

**TRANSPORTATION
PERFORMANCE MEASURES
FOR OUTCOME BASED SYSTEM
MANAGEMENT
AND MONITORING**

Final Report

SPR 753



Oregon Department of Transportation

TRANSPORTATION PERFORMANCE MEASURES FOR OUTCOME BASED SYSTEM MANAGEMENT AND MONITORING

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16. Abstract The Oregon Department of Transportation (ODOT) is mature in its development and use of performance measures, however there was not a standard approach for selecting measures nor evaluating if existing ones were used to inform decision-making. This research report inventories ODOT's high-level performance measures, compares them to Federal, State, and Agency goals, identifies a framework to determine the suitability of performance measures and select new ones, and identifies new recommended measures. The outcomes of the project include a framework for evaluating and selecting measures, and recommended Key Performance Measures for the Agency.			
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*SI is the symbol for the International System of Measurement

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1.0 INTRODUCTION

The Oregon Department of Transportation (ODOT) has used performance measures to monitor the State's transportation system for years. Collecting data has helped ODOT better track asset condition, evaluate system performance, project the outcome of investment choices, and communicate with external decision-makers and stakeholders.

Nevertheless, opportunities remain to improve agency performance measurement and reporting practices. ODOT staff note the need for better coordination among goals, measures, and reporting procedures within the agency and alignment with trends and requirements emerging at the Federal and state levels. Better alignment and coordination of goals and measures could reduce duplication of effort and streamline reporting procedures, and could improve communication with state decision-makers and Federal funding agencies.

The objectives of this ODOT Research Section study are to improve efficiency through better coordination among goals, measures, and reporting procedures within the agency; align goals and measures with emerging Federal and state trends; and improve the usefulness of performance measures through better data collection, analysis, and communication.

The study included the following tasks:

- Task 1: A synthesis of high-level, transportation-related goals reported in select ODOT, State of Oregon, and Federal planning documents. The review focused on goals most relevant to budget decisions and communication with external stakeholders.
- Task 2: An inventory of ODOT's major performance measures and an assessment of performance reporting practices based on a review of ODOT's key performance reports and interviews with ODOT staff.
- Task 3: A targeted review of other Departments of Transportation's (DOT) performance measurement programs to identify performance measures and reporting practices that may be applicable to ODOT's program and address issues identified in the Task 2 report.
- Task 4: A recommended set of core performance measures. These measures were drawn from existing ODOT measures and augmented with proposed additional new measures, some of which had been identified in Task 3 report as best practices from other DOTs.
- At this point, a half-day workshop with ODOT staff was conducted as part of this task to obtain feedback and guidance before proceeding further with development of data requirements and final recommendations.

- Task 5: Development of an evaluation framework to help ODOT assess how effectively different performance measures track progress and support management and investment decisions related to state transportation policies and goals.

This final report presents a summary of findings and recommendations, including the recommended Key Performance Measures (KPM) and other core performance measures, in Chapter 4.

2.0 PERFORMANCE GOAL AREAS

An important project objective was to identify areas of overlap as well as gaps in existing performance measurement and reporting. This objective was approached by identifying a small number of transportation system goals around which existing and potential performance measures could be organized for review and assessment.

The first main task of this research project identified the numerous areas of performance for which goals, objectives, and/or targets have been established at ODOT. This includes goal areas established by official ODOT policy documents, such as the Oregon Transportation Plan (OTP); the various modal plans, such as the Oregon Highway Plan; and general performance reporting documents, including the Annual Performance Progress Report (APPR), State of the System Report, and the Sustainability Program Report.

The project team inventoried the transportation-related goals included in selected ODOT, state, and Federal planning documents. The synthesis focused on high-level goal areas for transportation, that is, those most relevant to budget decisions and communication with external stakeholders about broad outcomes, critical attributes of system performance, and agency effectiveness. Specifically, we looked at the following sources:

- Moving Ahead for Progress in the 21st Century Act (MAP-21) and American Association of State Highway and Transportation Officials (AASHTO) performance goal areas;
- ODOT Goal Areas from the OTP, APPRs, State of the System Report, Modal Plans, and other ODOT planning and policy documents; and
- Other State of Oregon goal areas, including the Governor’s 10-Year Plan goal areas and Statewide Planning Goals, and goal areas found in other Oregon state agency documents.

To help consolidate similar goals and reduce the total number of goal areas, we began by organizing the numerous goals from these sources into three categories:

1. Goals related to broad societal outcomes that are supported through investment in the transportation system: safety, economic vitality, sustainability, and public health/livability.
2. Goals more directly focused on transportation system performance and condition, including mobility and congestion reduction, accessibility, preservation, freight movement, and system reliability.
3. Goals related to internal agency processes, including project delivery, transparency and coordination, and funding. The APPR goal area of “Stewardship” includes a number of these subareas.

Twelve relevant high-level goal areas emerged from this process:

1. Safety
2. Economic vitality
3. Sustainability
4. Public Health/Livability
5. Mobility and Congestion Reduction
6. Accessibility
7. Preservation
8. Freight Movement
9. System reliability
10. Project delivery
11. Transparency/coordination
12. Funding

The twelve goal areas were further consolidated by giving higher priority to those mentioned in multiple planning documents, and considering those which are required by the Federal government and the State. The following three groupings of goal areas guided this further synthesis and consolidation of goal areas:

Group 1: Goals appearing in MAP-21, the ODOT Annual Performance Report, and the Governor's 10-year plan. The agency already tracks these goals annually, and continued tracking is likely needed due to Federal and state requirements. These goal areas include:

- Safety
- Economic Vitality
- Sustainability
- Mobility and Congestion Reduction (grouped together, although each may require different performance measures)
- Project Delivery
- Preservation and Maintenance

Group 2: A second group of goal areas includes those required in MAP-21 or the Governor's 10-Year Plan but that not currently tracked in the APPR or named explicitly in the OTP.

- System Reliability
- Freight Movement

Group 3: A third group includes a subset of additional goal areas listed in the OTP and/or other Modal Plans, but not in MAP-21 or the Annual Performance Report.

- Accessibility
- Transparency and Coordination
- Public Health, Livability, and Quality of Life
- Funding
- Other goals that are grouped with related goals, such as security with safety, and connectivity with mobility

Applying the approach above, a recommended set of goal areas were created by including the overlapping goals in the first group, required goals from the second group, and selected additional goals from the third group. Additional emerging areas of policy focus such as intermodalism, emphasis on technology, or carbon-efficient transportation can be addressed through the inclusion of relevant objectives and performance measures under this group of core goals. The following structure of core goal areas for agency-wide performance reporting was recommended to ensure coverage of the key topical areas, while streamlining the process by nesting related system objectives or attributes (e.g., congestion reduction, reliability) under the higher-level common goal (e.g., mobility).

1. **Safety** (including system security).
2. **Economic Vitality** (including reliable freight movement).
3. **Sustainability** (including objectives related to climate change).
4. **Mobility** (encompassing other system performance objectives related to congestion reduction, accessibility, connectivity, and reliability for people and goods).
5. **Preservation and Maintenance** (i.e., system condition).
6. **Stewardship** (encompassing project delivery and other objectives related to transparency, coordination, and customer service).

While there are numerous possible variations on a defined set of core goals, the list above reflects the current state of emphasis among ODOT policy documents, Oregon executive-level initiatives, and Federal guidance.

3.0 PERFORMANCE MEASURES INVENTORY AND ASSESSMENT

This chapter presents the results of research tasks that provided an inventory and assessment of current ODOT performance measurement and reporting practices. We identified the specific performance measures collected and reported by various ODOT units in each of the three broad goal categories identified in Chapter 2 (i.e., societal outcomes, system condition and performance, and internal agency processes). This inventory and assessment provided an initial snapshot of coverage. We interviewed a number of ODOT staff involved in collecting, reporting and using performance data to help identify gaps in coverage or areas where staff themselves saw a need for improvement. We identified those specific goal areas where there seem to be insufficient metrics reported to adequately describe performance and progress towards high-level agency goals, or towards anticipated goals driven by MAP-21 and the 10-Year Plan for Oregon. Through a literature review and interview with select peer agencies, we identified a number of performance measures that would help close these gaps.

In the following sections we identify those areas of performance measurement that seem to be well-covered by existing measures, and then go on to describe in greater detail the areas where we found the evidence of room for improvement. These areas of improvement are discussed both in the context of broad goal categories, and the recommended policy goal framework presented in the previous chapter. (Specific recommendations for performance measures are presented in Chapter 4).

3.1 WHAT'S WORKING?

Performance measurement and reporting at ODOT are better established and more comprehensive for some goal areas than others. While improvements can always be made to the process and product, the following goal areas for the most part seem well-covered by mature performance measures that have been refined over time.

3.1.1 Measures of Societal Outcomes:

- Safety, particularly for highway system users (e.g., traffic fatalities and injuries, large truck at-fault crashes, highway-railroad at-grade crossing incidents, etc.).
- Sustainability of ODOT operations (e.g., greenhouse gas (GHG) emissions from all ODOT sources, biodiesel fuel use by ODOT fleet, etc.).

3.1.2 Measures of System Condition and Performance:

- Highway system condition (e.g., pavement and bridge condition).

- System utilization, particularly for motorized transportation modes (e.g., highway vehicle miles of travel, passenger rail ridership, alternative mode commuting).
- Highway system performance (e.g., hours of travel delay in urban areas, incident clearance).

3.1.3 Measures of Internal Agency Processes:

- Productivity of core agency processes (e.g., project completion timeliness, construction projects on budget, on-time project delivery).
- Customer satisfaction (e.g., overall customer satisfaction with ODOT, customer service levels at the Department of Motor Vehicle (DMV)).

In addition to the multitude of measures reported by various ODOT divisions and sections, a large number of prospective performance measures were developed as part of the ODOT “MOSAIC” Least Cost Planning effort. These are intended to support transportation planning and decision-making with information about total life-cycle costs, and the broad benefits and impacts of different investment alternatives. These measures are not currently generated or reported on a regular basis for ongoing performance monitoring, but rather are used to evaluate program or project alternatives. The MOSAIC Transportation Access Index, as well as MOSAIC measures proposed for the Economic Vitality, Quality of Life/Livability, and Funding goal areas, may be worth further evaluation to see whether they can be regularly generated and reported in a way that supports overall agency assessment of progress in these goal areas.

3.2 WHERE ARE IMPROVEMENTS WARRANTED?

The following areas seemed most likely to warrant additional measures to adequately define performance and progress:

3.2.1 Societal Outcomes:

- Safety for non-motorized travelers, an area of growing attention as the number of bicyclists and pedestrians increases in many parts of the State.
- Economic contributions/impacts of transportation investment and utilization, including the economic benefits of freight system investments.
- Sustainability, particularly at the level of KPMs contained in the APPR and Quarterly Business Reviews (QBR).
- Environmental Justice (or Equity) (i.e., the degree to which the transportation system impacts defined groups, particularly minority and low-income populations).
- Public health benefits and impacts from transportation investments.

3.2.2 System Condition and Performance:

- Freight movement, particularly as it contributes to economic vitality.
- Freight mobility for modes other than highway.
- Mobility for non-motorized passenger travel (pedestrian and bike), particularly measures that capture system utilization, quality, and connectivity.
- Mobility measures that zero in on Accessibility and Reliability, for highway and other major modes as well.
- Predictive measures of system condition, providing ODOT with the ability to better forecast future rehabilitation and replacement needs.

3.2.3 Internal Agency Processes:

- Stewardship objectives related particularly to employee retention, succession planning, and leadership development. Staff noted concern about the future impacts of attrition to ODOT capacity and institutional memory.
- The benefits of employee training.
- Funding availability and utilization.

While there may be other goal areas where other state DOTs are conducting innovative and useful performance reporting, the purpose of this task was to focus on those areas that current ODOT practice appeared to support less. To help identify potential measures to close the gaps in coverage, we conducted a targeted review of performance measures used by other agencies. This included an assessment of other state DOTs and metropolitan planning organizations' (MPO) performance measurement programs, and focused on those goal areas identified above that are not as thoroughly addressed by the performance measures currently monitored at ODOT.

3.3 RECOMMENDED IMPROVEMENTS BY GOAL AREA

Here we summarize general recommendations for improvement by the six major goal areas, as well as some subareas that fall within one of the six goals. Recommendations for specific performance measures are presented in below in Chapter 4.

3.3.1 Safety

Because highway and traffic safety is a relatively mature area of data analysis performance reporting, most of the recommended improvements in this goal area are related to non-motorized travel. With the growing emphasis on non-motorized transportation modes as part of the solution to the State's mobility and environmental goals, there is increased concern about the potential for significant increases in the number of incidents involving bicyclists and pedestrians that result in injury or fatality.

3.3.1.1 Gaps in Coverage:

- Improved reporting and data collection on crashes and incidents involving bicyclists and pedestrians is needed. Since the number of incidents involving non-motorized modes is low relative to the population, absolute values (number of events by location type, time of day, etc.) will be more meaningful than crash rates per capita or per mile of travel.
- The occurrence and location of incidents with fatalities or serious injuries that do not involve a motor vehicle are not well-reported (e.g., a pedestrian-to-bike collision, or solo bicycle incident). These data could be used together with cyclist and pedestrian behavioral data (e.g., from modified household travel surveys) to target improvements where most beneficial. Data collection is the challenge here, as many, if not most, incidents that do not involve a motor vehicle go unreported.

3.3.2 Economic Vitality

The focus of the economic vitality goal area is to promote the expansion and diversification of Oregon's economy. The OTP notes that efficient goods movement is critical to the State's economy. MAP-21 places particular emphasis on the role of freight mobility and reliability in supporting economic activity. Performance metrics should measure how efficiently the transportation system facilitates economic activity by providing mobility and reliability for people and freight movement, and by connecting markets.

3.3.2.1 Gaps in Coverage

Additional performance measures capturing the following elements of the freight system would help ODOT to more effectively monitor the relationship between the transportation system and economic vitality, including:

- The amount or value of freight moved, broken out by major modes;
- One or more measures of freight mobility, delay, or reliability;
- The condition of the freight system on important freight routes;
- One or more of the MOSAIC Economic Vitality indicators that are derived from transportation performance data and which capture the economic benefits of more efficient transportation services.

3.3.2.2 Oregon Freight System Performance Measures Findings

The *Oregon Freight System Performance Measures* report¹ identified 23 performance measures covering highway, rail, and water freight modes for near-term implementation, addressing five performance categories: 1) demand, 2) safety, 3) condition, 4) mobility,

¹ Oregon Freight System Performance Measures, Task 1 Final Report, January 2012.

and 5) economic vitality. That report's Appendix A details how these 23 performance measures were selected from a longer list of 33 measures in the initial recommendation, based on the relevant freight issues identified in the *Oregon Freight Plan*. Ten of those measures were considered for inclusion in ODOT's core performance measures, as they address the most relevant freight issues identified in the Oregon Freight Plan.

3.3.3 Sustainability

Sustainability focuses on how Oregon's transportation system – including construction, operation, and ongoing maintenance – affect natural resources and the environment. Performance metrics should measure the environmental impact of Oregon's transportation system and the ability of ODOT projects and operations to meet Oregonians' transportation needs without compromising the well-being of future generations.

3.3.3.1 Gaps in Coverage

The biannual Sustainability Report provides detail on the sustainability of ODOT internal operations, but improved or additional measures are warranted at the QBR level to monitor the impact of ODOT construction, operation and maintenance on the natural environment². Improving performance measures in the following areas would help to track the relationship between the transportation system and environmental sustainability:

- VMT reduction; and
- More quantitative measures of the impact of ODOT actions on streams and habitat (e.g., the number of acres of wetlands or miles of streams restored (beyond project mitigation requirements) or the acres/miles of habitat gained as a result of culverts removal or modification).

3.3.4 Environmental Justice

The objective of tracking performance in environmental justice is to monitor ODOT's progress in providing equitable access to transportation services, and to help ensure that transportation system construction, operation, and maintenance do not cause disproportionately adverse impacts on any Title VI protected group, particularly minority and low-income populations.³

At this time, ODOT does not report performance measures that specifically address environmental justice. One practical approach to measuring environmental justice is to use the same measures that are used to monitor transportation system impacts and benefits for the State's population at large, and then disaggregate the results to report specifically on the identified

² We use the term "operation" here to include the use of the transportation system by travelers, as well as the operation of certain elements of the system by ODOT or its partners (e.g., incident management or metering lights).

³ The 1999 Federal Highway Administration (FHWA) and Federal Transit Administration (FTA) memorandum, *Implementing Title VI Requirements in Metropolitan and Statewide Planning*, notes that while Title VI and environmental justice have often been raised during project development, it is important to recognize that the law also applies equally to the processes and products of planning.

groups of concern. These measures could include access to public transit and jobs, as well as affordability of transportation (e.g., annual household transportation costs).

ODOT might start by defining the populations of most interest and relevance for monitoring environmental justice, and then determine which issues (e.g., accessibility, health – are of most interest from a policy perspective). The literature review reveals that protected groups are defined differently by different agencies and reflect local priorities and policies, but Federal law specifically calls out minority and low-income populations.

ODOT should be able to estimate the distribution, or incidence, of results of several KPMs across these defined population groups. The performance measures most likely to be of value to decision-makers when disaggregated across these groups includes household transportation costs, accessibility to transportation services, accessibility to employment and essential public services, exposure to certain mobile source emissions, and traffic injury/fatality rates.

Several environmental justice concerns are best monitored at a finer geographic scale than statewide, and Oregon’s MPOs may need to be engaged to model and measure the differences in accessibility, localized pollutant emissions, etc., among communities or sub regions.

3.3.5 Public Health

Public health performance measures are intended to measure impacts the transportation system may have on the public health and well-being of Oregonians. These may include direct measures of transportation’s contribution to causal factors, such as mobile source particulate emissions. These could also include outcome measures that measure impact in terms of increased incidence of diseases with clearly established linkages to mobile source emissions, health care costs, or the economic cost to society of premature deaths from diseases known to be related to transportation emissions.

Another emerging area of public health impact measurement is the link between utilization of active transportation (biking and walking in particular) and improved public health, as measured by incidence of obesity or diseases to which obesity is a precursor or contributing factor. The difficulty, as expressed by some ODOT staff and other agencies as well, is in determining clear linkages and causality between transportation investment decisions and these outcomes.

Injury and fatality rates and costs are also public health concerns, and these impacts are covered under the safety goal area.

Currently, ODOT does not report performance measures that address the relationship between the transportation system and public health. Our literature review found that MPOs and large urbanized counties are more likely than state DOTs to employ performance measures of public health impacts of transportation; these are sometimes provided as estimates or forecasts of future public health impacts of Metropolitan or Regional Transportation Plans. ODOT might consider using a similar approach to compare alternative policy or investment scenarios in future modal or system-wide plan updates.

3.3.6 Mobility

The mobility goal area focuses on providing transportation options to Oregonians so that they can reach desired destinations in a reasonable amount of time. Availability of alternatives to the single-occupant vehicle has been an ODOT policy objective for some time, and the current selection of Mobility KPMs reflects this orientation. However, beyond general mobility, the following areas are not thoroughly covered by current ODOT measures:

- Non-motorized mobility (e.g., the ability to reach destinations via non-motorized modes, including walking and biking);
- Accessibility (e.g., land use characteristics and populations' proximity to transportation infrastructure); and
- Reliability (i.e., the predictability of travel time) for highway and transit modes.

3.3.6.1 Non-motorized Mobility

A comprehensive look at non-motorized travel is needed to identify the most appropriate improvements across several fronts. The current non-motorized measures are limited to quantity and “presence” measures (i.e., they reflect the availability of non-motorized facilities, but do not measure utilization, quality, etc.). ODOT should consider developing the ability to calculate a range of measures that describe the utilization, quality, and safety of the non-motorized infrastructure, such as:

- Bicycle and pedestrian volumes on key routes and crossings (e.g., pedestrian/bike bridges that cross major barriers such as freeways and rivers).
- Prevalence of household use of cycling and walking for trip purposes other than commuting.
- System quality descriptors, such as number of lanes and pavement quality on bike routes. Indexes such as the “Bicycle Level of Comfort” (BLOC) have been generated using these types of factors as inputs.
- Connectivity of bicycle and pedestrian facilities.

3.3.6.2 Accessibility and Reliability Measures

Accessibility can be described as time to reach a particular destination (e.g., employment, medical care, freight terminal); the availability of alternative modal choices; and the connectivity offered within and between modal systems. Currently, ODOT primarily reports on availability and connectivity (e.g., percent of urban state highway miles with bike lanes and sidewalks), and not on the time or spatial relationship between transportation system users and their preferred destinations.

Reliability is often defined as travel time reliability (i.e., the degree to which a trip can predictably be made within the expected duration). ODOT does not report a travel time reliability measure, although the MOSAIC project proposed reliability indexes based on both recurring and nonrecurring delay. Existing measures of ODOT operations that impact travel reliability include incident clearance times on urban highways and snow/ice/rock fall removal times on all highways; these should be continued.

Although ODOT does not broadly report any measures of accessibility or reliability, there are isolated instances of such measures being generated, and research has been undertaken to develop a comprehensive accessibility measure. The agency should consider further development and reporting of spatially based measures of access to important destinations, services, etc., via highway, transit and non-motorized modes.

- While accessibility is more often measured at the local and regional scale, Florida DOT measures percent of population within 30 minutes (drive time) of employment centers, airports, and passenger rail stations; and quantifies the adequacy of highway access, as measured by Level of Service, to freight rail terminals, air and marine ports.
- ODOT should continue to pursue development of the Transportation Cost Index (TCI), a measure of multimodal accessibility, to augment the other mobility-related measures. Implementation of the TCI might eliminate the need to develop and report other proximity-based accessibility measures, which are typically data intensive and applicable primarily in urbanized areas.
- ODOT should pursue development of a reliability measure or index for urban highway and transit systems; compatibility with MAP-21 guidelines or requirements should be maintained.

3.3.7 Preservation

ODOT staff singled out the inability to forecast bridge replacement needs sufficiently far into the future as a shortcoming. Further work is needed to confirm whether ODOT has the data and analytical tools (software) to generate forecasts of future bridge and pavement condition under different investment scenarios. It also needs to clarify how this information would be used to inform budgeting or other resource allocations decisions.

3.3.8 Stewardship/Internal Agency Processes

ODOT's stewardship goal area focuses on how efficiently internal agency processes function to deliver projects, programs, and services. ODOT reports several performance measures on its dashboard that monitor internal agency processes, and tracks a larger number of measures reported in the QBRs for various leadership teams. These include construction jobs, contracting timelines, completion timeliness, projects on budget, certified businesses, customer service, office wait times, phone wait times, and title wait times.

3.3.8.1 Employee Retention and Succession Planning

Performance measurement under the Stewardship goal is fairly comprehensive and does not reveal many obvious gaps. Discussion with ODOT staff nonetheless revealed some concerns about the loss of agency capacity and “institutional memory” resulting from staff departures due to retirement and other attrition. ODOT Human Resources reports a vacancy rate and a separation rate⁴. These measures describe the rate of change in headcount, but do not directly address the issue of employee retention or the loss of more experienced staff with significant tenure. (ODOT does measure exposure to turnover specifically from retirement i.e., the percentage of employees eligible for retirement in the current year and five years out.)

ODOT should consider additional measures to more accurately understand the cause and effects of separation, and to project future staff replacement needs. While these may not rise to the level of KPMs, they could be useful at the QBR level. We looked at other agencies for examples of more distinct measures of retention and found a few relevant examples, any of which could be adapted to augment ODOT’s current retention-related measures. Potential new or modified measures to address these internal issues include:

- A separation index, disaggregated by type or level of employment, benchmarked to peer organizations;
- Percentage of employees retained after three years;
- A “stability index” to reveal the average tenure of staff, in a single index or number.

3.3.8.2 Leadership Development

ODOT staff also singled out the need to measure the benefits, including avoided future costs, from investment in staff development and capacity building. Although measures of the value or productivity benefits of leadership training almost certainly exist, we have not identified appropriate measures for ODOT.

3.3.8.3 Funding Availability and Utilization

Capital and operating cost data are closely tracked and reported. As suggested by the MOSAIC project, a potentially useful new measure or index would report the percentage of project or program costs that are paid for by different sources, including direct user fees (tolls, mileage-or weight-based fees, etc.); and other state or Federal agencies through grants, loans, and/or multiagency funding initiatives. The desire is to track and, presumably, increase the amount and percentage of “new” funding that can be generated to support continuation or expansion of valuable programs. To the extent that Public-Private Partnerships are largely a method of financing rather than a source of funding, they should track separately rather than intermingled with funding sources.

⁴ Defined generally as the number of employee departures, or “separation count,” divided by the average employee count over the same timeframe, usually one year.

4.0 RECOMMENDED PERFORMANCE MEASURES

This chapter identifies a set of recommended core performance measures that will support the goals areas identified in Chapter 2. Initially, a broad set of measures were developed based on existing ODOT measures, new measures identified in the literature review, and measures expected to be required by MAP-21. These measures were presented to a number of ODOT staff at a one-half-day workshop.

The workshop served as a forum to present initial recommendations to ODOT and obtains feedback regarding which measures would most likely add value to improve decision-making and enhance communication at ODOT. The workshop was structured around existing ODOT measures that are working well, measures that could use improvement, and new measures that should be considered for adoption.

Following the workshop, the project Technical Advisory Committee (TAC) requested that a more structured evaluation be conducted of the complete list of available performance measures under consideration. The research team developed an evaluation process or framework built around several criteria, such as whether a measure focuses on desired policy outcomes rather than contributing factors, or monitors something that can be influenced by ODOT. The team conducted an assessment of over 90 measures by applying this evaluation framework, and prepared a revised set of core performance measures.⁵

4.1 SUMMARY OF EVALUATION RESULTS

The following is a brief summation of the assessment of measures, arranged by goal area.

4.1.1 Safety

The safety measures had the highest average scores of any of the goal areas; this is in part because the measures are, by and large, mature. Data exists, the measures are well-understood, and the connection to Federal and state policies and goals is clear. Less obvious candidates for inclusion in the core set are those safety measures that pertain to a specific modal subsystem or a demographically-defined user population. Interestingly, the emerging MAP-21 measures may push ODOT in the direction of tracking these more specific metrics, due to Federal policy initiatives on issues including elderly drivers and high risk rural roads.

4.1.2 Economic Vitality/Freight Mobility

The highest-scoring measures in this goal area all relate to the efficiency of truck travel on freight routes. This is in part because the data are more readily available than some of the

⁵ A detailed description of the evaluation process and results is presented in Technical Memorandum 5, Performance Measure Evaluation Framework and Data Assessment, revised May 2014.

measures that attempt to identify cumulative value of freight shipments, or performance data for modes other than highways. The implication is that the current availability of data should not be weighted as heavily as some of the other criteria in this evaluation process if ODOT is willing to invest in new data collection efforts in order to address some of the performance monitoring gaps. While data availability is an important consideration, it should not prevent the inclusion of measures that appear to be effective in driving policy decisions. The other takeaway from this evaluation is that multiple redundant measures should be avoided if they are essentially measuring variations of the same system characteristic or quality.

4.1.3 Sustainability

Few of the sustainability measures were highly scored by the evaluation methodology; this may suggest there is a weak connection between the measures that were chosen for evaluation and ODOT policy on sustainability. This is one of the harder goal areas to describe in terms of specific measures that relate directly to ODOT investment decisions. Several of the measures scored only average, or worse, on criteria such as influence, usefulness, and focus. What is clear is that the core set should include at least one measure each related to transportation emissions and fuel consumption (or alternative fueled vehicles). Less clear is how these measures will influence ODOT decisions about system investment, and the overall impact on sustainable transportation.

4.1.4 Public Health

Although the MOSAIC project provides potential measures of the public health and transportation interface, ODOT participants in the project workshop advised against adopting measures of public health outcomes attributed to transportation (e.g., premature deaths due to Fine Particulate Matter (PM_{2.5}) exposure); or of transportation system attributes that contribute to reduced health (e.g., number of households located less than 500 feet from high-volume roadways). The preferred approach instead is to report on transportation system attributes over which ODOT has reasonably direct control, and that have the potential to contribute to improved public health (e.g., these could include measures of the availability of non-motorized or active transportation options). Caution was suggested in measuring public health outcomes that imply direct causality between transportation investment decisions and health outcomes, positive or negative.

4.1.5 Mobility

Evaluation results of numerous mobility-related measures suggest two things. One, there is currently more data available to support measures of mobility than of accessibility. Two, there are significant data needs to bring other modes into equal footing with highways, beyond simple measures of utilization or presence of infrastructure or service. The higher-scoring measures address delay and reliability of the highway system, unquestionably a high priority for the State. However, measures of quality of performance and condition, and outcomes for users are much scarcer for the other modes. Future work should focus on improving the ability to generate comparable quality of service and outcome measures for cycling, walking, and intercity public transit. The recommended set of KPMs and other core measures include several mobility

measures that scored only average on the quantitative assessment. These are recommended for inclusion in the core set of measures until data improvements allow replacement with measures that are more clearly linked to desired policy outcomes.

4.1.6 Preservation and Maintenance

The more effective measures here focus on highway and bridge infrastructure condition, but again, this is partly because of the weight given to measures for which data is readily available. Because predictive models (e.g., deterioration models, needs analyses) are well-established for pavement and bridge, these measures should continue to evolve in the direction of providing the ability to estimate future performance under varying funding levels; a capability that is more elusive in the other goal areas. These are the more useful measures in linking investment decisions to future condition and performance. Future developments at a national level may provide a more comprehensive measure of overall pavement “health” than is provided by any single current measure.

4.1.7 Stewardship

None of the measures evaluated in this goal area scored particularly well, and some did especially poorly in the areas of focus, diagnostic capability, and relevance to ODOT planning and programming decisions. This suggests that several of the existing measures are not found to be particularly useful for decision-making or in defining outcomes for transportation system users. A reassessment of the intent of the stewardship goal area, and of the existing performance measures that have evolved to inform ODOT management teams, should be considered. A number of existing stewardship measures, including several current KPMs, are appropriate for monitoring and managing program-level outcome and accountability, but less useful in strategic decision-making or resource allocation across divisions. Examples include measures such as the percent of contracts going to construction phase within a certain number of days of target date, roadway closure clearance times, and DMV customer service wait times. To the extent that these measures serve primarily to assess internal operations of ODOT’s business lines and support decisions about allocation of resources within those lines, they are less suitable as KPMs. If they are instead perceived as indicators of overall agency effectiveness and customer service levels, and are used to inform executive decisions about strategic investment, they would be appropriate as KPMs.

4.1.8 Recommended Measures

Results from the application of the evaluation framework were combined with findings from the previous project tasks and workshop discussion to develop a revised recommended set of KPMs for high-level reporting, as well as a supplemental set of core performance measures to guide decision-making. In many cases, the quantitative evaluation results provided a sense of which existing ODOT measures should be carried forward and which could be archived without much loss of information or fidelity for decision-makers and the public at large.

There are, however, several measures recommended for inclusion in either the KPMs or the core measures that did not score particularly well in the criterion-based evaluation process. This was,

in some cases, due to the lack of a better measure in a performance area where some level of monitoring and reporting is preferable to none. An example of this is in the area of multimodal mobility, where the availability of data for modes such as intercity transit or bicycling does not support more sophisticated measures about system quality or performance. In these examples, basic measures of availability (e.g., percent of highway miles with bike lanes and sidewalks) or utilization (e.g., number of special transit service rides) are the best available proxies for more illuminating measures currently available. The recommendations, summarized in a series of tables below, include numerous notations about such limitations and potential future measures to consider as data availability improves.

The recommended actions are summarized in four tables that follow:

- **Table 4.1.** Recommended KPMs
- **Table 4.2.** Other Recommended Core Performance Measures
- **Table 4.3.** Possible MAP-21 Performance Measures
- **Table 4.4.** Measures Recommended for Discontinuation or Archiving

4.1.9 Recommended KPMs

Table 4.1 presents 22 recommended KPMs. These would typically be contained in public documents, such as the APPR and on-line dashboards for both internal management use and external reporting to the public. A small number of the existing KPMs are not included in this list, but are recommended to be included in the broader list of core measures instead. Additionally, a few new KPMs are recommended because it is believed they will become required reporting under the MAP-21 Federal Aid Highway program when the rulemaking is completed. However, not all of the anticipated MAP-21 required measures are recommended to be included as KPMs.

A list of measures that should be considered for discontinuation from regular ODOT performance reporting (including one current KPM) appears further below in Table 4.4, including a brief explanation of the rationale for the recommendation. These discontinued measures might be archived and retained for future use in the event that a past area of intense focus becomes of significant interest once again.

Over the course of this project several ODOT staff commented on the difficulty, perceived or real, of removing or modifying an existing KPM. This is perceived to be true, particularly with KPMs that have come about due to direct requests from elected or appointed officials. While the study did not research the process nor propose revisions to the process for adding and removing KPMs, it is something that ODOT should address further, both to clarify understanding among staff as to what the process entails, and to develop recommended changes to the process if found to be appropriate.

Table 4.1: Recommended Key Performance Measures: Existing, Modified and New
Text in italics indicates suggested additions or modification to existing ODOT KPMs.

REFERENCE #	MEASURE NAME AND BRIEF DESCRIPTION	SOURCE	NOTES
Goal Area: Safety			
1	Traffic fatalities: <i>Total number and rate per 100 million vehicle miles traveled (VMT).</i>	APPR	Suggested modification brings in line with probable MAP-21 reporting requirements.
2	<i>Serious Traffic injuries: Total number and rate per 100 million VMT.</i>	APPR	Suggested modification brings in line with probable MAP-21 reporting requirements.
3	<i>Total number and rate per 100 million VMT of fatal traffic accidents that involve alcohol.</i>	APPR	Change proposed to confirm with other traffic safety measures.
5, 80	Large Truck At-Fault Crashes: Total number and rate per million VMT of large truck at-fault crashes.	APPR, SOS, QBR Motor Carrier Division	
8	Travelers Feel Safe: Percent of public satisfied with transportation safety.	APPR	Recommend retaining despite acknowledged subjectivity of responses. Important for non-motorized travelers as well.
Goal Area: Economic Vitality and Freight Mobility			
M2	Truck Freight Mobility: Travel Time Index on freight significant routes.	Oregon Freight System Measures Final Report	May need to start initially with average travel time or truck-hours of delay, due to data limitations. Align with future MAP-21 measure.
M1	Annual hours of truck delay.	Oregon Freight System Measures Final Report	Modify to align with future MAP-21 measure if required, and discontinue if appropriate.
Goal Area: Sustainability			
117	<i>Percent of all light-duty vehicles that are zero- or low-emissions.</i>	Adapted from ODOT Sustainability Progress Report	Measure requires further specification to identify data sources.
109	<i>Gallons of non-renewable transportation fuel consumed in Oregon.</i>	Minnesota Dot	TAC suggestion to include as KPM for Sustainability.

Table 4.1: Recommended Key Performance Measures: Existing, Modified and New (continued)

Text in italics indicates suggested additions or modification to existing ODOT KPMs.

REFERENCE #	MEASURE NAME AND BRIEF DESCRIPTION	SOURCE	NOTES
Goal Area: Mobility			
9	Congestion: Annual hours of travel delay per capita in urban areas.	APPR	Possible MAP-21 measure
10	Special Transit Rides: Annual average number of special transit rides per each elderly and disabled Oregonian.	APPR	
11	Passenger Rail Ridership: Annual number of state-supported rail service passengers.	APPR	
12	<i>Intercity Passenger Service: Estimated annual ridership on scheduled intercity bus and rail passenger service.</i>	TAC	Acknowledges need to measure utilization rather than presence of service; include Amtrak Cascades and Public Oregon Intercity Transit (POINT) service volumes.
18	Bike Lanes and Sidewalks: Percent of urban state highway miles with bike lanes and sidewalks.	APPR	ODOT Bicycle Plan update should provide replacement KPM focused on utilization rather than presence of infrastructure.
121	Travel Reliability: Travel Time Index on Interstate and State highways	Various (e.g., Florida DOT Mobility Performance Measures Program)	Align with MAP-21 measure when required; expand coverage to National Highway system over time as data availability improves
Goal Area: Preservation And Maintenance			
15	Pavement Condition: Percent of pavement lane miles rated “fair” or better out of total lane miles	APPR	
133	International Roughness Index (IRI) on National Highway System and Interstates	AASHTO/FHWA	Include as KPM only if this becomes a required MAP-21 measure.
16	Bridge Condition: <i>Percent of total bridge deck on structurally deficient bridges.</i>	APPR	Previously worded in the APPR as a target, “Less than 10 percent of deck area on structurally deficient bridges.”
16	<i>Percent of state highway bridges that are not distressed</i>	ODOT Dashboard	Does not appear in 2012-2013 APPR/KPMs; recommended for inclusion as KPM by TAC.

Table 4.1: Recommended Key Performance Measures: Existing, Modified and New (continued)

Text in italics indicates suggested additions or modification to existing ODOT KPMs.

REFERENCE #	MEASURE NAME AND BRIEF DESCRIPTION	SOURCE	NOTES
Goal Area: Stewardship			
19	Timeliness: Percent of projects going to construction phase within 90 days of target date.	APPR, QBR PDLT	
20	Timeliness: Percent of projects with the construction phase completed within 90 days of original contract completion date.	APPR, QBR PDLT	
23	Customer Satisfaction: Percent of customers rating their satisfaction with the agency's customer service as "good" or "excellent"	APPR	

4.1.10 Other Recommended Core Performance Measures

Table 4.2 lists another 29 performance measures that are recommended to make up the remaining set of "core" performance measures for ODOT. These scored fairly high in the criterion-based process and provide a greater level of detail and breadth of coverage than the KPMs alone. It is expected that these measures would continue to appear in the QBRs and on internal dashboards for use by ODOT management and staff. They might also be used in periodic publications such as the State of the System report (SOS) where useful to provide additional detail about an area of particular interest to external stakeholders or the general public. Several of these recommended core measures will require further development of both data and analytical methods in order to be implemented (e.g., "bicycle level of comfort" or "roadway health index"), each of which could improve the impact of performance reporting on resource allocation decisions.

Table 4.2: Other Recommended Core Performance Measures: Existing, Modified and New
 Italics indicate suggested modification to existing ODOT measures.

REFERENCE #	MEASURE NAME AND BRIEF DESCRIPTION	SOURCE OR CURRENTLY REPORTED IN	NOTES
Goal Area: Safety			
2	Traffic injuries: <i>Total number and rate per 100 million VMT.</i>	APPR	Likely will want to continue to track all traffic injuries, whether “serious” by federal standard or not.
82	Transportation-related <i>serious injuries and fatalities by mode.</i>	SOS	Includes all transportation modes.
101	Per capita rate of traffic fatalities for drivers and pedestrians over 65 years of age.	New	MAP-21 likely to require monitoring and maintenance/ improvement of safety for older drivers and pedestrians, and on high risk rural roads. Not required for reporting but should be tracked. ODOT staff note the difficulty of computing fatality rate on rural roads due to low incidence.
102	Total number and rate of fatalities on high risk rural roads.	New	
4	Use of Safety Belts: Percent of all vehicle occupants using safety belts.	APPR	Recommend removal from KPMs.
Goal Area: Economic Vitality and Freight Mobility			
105	Tonnage shipped by freight-dependent industries.	Project TAC	
EC1	Annual value of freight shipped by all modes, <i>by commodity (or top ten commodities by value)</i>	Adapted from Oregon Freight System Measures Final Report	ODOT has limited influence over outcome, but a potentially useful indicator of multimodal freight system economic value and measure of efforts to enhance higher value export industries.
M1	Annual hours of truck delay per truck mile traveled.	Oregon Freight System Measures Final Report	
M3	Average travel time on freight-significant routes.	Oregon Freight System Measures Final Report	
106	Load limited bridges as a percent of total bridges on NHS.	Project TAC	

Table 4.2: Other Recommended Core Performance Measures: Existing, Modified and New (continued)
 Italics indicate suggested modification to existing ODOT measures.

REFERENCE #	MEASURE NAME AND BRIEF DESCRIPTION	SOURCE OR CURRENTLY REPORTED IN	NOTES
Goal Area: Sustainability			
108	Number of culverts fixed <i>and potential miles or acres of habitat gained.</i>	Recommended modification of an existing KPM	Changes provide better measure of the value projects completed. Removed from existing KPMs and added to Core measures.
118	On-road mobile source emissions.	New	Probable MAP-21 measure.
78	GHG emissions by sector.	SOS	
107	Transportation-related emissions.	Maryland DOT	Includes other than on-road sources (e.g., ports, freight terminals).
Goal Area: Mobility			
122	Percent of commuters who travel to work by transit, bicycle, walking, or HOV in select cities.	Minnesota DOT	Consider merging with rail ridership measure to generate single measure of alternative mode utilization.
123	Percentage of State-owned roadway centerline miles with a bicycle level of comfort (BLOC) grade “D” or better.	Maryland DOT	Offered as an example; the ODOT Bicycle Plan should generate measures for extent, condition, and performance of bike infrastructure.
125	Number of miles of bike lane and sidewalk/pedestrian path that are connected by gap-closure projects (annual).	Based on draft measure from North Central Texas Council of Governments	This measure would require further development.
127	Roadway Clearance Duration (The <i>median</i> time to clear <u>all lanes</u> when a lane blocking crash occurs).	QBR MLT	Arguably could make do with only one of these two measures, but recommend continuing for now due to subtle difference in what is measured by each (see underlined text).
128	Highway Closure Duration (The <i>median</i> time to open a <u>single lane</u> or establish a <u>detour</u> when a crash causes a <u>full</u> highway closure).	QBR MLT	
12	Intercity Passenger Service: Percent of Oregon communities of 2,500 or more with intercity bus or rail passenger service.	APPR	Relocated from KPMs; need to shift emphasis to utilization. Retain as core measure until better utilization data available.

Table 4.2: Other Recommended Core Performance Measures: Existing, Modified and New (continued)
Italics indicate suggested modification to existing ODOT measures.

REFERENCE #	MEASURE NAME AND BRIEF DESCRIPTION	SOURCE OR CURRENTLY REPORTED IN	NOTES
Goal Area: Preservation and Maintenance			
135	Planned vs. actual maintenance expenditures.	QBR MLT	
NA	Roadway Health Index.	FHWA report, “Improving FHWA’s Ability to Assess Highway Infrastructure Health”	Suggested future measure to replace or augment current pavement condition measures.
Goal Area: Stewardship			
14	Number of jobs sustained as a result of annual construction expenditures.	APPR	Recommend removal from KPMs.
21	Percent of original construction authorization spent.	APPR, WBR PDLT	Recommend removal from KPMs.
22	Certified Businesses: Percent of ODOT contract dollars awarded to Disadvantaged Business Enterprise (DBE) businesses.	APPR	Recommend removal from KPMs.
24	DMV Customer Services: Field office wait time (in minutes).	APPR	Noted as an important measure for DMV and visible for ODOT. The evaluation framework developed for this specific research project suggests that this should be considered for removal from KPMs, but continued as a core measure.
25	DMV Customer Services: Phone wait time (in seconds).	APPR	Recommend removal from KPMs.
26	DMV Customer Services: Title Wait time (in days).	APPR	Recommend removal from KPMs.
137	ODOT employee turnover (separation rate, length of service, or stability index).	QBR Highway Division	Alternative measures of average tenure, separation rate, or ODOT exposure to retirements need to be further explored for best fit with ODOT issues and objectives.

4.1.11 MAP-21 Performance Reporting

The 2012 Moving Ahead for Progress in the 21st Century (MAP-21) legislation will establish a set of performance measurement, management, and planning requirements. These are being implemented through a series of “notice of proposed rulemakings” over a period of multiple years and are expected to take full effect by spring 2015.⁶ An important component of MAP-21

⁶ A more detailed schedule and description of the rulemaking process is presented here: <http://www.fhwa.dot.gov/tpm/about/schedule.cfm>.

will be the requirement to report performance in several national performance goal areas, not unlike the goal areas in the APPR or OTP.

The goal areas recommended in Chapter 2 of this report are fairly consistent with the national goals of MAP-21. Goals for safety, environmental sustainability, economic vitality, and mobility all have a degree of similarity, but with varying degrees of agreement on specific objectives or subtopics. For example, MAP-21 focuses more on congestion reduction, while the OTP and APPR include the broader but related goals of mobility and accessibility, consistent with long-standing state policies that attempt to ensure a balanced, multimodal approach towards management of mobility, accessibility, and system congestion.

Only the performance measures for Safety have been identified at this time; future rulemakings are expected to establish the remaining measures for areas including freight mobility and economic vitality. Discussions between FHWA and the states, however, have indicated the type of performance measures that are likely to be required. ODOT appears reasonably well-positioned to address the seven national goal areas with limited modification to several existing performance measures.

Areas where additional work may be necessary to address the ultimate federal performance measures include:

- Measures of the efficiency and reliability of multimodal and intermodal freight movement.
- Measures quantifying project delivery in the previous fiscal year.
- Finer segmentation of some highway safety measures: MAP -21 program areas and target setting requirements identify some key aspects of safety, including elderly drivers, rural roads, and at-grade railroad crossings.
- Segmentation of pavement and bridge condition performance measures to call out Interstate and NHS facilities.
- System performance measures, including congestion and reliability, which at this time are still unspecified.
- Congestion Relief: The measures of delay and congestion likely to be required by MAP-21 may be focused on responsive to highway speed and travel time. ODOT should continue efforts to develop measures of mobility, accessibility and reliability that incorporate multiple passenger and freight modes, which would be more responsive to alternative solutions including alternative modes, demand management, pricing, etc.

Table 4.3 below provides a general context of the type of performance measures that may emerge from the federal rule-making process in 2014 and 2015. This information is provided to assist ODOT in making decisions about which measures to extend or add, but is only an estimate based on available information and is subject to change.

Table 4.3: Possible MAP-21 Performance Measures

ODOT GOAL AREA	U.S. DOT/FHWA NATIONAL PERFORMANCE GOAL AREAS(1)	POSSIBLE MAP-21 MEASURE	PROPOSED ODOT KPM?
Safety	Safety	Traffic fatalities: Total number and rate per 100 million vehicle miles traveled.	Yes
		Serious traffic injuries: Total number and rate per 100 million VMT.	Yes
		Rail crossing incidents: Number of highway-railroad at-grade incidents.	No
		Per capita rate of traffic fatalities for drivers and pedestrians over 65 years of age (2).	No
		Rate of fatalities on high risk rural roads (2).	No
Economic Vitality and Freight Mobility	Freight Movement and Economic Vitality	Travel Time Index on freight significant routes.	Yes
Maintenance and Preservation	Infrastructure Condition	Pavement Condition: International Roughness Index (IRI) on Interstate System and National Highway System.	Yes (3)
		Bridge Condition: Percent of deck area on structurally deficient bridges on National Highway System.	Yes
Mobility	System Reliability and	Travel Time Reliability (Travel Time Index or Buffer Index) on Interstate and NHS.	Yes
	Congestion Management and Air Quality	Travel Delay (e.g., Annual hours of delay, total and/or per capita).	Yes
		On-road mobile source emissions.	No
Sustainability	Environmental Sustainability	Unknown, other than mobile source emissions (in CMAQ).	
Stewardship	Reduced Project Delivery Delays	Specific FHWA measures unknown, possibly duration of NEPA documentation and approval.	(4)

(1) National performance goals for the Federal highway programs as established in MAP-21, Federal-Aid Program [23USC §150(b)].

(2) Not a MAP-21 required *reported* performance measure, but will be required to monitor the specific safety issues indicated.

(3) Recommending continuation of existing ODOT pavement condition measure as well for KPM reporting.

(4) Two existing ODOT Stewardship KPMs recommended that relate to project delivery.

4.1.12 Measures Recommended for Discontinuation

An important part of this process was the identification of existing performance measures that do not appear to provide sufficient value to warrant continued generation and reporting. Table 4.4 identifies 17 existing ODOT measures that should be considered for discontinuation from regular ODOT performance reporting. These might be archived and retained for future use in the event that a past area of intense focus becomes of interest once again. Table 4.4 also includes 13 measures from other sources which were included in the evaluation process in an effort to improve coverage in certain goal areas where existing ODOT measures were sparse. After completing the evaluation, however, it was determined that these measures should not be recommended for inclusion in either the KPMs or core measures.

The table below includes existing ODOT measures from sources as indicated that are recommended for discontinuation, as well as measures from other sources that were considered in the study, but ultimately not recommended for inclusion in the core measures.

Table 4.4: Measures Recommended for Discontinuation or Archiving

REFERENCE #	MEASURE NAME AND BRIEF DESCRIPTION	SOURCE OR CURRENTLY REPORTED BY	REASON FOR RECOMMENDING DISCONTINUATION OF MEASURE	CURRENT KPM?
Goal Area: Safety				
7	Derailment Incidents: Number of train derailments caused by human error, track, or equipment.	APPR	Although the measure may provide information about where to target resources for reducing derailments, incidents are relatively infrequent and location tends to fluctuate annually. Further, ODOT may have limited ability to influence condition or performance on privately-owned rail right-of-way.	Yes
79	Pedestrian fatalities in Oregon.	SOS	Redundant with modified measure #82, all transportation-system related injuries and fatalities.	No
103	Number of non-motorized crashes and injuries, including those not involving a motor vehicle (e.g., bike-to-pedestrian incident), by location/corridor.	Washington State DOT	Redundant with modified measure #82, all transportation-system related injuries and fatalities.	No

Table 4.4: Measures Recommended for Discontinuation or Archiving (continued)

This table includes existing ODOT measures from sources as indicated, as well as measures from other agencies that were considered in the study.

REFERENCE #	MEASURE NAME AND BRIEF DESCRIPTION	SOURCE OR CURRENTLY REPORTED BY	REASON FOR RECOMMENDING DISCONTINUATION OF MEASURE	CURRENT KPM?
Goal Area: Economic Vitality/ Freight Mobility				
74	Number of larger load permits issued in Oregon.	SOS	This measure seems to serve as a potentially inaccurate or misleading proxy for overall economic activity and freight transportation demand.	No
76	Investment needs for bridge segments on short line railroads.	SOS	This is a very specific measure that seems more appropriate to specific needs or investment analyses such as the periodic Oregon Freight Plan.	No
77	Key Oregon freight dependent industries and projected growth of related commodity tonnage with Oregon origin (2002 to 2035).	SOS	This measure was replaced by measure #105 (<i>Projected growth in freight-dependent industries by mode</i>).	No
104	Annual tons of cargo carried by air, water, and rail freight, broken down by import, export, and through.	Washington State DOT	Reporting tonnage alone not particularly useful. This measure was replaced by measure #105 (<i>Projected growth in freight-dependent industries by mode</i>).	No
D1	Tons and/or ton-miles of freight shipped.	Oregon Freight System Measures Final Report	This measure was replaced by measure #105 (<i>Projected growth in freight-dependent industries by mode</i>). This measure does not address unmet or deferred demand that might be caused by system congestion, reliability or price. Additional information (e.g., the ratio of freight system demand to system capacity) would be necessary to more fully track progress on providing an efficient freight system that gives Oregon a competitive advantage.	No

Table 4.4: Measures Recommended for Discontinuation or Archiving (continued)

This table includes existing ODOT measures from sources as indicated, as well as measures from other agencies that were considered in the study.

REFERENCE #	MEASURE NAME AND BRIEF DESCRIPTION	SOURCE OR CURRENTLY REPORTED BY	REASON FOR RECOMMENDING DISCONTINUATION OF MEASURE	CURRENT KPM?
Goal Area: Sustainability				
110	Average weekly storm water runoff quality at ODOT construction sites.	Washington State DOT	This measure seems more appropriate at the individual project level and would be difficult to roll-up into a meaningful statewide indicator that could be monitored over time for trends.	No
111	Non-internal combustion engine (non-ICE) vehicles registered in Oregon	Project TAC	Redundant with modified PM # 117	No
112	Reduction in VMT through transportation demand management programs.	Maryland DOT	Not clear that ODOT can accurately measure the VMT reduction associated with TDM programs. Mode split measures (e.g., #122) preferable to track change in travel behavior over time.	No
113	Acres of wetlands restored and miles of streams restored.	Maryland DOT	This measure was integrated with existing KPM #108 (Number of culverts repaired or replaced) and Maryland measure to track the actual acres or miles of habitat restored or gained through culvert projects).	No
114	Total GHG emissions from ODOT's building, energy, transportation, and solid waste sources.	ODOT Sustainability Progress Report	This measure is appropriate to report in ODOT's Sustainability Progress Report, but does not provide information that would impact decision making or outcomes at a statewide level.	No
115	Total biodiesel use as a percent of total diesel use.	ODOT Sustainability Progress Report	This measure is appropriate to report in ODOT's Sustainability Progress Report, but does not provide information that would impact decision making or outcomes at a statewide level.	No
116	Total number of trucks using anti-idling technology.	ODOT Sustainability Progress Report	Same comment as for measure #115.	No

Table 4.4: Measures Recommended for Discontinuation or Archiving (continued)

This table includes existing ODOT measures from sources as indicated, as well as measures from other agencies that were considered in the study.

REFERENCE #	MEASURE NAME AND BRIEF DESCRIPTION	SOURCE OR CURRENTLY REPORTED BY	REASON FOR RECOMMENDING DISCONTINUATION OF MEASURE	CURRENT KPM?
Goal Area: Sustainability (continued)				
117	Hybrid, best-in-class high-mileage vehicles, and gasoline vehicles using alternative fuels as percent of all light-duty gasoline-powered vehicles.	ODOT Sustainability Progress Report	Recommend modified version of this measure be considered as a KPM to track progress towards conversion of passenger vehicle fleet to low/zero-emission vehicles. Moved to Table 4.1.	No
Goal Area: Public Health				
119	What percent of households live within 500 feet of high-volume roadways?	Southern California Association of Governments	This measure does not directly address any of the current OTP policies; additionally, TAC and Agency reviewers commented that ODOT has little ability to influence the measure one way or the other.	No
120	What percent of residents live within a 1/2-mile walk of a park or open space?	Southern California Association of Governments	Although the measures does relate to OTP Policies, TAC and Agency reviewers commented that ODOT has little ability to influence the measure.	No
Goal Area: Mobility				
13, 70	Alternatives to One-Person Commuting: Percent of Oregonians who commute to work during peak hours by means other than single-occupancy vehicles.	APPR, SOS	This measure has been replaced by measure #122 (<i>Percent of commuters who travel to work by transit, bicycle, walking, or HOV in select cities</i>), which provides more detailed information on mode split.	Yes
71	Status of sidewalks along state highways (% sidewalks complete).	SOS	This measure is covered by measure #18 (<i>Percent of urban state highway miles with bike lanes and sidewalks</i>).	No
72	Status of bike facilities along state highways (% bike facilities complete).	SOS	This measure is covered by measure #18 (<i>Percent of urban state highway miles with bike lanes and sidewalks</i>).	No

Table 4.4: Measures Recommended for Discontinuation or Archiving (continued)

This table includes existing ODOT measures from sources as indicated, as well as measures from other agencies that were considered in the study.

REFERENCE #	MEASURE NAME AND BRIEF DESCRIPTION	SOURCE OR CURRENTLY REPORTED BY	REASON FOR RECOMMENDING DISCONTINUATION OF MEASURE	CURRENT KPM?
Goal Area: Mobility (continued)				
124	The number and percent of homes within a ½-mile of regional trail system.	Portland Metro	Although the measures does relate to OTP Policies, TAC and Agency reviewers commented that ODOT has little ability to influence the measure.	No
131	Avoided annual hours of delay per traveler resulting from operational or public transportation enhancements.	Washington State DOT	This is more of a program level measure for individual projects rather than a measure that will provide useful information for decision making to higher level audiences.	No
132	Bicycle and pedestrian facility gaps and missing connections.	North Central Texas Council of Governments	This measure is proposed to be replaced by measure #126 (<i>Number of additional miles on bike and pedestrian systems connected by critical gap closures each year</i>).	No
Goal Area: Preservation and Maintenance				
134	Percent of pavement lane miles rated “fair” or better out of total lane miles on national highway system.	Washington State DOT	Redundant with measure #15, retained.	No
136	OTIA III State Bridge Delivery Program Progress Summary.	Quarterly Business Review (PDLT)	As the OTIA III program draws to a close the measure will no longer need to be monitored.	No
Goal Area: Stewardship				
75	Projected number of distressed bridges under projected or current funding levels.	SOS	TAC recommended replacement with “percent not distressed” KPM (Table 4.1)	No
83	Total US Forest Service revenue to Oregon Counties’ Road Funds showing impacts from Loss of PL 106-393 (the “Secure Rural Schools and Community Self-Determination Act of 2000”)	SOS	Not highly relevant to ODOT investment decisions.	No
84	Distribution of ARRA funds in Oregon.	SOS	All ARRA funds have been distributed. This measure no longer provides relevant information to decision makers.	No

Table 4.4: Measures Recommended for Discontinuation or Archiving (continued)

This table includes existing ODOT measures from sources as indicated, as well as measures from other agencies that were considered in the study.

REFERENCE #	MEASURE NAME AND BRIEF DESCRIPTION	SOURCE OR CURRENTLY REPORTED BY	REASON FOR RECOMMENDING DISCONTINUATION OF MEASURE	CURRENT KPM?
Goal Area: Stewardship (continued)				
126	Percent of lane blocking crashes cleared within 90 minutes.	ODOT Performance Dashboard	Recommend reporting median clearance time (measures 127 and 128) as better way to track improvement or degradation in performance over time.	No

5.0 DATA NEEDS

The initial assessment of ODOT performance measures and reporting resulted in identification of several general data needs to support the new or modified performance measures. A more comprehensive assessment of data needs and costs was originally planned for Task 5, after the preliminary recommended set of core performance measures were identified. Upon TAC review of those preliminary recommendations, however, the research team was directed instead to develop an evaluation framework and to conduct a criteria-based evaluation of the +80 measures under consideration. This evaluation included an approximation of the level of effort or monetary resources required to develop each measure, but did not attempt to identify specific data requirements for each measure, nor the cost to ODOT to develop the data and measures. Our initial assessment of likely data needs resulted in the following suggestions and recommendations.⁷

5.1 MOBILITY, INCLUDING ACCESSIBILITY AND RELIABILITY:

- Accessibility measures need to evolve from simple measures of presence or absence of a facility, to spatial measures of the proximity of specific land uses via the transportation system. This could require more GIS-based data and modeling capabilities of the type already used by the Planning Section and Transportation Planning and Analysis Unit (TPAU) to develop and analyze projects and programs.
- ODOT is developing a measure of multimodal accessibility, the Transportation Cost Index (also called the Transportation Access Index). This measure would provide a single-number index that summarizes the relative accessibility of any location, taking into account both land uses and transportation infrastructure. The Research Section has funded development and testing of the index, and it is likely that additional staff resources would ultimately be required to roll the index out on a statewide basis or at least covering the state's MPOs.
- Extending the concepts of mobility and accessibility to walking and bicycling requires improved data on both the state-owned and local road systems, since much of the activity occurs on non-state routes.

5.2 SAFETY:

- More comprehensive data on crashes and injuries involving non-motorized travel will be useful as ODOT and partners take steps to significantly expand the use of non-motorized modes to achieve other goals such as energy conservation, compact urban land development, and greenhouse gas emission reductions.

⁷ These were originally presented in the Task 3 report, June 2013.

- Reporting on crashes and injuries that do not involve a motor vehicle (e.g., a pedestrian-to-bike incident) needs to be improved to better understand the causes of these incidents so that targeted solutions may be developed.
- Coordination of crash data collection and reporting, including locational data, should be improved, with benefits for staff efficiency and consistency of reporting on safety outcomes.
- Data are needed to support new MAP-21 reporting requirements, including injury severity and segmentation of crash records to focus on elderly drivers and high-risk rural roads.

5.3 ECONOMIC VITALITY:

- More detailed information on the value of commodities moved over the multimodal system is required to estimate the economic value of freight infrastructure improvements.
- The proposed MOSAIC index measuring the economic impact of improved transportation efficiency appears to be viable with existing data and analytical tools such as the Statewide Integrated Model (SWIM) and databases developed for the Oregon Freight Plan. Staff resource requirements to manage the data and generate performance measures could be significant, however.

5.4 SUSTAINABILITY:

- It is unclear whether ODOT or other State or Federal agencies currently collect the data that would be needed to expand measures of environmental sustainability to include acres/miles of habitat recovered or improved through augmented ODOT project design and delivery efforts. Additional GIS-based data analysis would likely be required.

5.5 PUBLIC HEALTH:

- Additional GIS-based data layers would likely be required to calculate measures of public health exposure risks related to proximity of transportation facilities.
- Partnership with other State agencies would be required to develop data and measures that can reliably link public health outcomes to transportation emissions or use of active transportation modes.

5.6 EQUITY:

- More data on protected populations would possibly be needed in GIS model systems to allow disaggregation/segmentation of certain KPMs by population group.

6.0 ORGANIZING FOR PERFORMANCE REPORTING

Organizational structure was not an area of focus for this research project. However, interviews with ODOT staff and discussions with Technical Advisory Committee (TAC) members generated enough comments on agency structure and processes such that it became apparent that consideration should be given to how ODOT is organized to report and utilize performance data and to suggest areas for further discussion by ODOT management. We also looked to the literature and interviews with other state agency staff for examples of different organizational approaches to collecting, managing, and reporting performance data. While we did not conduct enough follow-up investigation or analysis to support any firm recommendations, we offer the following points to help prompt further discussion within ODOT of organizational and process issues that impact performance reporting.

Since the time that much of our research was conducted (mid-2012 through mid-2013), there have been changes at ODOT that may supersede some of the observations and suggestions below. These include the further maturing of the Intermodal Leadership Team, and creation of the Performance Management Office within ODOT Government Relations.

6.1 INTERNAL OBSERVATIONS:

- ODOT has numerous performance reports for internal and external use, reflecting the distributed nature of performance reporting and utilization at the agency. Some of these reports have more measures than necessary or desirable for their intended purpose (e.g., of informing management-level decisions). Both the large number of measures reported by ODOT, as well as perceived proliferation of KPMs over time, was cited by some as causing too much time to be spent measuring and reporting information that does not impact decisions or outcomes in a meaningful way. ODOT should continuously assess which measures are the most useful to inform and support the decisions made by the agency, and which will be sensitive enough to reveal the changes in outcomes resulting from those decisions. The evaluation matrix developed through this project can be used to support such a process.
- Data “silos” reflect the organizational silos and distributed data management and reporting roles, impeding smoother flow of information within the agency. Staff suggestions for improving internal data coordination and communication included processing and disseminating more information through the Data Warehouse; further centralizing the data management process to make data more consistent and predictably accessible throughout the agency; and sharing data management tools more freely across business units.
- Information available through ODOT’s internal data portals is not as well-organized as desired, making it difficult and/or time consuming to easily identify or access the data in need. Prospective data users often need to request help from data management staff to both identify and locate the best data for their intended purpose.

- We did not hear strong or repeated arguments in favor of significant changes in the location of performance-data related functions within ODOT. Most called for improved communication and coordination of effort, but did not go so far as to suggest that these objectives require centralization of people or activities surrounding performance data and reporting.
- That notwithstanding, staff from a range of ODOT units suggested that clear identification of a champion and coordinator for performance measurement and reporting would facilitate other improvements in process and practice. There is currently no clear “home” for performance measurement the way there is at several other state DOTs and MPOs, and no single section or unit has responsibility for seeking improvements across a range of activities that support performance management.
- There are different opinions among those who generate and use performance reports as to what is the “correct” amount (breadth and depth) of detail to support performance management. The right amount of detail is a function of who is using the data and what type of decisions, if any, they are making based on the data. Creating the ability for various ODOT units to develop customized reports by tapping into a centralized, transparent and accessible database would provide the flexibility to tailor reporting to the specific needs.
- Investment in IT-driven approaches to performance measurement and reporting, such as performance dashboards with real-time data retrieval and report generation capabilities, were acknowledged to improve data access and quality, but opinions varied as to whether outcomes are changed in a way that justifies the financial and staff resource investment. This line of reasoning may be as much a comment on ODOT’s use of performance data to drive decision-making as on the data management and reporting methods employed. ODOT should consider how performance data is used within the agency to realize greater return on incremental investment in data systems.

If there is an emerging view or consensus from the TAC input and interviews conducted for this project, it would favor of creating a more visible structure to organize the various performance data collection, management, and reporting functions at ODOT. This approach does not require or presume the centralization of multiple functions that are currently distributed. Rather, it provides a mechanism to improve coordination and collaboration on a variety of issues. Such a structure should provide a forum for addressing objectives including defining the essential purposes for performance reporting at ODOT, identifying the specific target audiences for ODOT performance data, tailoring reporting capabilities and practices to those different audiences, and developing a cohesive response to MAP-21 reporting requirements. Technical issues and solutions such as common data definitions, improving consistency across data sources, and other strategic data management issues should follow from this objective-oriented approach to integrated performance management.

7.0 CONCLUSIONS

The essential findings and recommendations of this research project have been presented above, with Chapter 4 in particular presenting the recommended set of core performance measures. More general conclusions are provided here.

7.1 SELECTION OF PERFORMANCE MEASURES FOR REPORTING

ODOT's KPMs and other core measures (e.g., those that populate the various QBRs) need to be periodically reassessed and updated. This research effort resulted in the recommended removal of a small number of KPMs, and a larger number of other core performance measures, and replacement with measures that are more likely to drive decision-making about investment of agency resources and other prioritization decisions.

The evaluation framework and matrix developed for this project can be employed to support this kind of periodic reassessment. However, as noted in the Task 5 report, there are some potential structural biases in the evaluation model which tend to favor existing measures over potentially more useful ones, because of the time and money required to implement new measures. This bias can be mitigated through application of the weighting system built into the model.

Among the several evaluation criteria applied in the screening and assessment process, the ability of ODOT and/or its partners to influence outcomes was found to be particularly important. A significant degree of control over implementation, or the ability to exert substantial influence, was felt to be an important criterion. In some cases ODOT may not have a direct policy or implementation role that would effect change in a particular outcome, but there could still be opportunities to develop supportive policies that encourage or enable other players (other public agencies, private sector businesses, etc.) to take actions that will bring about change in the desired direction. An example of this is the state's potential role in facilitating and directing private sector investment in alternative fuel vehicles and fuel/electricity distribution networks. By granting HOV lane access to zero- and low-emission vehicles, or by facilitating the siting refueling stations and distribution lines, a state can indirectly influence the rate of shift to alternative fueled vehicles.

The systematic evaluation process also tends to leave few attractive (i.e., high-scoring) options in areas where the existing or potential measures simply do not perform well according to the evaluation criteria, (i.e., there are no standout measures by these evaluation criteria). The recommended performance measures included in Chapter 4 of this final report reflect consideration of additional qualitative factors, such as the need to provide coverage of important policy areas even where the currently available measures are found wanting. In these cases the results need to be interpreted to suggest that a level of investment in data beyond the norm is probably required to lift the performance measures to a higher level of usefulness. Simply reporting measures that are the easiest or least expensive to generate may do a disservice by perpetuating insufficient funding of necessary performance management components.

A concern heard throughout the investigation process is that several of the existing KPMs are of little strategic value because they are too general or qualitative (e.g., percent of public satisfied with transportation safety) to suggest any particular corrective action. A roughly equal number are felt to be too detailed to be of use in significant policy decisions. Several of the measures that have been recommended to be dropped from the list of KPMs or core measures still have value to managers and administrators for purposes of tracking efficiency and effectiveness of near-term actions, and for holding staff accountable to performance standards. But the value of some of these measures to senior management teams or the Oregon Transportation Commission is questionable.

7.2 PROCESS ISSUES

There are several clear objectives that warrant ongoing attention. These include improving the ease of data access and sharing across ODOT units, and more flexible report generation capabilities and procedures. Improvements to data management and report generation capabilities may help address the identified problems of too many measures or inappropriate measures for a particular report or audience, as managers would have more flexibility to create reports that suit their current needs. There is a need for better coordination of all performance measurement and reporting activities, including the use of performance data in decision-making.

7.3 ORGANIZATIONAL STRUCTURE

Changes intended to reduce impediments to information flow and coordination through centralization of data collection, management and reporting activities need to be considered on a case-by-case basis with clearly identified objectives. As we noted in our case study of the Florida DOT's performance reporting programs, periodic changes to the agency's organization chart (for completely different reasons) have a tendency to negate or undo efforts to house related performance reporting functions under one roof for any significant period of time. It appears to be just as important to address the question of how ODOT uses performance data to support or drive decision-making, as to address the questions of where performance data comes from and who is responsible for delivering performance reports.