Strengthening Mobility and Revolutionizing Transportation (Smart) Grants Program

Stage 1: Integrated Transportation System Monitoring, Management & Operations Planning Project

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PROJECT DESCRIPTION

The Stage 1 Integrated Transportation System Monitoring, Management and Operations planning project will integrate distinct traffic count databases into one comprehensive GIS database.

Counting traffic is vital for local and state governments to make informed decisions about mobility, infrastructure, and economic development projects. Traffic counts in Oklahoma are used to better understand the past and present to prepare for the future. Accurate and updated traffic counts will help the Oklahoma Department of Transportation (ODOT) and its partners understand where counts are increasing and decreasing and this provides useful information on pavement and maintenance needs and economic development decisions.

Currently, ODOT is moving toward a more data-driven approach to develop and select projects. Traffic count data is a key contributor to investment decision-making. Given the increasing importance of data in ODOT's planning and programming decisions, having accurate count data is more important than ever.

At the same time, pandemic-related changes in travel patterns highlighted a need and opportunity to improve the quality, timeliness, and clarity of traffic counting data. Significant changes in travel patterns that would have dictated changes in planning and systems operations went undetected in the past.

Historically, traffic operations have operated separately from traffic monitoring. New generations of intelligent transportation system (ITS) devices deployed for traffic operations are capable of supporting traffic monitoring uses and vice versa.

Through support provided by this Stage 1 SMART grant, ODOT will lay the foundation and ready itself for a pioneering initiative to break down barriers separating traffic operations from monitoring, resulting in an integrated and intelligent system that is more agile and adaptive to changing patterns in travel demand and travel demand. The integration of these divisions will create a model that could be replicated by transportation agencies nationwide.

Features of the future integrated approach will include:

- A unified, modernized and expanded set of ITS device sensors used for both traffic monitoring and operations.
- Automated incident and change detection. Changes in traffic flow due to traffic incidents will be detected automatically. Larger changes arising from changes in regional travel demand will automatically be detected and flagged for appropriate review and action.
- Expanded open data and transparency.
- Lower long-term cost.

Through funding provided by the Stage 1 SMART grant award, ODOT will:

- Improve the timeliness of data. Data collection cycles will be reduced from annual updates to real-time.

- Improve the accessibility of data. Data will be easier to access for DOT staff and the public.
- Improve the integration of data. Instead of maintaining separate networks of ITS devices for traffic monitoring and traffic operations, ODOT will maintain one integrated set of devices supporting multiple purposes.
- Engage partners to disseminate new traffic data standards and develop tools that turn data into actionable, usable information.

These improvements will advance SMART Grant goals related to open data, data portability, and transparency while improving the responsiveness and efficacy of ODOT's systems operations and planning efforts.

PROJECT LOCATION

The Stage 1 Integrated Transportation System Monitoring, Management and Operations planning project will serve the entire state of Oklahoma. Traffic counts are collected in all 77 counties in Oklahoma and the Stage 1 SMART grant will fund a System Integration project that will make the traffic counting process "smart" in rural, urban, and Tribal areas, as well as in 428 Historically Disadvantaged Census Tracts throughout the state.

COMMUNITY IMPACT

ODOT's integration of transportation monitoring data and operations management will improve data transparency and data sharing to the state's counties, metropolitan planning organizations (MPOs), councils of government (COGs), transit agencies, local governments, and tribal governments. Over 43 percent of Oklahoma's population is located in the 428 Historically Disadvantaged Census Tracts based on US Census data. This open data source will provide additional tools to support decision-making at the state, county, and local government levels including in Historically Disadvantaged areas. The data will provide traffic and speed data along all state routes to support improved performance management and project decision-making at all levels of government in all areas of the state. The potential connection to intelligent transportation systems and traffic operations will support the dissemination of real-time travel information to all users of the state transportation system. ODOT does not anticipate any negative externalities related to the integration of transportation monitoring data and operations management.

TECHNICAL MERIT OVERVIEW

Problem: Existing ODOT monitoring systems do not provide timely or accurate notification of changes in travel patterns.

Identification and Understanding of the Problem

- Traffic counts are an increasingly important input into ODOT data-driven planning and programming decision process.
- Home-grown traffic count/data management scripts have become a black box; currently in "triage mode" to keep traffic counts going.

- Resources for counting are limited; staff for conducting manual counts are in increasingly short supply.
- Existing count data from Houston Radar sites, short-term count sites, Miovision, and traffic forecasts are isolated in separate systems.
- Traffic monitoring and traffic operations maintain separate networks of ITS devices for similar purposes. Currently, real-time traffic data from ODOT's existing traffic monitoring sensors is not integrated into traffic operations.
- Detection of changes relies on human monitoring.
- The old model of estimating traffic counts using hose counts and a few automated permanent counters meets Federal requirements but puts ODOT at a disadvantage in terms of proactive planning and system operations. The current traffic counting and estimating process do not meet ODOT's needs and cannot accurately model reality, especially when there are unpredictable changes in areas with unanticipated high growth.

Proposed Solution – Integrated Transportation System Monitoring, Management and Operations planning project. ODOT will bring together its system operations and traffic monitoring divisions and expand the integrated network of ITS devices used to support their combined operations. Bringing together these related departments will allow for use of shared/combined resources, production, and dissemination of real-time data, detection of anomalies, improvement in data quality, timeliness and availability, and improvement in the quality and quantity of data available publicly.

- Shared and expanded system of ITS devices for traffic monitoring used by both operations and monitoring (that is, the same devices that are used to detect traffic incidents are also used for the statewide counting program).
- Automated change detection, implemented at multiple levels of temporal granularity (e.g. short-term detection for incidents; medium-term detection for systemic changes in travel patterns).
- Define a new process for continuously reallocating temporary counting resources (and new automatic count locations) to fastest-changing locations from least-changing locations (while maintaining continuity over time).
- Use of probe-based data or other crowd-sourced data sources for monitoring traffic trends beyond automatic traffic counter locations.
- Simply having more frequent, higher quality and accessible data can support better planning efforts in areas such as freight and safety.
    - Freight planning can benefit from a better understanding of where trucks are and how truck volumes change over time. This can lead to better freight project identification and prioritization methodologies.
    - Combining vehicle classifications, speed, traffic volumes, and crash data opens the door to advanced safety analysis including identifying hot spots, predictive risk assessments, before and after intervention studies, and more. All of which can lead to data-driven project identification and prioritization.

Specific scope elements include:

1. **Project Management, Partner Coordination, and Reporting.** Coordinate with partners to evaluate the feasibility of utilizing local traffic count data into ODOT's integrated traffic count database and mapping tool. This is described in more details in the Community Engagement and Partnerships on page 6.
2. **ITS Devices Planning.** Plan for purchasing and installing additional ITS devices for real-time monitoring of traffic counts and speeds. With funding from this grant, ODOT will lay the groundwork to expand its statewide real-time monitoring network of sensors, including identification of locations, required network connectivity, and operating procedures for updating locations over time.
3. **Update Traffic Counting Workplan.** Define workplan for updating the traffic counting program. This may include developing an RFP for traffic monitoring software capable of integrating real-time data from ITS devices. Modernize and improve data collection and processing procedures to reflect modern best practices. Develop procedures to identify anomalies and flag anomalous counts for manual review.
4. **Organizational Integration Assessment.** Complete internal organizational assessment of benefits, anticipated challenges, and identified risk of integrating traffic monitoring roles and capabilities with traffic operations and monitoring; establish a workplan to support this reorganization. Develop integrations for new and existing ITS devices to support their use for both traffic monitoring and systems operation use as well as traffic counting purposes.
5. **Technology Integration Assessment.** Develop functionality requirements for software to support integrated traffic monitoring and traffic operations, with a significant focus on automated anomaly detection and flagging and automated traffic operations actions such as automatically setting messages on Dynamic Message Signs.
6. **Improving Existing Data Interface.** Unify existing data sources into a single interface, allowing integrated access to ODOT's short-term, continuous count, traffic study counts, and traffic forecasts in a single user interface. This interface will also provide greater access to granular underlying data.
7. **Plan for Expanded Public Access.** Plan for expanded public access to traffic data, such as through developing and publishing an API to access traffic data or expanding and maintaining published data on ODOT's open data portal. Short-term and continuous count data should be exposed publicly through both a web-based application and API access. This will improve data access for both internal DOT staff, partners, and the general public.

Expected Benefits

Stage 1 activities funded through this grant will provide immediate benefit while establishing a foundation for greater benefit through a potential Stage 2 grant. Immediate benefits will include improved internal access to existing traffic data; alignment toward greater incorporation of data in decision-making; automation of some existing repetitive processes; and development of capacity for innovation and integration.

Anticipated long-term benefits include better planning outcomes; better data for internal users and external consumers; automation of repetitive tasks; internal capacity building; stronger integration with regional planning entities; and proof of concept for a re-alignment of traditional traffic monitoring and operations activities into a more effective combined division. In particular:

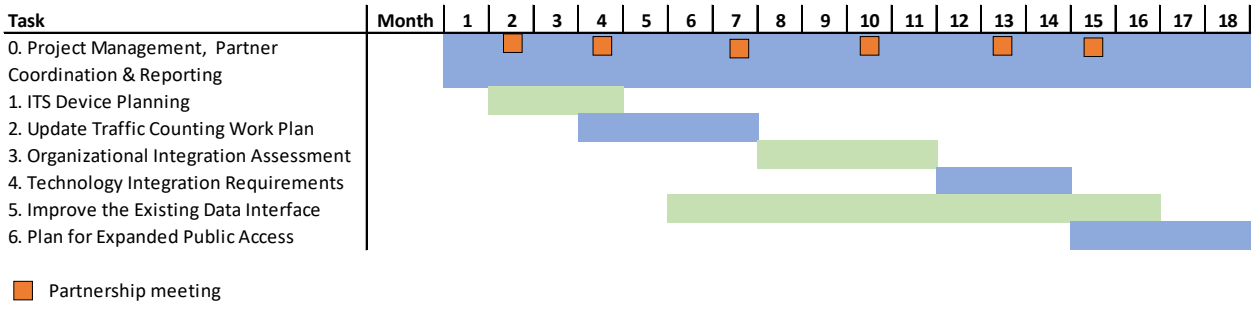
- **Better System Planning (for planners) Benefits**: Accurate traffic counts are the basis of ODOT's calculated Vehicle Miles Traveled (VMT), Average Annual Daily Traffic (AADT), truck volume percentages, and K and D factors. These data points drive important planning decisions, such as estimating transportation and environmental impacts based on proposed new development projects. AADT provides information on how busy roads are and it is a good indicator to identify areas that need preservation or capacity improvements.
- **Better Trip Planning (for drivers) Benefits**: Better information about roadway conditions will enable users to make better travel choices, whether altering a departure time or choosing an alternative route to avoid traffic congestion or incidents.
- **Public information and economic development benefits**: Traffic count information (and trends in traffic counts) helps inform private industry investment decision-making. Improving the accuracy and granularity of data available to individuals (such as someone considering purchasing a home near a busy road) or private industry will help individuals and industries better understand traffic patterns.
- **Automation Benefits**: Automating repetitive tasks will enable ODOT staff to spend more of their time focused on activities where human intelligence and subject matter expertise are essential for decision-making. This helps bridge staffing and recruiting gaps and supports the training and development of ODOT staff to work on higher-level challenges.

PROJECT READINESS OVERVIEW

Feasibility of Workplan

The Workplan elements described in detail in the technical overview section will be completed within 18 total months. The schedule provided in **Figure 1** illustrates the specific timeline of the Workplan tasks for the Stage 1 Integrated Transportation System Monitoring, Management and Operations planning project.

Figure 1: Project Schedule



ODOT currently uses technology including Miovision, automatic traffic recorders, and Houston Radar devices to provide AADT data on an online publicly available website. ODOT does not anticipate any new or additional legal, policy, or regulatory requirements related to the continued use and sharing of this data.

The project will improve data sharing and decision-making for all state highways in Oklahoma and will provide access to the data to all. The project will also improve traffic operations across the state through integration with ITS which will potentially improve travel time reliability and reduce congestion delays by providing real-time information to travelers and operations personnel. Improving travel time reliability and delay to motorists and freight vehicles will reduce costs for the users, shippers, and consumers of goods. In addition, by providing an open data source, ODOT will deliver cost savings to local governments, MPOs, and COGs by providing valuable data for their use.

As discussed in the Technical Overview Section, the project will not only provide an open data source for all local governments and tribal governments but ODOT will also provide training to these agencies and users to improve technical skills and decision-making at the local and regional levels.

To complete the Integrated Transportation System Monitoring, Management, and Operations planning process, ODOT will use contractors to install the technical elements across the state. ODOT is an equal opportunity employer and also ensures contractors comply with the Equal Employment Opportunity (EEO) Program requirements. ODOT completes contractor compliance reviews on all projects to monitor the utilization of minorities and women on ODOT projects. Each contractor must appoint a responsible company official to serve as their EEO officer. To ensure that contractors are meeting the requirements of the program, ODOT's systematic and comprehensive review of employment practices includes:

- Payroll review.
- Employee interviews.
- Meetings with EEO Officer to discuss deficiencies and corrective actions.
- Evaluation of employment practices and procedures.
- Determination of any discriminatory practices.
- On-site inspection.

Community Engagement and Partnerships

The Association of Central Oklahoma Governments (ACOG) and the Indian Nations Council of Governments (INCOG) serve as the Metropolitan Planning Organizations for the cities of Oklahoma City and Tulsa, respectively. Both MPOs have a traffic counting program and they work with member local governments to identify new or redundant traffic count locations to ensure the municipalities have proper counter coverage in their city. During the Stage 1 Integrated Transportation System Monitoring, Management, and Operations planning process, ODOT will coordinate with both MPOs to evaluate the feasibility of utilizing local traffic count data into ODOT's integrated traffic count database and mapping tool. If it is found to be feasible and beneficial to include local traffic counts in the integrated traffic count database and

mapping tool, this will occur during the Stage 2 Integrated Transportation System Monitoring, Management, and Operations implementation process.

Leadership and Qualifications

ODOT's Vision is to be an innovative and responsive leader in the Transportation Field. ODOT values our people for individual and team contributions, empowering them to make decisions through productive partnerships. We are accountable for meeting the transportation needs of citizens, businesses, and industries in the safest, most proficient manner possible. ODOT developed a project team that has the technical expertise to complete the Integrated Transportation System Monitoring, Management, and Operations planning process. The technical team that will deliver this project includes Lauren January, PE, Alan Stevenson, Cody Hamblin, and Jeremy Planteen.

Lauren January is the State Traffic Engineer and she leads the Traffic Engineering Division which includes Planning and Analytics Branch, Safety and Collision Branch, Operations, Work Zone Team, Sign Shop, Traffic Data Collection, Sign Programs, and Signal Maintenance. **Alan Stevenson** is the Assistant State Maintenance Engineer. Mr. Stevenson oversees all technology deployed on ODOT's highway system thru the ITS, Smart Work Zones, Fiber Optics, and LMR Wireless Branches. **Cody Hamblin** is the Engineering Manager for the Planning and Analytics Branch within Traffic Engineering Division. Cody is responsible for the development and review of design traffic for analysis, as well as for Annual Average Daily Traffic reporting and pavement design. **Jeremy Planteen**, is the ODOT Geospatial Data Manager. In this role he manages the Department's GIS files, geospatial data analytics, BI, mobile field data collection, GIS Infrastructure development, and partner outreach.

APPENDIX I – RESUMES

Lauren January, **PE** is the ODOT State Traffic Engineer and she leads the Traffic Engineering Division which includes Planning and Analytics Branch, Safety and Collision Branch, Operations, Work Zone Team, Sign Shop, Traffic Data Collection, Sign Programs, and Signal Maintenance. Ms. January has served as the Assistant State Traffic Engineer and an Engineering manager where she led the Geometrics and Operations Design Group, administered and reviewed Interstate Access Justification Reports for the entire state, conducted operational analysis utilizing VISSIM, HCS, and Synchro, and coordinated the update to the ODOT Roadway Design Manual. Ms. January has a Bachelor of Science in Civil Engineering from the University of Oklahoma, May 2008.

Alan Stevenson is the ODOT Assistant State Maintenance Engineer for the Oklahoma Department of Transportation. Alan oversees all technology deployed on ODOT's highway system thru the ITS, Smart Work Zones, Fiber Optics, and LMR Wireless Branches. Alan has been working in ODOT for the past 34 years, duties included the oversight of the design, operations, maintenance, and development of construction plans for ITS, Smart Work Zones, Fiber Optics, and LMR Wireless deployments. Alan is also responsible for the negotiations of public-private partnerships with third-party Telecommunications Companies and the overseeing of engineering and asset management of all ODOT, OTA, and the State's fiber optic inventory in a GIS platform.

Cody Hamblin is the ODOT Engineering Manager for the Planning and Analytics Branch within Traffic Engineering Division. He has been in this position for the past 2 and a half years. Before this, he was a member of the Planning and Analytics Branch for 5 years. Responsibilities and duties include analyzing and developing conceptual alternatives across the state for interchange and intersection designs. Cody is also responsible for the development and review of design traffic for analysis, as well as for Annual Average Daily Traffic reporting and pavement design. Cody is also involved in assisting local municipalities with Traffic Signal design and reviewing their operational performance. Cody graduated with a Civil Engineering degree from Brigham Young University and has been with ODOT since 2015.

Jeremy Planteen, is the ODOT Geospatial Data Manager. In this role he manages the Department's GIS files, geospatial data analytics, BI, mobile field data collection, GIS Infrastructure development, and partner outreach. Prior to working at ODOT, Mr. Planteen was a GIS Specialist for the Wyoming State Historic Preservation Office. In this role he developed and industry-first web-based GIS archaeological site catalog, implemented predictive analytics for archaeological site potential metrics, Section 106 review, and compliance. Mr. Planteen has Bachelor (200&) and Master's (2012) degree in Anthropology from Minnesota State University Moorhead and University of Wyoming, respectively.

APPENDIX II – SUMMARY BUDGET NARRATIVE

Oklahoma Department of Transportation is requesting $1,000,000 in Strengthening Mobility and Revolutionizing Transportation (SMART) grant funding to complete the Integrated Transportation System Monitoring, Management and Operations planning project. **Table 1** provides a breakdown of the budget, based on the workplan tasks outlined in the Technical Merit Overview. The only cost associated with this Stage 1 planning project is attributed to labor for ODOT staff and potential outside technical support to complete this planning project in 18-months.

Table 1: Stage 1 Budget

Task	Labor Budget
Project Management, Partner Coordination, & Reporting	$100,000
ITS Device Planning	$75,000
Update Traffic Counting Workplan	$50,000
Organizational Integration Assessment	$250,000
Technology Integration Assessment	$250,000
Improving the Existing Data Interface	$200,000
Plan for Expanded Public Access	$75,000
Total Budget	**$1,000,000**