Oregon Department of Transportation

OPERATIONS PROGRAM PERFORMANCE MANAGEMENT PLAN

JUNE 2021

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ACKNOWLEDGEMENTS

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Galen McGill – System Operations and ITS Manager

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Operations Program Work Planning & Coordination Team acting as Steering Committee

TRAFFIC INCIDENT MANAGEMENT STEERING COMMITTEE

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TRAVELER INFORMATION STEERING COMMITTEE

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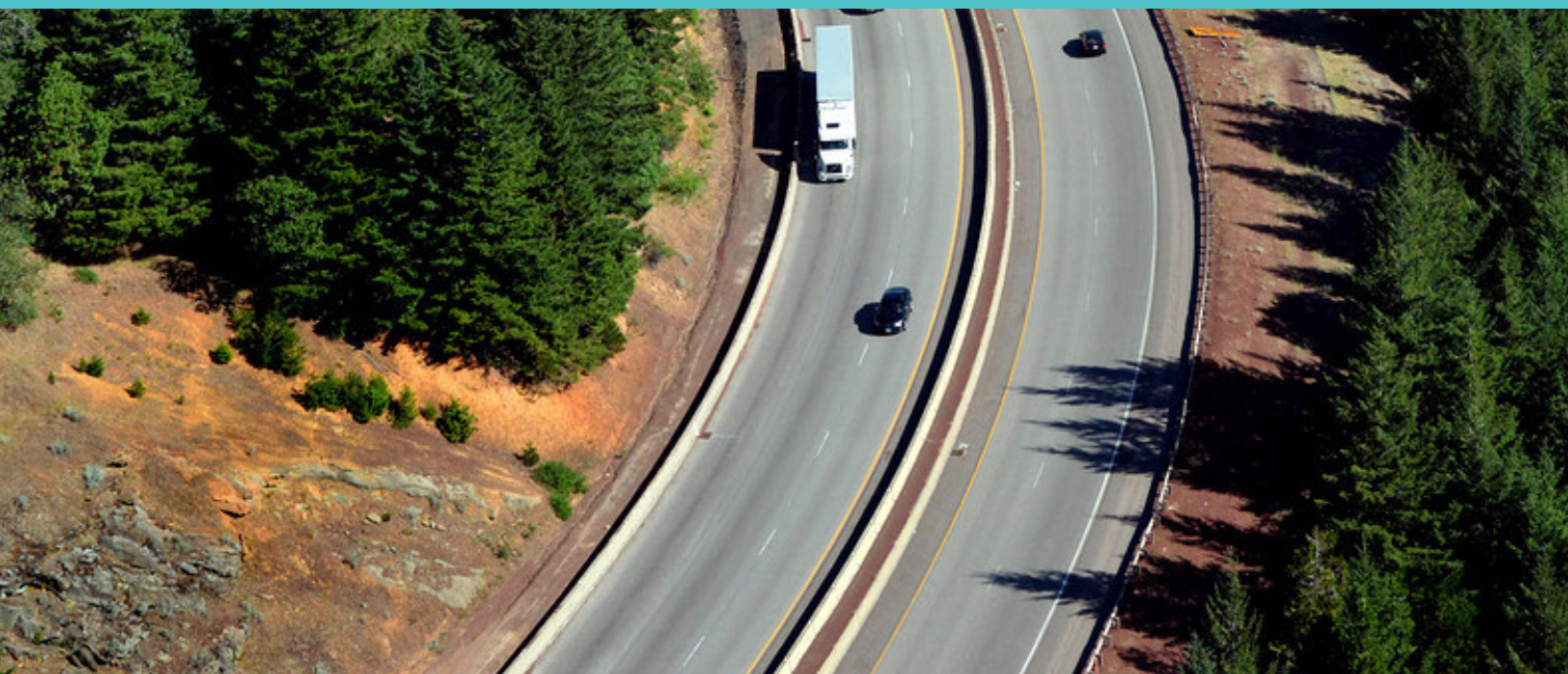
EXECUTIVE SUMMARY



This Oregon Department of Transportation (ODOT) Transportation System Management and Operations (TSMO) Performance Management Plan grew out of a capability maturity model (CMM) assessment administered with key ODOT staff in 2014. The performance management component of the TSMO program was determined to be one of the least mature and therefore an appropriate program focus area. Table 1 below illustrates the key action items identified in the CMM workshop to improve ODOT's level score. Given the significant progress ODOT made in implementing the plan since it was originally published in 2017 and the significant changes in data availability and analysis tools, ODOT published this update to the plan to reprioritize efforts to implement the program performance measures.

In **Table 1**, nearly all the CMM workshop identified action items were addressed with this TSMO Performance Management Plan. This report complements the Operations Program Plan published in 2018.

This performance management plan started with a national review of best practices. The plan was updated to reflect the progress made in implementing the original 2017 plan, and it included meetings with program stakeholders to reprioritize future development needs for program performance measures. Given the progress in planning and implementation of traffic signal related performance measures, a separate chapter for traffic signal performance measures has been added to the report.

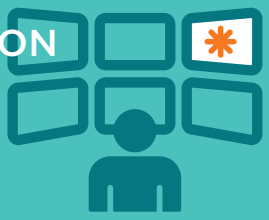
TABLE 1. CMM WORKSHOP ACTIONS TO ADVANCE TO NEXT LEVEL – TSMO PERFORMANCE MANAGEMENT

ACTION IDENTIFIED IN CMM	ADDRESSED IN THIS TSMO PERFORMANCE MEASURES PLAN
Develop comprehensive set of metrics to characterize overall TSMO performance of ODOT and its facilities	Yes
Corporately set program goals and define objectives	In Operations Program Plan
Reassess what new measures should be included and whether existing ones are still relevant	Yes
Develop an asset management methodology for arriving at appropriate and relevant metrics that capture key operational and performance characteristics	Yes
Prioritize the performance measures that ODOT collects and calculates, based on relevance and feasibility	Yes
Identify or develop a performance measure to characterize travel time reliability	Yes
Identify or develop an arterial performance measure and configure controllers to report this quantity automatically	Yes
Examine what data already exists at ODOT and what performance measures are desired by ODOT groups	Yes
Expand the ITS asset maintenance/management system to include signal maintenance work	Yes

A review of the national state of the practice and ODOT's current TSMO practice formed the basis for analyzing and prioritizing candidate performance measures within ODOT's TSMO Program Areas. These ODOT TSMO Program Areas were stratified and designated as:

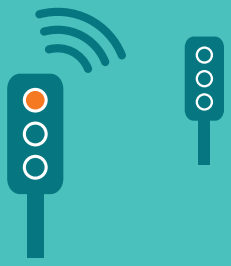
TRAFFIC INCIDENT MANAGEMENT

TRANSPORTATION OPERATIONS CENTER MANAGEMENT



MOBILITY

TRAFFIC SIGNAL MANAGEMENT



TRAVELER INFORMATION

ASSET MANAGEMENT

WORK MANAGEMENT

The goal for this plan is to create actionable performance measures which directly support the stewardship of Oregon's transportation system by improving the efficiency of the transportation system through optimizing operations and management and actively managing transportation assets to extend their life and reduce maintenance costs.

Keys to success of TSMO performance measures[1] are:

- Let **desired outcomes** drive the performance management program
- **Keep it simple** with a few useful metrics to start, which is why this plan is constrained to no more than six identified "core" performance measures per ODOT TSMO program area
- **Useful metrics** to staff and management, which were vetted through numerous steering committee and stakeholder committees
- **Well-defined metrics** meant to provide clarity for implementation and communication
- **Clear strategy** for communication and use of the measures

This plan lays out in detail the top priority performance measures stratified by usefulness (high, medium, and low) and currently reported or not, as a surrogate for practicality of implementation. Within these six program areas, six or less "core" performance measures were identified. Within this report, the core metrics are expanded to identify an action plan and a communication plan to discern strategy for implementing the new metrics or modifying existing metrics.

The following pages provide a summary of the "core" performance measures identified within this Operations Program Performance Management Plan to achieve the above performance measurement goal, along with a simplified definition of each. Core performance measures are defined as being the most important for measuring performance in each program area. The performance measures currently being reported (teal background) and which performance measures will be established in the future (white background).

[1] *Improving Transportation System Management and Operations (TSMO) Capability Maturity Model Workshop White Paper, Performance Measurement. USDOT, FHWA, April 2015.*

PROGRAM AREAS FOR PERFORMANCE MEASUREMENT

TRAFFIC INCIDENT MANAGEMENT

Traffic Incident Management (TIM) is the response to roadway incidents in the state of Oregon by ODOT and several partner agencies. TIM is a relatively mature area in the Operations Program with respect to performance measure reporting.

PROGRAM OBJECTIVE: Actively measure TIM-related performance to inform management strategies a nd actions, which improve the safety of emergency/incident responders and transportation system users; as well as reduce roadway delays during incidents.

CORE PERFORMANCE MEASURES:

ROADWAY CLEARANCE DURATION
Time till all lanes opened. Goal is lane blocking crashes cleared within 90 minutes.

ROADWAY CLOSURE DURATION
Time to get traffic moving around a crash related closure.

INCIDENT CLEARANCE DURATION
Time to completely clear a crash/ incident from roadway and all responders depart scene.

RESPONDER STRUCK-BY
ODOT and other agencies struck by/injury from Oregon Department of Consumer and Business Services (DCBS).

SECONDARY CRASHES
A collision occurring within an incident scene or within a queue of a preceding incident.

Existing Performance

Future Performance

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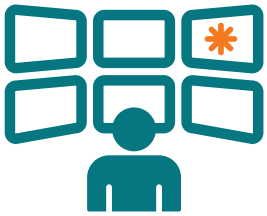
PROGRAM AREAS FOR PERFORMANCE MEASUREMENT

TRANSPORTATION OPERATIONS CENTER MANAGEMENT



ODOT's Transportation Operations Centers (TOCs) support a safe and efficient state transportation system by providing a regional point of contact for monitoring transportation system operations. TOCs also handle coordination of transportation related communications and services among internal and external customers. TOC managers need effective performance measures related to resource allocation and quality control of TOC work, and the logging of incident data is the foundation for useful and actionable performance measures to improve agency TSMO actions.

PROGRAM OBJECTIVE: Measure TOC performance and ability to communicate accurate and timely information to incident responders (both internal and external), to ODOT staff, and to the traveling public for effective incident response, quality traveler information, and appropriate resource allocation.

CORE PERFORMANCE MEASURES:

DISPATCH TIME

Time from crash reported to ODOT responders dispatched.

TOC STAFF WORKLOAD

Actions taken by TOC operators broken down by day of the week and hour of day.

OVER 90 MINUTE CRASHES WITHOUT AN ASSIGNED CAUSE

EVENTS WITH NO NOTIFICATION MESSAGE

CRITICAL (CURRENTLY MANDITORY) STATION ON-TIME REPORT

Records ODOT's performance in updating road and weather conditions at critical stations.

RADIO COMMUNI-CATIONS USAGE/ VOLUME

Measures radio communications at TOCs and with responders.

Existing Performance

Future Performance

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MOBILITY

Mobility related performance measures can be used to understand ODOT's ability to plan for, implement, operate, and maintain facilities that support efficient travel. These measures can also be used to validate whether a project or system modification is producing the intended outcome.

PROGRAM OBJECTIVE: To support ODOT operations staff with making day-to-day decisions about operation of traffic control systems and to inform planning for future system enhancements through improved understanding of trends and system performance.

CORE PERFORMANCE MEASURES:

TRAFFIC VOLUMES	TRAVEL TIME	HOURS OPERATING IN CONGESTED CONDITIONS	VEHICLE MILES TRAVELED	TRAVEL TIME RELIABILITY	BOTTLENECK ANALYSIS	HOURS OF MULTIMODAL DELAY
Multimodal traffic counts including autos, trucks, and transit.*	Average and percentile travel times, temporally and spatially.	Hours when the average speed is slow or "congested" for the roadway.	Total vehicle miles traveled on ODOT highways.	Regularity or predictability of roadway travel time, often comparing free-flow, average, and 80th/95th percentile travel times.	Identification and prioritization of bottlenecks (localized disruption of traffic).	Number of cumulative hours that drivers, trucks, and transit are delayed.

Existing Performance

Future Performance

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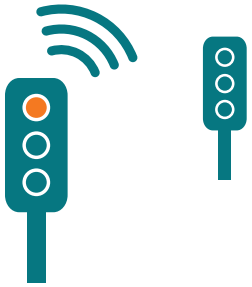
PROGRAM AREAS FOR PERFORMANCE MEASUREMENT

TRAFFIC SIGNAL MANAGEMENT



Effective traffic signal management helps the ODOT Operations Program achieve their core mission to provide safe and efficient travel. Traffic signal management performance measures can be used for many purposes, including assessment of the reliability of the transportation network, understanding the impacts of a project or system modification, and to proactively identify and address signal performance issues.

PROGRAM OBJECTIVE: To support mobility and ODOT's operations with making day-to-day decisions about operation of traffic control systems, re-examine signal timing and operations to enhance safety and efficiency, and aid in future planning.

CORE PERFORMANCE MEASURES:

SIGNAL VOLUME
Measures volume of all cars using signals around the state.

ASSET RATING
Measures signal health.

PERCENT OF ARRIVALS ON GREEN LIGHT
Measure the quality of progression as a percentage of vehicles that arrive at a traffic signal on green (inverse is arrivals on red light).

SIGNAL COMMUNI-CATION
Percent of signals with communication and/or percent uptime for those signals.

PURDUE SPLIT FAILURES
Events where queued traffic waits through more than one green light.

CONTROL DELAY
Measures intersection delay, delay by movement or signal phase and stop frequency.

Existing Performance Measures

Future Performance Measures

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TRAVELER INFORMATION

ODOT has developed a full suite of traveler information systems that provide critical information to the traveling public. Travelers can make better choices based on information from ODOT's traveler information systems by selecting safer routes and avoiding adverse weather and raod conditions. This program is particularly important to the state's trucking industry, freight mobility, on-time delivery, and a vibrant Oregon economy.

PROGRAM OBJECTIVE: Collect, analyze, and summarize performance measures which effectively measure ODOT's ability to communicate accurate, timely, and relevant information to the traveling public, promoting safe and efficient travel.

CORE PERFORMANCE MEASURES:

NUMBER OF PEOPLE VISITING ODOT COMMUNI-CATION OUTLETS

Measures usage of ODOT traveler information resources, such as TripCheck, 511, and social media (TwitterTM, WazeTM).

ATIS NOTIFICATION DELAY

Time from crash reported to notification made available for the traveling public. ATIS stands for Advanced Traveler Information System.

MAJOR INCIDENTS, WITH NO MESSAGE (ATIS)

CRITICAL STATION ON-TIME REPORT

On-time performance for updating road and weather conditions (most critical in winter operations or major events).

INFORMATION ACCURACY

Validation of data accuracy for quality assurance.

Existing Performance

Future Performance

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PROGRAM AREAS FOR PERFORMANCE MEASUREMENT

ASSET MANAGEMENT

Asset management programs effectively monitor and manage assets over their entire lifecyle. Useful and implementable asset management performance measures will greatly aid in prioritizing maintenance and capital project resources to keep the state's valuable TSMO assets in acceptable condition.

PROGRAM OBJECTIVE: Provide accurate and timely information to effectively maintain, operate, procure, test, repair, and replace TSMO assets.

CORE PERFORMANCE MEASURES:

TSMO ASSET INVENTORY AND LOCATION	LABOR HOURS PER ASSET For ITS and Traffic Signals	ITS - PERCENTAGE OF ASSET BEYOND DESIGN LIFE Transition to conditional rating	TRAFFIC SIGNAL CONDITION RATING	SIGN - PERCENT FAILING RETRO-REFLECTIVITY	STRUCTURE - CONDITIONAL
Existing Performance					
Future Performance					

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WORK MANAGEMENT

Work management is necessary to understand the balance between the levels of labor and workload needed to manage the Operations program and its assets. The performance measurement through this program area provides leadership with guidance for staffing and funding decisions, as well as providing the ability to forecast needs in the future.

PROGRAM OBJECTIVE: Collect, analyze, and effectively communicate metrics which improve ability to make efficient and timely staffing decisions and measure performance against level of service targets for completed work tasks and requests.

CORE PERFORMANCE MEASURES:

CURRENTLY ASSIGNED WORK ORDERS BY EMPLOYEE

Number of currently assigned work orders per employee.

RECENTLY CLOSED REQUESTS FOR WORK

Number of recently closed Requests for Work per week.

WORK ORDER BACKLOG

Number of Requests for Work that are open in the system per week.

CENTRAL SYSTEMS MAINT TEAM (CSMT) WORK CLASSIFI-CATION

Number of Requests for work and hours expended by work classification type (e.g. new infrastructure.

CENTRAL SYSTEMS MAINTENANCE (CSMT) TEAM RESOURCE TREND ANALYSIS

Metrics that relate CSMT resource demands based on growing infrastructure elements (e.g. cameras, VSL corridors, etc.)

ITS PROJECTS AND ASSET MAINTENANCE GROWTH

The number of active ITS projects and requests for work/ Micro-Main tickets for assets.

Existing Performance

Future Performance

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PROGRAM AREA PERFORMANCE MANAGEMENT PLANS

TRAFFIC INCIDENT MANAGEMENT

Traffic incident management (TIM) is the response to roadway incidents in the state of Oregon by ODOT and several partner agencies. In coordination with the Oregon State Police (OSP) and other partners, ODOT produced a TIM Strategic Plan in 2015 that outlines the goals and objectives of the TIM program. Program goals include:

- Enhancing the safety of first responders and the traveling public
- Improving the reliability and efficiency of the transportation system
- Strengthening the communication, coordination, and collaboration between responding agencies
- Establishing TIM as a core public safety discipline

TIM is a relatively mature area in the TSMO program with respect to performance measure reporting. This is because the program's performance measures are actively used within ODOT and by agency partners, such as the Oregon State Police (OSP). Specifically, one of ODOT's key performance measures for mobility and economic vitality, 90-minute roadway clearance duration, is gaining regular use within various ODOT business lines and the OSP.

TIM PERFORMANCE MEASUREMENT GOALS

The desired outcome of the TIM performance management program is to:

Actively measure TIM-related performance to inform management strategies and actions, which improve the safety of emergency/incident responders and transportation system users; as well as reduce roadway delays during incidents.

When implementing and measuring the progress of the TIM program towards the above objective, four goals should be used to guide ODOT and partner agency action:

1. Summarize data in ways that provide actionable information
2. Reduce on-scene time, roadway clearance time, closure time, and incident clearance time
3. Provide information to management and leadership teams regarding incident trends to guide the allocation of resources
4. Maximize incident responder safety through effective training, smart technology, and effective en-route, on-scene, and post-incident processes

EXISTING PRACTICES

Through the TIM Strategic Plan and the Mutual Assistance Agreement between ODOT and OSP, the TIM program has been successful in Oregon. This success includes tracking several performance measures including roadway clearance duration, roadway closure duration, incident clearance duration, and more. ODOT and it's partners have also found success in analyzing and determining the cause of crashes and fatal crashes that exceed the 90-minute clearance goal to better understand how to improve clearance time. The performance measure tracking success has also been supported by the over 7,000 Oregon incident responders who have completed the National TIM Responder Training.

TIM has the most mature TSMO measures.

Nationally, there are four recommended TIM metrics identified in the 2006 Federal Highway Administration (FHWA) Focus State Initiative and the 2011 NCHRP 20-24(37)D report:

- Roadway Clearance
- Incident Clearance
- Arrival Time
- Secondary Crashes

Of the national TIM metrics, ODOT collects and reports on roadway and incident clearance times. Arrival time data is becoming more reliable with system updates and more consistent check-ins back to the Transportation Operations Centers (TOC) from ODOT and non-ODOT responders. Secondary crashes are not currently reported as a performance measure, but are occasionally recorded through dispatch notes in TOC software when responders indicate there is a secondary crash.

A combination of sources are used to collect information to report on the current metrics, including ODOT's Traffic Operations Centers (TOCs) and event history reports (accessed through Inview). TIM performance measures currently reside in the TOCs Enterprise Data Warehouse (EDW), which is connected to Power BI and SSRS reports. In addition to the use of ODOT's data warehouse, ODOT also has access to probe data and analysis tools through the RITIS platform. Once agency data is integrated into RITIS, there are a number of useful tools including incident timeline reports useful for post-incident reviews and cost of delay reports that provide analysis of incident created delay and the associated system user costs resulting from the delay.

CORE TIM PERFORMANCE MEASURES

Five core mobility performance measures are shown in **Exhibit 1**. Core performance measures are defined as being the most important for measuring performance in each program area. The core performance measures for TIM were identified through a series of stakeholder workshops, that reviewed national best practices, ODOT, OSP, and towing best practices, and ranking exercises on what would be the most useful and actionable for enhancing the ODOT TIM program.

Exhibit 1 indicates which performance measures are currently being reported (teal background) and which performance measures will be established in the future (white background). Basic definitions of each core performance measure are also listed below.

The core performance measures will be updated, re-examined, and ranked on a regular basis to ensure the TIM program stays relevant for the needs of the traveling public.

EXHIBIT 1. ASSET MANAGEMENT CORE PERFORMANCE MEASURES

ROADWAY CLEARANCE DURATION	ROADWAY CLOSURE DURATION	INCIDENT CLEARANCE DURATION	RESPONDER STRUCK-BY	SECONDARY CRASHES
Time until all lanes opened. Goal is lane blocking crashes cleared within 90 minutes.	Time to get traffic moving around a crash related closure.	Time to completely clear a crash/ incident from roadway and all responders depart scene.	ODOT and other agencies struck by/injury from Oregon Department of Consumer and Business Services (DCBS).	A collision occurring within an incident scene or within a queue of a preceding incident.

Existing Performance Measures

Future Performance Measures

IMPLEMENTATION

The following section outlines how ODOT will improve data collection and track performance measures to manage the TIM program. Implementation includes:

- Identifying Data Needs and Sources
- Establishing Current and Future Performance Measures
- Completing Action Items in the TIM Program Area

DATA NEEDS AND SOURCES

ODOT and the Oregon State Police (OSP) have a long standing partnership of sharing data and information. Continuing to strengthen this partnership between OSP and ODOT, as well as other TIM responders (e.g. tow companies), will be important to continue accurately reporting incident data that informs performance measurement.

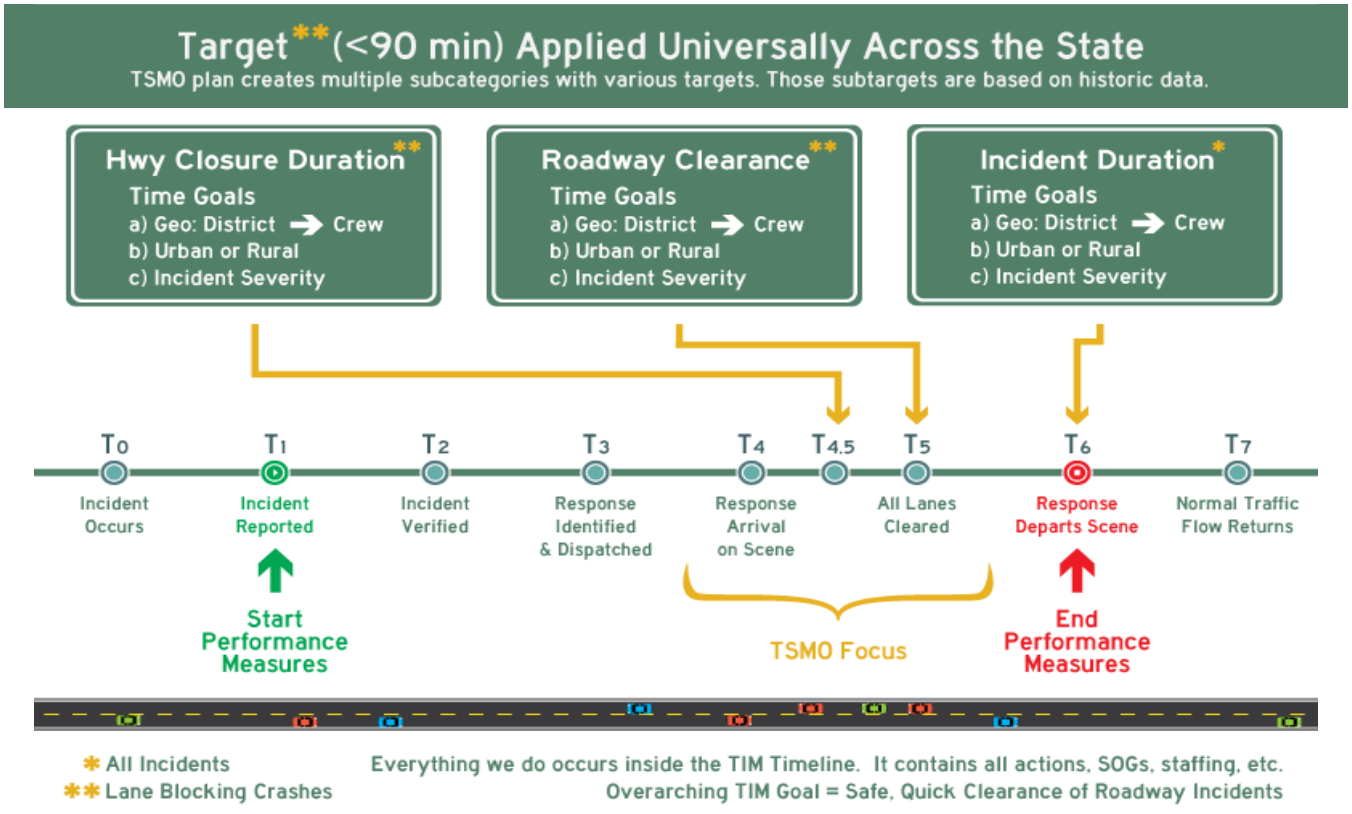
Key TIM partners include:

- Oregon State Police (patrol, crash reconstruction team, etc.) and other law enforcement such as county or city law enforcement
- Fire and emergency responders
- 911 emergency dispatch
- Tow companies

ODOT should continue to collaborate with the TIM partners listed above to receive incident timeline data that will aid in the accurate reporting of core performance measures. Moving to a singular, interagency dispatch communication exchange platform will be important for improving data sharing and supporting the TIM performance measure program. Some connections have already been established with Deschutes County, Hood River County, Wasco County, and Frontier 911.

Exhibit 2 shows an ODOT graphic illustrating the incident timeline milestones, key performance measures, and future refinements for the goals related to time in each performance metric. This future step is intended to "mine" data for clearer information to enhance the TIM program.

EXHIBIT 2. TIM KEY PERFORMANCE MEASURES WITH FUTURE TIME GOALS



Along with the primary data sources previously discussed, secondary data sources can be used to better understand and ensure data accuracy. For the TIM program area, data accuracy can be verified using reported crash data from the ODOT Crash Analysis Unit or improved police crash reporting forms that allow law enforcement to identify primary and secondary crashes. Other possible verification sources include WAZE/RITIS (real-time analysis) and INRIX (historical analysis) data

DESIRED, EXISTING, AND FUTURE PERFORMANCE MEASURES

Table 2 shows all TIM related performance measures that were identified through a series of stakeholder meetings and management discussions. The table delineates each performance measure by the identified **priority level** based on current technological capabilities and feasibility for agency. The table also separates metrics that are currently being collected (top row) from metrics that have yet to be consistently and accurately reported (bottom row). **Core performance measures** are also bolded in the table to show which measures are most important for measuring TIM performance.

On-scene time is consensus top priority TSMO measure for development.

The metrics listed below are not considered to be comprehensive, but rather, reflect the state of the TIM practice within ODOT and on a national scale.

Presenting current performance measures in different views and breakdowns would also help to improve their usability, and would help decision makers more easily identify problem areas to take action. For example, the statewide roadway clearance measure could be more useful if decision makers were able to aggregate the measure by:

- Geographic area
- Crash severity
- Roadway segment context (rural, urban)

TABLE 2. TIM PERFORMANCE MEASURES

TSMO PRIORITY LEVEL		HIGH	MEDIUM	LOW
CURRENT TSMO METRIC?	Yes	**Roadway clearance duration[a] (90-minute causal analysis)** **Incident clearance duration** Percent of crash incidents meeting goal for roadway clearance time Number of responders trained in National TIM training classes Number of responders trained in specific discipline[b]	**Roadway closure duration** Over 90 minute roadway clearance causes Incident frequency and distribution **Incident responder struck-bys and fatalities**	Verification time[b] Dispatch time[b] Percent of incidents with complete Key TIM incident duration milestone records
	No	Response time On-scene time[d] Tow arrival time Tow dispatch time Tow on-scene time	**Secondary crashes[c]** Arrival time	

Bold performance measures are identified as core performance measures in this program area.
[a] Identified as an ODOT Key Performance Measure.
[b] Identified in TIM Strategic Plan for future consideration.
[c] Identified in TIM Strategic Plan: Near-Term, SE-01, Track Secondary Incidents.
[d] On-scene time currently captured for ODOT staff but not other partner agency responders.

Increasing the number of ways a performance measure can be visualized should lead to a clearer understanding of what factors are contributing to the overall performance of the system, and could potentially enable ODOT to develop additional performance measures on a more contextual scale. These additional measures could be specific to urban or rural roadways, or for major or minor incidents.

Of the 19 performance measures that were identified, ODOT is currently reporting or measuring 11 of them at a range of maturity levels. For example, roadway clearance duration is considered a mature performance measure because it has both a reporting system and a goal set in place. Performance measures that are less mature are collected and reported on in a more informal manner.

Action plans for each core performance measure are detailed in the following sections.

TIM PROGRAM AREA PERFORMANCE MANAGEMENT ACTION ITEMS

Implement the following new "data views" for the **Roadway Closure Duration, Roadway Clearance Duration,** and **Incident Duration performance measures:**

NEAR-TERM

- ✓ Present data based on urban and rural geographies. Urban geography will be initially defined by Metropolitan Planning Organization (MPO) boundary or city limits (non-OSP coverage area). The data will be compiled and delivered into ODOT's source system via geospatial processes through assistance from the ODOT GIS Unit

- ✓ Present data based on incident severity classified into fatalities, major, and minor incidents. Major incidents are defined as major injuries, minor injuries, hazmat or motor carrier involved incidents. The source incident severity data comes from the event attribute dimension in the TOCS cube.

- ✓ Evaluate/implement district level performance measures. Oregon has very distinct maintenance districts, each with their own challenges, where a single set of goals may not be attainable across the state. Districts (especially rural ones) will need individualized goals to report accurately for their geographic area. For example, the Portland metropolitan area takes up a smaller portion of the state and it is densely populated, where as the Pendleton area is quite vast and has a population that is significantly smaller.

- ✓ Use TOC data to forecast IR position needs, scheduling and placement of coverage. Historical TOCS data will show which districts are most in need of IR positions. The frequency and distribution of incidents will help guide where and when IRs should be scheduled and placed.

- ✓ Create live dashboards for IR response so that TOC/dispatchers are able to track real-time lane and highway closures to help reduce the number of over 90 minute crashes.

ROADWAY CLEARANCE DURATION

Including 90 minute casual analysis

NEAR-TERM

- Report TIM measures using urban and rural geographies, and based on incident severity.
- Clarify when recovery time should begin, as evidence shows there is not consistent use across TOCs.
- Improve automatic push notifications for the TOCS. The current TOCS software auto generates alerts after over 90 minutes, despite the fact that the incident could already be in recovery.
- Accurately capture who performs the push/pull/drag (PPD) maneuver. Currently, TOCs support indicating that the maneuver was performed. ODOT would like more detailed information around which responder is using the method.
- Mark the start and completion time of the PPD maneuver. This detail will show the direct impact of this quick clearance method for on-scene and incident duration.

ROADWAY CLOSURE DURATION

NEAR-TERM

- Update the standard operating guide to reflect a more refined roadway closure performance measure. There is not a clear consensus among IR/TOC on how to measure should be counted.
- Evaluate the impacts of opening lanes on the overall return to normal traffic flow. When incident responders can open lanes incrementally once they are no longer needed for response activities, the overall impacts of the incident can be reduced.
- Use outside data sources (RITIS live feed) to help identify/speed up response time.

MID-TERM

- Identify the complexity level of incidents where OSP uses UAS. This will enable comparisons to be made among incidents, especially when reconstruction is involved, because reconstruction can vary significantly based on the location and severity of the incident.

INCIDENT CLEARANCE DURATION

NEAR-TERM

- Implement all three data view recommendations in the near-term implementation steps.
- Work collaboratively with OSP to identify and implement a process to improve the information sharing and consistency/accuracy of the last person on scene departure (often tow companies) back to ODOT. This incident clearance duration metric can be improved (as well as the on-scene time metric) by dispatch in TOCS or other database.
- Implement strategies to accurately and consistently collect each TIM incident timeline milestone, particularly first responder arrival and last responder departure. One specific strategy is to increase timer usage frequency and consistency among TOC dispatch.

STRUCK BY

NEAR-TERM

- Create an automated process to obtain struck-by data. ODOT currently uses emails and Excel files to gather data, which could leave room for human error. Automatically pushing and pulling data should reduce errors and streamline input.
- Work with the Oregon Department of Consumer and Business Services (DCBS) to develop clearer classification definitions, specifically on struck-by data related to work zones. This will allow ODOT to distinguish construction related incidents from traveling private vehicles.

SECONDARY CRASHES

NEAR-TERM

- Adopt the FHWA definition of a "secondary incident," which is “an unplanned incident (starting at the time of detection) for which a response or intervention is taken, where a collision occurs either a) within the incident scene or b) within the queue (which could include the opposite direction) resulting from the original incidents.”
- Develop a method to approximate secondary incidents based on the FHWA definition. GIS software and historic speed/volume data could be used to automate measuring and reporting secondary crashes.
- Conduct a pilot project using incident data and historical INRIX, WAZE or other combination of probe sample speed and incident crowd-sourced data to test the ability of third-party data to accurately reflect known secondary crash events.

LONG-TERM

- Create procedures for OSP and other law enforcement to report secondary crashes on crash reports to replace the initial secondary crashes definition created through the near-term action items. See Arizona DPS and Florida Highway Patrol for examples of entities with secondary crash indicators on crash reporting forms.

TIM PERFORMANCE MEASURES COMMUNICATION

TIM AUDIENCES

The primary audiences that are likely to be interested in the progression of performance measures for the TIM program area are:

- Regional TIM teams (both internal and external partners)
- ODOT district staff
- TOC management
- The ITS unit
- Oregon State Police

DELIVERY OPTIONS

Reporting and delivery of performance measure results for the TIM program will vary based on the audiences who will be viewing and making decisions with the information. Frequent discussions between the reporting agency and the intended audience will be critical for ensuring any reports created are actionable and informative. Each report should be as intuitive and useful as possible, as TIM user groups often have limited time to review results before making decisions.

The TIM/TOC stakeholders agreed that safety should be the primary focus for performance management in the TIM program area. Results and trends around on-scene time should be highlighted to gauge exposure and make correlations between TIM performance measure results and incident frequency and severity. This may require separate ODOT analysis on crash data.

All delivery of performance measure results should be consistent and useful for the TIM program users both externally (e.g. OSP), and internally within ODOT. Whenever new reports such as dashboards or displays of TIM performance measures are produced, trainings or assistance should be provided either in writing or in person to explain how to use the visualization and to discuss potential applications or enhancements. A staged approach for piloting new or altered reports or dashboards will also help to ensure visualizations are useful and functional. This could involve software programmers or other IT-related partners that manage the associated databases. Documentation should always be posted with the report.

TIM COMMUNICATIONS ACTION ITEMS

The communication action items below are all Near-Term efforts (to be completed within two years), with the exception of some of the technology components which will be addressed separately.

NEAR-TERM

- **Data on demand:**
  - Through a process of evaluation and identification from key stakeholders and management, document all production level TIM performance measure reports.

- **Region, District and Crew monthly reports:**
  - Solicit feedback from districts on frequency and format of region/district/crew level reports.
  - Work with crews, district management, and regional management to ensure monthly performance reports are meeting their needs. Continue outreach and coordination efforts through leadership teams like MLT Incident Response/TIM Task force, District Managers meetings, and TIM quarterly meetings. Share new reports with crews and solicit feedback to ensure reports are being used and are meeting the needs of customers.
  - Create monthly rollup reports from Power BI reports and diverge away from the old SSRS reports.

- **Dashboard(s) for management teams:** Develop a series of TIM dashboards that cover both frontline and management needs.

- **TIM Performance Measures yearly report to management teams:** Develop and disseminate a yearly TIM performance measure report to management teams. While the final detailed requirements need to be vetted by the MLT Incident Response/TIM Task Force and others, the intent of this yearly report is to highlight accomplishments and challenges within the TIM program in terms of TIM performance measures. The report should highlight areas where we are meeting or exceeding performance measure goals and highlight areas for continued improvement and focus.

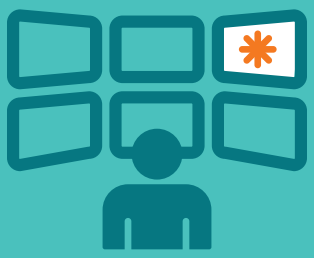
TIM/TOC stakeholders agreed that safety should be the priority.

- **IT software for visualizations, business intelligence and predictive analytics:** Improve the program's tools for visualizations, business intelligence, and predictive analytics.

LONG-TERM

- **Predictive analytics:** Develop a strategy to implement a predictive analytics tool. The use of predictive analytics in TIM is becoming more common and has been recently highlighted by the Tennessee DOT. Case studies have shown that predictive analytics can be an effective tool in helping shape resource allocation and staging of resources.

TRANSPORTATION OPERATIONS CENTER MANAGEMENT



ODOT's Transportation Operations Centers (TOCs) support a safe and efficient state transportation system by providing a regional point of contact for monitoring transportation system operations. TOCs also handle coordination of transportation related communications and services among internal and external customers. Staff perform tasks using multiple systems to ensure accurate information is provided to other ODOT staff, agency partners, and the public. TOCs Managers need effective performance measures related to resource allocation and quality control of TOC work. The logging of incident data is the foundation for useful and actionable performance measures to improve agency TSMO actions.

TOC PERFORMANCE MEASUREMENT GOALS

The desired outcome and objective of the TOC management performance management program is to:

Measure TOC performance and ability to communicate accurate and timely information to incident responders (both internal and external), to ODOT staff, and to the traveling public for effective incident response, quality traveler information, and appropriate resource allocation.

There are three goals that should be used to guide ODOT and partner agency actions when implementing and measuring the progress of the TOC management program area toward the above objective.

1. Ensure accurate and timely tasks completed through the TOC
2. Keep incident responders and the public safe and up-to-date with event information
3. Provide information

EXISTING PRACTICES

ODOT currently collects data and reports on a multitude of TOC Management performance measures. These include dispatch time, TOC total staff work load by hour of day and day of week, employee workload by hour of day and day of week, lane blocking incidents with no traveler information message (ATIS), events with no notification message, median time to notification, and notification in less than ten minutes (as discussed in the Standard Operating Guidelines or SOG). Staff can review reports and data through a link to the reporting server made available on Inview.

TOC operators are the direct link between on-scene events and ODOT for a majority of the information collected for both TOC management and TIM performance measures. An ODOT-developed software program, Trasportation Operation Center System (TOCS), is used to coordinate, collect, and report the information collected by TOC operators. In addition to TOCS, TOC operators communicate with other partner agencies using the Intertalk Radio System. Although many event milestones and actions are initiated through TOCs and their operators, the amount and quality of the data collected is greatly influenced by the TIM both internal to ODOT and externally. Incident responders also, both internal to ODOT and external, report back about on-scene conditions and milestones.

CORE TOC MANAGEMENT PERFORMANCE MEASURES

Six core mobility performance measures are shown in **Exhibit 3**. Core performance measures are defined as being the most important for measuring performance in each program area. The core performance measures for the TOC were identified through a series of stakeholder workshops, that reviewed national best practices and ranked what would be the most useful and actionable for enhancing the TOC. **Exhibit 3** indicates which performance measures are currently being reported (teal background) and which performance measures will be established in the future (white background). Basic definitions of each core performance measure are also listed below. Future focus for development of the TOC measures will be on further enhancements to the existing measures and development of the radio communications measure.

Five TOC management core performance measures are currently being reported.

EXHIBIT 3. TOC MANAGEMENT CORE PERFORMANCE MEASURES

DISPATCH TIME
Time from crash reported to ODOT responders dispatched.

TOC STAFF WORKLOAD
Actions taken by TOC operators broken down by day of the week and hour of day.

OVER 90 MINUTE CRASHES WITHOUT AN ASSIGNED CAUSE

EVENTS WITH NO NOTIFICATION MESSAGE

CRITICAL (CURRENTLY MANDITORY) STATION ON-TIME REPORT
Records ODOT's performance in updating road and weather conditions at critical stations.

RADIO COMMUNI-CATIONS USAGE/ VOLUME
Measures radio communications at TOCs and with responders.

Existing Performance Measures

Future Performance Measures

IMPLEMENTATION

The TSMO performance management implementation plan for the TOC management program area's core performance measures incorporated feedback and guidance from stakeholder and steering committee meetings. The TOC management program area is already reporting on most of the identified core performance measures, therefore much of the implementation section discusses how to enhance those existing reports. The following section outlines how ODOT will improve data collection and track performance measures to manage the TOC management program. Implementation includes:

- Identifying Data Needs and Sources
- Establishing Current and Future Performance Measures
- Completing Action Items in the TOC Program Area

DATA NEEDS & SOURCES

The TOC management performance measures, both for current practices and those identified for the future, rely heavily on TOC operators and TOCS for information. Actions taken by a TOC Operator in the TOCS software are time and date stamped and are the source of data for most of the TOC Management performance measures.

DESIRED, EXISTING, & FUTURE PERFORMANCE MEASURES

Table 3 shows all TOC management related performance measures that were identified through a series of stakeholder meetings and management discussions. The table delineates each performance measure by the identified **priority level** based on current technological capabilities and feasibility for agency. The table also separates metrics that are currently being collected (top row) from metrics that have yet to be consistently and accurately reported (bottom row). **Core performance measures** are also bolded in the table to show which measures are most important for measuring TOC performance.

ODOT is currently measuring and reporting on most of the performance measures shown in **Table 3**. These reports are fully developed and currently accessible through Inview. Many of these TOC metrics have a partial or complete overlap with ODOT's Traveler Information (TI) and Traffic Incident Management (TIM) programs; such as "Major Incidents with no ATIS", and thus coordination should continue.

Action plans for each core performance measure are further detailed in the sections below.

TABLE 3. TOC PERFORMANCE MEASURES

TSMO PRIORITY LEVEL		HIGH	MEDIUM	LOW
CURRENT TSMO METRIC?	Yes	**TOC total workload by hour of day and day of week** Employee total workload by hour of day and day of week or month **Dispatch time** RPS usage/acceptance	**Lane blocking crashes with no ATIS message** Median time to notification SOG Compliance: notification in less than 10 minutes **Events with no notification** No assigned cause on >90 minute crashes	Towing dispatcher delay Towing refused duration MM tickets created through TOCS Critical station on-time report
	No	**Intertalk Radio Communications**		

Bold performance measures are identified as core performance measures in this program area.

TOC MANAGEMENT PROGRAM AREA PERFORMANCE MANAGEMENT ACTION ITEMS

Program area overarching action items that apply to all TOC management metrics:

MID-TERM

✓ Develop a process to extract and fuse data from the Intertalk into system for integration with TOCS data for future enhancement of the TOC total workload measure.

DISPATCH TIME

The dispatch time is the number of minutes from the crash or event being identified to when incident responders are dispatched by the TOC.

The TOC management team, along with the ITS coordinator is expected to coordinate as the agency lead.

MID-TERM

- Use INRIX or other third party data to confirm incidents and shorten dispatch time for faster response.

TOC TOTAL STAFF WORKLOAD

Staff workload would include a series of metrics, such as time allocation to different projects, tasks and functions recorded to analyze effectiveness towards agency goals and objectives.

The TOC management team is expected to coordinate as the agency lead on these metrics. Specific enhancement action item were covered in the TOC management program area action item for integrating Intertalk data into the TOCS for more robust TOC staff work load management.

MID-TERM

- Continue to define actionable updates is on a TOC event. This creates a better comparison across TOCs as each center can have a varied workflow.

OVER 90 MINUTE CRASHES WITHOUT AN ASSIGNED CAUSE

Crashes and fatal crashes that exceed 90 minute roadway clearance should always have been assigned cause to the event.

NEAR-TERM

- Evaluate when a cause has not been assigned and track discrepancies when an event has multiple dispatchers updating the event.

MID-TERM

- Add more detailed reasons for what cause 90 minute incidents.

EVENTS WITH NO NOTIFICATION MESSAGE

This measures identify the number of major events that occur without a notification message being sent.

The TOC management team is expected to coordinate as the agency lead. General action items for this metric are covered in the TOC management program area overview, above, and in the Traveler Information program area section.

CRITICAL STATION ON-TIME REPORT

This measures records ODOT's performance in updating the road and weather conditions at critical stations.

It is an established ODOT performance measure that is measured and reported. The TOC management team is expected to be the agency lead.

RADIO COMMUNICATIONS

The TOCs use the Intertalk radio system for radio traffic to dispatchers & partners. Tracking volume will present TOC usage.

NEAR-TERM

- Develop a report to show dispatcher/ TOC usage.

TOC MANAGEMENT PERFORMANCE MEASURES COMMUNICATION

TOC MANAGEMENT AUDIENCES

The primary audiences that are likely to be interested in the progression of performance measures for the TOC management program area are:

- TOC management team
- TIM team leadership
- Traveler information team leadership
- ITS team

DELIVERY OPTIONS

The reporting of TOC management performance measures is an established process for ODOT. As seen above, many of the identified core performance measures already have reports that are created through SSRS and PowerBI.

The ability to aggregate information into different views will be important for enhancing existing reports in the future. This will improve the communication of performance measurement at the individual TOC operator level, to the TOC level, to the regional level, and up to the state level.

TOC MANAGEMENT COMMUNICATION ACTION ITEMS

The following are specific action items toward enhanced communication of TOC management performance measures:

NEAR-TERM

✓ Create live dashboards of TOC operations and on-going events to aid in safer and quicker response.

MID-TERM

✓ Assess the functionality of current reports and identify gaps or needs for future TOC core performance measure reports. This action should be led by the ITS unit, ITS Operations coordinator, traveler information coordinator, and the TOC managers.

APPENDIX/DEFINITIONS

Dispatch time = create date/time of event to first unit notified date/time.

Event action = an action is nearly every input which creates a record on the event history report.

- Each event creation is counted as one action.
- Updates to events which results in updating the record, whether using command line or inputting data via the GUI, counts as one action for each update.
- Closing the event, which clears signs and ATIS, counts as one action.
- Adding attributes, remarks, etc.
- Adding units, tows, etc.

The following changes in TOCS do not count as an event action:

- Any PA (user) action which is a system automated action.

Major Incident with No ATIS: Lane Blocking Crash/ Fatal Crash and impact is none of these: No Impact/ Unconfirmed/Unknown.

Critical Stations: Mandatory Level 1 Stations, and their percentage of time logging updates with +/- 1 hour of the scheduled update times.

Events with no notification: Notification worthy events detailed below.

Subtype is either in the following list: earthquake, hazmat cleanup, tsunami, sign down, signal not working, signal bulb out, amber alert, landslide, crash, fatal crash, hazmat, debris flow warning, bridge lift, closure.

Or the subtype is: property subtype and bridge related.

And disposition of the event cannot be in the following list: no action taken, refer to another agency, log only, UTL or gone on arrival.

MOBILITY

The core mission of ODOT's operations program is to provide safe and efficient travel. Mobility-related performance measures in the context of Transportation System Management and Operations (TSMO) can be used to understand ODOT's ability to plan for, implement, operate, and maintain facilities that support efficient travel.

There are several opportunities that could enhance the availability and use of mobility performance measures. One way to do this would be to integrate the numerous available data sources into a useful database(s) and reporting system. **Exhibit 4** illustrates an example of how multiple mobility-related data sources could be fused into one database. This integration process would require cross-business line collaboration and would result in the ability to comprehensively manage a long-term mobility program within ODOT.

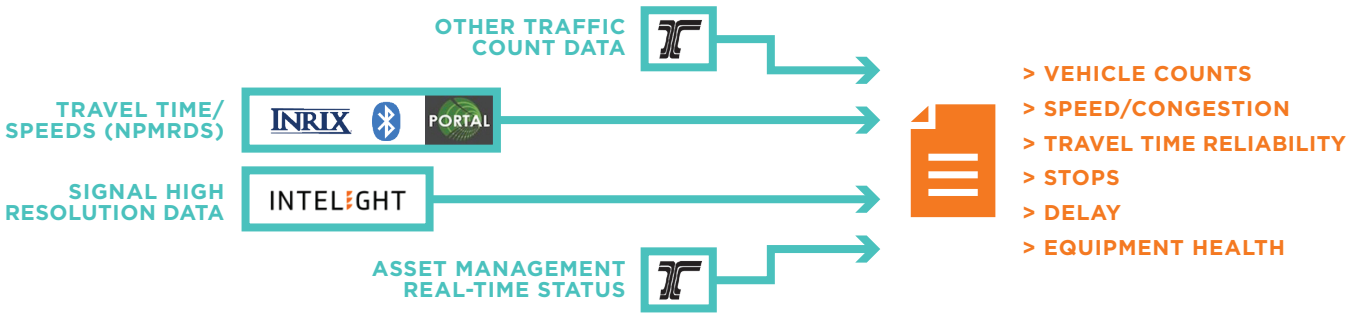
Within **Exhibit 4**, the database sources (left-side) and the desired mobility outcomes (right-side bullet list) were identified through a national literature review and in conversations with a system operations stakeholder group. This illustration is also one way that traditional data sources, manually collected through groups like the ODOT Policy, Data, and Analysis Division (PDAD), and emerging data sets, like Inrix, roadside Bluetooth readers, traffic signal controllers, and other traffic or weather sensors, can be blended together and used effectively.

In addition to a mobility database, there are several tools that have automated data processing and, therefore, have enhanced the capability of operations staff to identify and address the mobility needs of the state's roadway users. Some of these tools include:

- RITIS/Inrix probe data accessed through the ODOT Transportation Planning and Analysis Unit (TPAU) probe data contract
- ODOT's internal data warehouse/business intelligence system
- ODOT's central signal system (Intelight)
- The PORTAL system operated by Portland State University (PSU)

Both the Mobility Database and Data Processing Tools described above can be used to enhance the availability and use of mobility performance measures at ODOT. This benefits the agency overall, because evaluating a set of mobility performance measures can indicate whether the transportation system is running effectively and reliably. It can also validate whether a project or other system modification (i.e. variable speed corridor) is producing the intended outcome. The performance measures are also equally useful to transportation planners.

EXHIBIT 4. MOBILITY DATA SOURCES TO BE FUSED IN MOBILITY DATABASE(S)



Based on collected data, reported findings, and presented conclusions from TPAU, the Operations Program will need to meet regularly to define business requirements on:

- What type of data would be useful for mobility performance measures
- How to best present the performance measures

The Operations Program, in collaboration with the Policy, Data, and Analysis Division, will need to focus on the Mobility section of the TSMO Performance Management Program to advance in maturity as an agency, and ultimately be able to plan for, implement, operate, and maintain facilities that support efficient travel.

MOBILITY PERFORMANCE MEASUREMENT GOALS

The desired outcome and objective of the mobility performance management program is:

To support ODOT operations staff with making day-to-day decisions about operation of traffic control systems and to inform planning for future system enhancements through improved understanding of trends and system performance.

When implementing and measuring the progress of the mobility program area towards the above objective, there are four goals that should guide ODOT actions:

1. Promote efficient and reliable transportation system operations
2. Use metrics that are inclusive of auto, truck, pedestrian, bicycle and transit modes, as appropriate
3. Improve accessibility of system operations data to support evaluation of transportation improvement (e.g. capital projects)
4. Improve availability and accessibility of operations data to support transportation system planning (e.g. regional travel model calibration)

EXISTING PRACTICES

Mobility performance measures are currently assessed at ODOT in the ITS, TDS, Traffic, and TPAU units. ODOT has been collecting the following data in an established reporting fashion to support program needs:

- Traffic speed, volumes, and classification
- Vehicle miles traveled
- Facility and lane closures
- Road and weather conditions, work zones
- Incidents

These metrics support programs such as Traffic Incident Management (TIM), Highway Performance Monitoring System (HPMS), ODOT planning, Traffic Operations and Investigations, and other ODOT key performance measures (KPMs). Each metric has reports and applications for their respective performance measures.

ODOT's system operations stakeholder group has identified existing mobility performance measures that are collected in an ad-hoc, non-standard fashion often using more than one data input, data output and data application. These measures are often associated with newer automated reporting databases/tools and would thus establish a more uniform approach to collection and application within ODOT:

- Travel time and travel time reliability
- Running speed (space-mean speed) and point speed (point-mean speed)
- Highway/arterial congestion (locations, magnitude, direction, and duration)
- Multi-modal delay (vehicles, pedestrians, bicyclists)
- Health of traffic control infrastructure (traffic signals, traffic signal/ITS detection sensors, ITS communications, ITS gates, signage, striping)

Some data that would be used for the above metrics have challenges that will be discussed further in the implementation section. The challenges include not being available, being available only in specialized cases or systems, or being located in disaggregate databases.

EXHIBIT 5. MOBILITY CORE PERFORMANCE MEASURES

TRAFFIC VOLUMES	TRAVEL TIME	HOURS OPERATING IN CONGESTED CONDITIONS	VEHICLE MILES TRAVELED	TRAVEL TIME RELIABILITY	BOTTLENECK ANALYSIS	HOURS OF MULTIMODAL DELAY
Multimodal traffic counts including autos, trucks, and transit.*	Average and percentile travel times, temporally and spatially.	Hours when the average speed is slow or "congested" for the roadway.	Total vehicle miles traveled on ODOT highways.	Regularity or predictability of roadway travel time, often comparing free-flow, average, and 80th/95th percentile travel times.	Identification and prioritization of bottlenecks (localized disruption of traffic).	Number of cumulative hours that drivers, trucks, and transit are delayed.

Existing Performance Measures

Future Performance Measures

**The type and collection method of volume data varies across the state. Most of the system does not currently have continuous data. Pedestrian and bicyclist data is also not currently collected for a majority of the system. Multimodal delay is a very long term measure. Expected greater than five years out.*

CORE MOBILITY PERFORMANCE MEASURES

Seven core mobility performance measures are shown in **Exhibit 5**. Core performance measures are defined as being the most important for measuring performance in each program area. The core performance measures for mobility were identified through a series of stakeholder workshops, that reviewed national best practices, ODOT best practices, and ranking exercises on what would be the most useful and actionable for enhancing the ODOT mobility program. **Exhibit 5** indicates which performance measures are currently being reported. Basic definitions of each core performance measure are also listed below.

IMPLEMENTATION

The following section outlines how ODOT will improve data collection and analysis to evaluate system performance and mobility. Implementation includes:

- Identifying Data Needs and Sources
- Establishing Current and Future Performance Measures
- Completing Action Items in the Mobility Program Area

HIGHWAY DATA NEEDS AND SOURCES

ODOT collects several data types that could be used to assess mobility related performance measures.

Historically, performance measurement for mobility has been based on traffic volumes collected through ODOT's traffic counting program. The program, managed by the Transportation Systems Monitoring Unit, uses automatic traffic recorders (ATRs), and a newly implemented Traffic Monitoring System.

Additional performance measure data is collected by ITS systems on the freeway system in ODOT's Region 1. The additional data includes:

- Vehicle Counts
- Vehicle Speeds
- Vehicle Length
- Approximate Truck Volume and Speeds

The data is aggregated and shared with PSU's PORTAL system, which operates both as an archived data warehouse and performance measure visualization tool.

Collecting performance measure data on arterials has historically been challenging, at ODOT and on a national scale, due to the lack of uniformity or the use of a comprehensive collection method for measuring uninterrupted flow on signalized corridors. Despite this difficulty, ODOT has began utilizing data from its central traffic signal system to develop a strong baseline of arterial performance measures. An additional chapter to the performance management plan has been added to address performance measures for signalized arterials.

To compliment the data being collected by field devices, ODOT has begun working with probe data and additional analysis tools to report on performance measures. ODOT has already begun working with emerging technologies, specifically probe data. The Transportation Planning Analysis Unit (TPAU) recently procured travel time, running speed, and travel time reliability data for the entire state using the RITIS tool. RITIS displays INRIX probe data, and is so new that TPAU and others are currently in the process of validating performance measures, establishing guidelines for use of the tool, and establishing common applications. Use of probe data sources provide statewide highway and arterial input data that support the following performance measures:

- Travel time
- Travel time reliability
- Hours operating in congested conditions
- Bottleneck analysis

ODOT will need to continue testing products that improve data gathering for mobility related performance measures. Other technologies could include the use of the sensors and/or another black-box within the signal cabinet. There are additional emerging products similar to third-party probe data (like INRIX data and the RITIS platform) that use the traffic signal central management system or their own standalone platforms to offer multi-modal performance measurement as a service. This data is often offered in a "cloud" based database.

Other units outside of the Operations Program will lead the management and reporting for MAP-21 performance measures.

DESIRED, EXISTING, AND FUTURE PERFORMANCE MEASURES

Table 4 shows all mobility related performance measures that were identified through a series of stakeholder meetings and management discussions. The table delineates each performance measure by the identified **priority level** based on current technological capabilities and feasibility for agency. The table also separates metrics that are currently being collected (top row) from metrics that have yet to be consistently and accurately reported (bottom row). **Core performance measures** are also bolded in the table to show which measures are most important for measuring mobility.

Of the 19 performance measures that were identified, ODOT is currently measuring or reporting on 10 of them at a range of maturity levels. One example of this range is the Planning Time Index (PTI) performance measure. The data required to calculate PTI is currently collected through Inrix probe data and Bluetooth devices, however, the data has not been implemented on enough of the system to make meaningful conclusions.

Table 4 also groups the performance measures by level of priority. As shown, eight are considered "High" priority, seven are considered "Medium" priority, and four are considered "Low" priority. Priority levels were assigned based on a combination of the importance for the program and the feasibility in terms of data availability and level of effort to collect and report on it.

The core performance measures range in ease of implementation and level of effort necessary to be established within ODOT's performance measurement processes. Action plans for each core performance measure are further detailed in the following sections.

TABLE 4. MOBILITY PERFORMANCE MEASURES

TSMO PRIORITY LEVEL		HIGH	MEDIUM	LOW
CURRENT TSMO METRIC?	Yes	**Vehicle volume** **Truck volume** **Free flow travel time** **95th percentile travel time** **Planning Time Index** **Hours operating in congested conditions** **Bottleneck analysis**	Average segment speed **Travel Time Index** **Median travel time** **Vehicle miles traveled**	Planning time
	No		Bicycle volume **Vehicle delay** Pedestrian delay Bicycle delay	Pedestrian volume Percent of Urban State Highways with bicycle lanes or dedicated bicycle facilities[a] Percent of Urban State Highways with sidewalks or dedicated pedestrian facilities[a]

Bold performance measures are identified as core performance measures in this program area.
[a] Identified as a legislative Key Performance Measure.

MOBILITY PROGRAM AREA PERFORMANCE MANAGEMENT ACTION ITEMS

In addition to the action items that relate to each individual identified core performance measure, there are several program area overarching action items that apply to all mobility metrics:

NEAR-TERM

- ✓ Focus collaboration between the Operations program and TPAU on defining the needs and shape of mobility-related performance measures.
- ✓ Identify measurement gaps and address them with new technology, sensors, or data sources.
- ✓ Expand reporting to management teams.
- ✓ Complete integration of ODOT data into RITIS.
- ✓ Continue monthly meetings between the ITS Unit Manager/Performance Measure Coordinator and TPAU to refine road segments and define data presentation needs.

LONG-TERM

- ✓ ITS (Manager/Performance Measure Coordinator) needs to meet regularly (monthly) with TPAU to refine road segments and clearly express data presentation needs.
- ✓ Identify key mobility measures to include in the Operations Program Annual Report.
- ✓ Integrate or fuse data sources into a common analysis database and data warehouse for storage from all programs and units for mobility purposes. This could include modifying an existing ODOT tool, creating a custom ODOT tool or using an outside database tool (e.g. RITIS, IntelightTM, PORTAL, etc.).
- ✓ Develop and implement a data validation program to regularly check/ground truth data sources for accuracy and usefulness.
- ✓ Ensure ODOT has a program plan and consider deploying a pilot project to ingest broadcast messages from Connected and Autonomous Vehicles, defined in SAE J2735. This could include the basic safety message set that would capture vehicle information (counts, speeds, weather, etc) and leverage it into mobility-related performance measures.

TRAFFIC VOLUMES: VEHICLE VOLUME, TRUCK VOLUME, AND TURNING MOVEMENT COUNTS

Definition: Traffic volumes are counts of specific users of a facility. Users in the context of this report include personal vehicles, trucks, or cars. Facilities include segments or intersections.

Where: Freeways and arterials.

Unit Responsible for Implementation:
Policy, Data, and Analysis Division and System Operations and ITS

Enhancements of this measure would include the following action items:

NEAR-TERM

- Expand automated data collection with ATR stations, ATC controllers, and detection sensors. Consider augmenting programmed capital and preservation projects to add count devices/systems.
- Integrate count data from various sources, including traffic signals, ramp meters, and ITS, into the Oregon Traffic Monitoring System.

LONG-TERM

- Develop a data fusing automated tool to visualize and query traffic volume data across travel modes and facilities from multiple databases and sources. ODOT will need to collaborate to clearly identify needs and requirements to support the goals of the Traffic Counting Program, which may include blending of or replacement with third-party providers (e.g. connected vehicle big data set).
- Conduct pilot and/or research project(s) to test and validate accuracy and usefulness of various count technologies and third party data sources. Develop adjustment factors as needed to correct automated sources.

TRAVEL TIME: AVERAGE PEAK PERIOD, MEDIAN, FREE FLOW, AND VARIOUS PERCENTILES

Definition: Travel time is the number of minutes or hours it takes a vehicle to travel a certain road segment. The same data set can be used to calculate and report travel times for the average peak period, the median, free flow, and various percentiles.

Where: Freeways and Arterials

Unit Responsible for Implementation:
ODOT TPAU and System Operations and ITS

Enhancements of this measure would include the following action items:

NEAR-TERM

- Continually update reporting segments for desired travel time reporting routes on ODOT facilities. (Statewide number for Urban/Rural and facility type).
- Update processes and tools with the newly defined free flow speed, where free flow speed is equal to the posted speed limit.

LONG-TERM

- Increase the sample size and accuracy of travel time results through the fusion of added data sources and/or additional sensors.
- Integrate connected vehicle data as another data source.

HOURS OPERATING IN CONGESTED CONDITIONS

Definition: Hours operating in congested conditions is measured as the number of ours or proportion of hours where measured speeds fall below a defined threshold for congested conditions.

Where: Freeways and arterials

Unit Responsible for Implementation:
TPAU

Implementation of this measure would include the following action items:

NEAR-TERM

- Conduct pilot project to gauge hours of congestion and degrees of congestion statewide on various routes, districts and regions in order to set a baseline, which should be collected over six months at a minimum. Develop "top 10" worst and best hours of congestion comparison statewide.
- Continue to explore existing tools such as RITIS and Portal for data needs and potential reporting platforms and consider specific enhancement opportunities to make tools more useful for hours of congestion purposes.

LONG-TERM

- Develop repeatable hours of congestion analysis methodology and report(s).
- Integrate connected vehicle data into RITIS.

VEHICLE MILES TRAVELED: PER CAPITA

Definition: Annual miles of vehicle travel divided by the total population of the area. Vehicle miles traveled are all the miles driven in a certain area in a certain time.

Where: Freeways and arterials

Unit Responsible for Implementation:
TPAU and Transportation Data Section

Implementation of this measure would include the following action items:

NEAR-TERM

- Develop a standardized report for VMT by geographic area and facility type.

LONG-TERM

- Increase the number of reporting stations to attain more granularity.

TRAVEL TIME RELIABILITY: PLANNING TIME INDEX AND TRAVEL TIME INDEX

Definition: Planning Time Index (PTI) is the ratio of 95th percentile travel time to free flow travel time. This yields the total amount of time to plan for a trip due to expected variances. PTI is considered a better representation of travel time reliability across multiple time periods and locations because the free flow travel time (approximated as posted speed over the route length) is a uniform or constant value, and the 95th percentile travel time is the single dependent variable.

Travel Time Index (TTI) is the ratio of average travel time during the peak period to the free flow travel time.

Where: Freeways and arterials

Unit Responsible for Implementation: TPAU (implementation lead), ITS (business need identification lead)

Other notes: When relaying travel time reliability metrics such as PTI, TTI, and others, ODOT should account for nuances on arterials using the 95th percentile travel time due to non-through movements (e.g. - side streets or mainline left-turns). This nuance is not expected to be as prevalent with probe data sources which are constrained to links/traffic message channels such as RITIS or BluetoothTM on freeways.

NEAR-TERM

- Develop consensus through discussion and or testing of desired travel time reliability methodology(s), inclusive of analysis periods. Document guidelines to encourage uniform practice so that the metrics can be compared across projects, corridors and geographic areas of the state. Recommendations are to collect and report on PTI for all segments and all projects so that:
  - Reliability can be gauged across locations.
  - Staff can become familiarized with PTI results and degrees of unreliability.
  - Collect and report on PTI for all segments and projects at a minimum so that reliability can be gauged across locations, as well as familiarize staff with PTI results and degree of unreliability.
- Establish key travel time routes (ITS to provide) to regularly measure travel time reliability. Develop pilot comparison test of travel time reliability across interstate and the national highway system in Oregon to establish a solid performance baseline. Prepare a "top 10" worst and best list of routes for travel time reliability and conduct causal analysis to determine contributing factors and candidate solutions/treatments.
- Report on reliability on key routes for holidays and special events (e.g. US 20 in Sisters for the 4th of July, Interstate-5 for University of Oregon or Oregon State University home football games). ITS will provide TPAU with routes/times.

LONG-TERM

- Establish statewide methodology for automated reporting of travel time reliability measures. Maintain and update ranked list of travel time reliability segments for comparative performance. Link to programmed or aspirational candidate projects to improve travel time reliability.
- Conduct additional study into the effect of side-street and left-turn traffic (which has longer delays) at signalized intersections and their impact on 80th percentile travel times. Potentially consider using 85th percentile or other percentile travel times or different outlier filtering for probe data, if one desires through traffic travel time reliability.

BOTTLENECK ANALYSIS

A bottleneck is a localized disruption to traffic flow. The identification of bottlenecks is necessary to maximize the efficiency of the current facilities.

This measure will assist planners in developing projects to eliminate bottlenecks. This measure should analyze on geographic area and facility type. ODOT TPAU is expected to act as the agency implementation lead, after ITS/business defines path forward on segments and presentation. Enhancement of this measure would include the following action items:

NEAR-TERM

- Investigate further enhancement of and use the RITIS bottleneck tool.

MOBILITY PERFORMANCE MEASURES COMMUNICATION

MOBILITY AUDIENCES

The primary audiences that are likely to be interested in the progression of performance measures for the Mobility program area are:

- Region and statewide traffic units
- Planning and policy
- Transportation data section
- System Operations and ITS unit
- TSSU
- District maintenance staff
- Statewide and region leadership teams

DELIVERY OPTIONS

Each data set and performance measure should be delivered through a variety of different interfaces, or "views", so that staff, managers, and decision makers can access the information that is most relevant for their respective positions. As just one example, a decision maker might need a snapshot of statewide performance to make a budget decision, but a traffic signal engineer might need a more detailed view of a corridor. In all "views", the aggregation methodology should be clearly communicated so that audiences can understand how the data is being modified for each visual.

Several existing and newly acquired reporting tools can be expanded to include data and performance measure visualizations, including interactive maps and dashboards. ODOT could expand existing dashboards in their Bluetooth software, Portal, RITIS, Intellight MaxView (ODOT's central management software), and the signal performance measure (ATSPM) software. The goal of these dashboards would be to provide users the ability to aggregate information depending on their audience level. To make the most use out of performance measure reporting and dashboards, definitions and performance measure targets should be made clear.

MOBILITY COMMUNICATIONS ACTION ITEMS

The actions identified below summarize the primary methods for communicating and utilizing mobility related performance measures within ODOT.

For each action, the lead ODOT unit should ensure the presentation of performance measure results for each of the core performance measure is aligned with the desired messaging. This would include ensuring databases are integrated with dynamic Power BI, SSRS or other big data visualization tools.

NEAR-TERM

- ✓ Assess RITIS reporting capabilities and summarize usefulness for the core performance measures identified n this report, such as travel time, reliability, and travel speed. Led by TPAU and the ITS Unit. TPAU should also identify enhancements for additional reports or dashboards.

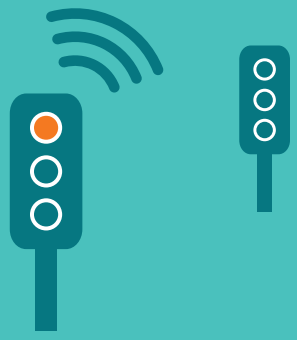
MID-TERM

Annually report performance measures to management teams and the public. Highlight mobility accomplishments and challenges. Final detailed requirements should be vetted by the mobility performance measure task force and other appropriate stakeholders.

- ✓ Identify traffic count reporting needs and requirements for modifying existing tools or procuring new tools. Led by the ITS unit and TDD. Discuss potential reporting and visualizations with the traffic group to fuse:
  - Pedestrian phase actuations
  - Bike lane counts or bike count technologies
  - Transit/freight

  Count graphics should start as a report and could grow into a summary dashboard. Future iterations could separate performance measures by mode or include all modes in one visualization.

TRAFFIC SIGNAL MANAGEMENT



Effective traffic signal management helps the ODOT Operations Program achieve their core mission to provide safe and efficient travel.

There are several ways ODOT could enhance the availability and use of traffic signal performance measures. Currently, data comes from the traffic signal controller's high resolution, event-based signal performance measures which is used to create Automated Traffic Signal Performance Measures (ATSPMs). This data is stored in Kinetic Signals, and can be used to create other non-ATSPM reports. There are opportunities to relieve stress on the production server and software program by integrating the signal data into the ODOT data warehouse. This would also keep an extended history of data and would allow for faster reporting and analysis.

Traffic Signal Management performance measures can be evaluated for many purposes. They can be used to show whether the system is running efficiently and reliably overall, and they can be used to understand the resulting impacts of a project or other system modification. They can be used to proactively identify and address signal performance issues rather than react to user complaints. In addition to the ways the Operations program can use the data, the traffic signal related performance measures are equally useful for the transportation planners and the Transportation Planning and Analysis Unit (TPAU) at ODOT.

TRAFFIC SIGNAL MANAGEMENT PERFORMANCE MEASUREMENT GOALS

The desired outcome and objective of the traffic signal performance management program is:

To support mobility goals and ODOT's operations staff with making day-to-day decisions about operation of traffic control systems, re-examine signal timing and operations to enhance safety and efficiency, aid in future planning, and establish a proactive approach to managing signals.

EXISTING PRACTICES

Traffic signal management performance measures are currently evaluated at ODOT in the Traffic-Roadway Section. ODOT has been collecting data to support program needs for:

- Signal traffic volume
- Traffic signal synchronization

These metrics support programs such as the highway performance monitoring system (HPMS), ODOT planning, traffic operations and investigations, and other ODOT key performance measures (KPMs). These metrics have reports and applications for their respective performance measures.

The following measures are often associated with newer automated reporting databases/tools:

- Quality of signal timing (percent arrivals on green lights, vehicles waiting through more than one green light).
- Health of traffic control infrastructure (traffic signals, traffic signal/ITS detection sensors, communications, signage, striping).

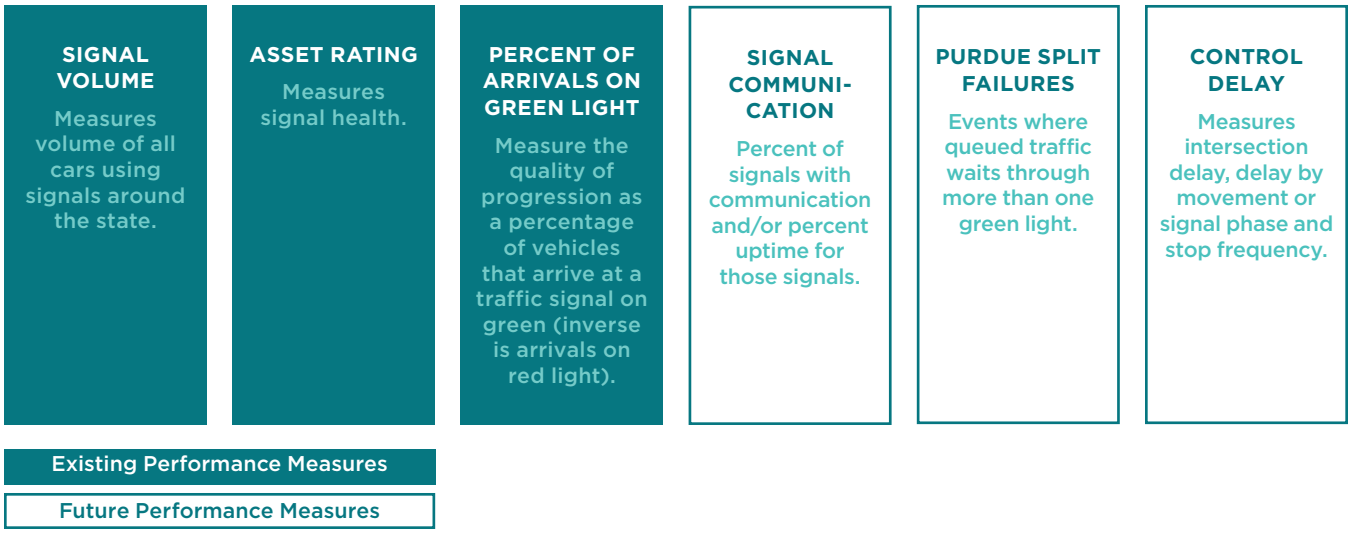
Establishing a more uniform approach to collecting and using the above measures within ODOT is very important.

CORE TRAFFIC SIGNAL MANAGEMENT PERFORMANCE MEASURES

Six core mobility performance measures are shown in **Exhibit 6**. Core performance measures are defined as being the most important for measuring performance in each program area. The core performance measures for traffic signal management were identified through a series of stakeholder workshops that reviewed national best practices, ODOT best practices, and included ranking exercises on what would be the most useful and actionable for enhancing the ODOT traffic signal management program.

Exhibit 6 indicates which performance measures are currently being reported (teal background) and which performance measures will be established in the future (white background). Future performance measures require more effort to establish at this time. Basic definitions of each core performance measure are also listed below.

EXHIBIT 6. TRAFFIC SIGNAL CORE PERFORMANCE MEASURES



IMPLEMENTATION

The following section outlines how ODOT will improve data collection and track performance measures to manage the traffic signal program. Implementation includes:

- Identifying Data Needs and Sources
- Establishing Current and Future Performance Measures
- Completing Action Items in the Traffic Signal Management Program Area

DATA NEEDS & SOURCES

Performance measures for the traffic signal management program mostly focus on arterial mobility and use traffic volumes and signal performance data. The data is collected through MaxView, ODOT's traffic signal program. Interoperability with ODOT's other performance management databases is critical to the success of this program and many others. It will be especially important to integrate traffic signal performance measures into any future data warehouse(s) that ODOT is developing.

Other potential sources for traffic signal management data gathering include:

- Traffic Signal Condition Rating
- Lane and Detector configurations from MaxView CV database
- RITIS

Traffic signal infrastructure health is another important metric that has a direct impact on arterial mobility. This includes performance measures related to signal infrastructure and communications infrastructure uptime, time spent in detector failure mode, the age of the infrastructure, the age of signal timing plans, and more.

In addition to advancements in traffic signal controller technology, such as the Advanced Transportation Controller (ATC), there are several emerging products that can produce additional performance measures related to arterial performance. These products use technology in the sensors and/or the black-box within the signal cabinet (e.g. GridSmart, Miovision, and Wavetronix). ODOT will need to continue testing products to determine where and how to automate the collection of performance measures on their arterials. Probe data based analytics tools have recently emerged as an option for measuring signalized arterial performance measures without the detection enhancements required to implement automated signal performance measures

TABLE 5. TRAFFIC SIGNAL PERFORMANCE MEASURES

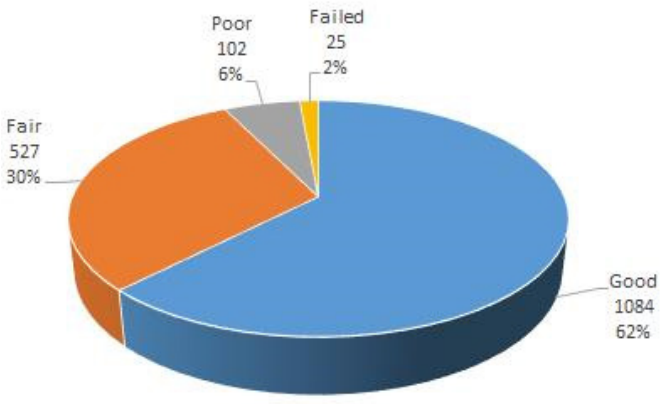
TSMO PRIORITY LEVEL		HIGH	MEDIUM	LOW
CURRENT TSMO METRIC?	Yes	Travel time index **Percent signals with communications** **Signal Volume** **Percent arrivals on green**	Vehicle detector uptime Ped detector uptime **Asset rating**	Percent ATCs installed Replacement of obsolete signal cabinets
	No	**Control delay**	**Purdue split failures** **Communications uptime**	

Bold performance measures are identified as core performance measures in this program area.

DESIRED, EXISTING, & FUTURE PERFORMANCE MEASURES

Table 5 shows all traffic signal related performance measures that were identified through a series of stakeholder meetings and management discussions. The table delineates each performance measure by the identified **priority level** based on current technological capabilities and feasibility for agency. The table also separates metrics that are currently being collected (top row) from metrics that have yet to be consistently and accurately reported (bottom row). **Core performance measures** are also bolded in the table to show which measures are most important for measuring traffic signal performance. The list is not considered comprehensive.

EXHIBIT 7. DETECTOR HEALTH CLASSIFICATION - ESTIMATES



TRAFFIC SIGNAL PROGRAM AREA PERFORMANCE MANAGEMENT ACTION ITEMS

In addition to the action items listed below that relate to each individual identified core performance measure, there are several program area overarching action items that apply to all traffic signal metrics:

NEAR-TERM

- ✓ Publish reports on detector uptime and communications uptime.
- ✓ Develop a report showing percentage of traffic signals that are remotely monitored.
- ✓ Evaluate traffic signal central management software (MaxView) for automated detector health and reporting capabilities (for core measure).

MID-TERM

- ✓ Advance the use of the new traffic signal data warehouse.
- ✓ Develop a report that evaluates performance goal on detector health,as seen in Exhibit 2.

LONG-TERM

- ✓ Aggregate reporting from the Data Warehouse statewide.

SIGNAL VOLUME

Measures the volume of all vehicles using signals.

NEAR-TERM

- Complete development of new traffic signal data warehouse.

MID-TERM

- Digitize cabinet schematics and relate to signal layout.
- Continue adding signals into the inventory as more are brought online with communication.

ASSET RATING

Measures the health and rating of each traffic signal.

NEAR-TERM

- Automated the update of basic signal inventory from Transinfo to the Micromain database.

MID-TERM

- Develop a plan for gathering traffic signal condition ratings for upload to Transinfo and tracking condition rating trends over time.

PERCENT ARRIVALS ON GREEN/RED

Percent arrivals on green are the number of user actuations on green traffic signal indication, expressed as a percentage of actuations over time.

Percent arrivals on red, the inverse, is equivalent to the stops for that movement.

When coupled with the proportion of green time allocated, one can calculate:

- The Platoon Ratio
- Percent of Arrivals on Green to Percent of Green Time for that Movement

Values over 1.0 indicate a productive use of green time and quality progression along signals in a corridor. The percent of arrivals on green have a direct impact on delay experienced at the interesection for a given movement.

Purdue University established a popular visualization chart to map vehicle actuations over a sensor to the traffic signal indication (red, yellow, or green). The chart spans all times of the day so that the proportion of arrivals on green can be easily determined. These results can be used to determine whether signal timing should be adjusted or if there is faulty infrastructure (e.g. broken detection) to address.

Percent arrivals on red, the inverse to percent arrivals on green, can directly indicate the delay and emissions along an arterial and are considered a secondary metric to percent arrivals on green.

NEAR-TERM

- Continue to use for before/after evaluations of signal timing.

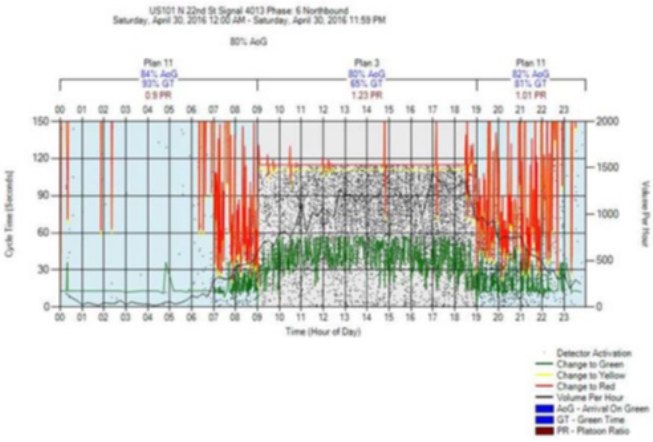
MID-TERM

- Configure lanes and detectors in MaxView CV (after deployment of Kinetic Signals).

LONG-TERM

- Statewide aggregate reporting driven off of the data warehouse.

EXHIBIT 8. PURDUE COORDINATION DIAGRAM, US101 LINCOLN CITY, OR (ATSPM SOFTWARE)



SIGNAL COMMUNICATION

Percent of ODOT signals with communications. ODOT's goal is to have communications in all cabinets within five years.

NEAR-TERM

- Enable detector diagnostics in MaxTime, as a standard (MaxTime/ATC's have a setting which can be enabled where they actually monitor for detector failure in real time, and that gets recorded in the event log). Train and ensure all signal timers are setting it up.
- Update the existing ODOT ATC signal PowerBI report that tracks internal progress.

MID-TERM

- Develop a new signal communication report. This report would look at day to day, as well as aggregate the signals by segment/ highway/district.

LONG-TERM

- Install ATC's at all ODOT owned AND maintained signals.
- Integrate ODOT's detector health research project findings into the uptime criteria.

CONTROL DELAY

The amount of additional travel time experienced by a user attributable to a control device. This looks at delay by movement or signal phase, as well as intersection delay; which calculates the vehicles stopped in the intersection approach at successive intervals.

NEAR-TERM

- Integrate RITIS API to retrieve travel time data for more in depth and automated reporting.

MID-TERM

- Develop the control delay report that will feature the different measures of delay.

LONG-TERM

- Statewide automated travel time index reporting for all coordinated systems.

PURDUE SPLIT FAILURE

Phase/split failures occur when queued vehicles must wait through more than one green indication to proceed through an intersection.

NEAR-TERM

- Expand implementation of ATC controllers and software to measure and aggregate quality of signal timing data.
- Create performance measure that tracks region's deployment of the latest traffic signal controller (roadside computer) technology, ATCs.
- For at least one corridor, ground-truth automated ATSPM software results with another data source (e.g. video/manual observation) to validate ATSPM tool.
- Validate and monitor in real-time, detector and communication health, for measurement locations to collect and transport data.

MID-TERM

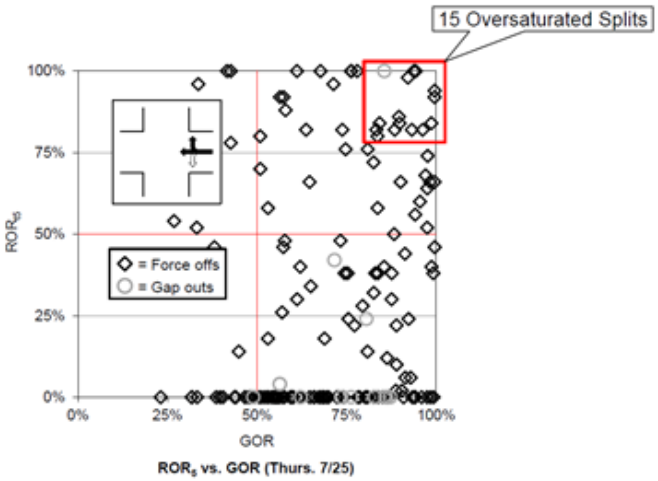
- Develop baseline metric results across pilot corridors to compare typical results for arterials at various levels of congestion. Identify proportion of conditions where signal timing detection may be broken.
- Develop implementation guidance for arterial ATSPMs, inclusive of detection design, and prioritization of metrics for different arterial issues (e.g. red light running versus bad progression).

LONG-TERM

- Automate the reporting of these measures, including alerts triggered to send to ODOT traffic or signal managers/staff when unusual conditions occur.
- Develop baselines for typical conditions and recommended thresholds and target goals.
- Develop a "top 10" list of split failure locations statewide on the national highway system. Develop "top 10" list of poorest percent arrival on green for coordinated movements along the national highway system. Use these metrics as indicators to drive action to address poor arterial operations and tell the story to ODOT decision makers.

This is approximated in a clever fashion with the Purdue Split Failure metric, which plots the percent occupancy of a stop bar detector on green (GOR) and the percent occupancy of the same stop bar detector on the first 5 seconds of red (RORt5), as shown in **Exhibit 9**.

EXHIBIT 9. PURDUE SPLIT FAILURE DIAGRAM, ATSPM PRESENTATION, DR. DARCY BULLOCK



The user can identify the threshold of GOR and RORt5 to classify as a problematic movement (Indiana DOT and Purdue propose an 80 percent threshold for each). The selected value will need to take into consideration contributing causes, if green time can be reallocated to help, and if the location is in fact controlling or critical to corridor operations.

TRAFFIC SIGNAL PERFORMANCE MEASURES COMMUNICATION

TRAFFIC SIGNAL PERFORMANCE MANAGEMENT AUDIENCES

The primary audiences that are likely to be interested in the progression of performance measures for the Traffic Signal Management Program are:

- Region and statewide traffic units
- Transportation data section
- ITS unit
- Traffic systems services unit (TSSU)
- District maintenance staff
- Statewide and region leadership teams

DELIVERY OPTIONS

Each data set and performance measure should be delivered through a variety of different interfaces, or "views", so that staff, managers, and decision makers can access the information that is most relevant for their respective positions. As just one example, a decision maker might need a snapshot of statewide performance to make a budget decision, but a traffic signal engineer might need a more detailed view of a corridor. In all "views", the aggregation methodology should be clearly communicated so that audiences can understand how the data is being modified for each visual.

Several existing and newly acquired reporting tools can be expanded to include data and performance measure visualizations, including interactive maps and dashboards. ODOT could expand existing dashboards in their Bluetooth software, Portal, RITIS, Intellight MaxView (ODOT's central management software), and the signal performance measure (ATSPM) software. The goal of these dashboards would be to provide users the ability to aggregate information depending on their audience level. To make the most use out of performance measure reporting and dashboards, definitions and performance measure targets should be made clear.

TRAFFIC SIGNAL PERFORMANCE MANAGEMENT COMMUNICATIONS ACTION ITEMS

The actions identified below summarize the primary methods for communicating and utilizing traffic signal related performance measures within ODOT.

For each action, the lead ODOT unit should ensure the presentation of performance measure results for each of the core performance measure is aligned with the desired messaging. This would include ensuring databases are integrated with dynamic Power BI, SSRS or other big data visualization tools.

NEAR-TERM

- ✓ Assess the functionality of current reports and identify gaps or needs for future reports on core traffic signal performance measures. Led by the Traffic signal group, ITS Unit, and TPAU.
- ✓ Assess ATSPM reporting capabilities through traffic signal central management software (Kinetic Signals and TransSuite), and ATPSM software. Led by the traffic group in the central office or a region. The traffic group should also identify enhancements for additional reports or dashboards.
- ✓ Identify additional statewide traffic signal measures for inclusion in the Operations Program Annual Report.

MID-TERM

- ✓ Improve awareness and accessibility of traffic signal reports for ODOT regions/districts/ electrical crews.

TRAVELER INFORMATION

ODOT has developed a full suite of traveler information systems that provide critical information to the traveling public. Travelers can make better traveling choices, based on information from ODOT's traveler information systems, by selecting safer routes and avoiding adverse weather and road conditions. This program is particularly important to the state's trucking industry because it supports freight mobility, on-time delivery, and a vibrant Oregon economy.

TSMO performance measures for traveler information are largely reflective of these general areas:

- Resource use (call volume, website visits), which reflects the usefulness of the data
- Timeliness of data updates (Advanced Traveler Information Systems (ATIS) updates within a threshold)
- Accuracy of data
- Accessibility of data

Active measurement of the effectiveness of these components allows agencies to assess the performance of traveler information programs relative to internal goals, objectives, policies, and best practices of national peers. National peers are experimenting with new mediums and procedures as they evolve from a phone-based 511 system to more web-based and on-demand systems for customers. Performance measures and implementation procedures should be flexible enough to capture metrics from a variety of sources.

TRAVELER INFORMATION PERFORMANCE MEASUREMENT GOALS

The desired outcome and objective of the traveler information performance management program is:

Collect, analyze, and summarize performance measures which effectively measure ODOT's ability to communicate accurate, timely, and relevant information to the traveling public, promoting safe and efficient travel.

There are two goals that should guide ODOT and partner agency actions when implementing and measuring the progress of the traveler information program area:

1. Ensure the program is delivering accurate and timely information to the traveling public; and
2. Provide information to management, leadership teams, and the legislature regarding trends in viewership and use of the various traveler information services.

Traveler information is particularly important to the State's trucking industry and supporting a vibrant Oregon economy.

EXISTING PRACTICES

ODOT provides traveler information in multiple formats, allowing users to determine the method best suited to their situation. Some of those formats are:

- Website, including TripCheck.com and TripCheck TV
- Phone (511)
- Social media (Twitter)
- TripCheck API

CORE TRAVELER INFORMATION PERFORMANCE MEASURES

Five core traveler information performance measures are shown in **Exhibit 10**. These performance measures were prioritized as the most important for traveler information through a series of stakeholder workshops that reviewed national best practices, ODOT best practices, and included ranking exercises to determine which performance measures would be the most useful and actionable for enhancing the program.

Exhibit 10 indicates which performance measures are currently being reported (teal background) and which performance measures will be established in the future (white background). Future performance measures require more effort to establish at this time. Basic definitions of each core performance measure are also listed below.

EXHIBIT 10. TRAVELER INFORMATION CORE PERFORMANCE MEASURES

NUMBER OF PEOPLE VISITING ODOT COMMUNI-CATION OUTLETS
Measures usage of ODOT traveler information resources, such as TripCheck, 511, and social media (TwitterTM, WazeTM).

ATIS NOTIFICATION DELAY
Time from crash reported to notification made available for the traveling public. ATIS stands for Advanced Traveler Information System.

MAJOR INCIDENTS, WITH NO MESSAGE (ATIS)

CRITICAL STATION ON-TIME REPORT
On-time performance for updating road and weather conditions (most critical in winter operations or major events).

INFORMATION ACCURACY
Validation of data accuracy for quality assurance.

Existing Performance Measures

Future Performance Measures

IMPLEMENTATION

The following section outlines how ODOT will improve data collection and track performance measures to manage the traveler information program. Implementation includes:

- Identifying Data Needs and Sources
- Establishing Current and Future Performance Measures
- Completing Action Items in the Traveler Information Program Area

DATA SOURCES AND NEEDS

Traveler information data sources currently reside within the agency's databases. In addition to the data currently being collected and stored, additional data sources that can validate existing data is a major need for the program. Waze and RITIS data along with other third party data sources are one potential way to validate or even replace other traveler information data sources.

DESIRED, EXISTING, AND FUTURE PERFORMANCE MEASURES

Table 6 shows all traveler information related performance measures that were identified through a series of stakeholder meetings and management discussions. The table delineates each performance measure by the identified **priority level** based on current technological capabilities and feasibility for agency. The table also separates metrics that are currently being collected (top row) from metrics that have yet to be consistently and accurately reported (bottom row). **Core performance measures** are also bolded in the table to show which measures are most important for measuring traveler information. The metrics listed below are not considered to be comprehensive, but rather, reflect the state of the traveler information practices within ODOT and on a national scale.

TABLE 6. TRAVELER INFORMATION PERFORMANCE MEASURES

TSMO PRIORITY LEVEL		HIGH	MEDIUM	LOW
CURRENT TSMO METRIC?	Yes	**Visits to TripCheck** **Calls to 511** **Lane blocking events with no ATIS message**	**ATIS delay** **Critical Station On-Time Report** Social media metrics	Percent of events reported to the public through TripCheck
	No		Frequency of traveler info updates during an incident Average response time to inquiries **Information accuracy**	Percent of construction events that haven't been updated in over a week

Bold performance measures are identified as core performance measures in this program area.

TRAVELER INFORMATION PROGRAM AREA PERFORMANCE MANAGEMENT ACTION ITEMS

There are several program area overarching action items that apply to all Traveler Information metrics:

NEAR-TERM

- ✓ Develop a dashboard and reports for storm reporting both during and immediately after events.
- ✓ Coordinate with ODOT Communications and AskODOT teams for a more holistic picture of traveler information and social media engagements. Frequent check ins and feedback loops should be established and maintained.
- ✓ Create a pilot project to test the potential use of Waze™ and/or the statewide RITIS probe data analytics tool for data validation to address CFR 23 511 for data accuracy, as well as statewide data coverage.
- ✓ Continue to develop and expand TripCheck API to include the ability to track how partners are using ITS data.
- ✓ Complete benefit analysis of traveler information related projects.

LONG-TERM

- ✓ Implement and document the procedure to use Waze™, RITIS or other useful third party data sources for data validation and coverage (CFR 23 511) across the state.
- ✓ Compare the duration between the time first reported and incident clearance against Waze™ or RITIS reported events and TOC events.

NUMBER OF PEOPLE VISITING ODOT TRAVELER INFORMATION OUTLETS

This measure is an established ODOT performance measure that is measured and reported. The ITS unit is the agency lead.

ATIS NOTIFICATION DELAY

ATIS notification delay is the time from incident verification to when an ATIS message is made available to the public through ODOT traveler information outlets.

The ITS unit is the agency lead.

MAJOR INCIDENTS WITH NO NOTIFICATION MESSAGE (ATIS)

This measure records the number of major incidents that do not receive a notification through Advanced Travel Information Systems (ATIS).

If all procedures and processes are followed, this measure should equal zero. It is an established ODOT performance measure that is measured and reported. The ITS unit is the agency lead.

CRITICAL STATION ON-TIME REPORT

This measure records ODOT's performance in updating the road and weather conditions at critical stations.

It is an established ODOT performance measure that is measured and reported. The ITS unit is the agency lead.

INFORMATION ACCURACY

Information accuracy measures the validity of the information provided to the public through duplicate sets of data from different sources

ITS will determine a valid data source (Inrix or other third party sources) and a methodology for the comparison. The ITS unit is the agency lead.

SYSTEM USAGE

NEAR-TERM

- Modify 511 data report to reflect change in data availability.
- Develop a process to collect and analyze data surrounding API usage.

LONG-TERM

- Investigate linkages between RPS information and impact on incident management.

TRAVELER INFORMATION PERFORMANCE MEASURES COMMUNICATION

TRAVELER INFORMATION AUDIENCES

The primary audiences that are likely to be interested in the progression of the traveler information program performance measures are:

- ITS unit
- FHWA
- Communication Section
- TOC dispatch and management teams
- District and crews responding to incidents and road and weather reports.

DELIVERY OPTIONS

Presenting performance measure results should be tailored to the wide variety of audiences that will be using the data. Each performance measure or data set should have several different visualization options so that staff, managers, and decision makers can access the graphic or information that would be most actionable for their respective jobs. Where a decision maker might need a snapshot of the statewide performance to make budget decisions, ODOT staff needs a more detailed view of the traveler information performance. It is recommended to set measure methodologies to allow for data to be aggregated up to higher levels and support all audience levels.

TRAVELER INFORMATION COMMUNICATIONS ACTION ITEMS

For each action item, the lead ODOT unit should work with the ITS unit. The following are specific action items towards enhanced communication of traveler information performance measures:

MID-TERM

- ✓ Assess the functionality of current reports to identify gaps and needs for future core performance measure reporting. Led by the ITS unit and traveler information program coordinator.
- ✓ Continue working with the ITS manager and other key stakeholders to develop tools and methods to disseminate "Google Analytics™-style" dashboards for easy access and viewing without Google account.
- ✓ Develop live dashboards and reports to aid in operations, specifically during severe weather conditions, snow plow tracking, and construction zones. The dashboards should alert viewers when follow up actions are required.

Ease of use and clarity for the traveling public is very important for the traveler information program area.

ASSET MANAGEMENT

Asset Management programs effectively monitor and manage assets over their entire lifecycle. They do this by:

- Monitoring overall asset condition trends
- Assisting in identifying critical infrastructure needs from both a maintenance and capital program perspective

ODOT's management of TSMO assets varies depending on the type of asset. Generally, ODOT's management of most categories of TSMO assets is not considered fully mature. The most significant progress has been made in the management of ITS signs and Traffic Signals, with set methodology and annual reporting on trends. This performance management plan will define the asset management measures that are necessary for effectively managing a comprehensive and proactive asset management program.

Useful and implementable asset management performance measures will:

- Greatly aid in prioritizing maintenance and capital project resources
- Make the business case for necessary funding levels to keep the state's valuable TSMO assets in acceptable condition

Table 7 summarizes how ODOT categorizes its TSMO assets. While there are many different groups responsible for various aspects for the TSMO asset management program, the table also summarizes the primary resources responsible for program management and for maintenance.

TABLE 7. ODOT TSMO ASSET CATEGORIES

CATEGORY	EXAMPLES	PROGRAM MANAGEMENT	MAINTENANCE
ITS	VMS, Drum signs, RWIS, Remotely operated gates	System Operations and ITS	TSSU
Traffic Signals	Traffic Signals, ramp meters, beacons	Traffic - Roadway	Region Electrical
Signs	Major and minor road signs	Traffic - Roadway	Region Sign Crews
Communications	Routers, Switches, Cellular routers, wireless Ethernet radio	System Operations and ITS	TSSU & Enterprise Technology
Illumination	Highway and Tunnel lighting	Traffic - Roadway	Region Electrical
Traffic Structures	Major support structures for traffic control equipment	Traffic - Roadway	Region Crews
TSMO Software & Servers	Central software systems, servers	System Operations and ITS	TAD & Server Application Infrastructure Team

Program management means responsibility for overall asset management and investment strategy.
Maintenance means day-to-day responsibility for keeping the asset category in operational condition.

ASSET MANAGEMENT PERFORMANCE MEASUREMENT GOALS

The desired objectives of the TSMO asset management performance management program are:

1. Monitor and report on trends in TSMO asset condition
2. Provide region staff data on TSMO asset-related capital project needs during the statewide transportation improvement program (STIP) update process
3. Use system data to proactively identify system maintenance needs
4. Provide accurate inventory (e.g. count, classification, install dates and location) information about TSMO assets

EXISTING PRACTICES

Existing practices vary across the categories of TSMO assets. ODOT uses a statewide maintenance management software tool (MicroMain) that provides asset management functions and can create work orders for ITS and Traffic Signals. This tool has the capability to manage TSMO assets with functions like:

- Asset Location
- Asset Attributes
- Asset Condition
- Work Order History
- Labor hours per asset

In addition to MicroMain, Traffic Signal inventory data is also currently kept in an Excel document. The Traffic-Roadway Section is planning to migrate this data into TransInfo.

ODOT maintains a comprehensive sign database which is integrated into ODOT's Transinfo system. ODOT's ITS Server inventory is also integrated into MicroMain. Similarly, the network management plan will track roadside assets and will merge into MicroMain. ODOT major traffic structures (sign bridge and cantilever structures) are included with ODOT's Bridge inventory managed by the Bridge Section. Inspection of major traffic structures is performed by the Region Bridge Inspectors. Software inventory is kept in a software maintenance work order system called request for work (RFW). No inventory of illumination exists. While some ODOT regions track illumination, a comprehensive inventory has not been implemented.

While the fact that there are multiple inventory systems isn't necessarily a problem, a consistent strategy for asset management performance measures would enable ODOT to manage their TSMO program more effectively. Specifically, a method to measure and report on trends related to asset condition is needed across all categories of TSMO assets. One example of this process would be transitioning the ITS category of assets from a life expectancy rating system to a condition rating system, similar to Traffic Signals and Major Traffic Structures. A 'snapshot' of all assets would be updated annually and included in both the Operations Program Annual Report and presentations to a wide ODOT audience.

EXHIBIT 11. ASSET MANAGEMENT CORE PERFORMANCE MEASURES

TSMO ASSET INVENTORY AND LOCATION	**LABOR HOURS PER ASSET** For ITS and Traffic Signals	**ITS - PERCENTAGE OF ASSET BEYOND DESIGN LIFE** Transition to conditional rating	**TRAFFIC SIGNAL CONDITION RATING**	**SIGN - PERCENT FAILING RETRO-REFLECTIVITY**	**STRUCTURE - CONDITIONAL**

CORE ASSET MANAGEMENT MEASURES

Six core TSMO asset management performance measures are shown in **Exhibit 7**. These performance measures were prioritized as the most important for TSMO asset management through a series of stakeholder workshops that reviewed national best practices, ODOT best practices, and ranking exercises on what would be the most useful and actionable for enhancing the program.

IMPLEMENTATION

The following section outlines how ODOT will improve data collection and track performance measures to manage their Operations Program assets over the entire lifecycle. Implementation includes:

- Identifying Data Needs and Sources
- Establishing Current and Future Performance Measures
- Completing Action Items in the Asset Management Program Area

DATA NEEDS AND SOURCES

It is difficult to summarize the data needs and data sources for the broad range of TSMO assets that ODOT maintains and operates. This is because TSMO assets are most often part of a dynamic system with multiple points of failure, and sometimes require specialized knowledge for appropriately maintaining and operating each asset. To account for this difficulty, the agency needs proactive, accurate, and effective information on the asset's lifecycle. This would include a robust inventory of asset locations and sufficient details relative to the type of asset and it's operational and maintenance needs.

A consistent process to assess asset condition with a rating would compliment the inventory. The rating would determine:

1. Design Life
2. Estimated Life Remaining

This would allow ODOT to quantify the true cost of ownership for each asset, the amount of funding that should be programmed for repairs/replacements, maintenance needs, and expected staff workload. The inventory and ratings should be kept in an enterprise database to promote interoperability and data access in a consistent platform across the agency.

There are several ways ODOT could conduct TSMO asset management data collection. Whichever method the agency goes with, it should be automated to the greatest extent possible. Potential sources for asset management data gathering include:

- Staff preventative maintenance (PM's) or reactive maintenance
- Agency work order management software
- Software or systems for active alerts or alarms for failures and status updates
- Proactive inventory or assessment effort(s)
- Network monitoring software

ODOT has made significant progress toward implementing core asset management performance measures for the Operations Program, with room for continued improvement.

DESIRED, EXISTING, AND FUTURE PERFORMANCE MEASURES

Table 8 shows all performance measures that were identified through a series of stakeholder meetings and management discussions. The table delineates each performance measure by the identified **priority level** based on it's usefulness and feasibility for action. The table also separates metrics that are currently being collected (top row) from metrics that have yet to be consistently and accurately reported (bottom row). One example of a metric that has not been consistently and accurately reported on is the FHWA's new Tunnel Inspection Program. ODOT would use the FHWA guidance to implement the performance measure, but has not done so at the time of this report.

TABLE 8. ASSET MANAGEMENT PERFORMANCE MEASURES

TSMO PRIORITY LEVEL		HIGH	MEDIUM	LOW
CURRENT TSMO METRIC?	Yes	**Asset inventory** **Traffic signal ATC deployment progress** **Asset location** **Traffic signal asset condition** **Labor hours** **ITS servers beyond design life** **ITS assets beyond design life**	Percent of signs meeting retro reflectivity goals **Structure rating (traffic structures)** Percent of proactive maintenance (ATM, VMS & Drum Signs; Signals)	None
	No	**IS asset condition and site rating** **Total or percent asset downtime (ATM, VMS & Drum Signs; Signals, Communication)** **Percent detection malfunction** **Critical network infrastructure beyond design life**	**Percent of illumination beyond service life** **Tunnel inspection (illumination)** **Percent of signals connected to a central system**	None

Bold performance measures are identified as core performance measures in this program area.

ASSET MANAGEMENT PROGRAM AREA PERFORMANCE MANAGEMENT ACTION ITEMS

There are several overarching action items that apply to all metrics in the asset management program area:

NEAR-TERM

- ✓ Track core Traffic Signal Asset Data in TransInfo and automate connections to other system that use this data
- ✓ Develop a clear inventory strategy and produce a report that details network infrastructure that's been identified as at or beyond it's expected service life
- ✓ Complete the implementation of OSP insight for the management of communications infrastructure (i.e. underground conduit, fiber, etc.)

MID-TERM

- ✓ Develop methodology for rating the condition of TSMO assets
- ✓ Produce a report showing average up time percentage for specific asset types and systems to measure and monitor system reliability
- ✓ Produce a report that evaluates detector health
- ✓ Produce a report that summarizes tunnel inspections and tunnel lighting conditions

LONG-TERM

- ✓ Develop an inventory for illumination assets
- ✓ Produce a report listing communications failures (data from solar winds, central system, and others)
- ✓ Implement the FHWA rating system for Tunnel Inspection/Lighting

COMMUNICATION STRATEGY FOR ASSET MANAGEMENT PERFORMANCE MEASURES

ASSET MANAGEMENT AUDIENCES

The primary audiences that are likely to be interested in the progression of performance measures for the Asset Management program area are:

- ITS unit
- Maintenance and operations leadership team
- Traffic Systems Services Unit
- Region and statewide traffic units
- District and region maintenance managers
- Region electrical managers
- Traffic operations leadership and standards team
- ODOT asset management and fix-it program staff

DELIVERY OPTIONS

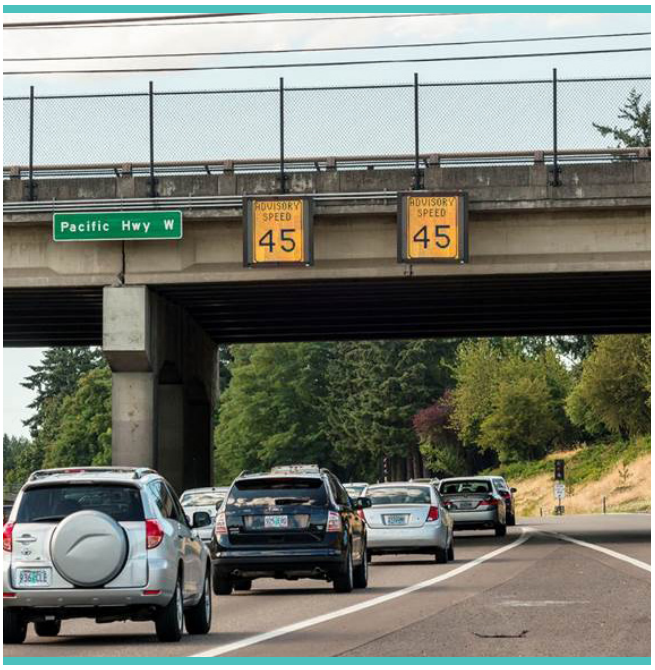
Each data set and performance measure should be delivered through different interfaces, or "views", so that staff, managers, and decision makers can access the information that is most actionable for their respective positions.

The systems currently being used at the agency are MicroMain (central database and asset management software) and PowerBI (asset reports). Neither of these systems are sufficient for the set of performance measures that were identified in this plan. An enhanced TSMO asset management tool would allow for a more clear and consistent understanding of performance measures related to asset management, and could tell a better story on overall system performance with the ability to highlight where change or action is needed. ODOT should review specific needs, gaps, and desired enhancements for the tool for each level of the agency listed above, to ensure that asset management performance measures are being communicated in a way that is useful and comprehensive.

ASSET MANAGEMENT COMMUNICATIONS ACTION ITEMS

The actions identified below summarize the primary methods for communicating and utilizing asset management performance measures within ODOT. All actions would likely be completed in the 'mid-term.'

- Share TSMO asset reports with the Operations Program leads in each ODOT region during the STIP development process
- Use asset conditions to produce a report on Operations Program funding needs
- Automate the connection of asset data to Enterprise GIS/TransGIS to continuously update agency-owned GIS layers for TSMO assets
- Incorporate performance metrics on TSMO asset management into the Operations Program annual report
- Present key asset management performance metrics in statewide or regional meetings
- Publish key Operations asset reports to the Inview General reports portal



WORK MANAGEMENT

Work Management is necessary to understand the balance between the levels of labor and workload needed to manage the Operations program and its assets. The performance measurement through this program area provides leadership with guidance for staffing and funding decisions as well as providing the ability to forecast needs in the future.

WORK MANAGEMENT PERFORMANCE MEASUREMENT GOALS

The desired outcome and objective of the work management performance management program is:

Collect, analyze, and effectively communicate metrics which improve ability to make efficient and timely staffing decisions and measure performance against level of service targets for completed work tasks and requests.

There are four goals that guide ODOT actions when implementing and measuring the progress of the ITS work management program area toward the above objective:

1. Ensure management staff has access to accurate and timely information about work load backlog to effectively make staffing decisions and facilitate decisions about work order priorities;
2. Link the ITS Maintenance Management System to the ODOT timecard systems;
3. Measure performance against work order completion time targets; and
4. Provide information to forecast future labor and budget needs as the quantity of TSMO assets continue to grow.

EXISTING PRACTICES

To manage an efficient and safe transportation system, ODOT has implemented several systems to help keep track of requests for work, work order backlog, and work activity. ODOT's IT staff utilizes both a Request for Work (RFW) System and Azure DevOps for tracking future work items. This means that work orders for ITS software systems are split and in some cases duplicated across two systems. The RFW system does track work orders by work order priority. Reporting capabilities are nearing maturity, and include:

- Work order backlog by priority,
- Average work order completion by priority,
- Work order backlog by system, and
- Work order completion by employee over a specified time period.

Micromain is the work order system used by ITS Field Maintenance staff. Micromain tracks preventative maintenance work orders in addition to repair work orders. Micromain also tracks work orders by work order priority. ODOT electrical crews have implemented Micromain for traffic signal maintenance work. Existing reports available using Micromain data include:

- Total labor hours per asset
- Preventative maintenance complete
- Average hours by asset by region
- Work order backlog for ITS Field Maintenance, by assigned employee, and by shop

Although at a fairly high level, ODOT captures maintenance information about other TSMO assets such as signs and illumination in a separate maintenance management system. The system does not track data at the asset level but instead tracks data about labor hours.

CORE WORK MANAGEMENT PERFORMANCE MEASURES

Six core work management performance measures are shown in Exhibit 12. These performance measures were prioritized as the most important for traveler information through a series of stakeholder workshops that reviewed national best practices, ODOT best practices, and included ranking exercises to determine which performance measures would be the most useful and actionable for enhancing the program.

Exhibit 12 indicates which performance measures are currently being reported (teal background) and which performance measures will be established in the future (white background). Future performance measures require more effort to establish at this time. Basic definitions of each core performance measure are also listed below.

IMPLEMENTATION

The following section outlines how ODOT will improve data collection and track performance measures to support the work management program. Implementation includes:

- Identifying Data Needs and Sources
- Establishing Current and Future Performance Measures
- Completing Action Items in the Work Management Program Area

DATA NEEDS AND SOURCES

As seen in **Exhibit 12**, the majority of the core Work Management performance measures are currently reported on. The data systems in place, the RFW system (software systems) and MicroMain (roadside assets), collect the data required.

DESIRED, EXISTING, AND FUTURE PERFORMANCE MEASURES

Table 9 shows all work management related performance measures that were identified through a series of stakeholder meetings and management discussions. The table delineates each performance measure by the identified **priority level** based on current technological capabilities and feasibility for agency. The table also separates metrics that are currently being collected (top row) from metrics that have yet to be consistently and accurately reported

EXHIBIT 12. WORK MANAGEMENT CORE PERFORMANCE MEASURES

CURRENTLY ASSIGNED WORK ORDERS BY EMPLOYEE	RECENTLY CLOSED REQUESTS FOR WORK	WORK ORDER BACKLOG	CENTRAL SYSTEMS MAINT TEAM (CSMT) WORK CLASSIFI-CATION	CENTRAL SYSTEMS MAINTENANCE (CSMT) TEAM RESOURCE TREND ANALYSIS	ITS PROJECTS AND ASSET MAINTENANCE GROWTH
Number of currently assigned work orders per employee.	Number of recently closed Requests for Work per week.	Number of Requests for Work that are open in the system per week.	Number of Requests for work and hours expended by work classification type (e.g. new infrastructure.	Metrics that relate CSMT resource demands based on growing infrastructure elements (e.g. cameras, VSL corridors, etc.)	The number of active ITS projects and requests for work/ Micro-Main tickets for assets.

Existing Performance Measures | Future Performance Measures

TABLE 9. WORK MANAGEMENT PERFORMANCE MEASURES

TSMO PRIORITY LEVEL		HIGH	MEDIUM	LOW
CURRENT TSMO METRIC?	Yes	**Currently assigned RFWs per employee** **Recently closed RFWs per day/ week/or month** **ITS Work order backlog by month** **CSMT Work Classification**	**CSMT Resource Trend Analysis** Annual maintenance costs by asset **Time to complete work orders by priority and asset type** Priority work order effort compared to other work efforts Annual number of hours expended by work classification and system	
	No	**ITS Project/Asset Growth**	**Work activity tracking** System uptime	Staff vs work order ratio

Bold performance measures are identified as core performance measures in this program area.

(bottom row). **Core performance measures** are also bolded in the table to show which measures are most important for measuring traveler information. The metrics listed below are not considered to be comprehensive, but rather, reflect the state of the work management practices within ODOT and on a national scale.

Action plans for each core performance measure are further detailed in the sections below.

WORK MANAGEMENT PROGRAM AREA PERFORMANCE MANAGEMENT ACTION ITEMS

The following lists the priority work management performance measures implementation items:

NEAR-TERM

- ✓ Continue efforts to enhance MicroMain to work for traffic signal work management.
- ✓ Develop a report showing the labor hours by priority for both field maintenance and central systems maintenance through Transportation Environment Accounting and Management System (TEAMS).
- ✓ Work towards a common nomenclature for both CSMT and Field Support for work classification.
- ✓ Continue efforts to develop reports showing work effort expended (hours) per work classification.

MID-TERM

- ✓ Provide training for staff using the RFW or DevOps systems to understand the work flows associated with each system.
- ✓ Develop trend analysis reports that predict CSMT operational workload based on infrastructure growth data.

LONG-TERM

- ✓ Create a report forecasting future maintenance costs based on historic average cost per asset type per region to assist with budgeting.
- ✓ Enhance data warehouse work to allow TEAMS data with MicroMain data to allow reporting of cost per asset in addition to labor hours per asset.

Work management is necessary to understand the balance between labor and workload.

WORK MANAGEMENT PERFORMANCE MEASURES COMMUNICATION

WORK MANAGEMENT AUDIENCES

The primary audiences that are likely to be interested in the progression of the Work Management program area performance measures are

- ITS manager
- TAD ITS program manager and team leads
- Region electrical managers
- TOC managers
- Region maintenance and operations teams
- Region traffic managers
- TSSU manager

DELIVERY OPTIONS

Presenting performance measure results should be tailored to the wide variety of audiences that will be using the data. Each performance measure or data set should have several different visualization options so that staff, managers, and decision makers can access the graphic or information that would be most actionable for their respective jobs. Where a decision maker might need a snapshot of the statewide performance to make budget decisions, a IT engineer might need a more detailed view of an ITS system's performance.

WORK MANAGEMENT COMMUNICATIONS ACTION ITEMS

The following are specific action item towards enhanced communication of work management performance measures:

NEAR-TERM

- ✓ Continue to update the monthly ITS field maintenance assigned work order report (TOC managers report) so that it is accessible on INVIEW.
- ✓ Distribute monthly report of CSMT work order assignments to ITS manager, TOC managers, and ITS program leads.
- ✓ Develop a strategy to clearly explain and identify automated reports and subscriptions.
- ✓ Continue to enhance annual report summarizing TSMO maintenance accomplishments and work backlog.