Performance Measurement Guidance

✔ LEVEL 1 TO LEVEL 2

Why Performance Measurement is Important

Performance measurement is essential as the means of determining program effectiveness, determining how changes are affecting performance, and guiding decision-making. In addition, operations performance measures demonstrate the extent of transportation problems and can be used to "make the case" for operations within an agency and to decision-makers and the traveling public, as well as to demonstrate to them what is being accomplished with public funds on the transportation system.

Improvement Target

From	No regular performance measurement related to TSM&O (L1)
To	TSM&O strategies measurement largely via outputs, with limited after-action analyses (L2)
By	Identifying output and outcome performance measures for the selected operations activities

Key Sub-dimensions

- Measures Definition Action Plan
- Data Acquisition Action Plan
- Measures Utilization Action Plan

Measures Definition Action Plan (L1 to L2)

Strategy Summary

Identify output performance measures to support development and evaluation of TSM&O activities in place and under consideration

Key Actions

A	Identify operational activities to be monitored
B	Review Federal Highway Administration rule (FHWA) implementing MAP-21 performance measure requirements; coordinate the development of operations-specific performance measures with those developed at the agency level for the MAP-21 requirement
C	Review FHWA Office of Operations activities related to performance measures for incident management, work zone management, weather management, and signal systems
D	Create taskforce to develop stepwise strategy to produce useful TSM&O measures working with existing agency program-wide performance measurement unit
E	Develop initial strategy for performance measures using available output data

ACTIONS

Action A: Identify operational activities to be monitored

Rationale: The selection of measures depends on the functions to be measured. Both output and outcome measures are important. While outcome measures most directly evaluate the impact of TSM&O strategies and their contribution to meeting agency mobility and safety mission, they require significant data collection and analytics. Output measures—more readily available—can be used to determine how efficiently resources are utilized to implement a given scale and level of specific TSM&O function and constitute an important starting point to a performance measurement program.

A.1 Identify which aspects of operations should be included in an operations performance measurement program. Examples include: incidents, weather, work zones, special events, traveler information, freight, and signal control.

A.2 Identify output measures useful for determining agency efficiency in strategy applications (for example in reducing incident clearance time). Consider the relationship between operational activities underway or under consideration and their implications for easily obtainable output

measures, and estimate the cost and level of effort associated with the amount and sophistication of activities involved. Output measures must relate to activities that are "actionable", those that can be changed by the agency. Example measures include number of events responded to, time to complete a given function, coverage of detection, miles of safety service patrol, costs and level of effort, etc.

Responsibility and Relationships: Staffing should come from the central office with district/regional traffic management center (TMC) support as appropriate. If an agency-wide performance measurement strategic plan has been prepared, then it should be used as guidance in developing performance measures.

Action B: Review Federal Highway Administration (FHWA) rule implementing MAP-21 performance measure requirements; coordinate the development of operations-specific performance measures with those developed at the agency level for the MAP-21 requirement

Rationale: FHWA is developing a formal rule to implement the performance management requirements imposed by MAP-21 legislation. The rule will deal with performance measures for congestion, reliability, and freight movement, among other functional areas such as pavements, bridges, and safety. FHWA will propose specific measures be used for each functional area; these will be outcome in nature. However, output measures must also be constructed so that operations activities can be geared to making improvements in the outcome measures.

B.1 Consider the relationship between the agency's TSM&O program focus and the federal rule with regard to the potential targets for measurement. Target setting will be a feature of the FHWA rule implementing MAP-21 requirements, and the agency should develop an understanding of how operations strategies affect progress toward the targets. This can be done in the short-term through modeling exercises. In the longer term, evaluations of operations projects will provide estimates of how the targets are affected.

Responsibility and Relationships: Staffing should come from the central office TSM&O program leadership in consultation with FHWA Division Office.

Action C: Review FHWA Office of Operations activities related to performance measures for incident management, work zone management, weather management, and signal systems

Rationale: FHWA and peer agencies have conducted studies of appropriate performance measures, data, analytics and other relevant considerations to support a performance measurement program that can supply useful background and input to the agency's efforts regarding TSM&O.

C.1 Review FHWA background memos and studies regarding measure for specific TSM&O activities

C.2 Review TSM&O measures strategy in relation to current statewide performance measurement program

Responsibility and Relationships: Staffing should come from the central office TSM&O program leadership in consultation with FHWA Division Office.

Action D: Create taskforce to develop stepwise strategy to produce useful TSM&O measures working with existing agency program-wide performance measurement unit

Rationale: All states are preparing strategies to comply with the MAP-21 performance measurement requirements, of which TSM&O congestion-related measures are a part and must be related to an agency's overall approach.

D.1 Review overall state performance measurement strategy including that for complying with federal requirements.

D.2 Consider issues associated with appropriate integration with agency program-wide activities and approaches, including performance measurement for both MAP-21 compliance and for internal uses in TSM&O improvement.

Responsibility and Relationships: Staffing should come from the central office TSM&O program leadership in consultation with FHWA Division Office.

Action E: Develop initial strategy for performance measures using available output data

Rationale: A performance measurement program must identify measures that: (1) are actionable in terms of where/how/how much the TSM&O function is deployed/implemented (i.e., will changes in a performance measure directly lead to actions by the agency); (2) have the capability to influence changes in deployment, configuration, technology, or procedures that may influence outcome measures of interest that support the agency's objective; and (3) can cost-effectively evolve from agency outputs to user-performance related outcomes (e.g. how reductions in lane-hours lost due to work zones can be expected to reduce overall congestion levels). While the strategy starts with output measures, it must be capable of evolving towards outcomes.

E.1 Identify the output performance measures that are consistent with the goals and objectives of the process in which they are being employed. Even though outcome measures are not expected to be developed at this stage, it is still important to consider the linkage for future evolution of the program, in terms of direct linkages between outputs that can be directly managed (e.g. lane hours lost to work zones linked to congestion levels). Determine a cost effective path for the data collection.

E.2 Determine the potential targets of the output performance measurement process and related analysis in light of the audiences and their interests. This includes the scope of the analysis, location of the improvement, travel modes that will use the system, time-of-day that might be affected, the year or years that are the subject of the analysis, and the level of detail and the subjects included in the analysis (e.g. planning, operations, etc.).

E.3 Relate the targets and related measures to key audiences, including technical and nontechnical groups, and groups defined by information needs, time, and locations. Measures must be able to be composed into statistics that are useful for the variety of potential audiences. Screen measures for those that are understandable and easily communicated regarding key use context (deficiency analysis and development, including selecting alternatives, congestion management, growth management, or optimizing the operation of the freeway systems). The set of measures must be technically capable of illustrating the problems and the effects of the potential improvements to the audiences involved.

E.4 Recognize multiple contexts for use of each measure, including problem identification and assessment, evaluation and comparison of alternative strategies, demonstration of effectiveness of various programs and projects, and ongoing real-time system monitoring and reporting. However, while it is desirable to maintain performance measures that are used for specific applications, a core set of measures should be used across all applications. This is particularly useful for congestion/mobility metrics. Increasing the flexibility of the measures also may improve the ability to use the information beyond the particular analysis.

E.5 Compare potential projects, programs, and policies to the measures in terms of their ability to illustrate the effect of the improvements, including all activities of interest to the agency and the audiences, as well as the ability of the measures and related analytics to yield reliable information.

Responsibility and Relationships: The performance measurement taskforce created in Action D above should lead the development of the performance measures strategy with inputs from relevant participants, both internal and external. In addition, state and regional planning staff should be involved to provide relationships to state and regional policy.

Examples/References:

- The FHWA website on general performance measurement for operations provides useful background: http://ops.fhwa.dot.gov/perf_measurement/index.htm
- A reasonable starting point for an appropriate short list of performance measures is found at: http://www.ite.org/M&O/ntoc_final_report.pdf

- Incorporating Reliability Performance Measures into the Transportation Planning and Programming Processes (SHRP 2 L05): http://www.trb.org/Main/Blurbs/168854.aspx
- Performance Measures for Freight Transportation: http://www.trb.org/Publications/Blurbs/165398.aspx
- The FHWA rulemaking process for MAP-21 performance management requirements is underway as of early 2014. Its status can be found at: https://www.fhwa.dot.gov/tpm/about/schedule.cfm

Data Acquisition Action Plan (L1 to L2)

Strategy Summary

Collect readily available data

Key Actions

A	Collect output measures from data that are already being collected
B	Identify output performance measure data gaps that will require new data collection
C	Develop rudimentary data management system

ACTIONS

Action A: Collect output measures from data that are already being collected

Rationale: Because most of the available performance data are collected for purposes other than reporting performance, obtaining data from existing traffic management and traveler information systems is often far more difficult than logic would dictate. Output measures are those that relate to specific activities undertaken by agencies (e.g., characteristics of incidents and work zones, incident response time, messages displayed on DMSs, traveler website "hits"). These are contrasted with outcome measures, which relate directly to the system conditions that travelers experience, such as delay and other travel time-based measures, as well as safety.

A.1 Review current output data collection activity and how data are collected and stored. In many cases, target data for utilization already exist, such as incident clearance times and safety service patrol responses.

A.2 Review current archiving function and ease of retrieving data, including software needed to efficiently store and retrieve data already "collected," and identify initial steps to produce useful archived data on a continuing basis.

Responsibility and Relationships: Relevant data may not all be exclusively collected by operations personnel. Other units within the agency may also collect useful data (e.g. work zone safety) as well as external organizations (e.g. weather). The first step is to identify if the data are being archived at all, and if so, what is its accessibility. Once accessibility is determined, a data processing system must be developed to produce the performance measures and associated reports. Central office should perform the scan and determine what the features of the data processing system should be.

Action B: Identify output performance measure data gaps that will require new data collection

Rationale: Once a clear understanding of the available data exists, it is possible to define the supplemental data collection that is needed to complete the data sets needed for the desired output performance monitoring system.

B.1 Identify output measures for which existing data are not available. Define supplemental data needed to fill in gaps in available data.

B.2 Develop phased program for collection.

B.3 Provide information that helps eliminate biases in previously collected data.

B.4 Recognize that the data used to support operations performance measures will have value for many other agency functions, such as planning and safety. It will be useful to involve other potential stakeholders in the data gap analysis at an early stage so that multiple uses of the data can be satisfied. This will help to build support for any new data collection activities.

Responsibility and Relationships: An existing performance measurement taskforce (as per Measures Definition Action D) may be used to include relevant participants, both internal and external. In addition, state and regional planning staff should be involved to provide relationships to state and regional policy.

Action C: Develop rudimentary data management system

Rationale: A start-up data management system is needed. There are several resources that can be used in the development of data archives for performance monitoring or other applications. At this stage, it may be possible to develop the system in-house.

C.1 Develop simple start up system, designed so that future expansion is facilitated. At this stage, the level of system sophistication need not be great, but expansion or migration plans to a more formal information management system should be considered.

C.2 See reference below for technical approach.

Responsibility and Relationships: An existing performance measurement taskforce (as per Measures Definition Action D) may be used to include relevant participants, both internal and external. IT staff should also be involved.

Examples/References:

- "Guide to Effective Freeway Performance Measurement: Final Report and Guidebook" is available at: http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_w97.pdf
- "Establishing Monitoring Programs for Mobility and Travel Time Reliability" (SHRP 2 L02): http://www.trb.org/Main/Blurbs/168765.aspx
- "Incorporating Reliability Performance Measures into the Transportation Planning and Programming Processes: Technical Reference" (SHRP 2 L05) provides a "how-to" guide for technical staff to select and calculate the appropriate performance measures to support the development of key planning products, including operations planning: http://www.trb.org/Main/Blurbs/168856.aspx
- A reasonable starting point for an appropriate short list of performance measures is found at: http://www.ite.org/M&O/ntoc_final_report.pdf
- Guidelines for Developing ITS Data Archiving Systems is available at: http://tti.tamu.edu/documents/2127-3.pdf

Measures Utilization Action Plan (L1 to L2)

Strategy Summary

Create standard performance reports for use in immediate improvement of the strategies for TSM&O

Key Actions

A	Create standard performance report for internal use that will identify trends in performance so that specific problems can be targeted
B	Prepare first "rough cut" benefit-cost estimates for key applications

ACTIONS

Action A: Create standard performance report for internal use that will identify trends in performance so that specific problems can be targeted

Rationale: Routine, periodic reports regarding output performance are needed both for strategy improvement and activity reporting.

A.1 Review examples of reporting from peer states and inquire regarding level of effort, cost and audience response.

A.2 Develop TSM&O reports for both internal use and for potential inclusion in external reporting such as agency dashboards. Include both current and trend data.

A.3 Develop reporting frequency for reports: weekly, monthly, quarterly, annually, or some combination.

A.4 Determine initial subjects of performance reports. Depending on data availability and staff resources, the reporting of events/disruptions (e.g., incidents, work zones, weather, special events) may be the initial subjects of performance reports. This is because the data are usually readily available within operating agencies, is simple in content, is not too voluminous, and is amenable to simple summaries and graphics. Recognize that outcome measures eventually will need to be included.

A.5 Determine how trends will be identified and tracked. Trends should be reported for both the characteristics and frequencies of events/disruptions as well as management activities to address them (e.g., incident and work zone duration). When reporting trends, it is very important to consider

sample sizes and seasonal changes in traffic. For example, incidents are fairly infrequent events and reporting weekly changes in incident occurrence is not very stable.

A.6 Perform trend analysis. Trend analysis should be the goal of performance reports, i.e., how are conditions changing on the system? Trends can be produced on a monthly basis, but same items may exhibit unstable patterns at such a short time interval (e.g., incidents), so in some cases, quarterly reports may be more appropriate. In addition, an Annual Report should also be produced that tracks changes from year-to-year. Trends should be developed for the entire region as well as individual corridors. Comparisons can be made between corridors to identify those that exhibit poor performance. Comparison to national benchmarks or to other regions (either within the state or for similar locations in other states) is another method for identifying where problems may exist.

Action B: Prepare first "rough cut" benefit-cost estimates for key applications

Rationale: Prior to full development of performance measures and supporting data, it may be useful to produce rough order of magnitude benefit-cost estimates to support program justification.

B.1 Review availability of useful cost and benefit data based on available data and/or estimates made of comparable TSM&O improvements from peer states.

B.2 Prepare estimated benefit cost estimates as part of business case of planning activities.

Responsibility and Relationships: Staffing should come from the central office, but in coordination with key strategy staff to ensure measure relevance. Performance reports generated for operations use may also be relevant for other parts of the agency, especially if agency-wide performance reporting is mandated.

Examples/References:

- "Guide to Effective Freeway Performance Measurement: Final Report and Guidebook" is available at: http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_w97.pdf
- "ITS Benefits, Costs, Deployment, and Lessons Learned Desk Reference" includes information on ITS benefits, costs, and lessons learned that have been compiled since the late 1990s. The benefit, cost, and lessons learned sections of the database all include links to supporting documentation in the form of reports, papers, or other related work: http://www.itskr.its.dot.gov/its/benecost.nsf/files/BCLLDepl2011Update/$File/Ben_Cost_Less_Depl_2011%20Update.pdf
- "Evaluating Alternative Operations Strategies to Improve Travel Time Reliability" (SHRP 2 L11) identifies and evaluates strategies and tactics intended to satisfy users' travel-time reliability requirements of roadways, including performance measures and targets: http://www.trb.org/Main/Blurbs/168142.aspx

- A Guidebook for Standard Reporting and Evaluation Procedures for TSM&O Strategies: http://tsmoinfo.org/documents/files/67/GuidebookforStandardReporting_FINAL.pdf