Speed Management Action Plan Template

Problem Identification, Solutions, Implementation, Evaluation

FHWA Safety Program

U.S. Department of Transportation
Federal Highway Administration

Safe Roads for a Safer Future
Investment in roadway safety saves lives

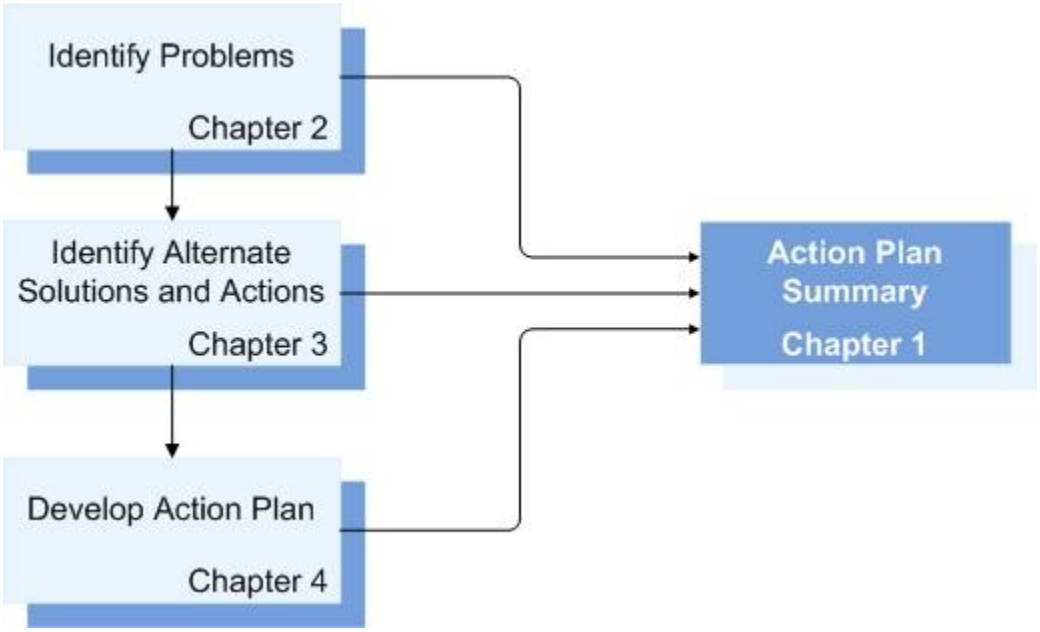
http://safety.fhwa.dot.gov

How to Use This Model Plan Template

Purpose: This Model Plan template is part of the Jurisdiction Speed Management Action Plan Development Package. This template was developed to provide a framework for State and local agencies to use in developing speed management safety action plans. The plan template provides guidance but allows the user to develop tailored actions, safety goals and a plan for countermeasures implementation through a systematic process, as well as to address larger speed management issues that often limit program effectiveness and durability.

Users may also refer to two pilot plans already developed: one is a plan for a local jurisdiction (a County) and the other is a statewide action plan. These plans provide examples that were developed using data and other input specific for those jurisdictions.

Process: To develop a Plan, the user should first begin with Chapter 2, the problem identification process. Identify system-wide safety issues and location-specific issues or risks. Appendix A provides more information about the network screening process to identify speeding-related safety problems at particular locations. Proceed with Chapter 3 to identify alternate countermeasures and strategies and the actions to prioritize and implement them. Finally develop Chapter 4, the prioritized and detailed Action Plan. Appendix B may aid in developing and organizing implementation strategies for Chapter 4.



After chapters 2 through 4 are developed, complete Chapter 1. Chapter 1 provides a summary and overview of the findings from the other chapters, an overview of the Action Plan, and a description of the Plan contents.

The template assumes a working knowledge of problem identification (data analysis, network screening, etc.), and other plan development processes, and knowledge of whom to coordinate with for relevant information. The Plan template provides descriptions of content rather than providing step-by-step instructions on developing the content. More information is available on all steps of the process including countermeasure identification, in the ***Speed Management Toolkit*** and resources mentioned in that companion document to this template.

Data sources that may be used include: crash data, roadway inventory data, and speed data, if available. Other sources of information include results of public or driver surveys, speed complaint databases that law enforcement agencies may compile, or public input from other transportation plans as well as citation data or other law enforcement data. However, note that speeding citation data should be used in conjunction with crash data; citations alone may not reflect where safety problems are greatest.

Plan Development Team - Expertise needed: Varied types of stakeholders and expertise are needed to identify problems and develop the plans. Data managers and analysts will be needed to provide, compile and analyze crash and other data to assist with problem identification in Chapter 2.

Chapter 2 and the other chapters also require engineering and other expert stakeholder input regarding current speed limit setting practices, enforcement and education practices, engineering/design policies, and practices and guidelines that may be in need of improvement. Planning, design, engineering, injury prevention, law enforcement, education, and communications expertise are also needed to identify alternate strategies (Chapter 3), conduct economic assessments, and prioritize the actions and strategies to implement (Chapter 4).

Chapter 4 requires Plan development. Many resources are available to assist with this process, including two pilot Action Plans already developed and mentioned above. Other resources are also mentioned in the Toolkit.

Speed Management Toolkit document: To help develop the Plan and select the most effective strategies, information on expected safety effects of different speed-related countermeasures is provided in the Speed Management Countermeasures section of the *Speed Management Toolkit* companion document. In addition, the Crash Modification Factors (CMF) Clearinghouse (also described in the *Toolkit*), and in-State sources may be consulted for up-to-date information about effective countermeasures.

Guidance for using the Template:

- Non-highlighted plain text is “boilerplate” text that may be general enough for use as is, although it may be modified as needed.
- Within boilerplate text, <Yellow> highlighted text, enclosed by angle brackets (< and >), is text intended for the user to adapt to their specific needs. Remove the brackets and highlights once the local information has replaced the generic content.

- Text highlighted inside gray tables, and also enclosed by angle brackets (< and >), describes intended Plan content for each section. In some cases, illustrative examples are provided. Users may find the examples relevant for their jurisdiction and adapt these to their use. The text boxes start off with action words (e.g. "Describe", "Summarize", "State," etc.) that provide guidance to the Plan developers. These text boxes and text enclosed in the angle brackets should also be removed from the Plan as the content for each relevant section is developed.
- *<Bracketed, italicized notes, which are also highlighted in green, provide additional instructions or information that may be useful to the Plan developers, but should be removed from the final Plan, as the notes could prove confusing for others not involved in developing the Plan.>*
- Appropriate tables should be used to summarize key plan elements:
    - Tables 1 and 2 in Chapter 1 (action items and implementation steps).
    - Table 3 (example presentation of speeding-related crash factors) in Chapter 2.
    - Tables 4 and 5 in Chapter 3 (action items and strategies to address problems identified).
    - Tables 7-12 in Chapter 4 (action items and implementation steps).

These tables provide, in some cases, an empty template that might be useful for presenting data or other plan elements, and in others, rather detailed lists of problem types, or alternate actions, strategies, and countermeasures.

In the latter cases, appropriate elements may be kept in the tables while others that are not appropriate or are not selected for focus may be eliminated. Any of these tables may be adapted or modified to provide a locally-tailored plan that will address identified needs. Figures and charts may also help to illustrate analysis results or other information.

Contents

Tables

Chapter 1. Overview of the Plan

<Remember to develop the content for Chapters 2, 3 and 4 before completing Chapter 1. Start with Chapter 2, Problem Identification.>1

1.1 Plan Purpose and Description

This Speed Management Action Plan characterizes the <State or Local Jurisdiction Name> speeding-related safety problems and speed management issues, identifies appropriate engineering, enforcement, and educational countermeasures and strategies, and outlines actions the <State / Locality, and other partners> can take to implement these strategies to reduce speeding and speeding-related fatal and injury crashes. This Plan will facilitate coordination and cooperation among various agency stakeholders including road planners, designers and managers, enforcement officials, public health practitioners, and policy-makers to implement a sustainable speed management program, and to target the most cost-effective and feasible countermeasures where they will have the greatest safety benefits.

The remainder of this chapter outlines the safety goals of the Plan, the need for the Plan, broadly describes the speed management approaches and the remaining Plan content, defines terms used, and provides an overview of the problems and the action items for implementing Plan strategies.

1.2 Safety Goals of the Plan

<The safety goals of the Plan are to reduce fatal and injury crashes in support of the Strategic Highway Safety Plan. A related goal may be to improve compliance with speed limits since lower operating speeds are expected to reduce the frequency of fatal and injury crashes. Include other introductory sentences such as a Vision Statement if desired. A typical plan timeline is five years.>

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[1] - Non-highlighted (plain) text is "boilerplate" text that may be general enough for use as is, or modified as needed.
- Text enclosed by <angle brackets>, and highlighted in yellow should be replaced with specific text for the jurisdiction Plan. Remove the highlights once jurisdiction information has replaced the generic content.
- Tables highlighted in light gray contain descriptions enclosed by angle brackets (< >) of specific types of Plan content with illustrative examples. These sections begin with action words (e.g. "Describe", "Summarize", "State," etc.) for the Plan developers. These tables and text enclosed by angle brackets should also be adapted or removed from the Plan as the specific content for each section is developed.
- *<Bracketed notes in italics emphasis, and also highlighted in light green>* provide additional instructions or information that may useful to the Plan developers, and should also be removed from the final Plan.

The safety goals of this Action Plan are as follows:

< State goals here and remove instructions and unused examples in this box:
Short term and long-term goals may be desirable. Goals may be stated in terms of numeric reductions, percent reductions, crash rate reductions, population-based rate reductions, or other relevant measures.

- **Goal 1:** e.g. Reduce fatal and injury crashes, especially those attributed to speeding by {__ percent} within {# years}. Speeding includes operating a vehicle at speeds above limits and exceeding a safe speed for existing conditions.
- **Goal 2:** Improve compliance with speed limits by {__ percent within # years}. >

<Note that the short-term safety goal reflects analysis of the problem, the potential solutions available, and assessment of what portion of the problem might be targeted by countermeasures within a five-year implementation period and what expected effects may be compared to if no action is taken. Plan implementers may adjust the crash reduction target to reflect the strategies selected and a more detailed determination of extent of planned implementation. Improved speed compliance serves as a nearer-term measure of effectiveness of countermeasures intended to reduce travel speeds. Plan implementers may wish to establish a specific speed compliance target as more data are gathered about the extent of speeding. They may also establish a long-term crash reduction target.>

1.2.1 Coordination with Strategic Plan or Other Comprehensive Safety Goals

Achieving the goals set forth in this Plan will contribute to the <State/Local jurisdiction meeting Strategic Highway Safety Plan (SHSP)> safety goals.

<Describe the State's SHSP goals, of other relevant Safety Plan goals.
State the recent issues or progress in meeting those goals here and how this plan can help to achieve strategic or other plan goals.
Are there existing speeding-related safety goals or specific speed management objectives or strategies within the strategic or other transportation safety plan? How will implementing this Plan help in meeting those objectives or strategies? >

1.3 Need for the Plan

<This section describes the general magnitude of the safety problems related to speeding. It also provides an overview of speed management challenges relating to public policies and support for speed management, or speed management practices, guidance, and other issues that may affect the selection and application of effective speed and safety countermeasures and strategies. If the State or local jurisdiction has adopted a Toward Zero Deaths vision/framework, that may also be discussed in this section.>

1.3.1 Crashes and Injuries related to Speeding <Too Fast for Conditions and/or Exceeding Limits>

<Provide an overview of crash, fatality, and injury problem and proportion of the problem related to speeding as identified in Chapter 2:

Describe the big picture:

- Numbers and proportions of total crashes, injury and fatal crashes related to speeding for the analysis time period.
- Both speeding-related indicators and crash severity indicators may be useful to help identify problems.
- Figures illustrating crash and injury trends over time and space may be desirable.
- Other high level descriptors such as rural/urban location, road classes or types, may be included if they are to be a key focus of the Plan or are significant portions of the problem, but more details can also be saved for Chapter 2, problem description.>

1.3.2 Estimated Comprehensive Cost of Crashes to Society.

<This section describes the comprehensive and / or the direct economic cost of crashes to the State/community.>

<If desired, describe the cost of crashes related to speeding; this may help to raise awareness of the comprehensive costs to society in addition to the personal loss of life and health. Also, comparing costs with expected benefits of treatments is a common way of estimating how resources may be allocated to achieve the most benefits from crash and injury-reducing countermeasures.>

1.3.3 Prevalence of Speeding

<This section describes the prevalence of driver speeding, and if sufficient data or other information is available to do so, may relate speeding to other safety concerns (e.g., pedestrian safety, rural road safety, etc.). This section also may describe driver attitudes to speed and speeding, cultural acceptance of speeding, attitudes towards enforcement, etc., if sufficient information is available.>

<Summarize the extent of the driver speeding problem, culture, etc., as documented in Chapter 2:

- Trends from collected speed data.
- Driver attitudes, beliefs, self-reported speeding from scientific surveys.
- Input from Traffic Law Enforcement and other experts.
- Input from other Safety Plans or Programs (community goals about speed management).>

1.3.4 Other Major Issues and Challenges

<This section describes challenges and issues in speed management that were identified through the problem identification process. Focus on key areas where policies, processes and practices are not up to recommended best practice.>

- **Speed Limit Setting Issues**

<This section describes current policies, practices and other issues that may limit effectiveness of speed limits as a safety measure>

Appropriately set speed limits represent a concerted effort to balance safety and travel efficiency for all modes of travel.

<Summarize issues with setting speed limits, as documented in Chapter 2:

- Speed limit setting methods (statutory and zoning, variations by jurisdictions, etc.)
- Driver, community, stakeholder perceptions about credibility of limits and safe limits, and extent that a collaborative process is used to gain commitment of all partner and meet safety needs.>

- **Planning, Design, Engineering and Other Challenges**

<This section describes issues or problems with implementing appropriate speed limits and integrating speed management into a systematic process to identify and prioritize existing roads that need treatment.>

<Summarize issues with coordination of speed management, planning, and design from Chapter 2:

- Incompatibility of speed limits and designs with each other or with road purposes, user needs, land uses, resulting in issues with safety and credibility of speed limits.
- Issues with systematic identification and prioritization of roads for speed limit and safety review, followed by implementing appropriate limits and supporting engineering and enforcement countermeasures.>

- **Enforcement Issues**

<This section describes issues relating to speed enforcement and providing an enforcement program designed to deter speeding.>

<Summarize challenges with enforcement of speeds from Chapter 2:

- E.g. Amount, targeting, coverage (of the crash problem) by enforcement.
- Enforcement-related laws or policies limiting speed enforcement or tools that can be used.
- Problems in consistency and swiftness of adjudication or consistency of penalties.>

- **Public Information and Education**

<This section describes issues relating to educating the public and policy-makers about speed and safety and providing effective enhancements of enforcement and engineering measures.>

<Summarize challenges with public information and education from Chapter 2:

- Conveying the importance of managing the risks of speeding to decision-makers and the public.
- Publicizing and promoting effective programs (enforcement and engineering).>

- **Overcoming Barriers**

This Plan identifies engineering and road design measures to help better manage speeds and to target related safety issues that may contribute to excessive speed for conditions types of crashes. Since it is only possible for engineering countermeasures to treat a small portion of the road network each year, the <State/Local Jurisdiction> also needs to seek ways to improve enforcement and adjudication to support established limits. Even if all roads are well-designed to support reasonable and safe speed limits, highly visible and committed enforcement is needed to support those limits. Chapter 2 describes the problems in more detail. Speed management is a complex endeavor that requires commitment of all stakeholders to work together. In addition, many strategies will require the support of policy-makers. Accordingly, this Plan includes much technical information that may be useful to planners, designers, and engineers, as well as information relevant for law enforcement, injury prevention specialists, policy-makers and other public stakeholders.

Some of the challenges of implementing effective speed management countermeasures can be met through Speed Plan activities that: 1) specifically address the barriers to a more systematic approach to implementing effective solutions; 2) prioritize strategies based on factual information and best practice knowledge; and 3) strengthen existing partnerships, communication, and working toward mutually-agreeable solutions. For example, some engineering measures with proven safety benefits (e.g. roundabout intersection designs), are likely to improve mobility as well as safety. Road diets or conversions of traffic lanes may help to reduce speeds and crashes while providing space for other uses such as bicycle lanes or parking for local businesses. Other speed management measures may similarly support multiple goals. The Plan's action steps should foster inter-agency and inter-departmental collaboration and implementation of effective strategies.

Challenging some of the existing beliefs about speed may also be important to maximize success. For example, widespread, low-level speeding may be as much or even more of a safety problem as flagrant, but less frequent speeding by large amounts. The Highway Safety Manual

estimates that a 2 mph reduction in average operating speed from 30 mph will yield a reduction in fatal crashes of 34 percent (AASHTO, 2010[2]).

This Speed Management Action Plan will help <the Plan State or other jurisdiction> stakeholders, including the department of transportation <__DOT>, public safety agencies, injury prevention partners, and other stakeholders work together to identify optimal solutions to reduce opportunities and motivations to speed and to improve road designs to reduce serious injuries and fatalities in a cost-effective manner.

1.4 Plan Approaches

<What speed management approaches and types of strategies will be used to help the State or local jurisdiction meet strategic or other overall traffic safety and injury reduction goals?>

<Describe the Plan objectives or approaches that will be used to meet the safety goals and develop and sustain an effective speed management program. Example: The Plan incorporates the following types of approaches to help meet the safety goals and sustain the program:

- Develop proactive and coordinated approaches to speed limit setting, roadway planning, roadway design, and other speed management measures to reduce the opportunities to speed and lower the risk of serious harm on improved or new roads.
- Use a systematic approach to identify and target treatments to locations with speed or safety issues.
- Use comprehensive and coordinated enforcement, educational, and engineering countermeasures to improve motorist compliance with speed limits and with the basic speed rule. Seek the support of multiple stakeholders and the public for effective speed management and crash reduction strategies.

These approaches and associated strategies and countermeasures are described in greater detail in later sections.>

1.5 Organization of this Document

The following descriptions of organization and content should aid users of this document:

Chapter 1 – Overview of the Plan – This chapter describes the Safety Goals of the Plan, Need for the Plan, the general Plan Approaches, a Summary of Action Items of the Plan, Evaluation and Update of the Plan, and Definitions of Terms used in the Plan.

Chapter 2 – Speeding-related Safety Problems – Chapter 2 describes the <State/local/jurisdiction-wide> speeding-related safety and severe crash problems identified. It

[2] AASHTO (2010). Highway Safety Manual, 1st edition. American Association of State Highway and Transportation Officials: Washington, D.C.

also describes general speed management issues that may limit effectiveness of the speed management program.

In addition, Chapter 2 describes <any particular> Plan focus areas for a systematic approach that were identified through data analysis or other safety problem identification. Countermeasures will be prioritized using feasibility and economic comparisons of alternate strategies.>

Chapter 3 Speed Management Action Items, Strategies, and Countermeasures – Chapter 3 describes the solutions to problems described in Chapter 2.

> **Jurisdiction-wide Speed Management Actions and Strategies.** This sub-section describes the types of proactive and comprehensive action steps and strategies needed to address comprehensive safety problems and speed management issues.
>
> **Actions, Strategies, and Countermeasures to Address High Crash Corridors/Roadway Segments/Zones.** This sub-section describes systematic and comprehensive actions and countermeasures to target existing speeding-related safety problems.

Chapter 4 – Multi-year Implementation Plan – Chapter 4 outlines the Detailed Proposed Implementation Actions and specific strategies that may be implemented within each Action Item, Selection and Ranking of Countermeasures, additional Implementation Steps, Evaluation Plan, and plan renewal processes (Action Plan Update).

References – A reference section may be included in the plan. References include sources for additional information that were used to develop the plan. In this template, cited references are included in footnotes on each page.

Appendix A – This supplemental information for Chapter 2 provides more information on network screening.

Appendix B – This supplemental information for Chapter 4 provides information on evaluation and performance measures.

Speed Management Toolkit – The *Speed Management Toolkit* is a companion document for the Action Plan template that contains additional information that may be useful to Plan developers. It includes countermeasures with expected crash and speed effects, tip sheets for communications and publicity efforts, and an annotated bibliography with links to key speed management resources that provide significant background on various aspects of Plan development and implementation. The Toolkit is mentioned throughout this template, as are specific resources included in that document.

1.6 Action Plan Summary

<Adapt the following as needed.> Speed limit review, engineering, and design strategies, enforcement and educational measures will be implemented through this Plan. As mentioned,

there are three basic approaches to implementation of strategies and countermeasures: Proactive, Comprehensive, and Systematic. A brief description of the approaches follows:

- A **Proactive approach** aims to foster creation of self-enforcing roadway designs appropriate to the land use and user needs (functions of the road) to reduce future speeding and injury risk. The approach aims to develop collaborative and consistent policies, procedures, and safety guidance in speed-limit setting and design for new projects and roadway improvements.
- The overarching objectives of **Comprehensive strategies** are to: seek community support for the program; coordinate various stakeholders and engage the community in setting and enforcing appropriate limits; and to complement and enhance the effectiveness of design and engineering measures with locally-tailored communications and educational measures.
- A **Systematic approach** is used to identify and coordinate treatment of existing speeding and safety problems with cost-effective countermeasures (engineering and enforcement-related measures), and to integrate this approach with other safety plans and safety focus areas.

For implementing the Systematic approach, the Plan uses problem screening (based on prior crashes) and follow-up diagnosis to identify and prioritize <corridors/routes/segments> with speeding-related problems to treat. The main road types to be treated through the Systematic approach within the current five-year period are:

<Below are some of the road types that may have speeding-related crash problem identified through a systematic analysis process. Plan analysts will identify the types for the jurisdiction>

<Multi-lane, but not physically-divided, urban routes.

Two-lane urban corridors.

Rural, two-lane roads.

Other site-specific problems (e.g. work zones/school zones).>

In addition, the systematic approach <may be> integrated into identification and problem diagnosis through:

<Spot safety programs.

Other safety plans, programs or transportation plans.>

The Systematic approach aims to make use of the following strategies:

- Reviewing speed limits, improving the relationship among speed limits, target operating speeds, and road design.
- Setting appropriate limits considering area land use, and user needs for safety as well as mobility.
- Implementing appropriate safety improvements and design changes to the roadway.

- Seeking support from enforcement, the courts, and public health professionals and communications experts to support reasonable and safe limits, and speed compliance by drivers.
- Determining the need for more extensive improvements such as major redesign.

The Proactive approach also makes use of similar processes, with some changes, but implements these for new projects and major upgrades.

The Comprehensive approach <might be used to frame(s)> the problems in an injury prevention context in order to improve decision-making and use of effective laws, policies, and speed management practices (enforcement, engineering, design, and communications).

Table 1 provides an overview of the Speed Management Plan Action Items that were selected as most promising or needed by <key stakeholders/Speed Management Work Group/Task Force considering problems identified in Chapter 2>. Each Action Item involves processes, coordinated actions, and policies to use to develop and implement the most appropriate types of countermeasures. Table 1 also identifies agency roles and prospective timelines for these Action Items.

Chapter 3 describes alternate countermeasures and strategies available to address identified problems through each planned Action.

Table 1. Action Items for <Plan Jurisdiction> Speed Management Safety Action Plan and Implementation Timeline.

<Plan developers adapt or modify Actions, Roles, or Timeline in Table 1 as needed, from Chapter 4.>

Table 1 - Action Item	Stakeholder Roles	Approach and Timeline for Startup
<1) Frame the Speeding and Safety Problem through a Public Information and Education Program to build support for effective policies and comprehensive strategies, to seek and leverage funding, and to improve effectiveness of enforcement and engineering countermeasures. (Comprehensive approach)>	<Lead: Injury prevention experts (e.g. State or local public health Dept., injury prevention office) Others: DOT communications and safety offices, courts representatives, law enforcement, emergency responders and medical profession, insurance industry, other business and private partners>	<Comprehensive 1 – 3 years>

Table 1 - Action Item	Stakeholder Roles	Approach and Timeline for Startup
<2) Develop a State task force to engage on speed limit setting and safety, improving consistency of outcomes, and restoring credibility of speed limits. Training and outreach, data collection and policies and guidelines may be addressed through this Action Item. (Proactive and Comprehensive; supports Systematic approach)>	<Lead: State/local DOTs and Injury Prevention offices Others: Elected Officials, Law Enforcement, Judicial Officials, Public and Private Stakeholders as appropriate Need support: Local elected and public officials>	<Proactive & Comprehensive 2 – 5>
<3) Develop an inter-agency speed and safety review process to assess land use and transportation plans, designs, and implemented projects to ensure that new and improved roads meet sound speed management design and safety principles for the area land uses and intended purposes of the street or highway. (Proactive approach)>	<Lead: Potentially – a liaison group such as regional or metropolitan planning organizations Others: roadway designers, engineering safety and mobility, bicycle and pedestrian divisions, county and local planning staff, elected officials, law enforcement representatives, injury prevention>	<Proactive 1 –3 years>
<4) Review existing speed limits, conduct additional diagnosis, and develop treatment plans for prioritized lists of problem corridors identified through network screening. (Systematic approach)>	<Lead: DOT safety and mobility office Others: Municipal Staff (city streets), County staff (rural routes), law enforcement agencies, judicial officials and prosecutors, health officials, regional planning organization, municipal planning organization Need support: Local elected officials if speed limits are changed>	<Systematic 2 – 5 years>
<5) Implement a sustainable, high visibility enforcement, and adjudication program. Target more of the network where serious crashes occur. (Comprehensive treatment in conjunction with Systematic approach)>	<Lead: State public safety/highway patrol agency, local law enforcement agencies Others: DOT units may assist with prioritization through systematic data analysis and review process; courts officials; injury prevention partners and communications experts>	<Systematic and Comprehensive 2 – 5 years>

Table 1 - Action Item	Stakeholder Roles	Approach and Timeline for Startup
<6) Implement speed and safety reviews of roadway segments or intersections within the HSIP (spot safety) program, and coordinate with other transportation safety plans and programs. (Systematic approach)>	<Lead: DOT safety & mobility offices/units Others: Law enforcement agencies, traffic engineers, bicycle and pedestrian transportation offices (esp. for urban areas), county/city transportation agency staff >	<Systematic 2- 5 years>

Table 2 describes Initial steps for Plan implementation.

Table 2. Key Next Steps for Action Plan Implementation.
<Plan developers tailor implementation steps, and add table content.>

Implementation steps	Timeline for Startup	Leadership	Steps Completed
Stakeholders review plan elements including problem types, potential countermeasures, and proposed action steps.			
Schedule meeting to prioritize most promising Action Steps and speed management countermeasures.			
Verify lead agencies, staff leadership and others to be involved in individual Action Step planning and implementation activities.			
Schedule workgroup meetings or coordinate with existing meetings for individual or combined action steps.			
Seek support of local elected officials and potentially private sponsors by conducting additional outreach.			

1.7 Evaluation and Performance Measures

The primary measures of program effectiveness are:

- <Changes in crash frequency and severity.
- Changes in operating speed distributions.>

Process and implementation measures will also be used to track and link program efforts to safety outcomes, and to improve and sustain the program. Specific countermeasures may be evaluated, as feasible, to determine treatment effects in the local context.

See Chapter 4, Evaluation Plan section, for more information.

1.8 Sustaining and Updating the Plan

As the stakeholders continue to meet and prioritize the Action Items and particular strategies, consider the following:

- The implementation timeline for this initial plan is <five> years, but can be changed as needed. Depending on the Action Items advanced, some strategies will likely require a longer timeframe to fully develop and implement, or may be on-going strategies to maintain.
- The plan is a working document, and may be updated and revised as actions or strategies are refined and revised.
- As already mentioned, a Plan evaluation using relevant performance measures is part of the implementation. Plan implementation and safety progress should be monitored with appropriate measures throughout the implementation period. The plan should be fully evaluated around the end of the implementation period as to how much of the plan was implemented and whether Safety Goals were met.
- To sustain and build the program, update the plan near the end of the initial plan period. The update will incorporate input from the Plan evaluation, an updated problem identification, and incorporation of new proven countermeasures.

1.9 Definitions of Terms

<Note: Users may prefer to include the glossary of needed terms for their jurisdiction Plan in other locations in the Plan such as before the main text or in an appendix.>

The following are definitions for terms used in this document:

Basic Speed Rule – "The Basic Speed Rule requires vehicle operators to drive at a speed that is reasonable and prudent. As a corollary to this rule, State laws usually provide that every person shall drive at a safe and appropriate speed when approaching and crossing an intersection or railroad grade crossing, when approaching and going around a curve, when approaching a hill crest, when traveling upon any narrow or winding roadway, and when special hazards exist with respect to pedestrians or other traffic or by reason of weather or highway conditions." <This State's Basic Speed Rule states "No person shall drive a vehicle at a speed greater than is reasonable and prudent under the conditions then existing. " >

<See NHTSA's Summary of State Speed Laws for information on each state's speed laws.> [3]

Comprehensive approach – A comprehensive approach aims to make use of the full range of strategies to address speeding-related safety problems related to the road user, the streets and highways, the vehicle, the environment, and the management system. Comprehensive strategies in this Plan include engineering and design, enforcement and judicial measures, education and publicity, management strategies, policies, evaluation, and coordinating the strategies to achieve the bottom-line safety targets.

Coordinated approach – The goal of a coordinated approach to any traffic safety area, including speed management "is to move away from independent activities of engineers, law enforcement, educators, judges, and other highway-safety specialists," including injury prevention and publicity experts, and to promote the formation of working groups and alliances that represent all of the elements of the safety system. In so doing, the team can draw upon their combined expertise and resources to reach the bottom-line goal of targeted reduction of crash fatalities and injuries.

Countermeasure – Essentially, a treatment to reduce the frequency and/or severity of crashes. Treatments may include design or engineering, enforcement, and education and awareness-related measures.

Crash modification factor (CMF) – Multiplicative factor used to compute the expected number of crashes after implementing a given countermeasure. Standard errors of the estimate give an idea of the quality of the estimate and potential variation of effect. If available, calibrated State estimates may provide a better estimate of effects for the State.[4]

Crash reduction factor (CRF) – Estimate of the percentage reduction in crashes due to a particular countermeasure.[5] The crash modification factor (CMF) estimates in tables in this document can be used to estimate expected crash reduction percentages <(1 – CMF) * 100>.

Highway Safety Improvement Program – The **"**Highway Safety Improvement Program (HSIP) <is> a core Federal-aid program. The goal of the program is to achieve a significant reduction in traffic fatalities and serious injuries on all public roads, including non-State-owned public roads and roads on tribal lands. The HSIP requires a data-driven, strategic approach to improving

[3] NHTSA (2011b). *Summary of State Speed Laws.* Eleventh Edition. Current as of February 1, 2010. DOT HS 811 457. U.S. DOT National Highway Traffic Safety Administration.
[4] Crash Modification Factors Clearinghouse. U.S. Department of Transportation, Federal Highway Administration. http://www.cmfclearinghouse.org/
[5] Ibid.

highway safety on *all* public roads that focuses on performance." This program was continued by MAP-21, the federal transportation law that went into effect October 21, 2012.[6]

Operating speed(s) – The speeds at which vehicles actually travel under free-flow (unconstrained or uncongested) conditions. The most often used measure of operating speed is the 85th percentile speed (see definition), but average or mean speed and other speed distributional measures may also be used.[7]

Proactive approach – A proactive approach, as described in this document, is a practice of planning and designing new roads or street improvements that considers intended operating speed and appropriate speed limits in the very earliest stages. A proactive approach aims to engage safety and mobility goals and various stakeholders in the planning, design, and operations of streets and highways to target speeds appropriate to the land uses and purposes of the road to minimize future problems. (See self-enforcing road design.)

Roadway Safety Audit – RSAs offer a formalized way for an expert, multi-disciplinary team to make a qualitative assessment of safety conditions from the perspective of different road users, and to identify potential treatment alternatives.[8]

Rural/urban crash – A rural or urban crash indicates whether the crash was reported to occur inside municipal boundaries (urban) or outside any municipality (rural).

Rural/urban road section – Rural or urban was defined by whether or not a road section was within municipality boundaries (urban) or outside (rural).

Self-enforcing road design – A self-enforcing roadway design, which may be an objective of the proactive approach, is road design that reinforces established limits and reduces *opportunities* to speed.[9] The goal of such designs is to increase consistency of design with limits, and to minimize the need for traffic law enforcement to enforce speed limits because the road itself induces drivers to adopt operating speeds that are within established limits.

Self-explaining road design – The development of a consistent design and appearance for each roadway purpose or function category.[9] Self-explaining designs complement self-enforcing

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[6] See FHWA's HSIP webpage for more information on eligibility and requirements: http://safety.fhwa.dot.gov/hsip/gen_info/resources_npr.cfm

[7] Donnell, E.T., Hines, S.C., Mahoney, K.M., Porter, R.J., McGee, H. (2009). Speed Concepts: Informational Guide. Report No. FHWA-SA-10-001, Washington, D.C.: Office of Safety, Federal Highway Administration.

[8] See FHWA Roadway Safety Audit Guidelines (2006) and other resources on FHWA's RSA webpages (http://safety.fhwa.dot.gov/rsa/) for more information. Include speed limit review and assessment of speeding-related safety issues as part of the audit process.

[9] Brewer, J. et al. (2001). Geometric Design Practices for European Roads. Report No. FHWA-PL-01-026, Washington, D.C.: FHWA. Available at: http://contextsensitivesolutions.org/content/reading/geometric-design-practices/resources/geometric-design-practices/

design by making the type of road, and associated speed limit(s), more readily evident to drivers.

Severe crash –Crashes involving more severe injuries include those with fatalities (K-type), disabling-type injuries (A-type), or evident (B-type) injuries, as indicated in the crash reporting system. The other two severities of crashes in the KABCO [10] scale are C-type, possible injury, and O, or non-injury/property damage only types. Some analysts may include crashes with possible injuries as a "severe crash" as well.

Speeding-related crash – Depending on availability, the definition of speeding-related crash used may be based on indications that any driver involved in the crash contributed to the crash by travelling "in excess of the posted limit" or "in excess of safe speed for conditions." The latter definition flows from Basic Speed Rule statutes. The public safety officers responding to and reporting on the crash make these assessments.

Systematic approach – In this document, the systematic approach is a process to identify and prioritize locations where speeding-related crashes are concentrated or greater than expected, and to apply systematic diagnosis and treatment of the problems. Diagnosis will include checks for consistency between speed limits, road design and operations (such as signal timing), and operating speeds. The systematic approach then follows up with application of appropriate remedies, including potential changes to speed limits to rectify inconsistencies and improve safety. Remedies may include design and engineering changes as well as application of enforcement and educational measures.

85th percentile speed – The speed at or below which 85 percent of vehicles travel.

[10] The KABCO injury severity scale was developed by the National Safety Council. More information is available on FHWA's Highway Safety Improvement Program (HSIP) manual web pages including in the following section on project prioritization http://safety.fhwa.dot.gov/hsip/resources/fhwasa09029/sec4.cfm. The full HSIP manual is available here: http://safety.fhwa.dot.gov/hsip/resources/fhwasa09029/fhwasa09029.pdf

Chapter 2. Speeding-related Safety Problems

<Start Plan development with this chapter: the problem identification process.> [11]

This chapter provides a brief description of the problem identification processes. It also describes the speeding-related safety problems and speed management issues identified through these processes. The safety problems are the targets for strategies and countermeasures outlined in Chapter 3. The general speed management issues and challenges are addressed through the Action Items and strategies outlined in the Plan as well as in some cases by specific countermeasures.

2.1 Problem Identification

<This section describes the types of analyses and other methods used to identify safety issues and speed management problems.>

2.1.1 Data Used

<Describe the data used for analyses and any limitations of the data available. (Descriptions of the data used may also be combined with analysis methods.)

- Crash data.
- Roadway inventory with road characteristics and traffic volume data.
- Spatial data such as land use data, jurisdictional overlays, etc.
- Speed data.
- Survey data – e.g. driver surveys about speeding, attitudes toward countermeasures, etc.
- Enforcement citation and conviction data.

Data limitations may include completeness, ability to identify speeding-related crashes, ability to match crashes to roadway sections; lack of traffic volume or other roadway characteristics in the roadway inventory file, or other factors that limit the ability to identify locations or other problem characteristics.>

[11] Non-highlighted (plain) text is "boilerplate" text that may be general enough for use as is, or modified as needed.
- Text enclosed by <angle brackets>, and highlighted in yellow should be replaced with specific text for the jurisdiction Plan. Remove the highlights once jurisdiction information has replaced the generic content.
- Tables highlighted in light gray contain descriptions enclosed by angle brackets (< >) of specific types of Plan content with illustrative examples. These sections begin with action words (e.g. "Describe", "Summarize", "State," etc.) for the Plan developers. These tables and text enclosed by angle brackets should also be adapted or removed from the Plan as the specific content for each section is developed.
- *<Bracketed notes in italics emphasis, and also highlighted in light green>* provide additional instructions or information that may useful to the Plan developers, and should also be removed from the final Plan.

2.1.2 Analysis Methods

Crash analysis was used to identify general characteristics of the speeding and severe crash problems in the jurisdiction. Analysis of speed data or other measurement of the speeding problem was used to identify locations or area types where speeding above limits is also prevalent.

<Operating speed is a measure of risk associated with frequency of severe and fatal crashes. 12>

<Summarize the analysis methods and what they were used for.

- **Jurisdiction-wide analyses** using crash data: Describe the years of data and types of analyses used to identify speeding-related crash trends and factors associated with significant proportions of speeding-related or severe crashes. These are issues that may be treated on a widespread basis, or form the basis for jurisdiction-wide enforcement and educational activities or uniform application of engineering measures.
- **Analysis of speed data, survey or citation data, road safety audits, focus groups, etc.,** to identify issues with driver compliance with limits, enforcement, and design issues – either jurisdiction-wide, or for particular areas.>

Network screening was used to identify<corridors/sections/intersections> with speeding-related and severe crash problems.

<The start of a systematic process to effectively allocate resources is to identify particular corridors, segments, intersections, or other zones that may have more than expected or a higher than average proportion of speeding-related or severe crashes for the type of road (for example, an undivided, multi-lane, urban arterial) or road section. Network screening is one process used to identify locations, such as road sections or corridors, where speeding may be contributing to crash and injury problems <see Appendix A>. The roads or areas identified through screening may be good candidates for further assessment of speeding-related safety problems and potential treatment.>

[12] AASHTO (2010). *Highway Safety Manual, 1st ed.* American Association of State Highway Transportation Officials: Washington, DC.

<Describe the analysis methods used to identify high crash zones or areas for systematic diagnosis and treatment:

- **Network screening or other analyses performed on subsets of the data.** Provide a general description of the methods and the data used. Crash data and roadway inventory data are the most likely data sources, but land use and other types of spatially-distributed data might also be used. Details documenting the approach used may be included in appendices if desired.

Appendix A of this document and the Highway Safety Manual[13] will also assist in the network screening process. >

2.1.3 Other Problem Identification Processes

<Describe other problem identification activities.

- Field assessments or **Roadway Safety Audits**[14] could be used to identify speeding-related safety problems.
- **Other safety program analyses or plans** may have already identified speeding-related crash problems or other speed management issues.
- **Stakeholder interviews or meetings** are also used to identify issues with speed limit setting, design and engineering, enforcement, and education-related speed management practices, policies, laws, or guidelines that have a bearing on utilization and effectiveness of speeding-related crash countermeasures.>

<2.2 Jurisdiction-wide <State/locality> Problems

This section characterizes crashes and injuries related to speeding, and identifies where and when crashes are concentrated or other significant aspects of the problem system-wide.

2.2.1 Crashes and Injuries

This section characterizes the crash and injury problem for the entire <State/locality>.

[13] AASHTO (2010). *Highway Safety Manual, 1st ed.* American Association of State Highway Transportation Officials: Washington, DC.

[14] See FHWA Road Safety Audit Guidelines (2006) and other resources on FHWA's RSA webpages (http://safety.fhwa.dot.gov/rsa/). Include speed limit review and assessment of speeding-related safety issues as part of the audit process.

<Describe the **total crashes reported for the jurisdiction, the analysis period and other relevant information about the crash data**. Provide an **overview** of:

- Number and percentage of total crashes that involved speeding.
- Number and percentage of various severity levels of crashes that involved speeding.
- If desired, include descriptors of urban or rural location, road classification or other jurisdictional types that are associated with the management and treatment of the problem.>

<Describe in **more detail,** the major findings identified from crash analyses of the problem. Detailed findings may be subset by area/jurisdictional type (rural or urban jurisdiction or ownership), road classification or function types, or other categories of interest. Characterize the number and percentage of various factors associated with speeding and/or severe crashes within the desired subsets or jurisdictions. Factors that may be related to speeding include:

- Crash types.
- Crash location characteristics.
- Environmental conditions.
- Driver factors.
- Potentially, interactions of various factors.>

<Table 3 provides describes crash factors most associated with speeding-related or severe crashes in the Jurisdiction.>

Table 3. Crash Characteristics Associated with Speeding-related (SR) and Severe Crashes <Jurisdiction-wide OR Urban/Rural, etc., and analysis Period>.

<Example only - other formats, variables, or multi-variable analyses may be preferred.>

Crash Characteristic	Number and Percent of Speeding-related crashes (total number)	Number and Percent of Severe crashes (total number)
Rural/urban location		
Two-lane, undivided		
Multi-lane, divided		
Multi-lane, undivided		
Crash at curve		
Road/lane departure type		
Dark (unlighted roadways)		
Dark (lighted roadways)		
Crash at Intersection		
Alcohol-involved		
Wet roads		
Teen driver		

2.2.2 Prevalence of Speeding

<This section describes the prevalence of speeding, driver or public attitudes toward speeding, and may include information about speeding from other plans, stakeholder input, or other measurement of the problem. Note that operating speed data are recognized as a safety surrogate measure because of the association with fatal and injury crashes. [15] However, speed data may only be available for certain types of corridors or areas and may be included under other sub-headings if more appropriate.>

<Describe results characterizing the extent of the driver speeding problem, widespread speeding above limits, speeding in certain areas or on certain road types, the culture and political acceptance of speeding, etc. Include key findings from:

- Jurisdiction-wide speed trends such as from a monitoring program or other jurisdiction-wide representative sample. *If there is no data, consider developing a speed data collection/monitoring program to track speeding trends and program progress.*
- Summaries of information from multiple spot speed studies conducted in the area; targeted speed studies may also be used to help identify corridor-specific problems. *See next section.*
- Driver surveys – attitudes, beliefs, self-reported speeding, attitudes toward enforcement, etc. from scientific surveys. *If data are not currently being collected, consider collecting such data to better understand the problem and inform decisions about potential solutions.*
- Input from Traffic Law Enforcement and other experts.
- Input from other Safety Plans or Programs (such as Safety Zone plans, Pedestrian Plans).>

2.2.3 Other Issues

<This section describes other speed management or policy issues that affect the safety, credibility, and enforceability of speed limits, or the improvement, design, safe operation and maintenance of roads in ways to help reduce speeding-related injurious crashes and support strategic highway safety goals. Some issues identified may pertain more to certain road types (high crash corridors) or jurisdiction types (e.g. cities/counties) and may be included within any subsections, as appropriate.>

[15] AASHTO (2010). *Highway Safety Manual, 1st ed.* American Association of State Highway Transportation Officials: Washington, DC.

- **Speed limit setting issues.** Appropriately set speed limits represent a concerted effort to balance safety and travel efficiency for all modes of travel.

<This section describes current policies, practices and other issues that may limit effectiveness of speed limits as a safety measure.>

<Summarize issues with setting speed limits or with the compatibility of speed limits and designs with each other, or with road purposes, operations and land uses, and that are detrimental to the safety and credibility of speed limits:

- Speed limit setting methods (statutory and zoning) or other policies. Do the various methods used, number, and type of agencies involved, or other factors affect the **consistency of outcomes** (for similar roads) **and safety of limits established?**
- **Driver, community, law enforcement, and other stakeholder perceptions** about credibility and safety of limits established. These issues can themselves lead to safety problems.
- Is a **collaborative process** used to gain commitment of all partners/road safety agencies (local governments, state agencies, law enforcement agencies)?
- Is informed public opinion regarding the trade-offs of safety risks and mobility included in the process? Consider how safety is incorporated into methods used (including statutory and speed zoning), and whether outcomes may send mixed messages to drivers about safe operating speeds >

- **Planning, design and other engineering problems.**

<This section describes planning, design, and engineering practices that may undermine speed limits as a safety countermeasure or reduce effective targeting of appropriate countermeasures. Problems that may result include low credibility of speed limits leading to low levels of driver compliance, low levels of enforcement or high enforcement tolerances because many drivers exceed limits, or speed limits that are higher than safe operating or design speed. Perceptual issues may also undermine speed limits as a safety measure in general. For example, statutory limits may be perceived by drivers as too low for the road design and create challenges to enforcement, but be perceived locally as correct for the land use, number of conflict points, and purposes of the road.>

<Describe issues or problems with the following (and others):

- Planning and designing new/improved roads for the target operating speed and speed limit.
  - Are intended limits and targeted operating speed set for new roads, with appropriate input, before design begins?
  - **Is there systematic identification and prioritization of existing roads for speed limit and safety review,** followed by implementing appropriate limits and supporting engineering and enforcement countermeasures? Do spot safety assessments regularly incorporate consideration of speeding and related crash issues?
  - Implementing speed transition areas and speed zones from rural to developed areas. Do agencies work together to design effective speed transition zones?>

- **Enforcement issues.**

<This section describes issues with the availability and commitment of enforcement resources, targeting of resources, publicity issues, support for technologies to aid enforcement, and support of enforcement by the courts to uphold swift and certain penalties for violations.>

<Describe issues or problems with:

- **Amount, type, and location of enforcement**. How much of the problem is targeted? Do resources go to where safety issues are greatest?
- **Public and political support** for enforcement in either rural or urban areas. Is there agreement among the public, local leaders, and local law enforcement officials? Are they well informed of safety issues and goals for enforcement of speed limits?
- **Lack of support for** or laws or policies that may limit use of **other enforcement tools** (e.g. automated methods such as speed cameras).
- **Law enforcement** commitment and ability to enforce limits established.
- **Adjudication or penalties for speeding citations.** Are penalties consistently applied and appropriate to the offense?>

- **Public information and education issues.**

<This section characterizes problems with public communications and education of varied stakeholders about the risks of speeding and the importance of managing speed (road safety agencies and policy-makers) or obeying limits (drivers).>

<Describe issues with public communications and educating varied stakeholders about the risks of speeding and the importance of managing speed or obeying limits, including

- Conveying the importance of managing the risks of speeding to decision-makers, law enforcement, and the public in order to make informed decisions.
- **Gaining public buy-in for crash-reducing engineering, enforcement, and educational countermeasures.** Is communication two-way? That is, are efforts made to garner public input, but also to communicate about the risks and address concerns about speed management countermeasures?
- **Publicizing enforcement.** How are speed enforcement programs publicized to improve driver compliance with limits and speed-deterrent effects of enforcement programs?>

2.3 High Crash <Corridor/Route/Roadway Segment/Intersection> Problems

*<**Results of Screening or Other Problem Identification***
The next sections describe road/area types and problems that will be the focus of Plan's Systematic diagnosis and treatment approach. These results are from network or other type of problem screening. The road types used may be changed as needed or as screening results suggest.
The first box in each section below (through the "Other Route Types" subheading) describes the problem extent (number and severity of crashes).

The second box in each section provides more detail on the type and nature of the problems from crash analysis, roadway safety audits, speed studies or other means. A few typical issues that may be present on these road types are included as examples, but analysis of crash problems and field diagnosis of each corridor or area will be needed to identify specific problems, and in Chapter 3, appropriate, alternate countermeasures.>

2.3.1 <Urban, Undivided, Multi-lane Corridors>

<Describe the number of , for example, undivided, multi-lane urban corridors identified for speed and safety review and what proportion of the speeding-related and severe crash problem is accounted for by the corridors.

- Number of corridors identified for speed and safety review out of total number of similar corridors.
- Percentage of total speeding-related crashes accounted for by corridors identified for speed and safety review out of total speeding-related crashes for all similar corridors.
- Percentage of severe/fatal crashes accounted for by corridors identified for speed and safety review out of total speeding-related crashes for all similar corridors.
- Mileage of corridors identified for speed and safety review out of total mileage of similar corridors.

The list of corridors identified for speed and safety review may be included in the text or in a separate appendix or spreadsheets.>

<Describe speeding-related issues or crash problems on, for example, urban, multi-lane streets**.** Typical problems observed or described in other resources include the following:

- **Transition speed zones** from rural, high speed, to lower limits may be inadequate in length, or inadequately signed; *or* lower speed zones may be too long.
- **The road design, signs and markings** may not change much from the high speed zone to the lower speed zone or adequately convey to drivers the need to slow or in extreme situations, there may be excess capacity/ too many lanes/too much width, so that the road looks like a rural highway. Speed limit credibility may be affected.
- **Inadequate separation** by mode, weight, and speed of traffic may result in wide speed variation within a corridor (at the same time). There may be inadequate provision of turn lanes for slowing vehicles. There may also be few pedestrian or bicycle amenities including places to walk, cycle or safely cross multi-lane roads separated from higher speed traffic.>

2.3.2 <Urban, Two-lane Corridors>

<Describe the number of, for example, urban, two-lane corridors identified for speed and safety review and what proportion of the speeding-related and severe crash problem is accounted for by the group of corridors/areas planned for implementation (as for Urban, Undivided, Multilane). The actual list of corridors identified for speed and safety review may be included in the text or in a separate appendix or spreadsheets.>

<Describe the speeding-related issues or problem types on urban, two-lane streets**.** Typical problems observed or described in other resources include the following:

- The **street design and configuration** may not change sufficiently from rural to more developed areas so that drivers perceive the appropriate driving speed.
- **Land use.** Development and land use may change gradually or intermittently affecting the perception of appropriate speed.
- **Transition speed zones**. Rural high speed to urban low-speed transition speed zones may be too short/long or inadequately signed or change in land use may be gradual.
- There may be a **lack of separation** or infrastructure for turning traffic, bicyclists, pedestrians (slower and unprotected), and transit users to travel along the street, and inadequate separation at crossing areas. Protected crossings and separate space to ride/walk become increasingly important as speeds climb above about 20 – 25 mph.
- **Local enforcement** resources may be stretched and focused on higher-volume corridors.>

2.3.3 <Rural, Two-Lane Routes>

<Describe the number of two-lane, undivided rural corridors identified for speed and safety review and what proportion of the speeding-related and severe crash problem is accounted for by the corridors. The actual list of corridors identified for speed and safety review may be included in the text or in a separate appendix or spreadsheets.>

<Describe the speeding-related safety issues or problem types on rural, two-lane roads**.** A few of the typical problems include the following:

- Many rural two-lane routes are legacy roads were **not designed to modern standards** and may include poor shoulders, trees, and other fixed objects near the roadway.
- **Design exceptions.** Travel speeds may exceed safe speed at curves, intersections with inadequate sight distance, etc.
- Crashes are widely dispersed: spot safety treatments may be needed at many locations or treatments may be inadequate to slow vehicles to a safe speed.
- There may be no space to **separate bicyclists and pedestrians** from higher speed traffic.
- **Enforcement levels** are likely low on lower-volume rural roads.>

2.3.4 <Other Route Types>

<Describe the number of any other route types to be included in the Plan (that were prioritized for speed and safety review) and what proportion of the speeding-related and severe crash problem is accounted for by the group of corridors planned for implementation. The actual list of corridors identified for speed and safety review may be included in the text or in a separate appendix or spreadsheets.>

<Describe speeding-related safety issues or problem types for other route types.>

2.4. <Other> Site-specific Crash Problems

<Describe other site-specific or area issues such as work zones, school zones, pedestrian safety zones or other area types with speeding-related and/or severe crash problems that may be a focus for further diagnosis and treatment. Are there problems that might be addressed through the action plan?>

Chapter 3 describes action items, strategies, and countermeasures for addressing the safety and speed management problems outlined in this chapter.

Chapter 3. Action Items, Strategies and Countermeasures

<Complete this chapter following chapter 2. [16] *Identify alternate actions, strategies and countermeasures that might be used or needed to address identified problems. Developers of this chapter may reference the Speed Management Toolkit document for additional information on speed management strategies, and for crash modification factors (expected change in crashes) for specific countermeasures, as well as for more information about where and when to implement these countermeasures.>*

This chapter describes alternate actions that may be used to address identified problems, select and implement strategies and countermeasures, and to systematically assess and treat the <routes/corridors/areas> identified through network screening or other means. This chapter also outlines alternate engineering and enforcement countermeasures that may be used to treat specific crash and safety problems.

<3.1 Jurisdiction-wide> Speed Management Actions and Strategies

The main focus of <jurisdiction-wide> proactive plan actions will be to foster creation of appropriate and self-enforcing roadway designs over time by engaging to develop more collaborative and consistent policies, procedures and guidance in speed-limit setting and design. Speed limit setting should be undertaken early in the planning and design process in conjunction with other major decisions about the purpose and design of the road. Among considerations, careful attention should be given to the current and future land uses and safety and mobility needs of the users considering the road's purpose in the network for each mode of travel.

A key focus of <jurisdiction-wide> comprehensive strategies is to build support among the public and law enforcement community to enforce and support established limits and to improve enforcement effectiveness in targeting and reducing serious crashes due to speeding. Enforcement and publicity are especially needed to supplement design and engineering when road designs or limits cannot be changed, or design and engineering measures are insufficient to achieve the safer operating speeds. It may also be desirable to engage with other stakeholders to seek changes in policies that may limit the use of effective tools or make other

[16] - Non-highlighted (plain) text is "boilerplate" text that may be general enough for use as is, or modified as needed.
- Text enclosed by <angle brackets>, and highlighted in yellow should be replaced with specific text for the jurisdiction Plan. Remove the highlights once jurisdiction information has replaced the generic content.
- Tables highlighted in light gray contain descriptions enclosed by angle brackets (< >) of specific types of Plan content with illustrative examples. These sections begin with action words (e.g. "Describe", "Summarize", "State," etc.) for the Plan developers. These tables and text enclosed by angle brackets should also be adapted or removed from the Plan as the specific content for each section is developed.
- *<Bracketed, italicized notes, also highlighted in light green>* provide additional instructions or information that may useful to the Plan developers, and should also be removed from the final Plan.

policy changes (e.g., increase funding for enforcement, authorize use of certain technologies, or others).

Tables 4, 5, and 6 describe three Action Items and related strategies that the <State, Counties and other partners may use to address the jurisdiction-wide and other speed management issues identified in Chapter 2. Most of the strategies outlined in Tables 4 through 6 do not have proven crash reduction or safety effects, but flow from best speed management principles or provide the framework for a sustainable speed management program, particularly for a Toward Zero Death approach.>

<Examples are given in Tables 4, 5, and 6. The Action Items, Strategies, and Problems should be adapted or modified as appropriate.>

Table 4. Communications Action and Strategies to Address <Jurisdiction>-wide Safety and Speed Management Issues.

<Plan developers adapt or modify table content.>

Potential Proactive and Comprehensive Action Items	
Frame the Speeding and Safety Problem and develop a Public Information and Education Program to build support for effective policies and comprehensive strategies, to seek and leverage funding, and to improve effectiveness of enforcement and engineering countermeasures. (*Comprehensive approach*)	
Strategies that may be Used	**Issues to be Addressed**
▪ **<Conduct surveys or other data collection to gather information about speeding behavior, or public attitudes and support for different types of strategies. See Speed Management: Road Safety Manual for Decision-makers and Practitioners.[17]** ▪ **Improve communications about the safety reasons for speed management efforts to increase support for effective policies and strategies. See Adding Power to Our Voices: A Framing Guide for Communicating about Injury, by the Centers for Disease Control and Prevention.[18]** ▪ **Seek support for technologies to improve enforcement reach and effectiveness (example automated enforcement methods). See Automated Enforcement for Speeding and Red Light Running. NCHRP Report 729 for more information about best practices.[19]** ▪ **Use publicity and education to enhance speed-deterrent effects of enforcement programs. (See Countermeasures That Work [20] and other resources for the types of programs that are likely to be effective, or seek technical assistance. Also see Keys to Communication Success tip sheets in the Speed Management Toolkit document.)>**	▪ <Lack of support or difficulty in setting or garnering support for appropriate speed limits, enforcement strategies, or engineering strategies (e.g. road diets, roundabouts). ▪ Widespread speeding above limits. ▪ Limited publicity of enforcement diminishes population-wide deterrent effects. ▪ Policies or funding priorities that limit speed enforcement. ▪ Challenges to enforcing in certain areas. ▪ Fines from enforcement efforts do not return to speed management or traffic safety programs. ▪ Political and administrative challenges to implement consistent adjudication of speeding violations. ▪ Legal or other barriers to implementing automated enforcement. ▪ Address specific prevalent types of speeding-related crashes including Too Fast for Conditions types (road/lane departures, wet weather, school zones, teen drivers, etc.).>

[17] *Speed Management: Road Safety Manual for Decision-makers and Practitioners.* (2008). Geneva: Global Road Safety Partnership. Available at: http://www.who.int/roadsafety/projects/manuals/speed_manual/en/

[18] National Center for Injury Prevention and Control. *Adding Power to Our Voices: A Framing Guide for Communicating about Injury.* Atlanta, GA: US Department of health and Human Services, Centers for Disease Control and Prevention; 2008 (revised March 2010). http://www.cdc.gov/injury/framing

Table 5. Setting Speed Limits Action and Strategies to Address <Jurisdiction>-wide Safety and Speed Management Issues.

<Plan developers adapt or modify table content.>

Potential Proactive and Comprehensive Actions	
Develop a State and local task force to engage on speed limit setting and safety. Efforts may focus on obtaining public input, speed limit setting goals and outcomes, methods (statutory and engineering), collaboration, processes, protocols and guidance needed to improve safety, consistency, and credibility of outcomes. (Comprehensive and Proactive)	
Strategies that may be Used	**Issues to be Addressed**
▪ **<Seek public input regarding speed limit priorities.** ▪ **Provide outreach on impacts of speeds and speed limits on safety.** ▪ **Develop a collaborative speed limit setting process among State and local stakeholders.** ▪ **Develop guidance and procedures for setting more uniform speed limits for different land uses and road types. See Methods and Practices for Setting Speed Limits: An Informational Report.**[21] ▪ **Conduct outreach/training to decision-makers and/or practitioners.>**	▪ <Speeds too high/low for local priorities and concerns. ▪ Mismatch of road designs, speed limits, and user needs. ▪ Varied methods, decision-processes, and outcomes in setting speed limits which may affect safety of limits implemented. ▪ Poor credibility of speed limits on some roads or locations (e.g. work zones with no workers present), which may lead to general lack of speed limit credibility. ▪ Difficulty in enforcing speed limits where inferred design speed or actual design speed is significantly higher than limit. ▪ Lack of agreement among jurisdictions about appropriate speed limits on similar road types.>

[19] Eccles, K.A., R. Fiedler, B. Persaud, C. Lyon, and G. Hansen (2012). *Automated Enforcement for Speeding and Red Light Running. NCHRP Report 729,* Washington, D.C.: Transportation Research Board. http://www.trb.org/main/blurbs/167757.aspx

[20] NHTSA (2011). *Countermeasures that Work.* Publication no. DOT HS 811 444, U.S. Department of Transportation, National Highway Traffic Safety Administration. http://www.ghsa.org/html/publications/countermeasures.html

[21] Forbes, G.J., Gardner, T., McGee, H., and Srinivasan, R. (2012). Methods and Practices for Setting Speed Limits: An Informational Report. Available at: http://safety.fhwa.dot.gov/speedmgt/ref_mats/fhwasa12004/

Table 6. Plan/Design for Speed Management (Action and Strategies) to Address <Jurisdiction>-wide Safety and Speed Management Issues.

<Plan developers adapt or modify table content.>

Potential Proactive and Comprehensive Action Items	
Develop an inter-agency speed and safety assessment process to review plans, designs, and implementation to ensure that new projects meet sound speed management design and operations principles for the area land uses and intended purposes of the road. (Proactive)	
Strategies that may be Used	**Issues to be Addressed**
▪ **<Coordinate with transportation and land use plans in setting limits and designing roads.** ▪ **Set or revise speed limits early in the new project process.** ▪ **Set performance measures for safety as well as mobility.** ▪ **Consider specific designs, signs, and markings to apply to similar road types throughout jurisdiction (self-explaining designs).** ▪ **Utilize tools such as the Interactive Highway Safety Design Model (IHSDM)[22] to evaluate design consistency and estimate safety and operational performance of design alternatives.** ▪ **Conduct speed and safety reviews (such as a road safety audit)[23] of all new and pending plans/designs to ensure that:** - **Design is matched to elicit speeds close to the intended speed limit (self-enforcing).** - **Operations features are coordinated with target speeds.** - **Design and operations separate different weight and speed of users on roads with moderate or high limits and target operating speeds.** ▪ **Prioritize speed-managing designs (such as roundabouts, fewer lanes, narrower lanes, shifting alignments) that will have long-lasting effects when designing non-freeway roads.** ▪ **Review policies, procedures and implementation for signing and managing and enforcing work zone speed zones.** ▪ **Review policies, procedures and implementation for establishing, signing and enforcing school zones.** ▪ **Consider variable speed limits for new / improved freeways.** ▪ **Consider lane/demand management options to manage freeway flows.>**	▪ <Operating speeds that are incompatible with operational or geometric features. ▪ Designs and operating speeds that are incompatible with user needs and area land uses. ▪ Reactive approach to identifying problems and providing safety treatments not as effective as initial good design. ▪ Lack of self-enforcing / self-explaining roadway designs. ▪ Difficulty in enforcing speed limits where inferred design speed or actual design speed is significantly higher than speed limit. ▪ Inconsistent design or design exceptions that contribute to unsafe speeds and crashes at those locations. ▪ Reactive approach to managing speed and providing safety treatments not as effective as initial good design.>

[22] Interactive Highway Safety Design Model (IHSDM). Available at http://www.fhwa.dot.gov/research/tfhrc/projects/safety/comprehensive/ihsdm/

[23] See the *Speed Management Toolkit* for links and resources on Road Safety Audits (RSA) and speed managing designs.

Specific opportunities to implement proactive actions and strategies include the following:

<Enumerate particular *types* of projects, or specific projects, programs, or training

3.2 Actions, Strategies, and Countermeasures to Address High Crash <Corridors / Zones or Sites>

As mentioned, the systematic approach is the process used to identify, prioritize, and treat existing safety and speed management problems by corridors or other areas in a cost-effective manner. <Tables 7, 8, and 9> describe three potential Action Items that may be used to implement a systematic approach to treating corridors or other areas of concern. The Action Items again provide an organizational framework for selecting and developing cost-effective treatment packages of countermeasures. The systematic approach to diagnose and treat speeding-related problems <can be applied to the corridors/segments/intersections, etc. identified through network screening, or through other screening processes (e.g., significant change in traffic volume, or land use change)> to target measures where they are most needed and will have the most cost-effective safety impacts.

Table 7. Systematic Action and Strategies to Address Speeding and Severe Crashes in High Crash <Corridors / Zones.>

<Plan developers adapt or modify table content.>

Systematic Actions	
Develop team and schedule to develop and implement a systematic speed and safety treatment prioritization process. (Systematic approach)	
Strategies that may be Used	**Issues to be Addressed**
▪ **<Conduct network screening to prioritize roads (corridors, roadway segments, intersections) with potential speeding-related safety issues; or develop regular schedule or other process.** ▪ **Conduct speed and engineering studies and additional diagnosis steps for prioritized list.** ▪ **Conduct road safety audits to aid in problem diagnosis.** ▪ **Develop corridor treatment plan. As part of the diagnosis and treatment development process:** - **Involve law enforcement and other local stakeholders.** ▪ **Prioritize an injury minimization approach to setting speed limits.** ▪ **If changing the limit is an option** - **Determine the appropriate limit.** - **Assess credibility of the speed limit to drivers and other stakeholders.** - **Determine what changes can be made to the roadway to improve safety and credibility of the proposed limit.** - **Determine what other safety improvements are needed – e.g., on higher speed roads, are safer pedestrian crossings needed?** - **Determine whether enhanced enforcement is needed to improve compliance with limits (including any changed limits).** ▪ **Apply consistent/similar countermeasures to similar location/problem types.** ▪ **Take advantage of maintenance and operations opportunities to make design or engineering improvements.>**	<This systematic approach should be used for each of the prioritized problem corridors /areas identified through network screening – e.g., undivided, multi-lane, urban streets; undivided, two-lane urban streets; and undivided, rural, two-lane routes and to prioritize appropriate treatments for the safety issues identified.>

Table 8. Enforcement and Publicity Action and Strategies to Address Speeding and Severe Crashes in High Crash <Corridors / Zones.>

<Plan developers adapt or modify table content.>

Systematic Actions	
Develop and implement a sustainable, high visibility enforcement and adjudication program. Target more of the network where serious crashes occur. (Comprehensive treatment in conjunction with Systematic approach)	
Strategies that may be Used	**Issues to be Addressed**
▪ **<Develop a sustainable, but randomly allocated high visibility enforcement plan targeting corridors or areas with high frequencies of severe crashes and speeding.** ▪ **Cover as much of the network where serious crashes occur as feasible to increase deterrence.** ▪ **Use visible enforcement and Publicize the enforcement.** ▪ **Create speed safety zones (e.g. schools, neighborhoods).** ▪ **Coordinate with law enforcement to focus on high crash roads where engineering changes cannot be implemented in the near term or are insufficient to address the problems.** ▪ **Supplement highly visible enforcement with covert methods. Publicize these to increase perception that enforcement may be encountered anywhere, anytime.** ▪ **Tighten adjudication of citations for targeted corridors and publicize the effort.** ▪ **Enhance deterrent effects of any type of speed enforcement program with publicity.** ▪ **Implement automated enforcement with civil penalties in areas where supplemental or continuous enforcement is needed.** ▪ **Publicize any type of enforcement strategy/program.>**	▪ <Widespread speeding above limits. ▪ Difficulty maintaining special or enhanced enforcement programs due to resource limitations. ▪ Impact of short-term, high-visibility efforts lasts only while program in place. ▪ Insufficient enforcement resources. ▪ Challenges enforcing in certain areas or times. ▪ Widespread plea agreements and low conviction rate for many violators who contest charges in court. Driver records may therefore not reflect risk and drivers may escape more severe sanctions. ▪ Speeding in school zones, neighborhoods, or along routes used by children, elderly, pedestrians, or cyclists.>

Table 9. Systematic Speed and Safety Review within HSIP and other Safety Plans and Programs.
<Plan developers adapt or modify table content.>

Systematic Actions	
Implement speed and safety reviews within the HSIP program, and coordinate with other transportation safety plans. (Systematic)	
Strategies that may be Used	**Issues to be Addressed**
▪ **<Incorporate routine review of speed limits and diagnosis of speeding issues into other safety programs and transportation plans including modal plans.** ▪ **Assess whether corridor-level speed management issues are contributing to spot safety problems.** ▪ **Implement corridor or area-wide speed reviews and speed management countermeasures if needed to supplement spot safety improvements.** ▪ **Coordinate with law enforcement to supplement or provide enhanced enforcement before engineering measures can be implemented.>**	▪ <Speeding at intersections. ▪ Roadway/lane departure crashes (frequent speeding-related types). ▪ Pedestrian safety and mobility problems; inappropriate speeds in pedestrian areas. Few places to safely cross.[24] ▪ Bicycle safety and mobility problems; difficulty for bicyclists to share higher speed roads; difficult crossings, turns, etc.[25] ▪ Spot safety problems related to speeding.>

The next three sections describe effective countermeasures that may be selected and implemented through the Systematic Approach Action Items to address speeding-related and speed management problems on the <Plan focus road types. Recall that the corridor screening approach included / did not include intersection crashes within the corridor analyses, and treatment of intersections is considered within each corridor type.>

Measures that reduce travel speeds may be expected to have effects on reducing the occurrence of more severe crashes of all types. Although individual diagnosis and treatment decisions should be performed *for each corridor or area,* application of more uniform designs, markings, and other proven treatments for similar area and road types may be helpful toward achieving more self-enforcing and self-explaining road designs. Such treatment could improve consistency of the message to drivers about safe speeds in similar land use and roadway contexts and help improve overall driver perception of safe and appropriate speeds.

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[24] Consult with partner agencies and relevant safety plans. Also see Nabors et al., 2007. *Pedestrian Road Safety Audit Guidelines and Prompt Lists.* Report no. FHWA-SA-07-007, Washington, D.C.: FHWA http://safety.fhwa.dot.gov/intersection/resources/fhwasa09027/190.htm

[25] Consult with partner agencies and relevant safety plans. Also see Nabors et al., 2012. *Bicycle Road Safety Audit Guidelines and Prompt Lists.* Report no. FHWA-SA-12-018, Washington, D.C.: FHWA http://safety.fhwa.dot.gov/ped_bike/tools_solve/fhwasa12018/

<Use the below sections and/or the road or area types identified in Chapter 2 (problems). Consult the Speed Management Toolkit or approved State resources for more information on alternate countermeasures or solutions. The Countermeasures section of the Speed Management Toolkit contains CMF estimates for a number of countermeasures that have substantial, quality evidence that they can achieve reductions in crashes or travel speeds.>

3.2.1 Countermeasures for <Urban, Multi-Lane Corridors>

Although <urban multi-lane corridors (not access-controlled)> may account for lower overall proportions of more severe crashes and speeding-related crashes compared to total crashes than some other road types, the crashes may also be condensed over a relatively smaller number of miles of roadway, since urban corridors may carry higher volumes of traffic. Speed management measures applied to these roadways may be cost-effective per mile of roadway treated, even if speeding crash rates (per vehicle miles travelled) are lower than on other types of roads. The availability of speed-controlling and crash-reducing countermeasures for urban (even if it is a small town or urban area) situations also increases the feasibility of treating speeding-related crashes on such routes. Some of these streets also tend to serve a variety of important functions from carrying through traffic to providing local access to homes, schools and businesses.

<If the limit can be changed, road safety reviews will consider whether the speed limit or the extent of a speed zone should be changed. A multi-disciplinary team may be used to perform a road safety audit in conjunction with the speed engineering study. See the bibliography in the Speed Management Toolkit for more information. Also see the Speed Management Toolkit document for more information on potential effectiveness of countermeasures.>

<In conjunction with any change in the limits (including possible changes in the length or extent of a special speed zone), determine and describe **what changes to the roadway are needed to support the new limit**. Countermeasures for urban, multi-lane, undivided corridors and their intersections include (but are not limited to):

- Implement road diets (conversions of regular traffic lanes to other uses such as parking or bike lanes).
- Implement gateway treatments and traffic calming treatments.
- Provide separated turning lanes, median separation/refuges, sidewalks and bikeways, and controlled crossing opportunities on roads that carry higher volume and speed of traffic.
- Enforcement and related communications will supplement or complement design and engineering improvements.[26]>

[26] Expected safety effects of some enforcement measures are described in the Toolkit. More information is also available in the NCHRP Guide for Reducing Speeding-Related Crashes and Countermeasures That Work. See also

3.2.2 Countermeasures for <Urban, Two-lane Corridors>

If the limit can be changed, road safety reviews will consider whether the speed limit or the extent of a speed zone should be changed.

<A multi-disciplinary team may be used to perform a road safety audit in conjunction with the speed engineering study. See the bibliography in the companion Speed Management Toolkit for more information. Also see the Speed Management Toolkit for more information on potential countermeasures effectiveness.>

<Determine and describe alternate design, engineering and enforcement countermeasures for

3.2.3 Countermeasures for <Rural, Two-Lane Routes>

Calming speeds on rural, two-lane roads and conveying safe speed for conditions is a significant challenge, given the many miles of roadway and the relatively widely dispersed nature of the problem. In addition, problems and design issues are frequent since most rural two-lane routes across the country were not designed to modern standards but to provide access to all rural locations and to nearby towns and cities. Since only routes with the most severe crash histories and higher traffic volumes are likely to receive significant upgrades and redesign, or even receive spot safety treatments in any given year, enforcement and publicity campaigns are important components of a comprehensive approach to reduce speeding-related crashes on rural roads.

<If the limit can be changed, road safety reviews will consider whether the speed limit or the extent of a speed zone should be changed. A multi-disciplinary team may be used to perform a

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Effectiveness of Behavioral Highway Safety Countermeasures, NCHRP Report 622 and other resources listed in the Countermeasures Toolkit references for more information on how to develop effective enforcement and publicity programs.

road safety audit in conjunction with the speed engineering study. See the bibliography in Speed Management Toolkit for more information.>

3.2.4 Countermeasures for <Other Route Types>

<Determine and describe alternate design, engineering and enforcement countermeasures for other route types.>

3.2.5 Countermeasures for School Zone/Work Zone /Other Site-specific Crash Problems

<Determine and describe alternate design, engineering and enforcement countermeasures for site-specific crash problems.>

3.2.6 Coordination with Spot Safety and Other Safety Plans and Programs

A pragmatic approach to speed management will utilize all possible ways to systematically implement speed and safety review and speed managing improvements within other safety programs, including the HSIP and any other spot safety programs. In addition, it may be prudent to incorporate speed and safety, along with multi-modal user assessments, into planned maintenance and operations improvement programs.

<If there is not already routine practice of conducting speed studies and speed limit review, and seeking input from law enforcement about the role speeding may play in spot safety issues, determine how such practices might be implemented.>

Other transportation plans and safety action plans, including modal plans, should be consulted to ensure that speed management measures and priorities are coordinated with overall safety and mobility goals for each jurisdiction/area. Countermeasures may serve multiple goals through good coordination.

3.2.7 High Crash <Corridors or Zones> Crash Reduction Targets

This section describes initial crash reduction targets for developing and implementing <corridor> treatment plans for a prioritized list of high crash <corridors/areas/sites.>

<Once the focus (the types and number of corridors or other area types) and crashes targeted and the extent of planned treatment implementation is determined, estimate a goal or target for crash reductions for each road/area type or treatment type, and the associated economic or comprehensive crash cost savings for the total package. Use State/ Local (if available) or national estimates of monetary or comprehensive crash costs.

- Target Crash Reductions for Urban, Undivided, Multi-lane Corridors.
- Target Crash Reductions for Urban, Two-lane Streets.
- Target Crash Reductions for Rural, Two-lane Routes.
- Target Crash Reductions for Other Route Types.
- Target Crash Reductions for OtherSite Specific Problems.
- Crash Reductions that may be achieved through Other Safety programs.>

The cost economic benefits of full implementation of this Plan are estimated to be:

<Insert a description of the expected economic benefits of implementing the Plan strategies and countermeasures for the extent of planned implementation.>
<The Highway Safety Manual and FHWA have information on methods to conduct an economic analysis. See one example, in Table 18, in Appendix B, of a cost-benefit assessment for one countermeasure that might be implemented on a number of corridors.>

Table 10. Economic Analysis for Speed Management Action Plan Countermeasures.
<Plan developers add table content.>

Crash Types / Severity	Expected Crashes with No Treatment	% Expected Crash Reductions	Five-year Crash Savings[27]	Avg. Monetary costs (State / local cost estimates)	Five-year Crash-cost savings*
Total crashes					
Fatal, disabling, evident injury-severity crashes					

*It may be reasonable to include more years of savings if the countermeasures will have a longer useful life.

[27] The number of years of crash savings would depend on the expected useful life of the project, and the Planning period used for long/short term goals.

Chapter 4. Multi-year Implementation Plan

<Complete this chapter following chapter 3.[28] Plan developers may select or adapt the appropriate implementation actions and strategies listed under each Action Item included below. As a follow-up in the process, specific performance measures should be developed to evaluate the overall Plan, strategies and individual countermeasures.

Appendix B includes additional information that may aid in developing and organizing implementation.>

Speeding is a complex issue that interacts with varied human cultural, economic and political, environmental, and roadway issues. Because of the inherent relationship between speed and severe crashes and fatalities, speed management should be a central tenet of a road safety program that aims to reduce fatalities and injuries. This chapter describes a Plan of Action Items to enable State and local stakeholders to arrive at locally-acceptable solutions to better manage speed appropriate to conditions and to reduce speeding-related crashes and serious injuries. Commitment to sustain a cooperative approach to speed management that balances safety and mobility goals, to Plan implementation, and to consider varied points of view by all partners is essential to success. Input from non-traditional partners such as injury prevention experts and two-way communications with the public stakeholders may also be essential to communicate the need for speed management, to build support, and to implement strategies that a majority of the public (all transportation stakeholders) deems appropriate. The sections following the Action Items outline more details for ranking and selecting specific countermeasures, and for implementing, evaluating and renewing the Plan.

4.1 Detailed Proposed Implementation Actions

This section outlines speed management actions <the Speed Management Task Force/ State DOT/County /City/Stakeholder Group> elected to use to reduce serious injury crashes. Each of the tables below provides strategies and implementation steps for the action items, as detailed in Chapter 3. This list was developed <with input from stakeholders and describes organizational roles, potential strategies, and countermeasures, and implementation steps for each Action Item>.

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[28] Non-highlighted (plain) text is "boilerplate" text that may be general enough for use as is, or modified as needed.
- Text enclosed by <angle brackets>, and highlighted in yellow should be replaced with specific text for the jurisdiction Plan. Remove the highlights once jurisdiction information has replaced the generic content.
- Tables highlighted in light gray contain descriptions enclosed by angle brackets (< >) of specific types of Plan content with illustrative examples. These sections begin with action words (e.g. "Describe", "Summarize", "State," etc.) for the Plan developers. These tables and text enclosed by angle brackets should also be adapted or removed from the Plan as the specific content for each section is developed.
- *<Bracketed notes in italics emphasis, and also highlighted in light green>* provide additional instructions or information that may useful to the Plan developers, and should also be removed from the final Plan.

<Again, Plan developers should select and modify the following Action Items and strategies as needed to reflect problems and priorities determined through the Plan development and prioritization process. The Action Items listed address common speed management issues and should match those developed in Chapter 3. The adopted Action Items may be included in Chapter 1, the Plan summary table (currently Table 1).>

Table 11. Strategies and Implementation Steps for Action Item 1.
<Plan developers adapt or modify table content.>

Action Item 1	**Frame the Speeding and Safety Problem through a Public Information and Education Program to build support for effective policies and comprehensive strategies, to seek and leverage funding, and to improve effectiveness of enforcement and engineering countermeasures. (Comprehensive approach)**
Lead	<Injury prevention (e.g. State Public Health Dept., Injury Prevention office)>
Others needed	<Others: DOT Communications and Safety Offices, Courts representatives DA's office, Law Enforcement, Emergency responders and medical profession, Insurance industry, other business and private partners>
Timeline	<5 – 8 years>
Strategies (Comprehensive)	▪ <Ensure that speed limits, including statutory maximums, are well-communicated to drivers. ▪ Improve and increase communications about the safety reasons for effective policies and strategies to improve public and political support. ▪ Seek additional funding to increase enforcement in rural and urban areas. ▪ Increase publicity and visibility/conspicuity of enforcement to enhance deterrent effects. ▪ Work toward gaining State authority to utilize automated (photo) speed enforcement as an enforcement tool. ▪ Draw on local creativity and resources (schools, businesses, partners such as Community Transportation Partners) to support and develop locally-tailored education, awareness, and enforcement strategies to enhance speed-deterrent effects of enforcement programs and potentially to target some of the top crash issues (rural, curves, nighttime).>
Implementation steps	A. <Recruit appropriate stakeholder partners for communications task force. B. Schedule first meeting. C. Set future meeting schedule and agenda. D. Coordinate with Action Item Planning Group 1. E. Set objectives and determine related performance measures. F. Determine strategies and programs. G. Implement strategies and programs. H. Document outcomes.>

Table 12. Strategies and Implementation Steps for Action Item 2.
<Plan developers adapt or modify table content.>

Action Item 2	**Develop a State task force to engage on speed limit setting and safety, improving consistency of outcomes, and restoring credibility of speed limits (Proactive and Comprehensive approaches). Training and outreach, data collection and policies and guidelines may be addressed through this Action Item. (Proactive)**
Leadership	<State/local DOTs and Injury Prevention offices>
Others needed	<law enforcement, judicial officials, public and private stakeholders, and elected officials, as appropriate>
Schedule	<1 - 5 years>
Strategies (Comprehensive and Proactive)	▪ <Set appropriate speed limits for the roadway design, context, and users to improve safety, enforceability and credibility of speed limits on new and existing roads. ▪ Develop a collaborative speed limit setting process with local governments and law enforcement. ▪ Take public concerns into consideration to *balance* safety and mobility.>
Implementation steps	A. <Recruit appropriate stakeholder representatives to task force. 1) Consider separate workgroups to focus on urban (city), rural (county), and freeway limits. 2) Consider work zone limits and implementation. 3) Review speed setting requirements/guidelines/strategies in use by other states, cities, counties, including any written procedures or manuals. 4) Include adequate public and varied safety stakeholder input to increase support for the program. B. Schedule first meeting. C. Set future meeting schedule and agenda. D. Coordinate with Action Item Planning Groups 1 and 3 (potentially others). E. Determine strategies and processes. F. Set objectives. Determine performance measures. G. Implement strategies and processes. H. Document outcomes.>

Table 13. Strategies and Implementation Steps for Action Item 3.
<Plan developers adapt or modify table content.>

Action Item 3	**Develop an inter-agency speed and safety review process to assess land use and transportation plans, designs, and implemented projects to ensure that new and improved roads meet sound speed management design and safety principles for the area land uses and intended purposes of the street or highway. (Proactive approach)**
Lead:	<Centralized transportation planning office or planning organization>
Others needed	<DOT: Transportation design, division or regional traffic engineering and planning offices, safety and mobility offices, bicycle and pedestrian planning/safety; city / county and local planning staffs; elected officials; law enforcement representatives, injury prevention experts >
Timeline	<On-going>
Work underway	<Incorporate into existing road planning or improvement projects processes.>
Strategies (Proactive)	▪ <Coordinate with transportation and land use plans in setting limits and designing roads. ▪ Set or revise speed limits early in the new project planning process to provide adequate safety for the land use, road type, and users expected, and to determine appropriate design. ▪ Conduct road safety audits of all new and pending projects, including maintenance and operations projects to ensure that: - Design is matched to elicit speeds close to the intended speed limit (self-enforcing). - Operations features are coordinated with target speeds. - Facilities are provided to separate different weight and speed of users on higher speed roads. ▪ Prioritize designs in new projects that manage speeds such as narrower and fewer lanes, roundabout intersection designs, tight turn radii at intersections, and shifts in travel ways (context-dependent).>
Implementation steps	A. <Recruit appropriate stakeholder partners for communications task force. B. Schedule first meeting. C. Set future meeting schedule and agenda. D. Coordinate with Action Item Planning Group 1. E. Determine strategies and programs. F. Set objectives. Determine performance measures. G. Implement strategies and programs. H. Document performance outcomes.>

Table 14. Strategies and Implementation Steps for Action Item 4.
<Plan developers adapt or modify table content.>

Action Item 4	Review existing speed limits, conduct additional diagnosis, and develop treatment plans for prioritized lists of problem corridors identified through network screening. (Systematic approach)
Lead	<engineering safety and mobility; regional /divisional field units>
Others needed	<DOT Division, municipal staffs and decision-makers, Regional Planning Organizations, Municipal Planning Organizations, , local law enforcement/law enforcement liaison, elected officials, courts officials>
Timeline	<5 years>
Work Underway	<Road Safety team visited a number of problem corridors and began diagnosis. RSA report summarizes findings and recommendations.>
Strategies (Systematic)	▪ <Conduct speed and engineering studies and additional diagnosis steps as per all safety programs, but with some differences as described in text under Selection and Ranking of Countermeasures (next section). ▪ Consider an injury minimization approach to speed limit setting. ▪ Utilize the US Limits tool for expert guidance in speed limit setting for speed zones. ▪ Consider whether statutory maximum limits are appropriate for entire corridors or whether entire corridors or portions of corridors should be changed. ▪ Identify alternate, feasible countermeasures from the Speed Management Toolkit and other resources. ▪ Determine speed limit, design and engineering and enforcement plan for the corridor.>
Implementation steps	A. <Recruit appropriate stakeholder partners for task force. B. Schedule first meeting. C. Prioritize corridors for further diagnosis. D. Establish diagnosis procedures – for example determine if independent RSA teams will be used to conduct audits. E. Selection and Ranking of Countermeasures (*see below).* F. Coordinate with planning group for Action Items 1, 3, 4, and 5, as appropriate. G. Set objectives. Define performance measures. H. Implement strategies and programs. I. Document performance outcomes.>

Selection and Ranking of Countermeasures - Action Item 4.E. continued

Detailed steps for Selection and Ranking of Countermeasures for Action item 4, (systematic diagnosis and treatment of existing problems) include:

1) In coordination with other owners/stakeholders: Finalize priority list of routes or areas for speed and safety review. The lists for different corridor types and area type's roadway segments and intersections in the HSIP list, Road Departure Plan, and others could be coordinated with or even combined into one prioritization list if appropriate. In addition, more routes may be added if some on the lists have already been treated or upgrades are pending.
2) Diagnose the problem for each corridor or focus area. See more on diagnosis in Diagnosis section.
    - Along with speed and engineering studies, diagnosis may involve conducting Roadway Safety Audits in cooperation with local government and law enforcement. Consider hiring independent audit teams to conduct RSAs.
    - Determine the area (land use) and roadway context (purposes and users of the road, what types of conflicts and crashes may occur based on existing design).
    - If changing the limit is an option, determine what speed limit should be set based on the roadway context, types of conflicts and crashes that may occur (injury/fatality risk).
    - Assess credibility of the speed limit to drivers.
3) Again, in collaboration with other stakeholders, determine appropriate speed limit and whether changes in the limit for the corridor are warranted based on safety concerns, the road design, the environmental context, and considering enforcement and other concerns regarding speed limit credibility. Coordinate with local agency representatives. Assess rural to urban transition areas or other speed zone changes if relevant.
4) Complete diagnosis and identify alternate countermeasures. If the recommendation is to change speed limits, consult and coordinate with local governments, stakeholders groups, law enforcement, judiciary and educators to implement.
    - Determine what design and engineering changes can be made to the roadway to improve credibility of the limit, and bring operating speeds more in line with desired limits (self-enforcing designs), reduce speed variance, or achieve other speed management objectives.
    - Determine what other engineering safety improvements are needed.
    - Determine whether enforcement enhancements are needed to increase compliance with limits (including any changed limits).
5) Conduct **feasibility assessments** (see below) on alternate measures.
6) Finalize the list of feasible countermeasures for the corridor or area. Combinations of multiple countermeasures may be needed.
7) Identify funding sources and levels and perform **economic assessments** (see below) for alternate, feasible treatment options and priorities within each program/funding area.
8) Identify the most appropriate set of countermeasures for each corridor or location.

These steps are discussed in Chapters 5, 6, 7, and 8 of the *Highway Safety Manual*.[29]

Feasibility Assessments. The intent of a feasibility assessment is to consider how likely the measure is to be implemented, and implemented well, taking financial and non-financial constraints and issues into consideration. This is also a time to consider opportunities exist to facilitate implementation. Some of the considerations may include:

- Barriers to implementation, local acceptability.
- Funding sources available.
- Current and future land uses along and near the corridor.
- Lifespan of the project.
- Applicability to multiple locations or need for consistent application of low-cost signs, markings, and design elements to improve driver comprehension and acceptance of limits.
- Potential for long-term improvement of compliance with speed limits (self-enforcing designs).
- Need for additional enforcement to supplement engineering measures.

Stakeholders may conduct feasibility assessment early in the Plan implementation process. For example, Plan implementers could select countermeasures and strategies that might be applied on a widespread basis to improve driver perceptions of appropriate speeds to drive on different types of roads. Such measures could then receive priority.

Economic Assessments. The intent of the economic analysis is to compare the benefits and costs of alternative countermeasures using the most appropriate estimates of expected safety effects available, once the problems and feasible alternate solutions have been identified.

<Chapter 7 of the Highway Safety Manual[30] has a detailed discussion on how economic assessments can be conducted. Table 18 in Appendix B provides one example for estimating the benefits of a road diet.*>*

Other economic considerations include overall funding allocation among different types and programs. In addition, consider the ability to implement speed management measures through planned maintenance or operations projects. Non-traditional funding sources may also be available to implement some types of improvements or programs.

[29] AASHTO, 2010). Highway Safety Manual, 1st ed. American Association of State Highway Traffic Safety Officials: Washington, DC.
[30] AASHTO (2010). Highway Safety Manual, 1st ed.

<*The* systematic approach may be strengthened by considering overall objectives of the program and whether systematic or system-wide application of similar measures to similar locations (if appropriate) may improve perception and speed selection by drivers. For example, greater consistency across a jurisdiction, or even across multiple jurisdictions, in application of speed limits, signs, markings, and designs may help to strengthen creation of self-enforcing, self-explaining roadways. Thus, measures for individual locations are perhaps best considered, not in isolation, but as part of an overall approach. Linkage of the systematic approach with proactive strategies and decisions about approaches may therefore also be important.>

Tables 15 and 16 also describe actions that will be part of a systematic approach to identifying, prioritizing, and determining appropriate treatments. These strategies include coordinating among analysts and diagnosticians, engineering, and enforcement to determine which roads would benefit most from supplemental/enhanced enforcement. Comprehensive enforcement and publicity strategies are also needed to increase system-wide deterrence of speeding. Finally, it is important that different agency types, organizational levels, and programs work together and communicate about other safety plans and goals that may benefit from a systematic approach to speed management. These actions are described in Table 16.

Table 15. Strategies and Implementation Steps for Action Item 5.

<Plan developers adapt or modify table content.>

Action Item 5	Implement a sustainable, high visibility enforcement and adjudication program. Target more of the network where serious crashes occur. (Comprehensive treatment in conjunction with Systematic approach)
Lead	<State or local department of public safety / highway patrol>
Others needed	<Others: DOT offices may assist with prioritization through systematic data analysis and review process; courts officials; injury prevention branch/agency, and communications experts>
Timeline	<1 - 2 years to start-up; on-going implementation>
Strategies (Comprehensive)	▪ <Develop a sustainable, but randomly allocated high visibility enforcement to corridors with high frequencies of severe crashes and speeding. ▪ Create safety zones with a package of treatments. ▪ Publicize the enforcement. ▪ Cover as much of the network where serious crashes occur as feasible. ▪ Coordinate with engineering and design to focus on roads where engineering changes cannot be implemented right away or are insufficient to address the problems. ▪ Supplement highly visible enforcement with covert methods. Publicize these to increase perception that enforcement may be encountered anywhere, anytime. ▪ Target enforcement to hours and locations when severe crashes are concentrated. ▪ Tighten adjudication of citations for targeted corridors and publicize the effort. ▪ Enhance deterrent effects of any type of speed enforcement program with publicity. ▪ Implement automated enforcement, along with civil penalties for speeding>.
Implementation steps	A. <Recruit appropriate stakeholder partners for task force. B. Schedule first meeting. C. Set future meeting schedule and agenda. D. Coordinate with Action Item Planning Groups 1, 4, and 5. E. Determine strategies, policies, and procedures and implementation needs. F. Set objectives. Define performance measures. G. Implement strategies and programs. H. Document outcomes.>

Table 16. Strategies and Implementation Steps for Action Item 6.

<Plan developers adapt or modify table content.>

Action Item 6	Implement speed and safety reviews of roadway segments or intersections within the HSIP (spot safety) program, and coordinate with other transportation safety plans and programs. (Systematic approach).
Lead	<DOT safety & mobility offices/units or local agencies>
Others Involved	<Others: traffic engineers, law enforcement agencies, bicycle and pedestrian transportation offices (esp. for urban areas), county/city transportation agency staff>
Schedule	<3 – 5 years; longer term>
Work underway:	
Strategies (Systematic)	▪ <Incorporate routine diagnosis of speeding issues into the HSIP program, Pedestrian and Bicycle safety programs, and the NC Roadway Departure Safety Plan implementation program. ▪ Assess whether corridor-level speed management issues are contributing to spot safety problems.>
Implementation Steps	A. <Identify existing and needed opportunities for coordination. B. Schedule meetings as needed or piggy-back on existing meetings C. Identify needs including but not limited to: 1) Speed studies. 2) Data and project plan sharing. 3) Law enforcement assistance for particular corridors or areas. 4) Coordinating with the Systematic approach (Action Item 4). 5) Innovative strategies. 6) Research/evaluation needs. D. Set objectives. Define performance measures. E. Implement strategies and programs. F. Document outcomes.>

Implementation Steps following Project Approval

Once treatment locations and countermeasures are approved, the following process steps should be performed:

- Design project(s) and allocate appropriate funding sources and/or pursue grants or private funding.
- Develop implementation schedule, assign tasks.
- Finalize safety targets or other goals.
- Identify measures of effectiveness and develop evaluation plan.
- Implement and complete evaluation.
- Communicate results to decision-makers and the public.

More details of these and other implementation processes are described in the NCHRP Guide for Reducing Speeding-Related Crashes, Section VI.[31]

4.2 Evaluation Plan

The goals of this Plan are to reduce fatal and injury crashes and to improve speed compliance. The primary measures of program effectiveness are safety measures:

- Changes in operating speed distributions (average speed, 85th percentile speed, percentage of speeders < _#_ > miles above limit).
- Changes in crash frequency and severity and changes in speeding-related crashes.

The program will be evaluated with respect to changes in crashes, especially more severe crashes and speeding-related crashes compared with trends absent the program. Speed measurements provide earlier feedback than crash trends and are a good indicator of safety risk.

The timing of crash-based evaluations will depend on when and how many measures are implemented, and the availability of sufficient years and number of crashes for evaluation. Additional technical assistance is available to help determine appropriate evaluation methods to control for other trends and safety programs.

Plan evaluation. On-going tracking of actions and countermeasures implementation will also be used to help document program efforts and provide support for findings relating to the program. Near the end of the implementation period, perform an assessment of whether safety goals of the overall Plan were met. Communicate results to decision-makers and the public, and use results to help develop ambitious targets for an updated Plan.

Countermeasures evaluation. It may be important to evaluate specific countermeasures to provide additional information about program effects as well as feedback about countermeasures effectiveness in the local context.

<More information about Plan and countermeasures evaluation is included in Appendix B. Table 19 provides an example Plan Evaluation Matrix that describes potential measures of effectiveness for different program elements. Table 20 describes countermeasures evaluation measures.
Consult with FHWA if additional technical assistance is needed.>

[31] NCHRP. (2009). Guidance for Implementation of the AASHTO Strategic Highway Safety Plan. Volume 23: A Guide for Reducing Speeding-Related Crashes. Washington, DC: Transportation Research Board. onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_500v23.pdf

4.3 Action Plan Update

The plan will be a working document, with additional implementation actions, schedules, and other updates incorporated as needed during the five-year plan period.

<Near the end of five years, following the plan evaluation, update the Plan incorporating lessons learned from the evaluation and implementation experiences, as well as from an updated problem assessment.>

Appendix A. Supplemental Materials for Chapter 2

Network Screening for Speeding-related and/or Severe or Other Crash Types

<This Appendix is intended to be an aid and provides background on the identification of speeding-related safety problems for Chapter 2. Appendix A may be removed in its entirety from the Plan or replaced with more detail about analysis procedures actually used in Plan development and/or details of analysis results obtained.>

There are many ways to screen a network to identify corridors, intersections, or roadway segments that may need safety treatment. The more advanced methods make use of safety performance functions and the empirical Bayes (EB) method in order to identify segments. These advanced methods are intended to address potential bias due to regression to the mean (RTM). To use such methods, there is a need for traffic volume data for all segments in the network. For the purpose of screening for speeding-related crashes, it is suggested that crash severity, as well as available crash data definitions of speeding-related crashes be used, either together, or separately and combined during the ranking process.

Network Screening using Crash and Other Data

This section provides an overview of a process that can be used for screening the network in evaluating the potential to reduce the number/severity of speed-related crashes. Based on the information provided in Chapter 4 of the recently published *Highway Safety Manual*, network screening involves five steps:

- Establish Focus.
- Identify Network and Establish Reference Populations.
- Select Performance Measures.
- Select Screening Method.
- Screen and Evaluate Results.

Establish Focus

This step identifies the intended outcome of the network screening. In our context, the intent is to identify locations with high number of speed related crashes that could benefit from different types of treatments. Speeding-related may include exceeding a safe speed for conditions and/or exceeding limits; severe crashes (may include fatal, disabling injury, and evident injury crash types or all injury types). Specific crash types or locations may also be used alone, or in combination with speeding-related and/or severe injury crash types.

Identify Network and Establish Reference Populations

This step refers to the types of sites and facilities that will be screened. The network/reference population may be decided based on which counties/facility types/conditions have a large number of speeding related crashes or rate of speeding related crashes (this will be evident from the tables that were produced earlier).

Sites could be divided into:

- Roadway segments.
- Intersections.
- Interchanges.
- Corridors/facilities, etc. (In almost every State, there are corridors and routes that are not mileposted. Hence, it may not be possible to determine where exactly the crash occurred in these facilities without a detailed review of crash reports. However, it may still be possible to know that the crash occurred along that facility. So, for such facilities, the analysis could be done at the facility level.)

Depending on the performance measures that are selected (from the next step), there may be a need to group sites based on traffic control and number of legs, e.g., speeding related crashes at four-leg stop controlled intersections may be screened separately from three-leg signalized intersections.

Select Performance Measures

Chapter 4 of the *Highway Safety Manual* provides a discussion of 13 possible performance measures (they are presented in relative order of complexity, from least to most complex):

1. Average Crash Frequency.
2. Crash Rate.
3. Equivalent Property Damage Only (EPDO) Average Crash Frequency.
4. Relative Severity Index.
5. Critical Rate.
6. Excess Predicted Average Crash Frequency Using Method of Moments.
7. Level of Service of Safety.
8. Excess Predicted Average Crash Frequency Using Safety Performance Functions (SPFs).
9. Probability of Specific Crash Types Exceeding Threshold Proportion.
10. Excess Proportion of Specific Crash Types. *<such as speeding-related and/or severe>*
11. Expected Average crash Frequency with EB Adjustment.
12. Equivalent Property Damage Only (EPDO) Average Crash Frequency with EB Adjustment.
13. Excess Expected Average Crash Frequency with EB Adjustment.

The selection of an appropriate performance measure may depend on at least two factors:

- Availability of data.
- Potential for Regression-to-the-Mean (RTM) bias.

Regarding availability of data, some of the measures require traffic volume data while others need calibrated safety performance functions (SPFs), which are mathematical equations that relate crash frequency with site characteristics including traffic volume. The other factor is the potential for bias due to regression toward the mean (RTM). RTM refers to the phenomenon when a period with a comparatively high crash frequency is observed, it is statistically probable that a lower crash frequency will be observed in the following period. The last three measures mentioned above make use of an approach called the empirical Bayes (EB) method in order to

account for the possible bias due to RTM. The use of the EB method requires the calibration of SPFs, which in turn require data on traffic volumes. Hence, for facilities without traffic volume data, the EB method cannot be applied.

Table 17 (adapted from Tables 4-1 and 4-2 of the Highway Safety Manual) indicate the data needs for the different performance measures and whether a particular method accounts for the potential bias due to RTM.

Table 17. Safety Performance Measures and Data Needs.

Performance Measure	Needed Data Inputs			Accounts for bias due to RTM
	Crash and Roadway Information for Categorization	Traffic Volume	Safety Performance Function	
1. Average Crash Frequency	X			No
2. Crash Rate	X	X		No
3. Equivalent Property Damage Only (EPDO) Average Crash Frequency	X			No
4. Relative Severity Index	X			No
5. Critical Rate	X	X		No
6. Excess Predicted Average Crash Frequency Using Method of Moments	X	X		No
7. Level of Service of Safety	X	X	X	No
8. Excess Predicted Average Crash Frequency Using SPFs	X	X	X	No
9. Probability of Specific Crash Types Exceeding Threshold Proportion	X			N/A[32]
10. Excess Proportion of Specific Crash Types	X			N/A
11. Expected Average Crash Frequency with EB Adjustment	X	X	X	Yes
12. EPDO Average Crash Frequency with EB Adjustment	X	X	X	Yes
13. Excess Expected Average Crash Frequency with EB Adjustment	X	X	X	Yes

[32] N/A means not applicable. Unlike the other 11 measures, these two measures look at proportion of crashes and hence RTM is not an issue.

Select Screening Method

The appropriate network screening method may depend on the type of facility being considered. For example, the screening method may be different for segments (roadway segment or ramp), nodes (intersection), and facilities/corridors (combination of segments and nodes).

Screening methods for segments

The simplest screening method for segments is to do a simple ranking where performance measures are calculated for all the segments under consideration and the results are ordered from high to low.

Two other methods: sliding window and peak search methods are more sophisticated and can be used to identify locations within a segment that may benefit from a countermeasure. For the sliding window and peak search method to work, it is necessary to know where exactly a crash occurred (it is not sufficient to just know that a crash occurred in a particular segment).

In the sliding window approach, a window of fixed length moves in defined increments and the calculations are performed at each window location. Each segment is characterized by the maximum value calculated at any window position within or overlapping the beginning or end of an adjacent segment. In so doing, there is an increased chance of detecting a high-risk site at the screening stage if the collision problem manifests itself in a window overlapping the adjacent site (Srinivasan et al., 2011).

The second is the peak search approach. This approach makes use of incrementally growing window lengths that are selected so no windows span multiple roadway segments. The window starts at the left boundary of a road segment and increases in length incrementally until it reaches the end. At each increment, there is a specific window where an estimated collision count can be calculated. For example, a segment of 0.5 mile can produce windows with lengths of 0.1, 0.2, 0.3, 0.4, and 0.5 miles assuming an increment length of 0.1 mile. The window with the largest value of a particular measure is then tested for statistical significance. The test of significance is the coefficient of variation, CV, equal to the standard error of the estimate divided by the estimate. A limiting value of the CV is specified by the analyst, and values of CV below the limiting value pass the test. If the window passes the test then the entire road segment is ranked by the largest value of the estimate per mile. If the test is not passed then the window size is increased and the process starts again for the road segment. The advantage of this method is that localized safety problems are not overlooked by using too large a window yet the statistical test ensures that they are in fact reliable estimates and not due to some randomness in the data (Srinivasan et al., 2011). With SafetyAnalyst, the user can choose to apply the sliding window or the peak search method.

Screening method for nodes or junctions

For nodes, a simple ranking method could be applied where the performance measures are calculated for each site and the results are used to rank the sites.

Screening method for facilities/corridors

Similar to nodes, a simple ranking method could be applied where the performance measures are calculated for each site and the results are used to rank the corridors. The *Highway Safety Manual* indicates that corridors are recommended to be approximately 5 to 10 miles long to provide more stable results. As mentioned earlier, this method may be the only option for roads that do not have mileposts and hence it is not possible to precisely locate a crash without reviewing individual crash reports.

Screen and Evaluate Results

The results of the screening process would be a list of sites/corridors ordered based on the selected performance measures. Those high on the list may need further review and diagnosis to determine if they will benefit from specific treatments. This will be discussed in the following sections.

Summary Comments Regarding Network Screening

The specific method that is used in network screening will depend not only on the data that are available in a particular state/jurisdiction, but the tools that are available as well. Some States have already implemented SafetyAnalyst and hence can make use of some of the more complex methods. Other States (e.g., North Carolina) use screening methods such as the sliding window, but they are used with only crash data unlike SafetyAnalyst that makes use of the sliding window method in conjunction with traffic volume and SPFs. So, there is probably a wide variation among the different States in how network screening is conducted. After the pilot States/jurisdictions are identified, the project team will work with them to use the appropriate network screening methods taking into account the availability of data elements and tools.

Diagnosis

The intent of diagnosis is the identification of the causes of the collisions and potential safety concerns or crashes that can be evaluated further.

Steps in Diagnosis (from the HSM):

This step includes descriptive statistics of crash conditions including counts by crash type, severity, and roadway/environmental conditions. It also includes the examination of collision patterns by location.

Step 2 – Assess supporting documentation

This goal of this step is to obtain and review documented information or input from local transportation professionals that provides additional perspective to the crash data review described in the previous step. The documentation reviewed may include traffic volumes for the study years, as-built plans, design criteria, maintenance logs, adverse weather conditions, and records of public comments and concerns.

Step 3 – Assess field conditions

This step will involve a review of roadway as well as traffic and other roadway user conditions. A formal road safety audit (RSA) may be used as part of the diagnosis process. An RSA provides the ability to assess behaviors as well as other road conditions, and to identify safety issues from the perspective of different types of road users using diverse types of expertise. Thus a formal RSA enhances the ability to fully consider all types of potentially appropriate treatments. See the *Speed Management Toolkit* bibliography about RSAs for more information and links to additional resources.

Most importantly, there will be need to collect data on traffic speeds and conduct an assessment of posted speed limits. Additional information and guidance on speed limits is also available in resources mentioned in the bibliography. These include USLIMITS2, an interactive expert decision-support tool, and others. USLIMITS2 provides a recommendation for speed limits for speed zones based on information about operating speed (85^{th} and 50^{th} percentile speed), site characteristics (the list of site characteristics depend on the type of facility; i.e., freeway, roads in undeveloped areas, and roads in developed areas). Crash information is also used when available. If for a particular roadway segment, the rate of crashes (both total and injury and fatal) are higher than the average for similar roadway segments, the system asks the user to conduct an investigation to determine whether the crash and injury rates could be reduced by engineering countermeasures. Depending on the user's response, the system recommends a speed limit for the speed zone. USLIMTS can be accessed at the following website being maintained by the Federal Highway Administration: http://safety.fhwa.dot.gov/USLIMITS/.

Information on other speed limit setting approaches is provided in *Methods and Practices for Setting Speed Limits: An Informational Report,* sponsored by ITE and FHWA which is available at http://safety.fhwa.dot.gov/speedmgt/ref_mats/fhwasa12004/.

Most States also establish some speed limits by default through statutory limits. These limits are typically established and changed by legislative action. Statutory speed limits on roadway segments can typically be changed through speed limit and engineering studies and posting of zoned limits on sections of such roads. Ensure compliance with established laws and guidelines in performing these speed limit engineering reviews.

The information developed through the field assessment/RSA can be used to help determine the types of problem and the most appropriate countermeasures. These may include increasing or decreasing the posted speed limit, making design or other engineering improvements to the roadway, and enhancing enforcement and publicity of enforcement. In particular, supplemental enforcement may be needed if improvements cannot be made to the roadway right away, or roadway changes alone are insufficient to bring about compliance with desired speed limits. Ideally, speed limits, design, and enforcement are considered as an entire package.

Appendix B. Supplemental Materials for Chapter 4

<This Appendix is intended to be an aid in developing and organizing implementation strategies for Chapter 4. This supplemental material is intended to be a resource for the Plan developers, including tables that could be modified for use in the Plan.
Table 18 gives an example of a cost-benefit analysis as part of the economic assessments associated with the selection and prioritization of countermeasures. The Highway Safety Manual[33] provides more information on how to conduct an economic assessment using different assumptions. The Federal Highway Administration also provides information in project prioritization chapter of the HSIP Manual.[34]>

Table 18. Example Cost-benefit Analysis of Road Diet Implementations.

Crash Injury Severity	5 Yr Exp. Crashes without Treatment	Exp. Crash Reduction [35]	Exp. Five Yr Crash Savings	Average Monetary Costs per Crash	Exp. 5-yr Crash Cost Savings [36]	Countermeasure Costs	Estimated Crash Costs Saved
<All	190	29% (low est.)	55	$15,000	$825,000	Minimal – if through resurfacing*	$825,000 low range
KAB-severity crashes	14	47% (high est.)	0.9 0.9 5.1	$158,200 (avg.)	$2,214,800	Minimal – if through resurfacing	$2.2 million (not including PDOs, possible injury)>

<*Other improvements such as medians or refuge islands could further reduce crashes, but add to costs>

<Countermeasures evaluation. *In order to properly estimate the safety performance of a treatment, it is necessary to select the appropriate study design and statistical analysis technique. Selection of the appropriate study design and statistical analysis technique depends on many factors including the nature of the treatment, how it has been implemented, and data that are available for the evaluation. The following documents discuss the issues associated with different types of study designs:*

- *AASHTO, Safety Effectiveness Evaluation, Chapter 9 of the HSM;*
- *Gross, Persaud, and Lyon, A Guide to Developing Quality Crash Modification Factors, Report FHWA-SA-10-032, December 2010*
- *Carter, Srinivasan, Gross, and Council, Recommended Protocol for Developing Crash Modification Factors, Final Report from NCHRP Project 20-07 (Task 314), February 2012*

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[33] AASHTO (2010). *Highway Safety Manual, 1st ed.* American Association of Highway Traffic Safety Officials: Washington, DC
[34] FHWA's Highway Safety Improvement Program (HSIP) manual web pages includes the following section on project prioritization http://safety.fhwa.dot.gov/hsip/resources/fhwasa09029/sec4.cfm. The full HSIP manual is available here: http://safety.fhwa.dot.gov/hsip/resources/fhwasa09029/fhwasa09029.pdf
[35] CMF estimates from Crash Reduction Factors for Traffic Engineering and ITS Improvements", NCHRP Project 17-25 Final Report, Washington, D.C., National Cooperative Highway Research Program, Transportation Research Board, (2008)Delineation." Report No. FHWA-HRT-09-045, Federal Highway Administration, Washington, D.C., (2009)
[36] Costs of future crashes saved are not discounted in this example.

Observational before-after studies and cross-sectional comparisons may be used. It is important to recognize that crash analysis may not be feasible or sufficient under many situations. For example, if sufficient number of sites and years of crash data are not available to provide a statistically reliable estimate of the safety effectiveness of a treatment, then it will be prudent for the analyst to consider surrogate measures such as average speed to obtain further insight into the effectiveness of a treatment.
Table 19 provides a program evaluation matrix that can be tailored to a jurisdiction's Plan.
The purpose of this table is to aid in tracking actions and countermeasures, to identify appropriate performance measures before implementation, and to ensure proper documentation so that appropriate evaluation is possible. The included text provides examples.>

Table 19. Example Plan Evaluation Matrix

Plan Evaluation Matrix Program elements	Intermediate Process Measures (Activities and Outputs)	Performance Measures (Outcomes)	Barriers to Implementation Issues and Resolution
<Proactive process: e.g. Coordinate among stakeholder agencies, including comprehensive land use and transportation planning stakeholders to set appropriate speed limits on urban roads that will be/are managed by the State.	▪ Processes and policies put in place. ▪ Design practices/guidelines updated. ▪ Number of in-process and new plans for which speed limits are determined early in the planning process. ▪ Number of new projects with speed and safety reviews at key stages. ▪ Changes/potential crash savings made as a result of speed limit and safety review of new projects.	**Shorter-Term** ▪ Driver speeding or speed compliance on roads implemented (compared with other similar roads that did not go through the process). ▪ Other road user measures of satisfaction (safety perception, level or quality of service, etc.). **Longer-Term** ▪ Improvements in stakeholder perceptions of consistency between road designs and speed limits.	e.g. Change to existing practice or policy>

Appendix B

Plan Evaluation Matrix Program elements	Intermediate Process Measures (Activities and Outputs)	Performance Measures (Outcomes)	Barriers to Implementation Issues and Resolution
<Systematic Process measures: e.g. Review existing speed limits and conduct roadway safety assessments for prioritized lists of corridors.	▪ Organizational structure, screening or other procedures developed or enhanced. ▪ Integration with existing programs. ▪ Number of corridors with speed and safety assessments. ▪ Number and proportion of locations warranting changed limits that were changed. ▪ Number and proportion of locations identified for safety improvements that had treatments (engineering or enforcement) implemented.	**Shorter-Term** ▪ Operating speed measures. **Longer-Term** ▪ Crash effects. ▪ Potentially other measures, depending on objectives of project.	e.g. Time, staffing limitations
Comprehensive process: Frame the injury prevention problem; improve public acceptance of speed management measures	▪ Public and policy-maker attitudes to speeding and/or speeding countermeasures. ▪ New legislation or policy change. ▪ Additional partners and supporting efforts.	**Longer-Term** ▪ Crash effects.	e.g. State laws prohibiting use of effective technologies; Lack of public support
Specific Countermeasures: e.g. Increase randomly targeted enforcement to a larger number of high crash corridors	▪ Document deployment strategy. ▪ Officer-hours deployed by location (coverage of crashes).	**Shorter-Term** ▪ Operating speed measures. **Longer-Term** ▪ Crash effects.	e.g. Allocating existing resources or increasing enforcement resources
Specific Countermeasures: Implement three road diets	▪ Document number of treatments (e.g. road diets implemented).	**Shorter Term** ▪ Operating speed measures. **Longer Term** Crash effects.	e.g. Community resistance to change>

<Table 20 describes potential evaluation measures of specific countermeasures. Evaluation of specific countermeasures will important to establish effectiveness and degree of effects of specific measures and will also contribute to estimates of overall program effects. While long-term speeding-related crash trends should also be monitored for program effects, evaluating countermeasures provides additional support for program effects as well as local estimates of countermeasure effectiveness. However, as mentioned earlier, sufficient years of crash data and perhaps multiple sites are required for robust evaluation.
If average or other operating speed measures are used, it will also be easier to attribute crash outcomes to action plan effects.
Again, the purpose of this table is to aid in establishing appropriate performance measures for selected countermeasures, and to ensure proper documentation so that appropriate evaluation is possible. The included text provides examples.>

Table 20. Example Countermeasure Safety Evaluation Matrix.

Countermeasure	Short-term Measures	Longer-term measures	Crash Cost Outcome
<Speed and crash-lowering engineering countermeasures (e.g., road diet)	▪ Before and after speed measurements at target and comparison sites (Identify similar untreated control/ reference locations).	▪ Follow-up speed measurements over time. (Ensure implementation dates are tracked.) ▪ Crash-based evaluation (at least three years after crash data).	▪ Crash cost savings over useful life compared with countermeasure cost.
Targeted enforcement	▪ Percentage of drivers complying with limit at target and comparison sites.	▪ Percentage of drivers complying with limit over different times before, during, after enforcement waves. ▪ Change in frequency or severity of crashes (if sufficient years, sites available).	▪ Crash cost savings.>

For More Information:

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