

Executive Summary, Research Readiness Level Assessment, and Technology Transfer

Assessment of Truck Parking Demand and Safety During Normal and Severe Weather Conditions in Nebraska

Research Objectives

To accomplish the goals stated above, the project team will work in consultation with the Technical Advisory Committee (TAC) to accomplish the following research objectives.

1. Use publicly available sources to create a complete inventory of public and private truck parking facilities along I-80 in Nebraska and the number of available parking spaces at each facility.
2. Analyze 2022 year-long truck GPS data from the American Truck Research Institute (ATRI), supplemented with satellite imagery data, to determine actual truck parking demand at all public and private facilities along I-80 in Nebraska and identify truck parking hotspots.
3. Objective 2 will provide NDOT with very accurate information regarding truck parking demand and utilization at each facility. However, the information will be limited to the year 2022. To provide NDOT with the ability to estimate the occupancy of truck parking areas in future years, a model will be developed to provide this information.
4. Identify undesignated truck parking clusters in inclement weather to determine where best to provide emergency parking.
5. Conduct an exploratory analysis of crashes that were likely due to truck parking shortages.

Research Benefits

The primary benefit of this project to NDOT is having factual data about truck parking supply and demand in Nebraska. The secondary benefit is understanding the extent of crashes that were most likely due to truck parking shortages. These data can be incorporated into the next update of the State Freight Plan and provide a basis for meaningful dialogues with the trucking industry and related stakeholders.

This project could potentially lead to more truck parking facilities across the state due to the business opportunities identified in this project for the private sector. Should that take place, it will make travel through the State safer for truck drivers and other travelers, reduce unnecessary travel and fuel consumption by trucks searching for a parking spot, and improve the efficiency of commercial vehicle operations. The providing lists the benefits of providing more truck parking by stakeholders (MnDOT, 2019)

Background

MAP-21 included a provision requiring truck drivers to use an Electronic Logging Device to record their compliance with Hours-of-Service (HOS) requirements. This mandate, effective as of December 2017, requires commercial drivers to stop and rest after 11 hours of driving. Around the same time this mandate became

effective, NDOT completed its first State Freight Plan. Through the planning process and discussions with the trucking industry and other stakeholders, the topic surrounding the availability of safe and convenient truck parking came to the fore, with truck drivers, motor carriers, and safety officials in Nebraska expressing concerns and seriousness of this issue. Commercial drivers seeking to comply with HOS regulations often park illegally, creating unsafe conditions for motorists and other commercial drivers. The extent of the problem in Nebraska is unknown and evidence is often anecdotal. For these reasons, the State Freight Plan recommended that NDOT develop an asset-based approach to understand how truck parking deficiencies affect safety and operations on its highway network.

To assess truck parking at the state level, this project proposes to develop a method to scan the entire State using satellite imagery to (1) determine truck parking lot occupancy, and (2) identify locations where trucks have parked illegally. In collecting this information over 10 years, trends and projections can be made to inform policy and provide factual data to guide discussions with NDOT's freight partners

Conclusion

This project examined truck parking capacity, demand, and utilization patterns along I-80 in Nebraska. The objectives were to (1) document the capacity of public and private truck parking facilities along I-80, (2) analyze spatial and temporal trends in parking demand, (3) develop models to predict occupancy at parking facilities, (4) identify clusters of undesignated parking during inclement weather, and (5) assess whether truck parking shortages contribute to truck-involved crashes. Within a one-mile buffer of I-80, 21 public facilities and 49 private facilities were identified. The spatiotemporal analysis of these public and private truck parking facilities using the National Agriculture Imagery Program and Google Earth Imagery data between 2010 and 2022 showed a higher parking occupancy rate at private facilities, with several private facilities experiencing 100% occupancy or higher. Public facilities near Omaha had a consistently high occupancy rate. To enable NDOT to estimate the occupancy rate of a facility, public or private, expansion factors were first developed using the 2022 ATRI GPS data. The number of trucks parked at public and private facilities was then estimated by multiplying the number of GPS-identified trucks that remained stationary for more than 60 minutes by the corresponding expansion factor. Building on these estimates, a hybrid Bayesian modeling framework was developed to predict occupancy. Parking facilities were clustered based on their inter-facility distances, resulting in groups containing either single or multiple facilities. Accordingly, a dynamic time series model was developed for individual facilities, while a panel model with time fixed effects and distance-based spatial lags was developed for multi-facility clusters. Results indicate that lagged occupancy is the strongest predictor, with spatial effects also significant in the panel model. Both models achieved strong predictive performance. During inclement weather, trucks were found to park in four locations: facility entry and exit areas, off-road sites, ramps, and shoulders. Lastly, statistical analysis showed no significant relationship between truck-involved crashes and parking shortages.

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Interested in finding out more?
Final report is available:
[HERE](#)

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NDOT Recommendations Based Off Research Project – 2026 – RRL4

This research produced quantitative data on truck parking supply and demand and found no statistically significant relationship between truck-involved crashes and parking shortages during normal or severe weather conditions. Satellite imagery and manual notation was used to estimate parking occupancy; however, more refined data may be obtained in the future through automated vehicle-counting technology to provide additional depth of analysis. Insights gained from this research will provide valuable guidance for the Strategic Planning, Traffic, and Operations Divisions.

Strategic Planning Division will use the findings as the NDOT updates the State Freight Plan. Additionally, the Operations Division will use the results to support the Transportation Systems Management and Operations (TSMO) system, grant applications, and truck parking plan development.

- As provided by Ryan Huff and Stephanie Camerone, Lead TAC Members

Research Readiness Level (RRL) Assessment

Level 4: Implementation with Follow-Up

Research will be revisited in 2 years.

RRL 4

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Technology Transfer

Webinars/Presentations

- Jahangeer J., Huynh, N., Zhao, Li, Riahifa, A. Khan, R. and Tang Z. Truck Parking Demand Analysis along Nebraska's Major Truck Freight Corridor: Utilizing Deep Learning Algorithms on Imagery Data. Presentation at *Transportation Research Board Annual Meeting*, Washington, DC, January 5-9, 2025.
- Riahifar, A., Huynh, N., Zhao, L., & Tang, Z. (2025). Optimizing Truck Parking Infrastructure Using a Bi-Objective Flow-Based Model. Presentation at the *INFORMS Annual Meeting*, Atlanta, GA, October 26–29, 2025.

Papers

- Jahangeer J., Huynh, N., Zhao, Li, Riahifa, A., Kahn, R., and Tang, Z. Truck Parking Demand Analysis along Nebraska's Major Truck Freight Corridor. Utilizing Deep Learning Algorithms on Imagery Data. Accepted by *ASCE's Journal of Transportation Engineer, Part A: Systems*.
- Riahifar A., Zhao Li, Huynh, N., Tang Z., and Madarshahian, A. A Bayesian Spatial-Temporal Approach to Truck Parking Demand Prediction: Evidence from the I-80 Freight Corridor. To be submitted to *Transportation Research Part D: Transport and Environment*.

**This brief summarizes Project SPR-FY24(036)
“Assessment of Truck Parking Demand and Safety During Normal and Severe Weather Conditions
in Nebraska”
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