SPR RESEARCH PROGRAM
SECOND-STAGE PROPOSAL SUMMARY

PROBLEM NUMBER & TITLE

26-70 | Development of a Truck Level of Traffic Stress

PROBLEM SUMMARY

To-date, ODOT has developed a Multimodal Level of Traffic Stress (LTS) methodology for autos, transit, bicycles and pedestrians *(1)*. These methods allow ODOT operations and planning analysts to perform high-level assessments suitable for applications like network screening using limited data extracted from existing databases or aerial imagery. This supports design choices and programming which improves the mobility of pedestrians and bicyclists *(2)*. No comparable methodology exists for assessing how transportation system design elements impact medium (delivery) and heavy (freight) trucks; there is a need for a truck-specific LTS methodology to similarly improve truck mobility and access in Oregon. About 35% of all VMT is commercial traffic, yet transportation analysis consistently focusses on passenger travel and ignores urban commercial and freight movement. This technical gap needs to be resolved; especially as urban areas develop more road reconfigurations have the potential to adversely impact trucks.

ODOT OBJECTIVES

This research will result in a validated methodology for assessing Truck LTS using a tiered system. The Truck LTS methodology will be immediately implementable by engineers and planners to assess existing infrastructure and make choices about proposed transportation system modifications that improve truck access and mobility. The research team will ensure the methodology is implementable by engaging CDL operators, engineers, and planners in selecting key design aspects of the transportation system that should inform the tiered system. The system will be validated with a simulator study which assesses CDL operator stress using biometric feedback devices *(4)*. This step is critical in the process. Many of the LTS models that have been developed and implemented have never been validated. They are based predominantly on conceptual relationships. Validation of the Truck LTS model is critical to its adoption in practice.

BENEFITS

For continuous improvement in public safety and ODOT operations: This research will result in a validated methodology for assessing Truck LTS using a tiered system. The Truck LTS methodology will be immediately implementable by engineers and planners to assess existing infrastructure and make choices about proposed transportation system modifications that improve truck access and mobility. The research team will ensure the methodology is implementable by engaging CDL operators, engineers, and planners in selecting key design aspects of the transportation system that should inform the tiered system. This study has the potential to improve working conditions of Freight Truck Drivers and better overall public safety, writ large. The trucking industry is shifting to younger less experienced drivers as driver retirements rise. This trend is confounded by increased restrictions to hours of service and limited access to high quality parking which creates miles of travel seeking parking instead of traveling progressing toward the final destination. We have been spoiled by experienced drivers who are retiring or leaving the occupation because wages are too low to overcome the aforementioned challenges (3). ODOT's mission is to "provide a safe and reliable multimodal transportation system that connects people and helps Oregon's communities and economy thrive". Improvements to the safety and efficiency of truck operations are integral to both a safe and reliable transportation system and a thriving economy. As trucks share the transportation system with other modes, promoting safety and accessibility for trucks will also benefit other modes (e.g., passenger cars, pedestrians, bicycles).

SCHEDULE, BUDGET & AGENCY SUPPORT

Estimated Project Duration: 22 months

Estimated Project Budget: $215,000

Internal ODOT Support: Carla Phelps, CCD Administrator; Erik Havig, Statewide Policy and Planning Manager; John Boren, Freight Program Manager; & Matt Bagwell, Principal Research Analyst.

FOR MORE INFORMATION

The complete Stage Two Research Problem Statement can be accessed online at:
https://www.oregon.gov/odot/Programs/ResearchDocuments/26-70

SPR RESEARCH PROGRAM
SECOND-STAGE PROBLEM STATEMENT
FY 2026

PROBLEM NUMBER & TITLE

26-70 | Development of a Truck Level of Traffic Stress

RESEARCH PROBLEM STATEMENT

To-date, ODOT has developed a Multimodal Level of Traffic Stress (LTS) methodology for autos, transit, bicycles and pedestrians *(1)*. These methods allow ODOT operations and planning analysts to perform high-level assessments suitable for applications like network screening using limited data extracted from existing databases or aerial imagery. This supports design choices and programming which improves the mobility of pedestrians and bicyclists *(2)*. No comparable methodology exists for assessing how transportation system design elements impact medium (delivery) and heavy (freight) trucks; there is a need for a truck-specific LTS methodology to similarly improve truck mobility and access in Oregon. About 35% of all VMT is commercial traffic, yet transportation analysis consistently focusses on passenger travel and ignores urban commercial and freight movement. This technical gap needs to be resolved; especially as urban areas develop more road reconfigurations have the potential to adversely impact trucks.

RESEARCH OBJECTIVES

This research will result in a validated methodology for assessing Truck LTS using a tiered system. The Truck LTS methodology will be immediately implementable by engineers and planners to assess existing infrastructure and make choices about proposed transportation system modifications that improve truck access and mobility. The research team will ensure the methodology is implementable by engaging CDL operators, engineers, and planners in selecting key design aspects of the transportation system that should inform the tiered system. The system will be validated with a simulator study which assesses CDL operator stress using biometric feedback devices *(4)*. This step is critical in the process. Many of the LTS models that have been developed and implemented have never been validated. They are based predominantly on conceptual relationships. Validation of the Truck LTS model is critical to its adoption in practice.

WORK TASKS, COST ESTIMATE & DURATION

Task 1: Brief Literature Review and Survey (3 months)

Conduct a literature review describing existing research on LTS methodologies and design factors anticipated to influence a Truck LTS methodology.

Task 2: Truck Level of Stress Design Charrette (2 months)

Conduct a design charrette which brings together CDL operators, engineers, and planners to identify elements of the roadway anticipated to influence a Truck LTS methodology. This discussion will result in conceptual descriptions drafted for each of four tiers of Truck LTS.

Task 3: Experimental Design (4 months)

The project team will design a full-scale Qualtrics survey and the static roadway environments for the OSU HV Simulator study representing each of four tiers of Truck LTS developed in the design charrette.

Task 4a: CDL Operator Survey (3 months)

A minimum of 400 CDL operators will be recruited to respond to a full-scale Qualtrics survey. Data will be used to expand results of the Charrette and to validate the results of the driving simulator investigation. Methods will meet standards similar to recently supported ODOT research efforts (5).

Task 4b: Subject Testing in Simulator (4 months)

A minimum of 30 CDL operators will be recruited to drive the simulated environments representing the Truck LTS tiers in the Heavy Vehicle Simulator. Participants will be outfitted with Shimmer+ Galvanic Skin Response (GSR) devices to record level of stress for each scenario.

Task 5: Data Analysis (4 months)

Analyze the qualitative and quantitative results of the survey as well as the GSR and simulator data to validate truck LTS tiers.

Task 6: Final Report, Research Note & ODOT Recommendations (2 months)

Prepare draft and final versions of the comprehensive study report and research note for review and acceptance of the project technical advisory committee.

KEY DELIVERABLES:

This research will result in a validated methodology for assessing Truck LTS using a tiered system. The Truck LTS methodology will be immediately implementable by engineers and planners to assess existing infrastructure and make choices about proposed transportation system modifications that improve truck access, mobility, and the safety of all road users. The research team will ensure the methodology is implementable by engaging CDL operators, engineers, planners, and agency decision makers in selecting key design aspects of the transportation system that should inform the tiered system. The system will be validated with a robust survey and a heavy vehicle simulator study which assesses CDL operator stress using biometric feedback devices *(4).* This step is critical in the process. Many of the LTS models that have been developed and implemented for other modes have never been validated. They are based predominantly on conceptual relationships. Validation of the Truck LTS model is critical to its usefulness as a tool and its adoption in practice.

Estimated Project Duration: 22 months

Estimated Project Budget: $215,000

IMPLEMENTATION

To improve safety planning and design as well as possible improvements in freight flow design.

POTENTIAL BENEFITS

This research will result in a validated methodology for assessing Truck LTS using a tiered system. The Truck LTS methodology will be implementable by engineers and planners to assess existing infrastructure and make choices about proposed transportation system modifications that improve truck access and mobility. The research team will ensure the methodology is implementable by engaging CDL operators, engineers, and planners in selecting key design aspects of the transportation system that should inform the tiered system.

The trucking industry is shifting to younger less experienced drivers as driver retirements rise. This trend is confounded by increased restrictions to hours of service and limited access to high quality parking which creates miles of travel seeking parking instead of traveling progressing toward the final destination. We have been fortunate to have experienced drivers. However, they are retiring or leaving the occupation because wages are too low to overcome the aforementioned challenges (*3*). Also, this labor profession experience drain implies possible negative public safety impacts, if driver levels of stress go unchecked/ uncorrected/ uninvestigated.

ODOT's mission is to "provide a **safe** and reliable multimodal transportation system that connects people and helps Oregon's communities and **economy thrive**". Improvements to the safety and efficiency of truck operations are integral to both a safe and reliable transportation system and a thriving economy. As trucks share the transportation system with other modes, promoting safety and accessibility for trucks will also benefit other modes (e.g., passenger cars, pedestrians, bicycles).

PEOPLE

ODOT CHAMPION(s): Carla Phelps, Commerce & Compliance Division Administrator; Erik Havig, Statewide Policy and Planning Manager; & John Boren, Freight Program Manager.

PROBLEM STATEMENT CONTRIBUTOR(s): David Hurwitz & Matt Bagwell (see below for contact info).

Name:	David Hurwitz
Title:	Professor
Affiliation:	Oregon State
Telephone:	541-737-9242
Email:	david.hurwitz@oregonstate.edu

Internal ODOT Supporters:

Name	Title	Email
Carla Phelps	Commerce & Compliance Division Administrator	Carla.D.PHELPS@odot.oregon.gov
Matt Bagwell	Principal Research Analyst	Matt.T.BAGWELL@odot.oregon.gov
John Boren	Freight Program Manager	John.BOREN@odot.state.or.us
Erik Havig	Statewide Policy and Planning Manager	Erik.M.HAVIG@odot.state.or.us

REFERENCES

1. ODOT Analysis Procedures Manual Chapter 14: Multimodal Analysis, URL: https://www.oregon.gov/odot/Planning/Documents/APMv2_Ch14.pdf [Accessed Feb, 2027]
2. Regional Mobility Policy Update, URL: https://www.oregonmetro.gov/regional-mobility-policy [Accessed Feb, 2025]
3. 2022 Freight and Economic Analysis Expert Task Group (FEA ETG), URL: https://www.oregon.gov/odot/Programs/ResearchDocuments/FreightandEconomicAnalysisETGPriorites2022.pdf [Accessed Feb, 2025]
4. Cobb, D., Jashami, H., & Hurwitz, D. (2021) "Bicyclists' Behavioral and Physiological Responses to Varying Roadway Conditions and Bicycle Infrastructure," *Transportation Research Part F: Traffic Behavior and Psychology*, Volume 80, Pages 172-188.
5. Hurwitz, D., Jashami, H., & Breuer, H. (2024) Safety and User Perceptions of Auxiliary Bike Lanes. Oregon Department of Transportation, Salem, OR pg141.

STAFF REVIEW PAGE

LITERATURE CHECK OF TRID & RIP:

☒ A review of TRID & RIP databases found no existing research that answers the research question.

ODOT DECISION LENSES

Climate: This research does not directly investigate climate, but may touch on some aspects.

Equity: This research focuses on equity in an indirect way that may have indirect impacts. It is worth noting that more women and people of diversified ethnic and racial backgrounds are entering the freight trucking labor force. Therefore, this research has implications for diversity, equity and inclusion in this area.

Safety: This research focuses on public transportation safety directly, as it relates to investigating truck driver levels of stress. The trucking industry is shifting to younger less experienced drivers as driver retirements rise. This trend is confounded by increased restrictions to hours of service and limited access to high quality parking which creates miles of travel seeking parking instead of traveling progressing toward the final destination. We have been spoiled by experienced drivers who are retiring or leaving the occupation because wages are too low to overcome the aforementioned challenges (3). ODOT's mission is to "provide a safe and reliable multimodal transportation system that connects people and helps Oregon's communities and economy thrive". Improvements to the safety and efficiency of truck operations are integral to both a safe and reliable transportation system and a thriving economy. As trucks share the transportation system with other modes, promoting safety and accessibility for trucks will also benefit other modes (e.g., passenger cars, pedestrians, bicycles).

TECHNOLOGY & DATA ASSESSMENT

☒ No Identified T&D output.

☐ At the end of this project, the implementing unit(s) within ODOT will need to coordinate the adoption of new technology or data in order to realize the full potential of this research.

TRANSAGENCY PARTNERS

List ODOT partners or affected units: ODOT Statewide, regional and local planning practices: PDAD-Freight, TPAU, Traffic Counts, Climate, Equity, Communications and Information dissemination to the public (senior ODOT leadership, statewide and local implications). One ODOT: How we assess planning inputs for decisionmaking.

Identify any issues of concern raised by an ODOT partners. Note expected mitigation that addresses these concerns: Added Time, Budget & Project Burden Considerations. But safety should be paramount in the public work we undertake as a state agency at ODOT.