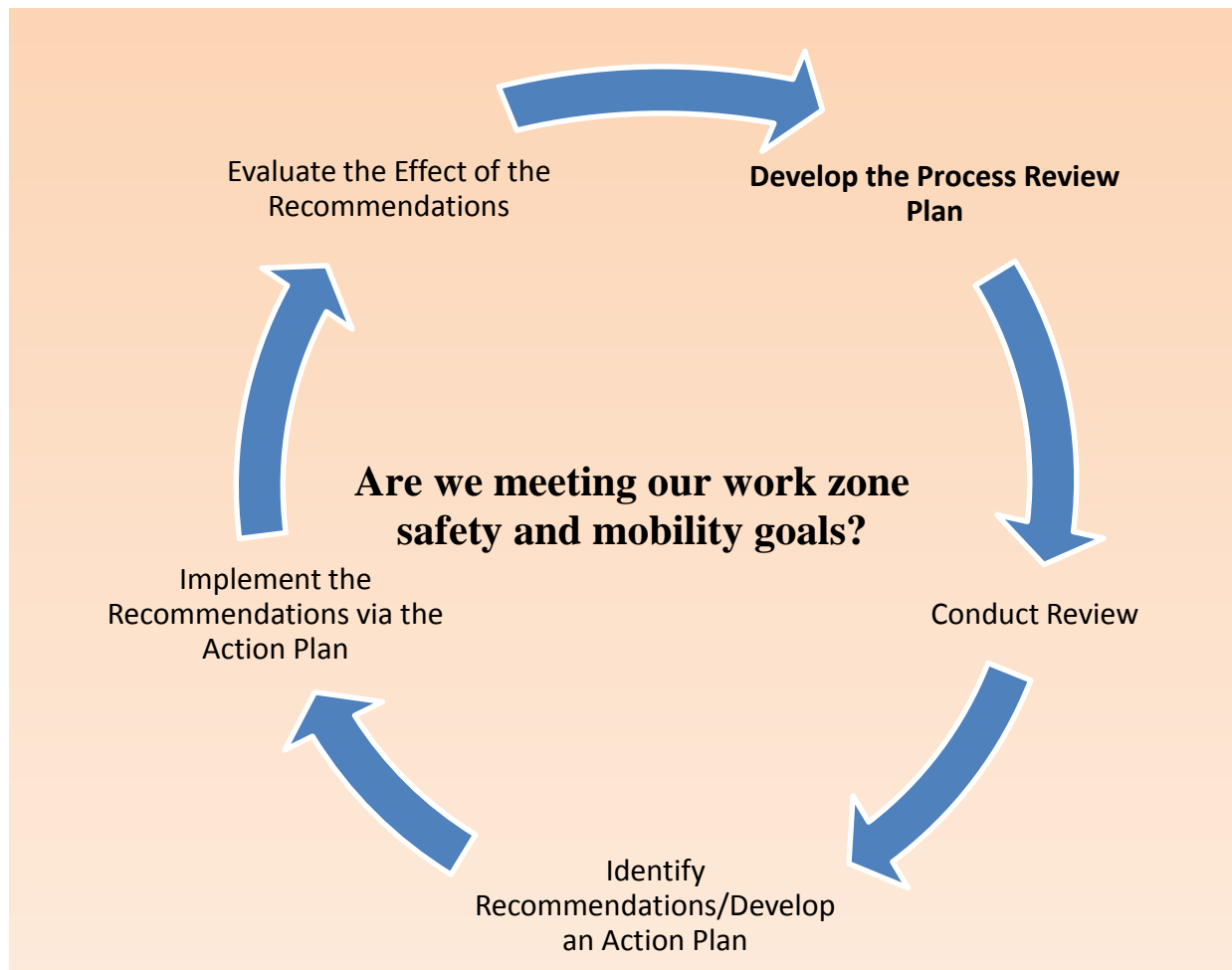


Guidance for Conducting Effective Work Zone Process Reviews



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CHAPTER 1. INTRODUCTION

PROCESS REVIEW BASICS

Federal regulations 23 CFR 630 Subpart J (the Work Zone Safety and Mobility Rule, established September 2004) require each state highway agency (SHA) to have a policy for the systematic consideration and management of work zone impacts on all Federal-aid projects. The policy should include state-level and project-level processes and procedures to address work zone impacts throughout the various stages of project development and implementation. Meanwhile, the updated Temporary Traffic Control Devices Rule (Subpart K, updated December 2007) calls for the increased focus on the consideration of positive protection use to improve worker and traveler safety, exposure control measures to reduce crash risk, and use of temporary traffic control devices above the minimum requirements to mitigate crash risk. This rule also requires SHAs to have a policy on the use of law enforcement personnel to enhance safety at work zones, and procedures outlining how payment for law enforcement usage in work zones will be handled.

One important activity included in the Work Zone Safety and Mobility Rule is a requirement that SHAs perform work zone process reviews every two years. Although the completion of process reviews is necessary to maintain compliance with the Rule, it is also an opportunity for a SHA to re-examine and take a holistic look at how well its work zone safety and mobility management practices are working. Long term, regular conduct of process reviews can lead to improvement in project delivery schedules, reduced capital and life-cycle costs, and better overall management of transportation operations in and around work zones.

A work zone process review should be a comprehensive evaluation of work zone management-related policies and procedures, the effectiveness of work zone impacts analyses and monitoring efforts, and ultimately, how well the SHA manages those impacts. The process review should help a SHA:

- Verify that it remains compliant with existing regulations pertaining to work zone safety and mobility management;
- Assess the effectiveness of improvements made in work zone safety and mobility management procedures since the prior process review cycle; and
- Establish goals for further improvements to work zone management procedures, the results of which can then be tracked in future process review cycles.

Process reviews should cover an agency's entire project development sequence, as well as maintenance operations. To do this, a multi-disciplinary team comprised of individuals from various divisions, field offices, and the FHWA Division Office is recommended. Both agency-level and project-

Process reviews that cover an agency's entire project development process, as well as maintenance operations, can lead to improvement in project delivery schedules, reduced capital and life-cycle costs, and better overall management of transportation operations in and around work zones.

level data should be examined as part of the review. Comprehensive details on how to conduct a work zone process review were previously developed and are available in FHWA's *Work Zone Performance Review Toolbox* (see <http://ops.fhwa.dot.gov/wz/prtoolbox/wzpr.htm>). The intent of this document is to share good practices and methods that agencies have found worthwhile in conducting their process reviews, and lead to more consistent and targeted improvements in SHA work zone policies and procedures across the country.

PROCESS REVIEW EXPERIENCES

Over the past several years, experiences with process reviews have varied from agency to agency. Some agencies have found their process review effort to be extremely revealing and positive. In these cases, the reviews served as important motivation to assess what practices and procedures were, and what were not, effective relative to work zone safety and mobility management. As shown in the example box below, these agencies identified and implemented a number of positive changes in their work zone policies and procedures based on the results of their process reviews.

Examples of Agency Policy and Procedure Improvements Identified through Recent Process Reviews

- *Several agencies found that many of their staff were not aware of their work zone safety and mobility policy, and so updates to the project development process manual (with hyperlinks to the policy and implementation guidelines) was identified as an action item.*
- *One agency found that they did not have a process in place to “close the loop” between construction staff and traffic control designers after a project was completed, and so the agency began to encourage close-out meetings between these staff to share lessons learned and determine ways to improve future work zone plans.*
- *One agency determined that although work zone crash data were available electronically within a few days of the crash occurring, few agency staff knew about it or accessed it regularly to monitor safety conditions at a project or for multiple-project agency-level assessments. The need to establish procedures and a schedule for analyzing work zone crash data was included as a process review action item.*

On the other hand, some agencies have experienced challenges in conducting their process reviews and/or with using the results of their reviews to make meaningful improvements to their work zone safety and mobility policies and procedures. Generally speaking, common reasons for these challenges include:

- A lack of upper management support for the process review effort, which has led to 1) a lack of participation by one or more agency divisions or offices, 2) a lack of time and labor allocated for those performing the review, and 3) an inability to approve and implement any changes to agency procedures identified by the review;

- A perception that the process review needs to be separate of other agency initiatives to improve work zone safety and mobility management, and is thus additional work without additional benefits to the agency;
- A perception that project inspections and traffic control compliance field reviews being done by the agency are sufficient as a process review, which has limited agency consideration of a broader range of potential improvements in policies, procedures, training, etc.

Overall, agencies have considerable flexibility in determining how to construct and conduct their process reviews. This flexibility is necessary given the many different agency organizational structures, regional roadway and traffic characteristics, and work zone issues that can arise. However, such flexibility can also make the process review daunting to agency staff. Many topics could be included in a process review, and multiple sub-questions could be generated under each topic that an agency could also consider. Certainly, it is not realistic for an agency to attempt to cover all topics within a single process review. At the same time, it can be difficult for an agency to decide where to focus its attention for a given process review. This can be particularly challenging after an agency has performed one or two such reviews, and has “picked the low-hanging fruit” in terms of making work zone safety and mobility policy and procedure improvements.

One of the purposes of this document is to provide additional guidance for agencies to define what form their process reviews should take; what topics/questions they should focus on for the review, whether other questions and topics should be included, and how to structure the review in a manner that will yield improvements in its work zone policies and procedures. In addition to contributing to the national evolution of work zone management state of the practice, process reviews should convey real, lasting value to every agency that makes them a priority.

CONTENTS OF THIS GUIDANCE

This document is divided into the following main sections:

- Work Zone Process Reviews: Tips for Success
- Effective Use of Data and Performance Measures in Process Reviews
- Connecting Process Reviews with Other Work Zone Safety and Mobility Improvement Efforts

Examination of successful process reviews has uncovered several useful concepts and approaches taken by various SHAs, which are summarized in the first section.

Next, because the Work Zone Rule emphasizes the use of data as part of the process review, this document stresses the importance of establishing and continuously monitoring meaningful work zone safety and mobility performance metrics. Examples are provided of several outcome-based measures and data that agencies can use to verify that previous improvements to work zone safety and mobility management procedures have worked, and to help identify other procedures that may need to be enhanced in order to achieve additional performance improvements.

Finally, process reviews are only one of several methods available to assist agencies striving to improve their work zone safety and mobility policies and procedures. The results of some of those methods can be coordinated with process reviews in order to yield synergistic benefits. These opportunities are described in the last section of this document.

CHAPTER 2. WORK ZONE PROCESS REVIEWS: TIPS FOR SUCCESS

A 9-step approach to performing a process review is shown in the box to the right. Looking across the experiences of agencies that have successfully completed process reviews to date, several high-value activities stand out as keys to success:

- Creating an effective process review team
- Adopting a continuous improvement perspective of process reviews
- Deciding what to target in the review

CREATING EFFECTIVE PROCESS REVIEW TEAMS

Participation from multiple offices and divisions of an agency is essential in a process review because it helps ensure that processes throughout the project development cycle, and those involving other types of work zone activities (maintenance, data collection, etc.) are included and considered. Also, involving divisions and offices throughout the agency aids in identifying, gathering, and using available data for the review, as well as in determining what data should be collected for future process reviews. It is important that process reviews be holistic, considering all parts of an agency's operation that influence work zone safety and mobility.

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Suggested Process Review Steps

1. *Assemble a multidisciplinary team*
2. *Develop a review plan*
3. *Conduct review*
4. *Analyze and interpret results*
5. *Develop inferences, recommendations, and lessons learned*
6. *Prioritize recommendations and lessons learned*
7. *Develop an action plan to implement the prioritized recommendations*
8. *Present findings*
9. *Initiate the action plan*

Recommended Division/Office Representatives to Include on Process Review Teams

Planning
Occupational (Worker) Safety
Construction Administration
Roadway/Project Design
Materials
Traffic Operations/Management
Traffic Safety
Permitting
Maintenance
District Staff (Resident, Area, and/or District Engineers)
Training/Workforce Development
Public Information Office
Design Consultants
FHWA Division Office

The offices and representatives that should be included on the review team are noted in the box to the right. Active participation from all relevant parts of the agency is needed in order to perform an effective process review. Having upper agency management support of the process review effort makes it easier to achieve good participation.

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It is recommended that the FHWA Division Office be included on the review team to provide support as needed. However, the process review is the responsibility and for the benefit of the SHA. FHWA should not lead an SHA's process review effort.

ADOPTING A CONTINUOUS IMPROVEMENT PERSPECTIVE OF PROCESS REVIEWS

Process reviews are intended to assist SHAs in developing a continuous improvement culture towards work zone safety and mobility management. This concept, illustrated graphically in Figure 1, is a major reason why process reviews are required every two years. The two-year cycle encourages SHAs to take an incremental, systematic approach towards improvement. Each process review should build upon the knowledge gained, lessons learned, and improvement successes achieved with previous reviews.

Adopting a continuous improvement perspective towards process reviews also has practical value to an SHA. Given current work demands on agency staff, it is often not feasible for SHAs to spend large amounts of time during each process review examining in detail all aspects of agency operations that could relate to improved work zone safety and mobility. Consequently, agencies with a continuous improvement perspective typically take a high-level look at the current effectiveness of their overall work zone safety and mobility policies and procedures during each review, and then focus in greater detail on one or two topic areas. These areas of special emphasis then rotate for each process review. For example, an agency may choose to focus on how to significantly improve its work zone mobility and safety data collection and analysis procedures to achieve useful performance measures in one process review. In the next process review, the agency might then work on determining how to best use those performance measures in project planning and project development tasks.

Some agencies have also established standing work zone management "teams" that meet regularly to review recent data, identify and discuss work zone safety and mobility-related issues at a program level, identify potential improvements, and establish action plans to implement those improvements. For these agencies, process reviews are used more to collate and document those ongoing improvement actions and assess overall how well the actions are working.

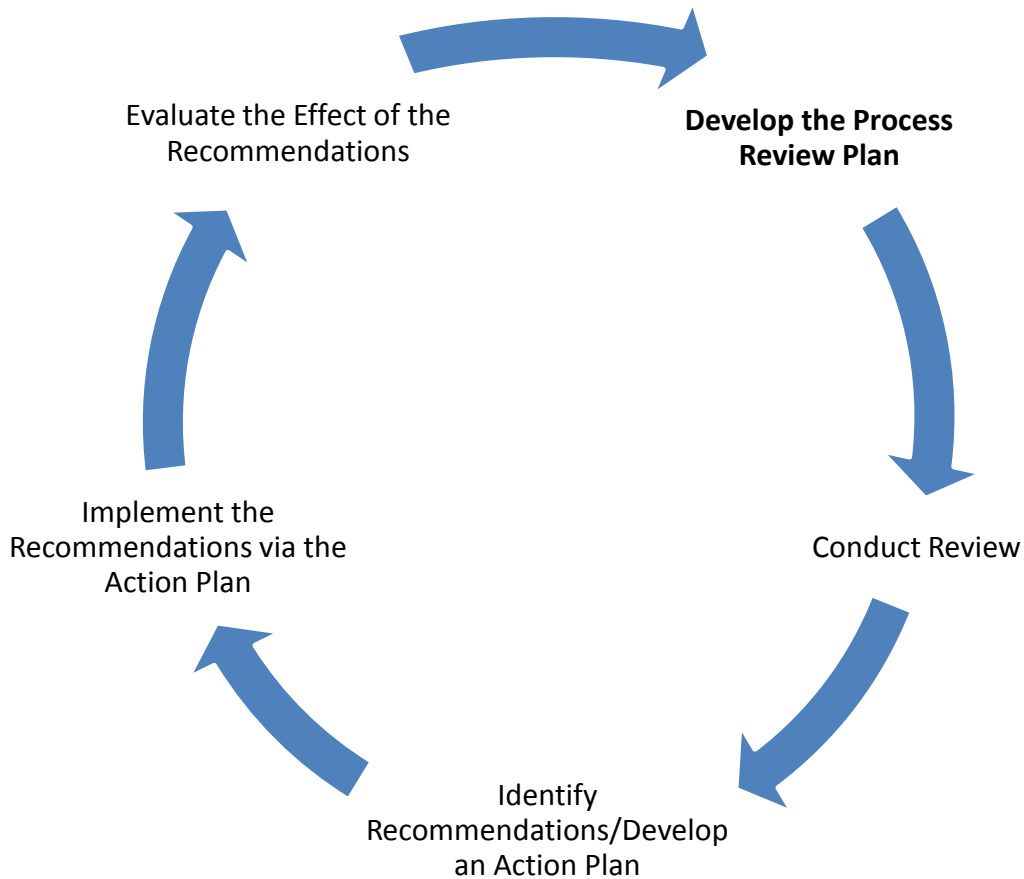


Figure 1. Work Zone Process Reviews: The Continuous Improvement Cycle

DECIDING WHAT TO TARGET IN EACH REVIEW

By establishing a continuing improvement perspective regarding process reviews, agencies can further investigate specific aspects of its work zone safety and mobility procedures and better understand what is working and what needs to be changed. Determining what to target within a given process review is a key activity that influences the effectiveness of each review. Three key questions (with follow-up questions about how to answer those main questions) can help an agency maintain a continuing improvement perspective, as depicted in Figure 2.

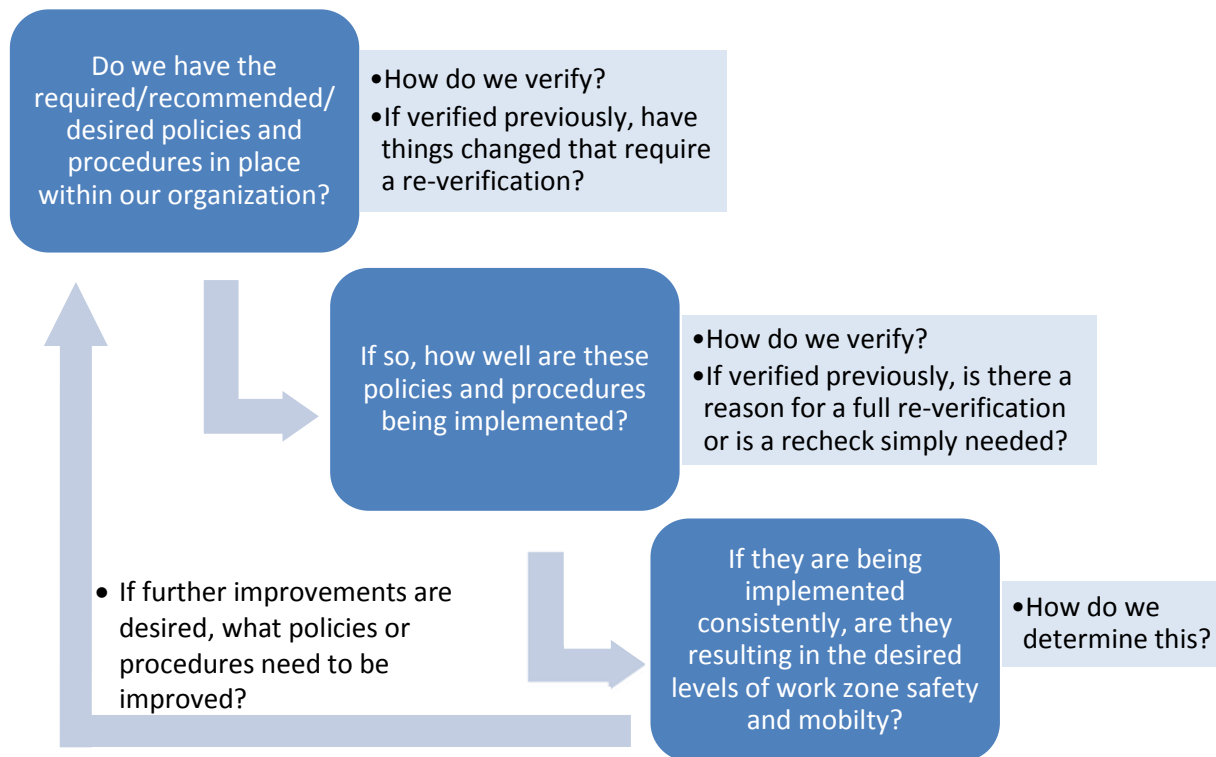


Figure 2. Questions to Help Guide Process Review Planning

In developing a plan for conducting process reviews, the agency should consider where it stands in this sequence, and base its plans for upcoming and subsequent reviews accordingly. Early process review efforts by many agencies have focused on verifying that all of the federal requirements regarding work zone safety and mobility policies and procedures are in place, and on assessing how well the policies and procedures have been implemented. Determining the level of implementation has been fairly easy for some agencies, but more difficult for others due to a lack of records or other data. Determining how best to verify implementation in future process reviews might be a focus area for those agencies. Eventually, it is desirable for agencies to be able to assess whether the required policies and procedures are having the desired effect on safety and mobility, and determining how best to obtain data to assess that could be another focus area of a future process review. If the agency determines that simply meeting the minimum requirements is not providing an adequate level of work zone safety and mobility performance, decisions may be made to establish new policies and procedures above the minimum requirements as part of the process review. This feedback would take the agency back to the first set of questions in Figure 2, with the emphasis focused on those new policies and procedures.

Thus, for most agencies, verifying compliance with the Work Zone Safety and Mobility Rule and the Temporary Traffic Control Devices Rule is the first priority in the process reviews. Figure 3 highlights the key requirements in those two Rules which agencies should verify that they have in place (and quickly recheck in future process reviews to ensure no changes have occurred) and are implementing. A simple, separate checklist to further aid agencies in assessing these requirements is included in Appendix A.

Subpart J and K Requirements to Check/Verify in a Process Review

- *Assessment and management procedures for work zone safety and mobility impacts have been incorporated into the entire project development cycle*
- *Data to manage work zone impacts is being collected and used during work zone implementation*
- *Training is available and required for personnel involved in all aspects of work zone transportation management and traffic control*
- *Procedures exist to identify significant projects and consider their needs throughout the project development process*
- *All Federal-Aid projects are required to have a transportation management plan (TMP), which at a minimum must include a temporary traffic control (TTC) plan that addresses traffic safety and control through the work zone; a TMP is encouraged for other projects as well*
- *The TMP requirements for significant projects also includes a transportation operations plan for the work zone impact area and a public information component; consideration of these components is encouraged for all projects*
- *TMPs are developed in consultation with other stakeholders (when appropriate)*
- *Plans, specifications, and estimates (PS&Es) include pay item provisions for implementing the TMP (either method-based or performance-based) and are not incidental to the contract*
- *Both the State and the contractor each designate a responsible person on each project trained and with authority to implement the TMP and address other safety and mobility impacts*
- *Policies and procedures are in place that promote consideration of:*
 - *Work zone positive protection devices to prevent intrusions*
 - *Exposure controls to avoid or minimize worker and road user exposure to work activities*
 - *Other traffic control measures to minimize work zone crashes*
 - *Safety entry/exit of work vehicles to/from the travel lanes*
 - *Interagency agreement/memorandum of understandings (e.g. utilities)*
- *Policy is in place addressing the use of uniform law enforcement, including some or all of the following:*
 - *Interagency agreements*
 - *Interactions between highway agency and law enforcement during project planning and development*
 - *Conditions where law enforcement needed or beneficial*
 - *Nature of law enforcement services to be provided, and procedures to determine project-specific services*
 - *Appropriate training on work zone safety and mobility for the officers*
 - *Procedures for interagency and project-level communications*
 - *Reimbursement agreements for law enforcement services*
- *Work zone traffic control is a separate pay item, and not incidental to the project:*
 - *Separate items are used for major categories of traffic control devices (TCDs), safety features (such as positive protection), work zone safety activities (such as law enforcement)*
 - *Lump sum can be used when estimates of TTC need is included in the PS&E*
 - *Unit price is used when contractor has no control over quantity and no firm quantity estimate is in PS&E*

Figure 3. Sample List of Rule (Subparts J and K) Requirements

Many of the questions listed in Figure 2 imply a need for data. The type and amount of “data” that best serves an agency during a process review depends on which of the questions the agency is working to answer. For answers to the question “Do we have all of the required/recommended/desired policies and procedures in place within our organization?”, it may be sufficient to simply document chapters/section numbers or active hyperlinks to those chapters/sections of the agency manuals, policies, guidelines, etc. that address the requirements. Meanwhile, some agencies striving to verify whether their policies and procedures are being implemented can examine forms, plans, reports, etc. that they require to be submitted as part of their project documentation efforts.

In other instances, agencies have used email questionnaires and/or in-person interviews by process team members to assess 1) awareness and 2) implementation of their work zone safety and mobility policies and procedures by their various division (e.g., planning, design, construction, project management, operations, maintenance, safety, etc.) and district/region staff. Agencies find that questions that are specific, measurable, and tailored to the type of work zone safety and mobility involvement of each division tend to be more valuable than questions that are vague and have no baseline. Examples of ways that questions can be made more specific and targeted are shown in Figure 4. Examples of questions to examine staff awareness, level of implementation, and perceived effectiveness of policies and procedures are illustrated in Figure 5. Other possible questions that might be included are included in Appendix B.

<i>General Questions are Less Useful</i>	<i>Specific Questions are More Useful</i>
<ul style="list-style-type: none"> • <i>Was consideration given to potential work zone impacts during planning efforts for the project?</i> • <i>Are TMPs being developed for significant projects?</i> • <i>Are travel conditions being monitored through the project? Have there been any problems?</i> • <i>Has the use of law enforcement been considered for significant projects?</i> • <i>Are work zones being coordinated to minimize impacts?</i> 	<ul style="list-style-type: none"> • <i>During planning, how are potential travel time impacts for projects estimated?</i> • <i>Were the results included in the assessment of build alternatives?</i> • <i>How does their consideration affect the decisions made?</i> • <i>Did the projects examined have a TMP developed and implemented?</i> • <i>What strategies were included?</i> • <i>Were the TMPs evaluated?</i> • <i>What were the results?</i> • <i>What methods are being used to measure or estimate travel delays on projects?</i> • <i>Are times when delays have exceeded policy thresholds being documented in project files?</i> • <i>On projects examined, how many times did travel delays exceed the policy threshold?</i> • <i>For projects where law enforcement was used, how was the decision to use enforcement made?</i> • <i>How much enforcement was used?</i> • <i>How was this decided?</i> • <i>What steps are taken to minimize multiple lane closures at the same time on the same section of roadway?</i> • <i>On adjacent roadways that are used as alternative routes for each other?</i>

Figure 4. Specific, Targeted Questions Help Answer Questions Posed in Process Reviews

One of the advantages of using questionnaires and interviews is to gather information on impediments to implementing policies and procedures. For example:

- Is it because of the way the policies and procedures are worded?
- Is it because it is not clear what constitutes implementation?
- Is it because there is disagreement with the policies/procedures, suggesting that more outreach and training to improve understanding and buy-in on them?

Although interviews and surveys are helpful to agencies in assessing the level of implementation of work zone safety and mobility policies and procedures as well as in obtaining perceptions of how effective the policies/procedures may be, outcome-based performance measures of both work zone safety and mobility impact are the most direct indicators of agency work zone safety and mobility mitigation efforts. Outcome measures include changes in crashes or crash risks, increases in delays and/or queues, and level of customer satisfaction with travel quality and/or efforts to mitigate other impacts. Additional information regarding the selection and use of outcome-based performance measures for process reviews is provided in the next section.

Outcome-based performance measures of both work zone safety and mobility are the most direct indicators of the impacts of agency improvement efforts.

Assessing Staff Awareness of Policies and Procedures:

- *Are you aware of the agency policy regarding the development, implementation, and evaluation of transportation management plans for significant projects?*
- *Do you know what training is available regarding work zone safety and mobility management?*

Assessing Staff Implementation of Policies and Procedures:

- *At what step in the project development process are significant projects first identified?*
- *What traffic control plan and work zone safety and mobility procedure-required strategies were used on this project?*
- *When does TMP development begin for significant projects in your jurisdiction?*
- *Are crash reports reviewed by project personnel during a project? Are changes made to the project in response to those data? What examples can you provide?*
- *Is a feedback mechanism being used by project staff to report problems with the TMP back to other project development personnel for future projects?*

Assessing Staff Perceptions of Effectiveness of Policies and Procedures:

- *Do the impacts assessment procedures used to evaluate significant projects provide realistic and useful estimates?*
- *Has the number of change orders to address work zone safety and mobility issues during construction increased or decreased since the work zone policy was changed?*
- *Have the operational goals established in the work zone policy been met on most of the significant projects? For those projects where it was not, what reasons led to the failure to comply?*

Figure 5. Questionnaires and Interviews can Assess Staff Awareness, Level of Implementation, and Perceived Effectiveness of Work Zone Policies and Procedures

DEVELOPING FINDINGS, RECOMMENDATIONS, AND ACTION PLANS

The findings, recommendations, and action plans are where the value of a process review is achieved. It is useful to document the three main types of findings in the review:

- Are there any instances in which our agency not in compliance with regulations and requirements?
- What requirements has our agency met, and how is our agency doing well and exceeding the requirements?
- Are there other policies and procedures that we should put in place to achieve our work zone safety and mobility mitigation goals?

Developing recommendations from the findings is then straightforward. An agency may find value in looking back over previous process reviews recommendations as part of this effort. Those recommendations not acted upon from the previous review should be examined to determine why they were not implemented (such as limitations in time availability, funding, or data). The reasons for inaction may be useful when developing the specific recommendations for the current review.

Once the recommendations have been developed, they can then be prioritized and an action plan established to implement the high-priority actions. One of the challenges that some agencies have encountered with process review findings is in the magnitude of recommendations that are generated. A continuous improvement perspective of process reviews is once again valuable here, looking at which actions need to occur before others can take place. The action plan should include:

- The specific action that needs to be taken;
- Who will be responsible for making it happen (i.e., the owner/champion);
- What resources, if any, will be required for implementation; and
- The anticipated timeline for completion.

DEVELOPING AND PRESENTING THE PROCESS REVIEW REPORT

A process review report need not be a lengthy document. A report that is focused and well-written is preferable, providing the necessary work zone safety and mobility improvement action plan for the agency over the next two years. Effective process review reports include:

- A simple statement of the objectives, scope, and plan identified for the review;
- The members of the team who participated in the review;
- The methodology used to conduct the review;
- The observations and findings identified;
- Recommendations generated; and
- The agreed-upon action plan.

Appendix C presents a process review report template to aid agencies in preparing their document.

CHAPTER 3. EFFECTIVE USE OF DATA AND PERFORMANCE MEASURES IN PROCESS REVIEWS

IMPORTANCE OF DATA AND PERFORMANCE MEASURES

The Work Zone Rule requires SHAs to “continually pursue improvement of work zone safety and mobility by analyzing work zone crash and operational data from multiple projects to improve State processes and procedures.” To date, most process reviews have relied extensively on field reviews of temporary traffic management and control plan implementation quality, project inspections, examination of statewide work zone crash counts (typically work zone fatalities), and staff questionnaires and interviews as the data to be analyzed. However, field reviews and inspection scores typically provide only a final snapshot perspective of traffic control plan implementation and maintenance quality, rather than an overall assessment of an agency’s entire work zone safety and management program. Likewise, crash statistics provide some insight into work zone safety, but such measures also require exposure data in order to generate useful information on the effectiveness of work zone safety policies and procedures across the agency. Even questionnaire/interview responses of agency staff provide only a subjective view of work zone safety and mobility management efforts and perceived effectiveness.

Outcome-based performance measures describe how much effect work zones have on safety and mobility in terms of increases in crash risk, travel times, travel time reliability, or level of customer satisfaction (the traveling public, business owners, etc.) with travel conditions.

Technology advances in recent years have increased the availability and timeliness of both mobility and safety data in work zones.

Traditionally, agencies have not emphasized the collection and analysis of outcome measures of work zone safety and mobility. Fortunately, technology advances in recent years have increased the availability and timeliness of both mobility and safety data on major roadways and in work zones. Consequently, agencies should consider the opportunities to make use of such data as part of their process reviews.

Examples of Data and Performance Measures for Work Zone Process Reviews

FHWA has published guidance on data needs and availability for work zone performance measurement as well as a primer on work zone performance measures (see <http://ops.fhwa.dot.gov/wz/resources/publications/fhwahop13011/index.htm> and <http://ops.fhwa.dot.gov/wz/resources/publications/fhwahop11033/index.htm>). SHAs refer to these resources to help include outcome-based measures in their process reviews. In general terms, agencies will need to gather and collate three different types of data:

- Exposure data – estimated or actual volumes, vehicle occupancies, pedestrian counts in and possibly around some of its work zones;
- Indicator/stratification data – times when certain work zone conditions and traffic control features were present at those work zones being examined. This data is combined with

exposure data to focus on high-impact times such as when work activity is occurring or when temporary lane closures are in place; and

- Performance data – measuring how much those work zones being examined affected crashes, travel times, or customer satisfaction levels.

Mobility Performance Measures

Mobility data and measures for work zone process reviews can be used in at least two ways:

- To assess the degree of compliance with stated objectives or performance thresholds in the agency's work zone policy or procedures; and
- To assess changes in absolute measures pertaining to work zone mobility observed from one process review to the next.

Project staff can gather data on queues, travel times, etc. for certain time periods (such as peak periods, during temporary lane closures, etc.), but the accuracy and thoroughness of data collection efforts must be carefully monitored. Performance data can also be obtained from electronic traffic sensors on site or from private-sector data. These data can then be analyzed in terms of frequency of violation of target thresholds and/or the extent by which the threshold was exceeded. Once the collection and analysis procedures have been established and institutionalized, comparison of the measures from one process review to the next can illustrate whether work zone mobility performance is improving, being maintained, or degrading. Differences in performance measures for certain subsets of projects (those involving long-term lane closures, for example) may suggest a need for additional changes in agency policies and procedures for those types of projects.

Example Mobility Measures Useful for Process Reviews^a

Compliance with Mobility Goals, Stated Thresholds

- Percent of significant projects with more than 10 events exceeding the maximum delay threshold stated in the agency's policy
- Number of events during all significant projects where the maximum delay threshold was exceeded

Absolute Mobility Measures and Changes over Time from Pre-Work Zone Conditions

- Average delay per vehicle during peak hour for significant projects examined
- Change in 95th percentile travel time experienced during a project
- Percent of time when queues existed at a project
- Percent of significant projects that experienced more than 5 events that exceed the maximum queue length and duration threshold stated in the agency's policy
- Change in number of hour-miles along the facility with operating speeds less than 40 mph

^a Numbers listed are illustrative; actual values used would be chosen by the agency

Safety Performance Measures

Some agencies have also established safety-related goals and performance metrics as part of their work zone safety and mobility policy. Crash data is the most direct indicator of safety, but can be challenging to obtain in a timely manner. Safety surrogate data, typically speeds or erratic maneuvers, are easier to obtain but more difficult to interpret with respect to how safety is affected. Worker injury data may also be considered. Both crash and worker injury data are usually sparse for shorter duration projects.

Example Safety Measures Useful for Process Reviews^a

Compliance with Safety Goals, Stated Thresholds

- Percent of significant projects that experienced statistically significant increases in crash frequency
- Average increase in crashes across the significant projects examined in the process review

Absolute Safety Measures and Changes over Time from Per-Work Zone Conditions

- Change in crash rate per-vehicle-mile traveled during peak and off-peak periods throughout construction
- Percent of vehicles exceeding the posted work zone speed limit by more than 10 mph
- Frequency of forced merges per 1000 lane closure vehicle passages
- Worker injury rates per 200,000 worker-hours (for comparison to the national BLS injury rate)

^a Numbers listed are illustrative; actual values used would be chosen by the agency

A methodology useful for work zone safety performance measurement is to estimate what the expected frequency of crashes would have been on a segment of road if the work zone had not been present, and compare that to the frequency of crashes that actually occurred during the project. Some agencies have used simple 3-year averages prior to construction as the expected crash frequency, whereas others have begun to employ more sophisticated crash prediction methods such as those documented in the *Highway Safety Manual*. The advantage of the more advanced methods is their ability to better address regression-to-the-mean and other statistical challenges associated with analyzing crash data; however, they do require special training to use and more data to properly apply.

Customer Satisfaction Performance Measures

In many cases, customer satisfaction performance measures may correlate with the mobility and safety measures described above. However, customer satisfaction measures will also reflect the results of agency and contractor efforts to mitigate these mobility and safety impacts. The traveling public generally understands the need to perform roadway repair and improvements, but is frustrated when efforts to keep them informed and/or minimize the inconvenience are not made. This is why public information efforts are so important for those significant projects that are expected to cause safety and mobility impacts.

Example Customer Satisfaction Measures Useful for Process Reviews^a

Compliance with Customer Satisfaction Goals, Stated Thresholds

- Percent of significant projects receiving more than 5 complaints per month
- Percent of customer satisfaction scores statewide below a “Good” value

Absolute Customer Satisfaction Measures and Changes over Time

- Average rating scores for each survey question (e.g., “How easy is it to safely travel through work zones you encounter?”)

^a Numbers listed are illustrative; actual values used would be chosen by the agency

The most common method of obtaining customer satisfaction performance measures is through the use of surveys (one-on-one, focus groups, online/email, etc.). Social media is also seeing increased use as a tool for assessing customer opinions.

CHAPTER 4. CONNECTING PROCESS REVIEWS WITH OTHER AGENCY WORK ZONE IMPROVEMENT EFFORTS

Work zone process reviews can be a powerful tool for agencies in their efforts to limit the safety and mobility consequences of work zones. For some agencies, opportunities may also exist to mesh their process review efforts with other activities underway to monitor work zones or to improve agency effectiveness in addressing work zone impacts. FHWA Division personnel perform an internal annual compliance review of a sample of projects in each state. Similarly, overall transportation systems operation and management efforts in metropolitan areas are periodically assessed, including efforts to minimize work zone impacts. Finally, a Work Zone Management Capabilities Maturity Framework (WZCMF) has recently been developed through FHWA support of the Strategic Highway Research Program (SHRP II).

The FHWA initiatives can be another source of performance data that agencies can consider when conducting their process reviews. Including FHWA Division representatives on the process review team is the most direct means of ensuring that these data are available and included in process review deliberations. Similarly, the WZCMF is another tool available to agencies striving to become more effective in work zone safety and mobility management. As will be discussed later in this section, the WZCMF and process reviews can be used together to achieve significant improvements in work zone safety and mobility management policies and procedures.

FHWA DIVISION OFFICE MONITORING INITIATIVES

Both of the internal FHWA monitoring efforts strive to track level of implementation and abilities to effectively manage work zone impacts. One effort is intended primarily for metropolitan areas. The work zone management portion of that activity solicits feedback from the Division offices on:

- regional efforts to coordinate projects in ways to minimize impacts to travelers,
- efforts to assess actual travel impacts of work zones in the region and to make adjustments to minimize those impacts,
- efforts to develop and implement TMPs that strive to minimize work zone impacts, and
- efforts to keep transportation management centers informed of upcoming lane closures so that appropriate management activities can be implemented.

Certainly, the responses provide important insights about these particular work zone safety and mobility procedures, and should be a source of data acquired and examined during each process review cycle.

Meanwhile, the second monitoring effort examines compliance with key work zone safety and mobility regulations in order to provide a national perspective of regulation implementation. Questions are developed to respond to for certain work zones. The questions can vary from assessment to assessment depending on the particular compliance topics of interest. A sampling effort is employed to achieve responses that provide a statistically valid indication of

compliance. Examples of the types of questions that might be included in an assessment effort are listed below:

- Did the TMP include a temporary traffic control (TTC) plan, transportation operations (TO) strategies, and public information (PI) strategies?
- Do the temporary traffic control devices for this project conform to the Manual of Uniform Traffic Control Devices (MUTCD)?
- Were positive protection devices considered in accordance with the agency's policy or was an engineering study completed to determine the need for positive protection devices, based on work zone situations that place workers at increased safety risk and where positive protection offers the highest potential for increased safety for workers and road users?
- Were separate pay items provided for major categories of traffic control devices, safety features, and work zone safety activities, including but not limited to positive protection devices and uniformed law enforcement activities?
- Did the State provide inspections at a level necessary to provide ongoing compliance with the State's quality guidelines to help maintain the quality and adequacy of the temporary traffic control devices for the duration of the project?
- Have the needs of all road users (motorists, bicyclists, pedestrians, including persons with disabilities) been accommodated through the work zone?
- Were temporary pedestrian facilities detectable and did they include accessibility features consistent with the features present in the existing pedestrian facilities where the existing pedestrian facilities were disrupted, closed, or relocated in a TTC zone?

Responses to these questions for the sample of projects examined in each state would be another good source of information to be considered in a process review effort.

THE WORK ZONE MANAGEMENT CAPABILITY MATURITY FRAMEWORK

Recent national research has led to the successful application of capability maturity models to transportation system operations and management improvement efforts. These models focus on several institutional features that determine a transportation agency's ability to improve the outcomes of system operations and management efforts. Work zone management is a key subset of an agency's effectiveness to improve transportation system operations. Consequently, a framework to apply the capability maturity model to work zone management has been developed. Additional information on this topic can be found here: http://onlinepubs.trb.org/onlinepubs/shrp2/SHRP2_S2-L06-RR-2.pdf.

The institutional features considered under the framework consist of six main sub-dimensions:

1. Business processes
2. Systems and technology
3. Performance measurement
4. Agency culture
5. Organization and workforce development
6. Collaboration

Several topics relating to the Work Zone Safety and Mobility Rule and Traffic Control Devices rule are specifically incorporated into this framework (see Table 1). Levels of performance have been identified for each of these topics, and a set of actions have been identified that provide direction to agencies on how to improve their capability on that particular topic:

- Level 1: Not Performed or Minimally Performed – Activities and relationships regarding work zone management are largely ad hoc, informal, and champion-driven – substantially outside the mainstream of other transportation activities.
- Level 2: Managed – Basic strategy applications are in place with key process and needed staff capacities under development – but limited accountability and collaboration and sustainable resources exist across the agency.
- Level 3: Integrated – Standardized strategy applications are implemented in priority contexts and managed for performance; the transportation systems management and operations (TSM&O) technical and processes are developed, documented, and integrated into the regional transportation agencies, and partnerships to achieve success are aligned.
- Level 4: Optimized – The TSM&O is a full, sustainable, region-wide program, established on the basis of continuous improvement with all partners.

Table 1. Sub-Dimensions Included in the Draft Work Zone Management (WZM) Framework

Sub-Dimensions	Topics Considered Under Each Sub-Dimension
Business Processes	<ul style="list-style-type: none"> • How does the determination of project “significance” (as defined by the agency and 23 CFR 630 Subpart J) affect project development decisions? • How does your agency consider road user costs in making WZM decisions? • Does your agency utilize innovative contracting to help achieve work zone management goals and objectives? • How does your agency develop, implement, and evaluate TMPs?
Systems and Technology	<ul style="list-style-type: none"> • How does your agency assess and adopt new technology and procedures for WZM? • How does your agency apply existing technology already in place to address WZM needs?
Performance Measurement	<ul style="list-style-type: none"> • How does your agency quantify WZM performance? • How are WZM performance measures used by your agency?
Culture	<ul style="list-style-type: none"> • How is WZM innovation encouraged within the agency? • Is WZM valued within the agency? • What type of agency WZM outreach and reporting exists?
Organization and Workforce	<ul style="list-style-type: none"> • What types of WZM knowledge and skills exist within the agency? • How are WZM knowledge, skills, and abilities developed within the agency? • How are WZM knowledge, skills, and abilities implemented within the agency?
Collaboration	<ul style="list-style-type: none"> • How does the agency utilize law enforcement for WZM needs? • How does the agency consider private-sector input (e.g., contractors, affected businesses) in addressing WZM needs? • How does the agency incorporate other stakeholders into the WZM process?

A synergistic relationship exists between the WZMCMF and agency process reviews. Specifically, the framework provides a systematic approach toward identifying actions that an agency can take to evolve towards a higher-performing organization regarding work zone safety and mobility management. In other words, efforts by an agency to apply the framework to its set of conditions could provide useful input into process reviews and action items. Conversely, data collected and examined regarding work zone management effectiveness in process review efforts could be key inputs for an agency wishing to apply the framework.

Use of the work zone capability maturity framework in conjunction with process reviews can provide synergistic benefits to many agencies.

CHAPTER 5. REFERENCES

Work Zone Process Review Toolbox. FHWA, U.S. Department of Transportation, Washington, DC. Accessible at http://ops.fhwa.dot.gov/wz/prtoolbox/pr_toolbox.htm.

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Ullman, G.L., G. Pesti, and R. Klein. *Guidance on Data Needs, Availability, and Opportunities for Work Zone Performance Measures*. Report No. FHWA-HOP-13-011. FHWA, U.S. Department of Transportation, Washington, DC, March 2013. Accessible at <http://ops.fhwa.dot.gov/wz/resources/publications/fhwahop13011/index.htm>.

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Guide to Improving Capability for Systems Operations and Management. SHRP 2 Report S2-L06-RR-2. TRB, National Research Council, Washington, DC, 2011. Accessible at http://onlinepubs.trb.org/onlinepubs/shrp2/SHRP2_S2-L06-RR-2.pdf.

APPENDIX A. SUBPART J AND K REQUIREMENTS CHECKLIST

Requirements	Present	Not Present	Not
<i>Assessment and management procedures for work zone safety and mobility impacts have been incorporated into the <u>entire</u> project development cycle</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Data to manage work zone impacts is being collected and used <u>during</u> work zone implementation</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Training is available and required for personnel involved in all aspects of work zone transportation management and traffic control</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Procedures exist to identify significant projects and consider their needs throughout the project development process</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>All Federal-Aid projects are required to have a transportation management plan (TMP), which at a minimum includes a temporary traffic control (TTC) plan that addresses traffic safety and control through the work zone</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>The TMP requirements for significant projects also includes a transportation operations plan for the work zone impact area and a public information component</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>TMPs are developed in consultation with other stakeholders (when appropriate)</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Plans, specifications, and estimates (PS&Es) include pay item provisions for implementing the TMP (either method-based or performance-based) and are not incidental to the contract</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Both the State and the contractor each designate a responsible person on each project with the training and authority to implement the TMP and address other safety and mobility impacts</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Policies and procedures are in place that promote consideration of:</i>			
○ <i>Work zone positive protection devices to prevent intrusions</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
○ <i>Exposure controls to avoid or minimize worker and road user exposure to work activities</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
○ <i>Other traffic control measures to minimize work zone crashes</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
○ <i>Safe entry/exit of work vehicles to/from the travel lanes</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
○ <i>Interagency agreement/memorandum of understandings (e.g. utilities)</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Policies are in place addressing the use of uniform law enforcement, including some or all of the following:</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
○ <i>Interagency agreements</i>			
○ <i>Interactions between highway agency and law enforcement during project planning and development</i>			
○ <i>Conditions where law enforcement is needed or beneficial</i>			
○ <i>Nature of law enforcement services to be provided, and procedures to determine project-specific services</i>			

Requirements	Present	Not Present	Not
<ul style="list-style-type: none"> ○ <i>Appropriate officer training on work zone safety and mobility</i> ○ <i>Procedures for interagency and project-level communications</i> ○ <i>Reimbursement agreements for law enforcement services</i> 			
<p><i>Work zone traffic control is a separate pay item, and not incidental to the project:</i></p> <ul style="list-style-type: none"> ○ <i>Separate items are used for major categories of traffic control devices (TCDs), safety features (such as positive protection), work zone safety activities (such as law enforcement)</i> ○ <i>Lump sum can be used when estimates of TTC need is included in the PS&E</i> ○ <i>Unit price is used when contractor has no control over quantity and no firm quantity estimate is in PS&E</i> 	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>

APPENDIX B. POSSIBLE IMPROVEMENT TOPICS TO CONSIDER

POLICY

- Should you establish/revise strategic goals specifically to reduce congestion and delay in work zones?
- Should you establish/revise work zone performance metrics that address: maximum queue lengths, number of open lanes, maximum traveler delay, and/or other measures?
- Should you establish/revise criteria to support selection and use of project execution strategies (e.g. night work and full closure) to reduce public exposure to work zones and reduce the duration of work zones?
- Should you establish/revise policies to support the use of innovative contracting strategies to reduce contract performance periods?

PROJECT PROGRAMMING AND PLANNING

- Should you establish/revise the planning process to encourage use of traffic analysis tools to determine the impact of future significant road construction and maintenance activities on network performance, effects of design alternatives to facilitate future road construction and maintenance, coordination efforts to best sequence the road projects that are planned, etc.?
- Should you establish/revise the planning process to include a transportation management cost component into project estimates for those projects deemed significant?
- Should you establish/revise the planning process to increase planning staff involvement during project design to help with analyses of potential transportation management mitigation strategies?

PROJECT DESIGN

- Should you establish/revise procedures to incorporate constructability reviews for significant projects that include consideration of transportation management mitigation strategies being contemplated (potentially including contractors in the review if allowed by law)?
- Should you establish/revise procedures for establishing project time estimates on significant projects where accelerated construction techniques are desirable?
- Should you establish/revise procedures to assess whether use of some type of work zone Intelligent Transportation Systems should be used on a project?

- Should you establish/revise procedures to solicit contractor input in the development of traffic control plans for significant projects (if allowed by law)?
- Should you establish/revise procedures as to how traffic impacts and flow characteristics are estimated for the traffic control plan being considered?

PROJECT CONSTRUCTION AND OPERATION

- Should you establish/revise procedures to consider the use of performance-based selection of contractors relative to previous project time completion history?
- Should you establish/revise procedures on when to encourage the inclusion of incident management services into the project TMP?
- Should you establish/revise procedures to allow flexible starting time for the contractor after the Notice to Proceed is issued?
- Should you establish/revise procedures requiring and/or providing training to uniformed law enforcement on work zone devices and layout?

APPENDIX C. WORK ZONE PROCESS REVIEW REPORT TEMPLATE

EXECUTIVE SUMMARY (Optional)

If the body of process review report is lengthy some agencies prepare a 1-2 page summary of the objectives, scope, conclusions, and action/implementation items documented.

INTRODUCTION/BACKGROUND

This section sets the stage and provides information that may be relevant to how the process review was developed and performed the agency. Possible items covered in this section could include:

- *A summary of the action items identified from the previous process review and subsequent efforts made to implement them since then,*
- *Other efforts undertaken since the last process review to improve work zone safety and mobility, and*
- *Any other efforts to improve overall transportation management effectiveness in a state or region that had work zone management implications (e.g., results of an application of the work zone capability maturity framework by the agency, etc.).*

PURPOSE/OBJECTIVE

In this section, the agency should describe what aspects of its work zone policies, processes, and procedures were focused on during this review. Possibilities include:

- *Verification of agency policy and process compliance with 23 CFR 630 Subpart J and K requirements (or a quick recheck if previously verified)*
- *Assessment of the quality of implementation of the required policies and procedures (or a quick recheck if previous assessments indicated good implementation)*
- *Assessment of whether other work zone process improvements were needed to further improve work zone safety and mobility, and identification of those improvements.*

SCOPE/METHODOLOGY

In this section, the agency should describe how the process review was performed. Items that should be covered are the following:

- *Listing of the members of the process review team*
- *Sources of data used in the process review (documents, files, checklists, FHWA division ratings, survey/interview questions, comparison of crash experiences and rates across projects, travel times, etc.) and how that data were selected/obtained*
- *Analyses performed on that data*

OBSERVATIONS/FINDINGS

The observations of the analyses performed are presented in this section. Any measures of performance computed should be reported, and compared to similar measures from previous reviews (if available) to determine what changes have occurred. Comments from interviews and surveys as to areas of potential improvement should also be noted, and any mobility and safety data gathered pertaining to those areas examined to further quantify the need for improvement.

CONCLUSIONS/RECOMMENDATIONS

Based on the collective assessment of all of the data gathered and examined in the previous section, the agency should generate a list of conclusions from the review. The conclusions should identify those areas and topics where the agency is performing well, as well as identifying areas to be improved. For the latter, the agency should develop a specific list of recommendations for changes to agency procedures, emphasis areas, etc., that are believed to be necessary to address those improvement needs.

ACTION/IMPLEMENTATION PLAN

In the last section of the process review report, the agency should prioritize the recommendations for improvements to agency processes, select those that agency will pursue, and develop an action plan for implementing those recommendations. Consideration should be given to how the various recommendations relate to each other (e.g., does one recommendation need to be accomplished before another?) and to whether any actions needed in order to implement one recommendation will assist or inhibit the ability to implement any other recommendations.

For the actions selected that will be pursued by agency, a matrix can be developed identifying:

- *What resources are needed in order to take that action*
- *Who will be responsible for ensuring that the action is taken*
- *The anticipated timeline needed in order to take the action*
- *How completion of the action will be determined, and by whom*

The action plan can then serve as the starting point for the next process review.

APPENDICES (Optional)

If desired, an agency may choose to include supporting materials used or referred to in the process review report. Items that have been included by some agencies include:

- *Copies of policies, procedures, guidelines*
- *List of questions used in the review (if questionnaires or interviews were used)*
- *Checklists, if deemed important for the implementation of the action plan*
- *Detailed data analyses results used in the review*



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