drivers primarily recommended expanding

[^1]existing parking facilities or building more parking facilities to improve truck parking issues in the region.

## 7. Washington State Truck Parking Survey Summary Report ${ }^{8}$

Washington State conducted a truck driver survey ( $n=473$ ) to seek feedback from stakeholders on how to improve truck parking along major freight corridors. Drivers indicated for overnight parking, they primarily use private truck stops, followed by public rest areas. Amenities drivers use at private truck stops include restrooms (94\%), truck parking (93\%), fueling services (93\%) and restaurants (87\%). At public rest areas, drivers use restrooms (96\%), truck parking (83\%) and vending machines ( $31 \%$ ). Driver-reported parking issues included: overcrowding at truck parking facilities, the excessive distance from one parking facility to the next and inconvenient placement of existing parking facilities. Drivers indicated additional parking is needed in urban areas and at Snoqualmie Pass. 7 percent of drivers indicated that they would only use new or enhanced truck parking facilities if they were directly accessible from the interstate. A majority of drivers were not willing to pay for truck parking for the 10-hour required Hours-of-Service (HOS) breaks (69\%).

## 8. Low Cost Strategies to Increase Truck Parking In Wisconsin. ${ }^{9}$

This survey effort, similar to that of the Mississippi Valley Freight Coalition, also surveyed truck drivers to collect location-specific data. Drivers identified metropolitan areas as having the most parking-related issues, particularly when staging. Ramp parking was found to be the result of inadequate parking to accommodate peak demand periods. Bad weather exacerbated these issues. Real-time truck parking availability information is recommended to better match existing supply with demand, particularly when drivers are not aware of nearby parking. Driverrecommended solutions included: expanding existing facilities, variable roadside message signs to notify drivers of real-time parking availability information and converting unused weigh stations into truck parking.

## 9. I-95 Corridor Coalition Truck Parking Availability Notification System User Requirements/Preferences Survey ${ }^{10}$

The I-95 Corridor Coalition is a partnership of key stakeholders along the I-95 corridor, including transportation agencies, toll authorities, transportation industry associations, law enforcement agencies and other relevant organizations. The I-95 Corridor Coalition tasked ATRI with assessing user needs and preferences to guide the development of a truck parking availability system (TPAS). 134 truck drivers were surveyed in March 2010.

[^2]The most common truck parking issues were: rest area time limits and truck parking only being available in unsafe locations or road shoulders/ramps. Parking was needed most often for HOS compliance. Access to restrooms, followed by fuel, security, and showers were the most important factors in parking location choices.

## 10. Utah Interstate 15 Truck Parking Study ${ }^{11}$

This survey sought to gather information on long-term (more than four hours) truck parking along the l-15 corridor in Utah. 66 percent of truck drivers indicated they choose parking locations once they were on the road. Drivers indicated that parking on road shoulders and ramps is the result of two factors: no available parking and no nearby parking facilities. Private truck stops were preferred for long-term stops. The most common solution suggested for truck parking issues was to build more truck parking spaces. Half of truck drivers indicated a desire for more information on parking availability.

## 11. A Comprehensive System for Assessing Truck Parking Availability ${ }^{12}$

ATRI co-designed a U.S. DOT-sponsored TPAS with the University of Minnesota, and conducted a survey to investigate how to best deliver truck parking availability information. The survey was available from September 17 to October 24, 2012. A total of 335 surveys were analyzed, of which 72 percent were submitted by truck drivers.

Required HOS breaks were the primary reason drivers cited for requiring parking, followed by shower and restroom breaks. The two most frequent parking issues reported were parking only being available in unsafe locations and the only available parking locations being on road shoulders or ramps. The most desired amenity for parking locations was restrooms, followed by fuel, showers, and adequate security.

## 12. Virginia Truck Parking Study ${ }^{13}$

The fiscal year 2014/2015 Virginia DOT Business Plan required a truck parking study to identify where additional truck parking was needed. This study included surveys of relevant stakeholders and sought information regarding unauthorized truck parking - locations where unauthorized parking occurs and why truck drivers park in unauthorized locations.

Truck drivers indicated there is a truck parking shortage in Virginia, which leads to parking in unauthorized locations. Other factors also contributed to unauthorized parking, including, lack of knowledge of where available parking is located, parking facilities being at or over capacity and inflexible appointment times at shippers/receivers.

[^3]More than 70 percent of drivers reported personal safety concerns related to overnight truck parking. Drivers indicated congestion, resulting in unreliable travel times, contributes to the difficulty of finding truck parking. 85 percent of drivers reported there are inaccessible areas at both public and private truck parking facilities. In Virginia, this is due to the functional obsolescence of the truck parking facilities - truck parking spaces were designed for much smaller vehicle configurations.

The report also included a survey of state troopers. Over 60 percent of state troopers indicated they have observed unauthorized parking. Of these, most state troopers ask drivers to move their vehicle (70\%), which may conflict with HOS requirements. Similarly, most truck stop operators ( $71 \%$ ) surveyed reported that they observe unauthorized parking at or near their facility.

## 13. Jason's Law Truck Parking Survey Results and Comparative Analysis ${ }^{14}$

FHWA surveyed over 8,000 truck drivers to meet requirements established by the Moving Ahead for Progress in the $21^{\text {st }}$ Century Act. Drivers reported that parking was most challenging in the Northeast and Southeast United States. ${ }^{15}$ The Mountain State region, which includes Colorado, was one of the least cited regions for having insufficient parking supply - less than 20 percent of drivers reported that parking supply is insufficient in this region. Nearly 80 percent of drivers have difficulty finding parking at least once a week. Evening hours (7:00 p.m. to midnight), followed by early morning hours (midnight to 5 a.m.), were the most difficult times to find safe parking. Drivers also indicated that finding parking on weekdays was more difficult than weekends.

## 14. Kansas Truck Parking ${ }^{16}$

To improve freight competitiveness and efficiency in Kansas, ATRI surveyed 1,300 truck drivers from May 15,2015 through June 24, 2015. The impact of parking shortages is significant. Nearly 80 percent of drivers reported that on average, they spend at least 30 minutes searching for truck parking in Kansas. Finding available parking is less challenging in rural areas, although demand was lower in rural areas. Drivers indicated restrooms are the most important amenity when deciding where to park. Over 80 percent of drivers indicated HOS compliance is their primary reason for seeking parking in Kansas. Half of drivers (52\%) reported that finding parking at both public and private parking facilities in Kansas is difficult.

[^4]
## 15. Managing Critical Truck Parking Tech Memo \#1: Commercial Driver Perspectives on Truck Parking ${ }^{17}$

Existing demand could potentially be better matched with existing supply at peak demand periods through reservation systems, which guarantee a truck parking space for a fee. In 2015, ATRI's Research Advisory Committee identified Managing Critical Truck Parking as a top research priority. To address this research priority, ATRI developed a truck driver survey to assess perspectives on parking reservation systems. A total of 1,417 truck driver responses were received from March 26 to May 1, 2015.

Over 60 percent of drivers reported that finding available parking is equally difficult at public and private parking facilities. However, drivers utilize private truck stops more for truck parking than public rest areas ( $56 \%$ versus $44 \%$ ). Nearly half indicated that they would not pay any amount for a parking reservation. 20 percent of drivers were willing to pay $\$ 5$ or less for a reservation, and 19.8 percent of drivers were willing to pay $\$ 6$ to $\$ 10$ for a reservation.

When a fee is charged, nearly half of drivers believed motor carriers should bear the cost of reservation fees ( $46.8 \%$ ). Reservation system use was more likely near major metropolitan areas ( $48.8 \%$ ). While drivers indicated an interest in using reservation systems, they were largely not willing to pay for reservations personally.

## 16. Evaluation of MDOT Truck Parking Information and Management System ${ }^{18}$

Michigan deployed a TPAS on I-94 at five private parking facilities in $2014 .{ }^{19} 60$ truck drivers were surveyed to gather information related to the Michigan TPAS. Drivers were largely interested in a system that could help them find available parking, agreeing that parking information is valuable and would save them time. However, most of the drivers surveyed relied primarily on past experience to inform their expectations of parking availability, followed by Michigan's TPAS. Drivers generally preferred variable message signs for disseminating parking availability information. The Michigan TPAS was found to have a statistically significant reduction in parking-related crash involvement. ${ }^{20}$

## 17. Mid America Association of State Transportation Officials (MAASTO) Truck Parking Survey ${ }^{21}$

States represented by MAASTO (Kansas, Indiana, Iowa, Kentucky, Michigan, Minnesota, Ohio and Wisconsin) received a $\$ 25$ million TIGER grant to develop a regional TPAS to distribute

[^5]real-time truck parking availability information at public and private parking facilities in eight of the ten MAASTO states. ATRI surveyed 2,659 truck drivers from July 12, 2016 to August 10, 2016 on parking issues in the region and preferences/requirements for the regional TPAS system. 90 percent of the drivers surveyed operate in the MAASTO region.

The majority of drivers reported spending at least 30 minutes searching for parking in the region. Only 10 percent of drivers reported spending less than 15 minutes searching for parking in the region. The predominant conditions of drivers operating in the region - parking twice per week in the region and spending 30 minutes searching for parking each time - yields a conservative annual estimate of 2,000 lost revenue miles or $\$ 3,185$ in potential revenue per truck.

Drivers indicated they are largely uncertain of parking availability in the region. Over 70 percent of drivers reported that finding parking at public and private parking facilities is equally difficult. The majority of drivers indicated parking is sometimes/rarely available at private truck stops ( $81.8 \%$ ) and public rest areas ( $88.6 \%$ ). Nine percent of drivers indicated they park on road shoulders and ramps often in the region.

## 18. The Washington State Truck Parking Survey Summary ${ }^{22}$

Washington State DOT surveyed truck drivers to gather state-specific truck parking information. A total of 1,118 survey responses were received, of which 84 percent were from truck drivers. Finding parking in Washington is difficult, where a majority of drivers typically spend over 30 minutes to find truck parking. Private truck stops were preferred for both short and long-term breaks. Nearly 60 percent of drivers expressed that overnight parking safety is a concern. 76 percent of drivers indicated they drive while fatigued more than 3 times a week due to inadequate parking availability. I-5, I-405 and I-90 are the corridors identified as having the most parking-related issues. 58 percent of drivers were unwilling to pay for a dedicated parking space.

## 19. North Carolina Truck Parking ${ }^{23}$

ATRI surveyed 777 truck drivers from October 19 to November 21, 2016 on truck parking issues in North Carolina. Of the truck drivers surveyed, 90 percent operate in North Carolina.

Drivers indicated they usually need parking in North Carolina for HOS compliance. Drivers devote a significant amount of time searching for parking in North Carolina - 86.9 percent indicated they spend 30 minutes or more searching for parking on average. This significantly impacts driver productivity and compensation, as per-mile compensation is the prevalent compensation model. Drivers reported that finding parking is difficult regardless of facility type private truck stops, public rest areas, and shippers/receivers were indicated as being equally difficult to find available parking by over half of respondents. Locating parking is most difficult during evening hours, with over half of drivers indicating 7:00 p.m. to midnight as the most

[^6]difficult time to find truck parking, followed by midnight to 5:00 a.m. Drivers identified Charlotte, Raleigh, and Greensboro as needing additional parking capacity.

Over half of drivers reported that shippers/receivers rarely or never permit on-site parking outside of appointments, and 75 percent of drivers reported that delays at shippers/receivers always or often exceeded an hour. The uncertainty of shipper/receiver delays in combination with parking shortages and HOS constraints reduces a drivers' ability to plan future parking stops.

The impact of this parking shortage is unauthorized parking - drivers indicated that they park on road shoulders or ramps for 15.4 percent of stops. Over 40 percent of drivers reported they have been asked to move while parked on a shoulder, and over 5 percent have been ticketed.

## 20. Managing Critical Truck Parking Case Study - Real World Insights from Truck Parking Diaries ${ }^{24}$

Information on truck parking issues is primarily gathered through survey-based approaches. This approach differed from survey based approaches, instead having truck drivers keep detailed 14-day travel diaries to document truck parking issues as they occurred. 148 truck drivers participated, generating data on 2,035 days of parking activity and 4,763 unique stops.

Websites and applications were used to locate parking by over half of the drivers in the sample. For 10-hour required HOS breaks, drivers prioritized parking facilities with expected parking availability, shower access, and parking space configurations that made entering/exiting a space easy.

Drivers experienced less difficulty locating parking on weekends than weekdays, based on less frequent observations of unauthorized parking and less time spent searching for parking. The use of truck parking spaces by passenger vehicles on weekends was higher than weekdays.

Time-of-day also impacted parking availability. Time spent searching for parking peaked from 4:00 p.m. to midnight. Peak unauthorized parking frequency occurred later - from 7:00 p.m. to 5:00 a.m. - suggesting that drivers park in unauthorized locations due to insufficient parking supply during peak demand periods. Over one third of drivers parked in an unauthorized location three to four times a week ( $36.5 \%$ ), followed by one to two times a week ( $25.7 \%$ ).

## 21. Atlanta Regional Commission Truck Parking Study ${ }^{25}$

To assess corridors requiring additional capacity and to better understand truck parking issues in the Atlanta area, ATRI conducted a truck driver survey ( $n=276$ ). All drivers surveyed indicated that they have experienced parking shortages in the Atlanta region. The most frequently used staging locations were outside of the Atlanta region (64.1\%) and outside of the shipper/receiver facilities on an adjacent roadway (63.4\%).

[^7]Over 90 percent of drivers indicated that finding parking in the Atlanta region typically takes more than 30 minutes. Finding available parking was most difficult from 7:00 p.m. to midnight according to 62.2 percent of respondents, followed by 4:00 p.m. to 7:00 p.m. (25.0\%). Nearly 60 percent of drivers indicated an interest in reserving parking in the Atlanta region, of which almost 70 percent were willing to pay $\$ 10$ or more for a reservation fee.

In the Atlanta region, drivers primarily found parking by driving until a safe parking location was found ( $68.8 \%$ ). Parking needs are primarily driven by required HOS breaks, awaiting dispatch, avoiding congestion and staging. Top amenities influencing stop location choice were restrooms, followed by adequate security, adequate lighting and fueling services.

## 22. Truck Parking: An Emerging Safety Hazard to Highway Users ${ }^{26}$

This report investigates truck driver opinions on truck parking issues in the Pacific Northwest (California, Idaho, Oregon, Washington and British Columbia). 61 percent of drivers have had difficulty finding parking when they needed to rest. Over 40 percent of drivers indicated that finding parking during evening hours (9:00 p.m. to midnight) was difficult. Fridays (54\%) and Mondays ( $39 \%$ ) were the most difficult days of the week to find truck parking. Drivers were asked to rank reasons for unauthorized parking on a 10-point scale, with 1 being the "most probable" and 10 being the "least probable." 43 percent of drivers indicated that no nearby parking facilities was a probable cause of unauthorized parking (rank of 1 or 2). No available parking at nearby parking facilities was another probable cause of unauthorized parking, with 34 percent of drivers ranking this reason as a 1 or 2.

The following location features were top rated ("important" or "very important"): restrooms ( $91 \%$ ), convenience to highway ( $90 \%$ ), fueling ( $83 \%$ ), adequate lighting ( $75 \%$ ) and adequate security ( $71 \%$ ). The following efforts to improve parking locations were top-rated ("effective" or "very effective"): increasing truck parking capacity at private truck stops ( $91 \%$ ), real-time truck parking availability information (85\%), increasing truck parking capacity at public rest areas ( $84 \%$ ), improving rest area amenities ( $84 \%$ ) and improving parking layout/configuration (81\%).

[^8]
## Summary

Since 1996, numerous organizations at the MPO, state and federal level have investigated truck parking adequacy issues by surveying the stakeholders most affected - truck drivers. In 1996, the truck parking shortage was first documented in truck driver surveys. Most drivers in 1999 reported difficulty finding parking at least once per week. Since these early surveys, parking capacity issues have not improved as a majority of drivers still report experiencing issues locating truck parking at least once a week. Numerous surveys indicate that finding truck parking has a significant impact on truck driver productivity; a majority of drivers report spending 30 minutes or more finding parking in the MAASTO region, Washington State, Kansas, North Carolina, and the Atlanta region.

Unauthorized Parking. Unauthorized parking, such as on road shoulders or ramps, is often the result of no nearby parking facilities or no available parking at nearby parking facilities. Adequate truck parking is needed to give truck drivers a way to rest when fatigued and comply with federal HOS requirements, as multiple surveys have found drivers primarily seek truck parking for HOS compliance. A majority of state troopers report that they ask drivers parked in unauthorized locations to move, which may conflict with HOS rest requirements. One survey found that drivers regularly drive while fatigued due to inadequate parking.

Time-of-Day and Day-of-Week Impacts. Drivers indicate that time-of-day impacts parking availability. Locating parking is the most difficult during the late evening and early morning. Multiple surveys have found that locating available truck parking is more difficult on weekdays than on weekends.

Metropolitan Areas. Parking issues are most severe in metropolitan areas. Truck drivers, who are normally averse to parking reservation systems, are more willing to use reservation systems in metropolitan areas.

Weather Impacts. In Washington State, it was found that additional parking was needed at Snoqualmie Pass, an area where parking is impacted by road closures. A Wisconsin study also found that adverse weather conditions exacerbate existing truck parking issues.

Location Preferences. Drivers generally prefer parking at private truck stops for long term breaks. Considerations of available amenities contribute to truck driver decisions of where to park. Restrooms, fuel, food, security/lighting, and proximity to route are amenities most cited by drivers when considering where to park.


Prepared by the

## American Transportation Research Institute

Arlington, VA


As part of a broader truck parking analysis sponsored by the Colorado Department of Transportation, the American Transportation Research Institute (ATRI) was tasked by Felsburg Holt \& Ullevig (FHU) to survey truck drivers on Colorado-specific truck parking issues to supplement a review of prior state, regional, and national driver surveys.

Truck parking is one of the most critical issues in the trucking industry. In fact, "truck parking" has ranked near the top of ATRI's Top Industry Issues list for numerous years (See Table 1). While carriers understand that truck parking capacity constrains truck operations and has a direct relationship to safety, it is the truck drivers who accrue the most negative impacts. These include being forced to park in illegal and dangerous locations due to a lack of safe, legal locations. Equally impactful is the effect that lack of truck parking has on driver wages. Based on ATRI analyses of truck parking diaries, truck drivers lose, on average, 56 minutes a day of revenue drive time - equating to $\$ 4,600$ in annual lost wages (Figure 1).

Table 1: Top Industry Issues

| Rank | Commercial Drivers | Motor Carrier Executives |
| :---: | :--- | :--- |
| 1 | Electronic Logging Device (ELD) <br> Mandate | Driver Shortage |
| 2 | Truck Parking | ELD Mandate |
| 3 | Hours-of-Service (HOS) | Driver Retention |
| 4 | Cumulative Economic Impact of <br> Trucking Regulations | CSA |
| 5 | Driver Distraction | HOS |
| 6 | CSA | Cumulative Economic Impact of <br> Trucking Regulations |
| 7 | Driver Health/Wellness | Transportation Infrastructure / <br> Congestion / Funding |
| 8 | Driver Retention | Driver Distraction |
| 9 | Transportation Infrastructure / <br> Congestion / Funding | Truck Parking |
| 10 | Autonomous Vehicles | Tort Reform |

Figure 1: Average Daily Productivity Loss per Driver


## METHODOLOGY

ATRI and FHU developed a 20-question driver survey to gather information on Coloradospecific truck parking issues (Appendix A). The survey was distributed through state trucking associations, the Colorado Department of Transportation, the Owner-Operator Independent Drivers Association and motor carriers that operate frequently in Colorado. Responses were collected from January 8, 2018 to February 8, 2018. A total of 176 responses were received.

First, respondents were screened to determine that they utilize truck parking in Colorado (Figure 2). A majority of respondents rely on parking in Colorado at least once per week (55.8\%).

Respondents that never require parking in Colorado are not included in the subsequent analysis (7.5\%).

Figure 2: Frequency Drivers Require Parking in Colorado


## DEMOGRAPHICS

Figure 3 displays respondents' employment classification. Employee drivers represented the majority of respondents (59.3\%), followed by owner-operators (O-Os)/independent contractors leased to a motor carrier (16.7\%).

Figure 3: Respondent Employment Classification


Table 2 displays the gender of responding truck drivers. Relative to the industry as a whole, where women comprise six to eight percent of drivers, female drivers are somewhat overrepresented in this sample (11.3\%). ${ }^{1}$

Table 2: Driver Gender

| Gender | Colorado <br> Driver <br> Respondents | Industry $^{2}$ |
| :---: | :---: | :---: |
| Male | $88.4 \%$ | $94.0 \%$ |
| Female | $11.6 \%$ | $6.0 \%$ |

Table 3 displays the age of driver respondents. Drivers aged 45 years and older are overrepresented, while drivers aged 44 years and younger are under-represented relative to the industry-at-large.

Table 3: Driver Age

| Age | Colorado <br> Driver <br> Respondents | Industry $^{\mathbf{3}}$ |
| :--- | :---: | :---: |
| Less than 25 years | $3.1 \%$ | $4.4 \%$ |
| $25-44$ years | $21.7 \%$ | $38.8 \%$ |
| $45-64$ years | $66.7 \%$ | $50.6 \%$ |
| 65 or more years | $8.5 \%$ | $6.3 \%$ |

All respondents were asked to indicate the industry segment they operate in (Table 4). Respondents operated primarily in the for-hire segment (75.5\%), followed by private fleet segment (16.6\%).

For-hire respondents were then asked to indicate their industry sector, shown in Table 4. Respondents primarily operate in the truckload sector (52.0\%), followed by the tanker sector (7.7\%). Specifications of "other" responses indicated they haul agricultural products and livestock.

[^9]Table 4: Respondent Industry Segment and Sector

| Segment | Percent |  |  |  |
| :---: | ---: | ---: | :---: | :---: |
| Private | $16.6 \%$ |  |  |  |
| For-Hire | $75.5 \%$ |  |  |  |
|  | Truckload | $52.0 \%$ |  |  |
|  | Less-than-Truckload | $4.4 \%$ |  |  |
|  | Flatbed | $4.4 \%$ |  |  |
|  | Tanker | $7.7 \%$ |  |  |
|  | Express / Parcel Service | $0.0 \%$ |  |  |
|  | Intermodal Drayage | $1.6 \%$ |  |  |
|  | Other | $2.7 \%$ |  |  |
|  | Don't Know |  |  | $2.7 \%$ |
| Don't Know | $7.9 \%$ |  |  |  |

Respondents were asked to classify the vehicle configuration they typically operate (Table 5). 5 -axle dry vans were the most common vehicle configuration ( $46.7 \%$ ), followed by 5 -axle refrigerated trailers (26.7\%). Refrigerated trailers, often called "reefers", often have unique parking needs - particularly in urban areas. Reefers are often required to idle to maintain refrigeration power, but there is a growing number of jurisdictions that ban idling due to noise and air quality.

Table 5: Vehicle Configuration

| Vehicle Configuration | Percent |
| :--- | :---: |
| 5-axle Dry Van | $46.7 \%$ |
| 5-axle Refrigerated Trailer | $26.7 \%$ |
| 5-axle Flatbed | $8.0 \%$ |
| 5-axle Tanker | $10.7 \%$ |
| Straight Truck | $1.3 \%$ |
| Longer Combination Vehicles <br> (Doubles, Triples, etc.) | $2.0 \%$ |
| Other | $4.7 \%$ |

The survey also solicited information on the frequency the respondent hauls hazardous material (hazmat) or oversize/overweight loads (Figure 4). The majority of respondents never transport hazmat ( $57.0 \%$ ) or oversize/overweight (81.4\%) loads. Nevertheless, these sectors and commodities require special truck parking considerations, including over-size spaces and security solutions such as improved lighting.

Figure 4: Frequency Respondents Transport Hazmat and Oversize/Overweight Loads


Next, respondents were asked about their average length of haul (Table 6). Respondents primarily run inter-regional trips (43.6\%) or long-haul trips (35.6\%). Only a small percentage of respondents ( $3.4 \%$ ) run local trips. Since most drivers in the sample hauled over 500 miles per trip, these drivers likely search for parking for both the 10-hour required HOS break and the required 30 -minute rest break.

Table 6: Average Length of Haul

| Average Length of Haul | Percent |
| :--- | ---: |
| Local (less than 100 miles per trip) | $3.4 \%$ |
| Regional (100-499 miles per trip) | $17.4 \%$ |
| Inter-regional (500-999 miles per <br> trip) | $43.6 \%$ |
| Long-haul (1,000+ miles per trip) | $35.6 \%$ |

## TRUCK PARKING ISSUES

Respondents were asked to indicate the relative ease of finding truck parking in Colorado for required HOS breaks, and compared to surrounding states, shown in Figure 5. Generally, respondents indicated that finding parking in Colorado is difficult. Nearly 80 percent of respondents disagreed/strongly disagreed with the statement that finding truck parking in Colorado is easy compared to surrounding states. A majority of respondents disagreed/strongly disagreed that finding parking is easy for the required 10-hour HOS break (84.5\%) and the required 30 -minute HOS break (67.9\%).

Figure 5: Ease of Finding Truck Parking in Colorado

It is easy to find truck parking in Colorado in comparison to truck parking in surrounding states.

| Strongly <br> Agree | Agree | Neutral | Disagree | Strongly <br> Disagree |
| :---: | :---: | :---: | :---: | :---: |
| $3.6 \%$ | $2.4 \%$ | $14.3 \%$ | $40.5 \%$ | $39.3 \%$ |

It is easy to find truck parking in Colorado for the required HOS 10-hour break.

| Strongly <br> Agree | Agree | Neutral | Disagree | Strongly <br> Disagree |
| :---: | :---: | :---: | :---: | :---: |
| $3.6 \%$ | $4.8 \%$ | $7.1 \%$ | $35.7 \%$ | $48.8 \%$ |

It is easy to find truck parking in Colorado for the required HOS 30-minute break.

| Strongly <br> Agree | Agree | Neutral | Disagree | Strongly <br> Disagree |
| :---: | :---: | :---: | :---: | :---: |
| $2.4 \%$ | $13.1 \%$ | $16.7 \%$ | $39.3 \%$ | $28.6 \%$ |

Next, respondents were asked about the frequency that shippers/receivers permit long-term parking on their property (Figure 6). A majority indicated that shippers/receivers rarely (53.7\%) or occasionally (31.7\%) permit long-term parking. More than ten percent of respondents indicated that shippers/receivers never permit long-term parking. Inflexible shipper/receiver parking policies may conflict with a driver's available HOS, forcing drivers to choose between violating HOS and parking illegally when their HOS time runs out at shippers/receivers. This issue is compounded by the mandated electronic logging device (ELD) mandate, as ELDs automatically record a change in duty status when a driver moves their vehicle. ATRI's truck parking diaries data indicates that ELD-managed truck drivers begin searching for truck parking twice as early as non-ELD truck drivers.

Figure 6: Frequency Shippers and Receivers Permit Long-Term Parking


Respondents were asked to estimate the frequency that locations are used for short-term (less than one hour) and long-term (more than one hour) parking needs (Table 7). Regardless of stop duration, a majority of parking needs are met by a combination of public rest areas, private truck stops and shippers/receivers. However, unauthorized locations such as road shoulders and highway ramps are indicated as stop locations for 23.5 percent of short-term stops and 18.0 percent of long-term stops on average. The frequency of unauthorized parking may increase after the ELD mandate is implemented in December of 2017, as drivers will not have any flexibility in their HOS. Additionally, the enforcement of laws prohibiting ramp/shoulder parking may create conflict with HOS compliance.

Table 7: Average Parking Location Utilization, by Stop Duration

| Stop Duration | 픈 0 0 0 0 0 0 0 0 0 |  |  |  |  |  |  |  |  | ¢ $\stackrel{\text { ¢ }}{\square}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Average ShortTerm Stops | 21.9\% | 34.6\% | 24.1\% | 12.3\% | 11.2\% | 10.2\% | 14.1\% | 2.8\% | 1.5\% | 11.5\% |
| Average LongTerm Stops | 20.8\% | 43.2\% | 23.8\% | 10.6\% | 7.4\% | 13.5\% | 16.8\% | 3.6\% | 1.7\% | 15.8\% |

Respondents were also asked about the amount of time spent searching for parking in Colorado for both short and long-term stops, shown in Figure 7 and Figure 8 respectively. Short-term
stops involve less time spent searching for parking. 36.9 percent of respondents indicated it takes 15 to 30 minutes to find short-term parking, followed by 30 minutes to one hour ( $35.7 \%$ ). For long-term stops, a majority of drivers devote more than 30 minutes to searching for truck parking in Colorado (82.2\%). Assuming a driver operates under the prevalent conditions of the sample - spending at least 15 minutes searching for short-term parking, 30 minutes searching for long-term parking, needing parking in Colorado once per week or less - nearly 27 hours annually are spent searching for parking in Colorado. ${ }^{4}$ A conservative estimate of the opportunity cost of the 27 hours spent searching for parking is $\$ 1,705.00$ of revenue per driver per year. ${ }^{5}$

Figure 7: Average Search Time for Short-Term Parking


[^10]Figure 8: Average Search Time for Long-Term Parking


Colorado corridor segments with insufficient parking capacity were of particular interest. Respondents were asked to rank order the relative difficulty of finding parking in Colorado on specific corridor segments, with 1 being the most difficult. (Table 8). The corridor segments where finding parking is the most difficult all surround Denver. The corridor segments surrounding Denver are critical for staging purposes. Changes to shipper/receiver contract requirements on truck parking outside of appointment hours could help alleviate the issues associated with staging near Denver. On U.S. highway and state highway segments, parking was not considered to be difficult (relative to interstates).

Table 8: Most Difficult Corridors to Find Safe/Legal Parking

| Corridor | Corridor Segment | Average <br> Rank |
| :--- | :--- | :---: |
| I-70 | West of Denver | 2.7 |
| I-25 | North of Denver | 3.0 |
| I-25 | South of Denver | 3.2 |
| I-70 | East of Denver | 3.9 |
| I-76 | I-70 to Nebraska border | 4.8 |
| US 40 | Utah border to I-70 | 4.9 |
| US 287 | Oklahoma border to I-70 | 5.5 |
| US 50 | I-25 to Kansas border | 5.6 |
| US 160 | New Mexico border to I-25 | 6.2 |
| SH 71 | I-70 to Nebraska border | 6.6 |

Drivers were next asked how truck parking issues on the corridors listed in Table 7 could be improved. Strategies for improving truck parking issues primarily indicated:

- More parking facilities were needed. Specifically, new public rest areas and private truck stops should be opened and closed public rest areas should be reopened.
- Shippers and receivers should permit parking.
- Hazmat routes should be eliminated.
- Truck parking spaces should accommodate current vehicle configurations.
- Local ordinances prohibiting truck parking reduce parking supply. Industrial locations should permit truck parking.
- Iowa, Indiana, Texas, Kansas, Missouri, Nebraska New Mexico, Texas and Wyoming were cited as examples of exemplary truck parking facilities.

On major Colorado freight corridor segments, respondents were asked to indicate their likely action in the event of a road closure (Table 9). Experiencing difficulty finding safe and legal parking is relatively common in the event of a road closure, particularly on corridors surrounding the Denver area where over 70 percent of respondents indicate that finding safe and legal parking is difficult with closures on I-25 and I-70. Difficulty finding parking was less prevalent on state and U.S. highways. Rerouting if a road closed was relatively uncommon. Depending on the roadway, a range of 9.5 percent to 26.2 percent of respondents indicated they reroute. For all road segments, an average of 17.4 percent of drivers would reroute in the event of a road closure.

Table 9: Consequences of Road Closures

| Corridor |  | When road closures <br> occur: |  |
| :--- | :--- | :---: | :---: |
|  | Segment | Finding <br> Safe and <br> Legal <br> Parking is <br> Difficult | I Reroute |
| I-70 | West of Denver | $88.1 \%$ | $10.7 \%$ |
| I-25 | South of Denver | $86.9 \%$ | $9.5 \%$ |
| I-25 | North of Denver | $76.2 \%$ | $20.2 \%$ |
| I-70 | East of Denver | $72.6 \%$ | $15.5 \%$ |
| I-76 | I-70 to Nebraska border | $64.3 \%$ | $16.7 \%$ |
| US 287 | Oklahoma border to I-70 | $57.1 \%$ | $20.2 \%$ |
| US 160 | New Mexico border to I-25 | $50.0 \%$ | $17.9 \%$ |
| SH 71 | I-70 to Nebraska border | $46.4 \%$ | $15.5 \%$ |
| US 50 | I-25 to Kansas border | $44.0 \%$ | $26.2 \%$ |
| US 40 | Utah border to I-70 | $40.5 \%$ | $21.4 \%$ |

Respondents were also asked to indicate specific corridors where closures and congestion in other states impact truck parking issues in Colorado. The following corridors were cited as impacting truck parking in Colorado: I-80 in Nebraska, I-70 in Kansas, I-80 in Wyoming and Northbound routes exiting Oklahoma.

Figure 9 displays the frequency that drivers experience specific truck parking issues in Colorado. Shipper and receiver delays were indicated to be a frequent issue, with respondents indicating that they experience delays exceeding one hour often (40.5\%) or always (22.6\%). Delays at shippers and receivers present a significant issue for drivers, limiting drivers' ability to preplan future parking stops. Personal safety concerns were cited as occurring occasionally ( $41.7 \%$ ) or often ( $25.0 \%$ ). Similarly, respondents indicated that truck parking is only available in unsafe locations occasionally ( $41.7 \%$ ) or often ( $23.8 \%$ ). Notably, respondents indicated that finding the parking shortage in Colorado makes fatigue management and HOS compliance difficult often (42.9\%) or always (13.1\%). Respondents also indicate that parking is only available in unauthorized locations on ramps and shoulders occasionally (25.0\%) or often ( $38.1 \%$ ). The issue of rest area time limit restrictions impacts respondents occasionally ( $27.4 \%$ ) or rarely ( $26.2 \%$ ). Issues related to vandalism and theft are infrequent, with most respondents indicating theft/vandalism occurs rarely (33.3\%) or never (44.0\%).

Figure 9: Frequency of Truck Parking Issues in Colorado

Safety Concerns

| Never | Rarely | Occasionally | Often | Always |
| :---: | :---: | :---: | :---: | :---: |
| $3.6 \%$ | $21.4 \%$ | $41.7 \%$ | $25.0 \%$ | $8.3 \%$ |

Parking shortage making fatigue management or HOS compliance difficult

| Never | Rarely | Occasionally | Often | Always |
| :---: | :---: | :---: | :---: | :---: |
| $3.6 \%$ | $8.3 \%$ | $32.1 \%$ | $42.9 \%$ | $13.1 \%$ |

Public rest area time limit restrictions

| Never | Rarely | Occasionally | Often | Always |
| :---: | :---: | :---: | :---: | :---: |
| $10.7 \%$ | $26.2 \%$ | $27.4 \%$ | $22.6 \%$ | $13.1 \%$ |

Can only find parking on ramps or shoulders

| Never | Rarely | Occasionally | Often | Always |
| :---: | :---: | :---: | :---: | :---: |
| $16.7 \%$ | $16.7 \%$ | $25.0 \%$ | $38.1 \%$ | $3.6 \%$ |

Parking only available in unsafe locations

| Never | Rarely | Occasionally | Often | Always |
| :---: | :---: | :---: | :---: | :---: |
| $10.7 \%$ | $20.2 \%$ | $41.7 \%$ | $23.8 \%$ | $3.6 \%$ |

Truck vandalism or theft

| Never | Rarely | Occasionally | Often | Always |
| :---: | :---: | :---: | :---: | :---: |
| $44.0 \%$ | $33.3 \%$ | $17.9 \%$ | $3.6 \%$ | $1.2 \%$ |

Shipper/Receiver loading/unloading delays exceed one hour

| Never | Rarely | Occasionally | Often | Always |
| :---: | :---: | :---: | :---: | :---: |
| $6.0 \%$ | $6.0 \%$ | $25.0 \%$ | $40.5 \%$ | $22.6 \%$ |

## CONCLUSION

Colorado-Specific Issues. This survey sought to elucidate issues related to truck parking in Colorado. Segments of I-25 and I-70 surrounding Denver were found to have the most severe parking issues. When road closures occur, rerouting is relatively uncommon. Responses indicating they reroute when a specific corridor segment closed range from 9.5 to 26.2 percent. Difficulty finding safe and legal parking is relatively common when road closures occur, particularly in the Denver area.

Search Times. A majority of respondents indicated they spend over 30 minutes searching for long-term (over one hour) parking (82.2\%). Respondents devoted slightly less search time for short-term stops (less than an hour), with 36.9 percent of respondents spending 15 to 30 minutes searching for parking and 35.7 percent of respondents spending 30 minutes to an hour
searching for parking. The prevalent parking frequency and search times reported in the survey represent an opportunity cost of 27 hours or \$1,705.00 per driver per year.

HOS Compliance. A majority of respondents reported challenges in locating available parking for the required 10-hour HOS break (84.5\%), the required 30-minute HOS break (67.9\%), and relative to surrounding states (79.8\%). Respondents also indicated that the parking shortage in Colorado can make fatigue management/HOS compliance difficult often (42.9\%) or always (13.1\%).

## Appendix A: Survey

1. How often do you need truck parking in Colorado?

- Less than once a week
- Once a week
- 2-4 times a week
- 5-6 times a week
- Everyday
- Never

NOTE: If answer is "Never" survey ends.

## Demographics

2. Gender

- Female
- Male

3. What is your age?

- Younger than 25
- 25-44
- 45-64
- 65+

4. In what segment of the trucking industry do you primarily operate? (check one)

- For-hire
- Private
- Don't know

5. If for-hire, which sector best describes your operation? (check one)

- Truckload
- Less-than-truckload
- Specialized, flatbed
- Tanker
- Express / Parcel Service
- Intermodal Drayage
- Other (please specify): $\qquad$
- Don't know

6. Which of the following best describes your employment: (check one)

- Employee driver
- Owner-operator (O-O) with own authority
- O-O / Independent Contractor leased to a motor carrier
- Fleet executive / manager
- Other: $\qquad$

7. What is the primary vehicle configuration that you typically operate? (check one)

- 5-axle Dry Van
- 5-axle Refrigerated Trailer
- 5-axle Flatbed
- 5-axle Tanker
- Straight Truck
- Longer Combination Vehicles (Doubles, Triples, etc.)
- Other (please specify): $\qquad$

8. How regularly do you haul the following loads?

| Load | Never | Rarely | Occasionally | Often | Always |
| :--- | :---: | :---: | :---: | :---: | :---: |
| Hazmat | $\bigcirc$ | $\bigcirc$ | $\bigcirc$ | 0 | 0 |
| Oversize / Overweight | $\bigcirc$ | $\bigcirc$ | 0 | $\bigcirc$ | 0 |

9. In general, what is your overall average length of haul? (check one)

- Local (less than 100 miles per trip)
- Regional (100-499 miles per trip)
- Inter-regional (500-999 miles per trip)
- Long-haul (1,000+ miles per trip)
- Don't know


## Parking in Colorado

10. In general, it is easy to find truck parking in Colorado: (check one for each row):

|  | Strongly <br> Agree | Agree | Neutral | Disagree | Strongly <br> Disagree |
| :--- | :---: | :---: | :---: | :---: | :---: |
| compared to other <br> surrounding states. | $\bigcirc$ | $\bigcirc$ | $\bigcirc$ | $\bigcirc$ | $\bigcirc$ |
| for the mandatory Hours <br> of Service 30-minute <br> break. | $\bigcirc$ | $\bigcirc$ | $\bigcirc$ | $\bigcirc$ | $\bigcirc$ |
| for the mandatory Hours <br> of Service 10-hour <br> break. | $\bigcirc$ | $\bigcirc$ | $\bigcirc$ | $\bigcirc$ | $\bigcirc$ |

11. For every 10 short-term (less than 1 hour) parking stops you make in Colorado, how many are at the following location types? (Sum total must equal 10)

| Location Type | Number of Stops |
| :--- | :---: |
| Public Rest Area |  |
| Private Truck Stop |  |
| Shipper / Receiver Location |  |
| Highway On-Ramp / Off-Ramp |  |
| Roadside / Shoulder |  |
| Abandoned Lot / Isolated Area |  |
| Other Business / Temporary Parking Lot <br> (e.g. Walmart, casino, restaurant) |  |
| Weigh Station |  |
| Hotel / Motel / Lodging |  |
| Other | TOTAL |

12. For every 10 long-term (more than 1 hour) parking stops you make in Colorado, how many are at the following location types? (Sum total must equal 10)

| Location Type | Number of Stops |
| :--- | :---: |
| Public Rest Area |  |
| Private Truck Stop |  |
| Shipper / Receiver Location |  |
| Highway On-Ramp / Off-Ramp |  |
| Roadside / Shoulder |  |
| Abandoned Lot / Isolated Area |  |
| Other Business / Temporary Parking Lot <br> (e.g. Walmart, casino, restaurant) |  |
| Weigh Station |  |
| Hotel / Motel / Lodging |  |
| Other | TOTAL |

13. How frequently do shippers/receivers allow long-term/overnight parking in Colorado?

| Never | Rarely | Occasionally | Often | Always |
| :---: | :---: | :---: | :---: | :---: |
| $\bigcirc$ | $\bigcirc$ | $O$ | $\bigcirc$ | $\bigcirc$ |

14. How much time does it typically take to find parking in Colorado?

| Parking Type | < 15 Minutes | 15-30 Minutes | 30 Minutes-1 Hour | >1 Hour |
| :---: | :---: | :---: | :---: | :---: |
| Short-Term Parking <br> (less than 1 hour) | 0 | 0 | 0 | 0 |
| Long-Term Parking <br> (more than 1 hour) | 0 | 0 | 0 | 0 |

15. Please rank the difficulty of finding safe and legal parking in Colorado for the following corridors under normal operating conditions, with 1 being the MOST difficult. Please mark "N/A" if you do not drive the corridor.

| Corridor | Rank |
| :--- | :--- |
| I-25 north of Denver |  |
| I-25 south of Denver |  |
| I-70 east of Denver |  |
| I-70 west of Denver |  |
| I-76; from I-70 to Nebraska border |  |
| US 40; from Utah border to I-70 junction (MP 232) |  |
| US 50; from I-25 junction to Kansas border (MP 100) |  |
| US 160; from New Mexico border to I-25 junction <br> (MP 50) |  |
| US 287; from Oklahoma border to I-70 junction (MP <br> 361) |  |
| SH 71; from I-70 (MP 361) to Nebraska border |  |

16. How can truck parking be improved and where on these corridors? (NOTE: Questions about the impact of closures will follow.)
17. When closures occur on the following corridors: (check all that apply)

| Corridor | Finding safe <br> and legal <br> parking is <br> difficult. | I reroute to an <br> alternative <br> route. |
| :--- | :---: | :---: |
| I-25 north of Denver | $\square$ | $\square$ |
| I-25 south of Denver | $\square$ | $\square$ |
| I-70 east of Denver | $\square$ | $\square$ |
| I-70 west of Denver | $\square$ | $\square$ |
| I-76; from I-70 to Nebraska border | $\square$ | $\square$ |
| US 40; from Utah border to I-70 junction (MP <br> 232) | $\square$ | $\square$ |
| US 50; from I-25 junction to Kansas border <br> (MP 100) | $\square$ | $\square$ |
| US 160; from New Mexico border to I-25 <br> junction (MP 50) | $\square$ | $\square$ |
| US 287; from Oklahoma border to I-70 junction <br> (MP 361) | $\square$ | $\square$ |
| SH 71; from I-70 (MP 361) to Nebraska border | $\square$ | $\square$ |

18. Are there any corridors in other states that, when closed or congested, alter your parking needs in Colorado? Please explain.
19. How often do you personally experience the following in Colorado? (check one response for each row)

| Condition | Never | Rarely | Occasionally | Often | Always |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Safety concerns | $\bigcirc$ | 0 | $\bigcirc$ | O | O |
| Parking shortage making fatigue management or hours of service compliance difficult | O | O | O | O | O |
| Public rest area time limit restrictions | 0 | 0 | O | 0 | 0 |
| Can only find parking on ramps or shoulders | O | O | O | O | O |
| Parking only available in unsafe locations | O | O | O | O | O |
| Truck vandalism or theft | O | O | O | O | O |
| Shipper/Receiver loading/unloading delays exceeding one hour | O | O | 0 | O | O |

20. Do you have any additional information about truck parking in Colorado that you would like to share? What is your biggest truck parking issue, if not already discussed? Are there other states that better handle/provide truck parking, and how so?

## MEMORANDUM

TO: J ason Wallis
FROM: Lyle DeVries, PE, PTOE
Paul F. Brown, PE, PTOE
DATE: J anuary 8, 2019
SUBJ ECT: CDOT Truck Parking Assessment
Truck Parking Facility Inventory Technical Memorandum
The Colorado Department of Transportation (CDOT) Truck Parking Assessment is a state-wide evaluation of existing truck parking utilization in Colorado. To measure utilization, two key measures are needed-the available number of truck parking spaces and the number of trucks using those spaces. This memo documents the development of the first of these measuresdetermination of available truck parking. It describes the data sources used, outlines the process applied to compile these data, and provides both detailed and summary data that make up the final inventory.

The inventory focused on truck parking along the following routes, as defined in the project scope.

- I-25; from the New Mexico Border to the Wyoming Border, split into north and south at I-70 in Denver
- I-70; from the Utah Border to the Kansas Border, split into east and west at I-25 in Denver
- I-76; from I-70 (Arvada) to the Nebraska Border
- US 40; from the Utah Border to the I-70 J unction at MP 232 (Empire J unction)
- US 50; from the I-25 J unction at MP 100 (Pueblo) to the Kansas Border
- US 160; from the New Mexico Border to the I-25 J unction at MP 50 (Walsenburg)
- US 287; from the Oklahoma Border to the I-70 J unction at MP 361 (Limon), split into north and south at US 50 in Lamar
- SH 71; from the I-70 J unction at MP 361 (Limon) to the Nebraska Border

It is understood that the list does not capture every truck route in the state, but it captures the majority of Colorado's maj or freight corridors, and that most longer-distance truck trips will use at least a portion of these corridors for part of their trip.

A key distinction made during the inventory process is the difference between a truck stop and truck parking. Many large commercial truck stops provide a wide range of truck services, including fuel, food, and long-term parking. Smaller truck stops often provide fuel and food services, but do not have adequate right-of-way to provide long-term parking. Online mapping tools, truck services guides, and other sources may incorrectly identify these differing truckrelated facilities as long-term truck parking sites. Further, rest areas, welcome centers, and scenic areas may provide long-term truck parking without the dedicated fuel and food services that are reflected in truck stop inventories. The project team was careful to verify (when

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possible) that long-term truck parking is available at each facility included in the truck parking inventory.

## Data Sources

The project scope identified several baseline data sources, and specifically called out CDOT's 2007 statewide truck parking study as a starting point for this effort. This report was used to develop a preliminary inventory framework in an Excel table and populate historical data available from the 2007 effort. These data were then reviewed, validated, and expanded to encompass the current study area network and reflect 10 years of changes in the truck parking network. To complete this effort, the project team used various publicly available datasets and mapping tools.

## Key Tools

The truck parking inventory took advantage of several primary sources to compile and update truck parking data. These included:

- Previous CDOT efforts:
- Truck Parking Issues at State Facilities in Colorado (2007)
- Truck Parking Guide (2012)
- Rest Area Assessment (2015)
- Outside data sources:
- Desktop aerial mapping software (Google Earth)
- The Trucker's Friend (www.truckstops.com) - This website is the official truck stop data provider to NATSO (formerly the National Association of Truck Stop Operators, www. natso.com). It allows users to enter a ZIP code or place name and finds truck stops within a specified radius of that location. Larger cities along each project truck route were entered in the website's search tool to identify truck stop locations for further evaluation of truck parking. The website presents parking data for each truck stop in broad ranges, so site-specific truck parking data from this website were typically not used in the study.
- Online aerial and street view mapping (Google Maps)
- CDOT OTIS database - Although desktop, online, and GIS-based tools readily provide latitude / longitude data, these data are not necessarily related to milepost data along state highways. As part of the data collection effort, OTIS was used to ensure that mileposts associated with various facilities were reasonable based on CDOT's current milepost system.
These key resources allowed the project team to develop an inventory reflecting existing 2017 truck parking conditions along major corridors. In a few instances, detail on newer facilities or sites in rural areas was lacking, and additional research was conducted.


## Supplemental Tools

For a small number of sites, further research was performed to refine the data collected for each site. Supplemental tools included:

- Truck Stop corporate websites - These websites were accessed to find data for sites under construction or where services could not be identified through other means. The most common websites used were Love's (www.loves.com) and Pilot / Flying J (www. pilotflyingj.com). Smaller provider websites were found using online search tools.
- Local agency assessor websites - When available, these websites were accessed to determine if vacant land adjacent to identified truck stops were owned by the truck stop and might be available for truck parking. Unless an agreement between two separate land owners could be located, parcels with different ownership than active truck facilities were not considered as sites available for truck parking.
- Local agency development review websites - In several cases, aerial or other data indicated that a potential truck parking location was under construction during the inventory. Development review websites were checked in an attempt to locate site plans for these new facilities. When site plans could be found, these were used to confirm planned truck parking and determine the number of available truck parking spaces.
- CDOT review - For several sites, the project team coordinated with CDOT to determine if agreements were in place for truck parking, or if CDOT staff has knowledge of specific sites. The results of this effort have been reflected in the inventory as appropriate.

With materials from these additional sources, existing truck parking information for each identified facility was acquired. These tools allowed the project team to develop a robust dataset reflecting 2017 truck parking conditions along the project corridors.

## Site Amenities

Amenities for each of the 118 studied sites were gathered as part of the inventory process. These amenities included availability of:

- Fuel - Sites that provide fuel typically allow pay-at-the-pump for 24 hours, but some sites may not allow cash payment if the store associated with the site is not open the entire day. It was assumed that most truckers have access to credit cards or fleet cards that would allow for the use of pay-at-the-pump services. Hence, any site where pumps could be identified in aerial or street view photography were assumed to provide fuel.
- Phone - With the widespread use of cellular phones, pay phones have disappeared from many locations. For inventory purposes, it was assumed that sites where a telephone number could be found would be able to provide phone service to truckers without cell phones in an emergency. For locations where no telephone number could be found, aerial and street-level photography were reviewed to determine if a pay phone could be identified. Otherwise, the site was assumed to be lacking phone service.
- Food - Food was assumed to be available if either a convenience store or restaurant could be identified at the site. Most truck stops provide convenience store amenities, and many also provide restaurants (either fast food or sit-down). Sites with vending machines were not considered to provide food as an amenity.
- Restrooms - Each site was evaluated to determine if a fixed structure providing restroom facilities is available using aerial and street view photography. It was assumed that convenience stores and restaurants would provide restrooms for customers, and that pit toilets serve as adequate restroom facilities where there is no commercial establishment. Sites with temporary restroom facilities (portable toilets) were not considered to have restrooms unless fixed structure toilets were also available.
- Trash - Most inventoried sites provide routine trash collection, either through the commercial establishment that operates the facility, or through CDOT maintenance activities. Although some sites are posted to accept limited amounts of trash (and most sites preclude large-scale dumping), trash facilities were deemed available at commercial sites and at public facilities where trash cans were observed through aerial or street view photography.
- Showers - Truckers that drive vehicles with sleeper cabs often sleep in their trucks for convenience and to save on lodging expenses. However, sleeper cabs typically do not provide showers, so commercial truck stops often provide showers for rent. It was assumed that public sites do not have this amenity. Since this amenity is interior to the building at commercial establishments, on-street signage and facility websites were used to determine which commercial facilities provide showers. If no website advertising or on-street signage could be found, it was assumed that the facility does not provide showers.
- Lodging - Truckers that drive vehicles without sleepers and those that prefer to spend a night in a hotel room seek out lodging for their rest stops. The inventory looked for hotels / motels either co-located with truck parking facilities or within an easy walk of these sites. An 'easy walk' was defined as 2-3 blocks ( $1 / 8$ to $1 / 4$ mile) without crossing a limited access highway.

Although these data are not integral to usage statistics (collected separately), they are useful for evaluating why some facilities are better used than others and provide a basis for truck stop services mapping.

## Data Review and Compilation

The data collected above were assessed, and the following efforts were completed:

- Each site was assigned a unique identifier for tracking through project analyses. Sites were also assigned to the following categories:
- TS = Truck Stop
- WS = Weigh Station
- $\mathrm{SA}=$ Scenic Area
- Emergency truck parking sites were not included in the inventory.
- Sites were evaluated to determine if they provide full-time use or are only available for emergency truck parking. For example, the Dotsero truck parking area (I-70 Interchange 133) was established for emergency parking, but CDOT opened it up to fulltime use prior to 2017. Hence, it is shown as a full-time facility in the inventory.
- The inventory considered sites within approximately 30 miles of Colorado along each of the study routes. These sites, while not reflected in the state-wide totals for truck parking and amenities, provide data within about a 30 -minute travel time from Colorado, and can therefore affect attractiveness and utilization of Colorado facilities near the state line.
- Hours of operation were reviewed when available. If a truck driver wishes to use a site for a mandatory rest period, the site must be available for the duration of that rest period. Sites that close for part of the day (typically overnight) were not included as available truck parking. Locations where the truck parking remains available, but amenities are only provided during certain hours, were retained.
- Locational information collected for each site included a street address (where available), main street and cross street, latitude / longitude, and mileposts. For facilities along interstates, the freeway interchange number was also recorded.
- Sites were assigned to a primary route. Communities at the intersection of multiple routes (such as Lamar) often have multiple truck parking facilities. In these areas, some facilities may serve trucks traveling along one route better than trucks traveling along another route. For example, there are four facilities in Limon-three on the west side (at 1 - 70 Interchange 359) and one of the east side (I-70 interchange 361). Although a truck driver on any route may use any of these facilities, a through trucker traveling between US 287 and SH 71 would have to travel out-of-direction along I-70 to reach the facilities at Interchange 359. Hence, the facility at Interchange 361 is associated with US 287 and SH 71 (in addition to I-70), but the facilities at Interchange 359 are only associated with I-70.
- Weigh stations were reviewed but were removed from the available truck parking dataset. Although these are truck-oriented facilities, they are not designed to accommodate long-term truck parking. The Colorado Department of Revenue and the Colorado State Patrol use available truck parking spaces for enforcement activities, and no parking amenities are provided at these sites.
- Chain stations were reviewed but were removed from the available truck parking dataset. Although these are also truck-oriented facilities, they are not designed to accommodate long-term truck parking. These sites need to be available for multiple trucks during chain up / chain down to allow for safer truck operations during inclement weather.

The project team evaluated 188 total sites, including 130 Interstate sites and 58 sites on US Routes / State Highways. After removing out-of-state sites and eliminating non-truck parking sites (weigh stations, emergency parking, etc.), the following summary tables were prepared.

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## Table 1 - Truck Parking Sites by Corridor

| Corridor | Parking <br> Areas | Rest Areas | Scenic Areas | Truck Stops | Total Sites |
| :--- | :---: | :---: | :---: | :---: | :---: |
| I-25 | 1 | 5 | 0 | 16 | 22 |
| I-70 | 5 | 9 | 4 | 24 | 42 |
| I-76 | 0 | 3 | 0 | 13 | 16 |
| US 40 | 3 | 2 | 0 | 5 | 10 |
| US 50 | 0 | 1 | 0 | 6 | 7 |
| US 160 | 2 | 3 | 0 | 8 | 13 |
| US 287 | 1 | 1 | 0 | 5 | 7 |
| SH 71 | 1 | 0 | 0 | 0 | 1 |
| Total | $\mathbf{1 3}$ | $\mathbf{2 4}$ | $\mathbf{4}$ | $\mathbf{7 7}$ | $\mathbf{1 1 8}$ |

## Table 2 - Truck Parking Spaces by Corridor

| Corridor | Parking <br> Areas | Rest Areas | Scenic Areas | Truck Stops | Total Spaces |
| :--- | :---: | :---: | :---: | :---: | :---: |
| I-25 | 8 | 95 | 0 | 620 | 723 |
| I-70 | 73 | 68 | 14 | 1798 | 1953 |
| I-76 | 0 | 65 | 0 | 313 | 378 |
| US 40 | 27 | 10 | 0 | 35 | 72 |
| US 50 | 0 | 6 | 0 | 223 | 229 |
| US 160 | 6 | 13 | 0 | 171 | 190 |
| US 287 | 15 | 13 | 0 | 178 | 206 |
| SH 71 | 11 | 0 | 0 | 0 | 11 |
| Total | $\mathbf{1 4 0}$ | $\mathbf{2 7 0}$ | $\mathbf{1 4}$ | $\mathbf{3 3 3 8}$ | $\mathbf{3 7 6 2}$ |

Detailed tables showing the sites along each corridor are attached to this memo.

## Conclusions

Using the assumptions above, the project team collected general inventory data for over 180 truck parking sites, and compiled details for 118 truck parking locations in Colorado. The effort concluded that there are almost 3,800 truck parking spaces across the state spread over the detailed inventory sites. About two thirds of the sites are located along interstates, with the remainder located along US Routes and State Highways. CDOT's Rest Areas provide less than 10\% of these spaces, with most of the inventoried spaces provided by commercial facilities. The general review of nearby out-of-state facilities indicated that there are facilities north and south of Colorado along l-25, but that there are few facilities in neighboring states along other study corridors.




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## Resources

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US 40 Corridor $\underset{\substack{\text { Steamboat } \\ \text { Springs }}}{ }$



## I-70 Corridor



438
Seibert Stratton Burlington



US 50 Corridor


Truck Parking Assessment

## MEMORANDUM

TO: J ason Wallis
FROM: Lyle DeVries, PE, PTOE
DATE: J anuary 11, 2019
SUBJ ECT: CDOT Truck Parking Assessment GPS Data notes

In completing the TPA, the project team made extensive use of data provided by the American Transportation Research Institute (ATRI). ATRI conducts transportation research, with an emphasis on the trucking industry's essential role in a safe, efficient and viable transportation system. ATRI researchers have developed a dataset of positional data sampled from trucks throughout the US. This positional data was used in the Truck Parking Assessment (TPA) for the following purposes:

1. Track and quantify truck movements within and at the edges of Colorado to understand major origins/ destinations and travel patterns extending across the country.
2. Record the number of trucks parked at official truck parking locations along the eight TPA corridors to allow the TPA team to assess the demand for parking along each corridor

This memo provides notes describing the TPA project team's methodology for using the data in accomplishing these purposes.

## Description of the Data

The project data were derived from GPS devices deployed in 700,000 trucks throughout the United States (US). These GPS devices allow ATRI to gather significant amounts of data regarding truck movements. Truck position can be recorded at very short time intervals, facilitating an understanding of truck travel speeds, stops, starts, and routing. The number of GPS-equipped trucks does not cover the entire fleet of trucks across the US, so some adj ustment is necessary to extrapolate the data to appropriately represent the full magnitude of truck movements and stops.

## Data Collection Periods

Truck position data were gathered from four 2-week time periods during the Year 2017. These time periods were selected to represent each of the four quarters of the year. The selected times represent dates that were relatively free of road closures along the interstates in Colorado. Holiday times were avoided. Data from the Colorado Department of Transportation (CDOT) COGNOS system were used to evaluate closure times.

The two-week time periods are listed as follows:

- Quarter 1: February 20-March 6
- Quarter 2: April 5-18
- Quarter 3: July 10-23
- Quarter 4: November 3-16

Each time period spanned 14 days and included two weekends.

Two closure events that occurred in the Year 2017 were selected for analysis to better understand how closures affect truck parking. These time periods were selected through careful review of closure event data and media reports. Two closure events were chosen for analysis, listed as follows:

January II, 2019
CDOT Truck Parking Assessment - GPS data notes
Page 2

1. December 12, 2017: A truck crashed along I-70 near Georgetown, and I-70 was closed in both directions for 4.5 hours, and eastbound remained closed for another 5 hours. Truck position data from the day of the closure as well as a normal condition December 5 were utilized to provide a comparison of baseline vs. closure conditions.
2. March 23, 2016: A Spring blizzard shut I-25 down between Castle Rock and Ft. Collins and I-70 east of Denver was closed. Truck position data from the day of the blizzard as well as a normal condition December 5 were utilized to provide a comparison of baseline vs. closure conditions.

## 2017 Regulatory Climate

Hours of Service (HOS) regulations determine the length of time drivers can be on the road and allowed breaks. The HOS rules in effect at the time of data collection are summarized in Table 1.

Table I. Hours of Service (HOS) Rules

| Rule | Description |
| :--- | :--- |
| 11-Hour Driving Limit | May drive a maximum of 11 hours after 10 consecutive hours off duty. |
| 14-Hour Limit | May not drive beyond the 14th consecutive hour after coming on duty, <br> following 10 consecutive hours off duty. Off-duty time does not extend <br> the 14-hour period. |
| Rest Breaks | May drive only if 8 hours or less have passed since end of driver's last off- <br> duty or sleeper berth period of at least 30 minutes. |
| Sleeper Berth Provision | Drivers using the sleeper berth provision must take at least 8 consecutive <br> hours in the sleeper berth, plus a separate 2 consecutive hours either in <br> the sleeper berth, off duty, or any combination of the two. |

The Electronic Logging Device (ELD) mandate was issued in December of 2015 and truckers were required to be in compliance by December of 2017. Full compliance is anticipated by December of 2019.

These regulations exert a significant influence on the use of truck parking.

## Truck Movement Information

The TPA made use of truck movement information to understand major origins and destinations throughout Colorado and at the borders. Below is a graphic representation of the data from J uly of 2017.

July 10-23, 2017 Originating Truck Trips


The total number of trips made by GPS-equipped trucks during the 2-week period are recorded in the data. A trip origin was marked as the census block where a truck begins moving following a stop of more than 30 minutes. A truck trip can also begin when a truck exits the area in white surrounding the state (catchment zone) and enters the study area. A destination is marked as the census block where a truck takes a stop of more than 30 minutes, or once a truck exits the study area and enters the catchment zone. The relative magnitude of truck origins and destinations can be easily understood from the graphic depiction.

Data from GPS-equipped trucks were also used to develop a picture of truck movements across the US. A period of 7 days was extracted from the data to understand how trucks starting in Denver make their way across the country. A graphical depiction of where trucks traveled in 1 day is provided on the
 right.

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## Truck Parking Data

The GPS data were used to count the number of trucks parked at specified locations where official truck parking is provided. Truck parking data were incorporated into the study using the following steps:

1. Develop boundaries defining the use of all truck parking facilities included in the study. Create polygons in the GIS dataset to serve as the boundaries within which official parking is allowed at each site. A total of 147 official truck parking sites were analyzed along with 10 locations where truck parking is known to occur without official authorization. An example polygon is depicted on the right, at a truck parking lot southwest of the State Highway 119/ I-25 interchange.
2. Identify the number of available spaces associated with each polygon. In the case of the example the spaces number 40.
3. Gather GPS data for the defined time windows. The GPS data count the number of stationary trucks on the site. Once a truck is recorded at a location, that truck was counted at the location once per hour for each hour the truck
 fell within the boundaries of the polygon. The result of this analysis is a hour-by hour profile of truck parking demand for those trucks that are equipped with GPS devices.
4. Develop expansion factors that can be used to extrapolate the number of GPS-equipped trucks to represent the total number of trucks parking at a given location. The expansion factors were developed through the following steps:
a. Compile all available truck traffic counts along TPA corridors from information provided by CDOT. Extract 24 -hour bidirectional truck counts from a single day within each of the four quarterly time frames from locations that lie close to truck parking locations.
b. Compare the counted truck trips with the number of GPS-equipped trucks counted at the same location during the same day.
c. Divide the CDOT truck count by the count of GPS-equipped trucks. The result is the expansion factor to be utilized for all truck parking facilities located within a reasonable distance of the count location.
The average expansion factor applied to the TPA corridor facilities was 2.96, meaning that GPSequipped trucks comprised approximately 34 percent of all trucks.
5. Multiply the hourly recorded parked trucks at each location by the expansion factor and develop a 24hour profile for all trucks. Average the profile over the full two-week time period to develop a characteristic hourly parking demand curve for each of the four two-week time periods. An example is shown below, again for the truck parking lot southwest of the State Highway 119/l-25 interchange.

6. Identify the highest number of parked trucks during any single recorded hour ( 24 in the depicted graphic), and develop a parking usage percentage by dividing that number by the number of parking spaces supplied at that location. Compile statistics for all parking areas to understand how current facilities are being utilized.
7. Develop a plot of peak parking usage and available spaces within a 30 -minute travel distance along each TPA corridor. 30-minute travel distances may be calculated using a variety of methods. For the TPA, these distances were calculated using GIS-based tools available from ESRI and Here!

Upon compiling information for all of the TPA corridors, the usage levels were categorized into one of three color-coded levels and noted on the corridor graphics included in the TPA report:

- Red: Heavy usage levels, 85 percent or more based on peak parking usage percentage
- Yellow: Intermediate usage levels: 60-84 percent
- Green: Moderate usage levels, less than 60 percent.

The methodologies described herein may be replicated for future updates to the TPA as more recent data become available.

## Denver, CO 7-day Truck Flows

## -ATRI









February 20 - March 6, 2017 Originating Truck Trips


February 20 - March 6, 2017 Terminating Truck Trips


April 5-18, 2017 Originating Truck Trips


## April 5-18, 2017 Terminating Truck Trips



July 10-23, 2017 Originating Truck Trips


July 10-23, 2017 Terminating Truck Trips


# Near Castle Rock, CO March 23, 2016 Blizzard 

## March 23, 2016 Blizzard

- More than a foot of snow recorded at Denver International Airport
- About two feet of snow was recorded in Boulder, CO
- I-70 closed east of Denver through Thursday, March 24, 2016 early morning
- $\mathrm{I}-25$ closed between Castle Rock and Denver during the storm and later reopened



During Blizzard
March 23, 2016: 1:00 PM-7:00 PM


## Near Georgetown, CO Truck Bridge Strike: December 12, 2017

## Bridge Strike: 12/12/2017

- 10:30 AM: A truck traveling eastbound crosses into westbound lanes and into the support columns of a bridge. Both directions of I-70 close following the bridge strike.
- 3:00 PM: Westbound lanes open
- 8:00 PM: Eastbound lanes open

Normal Operations: December 5, 2017


Normal Operations: December 5, 2017


Truck Bridge Strike
December 12, 2017: 10:30 AM - 3:00 PM

Speed (mph)

- 0-15
- $16-30$ 31-45 46-55
$56+$
Bridge Location


Truck Bridge Strike
December 12, 2017: 3:00 PM - 8:00 PM


Truck Bridge Strike
December 12, 2017: 8:00 PM - Midnight

## Speed (mph)

- 0-15
- $16-30$ 31-45 46-55
- 56 +Bridge Location


www.codot.gov


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