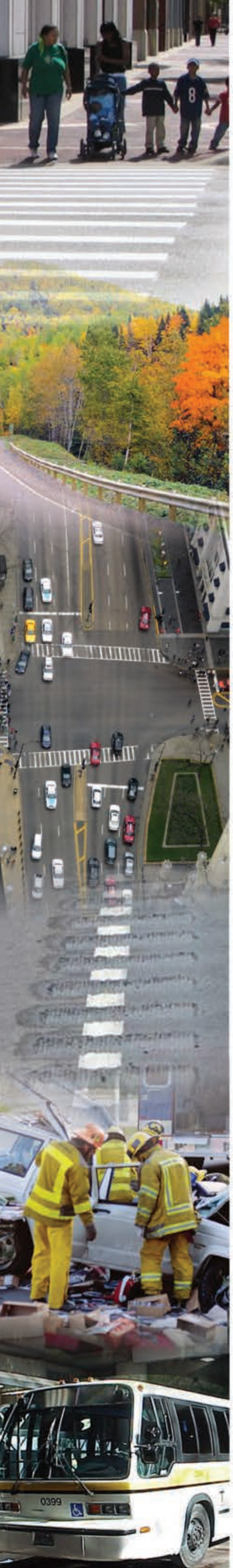

# Integrating Road Safety into NEPA Analysis

## A Practitioner's Primer

June 2011

U.S. Department of Transportation
Federal Highway Administration

*with support from*

TSP
TRANSPORTATION SAFETY PLANNING
planning it safe

Transportation Safety Planning Working Group

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16. Abstract

This primer presents an introduction to the topic of addressing safety as part of the environment analysis process, as directed by the National Environmental Policy Act (NEPA). It presents practitioners with basic concepts for including meaningful, quantitative analysis of project safety issues and for taking advantage of the latest tools, research, and techniques for improving road safety within a project scope. The primer highlights the opportunity and benefits of linking safety planning to the environmental analysis at every stage of the NEPA process. The primer contains the following sections:

- Considering Safety Prior to the NEPA process;
- NEPA Overview and Levels of Documentation;
- Public and Stakeholder Outreach;
- Purpose and Need Statements;
- Alternatives Analysis;
- Defining the Affected Environment; and
- Analysis of Environmental Impacts and Mitigation.

Appendix A contains related resources, including links to on-line courses, tools, and research documents covering topics such as the basics of the NEPA process, road safety analysis, and safety countermeasure selection. Appendix B contains case studies illustrating best practices in incorporating safety into the NEPA process.


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## SI* (MODERN METRIC) CONVERSION FACTORS

### APPROXIMATE CONVERSIONS TO SI UNITS

| Symbol | When You Know | Multiply By | To Find | Symbol |
|---|---|---|---|---|
| | | **LENGTH** | | |
| in | inches | 25.4 | millimeters | mm |
| ft | feet | 0.305 | meters | m |
| yd | yards | 0.914 | meters | m |
| mi | miles | 1.61 | kilometers | km |
| | | **AREA** | | |
| $in^2$ | square inches | 645.2 | square millimeters | $mm^2$ |
| $ft^2$ | square feet | 0.093 | square meters | $m^2$ |
| $yd^2$ | square yard | 0.836 | square meters | $m^2$ |
| ac | acres | 0.405 | hectares | ha |
| $mi^2$ | square miles | 2.59 | square kilometers | $km^2$ |
| | | **VOLUME** | | |
| fl oz | fluid ounces | 29.57 | milliliters | mL |
| gal | gallons | 3.785 | liters | L |
| $ft^3$ | cubic feet | 0.028 | cubic meters | $m^3$ |
| $yd^3$ | cubic yards | 0.765 | cubic meters | $m^3$ |
| | | NOTE: volumes greater than 1000 L shall be shown in $m^3$ | | |
| | | **MASS** | | |
| oz | ounces | 28.35 | grams | g |
| lb | pounds | 0.454 | kilograms | kg |
| T | short tons (2000 lb) | 0.907 | megagrams (or "metric ton") | Mg (or "t") |
| | | **TEMPERATURE (exact degrees)** | | |
| °F | Fahrenheit | 5 (F-32)/9 or (F-32)/1.8 | Celsius | °C |
| | | **ILLUMINATION** | | |
| fc | foot-candles | 10.76 | lux | lx |
| fl | foot-Lamberts | 3.426 | candela/$m^2$ | cd/$m^2$ |
| | | **FORCE and PRESSURE or STRESS** | | |
| lbf | poundforce | 4.45 | newtons | N |
| lbf/$in^2$ | poundforce per square inch | 6.89 | kilopascals | kPa |

### APPROXIMATE CONVERSIONS FROM SI UNITS

| Symbol | When You Know | Multiply By | To Find | Symbol |
|---|---|---|---|---|
| | | **LENGTH** | | |
| mm | millimeters | 0.039 | inches | in |
| m | meters | 3.28 | feet | ft |
| m | meters | 1.09 | yards | yd |
| km | kilometers | 0.621 | miles | mi |
| | | **AREA** | | |
| $mm^2$ | square millimeters | 0.0016 | square inches | $in^2$ |
| $m^2$ | square meters | 10.764 | square feet | $ft^2$ |
| $m^2$ | square meters | 1.195 | square yards | $yd^2$ |
| ha | hectares | 2.47 | acres | ac |
| $km^2$ | square kilometers | 0.386 | square miles | $mi^2$ |
| | | **VOLUME** | | |
| mL | milliliters | 0.034 | fluid ounces | fl oz |
| L | liters | 0.264 | gallons | gal |
| $m^3$ | cubic meters | 35.314 | cubic feet | $ft^3$ |
| $m^3$ | cubic meters | 1.307 | cubic yards | $yd^3$ |
| | | **MASS** | | |
| g | grams | 0.035 | ounces | oz |
| kg | kilograms | 2.202 | pounds | lb |
| Mg (or "t") | megagrams (or "metric ton") | 1.103 | short tons (2000 lb) | T |
| | | **TEMPERATURE (exact degrees)** | | |
| °C | Celsius | 1.8C+32 | Fahrenheit | °F |
| | | **ILLUMINATION** | | |
| lx | lux | 0.0929 | foot-candles | fc |
| cd/$m^2$ | candela/$m^2$ | 0.2919 | foot-Lamberts | fl |
| | | **FORCE and PRESSURE or STRESS** | | |
| N | newtons | 0.225 | poundforce | lbf |
| kPa | kilopascals | 0.145 | poundforce per square inch | lbf/$in^2$ |

*SI is the symbol for the International System of Units. Appropriate rounding should be made to comply with Section 4 of ASTM E380. (Revised March 2003)

*report*

# Integrating Road Safety into NEPA Analysis

## *A Primer for Safety and Environmental Professionals*

Federal Highway Administration
June 2011

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# Foreword

To further promote a safer transportation system, the Federal Highway Administration would like to share this new resource, "Integrating Road Safety into NEPA Analysis: A Primer for Safety and Environmental Professionals."

This primer presents an introduction to the topic of addressing safety as a part of the environmental analysis process, as directed by the National Environmental Policy Act (NEPA). It presents practitioners with basic concepts for including meaningful, quantitative analysis of project safety issues and for taking advantage of the latest tools, research, and techniques for improving road safety within a project scope. The primer highlights the opportunity and benefits of linking safety planning to the environmental analysis at every stage of the NEPA process.

To provide the reader a better understanding of what is discussed in this primer, several case studies have been included in the document. The case studies highlight noteworthy practices in integrating safety into the NEPA process.

This primer will be of interest to the planners, environmental specialists, and transportation safety practitioners who are interested in learning more about how to incorporate scientific safety analysis into the environmental documents, in particular those in state departments of transportation, metropolitan planning organizations, and other organizations involved in the NEPA process.

Thank you for your efforts to integrate safety considerations into the comprehensive transportation planning and environmental processes. Together we are saving lives and reducing injuries and crashes.

Sincerely yours,

Anthony T. Furst

Acting Associate Administrator for Safety

Federal Highway Administration

Gloria M. Shepherd

Associate Administrator for Planning, Environment, and Realty

Federal Highway Administration

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# Abbreviations

AASHTO – American Association of State Highway Transportation Officials

CE – Categorical Exclusions

CSS – Context Sensitive Solutions

DEIS – Draft Environmental Impact Statement

EA – Environmental Assessments

EIS – Environmental Impact Statements

FEIS – Final Environmental Impact Statement

FHWA – Federal Highway Administration

FONSI – Finding of No Significant Impact

HSIP – Highway Safety Improvement Program

IHSDM – Interactive Highway Safety Design Model

MUTCD – Manual on Uniform Traffic Control Devices

NCHRP – National Cooperative Highway Research Program

NEPA – National Environmental Policy Act

PEL – Planning and Environmental Linkages

ROD – Record of Decision

RSA – Road Safety Audits

SAFETEA-LU – Safe, Accountable, Flexible, and Efficient Transportation Equity Act: A Legacy for Users

SHSO – State Highway Safety Office

SHSP – Strategic Highway Safety Plan

TIP – Transportation Improvement Programs

# Preface

This primer presents strategies to capitalize on the National Environmental Policy Act (NEPA) process as an effective tool for maximizing the safety benefits of transportation projects. It describes how to take advantage of the latest safety research and analysis techniques at every stage of the NEPA process, and how to link these to safety planning. It is one of a series of primers covering integration of different elements of safety into the transportation planning process.

*www.pedbikeimages.org/danburden*

The NEPA process provides a unique opportunity to apply the latest research and analytical techniques for project-level safety analysis. These techniques are becoming more sophisticated as the field of transportation safety advances. Crash data collection techniques have improved, new tools and protocols for analyzing crash data are available, and research on the effectiveness of safety improvement strategies has expanded. Furthermore, all states have a multidisciplinary transportation safety planning process in place.

However, not every stage of transportation project development fully reflects these advancements. This raises the question, has the NEPA process reached its potential value for shaping project-level decision-making? Few NEPA documents contain scientific safety analysis or reference research demonstrating that planned improvements will have a safety benefit. This document is intended to improve the consideration of safety issues in the NEPA process and documents.

# 1.0 Introduction

This primer presents techniques to address safety in the National Environmental Policy Act (NEPA) process. It is designed with two audiences in mind: NEPA practitioners interested in learning the basics of how to incorporate scientific safety analysis into NEPA documents; and safety professionals (planners and engineers) interested in understanding the basics of the NEPA process and where safety consideration can be incorporated.

> **The Importance of Improving Road Safety**
>
> Traffic crashes have an enormous impact on human society, causing suffering, death, disability, and associated economic impacts. According to the National Highway Traffic Safety Administration's 2008 Traffic Safety Facts Report, about 37,000 individuals died in traffic crashes in 2008 and about 2.3 million were injured in the United States. In 2000, NHTSA estimated the annual economic cost of crashes at $230 billion.
>
> Given the enormity of the problem, the U.S. Department of Transportation (U.S. DOT) considers safety its primary focus. Former U.S. DOT Secretary Rodney Slater stated, "Safety is our North Star by which we in DOT will be guided and judged."
>
> The agency's mission includes the guidance that "Safety should be considered first, every time, and at every stage of a project." This directive inspires work throughout the agency and is a leading motivator of this report.

The primer is intended to educate practitioners on ways to incorporate meaningful consideration of safety impacts in NEPA documents, and to avoid cursory or simplistic treatment of safety. For example, NEPA analysis frequently assumes safety will be maximized solely through adherence to roadway design standards. Yet traffic crashes continue to be a frequent occurrence, even on newly constructed roadways; and nationally, tens of thousands die each year in traffic crashes. Addressing this problem requires considering more than standards to maximize the safety of new transportation projects.

The NEPA process provides a unique opportunity to improve safety for new roadway projects. The process should:

- Include a safety analysis commensurate with the complexity of the project as part of the review process;
- Utilize the best available safety data specific to the project location in the review process;
- Involve safety analysis using the best available information and tools;
- Promote dialogue with the general public and key stakeholders about the safety aspects of the project;
- Address potential safety issues associated with construction; and

- Incorporate innovative educational and enforcement techniques to address issues, such as speeding or impaired driving.

## 1.1 Primer Organization

The primer contains the following sections:

- Considering Safety Prior to the NEPA process;
- NEPA Overview and Levels of Documentation;
- Public and Stakeholder Outreach;
- Purpose and Need Statements;
- Alternatives Analysis;
- Defining the Affected Environment; and
- Analysis of Environmental Impacts and Mitigation.

Appendix A contains related resources, including links to on-line courses, tools, and research documents covering topics such as the basics of the NEPA process, road safety analysis, and safety countermeasure selection. Appendix B contains case studies illustrating best practices in incorporating safety into the NEPA process.

## 1.2 Using the Primer

The primer is intended to provide basic information to help practitioners get started in understanding how to improve consideration of safety in NEPA analysis. References to more comprehensive resources are provided, where appropriate.

Practitioners can use this primer to:

- Link safety planning processes to NEPA analysis;
- Identify and gain input from safety stakeholders during public outreach and scoping;
- Understand the value of using safety analysis techniques to identify and address substantive safety problems, and to compare project alternatives; and
- Identify opportunities for safety mitigation and going above and beyond required mitigation to enhance safety.

Note that this document serves two audiences – NEPA and safety practitioners – in an effort to inform both groups on safety-NEPA process linkages. Those with NEPA training may wish to skim over information on the basics of the NEPA process; similarly, those with safety background may wish to skim information on the fundamentals of safety science and planning.

# 2.0 NEPA Overview and Levels of Documentation

## 2.1 NEPA Overview

The National Environmental Policy Act (NEPA) requires examination of potential impacts to the social and natural environment when considering proposed transportation projects involving Federal funds or approval action. Supporting the Act, the Federal Highway Administration (FHWA) adopted the policy of managing the NEPA project development and decision-making process as an "umbrella," under which all applicable environmental laws, executive orders, and regulations are considered and addressed prior to the final project decision and document approval. This umbrella includes laws relating to historic preservation, endangered species, wetlands, and others.

**FHWA's Role in the NEPA Process**

As lead Federal agency in the NEPA process, the FHWA is responsible for scoping projects, involving relevant agencies, developing consensus among a wide range of stakeholders with diverse interests, resolving conflict, and ensuring that quality transportation decisions are fully explained in the environmental document.

*Source: FHWA Environmental Toolkit.*

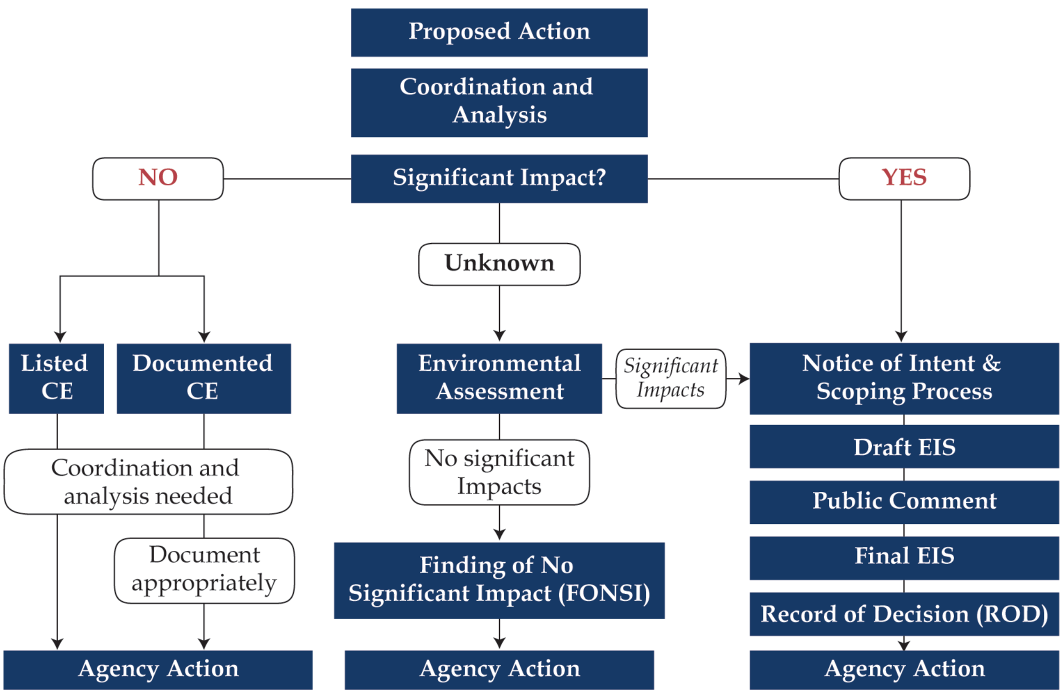
Safety considerations can arise in many stages of the NEPA process. Safety concerns may be part of the impetus for the transportation project (the project purpose and need). Safety issues may arise during public outreach as a community concern; or may be a concern held by agency stakeholders, such as engineers, local government officials, public health professionals, law enforcement, emergency medical services professionals, and others. Project alternatives may include safety-related improvements or mitigation strategies to address negative safety-related consequences.

Although safety can be a central focus for some NEPA documents, it is more frequently one of several factors considered during the project development decision-making process. Other project goals may include enhanced mobility, environmental protection, historic preservation, community livability, and other factors deemed important by the project's stakeholders. Practitioners must balance competing objectives to best meet the needs of the community as appropriate for the context. The context sensitive solutions (CSS) approach discussed in Section 5.3 can help practitioners address the need to balance competing priorities.

## 2.2 Classes of Action

The first major step in conducting NEPA analysis is to determine the potential environmental resource impacts resulting from a proposed action. This review determines the type of the class of action that prescribes the appropriate level of documentation. The three classes of action are: Categorical Exclusions (CE), Environmental Assessments (EA), and Environmental Impact Statements (EIS). This primer focuses primarily on integrating safety into the steps involved in preparing EAs and EISs. However, practitioners also can incorporate safety into Categorical Exclusions; in fact, consideration of safety in CEs is critical to integrating safety and the NEPA process given that the vast majority of NEPA documentation is completed as CEs. Figure 2.1 illustrates the process of deciding on and carrying out the appropriate level of documentation.

**Figure 2.1 NEPA Decision-making Process**
*Levels of Documentation*




### Categorical Exclusions

Categorical Exclusions are appropriate for projects that individually or cumulatively do not have significant environmental impacts. They are the most frequently used NEPA documentation. Many small-scale safety projects are likely to qualify as a CE, as indicated in the text box on page 6.

Although CEs by definition do not require extensive analysis and do not have significant impacts, safety-related considerations may still arise. Appropriate questions to ask include:

- Will the project have any implications for safety?
- Were existing safety conditions examined?
- Even if no potential safety impacts are identified, is it still possible to improve safety, taking each type of user (e.g., vehicles, pedestrians, bicyclists) into consideration?
- Does the project design incorporate best practices for safety?

Even if the project qualifies as a CE, safety can still be improved in most cases. The following examples show how to consider safety in projects likely to qualify as categorical exclusions:

- **Roadway resurfacing and rehabilitation projects.** Roadway resurfacing presents an opportunity to make the roadway safer (i.e., elimination of hazardous edge drop-offs or installation high-visibility pavement markings). Refer to the FHWA guidebook on incorporating safety into roadway resurfacing projects.[1]
- **Landscaping projects.** Practitioners can consider road safety in landscaping projects by ensuring, at a minimum, landscaping does not obscure sight distances (the ability of road users to see one another and fixed objects along the roadway) and enhances safety where possible. Landscaped medians, for example, can help slow vehicles as they enter commercial areas,[2] thereby, reducing the risk of a crash with pedestrians, bicyclists, or other vehicles.
- **Downtown revitalization projects.** Downtown revitalization projects provide an opportunity to incorporate proven safety countermeasures, such as exclusive pedestrian signal phasing at areas with high concentrations of pedestrians, median islands, or traffic calming to slow vehicles.

Design stage Road Safety Audits (RSA) are a useful tool for identifying opportunities to enhance the safety of any project regardless of the level of NEPA documentation (see the discussion of RSAs in Section 5.0 of this document).

[1] FHWA, 2006, *Good Practices: Incorporating Safety into Resurfacing and Restoration Projects,* http://safety.fhwa.dot.gov/roadway_dept/strat_approach/fhwasa07001/fhwasa07001.pdf.

[2] FHWA, 2009, *Engineering Countermeasures for Reducing Speeds: A Desktop Reference of Potential Effectiveness,* http://safety.fhwa.dot.gov/speedmgt/ref_mats/eng_count/.

**Example Projects Likely to Qualify as Categorical Exclusions**

- Activities which do not involve or lead directly to construction (e.g., planning and research activities).
- Construction of bicycle and pedestrian lanes, paths, and facilities.
- Activities included in the state's highway safety plan under 23 U.S.C. 402.
- Landscaping.
- Installation of fencing, signs, pavement markings, small passenger shelters, traffic signals, and railroad warning devices where no substantial land acquisition or traffic disruption will occur.
- Improvements to existing rest areas and truck weigh stations.
- Promulgation of rules, regulations, and directives.
- Deployment of electronics, photonics, communications, or information processing (e.g., traffic control and detector devices, lane management systems, dynamic message signs).
- Modernization of a highway by resurfacing, restoration, rehabilitation, reconstruction, adding shoulders, or adding auxiliary lanes (e.g., parking, weaving, turning, climbing).
- Highway safety or traffic operations improvement projects, including the installation of ramp-metering control devices and lighting.
- Bridge rehabilitation, reconstruction, or replacement; or the construction of grade separation to replace existing at-grade railroad crossings.
- Approvals for changes in access control.

*A complete list of projects likely to qualify as CEs can be found under 23 CFR, § 771.117 Categorical Exclusions.*

## Environmental Assessments and Environmental Impact Statements

Environmental Assessments (EA) are appropriate when the significance of an environmental impact is unknown. EAs result in either a Finding of No Significant Impact (FONSI), or the determination that the preparation of an EIS is required.

EISs are the appropriate level of documentation for projects with significant environmental impacts. These projects make up a small percentage of NEPA documents prepared, but contain the highest level of detailed analysis.

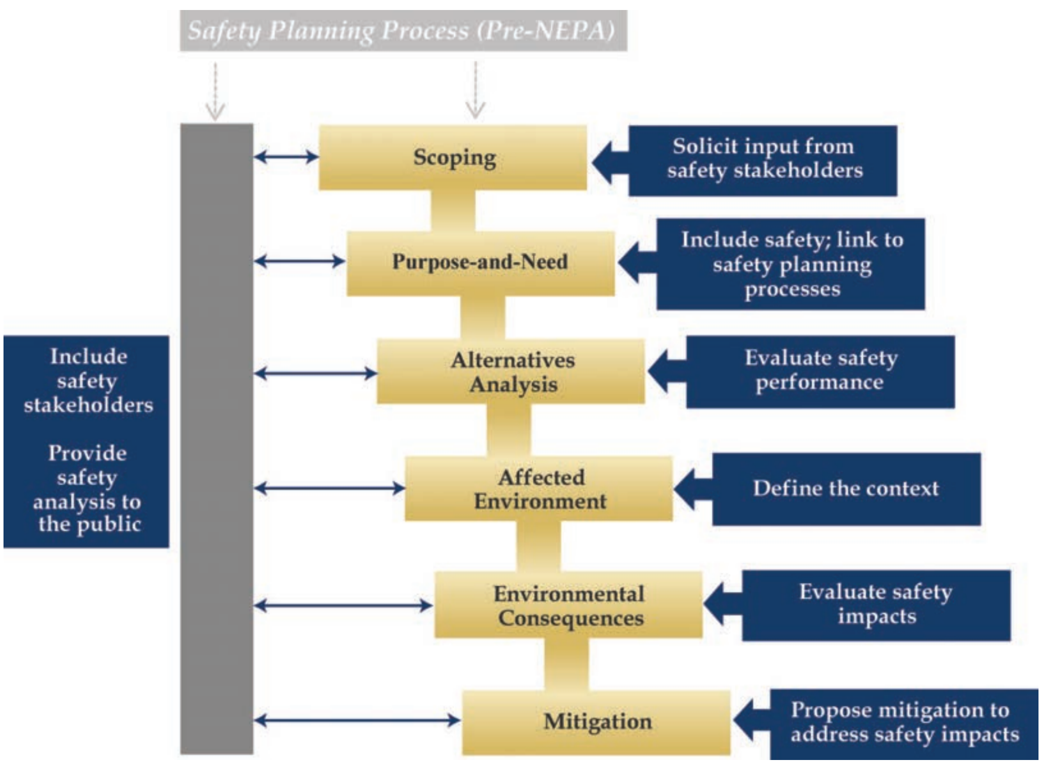
Figure 2.2 illustrates the major stages of an EIS, (including scoping, development of the purpose-and-need statement, alternatives analysis, defining the affected environment, analysis of environmental consequences, and mitigation); and summarizes how safety considerations can be incorporated into each part (for example, by soliciting input from safety professionals during project scoping).

EAs have the same components, but require far less detail than EISs, and do not require a formal project scoping process. The inputs for safety, however, remain the same.

Safety considerations, which are shown to the right of Figure 2.2 in the blue boxes, are best addressed in early steps (scoping and development of purpose-and-need statement) through initial input from safety stakeholders and transparent discussion of safety issues, including linking back to the safety planning process. Inclusion of safety in the alternatives analysis is based on evaluating safety performance as part of a comprehensive assessment of potential project alternatives. During the impact assessment portion of the environmental process (Affected Environment, Environmental Consequences), it is important to describe the environment from a safety context, and to assess the potential safety impacts of project development. Finally, mitigation should also include mitigation of any potential safety impacts.

The coordination and consultation, or public involvement, portion of the NEPA process is represented by the blue box to the left of Figure 2.2. Safety stakeholders, including public officials and private citizens, represent an important constituent group to include in both EISs and EAs. Their comments should be solicited at key NEPA milestones, as should comments from a broad public. In addition, the public should be provided with safety analyses and data for review and comment.

**Figure 2.2 Integrating Safety into NEPA Analysis**




The following sections provide further detail on integrating safety into the NEPA process, beginning with establishing a connection with safety before the formal NEPA process even begins, and then throughout the steps in the NEPA decision-making process.  Although the sections are organized around the steps involved in preparing EAs and EISs, much of the information speaks to how to improve the safety of all types of transportation projects through rigorous safety analysis and use of proven countermeasures, and is therefore relevant to CEs as well.

# 3.0 Considering Safety Before the NEPA Process

## 3.1 Introduction

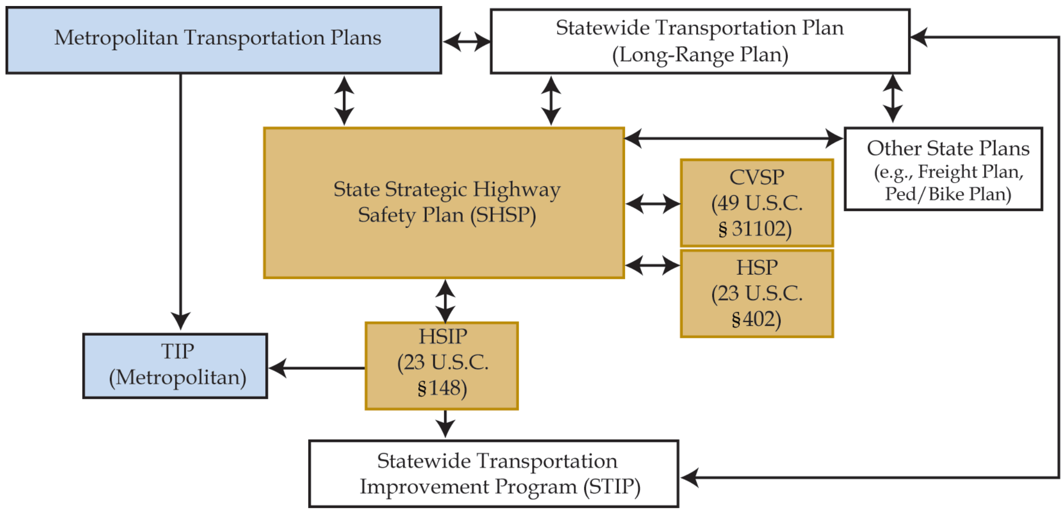
The passage of the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) in 2005 opened a new era for transportation safety planning. SAFETEA-LU established a core highway program focused on safety and required all states to develop a Strategic Highway Safety Plan (SHSP). The SHSP identifies the top priority road safety issues in the state, and describes strategies for addressing the problem, including education, enforcement, engineering, and emergency response.

SHSPs do not typically contain lists of specific safety projects for implementation, and thus do not link directly to project development and NEPA review. Rather, they are intended to be implemented through linkage to other planning processes, specifically state and regional transportation plans and transportation improvement programs (TIP), and other planning processes (pedestrian, bicycle, commercial motor vehicle safety, freight, Highway Safety Program, and Highway Safety Improvement Program). Figure 3.1 illustrates how these linkages are intended to occur. This integration advances the safety agenda because it reflects statewide priorities, provides a blueprint for action for key agencies, and influences resource distribution. Examples of how plan integration is accomplished include:

- Explicitly addressing transportation safety within the scope of statewide and metropolitan planning organization (MPO) long-range transportation planning (LRTP) process integrates the SHSP into the LRTP.
- S/TIPs, developed by the states and MPOs, are capital programming documents. These programs are resource constrained, and identify projects and funding that reflect society's mobility, operational, and safety needs. Therefore, they should support the emphasis areas and strategies in the SHSP. SHSP emphasis area strategies and actions can be used as tools for selecting and prioritizing HSIP investment decisions.
- Consistency between Highway Safety Plans (HSP) and SHSP emphasis areas will better channelize the Federal funds targeting identified highway safety problems.
- The Commercial Vehicle Safety Plan (CVSP) aims to reduce the number and severity of crashes and hazardous materials incidents involving commercial motor vehicles (CMV) through consistent, uniform, and effective CMV safety

programs. CVSPs may also address some of the behavioral safety elements of the SHSP. Note: Many, if not most, states continue to work on developing these linkages.

**Figure 3.1 Integrating SHSP Priorities into other Plans and Programs**




Note: State safety-related plans are shown in grey; state nonsafety-related plans are shown in white; and metropolitan transportation plans are shown in light blue.

## 3.2 Linking the NEPA Process to Safety Planning

Begin consideration of safety prior to the NEPA process, particularly during safety planning processes. Linking safety planning to project development processes helps in:

- Reducing roadway-related fatalities and injuries;
- Making individual projects consistent with (or supporting) regional- or state-level safety goals and plans;
- Integrating safety to the project purpose and need;
- Facilitating safety stakeholders to provide early input into the project; and
- Including safety considerations during the design, construction, and operation phases.

The degree of linkage may depend on whether the project is safety-focused and the amount of public engagement that has occurred. Safety-focused projects should directly support specific strategies listed in the SHSP. For example, if analysts identify run-off-road crashes as an issue at the project site, they should reference the SHSP and incorporate strategies identified in the SHSP to address run-off-road crashes. If the project is funded with Federal Highway Safety Improvement Program (HSIP) funds, it should be included in the HSIP project list, as well as in both a long-range plan (LRP) and a program document (TIP); and the NEPA document should reference any safety analysis conducted to demonstrate the existence of a safety problem at the project site (e.g., results of network screening to identify high-crash concentration locations).

For both safety projects and nonsafety projects, check to ensure the project is consistent with the overall safety goals listed in the SHSP, which should integrate with state and regional planning goals.[3] For example, if the SHSP sets a goal of reducing crashes by 50 percent, regional transportation plans could incorporate at least the same crash-reduction goal, and include safety benefits as a project prioritization factor. Individual projects competing for funding in the region should be able to reference this goal and demonstrate whether they support it. Finally, projects should incorporate any systemic safety improvements identified in the SHSP or other safety plans. Systemic safety improvements are safety countermeasures appropriate for deployment on most or all facilities prone to certain types of crashes, as opposed to targeted deployment only at safety "hot-spots" (locations where an unusually high number of crashes has occurred). Examples of systemic safety countermeasures could include:

- Improved delineation and installation of rumble strips on all rural roads to prevent run-off-road crashes;
- Installation of cable median barriers on all major highways to prevent cross-median head on collisions;
- Installation of high-visibility crosswalk markings and pedestrian countdown signals at all urban intersections; and
- Use of oversized, high-visibility signage in all areas where older drivers are prevalent.

Incorporating systemic safety features into projects recognizes the fact that while crashes may historically occur more in some places than others, this is in part due to random chance. Future crashes can occur in any place at any time.

## 3.3 Transitioning into the NEPA Process

The results of safety planning and traditional transportation planning processes may be very useful in NEPA analysis. However, this information is frequently lost or disregarded during the transition to NEPA review, if it is collected at all. When initiating the NEPA process, consult with transportation planners and safety professionals for collection and use of relevant materials and data. Examples of useful information might include:

[3] As per CFR 924.9(J).

- **State, regional, or project analysis of high-crash locations.** Analysts can use this information to demonstrate the existence of a safety issue at the project site, and can cite it during the development of the project purpose and need statement (see Section 5.0).
- **Results of corridor planning studies.** Major corridor studies conducted in advance of the NEPA process may contain crash data analysis, public input, or other safety-related data practitioners can reuse during the NEPA process.[4] The Planning and Environmental Linkages (PEL) initiative promotes the use of the information developed in corridor and other planning studies to inform the NEPA process. See the FHWA's Planning and Environmental Linkages web site: http://www.environment.fhwa.dot.gov/integ/index.asp.
- **Input from safety experts.** Safety experts may have examined conditions at the project site during an RSA, or during investigations of fatal crashes in the project corridor. NEPA practitioners can collect and reuse this information during NEPA analysis.

[4] As per 23 CFR 450.212.

# 4.0 Public and Stakeholder Outreach

## 4.1 Introduction

This section describes techniques for incorporating safety into public involvement activities related to NEPA. Public involvement requirements under NEPA are summarized in the text box below. In addition, SAFETEA-LU Section 6002 requires that lead agencies establish a plan for coordinating public and agency participation and comment during the environmental review process.

**Public Involvement Requirements**

Each state must have procedures approved by the FHWA to carry out a public involvement/public hearing program pursuant to 23 U.S.C. 128 and 40 CFR Parts 1500 through 1508. State public involvement/public hearing procedures must provide for:

1. Coordination of public-involvement activities and public hearings with the entire NEPA process.
2. Early and continuing opportunities during project development for the public to be involved in the identification of social, economic, and environmental impacts, as well as impacts associated with relocation of individuals, groups, or institutions.
3. One or more public hearings or the opportunity for hearing(s) to be held by the state highway agency at a convenient time and place for any Federal-aid project which requires significant amounts of right-of-way, substantially changes the layout or functions of connecting roadways or of the facility being improved, has a substantial adverse impact on abutting property, otherwise has a significant social, economic, environmental or other effect, or for which the FHWA determines that a public hearing is in the public interest.
4. Reasonable notice to the public of either a public hearing or the opportunity for a public hearing. Such notice will indicate the availability of explanatory information. The notice shall also provide information required to comply with public involvement requirements of other laws, Executive Orders, and regulations.

Source: FHWA Environmental Toolkit, Public Involvement Overview, http://www.environment.fhwa.dot.gov/projdev/tdmpubinv2.asp.

The extent to which public involvement activities focus on safety is partially a function of the main purpose of the project (safety-focused or nonsafety-focused) and the potential level of impact. Identify safety-focused projects through analysis, community input, safety plans, or more traditional planning processes. Introduce the topic of safety early in coordination, public involvement, and project development activities, such as advisory committees and stakeholder interviews.

## 4.2 Scoping

The scope of an Environmental Impact Statement (EIS) refers to the range of actions, alternatives, and impacts to be considered. The scope is determined by the lead agency, preparers of the EIS, and the public, including other agencies. Scoping is the process of determining the scope of an EIS. It is a unique NEPA task that is required only for EISs. Part of the scoping process includes obtaining the public's opinion on what important issues, including safety, should be addressed, and what project alternatives should be included in the EIS.

While not required for CEs or EAs, the concept of scoping has merit for any NEPA class of action. Soliciting comments early in the project development process elevates stakeholder input and allows it to help shape the range of actions, alternatives, and impacts to be addressed. This focus on scoping-oriented outreach can also facilitate early and effective consideration of safety as well. The techniques described in the rest of this chapter apply to public involvement activities during scoping, as well as other stages of the NEPA process.

## 4.3 Who to Contact

Many individuals and groups can provide valuable input into the safety aspects of a project. Three important groups to consider include safety specialists, affected agencies and community groups, and facility users (discussed below).

*www.pedbikeimages.org/danburden*

Outreach to safety stakeholders does not eliminate the need for required outreach to other types of stakeholders, including low-income and minority populations protected by Title VI and related statutes.

### Safety Specialists

Safety specialists possess unique knowledge of how to diagnose safety problems and address them using proven safety countermeasures. Drawing professionals from a range of backgrounds increases the likelihood that safety problem is diagnosed accurately, and a range of possible solutions is investigated. For

example, the following describes types of input that could be provided by different types of safety specialists:

- Engineers with safety training can analyze crash data; determine which types of crashes are most prevalent; and identify changes to the roadway geometry, roadside features, signing, striping, or operations to address the identified issues. Engineers also may have knowledge of safety treatments to benefit specific users (e.g., pedestrians, bicyclists, and older road users); and knowledge of the Manual on Uniform Traffic Control Devices or MUTCD.
- Representatives of the Governor's Highway Safety Office have knowledge of driver behavior issues.
- Maintenance crews have firsthand knowledge of the types of safety issues occurring on the facility (e.g., identifying locations where damaged roadside hardware may suggest a pattern of run-off-road-crashes).
- Local law enforcement officials may be aware of infrastructure and behavioral issues contributing to an identified crash problem (e.g., high incidence of late night crashes involving college students driving home after drinking).
- Emergency response personnel may be able to identify the degree to which poor response times are contributing to a high incidence of injuries and fatalities and suggest solutions. They also sometimes are the first to recognize a hot spot, or wet weather problem area because of multiple responses to the same location.

Incorporate the input of these professionals early in the project development process. Ideally, consult with them prior to initiation of the NEPA process (see Section 2.0) during safety planning processes. If this did not occur, consult with them during the early stages of developing the project purpose and need statement (see Section 5.0 for more detail). RSAs, also discussed in Section 5.0, are a tool for engaging safety professionals in diagnosing safety problems on an existing or planned facility.

In addition to contributing to problem diagnosis, safety professionals can contribute to or comment on the development of alternatives and the selection of mitigation strategies. For example, they may be able to suggest proven safety countermeasures to include in project alternatives, or to mitigate any expected safety impacts. Document all feedback so it can be used to meet NEPA outreach requirements. Documentation also is important to create a record of decisions (ROD) and commitments made during the NEPA process, so these can be communicated during project development and construction.

## Affected Agencies and Community Groups

Public agencies affected by the project may have special concerns or knowledge regarding the project's safety impact. Transit agencies may suggest improvements to pedestrian safety around transit stations. Officials from local public schools may be concerned about ensuring child safety to and from school.

Community groups and the general public will also likely have opinions or concerns regarding the safety of the facility. Local merchants may voice concerns regarding any roadway changes that affect access to their property. Community groups representing specific interests (bicycle and pedestrian advocacy groups, freight community, older drivers, disabled individuals, etc.) will advocate for consideration of all users.

**Case Study: Safety and Public Outreach**

A 40-mile stretch of U.S. 8 in western Wisconsin has been of interest to a coalition of county and local officials concerned with safety and congestion along the corridor. Input from the coalition has played a significant role in the selection of the preferred corridor for the eventual construction of a multilane facility. The coalition established a close working relationship with the Wisconsin Department of Transportation (DOT) to study corridor safety and congestion, participated in public forums, and held meetings. High fatalities on a particular segment prompted them to request a Road Safety Audit that will inform selection of the preferred alternative. Appendix B.5 provides more detail on this case study.

In considering outreach targets, first investigate the context and the specific type of safety problem at hand. Is the project near a school, a major bicycle route, a downtown area, or a freight corridor? Does the safety problem particularly affect bicyclists, pedestrians, or older residents? The context and the nature of the problem should inform the selection of stakeholders. Refer to Section 7.0, *Defining the Affected Environment*, for how context-specific factors may influence safety.

## Facility Users

Outreach activities also provide an opportunity to gain insight from members of the general public who use the facility. Regular users of a transportation facility may be aware of problems missed by transportation engineers or other safety specialists. Reaching out to a range of users (vehicles, freight, pedestrians, bicyclists, etc.) will provide a more balanced perspective.

Facility users or members of the general public also may suggest solutions to identified safety problems. However, they may not be aware of the research regarding the likely safety benefits of their suggestions. It is, therefore, critical to use public outreach as an opportunity to educate the public and elected officials about the true safety impacts of certain types of project features. For example, if several crashes have occurred at a stop-controlled intersection, community members might advocate for installing a traffic signal to reduce crashes. However, research has shown that installing a traffic signal may actually increase the

frequency of crashes.[5] Use simple educational materials to communicate to the public the likely impacts of their requests and the safety benefits of alternatives.

Table 4.1 lists possible stakeholders organized by context. It does not list all possible stakeholders.

### Table 4.1 Potentially Interested Stakeholders

| Stakeholder | Specialized Knowledge/Concerns |
|---|---|
| **Safety Specialists** | |
| Safety engineers | Safety problem diagnosis; knowledge of proven safety countermeasures and best practices. |
| Maintenance crews | Personal experience and data reflecting safety issues on the facility. Awareness of areas that need safety improvement. |
| Traffic operations center personnel | Knowledge and data regarding incidents, crashes, and other issues on highway facilities. Familiarity with issues relating to incident response. |
| Law enforcement | Personal experience and data regarding safety issues on the facility. Awareness of behavioral safety issues (intoxication, speeding, etc.) affecting the facility. |
| Incident response teams | Knowledge of poor incident response times contributing to degraded trauma care outcomes; knowledge of hot spots on facility. |
| **Affected Agencies and Community Groups** | |
| School representatives | Child safety/school access. |
| Transit agency representatives | Impact of safety features on transit operations/safe pedestrian access to transit stations. |
| Local merchants | Impact of safety features on access to their business. |
| Bicycle and pedestrian advocacy groups | Bicycle and pedestrian safety concerns and solutions. |
| **Facility Users** | |
| Drivers, bicyclists, pedestrians, delivery trucks | Personal experience with safety and mobility issues on the facility. |

[5] Transportation Research Board, 2003, *NCHRP 500 Volume 5, A Guide for Addressing Unsignalized Intersection Collisions*, http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_500v5.pdf.

## 4.4 Questions to Ask

Gather input on safety-related questions during each stage of the NEPA process, as required by Federal regulations (see box). The following sections list possible questions to ask during each major stage.

**Topics to be Covered During Public Involvement – 23 CFR 771.111(h)(2)(v)**

State public involvement/public hearing procedures must provide for explanation at the public hearing of the following information, as appropriate:

- The project's purpose, need, and consistency with the goals and objectives of any local urban planning;
- The project's alternatives and major design features;
- The social, economic, environmental, and other impacts of the project;
- The relocation assistance program and the right-of-way acquisition process; and
- The state highway agency's procedures for receiving both oral and written statements from the public.

### Purpose and Need Statement

Whether or not the project is safety focused, early dialogue about the project purpose and need statement should address safety. Sample questions for the public might include:

- What safety problems or issues have you experienced in this area/facility/corridor?
- What safety problem or issue do you think this project should address? What is your vision for improving safety in this corridor/area/project?
- Which types of road users (e.g., elderly, pedestrians, transit, and commercial vehicles) require special consideration?
- Are there special features of the proposed project and its surrounding environment that might have safety implications? If yes, what are the features and what are the safety implications?

### Range of Alternatives

During development of project alternatives, stakeholders traditionally give input on how well each alternative meets the purpose and need of the project. To expand this discussion, provide stakeholders with meaningful information and analysis about the safety characteristics of each alternative so they can offer informed input on the alternatives. (See Section 6.0, *Alternatives Analysis*, for a discussion of how safety analysis tools can be used to provide quantitative information regarding the expected safety performance of different alternatives.)

Sample questions for this stage of public involvement may include:

- Have any existing safety problems been addressed by the alternatives shown?
- Have the alternatives created any new safety concerns?
- Has safety been sufficiently integrated into all alternatives?
- Do you see any potential safety issues that should be addressed?
- Do you have any concerns regarding the safety of proposed alternatives?

As stated earlier, it is important to educate the public on which project features have proven safety benefits versus those that do not.

## Social, Economic, and Environmental Impacts

Include safety topics in the discussion of project social, economic, and environment impacts.  Questions may include:

- Have safety impacts been adequately addressed for all populations?
- Has the impact assessment missed anything or anyone?
- Are there any land uses or community features that create unforeseen safety implications?
- Have any potential safety concerns been avoided or mitigated in the preferred alternative?

Chapter 7 of the Highway Safety Manual (discussed in Appendix A.4) provides information on analyzing the economic and social impacts of highway crashes. The Highway Safety Manual (HSM) is a definitive, science-based manual that takes the guess work out of safety evaluations.  It provides tools to conduct quantitative safety analyses, allowing for safety to be quantitatively evaluated alongside other transportation performance measures, such as traffic operations, environmental impacts, mobility measures, or construction costs.  The Highway Safety Improvement Program manual is another relevant reference document. Both of these resources can assist in generating additional questions to engage the public.

Document all feedback to ensure NEPA public outreach requirements are met and decisions are recorded for future reference.

# 5.0 Purpose and Need Statements

## 5.1 Introduction

The statement of the project purpose and need is the core component of the NEPA document. It describes the impetus for the project and serves as the benchmark against which project alternatives are evaluated.

Incorporation of safety into the project purpose and need statement involves several considerations, including:

- Linking the purpose and need statement to safety planning processes and documents. The process of defining the purpose and need for a project should flow from earlier planning activities, such as the development of metropolitan and state transportation plans and safety plans (discussed in Section 3.0).
- Linking the purpose and need to concerns and issues raised during public outreach (discussed in Section 4.0).
- Incorporating explicit justification of the extent and nature of the safety problem, if one exists.
- Incorporating safety issues for all modes of travel and vulnerable road users as appropriate, given the project context.

> **Purpose and Need**
>
> The Council on Environmental Quality (CEQ), the agency responsible for coordinating Federal environmental efforts, provides a brief description of the Purpose-and-Need: *"The statement shall briefly specify the underlying Purpose-and-Need to which the agency is responding in proposing the alternatives, including the proposed action."* (40 CFR 1502.13).
>
> The FHWA technical advisory T 6640.8A states that the Purpose-and-Need statement will: *"Identify and describe the proposed action and the transportation problem(s) or other needs which it is intended to address (40 CFR 1502.13). This section should clearly demonstrate that a 'need' exists and should define the 'need' in terms understandable to the general public. This discussion should clearly describe the problems which the proposed action is to correct. It will form the basis for the 'no action' discussion in the 'Alternatives' section, and assist with the identification of reasonable alternatives and the selection of the preferred alternative."*

The latter two topics are discussed in more detail below.

## 5.2 Defining the Safety Problem

Safety is often included in the purpose and need statement for a project without sufficient analysis to define the problem. For example, the statement may cite the fact that road features are not up to the most recent design standards as justification

that a safety problem exists. Defining the true safety performance of the roadway requires understanding the difference between substantive and nominal safety.

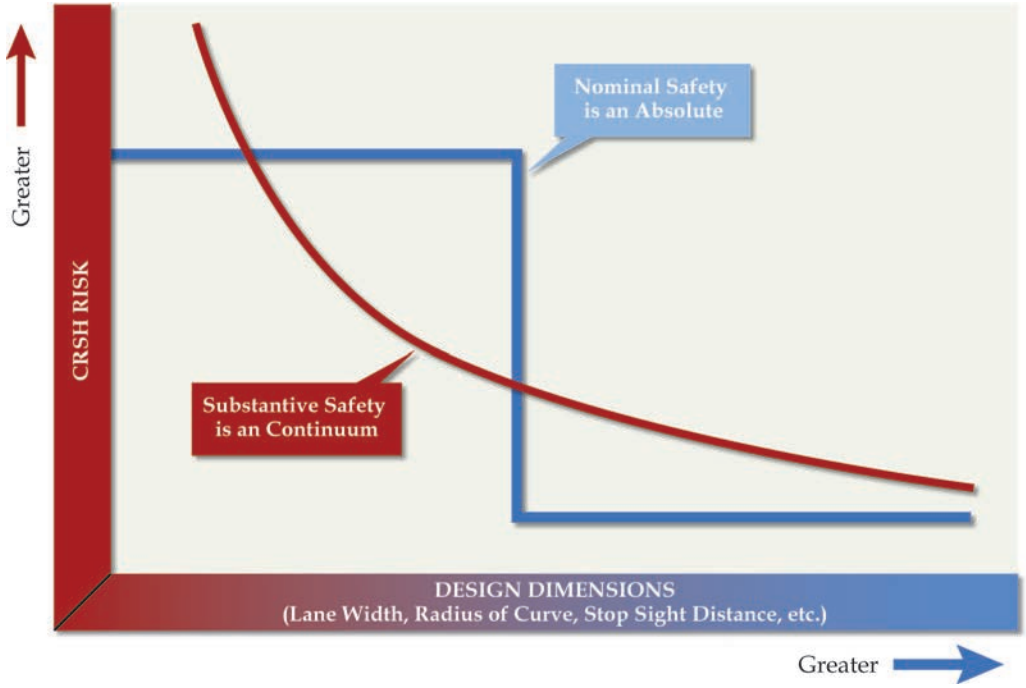
### *Substantive Safety versus Nominal Safety*

Design standards provide a consistent, predictable roadway environment, but do not necessarily result in a safer roadway environment. Although uniform roadway designs may confer some safety benefit, few design standards have been rigorously evaluated to quantify their safety impact.

The concepts of "substantive" and "nominal" safety have been developed to help differentiate between design changes that improve safety and those that simply comply with standards. The National Cooperative Highway Research Program (NCHRP) 480, *A Guide to Best Practices for Achieving Context Sensitive Solutions*, explains that nominal safety refers to a design or alternative's adherence to design criteria and/or standards; whereas, substantive safety refers to the actual performance of a highway or facility as measured by its crash experience (number of crashes per mile per year, consequences of those crashes as specified by injuries, fatalities, or property damage). It notes that a road can meet all design standards and still have poor safety performance (substantive safety); conversely, a roadway can have design exceptions and still show good safety performance relative to similar roadways of its class. Tort liability concerns frequently lead designers to comply with nominal safety standards, unless substantial documentation is provided to support a deviation from those standards.

The FHWA's report "Mitigation Strategies for Design Exceptions" illustrates the difference between nominal and substantive safety (Figure 5.1). Nominal safety (blue line) is an "either-or" —a design feature or roadway either meets minimum criteria or it does not. On the other hand, substantive safety (red line) is the actual long-term or expected safety performance of a roadway; determined by its crash experience measured over a long enough time period to provide a high level of confidence that the observed crash experience is a true representation of the expected safety characteristics of that location or highway. Figure 5.1 states that current understanding of the relationships among roadway elements, traffic, drivers, and other factors suggests the true safety risk is better represented by the red line (substantive safety). Incremental changes in design dimensions (typical of design exception decisions) may result in incremental changes in substantive safety. Designers should seek knowledge and data to establish the substantive safety of a contemplated design decision. In many cases, substantive safety can be maximized within the constraints of design standards, since many are written so as to permit a great deal of flexibility. Design exceptions can be pursued in cases where a substantive safety improvement would violate a design standard.

**Figure 5.1 Nominal and Substantive Safety**




Source: FHWA Technical Report, Mitigation Strategies for Design Exceptions.

### *Analysis Techniques*

The challenge of evaluating substantive safety is that it requires detailed analysis; whereas, nominal safety involves a straightforward design check. Fortunately, many techniques and tools are available to assist in the identification of the magnitude and nature of a safety problem, ranging from simple to very sophisticated. Appendix A.4 lists these resources and tools, such as the HSM, the Safety Analyst Software tool, and the Interactive Highway Safety Design Model software tool. The HSM, for example, provides a detailed analysis procedure and tools for identifying "sites with promise" or areas with potential for crash reduction. One tool identified in the HSM is the Levels of Service of Safety (LOSS) methodology (see box below).

For example, to review the substantive safety of a two-lane rural highway, an analyst could compare its safety performance with that of similar two-lane rural highways in the state (not to all highways or other highway types). It is important to compare a road to similar roads in its class, because the expected safety performance of the road is strongly related to its context (e.g., traffic volume, location, functional classification, terrain, etc.). If the roadway in question has a significantly higher incidence or severity of crashes than other roads of its kind, it may have a substantive safety problem.

The accuracy of safety analysis depends on the availability and quality of underlying crash and associated road network and exposure data (e.g., traffic volumes). Crash records databases are frequently incomplete (for example, lacking complete crash records for nonfatal crashes or those occurring in rural areas) and are subject to error. Even if data is available, it can be inconclusive due to the strong influence of random chance on the incidence and location of crashes. A recent FHWA report[6] suggests addressing these issues:

- Is the data reasonable?
- Was the data collected consistently?
- Was quality control/quality assurance in place to verify the data?
- RSAs (discussed below) also can be used to incorporate the observations of skilled safety practitioners as a means to supplement safety analysis, particularly if safety data is inconclusive or of poor quality.
- The HSM provides a more complete discussion of data quality issues in road safety analysis.

**Case Study – Safety Analysis Techniques**

The Colorado DOT is studying a new six-lane bridge and highway interchange to connect the Stapleton Redevelopment Area and major interstates I-70 and I-270. For the original Draft EIS, the Colorado DOT used an LOSS approach to compare traffic safety under existing conditions and for future design alternatives. The LOSS uses qualitative measures to characterize the actual safety performance of a road segment compared to the expected safety performance. The LOSS analysis identified the need for safety improvements and informed the selection of appropriate countermeasures to remedy the issues. Appendix B.2 provides additional detail on this case study.

### *Road Safety Audits*

Road Safety Audits (RSAs) are another tool used to identify and describe a safety problem to support development of a NEPA purpose and need statement. An RSA is a formal safety performance examination of an existing or planned road or intersection by an independent, multidisciplinary team. It estimates and reports qualitatively on potential road safety issues, and identifies opportunities for safety improvements for all road users.

[6] FHWA, 2010, *Interstate System Access Information Guide*, http://www.fhwa.dot.gov/design/interstate/pubs/access/access.pdf.

RSAs help answer the following questions: 1) What elements of the road may present a safety concern – to what extent, to which road users, and under what circumstances? 2) What opportunities exist to eliminate or mitigate identified safety concerns?

RSAs can be helpful at multiple stages in the project development process, including planning, preliminary design, and final design. RSAs also can be conducted during construction to minimize the safety consequences of road construction. Given this flexibility, RSAs may be used at many stages of the NEPA process, including as a tool to define the purpose and need statement (see example below); to evaluate the safety performance of project alternatives while still in the design stage; and to identify opportunities to reduce construction-related safety impacts. RSAs can be particularly helpful in diagnosing safety problems or opportunities to improve safety when crash data is limited or requires careful interpretation. For example, an RSA team could identify cases where lack of pedestrian crossings inhibits pedestrian use resulting in low numbers of crashes.

**Case Study: Expediting Safety Improvements from RSAs**

The Tennessee DOT has an extensive program to conduct Road Safety Audit Reviews (RSAR) that examine the need for safety improvements for existing road segments, intersections, corridors, and ramp queues. These types of activities include, but are not limited to, pavement markings, rumble strips, traffic lights and/or signs, guard rails, and concrete barrier end treatments. Tennessee DOT has prepared a Programmatic Categorical Exclusion (PCE) for most of these types of projects, presuming they stay within existing right of way. In this manner, Tennessee DOT is able to expeditiously address safety problems as soon as they are evident. See Appendix B.6 for details.

## 5.3 Considering Multimodal Safety

When incorporating safety analysis into the project purpose and need, consideration should be given to all affected road users, including drivers, rail, transit, and particularly those likely to be more vulnerable in crashes, such as the elderly, children, disabled, pedestrians, and bicyclists. Specialized tools and resources are available to evaluate safety problems for a range of user groups. See Section 7.0, *Defining the Affected Environment*, for suggestions.

**Case Study: Addressing Multimodal Safety**

The Washington, D.C. DOT developed a streetscape plan for redesigning South Capitol Street as part of a redevelopment project along the Anacostia River waterfront. As part of the assessment, D.C. DOT investigated and analyzed existing and future multimodal patterns and crash rates in the South Capitol corridor. The findings from this analysis were included in the Draft EIS detailing the safety issues that needed to be addressed. It was determined that transforming South Capitol Street from an expressway to an urban boulevard design and including numerous pedestrian and bicycle safety features would address these issues and contribute to the safety, accessibility, multimodal mobility, and economic development of the corridor. See Appendix B.3 for details.

Identifying the safety problems experienced by a range of users is part of sensitivity to the project's context and is consistent with the philosophy of Context Sensitive Solutions (CSS). However, a perception may exist that deviating from project design standards to adapt to the community context and the needs of multiple users may result in negative safety consequences (see box below).

**Context Sensitive Solutions and Safety**

Context Sensitive Solutions (CSS) is a collaborative, interdisciplinary approach that involves all stakeholders in providing a transportation facility that fits its setting. CSS grew out of landmark Federal transportation policies (Intermodal Surface Transportation Efficiency Act and the National Highway System Designation Act) emphasizing the importance of flexible highway design.

A core principle of CSS is "exercise flexibility and creativity to shape effective transportation solutions, while preserving and enhancing community and natural environments." Applying this principle often means adapting road design standards, such as lane widths, turning radii, and design speeds, to match the community context.

Because of the belief that road design standards ensure safety, some assume that changing design standards to apply the philosophy of CSS will result in negative safety outcomes, and therefore, CSS and safety are incompatible. This is not the case, as design standards do not equate to safety, and many design standards have not been tested for their safety effects. To determine the true or "substantive" safety of design features, safety practitioners should apply the latest available analytical tools, and make use of research identifying proven safety countermeasures.

Safety is considered a cornerstone of sustainability and livability, and CSS is a tool by which to achieve these goals. Safety is also an important stakeholder value that communities want to achieve in addition to, rather than instead of, other stated goals.

## 5.4 If Safety is Not Part of the Purpose and Need

If no substantive safety problem exists or safety is not a part of the project purpose and need, safety analysis does not necessarily need to be included in the purpose and need statement. However, it may still be appropriate and beneficial to identify possible safety enhancements to the project's safety. Every modification to a roadway presents a potential opportunity to improve design, and some agencies, including FHWA, specifically encourage or mandate consideration of safety as part of every project. Transportation agencies can use discretion in determining whether to address safety as part of every project. Agencies should avoid using generic statements regarding project impacts to meet the goal of addressing safety in all projects, and should instead strive to use objective analysis and proven countermeasures to demonstrate substantive safety benefits.

## 5.5 Summary

If safety is part of the project purpose and need, the purpose and need statement should include analysis to define the problem, reference applicable safety plans, incorporate the results of public outreach, and address the safety of all road users.

Table 5.1 provides information and data that may be included in purpose and need statements.

**Table 5.1 Information and Data to Include in Purpose and Need Statements for Safety Focused Projects**

| Type of Information | Example Information to Consider for Inclusion |
|---|---|
| Roadway performance | Comparison of roadway crash rates to expected crashes for similar facility types given traffic volumes to identify the existence of a safety problem (see HSM for analysis techniques).<br><br>Crash rates for multiple types of road users. |
| Contributing crash factors | Analysis of crash history to indicate predominance of certain crash types. |
| Multimodal safety issues | Safety issues for specific types of road users, including pedestrians, bicyclists, freight vehicles, and transit vehicles. |
| Public perceptions | Safety issues raised by the public as being of concern. |
| Results of RSA | RSA results indicating any findings regarding deficiencies/opportunities for improving safety performance. |

# 6.0 Alternatives Analysis

## 6.1 Introduction

This section describes how to integrate safety considerations into the alternatives analysis. The extent to which safety is emphasized in this discussion is a function of whether the project is safety focused or not. For projects where safety is a key component of the project purpose and need statement, each alternative should be evaluated for the degree to which it achieves the desired safety improvement purpose. For general-purpose projects, safety improvement may not be an evaluation criterion for each alternative, or may be weighted differently than for a safety-focused project. However, practitioners can still suggest inclusion of safety features, as appropriate, for the project context.

**Regulations on Alternatives Analysis**

CEQ NEPA regulations describe the importance of the alternatives analysis: "This section is the heart of the environmental impact statement. Based on the information and analysis presented in the sections on the Affected Environment (Sec. 1502.15) and the Environmental Consequences (Sec. 1502.16), it should present the environmental impacts of the proposal and the alternatives in comparative form, thus, sharply defining the issues and providing a clear basis for choice among options by the decision-maker and the public."

FHWA Technical Advisory T 6640.8A guidance recommends that the Alternatives Analysis section of environmental documents begin with a concise discussion of how and why the "reasonable alternatives" were developed for detailed study, and explain why other alternatives were eliminated.

## 6.2 Developing Alternatives

### Safety-Focused Projects

For safety-focused projects, develop alternatives that solve a specific safety problem, and do so in close consultation with safety specialists and stakeholders, particularly if their input was not collected or documented during the planning phase. Document all comments received, and use this input to modify alternatives and improve the overall project outcome.

Base the development of alternatives on a clear understanding of the safety problem. Specialized tools are available to help identify the safety problem and develop solutions (see Appendix A.4). The HSM is the most recent and comprehensive resource describing the state-of-the-art analytical processes for identifying the causes of crashes and developing solutions. The HSM also provides techniques for evaluating the safety impacts of specific design alternatives on certain types of roads.

As much as possible, consider the full range of possible safety solutions, not only engineering countermeasures, but also operational improvements that benefit safety (improved incident response) and behavioral countermeasures (education and enforcement). The NCHRP 500 Research Reports include a series of more than 20 guidebooks indicating a range of 4E (engineering, enforcement, education, emergency response) countermeasures to address a variety of safety solutions.[7]

Select countermeasures not only for their appropriateness in addressing the identified safety problem, but also their effectiveness. The best countermeasures are those that have been proven to reduce fatalities and serious injuries through rigorous study (see inset box below on proven countermeasures). Appendix A.4 lists additional resources for identifying the effectiveness of different types of safety countermeasures.

**Proven Safety Countermeasures**

On July 2008, the FHWA issued a guidance memorandum on the consideration and improvement of proven safety countermeasures. The guidance states: "While there is still much work to do on determining the precise effectiveness of some safety countermeasures, we are highly confident that certain processes, infrastructure design techniques, and highway features are effective and should be encouraged whenever Federal funds are used. Safety should be considered at every stage of the project development process. Every investment decision should consider the impact on safety, and every Federally-funded project should include appropriate safety enhancement features." The document goes on to list nine safety countermeasures that research has proven to be effective in reducing fatalities and injuries, and are specifically encouraged by the FHWA:

1. Road Safety Audits,
2. Rumble Strips and Rumble Stripes,
3. Median Barriers,
4. Safety Edge,
5. Roundabouts,
6. Left- and Right-Turn Lanes at Stop-Controlled Intersections,
7. Yellow Change Intervals,
8. Medians and Pedestrian Refuge Areas in Urban and Suburban Areas, and
9. Walkways.

*Source: FHWA Guidance Memorandum on Consideration and Implementation of Proven Safety Countermeasures (http://safety.fhwa.dot.gov/policy/memo071008/.*

[7] The NCHRP 500 Series Reports are available at: http://safety.transportation.org/guides.aspx.

### General Purpose Projects

The safety elements of the alternatives that would be considered for a safety-focused project also may be relevant for general-purpose projects. The difference is that the development of the alternatives will have to balance the degree to which they can satisfy all of the identified transportation problems, not just the safety issues.

Even if a project is not safety focused, consider incorporating safety into the development of alternatives. As described in public outreach, give safety specialists an opportunity to review the project design early on to avoid potentially costly design changes. Even if the project design is acceptable, safety specialists may be able to suggest low-cost safety improvements[8] that could be added without significant impacts to the project scope, schedule, or cost. They also may be able to suggest systemic features that have been identified for inclusion on the appropriate types of roadways due to their proven safety benefit – shoulder rumble strips on rural roads are one common example. Consider an RSA, discussed in Section 5.0, to obtain input from experts on how to improve the safety of a project alternative in the preliminary design stage.

**Case Study: Using Proven Countermeasures**

The State Route 502 Corridor-Widening Project in the Seattle, Washington region is an example of the incorporation of proven safety countermeasures into the development of alternatives for a general-purpose project. Section 3 of the Environmental Impact Statement, Comparison of Alternatives, discusses the safety benefits of medians, a proven safety countermeasure. The benefits specific to the project include creating a protected turn lane, eliminating turning movements, and reducing the likelihood of a head-on crash by creating a physical barrier between lanes. See Appendix B for additional details.

## 6.3 Screening Alternatives

NEPA requires that the potential environmental impacts of each alternative be identified and used in determining which alternatives should be advanced through the NEPA analysis and selection process (as long as they also meet the project purpose and need). The selection of reasonable alternatives should be based on: 1) consideration of alternatives that avoid impacts; 2) consideration of the alternatives that minimize impacts; and 3) consideration of the potential mitigation of impacts of each alternative, all while meeting the project purpose and need.

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[8] For more information on low-cost safety improvements, refer to the following resource: FHWA, 2003. *Low Cost Traffic Engineering Improvements – A Primer,* http://ops.fhwa.dot.gov/publications/low_cost_traf/low_cost_traf.pdf.

## Safety-Focused Projects

A comprehensive stakeholder involvement process is likely to generate a range of alternatives that must be reduced to a smaller set of reasonable alternatives for detailed analysis. A first level of evaluation can be conducted to eliminate alternatives that clearly do not meet the project purpose and need. Further screening may include: 1) the degree to which the alternative solves the problem; 2) compatibility with existing or planned transportation systems; and 3) compatibility with local and/or community goals and objectives.

For projects where safety is a key component of the purpose and need, screen the alternatives with respect to their relative safety benefit (typically defined as the degree to which the project would reduce crashes, fatalities, and/or serious injuries).

Rigorous analysis may not be feasible in all cases, but some assessment of likely safety performance should be included, such as empirical evidence demonstrating the effectiveness of safety features in each alternative compared to a No-build alterative (which presumes none of the alternatives is constructed). The HSM provides specific guidance regarding how to estimate future collisions on certain facility types with and without safety improvements. The basic approach is to apply a safety performance function, which is an equation that predicts changes in collisions as a function of changes in exposure (e.g., volumes of vehicles, bicyclists, pedestrians) to future crash outcomes. This will allow the estimation of future safety conditions for a No-build alternative. Then, practitioners can identify the safety improvements associated with each "build" alternative, and calculate their expected impact on future collisions.

The effectiveness of safety improvements is typically expressed through crash reduction factors, which represent the expected percentage reduction in crashes from countermeasures. The HSM provides the best available crash reduction factors and tools for estimating the potential effects of transportation decisions. The FHWA's Crash Modification Factors Clearinghouse contains a more comprehensive inventory of all available crash reduction factors, including a star rating to indicate their quality.

As a general rule, use research and analysis to demonstrate the benefits of proposed safety features. If the information is unavailable, a safety benefit cannot be assumed. Adherence to the latest design standards is not sufficient as evidence of a safety benefit. Numerous publications, software, and other resources identified in Appendix A.4 are available to help define the safety benefit of features proposed for various alternatives. For example, the Safety Analyst tool and the Interactive Highway Design Model both can be used to predict future collisions with and without safety countermeasures.

## General-Purpose Projects

Ideally, all project alternatives would be designed to be safe and practical, regardless of whether the project was safety focused. In most cases, providing the safest possible design is compatible with other project objectives. However, in some cases, tradeoffs between safety and other objectives (e.g., mobility) arise, particularly in the context of general-purpose projects. The project purpose and need statement should serve as the primary guidance document in deciding how best to balance safety and mobility objectives through the project alternatives. The CSS approach discussed previously also can be useful. It suggests practitioners balance any competing priorities by fully considering the context of the project, including the character of the local community and the desires of community members.

**Case Study: Analyzing Safety in Alternatives Analysis**

The Town of Eagle, Colorado recently prepared an Environmental Assessment for the future East Eagle Interchange project. This assessment identified the Preferred Alternative that would best meet the need to improve the operational and safety aspects of the transportation network. The study used crash data to demonstrate that safety problems would persist and crashes would increase if no action was taken to improve the roadways in the study area. The study also included the use of a safety performance function to estimate future crash rates of the project alternatives, and to inform the selection of countermeasures. The Town also created a Project Working Group, which developed a five-step process to identify and evaluate the alternatives. Throughout this process, safety elements played a prominent role in goal setting, evaluation, and eventual selection of the Preferred Alternative. Appendix B.1 provides additional detail on this case study.

# 7.0 Defining the Affected Environment

## 7.1 Introduction

Defining the affected environment in a project study area provides the foundation for developing and evaluating project alternatives, and identifying mitigation strategies. The existing condition of the affected environment is typically used as a baseline for comparison of any build alternative against the No-build alternative. Both quantitative and qualitative descriptions are desirable.


*Contextsensitivesolutions.org – WSDOT*

Examples include, but are not limited to, identifying the location, size, and quality of wetlands; describing and mapping significant historic and cultural properties; and mapping neighborhoods, towns, communities, schools, hospitals, businesses, and parks.

The existing condition of safety in the project area provides a baseline for comparison with the proposed improvements. This comparison is especially pertinent when safety is a primary reason for the project. Defining the context of the project also is important when considering the potential safety issues or impacts. The community context helps define the key safety concerns, the needs of special types of road users, and the safety solutions that are most appropriate. In addition, considering community character as part of project development is consistent with national best practices — specifically the concept of Context Sensitive Solutions (CSS).

## 7.2 Project Contexts and Safety Considerations

The following are some examples of special types of project contexts that could influence the definition of safety issues and solutions.

## Downtown Areas

Downtown areas tend to have high concentrations of bicyclists, pedestrians, and transit vehicles, and a high density of intersections. Parking locations also can have safety implications. Vehicles conflict with crossing pedestrians, and local buses attempting to reach transit stops may conflict with bicyclists. Balancing the safety and mobility needs of these users at intersections and along crowded streets, while balancing other community needs, is a key challenge. Designs that might be appropriate in rural or suburban areas, such as providing larger turning radii, widened shoulders, or removing trees near the roadside, may conflict with community desires to enhance walkability and livability. The FHWA-sponsored CSS web site provides resources on these topics: http://www.contextsensitivesolutions.org.

**Complete Streets**

Many jurisdictions and agencies are pursuing "complete streets" policies. These policies require agencies to design and operate roadway facilities to provide a basic level of safety and accommodation for all roadway users, including drivers, transit users, pedestrians, bicyclists, older people, children, and the disabled. This could mean, for example, requiring sidewalks on all newly constructed roadways; however, the exact requirements of complete streets policies vary by jurisdiction.

## Schools and Senior Centers

*www.pedbikeimages.org/danburden*

Children, elderly, and disabled people are more vulnerable than other groups to die if involved in a traffic crash. Give special consideration to the safety in areas with high concentrations of these populations, particularly at roadway crossings. Consider a mix of safety strategies, such as median refuges at roadway crossings, in-school educational programs focused on child safety, or heightened fines for speeding in school zones.

Specific outreach activities to support NEPA goals can be oriented toward these vulnerable groups, including school events, provided that they are well-integrated into the NEPA process and sufficiently documented. Special outreach to seniors should be undertaken as well, with "scoping"-like focus groups to discuss pedestrian activity patterns and ongoing discussion to discuss special needs and design considerations with seniors. Strong coordination with Safe Routes to School (SRTS) coordinators also is important to ensure effective stakeholder outreach.

The NCHRP 500 Volume 9, A Guide for Reducing Collisions Involving Older Drivers, and the web site of the FHWA-sponsored National Safe Routes to Schools Center may be helpful: http://www.saferoutesinfo.org/resources/index.cfm?/publications.cfm).

### Transit Stations

A unique range of issues arise in safety around transit stations. In particular, transit stops are frequently the site of crossing pedestrians, and it is important to enhance their visibility to motorists, including transit bus drivers. Transit stop placement is an important consideration; at intersections, far-side stops are usually preferred for a variety of safety and operational reasons. One safety advantage is that pedestrians cross in back of the bus.

The web site of the FHWA-sponsored Pedestrian and Bicycle Information Center contains information on improving pedestrian safety around transit stations (http://www.walkinginfo.org/transit/access.cfm/).

### Freight Routes

Freight vehicles have special needs such as turning radii that will safely accommodate turning movements, truck rest stops that allow drivers to rest and reduce the risk of crash, and escape ramps in areas with steep grades. Give these users special consideration in areas with high volumes of freight vehicles. NCHRP 500 Volume 13: A Guide for Reducing Collisions Involving Heavy Trucks provides information improving safety for heavy trucks. Some proven countermeasures from this report include performing safety consultations with carrier safety management, and installing interactive truck rollover signing.

### Rural Roadways

Rural roadways have higher crash rates than other types of roadways. Typical safety issues include nighttime visibility, impaired driving, speeding, animal crossings, fixed objects next to the roadway, sharp curves, and lack of a “clear zone” where drivers can safely stop if they run off the road. Visit the FHWA’s Local and Rural Road Safety web site for resources: http://safety.fhwa.dot.gov/local_rural/. The University of Minnesota’s Center for Excellence in Rural Road Safety is another important resource: http://www.ruralsafety.umn.edu/.

### High-Crash Locations

Any of the possible project contexts mentioned previously can be the site of a high number of crashes. These locations deserve special consideration, particularly if the analysis suggests that the number of crashes is higher than expected given the roadway type and volumes of vehicles and other roadway users. The HSM contains detailed information on identifying high-crash locations and addressing issues. These locations are identified as part of the Federal Highway Safety Improvement Program.

Table 7.1 summarizes some of the special characteristics and issues arising in these contexts.

**Table 7.1 Summary of Characteristics and Considerations in Special Contexts**

| Context | Characteristics | Key Considerations |
|---|---|---|
| Urban downtowns | • Mix of road users<br>• High intersection densities<br>• Right-of-way constraints | • Balancing the needs of multiple users, including transit buses, automobiles, delivery vehicles, bicycles, pedestrians, etc.<br>• Preserving the downtown character.<br>• Maintaining a bicycle- and pedestrian-friendly environment.<br>• Working within existing right of way. |
| Schools and senior centers | • High density of the most vulnerable road users | • Ensuring child/senior safety at roadway crossings. |
| Transit stations | • High volumes of crossing pedestrians<br>• Turning/weaving transit vehicles | • Ensuring safe pedestrian crossings and pedestrian visibility to oncoming motorists.<br>• Balancing safety objectives with impacts on transit operations (e.g., signal retiming).<br>• Balance safety needs of transit vehicles with needs of other users (e.g., bicyclists weaving in and out of transit lane). |
| Freight routes | • High volumes of freight vehicles | • Providing safety features designed to improve safety of freight vehicles (e.g., escape ramps, rest stations).<br>• Balancing freight vehicle needs (e.g., wide turning radii) with the needs of other users (e.g., pedestrians in downtown areas, community members concerned about freight impacts). |
| Rural roadways | • High crash rates<br>• High incidence of alcohol, speeding-involved collisions | • Providing safety features, including roadway clear zones, improved nighttime visibility, improvement of marking and signing, incorporation of safety edge, enforcement of speeding and impaired driving, etc. |
| High-crash locations | • Higher than expected crash sites and road segments | • Investigating and addressing the contributing factors at high-crash concentrations. |

# 8.0 Analysis of Environmental Impacts and Mitigation

## 8.1 Introduction

The analysis of the environmental consequences, as a result of a proposed project, represents the core of the environmental impact analysis for a project.

**Regulations on Analyzing Environmental Effects and Consequences**

The CEQ regulations at 40 CFR 1508.8 define "effects" as follows:

*Effects includes ecological (such as the effects on natural resources and on the components, structures, and functioning of affected ecosystems), aesthetic, historic, cultural, economic, social, or health, whether direct, indirect, or cumulative. Effects also may include those resulting from actions which may have both beneficial and detrimental effects, even if on balance the agency believes that the effect will be beneficial.*

FHWA Technical Advisory T 6640.8A recommends that the section on environmental consequences includes the probable beneficial and adverse social, economic, health, and environmental effects of alternatives under consideration; and describes the measures proposed to mitigate adverse impacts. The information should have sufficient scientific and analytical substance to provide a basis for evaluating the comparative merits of the alternatives.

Safety-focused and general-purpose projects are no different than any other transportation projects with respect to the required analysis of the potential for impact on environmental resources and features. Each project must have a specific and concise purpose and need statement. Creating a comprehensive description of the affected environment, including mapping and quantitative, as well as qualitative data, will be just as important for these safety projects as for any other transportation project.

For both safety-focused and general-purpose projects, direct, indirect, and cumulative environmental impacts related to safety may occur. Direct impacts may include, but not be limited to, the impacts related to the project, such as increased traffic due to capacity increases, facility construction impacts on sensitive environmental resources, or construction impacts on road user safety. These impacts may, in turn, create additional indirect impacts that must be considered. Follow the usual procedures, but keep in mind the following impacts and/or benefits that may be specific to safety-focused projects.

Specific project features that may affect safety include:

- Design speed;
- Access management (e.g., driveways);
- Sight distance;
- Geometry (e.g., ramp design and configuration, presence or lack of turn lanes);
- Safety impacts on vulnerable modes or users;
- Access for emergency vehicles;
- Signalization;
- Roadway/roadside features; and
- Work zone safety during construction.

Construction impacts a common type of safety-related impact cited in environmental documents. Safety impacts also can be considered in the analysis of indirect and cumulative impacts. A third area to consider is the potential to integrate beneficial safety enhancements beyond required mitigation.

## 8.2 Construction Impacts

Safety-related construction impacts are a common type of safety-related impact requiring mitigation. This issue is particularly significant since approximately 1,000 fatalities occur each year in work zones; moreover, the FHWA's Work Zone Final Rule (23 CFR 630) requires consideration of work zone safety and mobility issues in project development. Resources are available to assist practitioners in identifying safety countermeasures appropriate for work zones, such as the FHWA-supported National Work Zone Safety Information Clearinghouse (http://www.workzonesafety.org/). The AASHTO NCHRP 500 Series Guide on Reducing Work Zone Collisions is another helpful resource listing proven countermeasures for reducing work zone collisions, such as:

- Improve maintenance and construction practices;
- Utilize time-related contract provisions;
- Use nighttime road work; and
- Use demand management programs to reduce volumes through work zones.

If work zone impacts are significant, consider a construction stage RSA (see Section 5.0) to identify potential problems in the work zone and means of addressing them.

Although addressing short-term safety issues during construction is very important, it is not a substitute for careful consideration of the long-term safety

outcomes of the project itself, which should be evaluated during alternatives analysis.

## 8.3 Indirect and Cumulative Impacts

Safety-related impacts may be an important component of the analysis of the indirect and cumulative impacts. This is because of the potential for safety impacts to result from the interactions of traffic and land use development over time. For example, new housing, commercial, or industrial developments associated with new transportation facilities could lead to:

- Increased pedestrian traffic resulting in the need for additional pedestrian safety features around the project site (e.g., high-visibility crosswalks, flashing beacons, pedestrian countdown signals);
- Increased freight traffic resulting in the need for changes in roadway design to accommodate freight turning movements;
- Increased numbers of vulnerable road users (e.g., elderly, handicapped) requiring additional safety features, such as oversized or high-visibility road signs for older users, accessible pedestrian signals, etc.; and
- Expected changes in travel behavior (e.g., more bicycling and walking, increase in transit-dependent population) resulting from expected land use changes, such as densification.

Some of the analytic methods discussed previously, such as safety performance functions provided in the HSM, take into account expected changes in the volumes of personal vehicles and pedestrians in predicting future safety impacts.

The case study below on Health Impact Assessment illustrates an analysis of long-term project impacts on pedestrian safety.

**Case Study: Health Impact Assessments**

Health Impact Assessments (HIA) are an emerging tool for assessing and capturing all health-related impacts associated with policies or projects, which may include road safety impacts. HIAs are not required as part of NEPA, but have been prepared voluntary, in some cases, as a supplement to environmental documentation.

For example, the Health Impacts Group at the University of California, Berkeley recently evaluated the health impacts of a proposed housing development project in Oakland, California. The Oak-to-9th Health Impact Assessment included the application of a predictive model for measuring the additional pedestrian crashes likely to result from higher vehicle volumes surrounding the future development. This information suggested a need for enhanced mitigation of future pedestrian safety impacts.

*Source: UC Berkeley Health Impact Assessment Group, http://sites.google.com/site/ucbhia/projects-and-research.*

Since potential safety impacts relate to community context, the assessment of indirect and cumulative impacts also allows for close CSS review when considering potential mitigation and/or avoidance of safety impacts.

## 8.4 Mitigation and Enhancements

Consider proven safety countermeasures as mitigation for safety-focused projects to integrate safety into NEPA decision-making. Document the safety benefits of proposed features. Refer to Appendix A.4 for resources to help quantify and document the benefits of safety countermeasures.

Practitioners also may go beyond the required mitigation to enhance the safety of the roadway. With safety as a primary Federal goal, the enhancement of safety should be considered as a potential value-added benefit of every project. This statement is particularly true when safety is a state, regional, or local goal.

## 8.5 Safety After the NEPA Process

Safety improvement does not end with the NEPA process. Safety can be improved and monitored during project construction, maintenance, and operation. Behavioral strategies, such as enforcement and education, can be employed at any time to reduce crashes. The NCHRP 622, *Effectiveness of Behavioral Safety Strategies*, lists a number of behavioral strategies proven to reduce crashes, such as sobriety checkpoints, bicycle helmet laws, passive alcohol sensors, and many others. Another resource is Countermeasures That Work: A Highway Safety Countermeasure Guide for State Highway Safety Offices. Both resources are described in more detail in Appendix A.4. Finally, programs can be implemented for honoring safety commitments and mitigation strategies from the NEPA process during construction and beyond.

# A. Resources

This section lists several types of resources to assist practitioners in incorporating safety into the NEPA process, including:

- NEPA training programs;
- References for NEPA regulation and guidance; and
- Analytical tools and resources for identifying and addressing project-level safety issues.

## A.1 NEPA Training

- FHWA Environmental Review Toolkit – http://www.environment.fhwa.dot.gov/projdev/index.asp;
- FHWA-NHI 142005 – NEPA and Transportation Decision-Making;
- FHWA-NHI 142036 – Public Involvement Techniques for Transportation Decision-Making;
- FHWA-NHI 142052 – Introduction to NEPA and Transportation Decision-Making – Web-Based; and
- See the following URL for details on these courses: http://www.nhi.fhwa.dot.gov/training/nhistore.aspx.

## A.2 Safety Training

The FHWA Office of Safety web site (http://safety.fhwa.dot.gov/training/) provides links to multiple safety training opportunities, including:

- Safety Professional Capacity Building;
- National Highway Institute, including courses on Transportation Safety Planning and other topics;
- Improving Safety of Horizontal Curves;
- Designing for Pedestrian Safety;
- Developing a Pedestrian Safety Action Plan;
- Planning and Designing for Pedestrian Safety;
- Application of Crash Reduction Factors (CRF);
- Science of Crash Reduction Factors;

- Supply and Demand for Highway Safety Professionals in the Public Sector;
- Core Competencies for Highway Safety Professionals;
- Model Safety Curricula – Safety 101; and
- Professional Development – Safety 101.

## A.3 References for NEPA Regulation and Guidance

### Legislation

Federal-Aid Highways, Title 23, United States Code, "Highways," National Environmental Policy Act of 1969, as amended (NEPA), plus numerous other related statutes and orders, http://environment.fhwa.dot.gov/projdev/tdmpdo.asp.

### Regulations

- "Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act" – 40 CFR Parts 1500-1508, November 29, 1978 (Council on Environmental Quality – CEQ); and
- "Environmental Impact and Related Procedures" 23 CFR 771, August 28, 1987 (FHWA), http://environment.fhwa.dot.gov/projdev/tdmpdo.asp.

### FHWA Guidance

- "NEPA and Transportation Decision-Making – Project Development and Documentation Overview," FHWA, August 21, 1992, http://environment.fhwa.dot.gov/projdev/tdmpdo.asp; and
- "Guidance for Preparing and Processing Environmental and Section 4(f) Documents" – FHWA Technical Advisory T6640.8A, October 30, 1987, http://www.environment.fhwa.dot.gov/projdev/impTA6640.asp.

### Other Guidance

- Questions and Answers about NEPA Regulations, Council on Environmental Quality (CEQ) Memorandum, March 16, 1981.
- The RED BOOK – Applying the Section 404 Permit Process to Federal-Aid Highway Projects, FHWA, et al., September 1988.

- FHWA Environmental Guidebook (primarily an internal document) – An all-inclusive compendium of environmental guidance information that includes the following:
  - Section 4(f) Policy Paper, October 5, 1987, as updated June 7, 1989;
  - Transportation Enhancement Activities, FHWA Memorandum, April 24, 1992;
  - Cooperating Agencies, FHWA Memorandum, March 19, 1992; and
  - Purpose-and-Need, FHWA Memorandum, September 18, 1990.
- NEPA and Transportation Decision-Making – Project Development and Documentation Overview, August 21, 1992, http://environment.fhwa.dot.gov/projdev/tdmpdo.asp.

# A.4 Analytical Tools and Resources for Identifying and Addressing Project-Level Safety Issues

## Reference Documents

### *State Strategic Highway Safety Plans*

Federal transportation legislation (SAFETEA-LU) requires states to develop a State Strategic Highway Safety Plan (SHSP). The SHSP identifies the state's most significant safety problems, and provides specific strategies from across the four "Es" of safety (engineering, education, enforcement, emergency response) to address them. Project planners and designers can refer to the SHSP for ideas on how to incorporate safety concepts into project development. Ideally, all safety projects should address a specific problem highlighted by the SHSP.

### *NCHRP 500 Series*

In addition to using SHSPs as a resource, project planners and designers can refer to the NCHRP 500 Series for detailed research on a wide range of safety strategies. The 500 Series consists of more than 20 guides containing strategies for implementing each of the AASHTO's SHSP priority emphasis areas.

The guides are designed to support implementation of the 4E approach within each emphasis area by providing concrete ideas for how the emphasis area applies to the 4Es. Each guide provides the following information:

- Description of the problem.
- Strategies for addressing the problem (strategies from multiple Es are typically included), information on expected effectiveness, keys to success, potential difficulties, associated measures and data, organizational and policy issues, cost issues, legislative needs, and other topics.

- A list of related strategies for "creating a truly comprehensive approach" – this typically includes general discussion of how all the "Es" can get involved in implementing the emphasis area.
- An index of strategies by effectiveness (proven, tried, and experimental); implementation timeframe; and relative cost.

Source: http://safety.transportation.org/guides.aspx.

### *Highway Safety Manual*

The purpose of the Highway Safety Manual (HSM) is to provide the best factual information and proven analysis tools for crash frequency prediction. The HSM will facilitate integrating quantitative crash frequency and severity performance measures into roadway planning, design, operations, and maintenance decisions. The primary focus of the HSM is the increased application of analytical tools for assessing the safety impacts of transportation project and program decisions.

The HSM can be used to:

- Identify sites with the most potential for crash frequency or severity reduction;
- Identify factors contributing to crashes and associated potential countermeasures to address these issues;
- Evaluate the crash reduction benefits of implemented treatments;
- Conduct economic appraisals of improvements to prioritize projects;
- Calculate the effect of various design alternatives on crash frequency and severity; and
- Estimate potential crash frequency and severity on highway networks, and the potential effects of transportation decisions on crashes.

Source: http://safety.fhwa.dot.gov/hsm/factsheet/.

### *FHWA – Crash Modification Factors Clearinghouse*

The FHWA maintains a comprehensive database of available crash modification factors (CMF) for a wide range of safety countermeasures. CMFs include a star rating (one to five stars) indicating their quality.

Source: http://www.cmfclearinghouse.org/.

### *NCHRP 622 – Effectiveness of Behavioral Highway Safety Countermeasures*

The National Cooperative Highway Safety Program Report 622 (*Effectiveness of Behavioral Highway Safety Countermeasures*) provides information on the effectiveness of educational and enforcement countermeasures. Countermeasures are divided into five categories: proven, likely, uncertain, unknown, and varies.

Source: http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_622.pdf.

*Countermeasures That Work: A Highway Safety Countermeasure Guide for State Highway Safety Offices*

"Countermeasures that Work" is a guide to assist State Highway Safety Offices (SHSO) in selecting effective, science-based traffic safety countermeasures for highway safety emphasis areas. As with the NCHRP 500 Series, this guide arranges countermeasures under each emphasis area. It then categorizes each safety improvement as a subgroup within each emphasis area, and rates them according to effectiveness. This effectiveness rating is based on published research and consists of five levels:

- **5 Stars –** Demonstrated effective by several high-quality evaluations with consistent results.
- **4 Stars –** Demonstrated effective in certain situations.
- **3 Stars –** Likely effective based on balance of evidence from high-quality evaluations or other sources.
- **2 Stars –** Effectiveness still undetermined; different methods of implementing this countermeasure produce different results.
- **1 Star –** Limited or no high-quality evaluation evidence.

Source: www.ghsa.org/html/publications/countermeasures/index.html.

## Software Tools

*Safety Analyst*

Safety Analyst consists of six software programs to analyze the safety performance of specific sites, to suggest appropriate countermeasures, quantify their expected benefits, and evaluate their effectiveness. These six tools are:[9]

1. **Network Screening Tool –** Identifies sites in need of safety improvement;
2. **Diagnosis Tool –** Diagnoses the nature of safety problems at specific sites;
3. **Countermeasure Selection Tool –** Assists users in selecting countermeasures to reduce crash frequency and severity at specific sites;
4. **Economic Appraisal Tool –** Conducts economic appraisals of the costs and safety benefits of countermeasures selected for a specific site;
5. **Priority Ranking Tool –** Provides a priority ranking of sites and proposed improvement projects based on the benefit and cost estimates determined by the economic appraisal tool; and

[9] Source: www.safetyanalyst.org/scope.htm.

6. **Evaluation Tool –** Enables the design and application of well-designed before/after evaluations.

### *Interactive Highway Safety Design Model (IHSDM)*

IHSDM is a suite of software analysis tools for evaluating the safety and operational effects of geometric design decisions on highways. IHSDM is a decision-support tool that checks highway designs against policy values, and provides estimates of a design's expected safety and operational performance. The IHSDM consists of six evaluation modules:

1. **Crash Prediction –** Estimates the frequency of crashes expected on a roadway based on its geometric design and traffic characteristics;
2. **Design Consistency –** Helps diagnose safety concerns at horizontal curves;
3. **Intersection Review –** Identifies potential safety concerns and possible treatments to address those concerns;
4. **Policy Review –** Checks roadway-segment design elements for compliance with relevant highway geometric design policies;
5. **Traffic Analysis –** Uses a traffic simulation model to estimate traffic quality of service measures for an existing or proposed design under variable traffic flows; and
6. **Driver/Vehicle –** Permits the user to evaluate the drivability of a roadway design, and to identify existing conditions that could result in loss of vehicle control.

### *Levels of Service of Safety*[10]

The Level of Service of Safety (LOSS) tool was developed by engineers at the Colorado DOT. The concept of Level of Service of Safety uses quantitative measures to characterize the safety of a roadway segment in reference to its expected performance.

The LOSS is determined by using the Safety Performance Function to predict the expected number of crashes for a given location, and compare it to the actual number of crashes (including frequency and severity). This is used to rate the road segment as follows:

- **LOSS-I –** Indicates low potential for crash reduction;
- **LOSS-II –** Indicates low to moderate potential for crash reduction;

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[10] Kononov and Allery, 2003, Level of Service of Safety Conceptual Blueprint and Analytical Framework, Transportation Research Record, Transportation Research Board, http://diexsys.com/PDF/1840-007.pdf.

- **LOSS-III –** Indicates moderate to high potential for crash reduction; and
- **LOSS-IV –** Indicates high potential for crash reduction.

The LOSS method is intended to:

- Help bring about consensus on the subject of the magnitude of safety problems for different classes of roads;
- Bring the perception of roadway safety in line with reality of safety performance of a specific facility; and
- Provide a frame of reference from a safety perspective for planning major corridor improvements.

# B. Case Studies

## B.1 Colorado DOT: East Eagle Interchange – *Innovative Process for Including Safety in Alternatives Analysis*

The Town of Eagle, Colorado recently prepared an Environmental Assessment (EA) for the future East Eagle Interchange project.

The purpose of the EA was to identify transportation projects that improved roadway connectivity in the East Eagle area and accommodated anticipated growth and development. Four primary needs were expected to be met by these improvements, but specific to safety, the identified needs were to:

- Address current safety problems along Eby Creek Road by reducing overall traffic congestion; and
- Provide a second connection between I-70 and U.S. 6 built to modern design standards.

The Preferred Alternative was chosen, in part, because it met the need to improve the operational and safety aspects of the transportation network.

There can be many competing interests and priorities during the development of a transportation project, but to equally consider all of the needs of a project (mobility, safety, and connectivity), the Town of Eagle followed a data-driven and innovative process for selecting their Preferred Alternative.

This evaluation was performed using congestion, safety, and environmental data. For the safety element, crash data was taken from a safety study completed by the Colorado DOT in 2008. The data specifically looked at the trends in crash rates along I-70 from 2000 to 2004 and used it as a baseline to demonstrate that safety problems would persist and crashes would increase if no action was taken to improve the roadways in the study area. This study also included an innovative approach to determine the future safety performance of the project alternatives. Specifically, they developed a safety performance function to estimate crash rates for out-years and to inform the selection of countermeasures. Safety performance functions describe the relationship between traffic exposure (Average Daily Traffic – ADT) and crash frequency (crashes per mile per year).

Once the Town had a complete understanding of transportation issues and needs, they formed a Project Working Group (PWG) consisting of representatives from the FHWA, Colorado DOT, the Town of Eagle, and Eagle County, along with engineering and environmental consultants. The PWG created a step-by-step process to identify, develop, and evaluate all of the alternatives, and

eventually select the alternative that met all of the defined needs. Throughout this five-step process, safety elements played a prominent role in the goal setting, evaluation, and eventual selection of the Preferred Alternative. The steps were as follows:

1. Develop project goals, evaluation criteria, measures of effectiveness, and design criteria;
2. Develop a full range of alternatives;
3. Develop and perform criteria and an initial prescreening of alternatives;
4. Develop and perform a comparative evaluation of the remaining alternatives to be analyzed in the EA; and
5. Conduct a detailed analysis on the Preferred Alternative and the No Action Alternative as described in this EA.

During the first step, each potential alternative had to meet five specific goals to advance to the next stage. Two of the five goals were specific to safety.

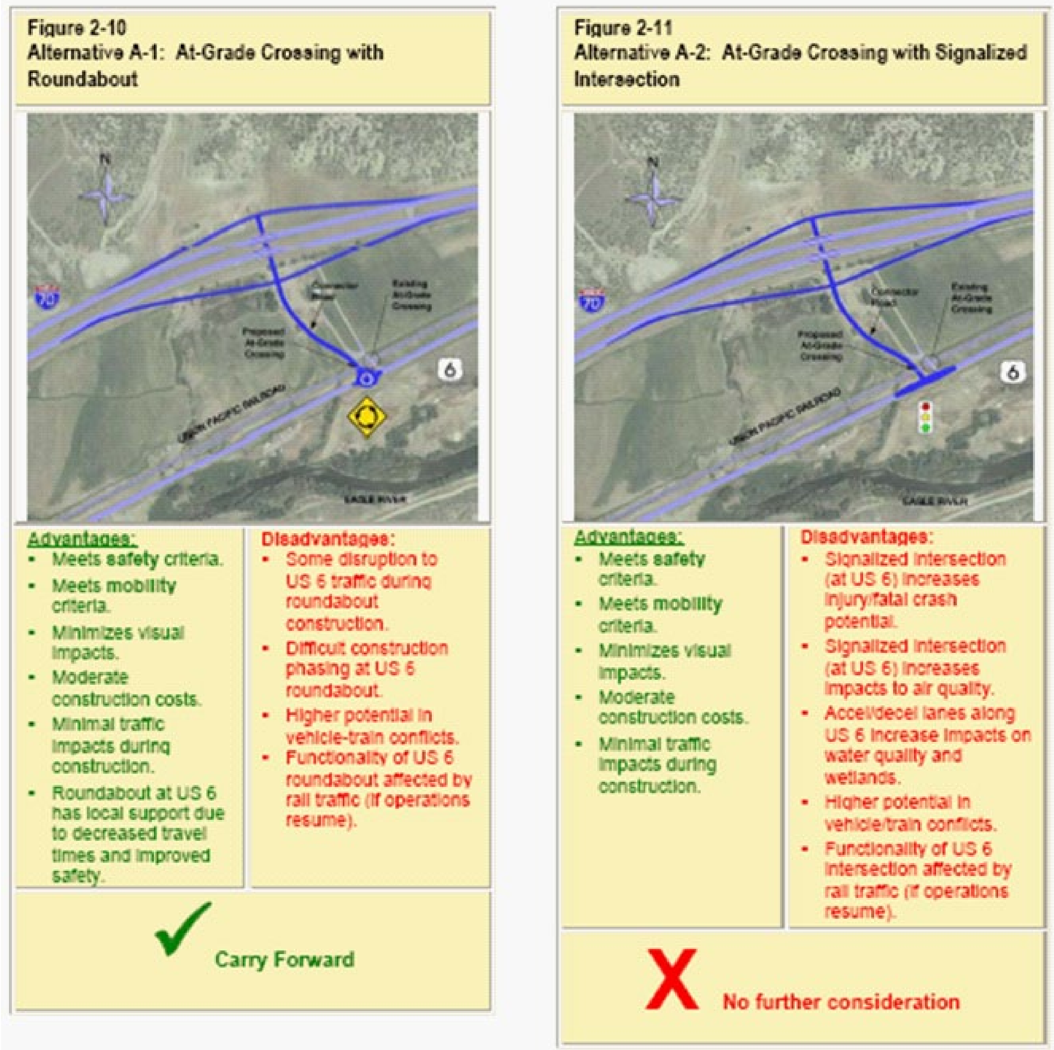
- **Goal 1 –** Improve connectivity between U.S. 6 and I-70 east of Eagle;
- **Goal 2 –** Relieve future congestion from proposed development in the Eagle and Gypsum areas on the existing Eagle interchange ramps, as well as along Eby Creek Road;
- **Goal 3 –** Meet safety requirements of all users traveling through the study area (e.g., lane and shoulder widths, stopping sight distance, traffic control, etc.);
- **Goal 4 –** Improve operational and safety aspects of the transportation network for all users within the study area (including bicyclists and pedestrians); and
- **Goal 5 –** Be consistent with East Eagle area plans.

Each alternative that fit within the above goals was then rated based on five evaluation criteria – its impact on safety, mobility, environment, community, and implementation. To effectively measure the safety benefits in each alternative, a specific set of criteria was used. This included:

- **Crash Reduction –** A measure of the relative safety of an alternative from a crash potential standpoint;
- **Emergency Response Times –** Ability to improve emergency response times;
- **Interchange Spacing –** Ability to meet safe interchange spacing;
- **Pedestrian/Bicycle Safety –** Ability to safely accommodate pedestrians and bicyclists;
- **Traffic Safety Standards –** Ability to meet AASHTO, Colorado DOT, and/or local agency design standards; and
- **Vehicle/Train Conflicts –** Ability to minimize vehicle/train conflicts.

If the alternative met the projected goals and was positively evaluated, it was then summarized based on its advantages and disadvantages. Figure B.1 depicts the initial screening process for one of the alternatives. This process was completed for all of the alternatives until a Preferred Alternative was chosen.

**Figure B.1 Alternatives Analysis Summary Sheets**




Source: East Eagle Interchange Environmental Assessment, August 2010.

By using a well-defined process with specific goals, data, and methods, the Town of Eagle was able to establish a Preferred Alternative that met the critical safety, mobility, and community needs established at the beginning of the project.

## B.2 Colorado DOT: Central Park Boulevard – *Safety Analysis Techniques*

The project area contains the Stapleton Redevelopment Area, a 4,700-acre mixed-use development area located in eastern Denver, Colorado. The site is projected to accommodate 30,000 residents and provide employment for 35,000 workers. The current accessibility options to/from Stapleton are congested and expected to worsen as more development occurs.

To address these issues, a new six-lane bridge and highway interchange was proposed to be constructed. The I-70/Central Park Boulevard (CPB) Interchange will provide direct access between the Stapleton Redevelopment Area and major interstates I-70 and I-270; will connect the north and south sides of the Stapleton redevelopment; and will provide safe access for automobiles, pedestrians, and bicyclists.

The I-70/CPB Interchange project was an element of the I-70 East Draft Environmental Impact Statement (DEIS), which covered transportation improvements along a large stretch of the I-70 highway corridor, from I-25 to Tower Road. However, with the availability of new funds, the City and County of Denver (CCD) and the FHWA decided to advance the CPB Interchange project independently, triggering its own NEPA process. The resulting Environmental Assessment (EA) carries forward the crash data (1999 to 2001) from the original DEIS, which was used as a baseline to portray the existing safety issues along the entirety of I-70 East and make projections about future issues in the study area. This data is included in the EA primarily to set the context for safety concerns in the study area, but not as part of the purpose-and-need statement, which does not explicitly reference safety:

> *The purpose of the identified project is to provide improved connectivity to I-70 that supports local and regional access to/from existing and planned land uses served by CPB north and south of I-70. The project is needed due to the development of Stapleton and the projected levels of congestion in the area.*

The Preferred Alternative for this project was chosen because it exemplified the specific elements of the purpose-and-need statement. It also reflects input obtained from nearby neighborhoods, businesses, local jurisdictions, and stakeholders. However, the concept for analyzing and utilizing safety data, which was used for the DEIS, is innovative and worthy of replication in other states.

For the original DEIS, the Colorado DOT used a Level of Service of Safety (LOSS) approach to compare traffic safety under existing conditions with safety conditions for future design alternatives. The magnitude of safety problems on highway segments was then evaluated using safety performance functions. A Safety Performance Function (SPF) is a probability function describing the relationship between traffic exposure (Average Daily Traffic (ADT)) and crash frequency (crashes per mile per year). The SPF defines the normal or expected number of crashes at a specific ADT. The degree of deviation from the expected performance is classified as LOSS I to IV.

The LOSS uses qualitative measures to characterize the actual safety performance of a road segment to the expected safety performance. It is assessed for total crashes and injury/fatal crashes separately.

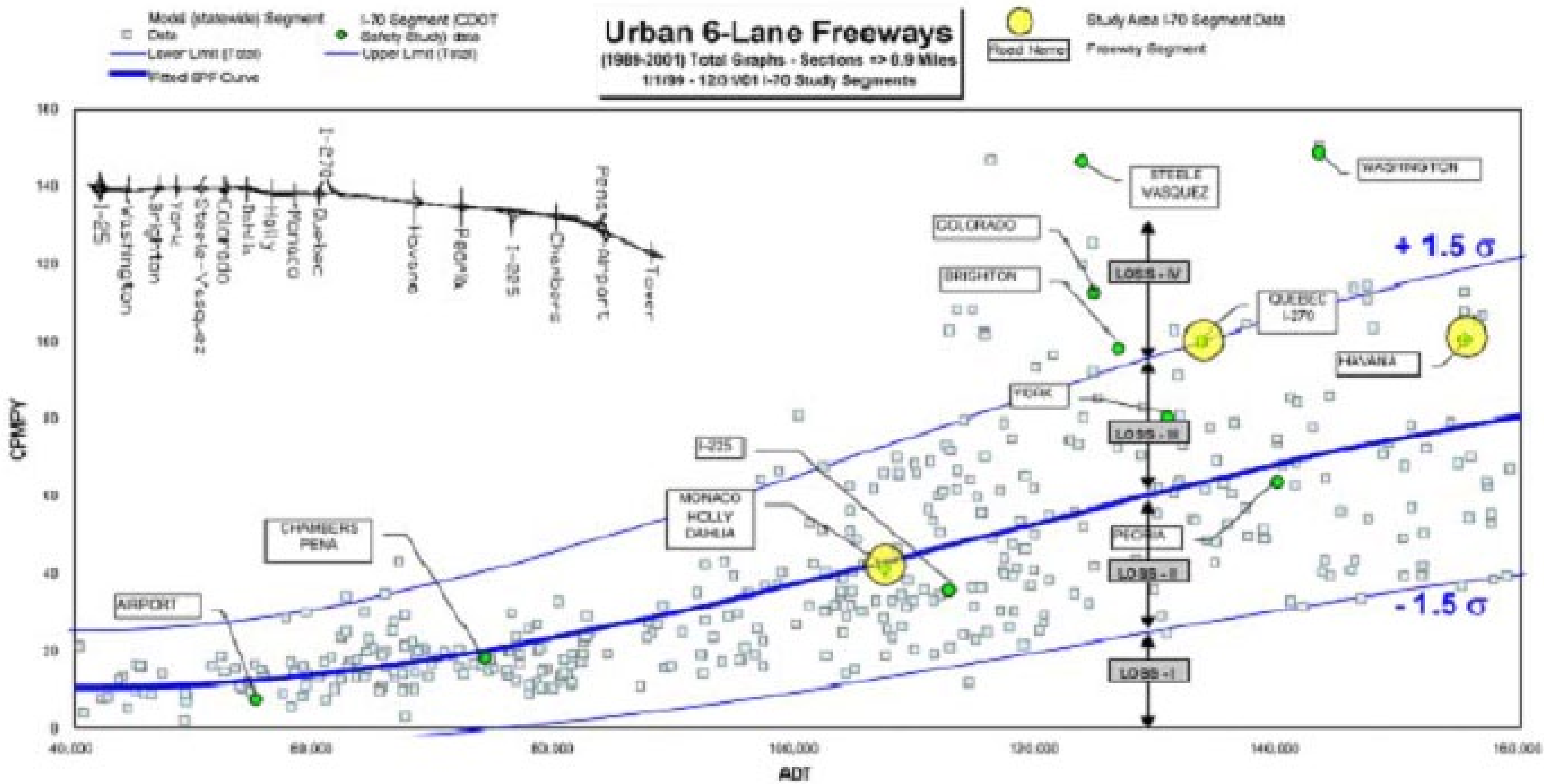
- **LOSS I –** Indicates low potential for crash reduction;
- **LOSS II –** Indicates better than expected safety performance;
- **LOSS III –** Indicates less than expected safety performance; and
- **LOSS IV –** Indicates high potential for crash reduction.

The two road segments on I-70 within the CPB area experienced an LOSS of IV and an LOSS of III for total crashes, and an LOSS III for injuries and fatal crashes. Figure B.2 depicts the Colorado DOT LOSS model for total crashes on six-lane freeways. The overall intent of the LOSS analysis was to identify the need for safety improvements, and to inform the selection of appropriate countermeasures to remedy the issues. Colorado DOT also analyzed crash concentrations and patterns on road segments and interchanges to identify any safety problems within the study area. This included analysis of crash type, severity, direction of travel, road conditions, spatial distribution, and time-of-day travel patterns. The EA cites this analysis to support an assertion that these road segments and interchanges were in need of potential improvement, but does not suggest specific countermeasures or design ideas to remedy the issues.

The Preferred Alternative was chosen based on engineering, environmental, and other criteria. The "other" criteria included consistency with other planning documents and the ability to provide multimodal access. Although safety was not specifically noted as being part of the selection criteria for the multimodal elements of the project, the direct access between the north and south side of I-70 will provide an enhanced environment for pedestrians and bicyclists as a result of including the following improvements:

- A 12-foot wide sidewalk on both sides of Central Park Boulevard interchange;
- Well-lit walkways across the Central Park Boulevard bridge;
- Tightly designed ramp intersections at each end of the bridge to best accommodate pedestrian movements through the intersection areas; and
- NCHRP 500, Volume 10, *A Guide for Reducing Collisions Involving Pedestrians*, indicates that sidewalks and lighting are proven to improve pedestrian safety.

## Figure B.2 Colorado DOT LOSS Model for Total Crashes in Study Area




Source: CDOT 2004; Kononov and Allery 2003.

Notes: CPMPY — crashes per mile per year
ADT — average daily traffic (vehicles per day)
σ — standard deviation for statewide model segment data
LOSS — Level of Service of Safety
SPF — Safety Performance Function

## B.3 Washington DOT: SR 502 – *Using Proven Safety Countermeasures*

The purpose of the SR 502 corridor-widening project is to improve mobility and safety along the SR 502 corridor between NE 15th Avenue and NE 102nd in North Clark County, Washington, where collision and congestion rates have been increasing. Safety concerns in the project area included:

- High number of crashes;
- High number of access points;
- Risky left turns at unsignalized intersections;
- Diversions to alternate routes; and
- Lack of pedestrian and bicycle infrastructure.

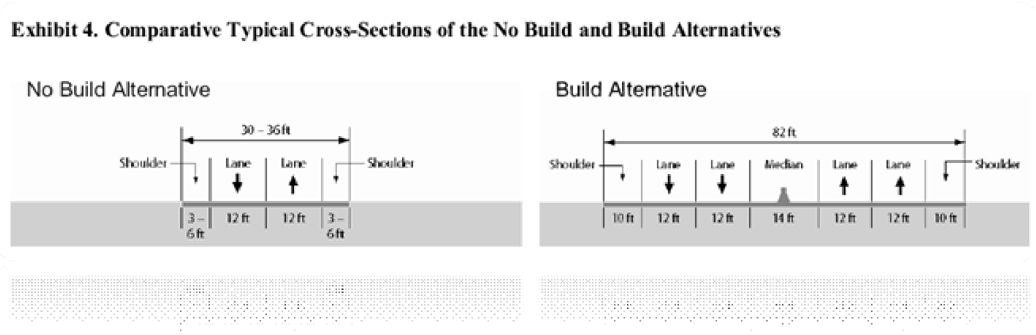
Since one of the two primary objectives of this project was to improve safety in the corridor, alternatives were evaluated based on how well they met the purpose-and-need, specifically looking at the number of locations — either at driveways or intersections — where traffic patterns crossed and created potential conflict points.

The EIS began with a total of nine alternatives:

- Five on-corridor alternatives that would widen and reconfigure the existing SR 502 alignment;
- Two off-corridor alternatives that would relocate SR 502 to a new roadway north or south of the existing alignment; and
- Two options for a transportation system management/transportation demand management (TSM/TDM) alternative.

Two on-corridor alternatives, the off-corridor alternatives and the TSM/TDM alternatives, were eliminated early as they did not meet the mobility and safety needs of the project. Of the three remaining on-corridor alternatives, Washington DOT created a hybrid that minimized the environmental effects and satisfied the project's purpose-and-need for safety and mobility. The hybrid, or the Pink Alternative, became the Preferred Alternative studied in the Final Environmental Impact Statement (FEIS). The cross-section for the Preferred Build Alternative is shown in the below diagram. In 2010, the FHWA signed the Record of Decision (ROD) for the SR 502 corridor-widening project, concurring with Washington DOT on the Preferred Alternative.

## Figure B.3 Build – No-build Alternative




Under current or No-build conditions, the collision rates in this corridor already exceed the statewide average and are projected to increase with traffic volumes. The Preferred Alternative presents a number of safety measures to reduce injury and fatality rates.

As shown in the cross-section diagram, the Preferred Alternative has a 14-foot median, running the length of the corridor. As noted in the EIS, this roadway design feature is a proven safety treatment, as it greatly reduces head-on crashes and restricts left-hand turning movements and u-turns, unless at signalized intersections and in protected turn lanes. In some instances, center turn lanes are viable alternatives to center medians. However, they were not considered here because they are designed for managed access, low speed urban roadways with traffic volumes under 24,000 per day. SR 502 is projected to be four-lanes with 42,000 vehicles per day, which would make it hard for cars to find appropriate gaps in traffic to make left turns from a center lane. Cars turning left from driveways or unsignalized intersections also would need to cross multiple lanes of traffic, making the center-lane option unsafe.

Access control was an additional consideration. There are approximately 150 driveway access points onto SR 502, but only one signalized intersection in the corridor that provides cars with a safe opportunity to turn left. Outside this intersection, drivers can currently make left-hand turns to and from driveways, and across oncoming traffic onto SR 502, wherever they choose. To provide the left-turn option, but in a more managed way, driveway connections onto SR 502 would be consolidated and three intersections were assessed to see if traffic conditions, pedestrian characteristics, and physical characteristics of the locations would warrant a traffic signal. In the Preferred Alternative, four intersections would be signalized, eliminating other conflicting movements, which generally require quick reaction time and judgment. These additions, plus the new median, will mean that access onto and across the project corridor will be controlled, and will reduce crashes.

The number of travel lanes on SR 502 will be increased from one to two in both directions, which would provide a safer means to pass slow-moving vehicles. The additional capacity on SR 502 also is projected to ease current and projected congestion issues. Analysis suggested that additional capacity would encourage people that currently utilize alternate routes to avoid SR 502 traffic to use the safer, more direct route that the project will provide.

The Preferred Alternative also calls for 10-footwide shoulders that will provide a safe area for broken down cars, as well as safe bicycle mobility. The four intersections also will have crossing treatments allowing pedestrians to access both sides of SR 502.

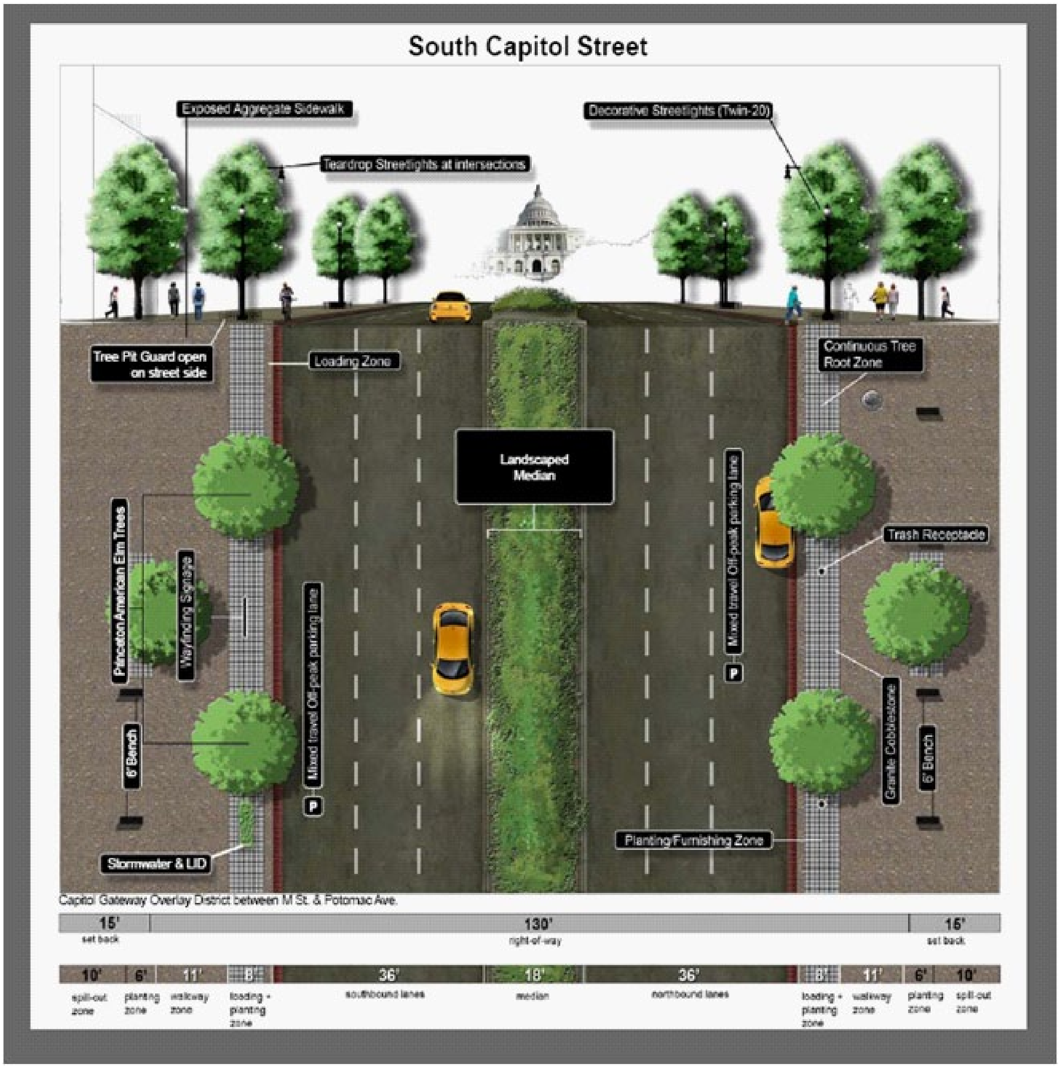
The Preferred Alternative meets the purpose-and-need of this project by specifically addressing all of the safety concerns (as well as mobility concerns) for this corridor.

## B.4 District of Columbia DOT: South Capitol Street – *Addressing Safety for Multiple Modes*

The roots of this Draft Environmental Impact Statement (DEIS) began in 2000, when the Mayor of Washington, D.C. brought together Federal and District agencies to guide development along the Anacostia River waterfront. From these initial meetings, the District DOT Office of Planning created the Anacostia Waterfront Initiative Framework Plan, which examined the potential for development on and near the waterfront. The Plan also addressed South Capitol Street, which was identified as a potential civic gateway to the central part of the city by providing a mix of shopping, housing, and offices. Encouraging the development of South Capitol Street would serve as a catalyst for the development of the Anacostia Waterfront. This idea started the process for a series of plans and studies to investigate and analyze existing and future transportation patterns in the South Capitol corridor. As it stands today, the stated purpose of the South Capitol Street project in the DEIS is to improve safety, multimodal mobility, and accessibility; and support economic development.

Historic city planning documents call for South Capitol Street to serve as a gateway into Washington, D.C. Yet today, the corridor functions mainly as an expressway, lacking any characteristics of its historic or gateway functions. By transforming South Capitol Street from an expressway to an urban boulevard, the project would improve multimodal mobility, safety, accessibility, and economic development. In particular, a streetscape concept would improve the safety of the pedestrian and cycling environment by adding widened sidewalks; widened curbside lanes on some streets for bicycle travel; and increased pedestrian- and bicycle-oriented elements, such as street trees, benches, and decorative streetlights. The current streetscape concept for South Capitol Street, found in the DEIS, is shown in Figure B.4.

**Figure B.4 Streetscape Concept for South Capitol Street**




Crash data from January 1, 2000 until December 31, 2004 shows that some of the highest fatality rates in the District occur at four major intersections within the corridor. Crash severity rates at intersections in the corridor were calculated using the equation shown in the box at right. Rear-end crashes are the most frequent type of crashes, followed by left-turn and sideswiped crashes.

Factors contributing to these unsafe conditions include:

- Local roads overloaded with regional traffic;
- Inadequate sight distance;
- Insufficient/lack of advanced warning signs;
- Weaving traffic patterns;

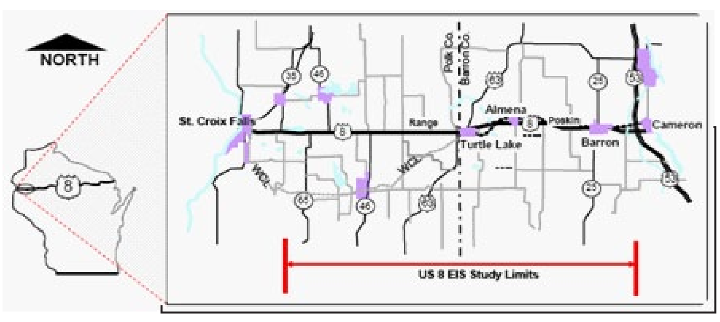
- S-curve alignment of the approach roads to the Frederick Douglass Memorial Bridge;
- Nonstandard pedestrian and bicycle facilities; and
- Lack of crosswalks, pedestrian signals, median barriers, and grade separations.

To address these issues, the DEIS evaluates two build alternatives (1 and 2) and a No-build alternative. The No-build would not adequately address the safety issues because it would include only small and isolated safety improvements. These would reduce left-turn and some rear-end crashes, but would not be sufficient to address additional crashes expected as traffic volumes increase.

Both Build Alternatives 1 and 2 include redesigned intersections with additional turn lanes and reconfigured interchanges intended to improve traffic flow and reduce the likelihood of crashes among motorists. Pedestrian and bicycle safety improvements would include new crosswalks, pedestrian signals, curb cuts, refuge islands, and other bicycle accommodations. Alternatives 1 and 2 also would replace the Frederick Douglass Memorial Bridge with one that meets current design standards and provides a safer crossing for pedestrian and bicyclists. The primary difference between the two alternatives is that Build Alternative 2 increases the number of at-grade intersections and traffic circles/ovals, which could create conflicting movements between automobiles. Build Alternative 1 proposes to keep median barriers and maintain grade separations, reducing the potential for conflicts.

The Preferred Alternative will eventually be chosen and further examined in the FEIS. The proposed urban boulevard design for South Capitol Street will contribute to the safety, accessibility, multimodal mobility, and economic development of the corridor.

## B.5 Wisconsin DOT: U.S. 8 – *Public Involvement and Safety*




A 40-mile stretch of U.S. 8 runs east to west in Wisconsin from WIS 35 North in Polk County to U.S. 53 in Barron County. This corridor passes through the Communities of Range and Poskin; the Villages of Turtle Lake and Almena; the City of Barron; and the Towns of St. Croix Falls, Balsam Lake, Apple River, Beaver, Almena, Clinton, Barron, and Stanley. Since the mid-1990s, the corridor has been of interest to a group of county and local officials, concerned with safety and congestion along the corridor.

Known today as the U.S. 8 Coalition, the group has expanded and consists of county highway commissioners, highway committee chairpersons, and community members from each county. The group's goal is to promote, develop, and prioritize improvements to U.S. 8. In 2001, the original legislative mandate to study this stretch of the corridor was the direct result of input from the Coalition.

The purpose of this project was to identify the preferred corridor for the eventual construction of a multilane facility meeting future transportation and safety needs for U.S. 8. Because of the length of the corridor and the complexity of issues in each community, analysts divided the corridor into seven individual segments for study. Each segment had one or more alternatives in addition to the No-build alternative. Of the seven segments, the Turtle Lake segment is the only one without a Preferred Alternative. Due to the number of severe crashes in the Village of Turtle Lake, analysts concluded further study in the form of a Tier 2 EIS or EA was needed.

The project Tier 1 EIS, including an ROD, has been completed, resulting in consensus on the basic location and design vision for the overall corridor. The Tier 2 environmental documentation will include formal corridor preservation for the preferred segments, and Tier 3 will include advancement of the proposed alternatives to projects that move to final design.

Due to the interest and commitment of the U.S. 8 Coalition, public support has been high for improvements that address congestion, safe access to and from U.S. 8, and mobility for both local and regional traffic. In 1994, the Coalition developed purpose and mission statements to formalize its desire to provide a safe route that met the growing demands of the collective communities. The purpose of the group is to *secure the provision of safe and efficient travel and economic growth on U.S. 8 for the next generation;* and the mission is to *work cooperatively in promoting, developing, and prioritizing improvements to U.S. 8 from the Minnesota/Wisconsin border to WIS 13 in Price County.* From the beginning, the Coalition established a close working relationship with the Wisconsin DOT, who ultimately helped them secure money from the State Legislature to study the safety and congestion impacts along this 40-mile stretch of U.S. 8. As part of the EIS environmental process, the Coalition participated in public forums, held their own meetings to update members regarding the progress and issues along the project, and made a commitment to long-range planning activities in their local Comprehensive Plans.

Another element of this project indicative of the Coalition members' commitment to safety in the corridor was the response to the road safety analysis. Updated crash analysis, covering 2001 to 2006, showed the crash rates throughout the corridor, as a whole, were below the statewide average, but fatal crash rates exceeded the statewide average on more than one-half of the individual segments. In particular, the recent number of fatal crashes in the Village of Turtle Lake prompted the Village to ask for a Road Safety Audit from Wisconsin DOT. This delayed the recommendation of a Preferred Alternative in the Tier 1 EIS for the Village of Turtle Lake, but the results of the road safety audit will be used to inform the

Tier 2 environmental documentation. Tier 2 will specifically evaluate and select a Preferred Alternative for the Turtle Lake segment that meets the safety needs of the project.

## B.6 Tennessee DOT: *Expediting Road Safety Improvements*

The Tennessee DOT has an extensive program to conduct Road Safety Audit Reviews (RSAR) that examine the need for safety improvements for existing road segments, intersections, corridors, and ramp queues. The intent of the RSAR program is to implement low-cost safety improvements in an expedited manner.

The RSAR process involves a multidisciplinary team, including staff from the Short-Range Planning Office, the Project Safety Office, the Conceptual and Environmental Documentation Office, the State Bike/Pedestrian Coordinator, Region Design Office, and the Region Traffic Office. Additional professionals (e.g., law enforcement, structural, or right-of-way) participate as needed. The RSAR team examines the interaction of project elements and considers the safety of all road users while promoting Tennessee DOT's goal of reducing injuries and fatalities.

Tennessee DOT's Project Safety Office manages the RSAR process. They initiate the RSAR and perform the following duties:

- Gather data and other information about safety issues at site;
- Analyze crash data;
- Identify sites in the study area that are eligible for safety funding; and
- Conduct a RSAR and prepare report.

Environmental staff are invited to prebriefings and to discuss safety issues identified during the RSAR, as well as to recommend improvements. At the prebrief meeting, participants plan a site visit and review data, including collision history, collision diagram, traffic volumes, and aerial photos. The multidisciplinary team conducts the site visit and considers all factors that could impact safety, such as all road users, environmental conditions, safety, road user characteristics, and surrounding land uses.

The RSAR focuses almost entirely on safety improvements, and does not consider operational issues in detail. If an operational or design issue did arise during the audit, the project would be handled in more traditional manner with coordination between the planning and NEPA staff. Under typical conditions, the RSAR safety recommendations qualify for treatment as a Categorical Exclusion (CE), allowing expedited execution. These types of activities include, but are not limited to, pavement markings, rumble strips, traffic lights and/or signs, guard rails, and concrete barrier end treatments.

Tennessee DOT has prepared a Programmatic Categorical Exclusion (PCE) for most of these types of projects, presuming that they stay within existing right-of-way. The PCE includes technical studies: historical, archaeological, air and noise, hazardous materials, and ecological reports that are subject to the FHWA oversight and approval. In this manner, Tennessee DOT is able to expeditiously address safety problems as soon as they are evident.

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