

**RESEARCH**



**Report No. UT-26.01**

# **IMPLEMENTING THE SAFE SYSTEM APPROACH FOR SPEED MANAGEMENT IN UTAH**

**Prepared For:**

Utah Department of Transportation  
Research & Innovation Division

**Final Report  
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16. Abstract Speed management is central to reducing fatal and serious injury crashes. The Safe System Approach, an emerging roadway safety paradigm in the United States, recognizes human error and vulnerability and focuses on minimizing crash severity through coordinated policy, design, and operational strategies. This research examines how Safe System Approach principles can be applied to speed management, with a focus on identifying practical countermeasures and implementation strategies relevant to the Utah Department of Transportation (UDOT). A compendium of practice was conducted to evaluate speed management countermeasures and document how cities and state Departments of Transportation are implementing Safe System Approach-based strategies. Thirty-two countermeasures were identified, including policy-based programs, automated enforcement, and roadway design treatments such as road diets, roundabouts, curb extensions, and gateway features. Findings show that implementing multiple, coordinated strategies is more effective than isolated interventions. The use of high-quality, context-sensitive speed and safety data supports proactive alignment of speed limits, roadway design, and safety goals. Establishing a clear Safe System Approach vision, supported by available federal and state tools, provides agencies with clear guidance for implementation. Based on the results of this research, several recommendations were provided for UDOT, including continuing to implement countermeasures for speed management in speed limit setting policies, evaluating current policies related to speed safety cameras in the state, incorporating Safe System Approach practices in the Strategic Highway Safety Plan, creating a speed management action plan, and placing a strong emphasis on community education tied to speed management.					
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## **LIST OF ACRONYMS**

Caltrans	California Department of Transportation
DOT	Department of Transportation
EMS	Emergency Medical Services
FARS	Fatality Analysis Reporting System
FHWA	Federal Highway Administration
HSIP	Highway Safety Improvement Program
HVE	High-Visibility Enforcement
ITE	Institute of Transportation Engineers
MassDOT	Massachusetts Department of Transportation
MnDOT	Minnesota Department of Transportation
NACTO	National Association of City Transportation Officials
NCHRP	National Cooperative Highway Research Program
NDOT	Nevada Department of Transportation
NHTSA	National Highway Traffic Safety Administration
ROW	Right-of-Way
SHSP	Strategic Highway Safety Plan
SS4A	Safe Streets and Roads for All
TAC	Technical Advisory Committee
UDOT	Utah Department of Transportation
UDPS	Utah Department of Public Safety
USDOT	United States Department of Transportation
VRU	Vulnerable Road User
WSDOT	Washington State Department of Transportation

## **EXECUTIVE SUMMARY**

Speed is a critical determinant of traffic safety outcomes, directly influencing both the likelihood and severity of roadway crashes. As vehicle speeds increase, crash forces quickly exceed the human body's tolerance, leading to preventable fatal and serious injuries. The Safe System Approach addresses this risk by acknowledging human error and vulnerability and by designing transportation systems that reduce severe outcomes even when mistakes occur. Speed management is a foundational element of the Safe System Approach and is essential to achieving long-term safety goals.

This research explores how the Safe System Approach can be applied to speed management within the Utah Department of Transportation (UDOT). The study synthesizes federal guidance, particularly the Federal Highway Administration's "Safe System Approach for Speed Management Framework," with a review of policies, plans, proven countermeasures, and case studies from peer and neighboring cities and states. These examples were selected based on the clarity of available documentation and their demonstrated application of Safe System Approach principles related to speed. The findings provide practical direction for establishing a shared vision, building consensus, and advancing proactive, systemwide speed management strategies.

The primary finding of this research is that effective Safe System Approach speed management depends on the coordinated implementation of multiple strategies rather than reliance on a single countermeasure. Jurisdictions that made progress toward reducing fatal and serious injury crashes consistently combined policy direction, roadway design, speed limit setting, enforcement, education, and land use considerations. Aligning these elements within a unified framework allowed agencies to reinforce safety objectives across planning, design, and operations, resulting in more consistent and durable outcomes.

Another key finding is the critical role of integrating high-quality, context-sensitive data into speed management decisions. Agencies that use data proactively (e.g., operating speed data, serious injury and fatal crash trends, citation data, and land use context) were better able to identify systemic risk and align speed limits and roadway design with injury minimization goals

before severe crashes occurred. The research also highlights the limitations of relying solely on traditional speed study methods, which reflect existing driver behavior rather than safe operating conditions. Instead, data should be used to inform target speeds based on human tolerance and roadway context.

The research further finds that establishing a clear and shared Safe System Approach vision is essential for building internal and external consensus. Agencies that embedded Safe System Approach principles into formal documentation (e.g., Strategic Highway Safety Plans, speed management action plans, and design guidance) created a common foundation for decision making. Clear articulation of goals and principles helped align state and local partners, supported communication with elected officials and the public, and strengthened institutional commitment to safer speeds.

Finally, this study finds that transportation agencies have access to a wide range of tools and resources that provide actionable guidance for implementing the Safe System Approach for speed management. Federal frameworks, state-level guidance, and practitioner resources offer practical steps for setting target speeds, integrating design strategies, and aligning policies with Safe System Approach principles. Agencies that actively used these tools were better positioned to move from concept to implementation.

Based on these findings, this research presents recommendations focused on establishing a Safe System Approach vision for speed management, coordinating strategies across disciplines, improving the use of high-quality data, and leveraging existing tools and resources. Together, these actions provide UDOT with a structured and evidence-based path to advance safe speeds, strengthen its safety culture, and reduce fatal and serious injury crashes across the roadway network.

## **1.0 INTRODUCTION**

### **1.1 Problem Statement**

As noted in the Federal Highway Administration (FHWA) “Safe System Approach for Speed Management,” “Speeding, exceeding the posted speed limits, or traveling too fast for conditions was a contributing factor in almost 29 percent of all fatalities in 2021...Speed is fundamental in dictating injury risk for all road users in any crash, especially for vulnerable road users (VRUs) such as pedestrians and bicyclists” (Kumfer et al., 2023). In evaluating Utah crash data from January 1, 2019 through December 31, 2024, speed-related crashes accounted for 32 percent of fatal crashes in the state (UDPS, 2026). The “Safe System approach represents a paradigm shift in how road safety is addressed. Foundational to the Safe System approach is that no person should be killed or seriously injured when using the road system, and that it is a shared responsibility by all parties involved to ensure this becomes reality” (Kumfer et al., 2023).

### **1.2 Objectives**

The purpose of this research is to build upon previous research conducted by Brigham Young University for the Utah Department of Transportation (UDOT) to evaluate the Safe System Approach for intersections (Schultz et al., 2024) by expanding the research to include the Safe System Approach for speed management. Case studies of locations that have implemented the Safe System Approach will be analyzed, with a focus on speed management. Further measures and policies recommended by the Institute of Transportation Engineers (ITE) and the FHWA will be discussed. This research will also investigate how other state Departments of Transportation (DOTs) are applying the Safe System Approach for speed management. The results of this research will allow the UDOT Traffic & Safety Division to continue to identify new and innovative ways to improve safety and manage speeds across the state using the Safe System Approach.

### **1.3 Scope**

This report is intended to provide information and recommendations concerning the Safe System Approach and how it should be implemented with speed management practices within Utah. To accomplish this, the research team completed a comprehensive literature review, evaluated the state of the practice in other states and jurisdictions, and provided recommendations for implementation for UDOT.

A comprehensive literature review was completed to train and inform new research assistants regarding the general topic of safety and to address specific topics in the research including background on the Safe System Approach, safety analysis procedures, and background on the FHWA Safe System Approach tools currently in place or under development related to speed management. A key outcome of the state's safety research is the transfer of knowledge that supports the development of the next generation of safety engineers.

The research team identified several states and other jurisdictions where Safe System Approach methods have been effectively used for speed management and prepared a synthesis of best practices from these states and jurisdictions. Several best practices have been presented at various ITE annual meetings, webinars, and publications. The research team worked closely with the UDOT Technical Advisory Committee (TAC) members to identify any examples to be specifically addressed. The research team then evaluated and summarized the different Safe System Approach methodologies identified for implementation in Utah. The research team prepared a comparison table of the different approaches and identified how they could be implemented and evaluated and discussed the quantification of safety benefits (as available) for reducing speeds.

Finally, limited conclusions and recommendations were identified by the research team based upon observations and analysis in each of the tasks above that can aid UDOT in better implementing the Safe System Approach for speed management across the state.

## 1.4 Outline of Report

This report contains the following chapters:

- Chapter 1 introduces the research topic, objectives, scope, and report outline.
- Chapter 2 includes a literature review exploring topics connected to the research.
- Chapter 3 contains a state of the practice for applying the Safe System Approach for speed management.
- Chapter 4 evaluates and categorizes measures and policies discussed in the state of the practice.
- Chapter 5 provides concluding remarks.
- Chapter 6 provides recommendations and implementation plan suggestions for how the Safe System Approach can be implemented for speed management in Utah.

The chapters are followed by a References section.

## **2.0 LITERATURE REVIEW**

### **2.1 Overview**

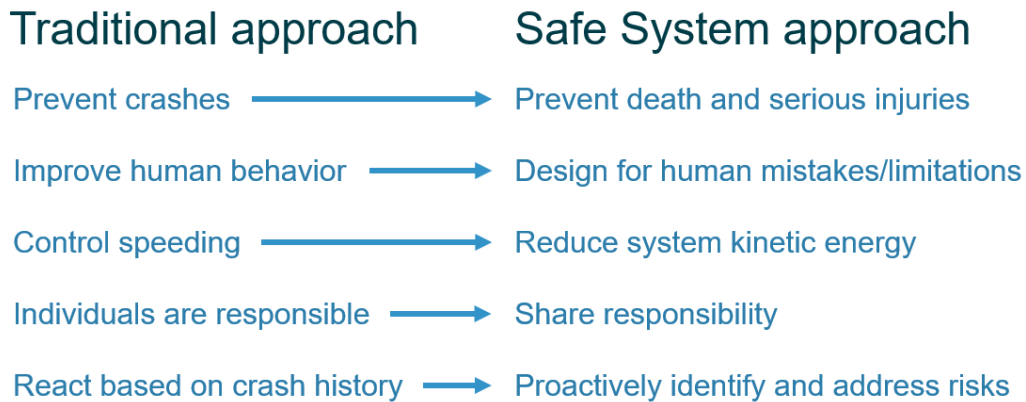
This literature review aims to explore existing research on the Safe System Approach and how it relates to speed management. It begins with a historical overview of the Safe System Approach, highlighting how it differs from traditional methods. Next, the review covers systemic safety analysis and the Systemic Safety Project Selection Tool. It then briefly discusses the guiding principles and core elements of the Safe System Approach. Finally, the review details the Safe System Approach for Speed Management Framework presented by the FHWA, which serves as the foundation for much of this research.

### **2.2 History of the Safe System Approach**

A Vision Zero policy was first enacted by Sweden in 1997 (Lie and Tingvall, 2000). This type of policy has since been implemented by several more European countries and around the world, including in the United States. The main objective of Vision Zero is to reach zero fatalities or serious injuries due to roadway crashes. Vision Zero introduced several ideas that differ from traditional safety approaches. Traditionally, responsibility for road safety has been placed on individual road users. Vision Zero acknowledges that people will make mistakes, and that the transportation system should be designed so that human errors do not result in serious injury or death. While road users still have the responsibility to follow the laws, Vision Zero shares the responsibility of roadway safety with system designers. Not all crashes will be prevented, but they should be limited such that no crash results in a fatality or serious injury. Through the implementation of Vision Zero policies, Sweden's fatality rate was reduced from 7 to 3 deaths per 100,000 persons over a decade (Ecola et al., 2018).

Vision Zero describes the goal of transportation agencies and the Safe System Approach describes the method of how the goal is achieved (Porter et al., 2021). The Safe System Approach is a comprehensive approach to safety that focuses on preventing fatalities and serious injury while designing for human mistakes and limitations. It includes several elements that state DOTs and other jurisdictions can directly address. This approach is intended to focus on one

unified system to create continuity throughout and increase the safety and resiliency of the transportation system. The Safe System Approach differs from traditional safety approaches by focusing on reducing the kinetic energy in the system rather than focusing primarily on controlling speeding. Additionally, this approach promotes proactively identifying and addressing risks to prevent potential crashes before they occur. The differences between traditional safety approaches and the Safe System Approach are summarized in Figure 2.1



(FHWA, 2024a).

**Figure 2.1 Comparison of Traditional and Safe System Approaches (FHWA, 2024a)**

Although controlling speeding is not a part of the Safe System Approach, speed is the key determinant of kinetic energy in a crash. In order to reduce the kinetic energy in the system, speed management is a central part that determines the level to which a Safe System can be achieved (Porter et al., 2021). A Safe System Approach strives to manage speeds through a multifaceted speed management framework so that impact forces experienced by road users do not exceed their physical tolerances (Kumfer et al., 2023).

### 2.3 Systemic Safety Analysis

Systemic safety analysis, also known as the systemic approach to safety, was created by the FHWA and is focused on improving safety proactively by addressing high-risk roadway features correlated with severe crash types (Preston et al., 2013). It supplements traditional safety analysis by broadening traffic safety efforts to include crash history and risk to make low-cost

safety improvements. This data-driven process identifies potential sites and projects that may not be captured by traditional methods.

The key distinction of systemic safety analysis is that it examines common issues across the entire roadway system rather than concentrating solely on specific locations with high crash histories or densities. While traditional safety analysis addresses specific high-crash locations, referred to as hotspots, the systemic approach targets crash types dispersed across the network. Thus, it offers a comprehensive and complementary strategy for preventing fatal and serious crashes (Shaon et al., 2023). Both methods are essential for an effective safety management program.

The FHWA has developed a Systemic Safety Project Selection Tool to help transportation agencies incorporate a systemic approach to safety planning and project selection processes. The purpose of this tool is to find locations within a roadway network that share risk factors associated with severe crashes, even if those locations have minimal crash histories, thus proactively addressing potential crash areas. The tool consists of six steps, organized into three elements, as depicted in Figure 2.2.



**Figure 2.2 Systemic Safety Project Selection Tool (Preston et al., 2013)**

Element 1 is the Systemic Safety Planning Process and is divided into four steps, which are to Identify Focus Crash Types and Risk Factors, Screen and Prioritize Candidate Locations, Select Countermeasures, and Prioritize Projects. Following that is Element 2, which is a Framework for Balancing Systemic and Traditional Safety Investments. This element only has one step, which is to Identify Funding for the Systemic Program and Implement it. Finally, Element 3, an Evaluation of a Systemic Safety Program, also has only one step, which is to Perform Systemic Program Evaluation (FHWA, 2026a). The following sections will summarize the Systemic Safety Project Selection Tool elements and steps.

### 2.3.1 Systemic Safety Planning Process

Element 1, the Systemic Safety Planning Process, provides a step-by-step approach for systemic safety planning. The goal of this element is to identify different candidate roadway locations for safety investments. This is done by comparing the characteristics of a roadway with characteristics that are associated with severe crashes (Preston et al., 2013). This element has four sequential yet iterative steps, which are as follows:

1. Identify Focus Crash Types and Risk Factors;
2. Screen and Prioritize Candidate Locations;
3. Select Countermeasures; and
4. Prioritize Projects.

The following subsections will describe each of these steps.

#### *2.3.1.1 Identify Focus Crash Types and Risk Factors*

The first step in Element 1 analyzes systemwide crash data to identify focus crash types and associated risk factors. This helps pinpoint locations with similar risks for prioritization. Key data elements include system type, crash type, facility type, and location characteristics. These elements are supported by details like traffic volumes, roadway features, and intersection attributes. The process involves the following three tasks:

1. **Select Focus Crash Types:** Analyze crashes to identify those with the greatest potential for reducing severe outcomes, guided by state or regional Strategic Highway Safety Plans (SHSPs).

2. **Select Focus Facilities:** Use a “crash tree” to determine where specific crash types frequently occur.
3. **Identify and Evaluate Risk Factors:** Document common characteristics of crash locations to refine risk analysis using additional road and intersection data.

This step establishes focus crash types, facilities, and risk factors, forming the foundation for further safety planning.

#### *2.3.1.2 Screen and Prioritize Candidate Locations*

The second step in Element 1 creates a prioritized list of roadway locations for safety improvements using two key data types: site-specific crash information and roadway characteristics, including risk factors like geometry and traffic elements. The process involves three tasks:

1. **Identify Network Elements to Analyze:** Identify relevant roadway elements like curves and intersections, ensuring segments are homogeneous in design and traffic characteristics.
2. **Conduct Risk Assessment:** Document roadway and traffic features, along with crash history, using field reviews or existing data.
3. **Prioritize Focus Facility Elements:** Rank locations based on the presence of risk factors, with more factors indicating higher priority. Risk factors can also be weighted depending on their connection to severe crashes.

This step results in a ranked list of locations that highlights areas with the highest need for safety enhancements.

#### *2.3.1.3 Select Countermeasures*

The third step in Element 1 focuses on selecting countermeasures to address identified crash types and risk factors effectively. The process involves the following three tasks:

1. **Assemble a Comprehensive List of Countermeasures:** Compile a detailed list of potential countermeasures using resources like research reports, safety plans, and

agency experience. Examples include FHWA’s countermeasure guides and updates to traffic signs.

2. **Evaluate and Screen Countermeasures:** Assess countermeasures based on safety effectiveness, costs, and maintenance feasibility. Use tools like the Highway Safety Manual and benefit-cost analyses to prioritize options.
3. **Select Countermeasures for Deployment:** Develop a short list of low-cost countermeasures with a few higher-cost options for specific needs. Consider crash reduction potential, implementation costs, and high-priority locations.

The result of this step is a focused list of countermeasures to guide safety project development and support future program evaluations.

#### *2.3.1.4 Prioritize Projects*

The fourth step in Element 1 focuses on prioritizing projects by applying selected countermeasures to at-risk locations. The process involves three tasks:

1. **Create a Decision Process for Countermeasure Selection:** Develop a consistent decision process for assigning countermeasures to high-priority locations. Establish criteria, such as volume, environment, and land use, to match countermeasures to similar crash and risk characteristics. Tailor processes to specific facility types or issues, knowing that no single countermeasure fits all locations.
2. **Develop Safety Projects:** Use the decision process to assign countermeasures to candidate locations. Document site details, select countermeasures, estimate costs, and summarize risk scores. Group projects into efficient design packages for implementation.
3. **Prioritize Safety Project Implementation:** Rank projects based on various factors, namely funding availability, crash reduction potential, outreach needs, and environmental constraints. Coordinate with existing programs and adjust priorities as needed to ensure practicality.

The result is a prioritized list of safety projects, completing the systemic safety planning process and establishing a systemic safety program for the jurisdiction.

### 2.3.2 Framework for Balancing Systemic and Traditional Safety Investments

Element 2 is a Framework for Balancing Systemic and Traditional Safety Investments. This element helps agencies determine how to distribute their safety funding between projects identified through the traditional site analysis and those identified through a systemic safety approach (Preston et al., 2013).

There is one step in Element 2, which is to Identify Funding for the Systemic Program and Implement it. This step reviews past safety investments and crash history to guide future actions. It combines insights from historical effectiveness, agency goals, and roadway characteristics to assess the benefits of systemic investments. Funding decisions are driven by program goals, not solely cost-benefit analysis. Next, a funding determination framework can be made, emphasizing a balance between systemic and site analysis projects rather than fully prioritizing one approach. This balance varies by region, roadway type, and crash focus (e.g., urban vs. rural, or state vs. local). Agencies should tailor their safety funding budget to reflect their unique crash and roadway characteristics. Safety program managers can evaluate their systemic safety planning to determine funding needs and understand potential crash reductions from different investment levels. Several states have developed spreadsheet tools to estimate crash reduction for systemic programs. This data-driven framework can guide safety investment decisions by continuously reassessing and adjusting the approach based on the results of ongoing evaluations.

### 2.3.3 Evaluation of a Systemic Safety Program

Element 3 is an Evaluation of a Systemic Safety Program. The aim of this element is to guide agencies in evaluating their systemic safety programs and adjusting based on the evaluation results to ensure their effectiveness (Preston et al., 2013).

Element 3 also has only one step, which is to Perform Systemic Program Evaluation. Systemic safety programs are constantly evolving, which can make their evaluation challenging, especially in areas without recent crash data. However, quantifying their effectiveness is essential for improving safety planning, gaining institutional support, and justifying investments. This step outlines potential evaluation methods, data needs, and performance measures, with

further research required as the approach develops. Evaluation occurs at three levels, which are as follows:

1. **Output (Implementation of Countermeasures):** Evaluate whether projects align with planned goals, including funding, focus crash types, facility types, and countermeasure application.
2. **Focus Crash Types (Reduction in Severe Crashes):** Track long-term trends in crash frequency and severity, using at least 3 years of data to assess the effectiveness of systemic countermeasures.
3. **Countermeasure Performance (Effectiveness of Specific Countermeasures):** Evaluate individual countermeasure performance to guide resource allocation toward successful strategies.

A comprehensive evaluation process across these levels ensures that systemic safety programs are refined, resources are efficiently allocated, and safety improvements are integrated into agency practices. The FHWA has announced plans for the Systemic Safety User Guide, which will be a substantial update that builds upon the Systemic Safety Project Selection Tool. It has not yet been announced when this guide will be released (FHWA, 2026a). More information on systemic safety analysis and the Systemic Safety Project Selection Tool can be found in the FHWA report (Preston et al., 2013).

## 2.4 Safe System Principles

The Safe System Approach focuses on accommodating human error, sharing responsibility, and proactively making changes to prevent fatalities in transportation-related crashes. The approach is based on six main principles and five core pillars, called elements, as shown in Figure 2.3. The principles that the Safe System Approach follows are (FHWA, 2024b):

1. Death/Serious Injury is Unacceptable;
2. Humans Make Mistakes;
3. Humans are Vulnerable;
4. Responsibility is Shared;

5. Safety is Proactive; and
6. Redundancy is Crucial.



**Figure 2.3 The Safe System Approach Elements and Principles (FHWA, 2024b)**

The following subsections will briefly describe each of these principles.

#### 2.4.1 Death/Serious Injury is Unacceptable

The foundation of the Safe System Approach is the idea that no one should be killed or seriously harmed while using the transportation network. While eliminating all crashes is an unrealistic goal, preventing crashes that result in fatality and serious injury is the objective of this approach. Safety for all transportation users, regardless of their backgrounds, abilities, or modes, should be put first (Khan and Das, 2024).

### 2.4.2 Humans Make Mistakes

For decades, the focus in safety programs has been on preventing human error, however, the Safe System Approach focuses on accommodating human error. Compliance will never be perfect as humans inevitably make mistakes (Ecola et al., 2018). This approach emphasizes designing to account for human error and injury tolerances to allow for reasonable human mistakes without a fatality (Khan and Das, 2024). Following this approach results in creating safer environments that forgive human errors and reduce the impact of mistakes.

### 2.4.3 Humans Are Vulnerable

Human bodies are inherently vulnerable to external forces. The Safe System Approach emphasizes that there is a maximum amount of force from crashes that human bodies can tolerate. Recognizing this can lead to having a human-centric transportation system that considers human vulnerabilities. By doing so, the kinetic energy can be managed to a level that eliminates chances of fatalities or serious injury by not exceeding these tolerances (Khan and Das, 2024). This principle once again acknowledges that humans make errors, however, the well-being of road users is prioritized so that these errors do not result in death or serious injury.

Pedestrians, cyclists, and other non-motorized road users are especially vulnerable. These unprotected travelers are exposed to greater risks along the roadway than drivers in vehicles and are referred to as VRUs.

### 2.4.4 Responsibility Is Shared

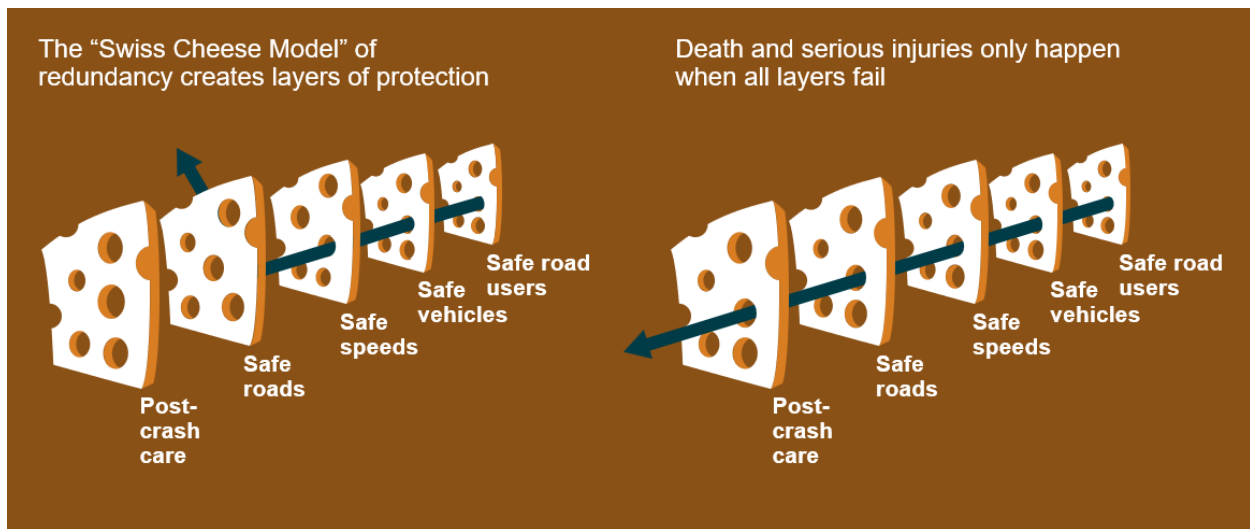
There is no one entity responsible for road safety, rather the Safe System Approach emphasizes that responsibility is shared by all involved. Government agencies may design the road system and execute a safety action plan, but there are additional stakeholders needed to collaborate and contribute to preventing fatalities and serious injury on the roadways (Khan and Das, 2024). The responsibility to create a safe environment is shared between road users as well as roadway and vehicle designers (Ecola et al., 2018). Increased engagement from each stakeholder across the entire transportation system assists in comprehensively increasing road safety.

### 2.4.5 Safety Is Proactive

The Safe System Approach encourages a proactive approach to safety that looks to prevent future crashes through systemwide changes. Regular review and monitoring can assist in improving areas where crashes continue to occur (Ecola et al., 2018). Detecting and reducing latent hazards in the system can provide recommendations to systemically implement throughout the system (Khan and Das, 2024). Avoiding a solely reactive perspective on safety and instead looking forward to the future will prevent potential fatal and serious injury crashes.

### 2.4.6 Redundancy Is Crucial

The principle of redundancy is a crucial aspect of the Safe System Approach. All components, or Safe System elements, of the system must be strengthened (Khan and Das, 2024). This creates a resilient system that continues to protect people and reduces the potential for serious consequences after a crash, even if one or more parts of the system fail. The layered protection provided by this redundancy can be visualized through the “Swiss Cheese Model” shown in Figure 2.4 (FHWA, 2024a). Each layer represents an element of the Safe System Approach, with holes representing potential weaknesses of each element. Even if one part fails, the other elements work to prevent fatal or serious crashes. Only when the weaknesses of all the elements are aligned would death and serious injuries occur.



**Figure 2.4 Swiss Cheese Model (FHWA, 2024a)**

## 2.5 Safe System Elements

As shown previously in Figure 2.3, the Safe System Approach consists of five key elements that can be improved to help a transportation system adhere to the Safe System principles. By addressing and improving each element holistically, the system creates layers of redundancy, reducing the likelihood of fatal crashes. The elements of the Safe System Approach are (USDOT, 2025):

1. Safe Road Users;
2. Safe Vehicles;
3. Safe Speeds;
4. Safe Roads; and
5. Post-Crash Care.

The following subsections will briefly describe each of these elements.

### 2.5.1 Safe Road Users

The Safe Road Users element emphasizes the importance of safe and responsible behavior by all road users while highlighting that roadway conditions are designed to ensure people can reach their destinations safely. The Safe System Approach promotes adherence to traffic laws and supports roadway designs that encourage and facilitate safer actions (Khan and Das, 2024). According to the United States Department of Transportation (USDOT), the three most common behavioral safety factors in fatal crashes are failure to wear seat belts, impaired driving due to alcohol, and speeding. In 2022 alone, these three behaviors contributed to 20,352 driver fatalities, underscoring the critical need for responsible driving practices (USDOT, 2025). These statistics highlight the vital role that individual responsibility plays in reducing traffic fatalities and fostering a culture of safety on our roads.

### 2.5.2 Safe Vehicles

The Safe Vehicles element of the Safe System Approach emphasizes the importance of vehicle technologies and design in preventing crashes and minimizing their impact. Active safety features, such as emergency braking systems, and passive features, like seat belts and airbags,

play a critical role in protecting passengers during collisions (Khan and Das, 2024). Advanced technologies, such as Intelligent Speed Assistance, further promote safer driving behavior by encouraging drivers to maintain appropriate speeds (Kumfer et al., 2023). According to the USDOT, expanding the availability of vehicle systems that prevent crashes and reduce crash severity is essential. Regulatory measures like the Federal Motor Vehicle Safety Standards have mandated seat belts and airbags, which are estimated to have saved 425,000 lives since their introduction. These advancements demonstrate the potential of safe vehicle features to significantly improve road safety for both occupants and non-occupants.

### 2.5.3 Safe Speeds

Safe Speeds are a central component of an effective speed management program as well as the Safe System Approach (Kumfer et al., 2023). Higher speeds exponentially increase the risks on roadways, particularly for VRUs like pedestrians, making speed management crucial for enhancing safety. In Utah, data from 2019 to 2024 reveal that over 30 percent of all motor vehicle fatalities were related to speeding (UDPS, 2026). Slower speeds help prevent collisions and limiting the speed of impact significantly reduces the severity of injuries. Achieving safe speeds requires a comprehensive and multifaceted approach that integrates road design, infrastructure, speed limits, education, enforcement, and consideration of factors like context, density, and mode of transportation (Khan and Das, 2024). Addressing speed holistically is vital for creating safer roads for all users.

### 2.5.4 Safe Roads

Safe Roads are a foundational element of the Safe System Approach, focusing on roadway design to enhance safety for all users. This involves physically separating different types of road users, such as drivers, cyclists, and pedestrians, and incorporating clear zones to reduce potential conflicts (Khan and Das, 2024). Infrastructure plays a key role in influencing driver behavior, with thoughtfully designed roads encouraging lower speeds to improve safety outcomes (Kumfer et al., 2023). Roadway environments should be designed to mitigate human errors, account for injury tolerances, and promote safer behaviors, particularly for the most vulnerable users (USDOT, 2025). Roadway design also impacts how people interact with the surrounding transportation network, including land use and connections to other modes like rail

and transit. By incorporating elements that provide redundancy and layers of protection, safer roadways can prevent crashes and reduce harm when collisions occur.

### 2.5.5 Post-Crash Care

Post-Crash Care is a vital element of the Safe System Approach, encompassing emergency services, medical treatment, crash reporting, investigation, traffic incident management, and legal processes (Khan and Das, 2024). Effective post-crash care requires infrastructure designed to facilitate the rapid response of first responders, ensuring they can reach crash sites as quickly as possible (Kumfer et al., 2023). According to the USDOT, improving survivability in crashes depends on timely access to emergency medical care and robust traffic incident management practices that protect first responders and prevent secondary crashes (USDOT, 2025). The prompt arrival of skilled Emergency Medical Services (EMS) personnel is particularly important in rural and tribal areas, where longer response times and limited EMS resources pose significant challenges. These practices can be incorporated into highway safety planning by utilizing 911 and EMS data, coordinating efforts among highway safety teams, EMS, and 911, and integrating post-crash care into comprehensive safety plans (USDOT, 2025). By prioritizing these strategies, communities can enhance post-crash outcomes and build a safer, more responsive transportation system for all.

## **2.6 The Safe System Approach for Speed Management Framework**

The amount of kinetic energy per crash contributes to the level of severity, and speed is the key determinant of kinetic energy. Because of this, speed management is central to the extent to which a Safe System can be achieved (Porter et al., 2021). A Safe System Approach strives to manage speeds so that the physical tolerances of road users are not exceeded by any impact forces that may be experienced. In the FHWA report titled “Safe System Approach for Speed Management,” a framework for speed management is proposed (Kumfer et al., 2023). This framework dovetails with the strategic emphasis on a multifaceted speed management approach, which is emphasized in the National Roadway Safety Strategy (USDOT, 2022b).

The following sections will describe the five cyclical stages that are presented in the framework (Kumfer et al., 2023):

1. Establishing a Vision and Building Consensus for Speed Management;
2. Collecting and Analyzing Speed and Safety Data;
3. Prioritizing Locations for Speed Management Proactively;
4. Selecting Speed Management Countermeasures; and
5. Ongoing Monitoring, Evaluation, and Adjustment.

### 2.6.1 Establishing a Vision and Building Consensus for Speed Management

The first stage given in the Safe System Approach for Speed Management Framework is establishing a vision and building consensus for speed management. This stage covers key ideas including the identification and understanding of potential policy barriers, various methods to mitigate or overcome these barriers, and institutional mechanisms for implementation. The information given in this section is especially relevant to transportation agencies looking to institute a new Safe System-based speed management program. This section covers examining existing legal constraints and sociopolitical factors in a jurisdiction, determining the practical scope of speed management activities, and mechanisms for establishing a vision for speed management for state and local agencies (Kumfer et al., 2023).

#### *2.6.1.1 Examine the Existing Legal Constraints and Sociopolitical Factors in a Jurisdiction*

Creating a speed management program begins with examining existing legal constraints and sociopolitical factors in a jurisdiction. There may be state and local ordinances that govern speed limits or provide other design codes that limit the ability to change speeds in an area. Being aware of these existing legal constraints as well as other potential sociopolitical factors that affect speed management is necessary for creating a program that is allowed within the laws and ordinances governing a jurisdiction. While state DOTs may not be able to easily make changes to statutory speed limits, they can adopt policies that influence how local agencies design roads and post speed limits.

With various constraints in mind, exemptions may need to be a necessary part of a speed management program. For example, some local agencies are bound by local codes to follow the International Fire Code and require a 28-foot street with parking on both sides. This type of roadway often induces higher operating speeds due to minimal visual friction, so exemptions from local codes may be needed to avoid designing these types of roadways.

### *2.6.1.2 Determining the Practical Scope of Speed Management Activities*

Once all legal and sociopolitical factors that affect speed limits have been identified, the applicable road segments for speed limit changes must be identified as well as the scope of speed management activities. In determining where speed limits can be changed, the FHWA recommends answering several related questions:

- Who owns the roadway?
- What speed limit is posted on this roadway?
- Where are the speed limit signs located on this roadway?
- Are there any applications for slow-speed zones on this roadway?
- What design features may need to be changed to accommodate a speed limit change?

Considering the answers to these questions will assist in prioritizing locations for treatment. The greatest benefit is seen when all roads in a network are aligned with speed management goals, however, some agencies may need to prioritize specific roadways first before moving forward. Applicable areas to be considered for wide-scale speed management efforts include urban cores and school zones, however, success has been found in other contexts as well. Highlighting examples of successful implementation of speed management efforts will help demonstrate efficacy to the public and build support for more projects.

Speed limit adjustments can be used to align operating speeds with target speeds, but first, appropriate target speeds for the roadway must be identified. There are many resources currently available to assist in identifying target speeds. Some agencies use base speeds that correspond to a 10 percent chance of fatality based on target crash types. Other agencies may use roadway context to determine maximum speeds. Whatever method is used, an end goal should be lowering speed limits to these target speeds. However, while lowering speed limits may be effective at reducing mean speeds, using only speed limit changes is unlikely to produce target speeds. Following the Safe System Approach, various roadway modification components of a speed management program should be used along with lowering speed limits to achieve target speeds.

### *2.6.1.3 Establishing a Vision for Speed Management: Mechanisms for State Agencies*

There are several mechanisms through which state-level agencies can establish a vision for speed management including policies, plans, and manuals. State transportation policies or executive orders can be used to promote a statewide vision of what speed management should look like. Network-wide consistency of a speed management vision will help with each of the subsequent stages of implementing a speed management plan.

States typically receive federal funding from the Highway Safety Improvement Program (HSIP) and are required to create and update an SHSP with safety performance targets. State SHSPs tend to emphasize speeding and enforcement, but a focus on speed management would better align with the Safe System Approach (Finkel et al., 2020). Additionally, a new rule has been created by FHWA that requires states to dedicate a minimum of 15 percent of HSIP funding to projects that address VRU safety if annual VRU fatalities represent 15 percent or more of total annual crash fatalities. Following this rule also aligns with creating a Safe System (FHWA, 2022).

Roadway design manuals can be used to set target speed ranges for roadway contexts and classifications, increasing consistency across the road network. Historical design standards may need to be updated to reflect new research and knowledge. Mismatches between the current land uses and original roadway designs can serve as motivation for lowering the target speeds for certain roadways (Kumfer et al., 2023).

### *2.6.1.4 Establishing a Vision for Speed Management: Mechanisms for Local Agencies*

Although the ability of a local agency to establish a speed management vision varies from a state agency, there are several mechanisms available and additional methods should be investigated. One main strategy is to adopt an organizing approach to planning, like Vision Zero. Having a clear plan helps unite diverse stakeholders with a goal. Additional policies and programs that can be implemented are Slow Streets, partially closing streets or providing traffic calming devices to create zones with slow speeds (Glandorf, 2020), or Complete Streets, an approach to policymaking, planning, design, and operations with a focus on multimodality to increase safe and accessible transportation options (Porter et al., 2024).

## 2.6.2 Collecting and Analyzing Speed and Safety Data

Collecting and analyzing speed and safety data is an important part of a speed management program. This section reviews the different types of data that can be used to identify speed problems on a network as well as their sources and limitations. The Safe System Approach for Speed Management framework should be a data-informed approach. Clear information can be leveraged to enforce a speed management vision while also supporting ongoing evaluation efforts. This section covers using a data-informed approach, relevant data for a speed management program, and the importance of quality data (Kumfer et al., 2023).

### *2.6.2.1 Using a Data-Informed Approach*

Data should be used to inform every step of the speed management process. This approach helps combat false perceptions. Existing information must be gathered and as these data are collected and information is shared, the public buy-in increases. Transparency in communication is important for a speed management program, so key information and explanations should be shared with all stakeholders, such as local and state agencies, enforcement personnel, and safety educators.

### *2.6.2.2 Relevant Data for a Speed Management Program*

Data are necessary and relevant to a speed management program to model and determine project prioritization. Examples of necessary data are roadway data (e.g., number of lanes, lane width, access), traffic volumes (e.g., vehicular annual average daily traffic, turning movements), speed data, traffic control type and location, lighting facilities and location, crash history, and other contextual information. While gathering these data for an entire network is time and resource intensive, doing so enables agencies to make informed decisions.

### *2.6.2.3 Importance of Quality Data*

Having quality data is key to producing an accurate speed management program, although often there are limitations. More accurate data can be especially beneficial for speed management programs. However, surrogate data such as the speed limit is often used to estimate operating or impact speeds. Because speed is an important factor of safety, assuming operating speeds based on the speed limit instead of using actual operating speeds can lower the accuracy

of crash data. Underreporting of many collisions, especially with pedestrians, also decreases crash data accuracy.

Statistical models and data science methods can be used to overcome many data limitations when used correctly. Accurate data can then allow for comparative before-after studies to understand the capabilities for a specific treatment. To supplement traditional safety data given the many limitations, agencies may consider collecting network-wide operating speed data, maintaining accurate records of project installation and completion, and adopting Safe System Approach-based risk measures to identify risks proactively.

### 2.6.3 Prioritizing Locations for Speed Management Proactively

In recognizing that the entire network cannot be targeted simultaneously, several different methods can be followed to identify locations for treatments. These include systemic analyses, placemaking frameworks, and equity considerations. It may be beneficial to target specific segments with speed or crash problems first while building support for widespread systemic improvements. The Safe System Approach Framework can be used to proactively identify locations where operating speeds exceed target speeds, since these locations have an increased risk of death and serious injury. This section covers prioritizing locations for systemic countermeasure implementation and schemes for prioritization (Kumfer et al., 2023).

#### *2.6.3.1 Prioritizing Locations for Systemic Countermeasure Implementation*

Systemic countermeasure implementation can be used to proactively prioritize locations for speed treatments. Typically, safety analysis is performed after a crash has occurred and focuses on treating human error factors such as exceeding the speed limit or aggressive driving. Systemic safety initiatives use information from well-documented serious crashes to identify pervasive crash types, facility types, and risk factors. Once identified, these factors can be used to recognize roadways with similar characteristics and preemptively address crashes there.

The Safe System Approach for Speed Management Framework fits into a four-component Systemic Safety Project Selection Tool procedure described earlier. This process begins with identifying focus crash types and risk factors, followed by screening and prioritizing candidate locations before selecting countermeasures and finally prioritizing projects (Preston et

al., 2013). A program like this should be specific, regularly updated, and fine-tuned. Specific prioritization may depend on the responsible jurisdiction.

### *2.6.3.2 Schemes for Prioritization*

Several strategies for prioritization can be used for determining speed management activities, including equity and placemaking concepts. Historical inequitable traffic planning and patterns of development have led to unequal social costs of traffic being borne by Black and Indigenous road users. Higher speeds are often used through these communities at their expense. Similarly, there tends to be a concentration of pedestrian fatalities in low-income communities and communities of color (Kumfer et al., 2023).

The desired activity of a space can also be used to prioritize roadways for speed management activities. Placemaking is a method of planning public spaces, such as transportation and facilities, so that the physical and social qualities of the space are balanced to promote desired values such as health and well-being. Placemaking for transportation entails considering who can or should use a roadway to reach a destination. This may be based on land use context, movement, and place. Locations that are intended to serve as specific public places with multi-modal use can be prioritized for speed management efforts. Researchers have begun to integrate the concept of place into crash prediction models and have found trends that can additionally be used to make changes proactively.

### 2.6.4 Selecting Speed Management Countermeasures

Implementing the Safe System Approach for Speed Management Framework may include infrastructure and speed limit changes where possible to achieve target speeds. Countermeasures such as traffic calming can reduce operating speeds to be closer to the desired speeds. Several factors must be considered when determining which kinds of roads will require supporting infrastructure and when speed management projects can be implemented. This section covers determining appropriate speed limits to match target speeds, informing the public about speed management benefits to build support, identifying and implementing roadway redesigns or behavioral treatments to support speed limit changes, countermeasures for improving speed limit compliance, and various speed management resources (Kumfer et al., 2023).

#### *2.6.4.1 Determine Appropriate Speed Limits to Match Target Speeds*

Appropriate speed limits must be determined to match target speeds. Target speeds should incorporate the needs of all users and remain consistent with their context. Specific contexts may provide mobility for motor vehicles as well as a safe environment for pedestrians, bicyclists, and transit users. Intermediate speeds may be necessary to achieve public buy-in when lowering speed limits. These may be achieved with incremental adjustments of 5 MPH or more.

#### *2.6.4.2 Inform the Public About Speed Management Benefits to Build Support*

There are several benefits to speed management and informing the public about these benefits can assist in building support for future efforts. Some of the positive effects of speed management include promoting physical activity, improving accessibility and equity, creating safe environments, reducing vehicle emissions, and decreasing air pollution.

#### *2.6.4.3 Identify and Implement Roadway Redesign or Behavioral Treatments to Support Speed Limit Changes*

Additional physical elements or other speed management treatments may be necessary to support any speed limit changes. Potential roadway treatments should be identified and implemented as needed. These may include vertical deflections, horizontal shifts, narrowing, intersection treatments, and signal timing modifications. When identifying the correct treatments, consideration should be given to minimizing potential conflicts with emergency vehicles, transit, and impacts on individuals with disabilities.

Behavioral treatments can also be implemented. These may include increasing the density of speed limit signs, installing speed feedback signs, traditional enforcement, and automated enforcement. Different treatments may not be available or effective for addressing certain design issues, so care should be taken in identifying which treatments would be most useful for each roadway.

#### *2.6.4.4 Countermeasures for Improving Speed Limit Compliance*

For certain roadways, changing speed limits may not be possible, or existing speed limits are already appropriate, so compliance needs to improve. Additional measures for improving compliance can be implemented. This may include informing the public and getting buy-in

through community outreach programs. Furthermore, behavioral treatments to support speed limits or roadway design changes to achieve speed limits can be identified and implemented.

#### *2.6.4.5 Speed Management Resources*

There are many resources available to assist in setting appropriate speeds and implementing a speed management program. Potential speed limit resources include USLIMITS2 (FHWA, 2026b), National Association of City Transportation Officials (NACTO) City Limits (NACTO, 2020), National Cooperative Highway Research Program (NCHRP) Report 966 (Fitzpatrick et al., 2021), and the Infrastructure/Speed Limit Relationship in Relation to Road Safety Outcomes Report (Jurewicz and Turner, 2010). Infrastructure resources include the FHWA Road Diet Informational Guide (Knapp et al., 2014) and the FHWA Self-Enforcing Roadways Guidance Report (Donnell et al., 2018). Behavioral resources include the FHWA Speed Safety Cameras report (FHWA, 2021) and speed feedback signs, the use of which can be guided by research. Resources on federal funding include the HSIP and Safe Streets and Roads for All (SS4A) (USDOT, 2022a).

#### 2.6.5 Ongoing Monitoring, Evaluation, and Adjustment

The final step in the Safe System Approach for Speed Management Framework consists of ongoing monitoring, evaluation, and adjustment to ensure long-term goals are met as safety performance changes over time. Incremental improvements may be necessary due to difficulties with implementing system-wide changes at once. Ultimately, this framework is not a linear process, but rather a cycle that continues to move toward preventing all death and serious injury on roadways. This section covers monitoring and data collection, evaluating current speed management efforts, speed enforcement, education of road users, and useful technologies (Kumfer et al., 2023).

##### *2.6.5.1 Monitoring and Data Collection*

Monitoring changes and collecting data helps to inform future decision making for speed limit programs as well as to determine locations where additional intervention may be required. This may include locations that require additional enforcement, infrastructure, or other supporting initiatives. These may be needed due to the limited effectiveness of the implemented

countermeasures or other unexpected consequences that need to be managed. Results from monitoring also help communicate to the public why speed management programs are used and dispel myths surrounding them.

#### *2.6.5.2 Evaluating Current Speed Management Efforts*

Evaluating current speed management efforts can help demonstrate the extent to which goals are achieved, improve decision making for future programs, determine locations where additional interventions are needed, and demonstrate the safety benefits of programs to the public. Additionally, behavioral data can be collected and analyzed. This may consist of awareness of speed management, perceptions of speed management activities, road user counts and latent demand, and road user behavior. These data can be collected using mailed public surveys, intercept surveys along roadway segments, counts taken before and after implementation, and evaluations of recorded video data. Analyzing these can lend context to measures of efficacy and help agencies understand how the public perceives projects.

#### *2.6.5.3 Speed Enforcement*

Speed enforcement tends to be less effective in producing long-term changes in behavior. This is because drivers tend to select their operating speeds based on prevailing roadway conditions. Speed cameras have been highly effective for several agencies, but safety and equity must be considered when implementing them. When possible, agencies should consider alternatives to speed enforcement to produce target speeds.

#### *2.6.5.4 Education of Road Users*

Educating road users about safety on roadways is an essential part of a speed management program. Since the responsibility to prevent fatalities and serious injury on roadways is shared by all stakeholders, transparency and positivity are necessary. Being explicit when engaging in communication activities related to traffic safety culture can help educate stakeholders, especially road users. The goal is to create a proactive safety culture. This is achieved when road users choose to go beyond what is legally required and influence others in a manner that discourages unsafe activities.

#### 2.6.5.5 *Useful Technologies*

Research is ongoing around the Safe System Approach and related potentially beneficial technologies that can be applied within a speed management program. These may include technologies such as connected infrastructure or automated systems. The FHWA has published a proven safety countermeasures website that is frequently updated with the latest innovations (FHWA, 2026c). Reviewing this page regularly as well as other sources allows agencies to identify new methods, and, if implemented, data can be collected on uses and best practices to share with other agencies.

### **2.7 Summary**

The purpose of this chapter was to provide background information on the Safe System Approach and how it can be incorporated into speed management practices. The Safe System Approach originates from Vision Zero and represents a paradigm shift in safety methodology from traditional practices. Vision Zero describes the goals of a transportation agency, while the Safe System Approach outlines how those goals can be achieved, with an emphasis on shifting the responsibility in roadway safety away from just road users and instead sharing it with the system designers.

The FHWA has published a report, “Safe System Approach for Speed Management,” which proposes a framework for speed management that is in line with the elements and principles of the Safe System Approach, including utilizing the systemic safety analysis process. This framework has been developed by the FHWA to provide a methodology for DOTs and other agencies to follow when creating a speed management program so that it aligns with the Safe System Approach ideology. While the provided framework is relatively new, DOTs in several states have begun implementing variations of the ideas presented here. These applications, as well as existing UDOT programs, policies, and practices that align with the Safe System Approach for Speed Management Framework, will be explored in the next chapter.

## **3.0 STATE OF THE PRACTICE**

### **3.1 Overview**

Safe System Approach for speed management methodologies have been developed and implemented across the United States. This chapter aims to review the current state of the practice related to speed management following Safe System Approach principles. The chapter begins by reviewing the several programs that UDOT has that support these principles, including the state's SHSP and UDOT's speed-limit-setting policies. The next section reviews 31 specific speed management countermeasures that align with Safe System principles and have been proven to decrease speeds. Finally, several city and state agencies have begun implementing these speed management countermeasures and other programs based on the Safe System Approach. Some have found success that they have published for other agencies to learn from, and case studies from these efforts will be reviewed.

### **3.2 Existing UDOT Policies and Programs**

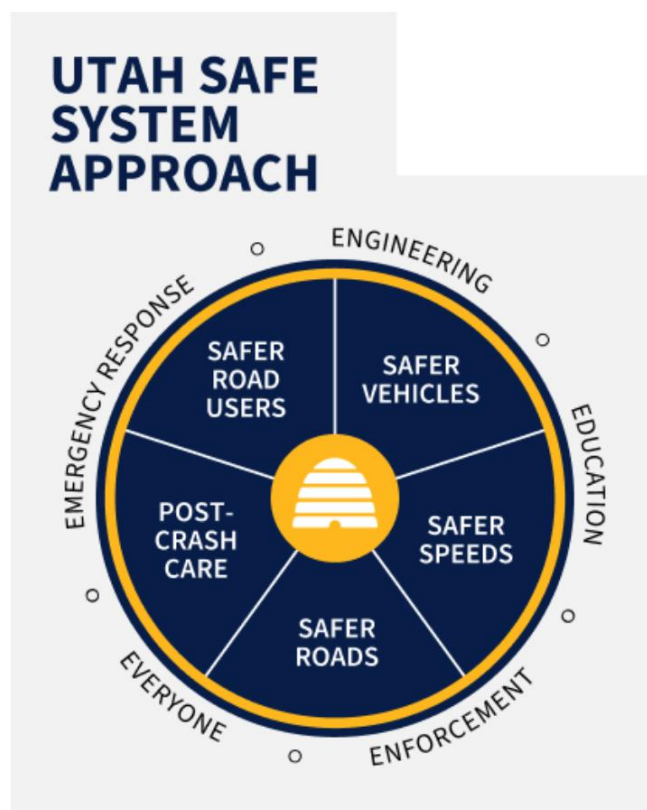
UDOT currently has several policies and programs that align with Safe System Approach principles. Utah's SHSP supports their goal of Zero Fatalities through several specific emphasis areas that relate to speed management. Additionally, UDOT's new speed limit establishment policy, along with the related speed study guidelines and speed management info sheets, promotes a more holistic view of speeds that differs from more traditional practices. These four plans and policies will be described in the following sections.

#### **3.2.1 Utah's Strategic Highway Safety Plan**

In 2003, the Utah Safety Leadership Executive Committee and Utah Safety Leadership Committee were established to create a comprehensive integrated plan for Utah that aimed at reducing fatal and serious injury crashes with the ultimate goal of Zero Fatalities (UDOT, 2025). This goal is the foundation of Utah's SHSP, and all emphasis areas are designed to help Utah reach Zero Fatalities. Additionally, the SHSP aligns with goals nationwide and globally, including the national strategy on highway safety, Toward Zero Deaths (TZD Steering

Committee, 2014). This plan is updated every 5 years with the current plan being used to coordinate safety efforts starting in 2025.

The SHSP is focused on integrating the Safe System Approach with Utah’s Five E’s: engineering, education, enforcement, emergency response, and everyone (UDOT, 2025). Engineering covers innovation in planning, designing, building, and maintaining safer transportation systems. Education focuses on helping the public understand safe behaviors and strengthening a culture of safety since human error contributes to 94 percent of crashes. Enforcement reminds people of the laws associated with using the roadway network. The swift response time of EMS can provide life-saving health care in the event of a crash. Finally, the Road to Zero starts with everyone doing their part—we all need to work together to reach this goal. These are complemented by the Safe System Approach elements of safer road users, safer vehicles, safer speeds, safer roads, and post-crash care. A graphic of the Utah SHSP approach is shown in Figure 3.1.



**Figure 3.1 The Utah Safe System Approach (UDOT, 2025)**

Several safety emphasis areas are described in Utah’s SHSP, including speed management (UDOT, 2025). Speeding is a major concern in Utah and a leading contributing factor to fatal and serious injury crashes. This emphasis area focuses efforts on reducing speeding and associated elements of reckless and careless attitudes and behaviors. The suggested strategies for this emphasis area begin with several existing strategies, such as having law enforcement participate in speed management efforts, funding special speed enforcement campaigns, providing public information and educational outreach activities, and implementing traffic calming and other speed countermeasures. Additionally, other strategies that can be implemented are promoting public awareness and voluntary compliance with motorists obeying posted speed limits, developing a speed management tool that law enforcement can access to manage speed, working with local courts and officials to increase penalties for speeding violations, and using variable message signs to encourage drivers to travel at safe speeds.

### 3.2.2 Establishing Speed Limit Policies

In 2023, UDOT updated its policy on the establishment of speed limits on state highways to include the consideration of roadway context (UDOT, 2023a). The policy states that all state highway speed limits will be set based on an engineering and traffic study. For access category 1 (freeway and interstate system) facilities as well as facilities outside of an urbanized or other developed area, UDOT will continue to establish speed limits within 5 MPH of the 85<sup>th</sup> percentile speed. For all other roadways, UDOT will use the access category of a roadway to identify a recommended range of posted speed limits and then use the roadway context to determine what the posted speed limit should be within the recommended ranges outlined in Table 3.1. However, for rural roadways that do not meet design standards, the speed limit may be lower than the 85<sup>th</sup> percentile. Definitions for the different access categories can be found in Utah’s Administrative Rule R930-6 (UDOT, 2019).

**Table 3.1 UDOT Access Category Recommended Speed Ranges (UDOT, 2023a)**

<b>Access Category</b>	<b>Recommended Posted Speed Limit Range Within Developed Areas (MPH)</b>
2 – System priority-rural importance (S-R)	45-55
3 – System priority-urban importance (S-U)	35-50
4 – Regional-rural importance (R-R)	40-50
5 – Regional priority-urban importance (R-PU)	35-45
6 – Regional-urban importance (R-U)	30-45
7 – Community-rural importance (C-R)	30-40
8 – Community-urban importance (C-U)	30-40
9 – Other importance (O)	15-30
10 – Freeway one-way frontage road (F-FR)	35-55

When using roadway context, the 85<sup>th</sup> percentile speeds will still be considered in determining the desired speed limit (UDOT, 2023a). If the selected speed limit deviates by more than 10 MPH from the 85<sup>th</sup> percentile speed, UDOT will consider implementing speed management measures. Additionally, UDOT may set a speed limit outside of the access-category ranges if pedestrian, bicycle, or on-street parking activity is outside what is typical for the access category, or if access is more restricted than typical for the access category. One example of this is where there is a raised median. When considering where to set the speed limit within the range, roadway conditions should be considered. The speed limit can be set at the lower end of the range where there is a history of pedestrian, bicycle, or severe speed-related crashes; frequent pedestrian or bicycle activity; frequent parking activity; slower observed speeds; or curves or other conditions that provide limited sight distances. The speed limit can be set at the higher end of the range where there is no history of pedestrian, bicycle, or severe speed-related crashes; limited pedestrian or bicycle activity; no or infrequently used on-street parking; faster observed speeds; and adequate geometry.

### 3.2.3 Speed Study Guidelines

UDOT provides a document that outlines the guidelines for the required speed study that is used to set speed limits (UDOT, 2023c). Several datasets are required, including spot speed

data, crash data from the past 5 years, access category, context, and road conditions. Additional considerations may include the land use mix, access frequency, turning volumes and effects, development and growth, the encouragement of active transportation, and sense of place.

Speed zone requirements, including the usage of transition zones, are also outlined in these guidelines (UDOT, 2023c). Speed zones are roadway segments with a continuous speed limit. The roadway segment should be at least 0.3 miles long for speed limits of 45 MPH or less and at least 0.5 miles long for roads with posted speed limits above 45 MPH. Speed zones should be as long as possible while only covering areas of similar context to ensure driver confidence in speed limits. Speed zones should not change within an intersection influence area, and, when practical, should change at the same location in both directions. For school speed zones, the speed limit change must be made at least 300 feet before and after the speed zone. Transition zones are used when the speed limit is reduced by more than 15 MPH. For reductions greater than 30 MPH, multiple transition zones are needed. These zones should be 0.15 to 0.5 miles in length, ensuring that they are not so long that drivers begin to speed up again. Their placement should align with land use cues and access changes to assist in driver compliance.

Guidelines are also given for speed limits on intersection and roundabout approaches (UDOT, 2023c). For signalized intersections, a maximum speed limit of 55 MPH should be used, and for all roundabout approaches, a maximum speed limit of 45 MPH should be used. This speed limit guideline applies to the entire signal and roundabout influence area, within 0.25 miles, and has precedence over all other factors. Additionally, when setting speed limits, suitable context should be used to provide cues for the upcoming intersection or roundabout, especially in rural areas.

#### 3.2.4 Speed Management Info Sheets

Along with the updated speed-limit-setting policy, UDOT published several speed management info sheets that describe measures that can be used to slow traffic within the framework of the Safe System Approach (UDOT, 2023b). When there is a disconnect between vehicle speeds and the roadway context or when 85<sup>th</sup> percentile speeds are higher than recommended for safety, speed management measures should be used. Simply lowering speed limits is not effective speed management. The info sheets suggest that speed management may

mean “engineering up” in some locations to accommodate the speeds users want to travel, rather than always slowing them down, and each solution will be roadway specific. Details are provided in the info sheets on several speed management countermeasure options that can be used. These will be covered in Section 3.3, along with additional measures.

### **3.3 Typical Speed Management Countermeasures**

Several speed management countermeasures have been tested and proven to affect speeds when implemented. This section will describe the speed management benefits, location characteristics, and costs of 32 countermeasures. Speed management benefits are described in several different ways depending on the source information, including speed reduction values and anticipated speeds with the countermeasure. The location characteristics will include the appropriate UDOT access categories using the suggested speed ranges shown in Table 3.1. Costs will be summarized on a scale of low (\$), moderate (\$\$), and high (\$\$\$).

The countermeasures have been sorted based on the four speed management principles from the FHWA “Speed Limit Setting Handbook,” which are education and enforcement, deflection, enclosure, and engagement (Schroeder et al., 2025). Many of these countermeasures can be used temporarily, seasonally, or permanently, affecting the potential costs. Implementing countermeasures temporarily or seasonally instead of permanently may be an important consideration for rural areas or locations with harsh winters (FHWA, 2018a). Some of the countermeasures described may have short-term benefits, require enforcement, or be for the purpose of traffic flow and have the added benefit of increased safety. All of these factors should be considered before implementation (FHWA, 2018b). Jurisdictions may also have existing regulations on the use of speed management countermeasures which should be considered. Additionally, some countermeasures may have minimal effects; however, speed exponentially affects kinetic energy, and small changes in operational speeds can make a large difference in the severity of a crash.

#### **3.3.1 Education and Enforcement**

Many drivers are unaware of their speed while driving. Enforcement can help alert drivers to pay attention and education programs can help make drivers aware of the potential

consequences of speeding. Additionally, education programs can communicate the benefits of speed management and slower speeds to the public (Schroeder et al., 2025). There are several available measures that can be implemented in this area to help improve speed management. These are described in the following sections and summarized in Table 3.2.

**Table 3.2 Education and Enforcement Countermeasure Summary**

<b>Countermeasure</b>	<b>Speed Benefits</b>	<b>Access Category</b>	<b>Speed Range (MPH)</b>	<b>Cost</b>
Increase Public Awareness	Not measured	All	All	\$
Neighborhood Street Watch	Not measured	All	All	\$
Safe Community Programs	Not measured	All	All	\$
Conventional Speed Enforcement	Reduces speeds by 5-7 MPH	All	All	\$\$
Speed Safety Cameras	Reduces proportion of vehicles speeding by 65%	All	All	\$

### 3.3.1.1 Increased Public Awareness of Risks and Penalties

Educating the public may help alter behaviors when drivers speed because they do not perceive that there is risk or a chance of being cited. Educational programs and activities are best for informing young and inexperienced drivers of the potential consequences of speeding (Neuman et al., 2009). For some drivers, appealing to their pocketbook may be more effective than educational programs. Making drivers aware of the direct costs associated with excessive speeding, whether related to a crash or not, can be an effective strategy. Drivers who repeatedly disobey speeding laws are a significant contributor to overall safety risk. As such, using varying penalties for different offenses, and especially increased penalties for repetition, can help minimize extreme violations and repeat offenders. Implementing these programs is typically low-cost.

Although seatbelt use is not directly related to a reduction in the occurrence of speeding-related crashes, it is closely related to a reduction in fatal and serious injury crashes that may be a result of speeding-related crashes (Neuman et al., 2009). Initiating programs to maximize the use of occupant restraints by all vehicle occupants can help educate drivers on their importance. These can include providing access to appropriate information, materials, and guidelines for

those implementing programs to increase occupant restraint use. Emphasis should also be placed on ensuring that restraints for children of all ages are properly used.

#### *3.3.1.2 Neighborhood Street Watch and Traffic Management Programs*

Establishing Neighborhood Street Watch committees or local traffic management programs can help educate drivers and decrease speeding (Neuman et al., 2009). A neighborhood street watch committee, along with posted signs that alert drivers to “watch their speed,” can draw their attention to their speeds as they travel through residential neighborhoods. Traffic management programs, such as the Pace Car Program implemented in Salt Lake City in the early 2000s, can encourage citizens to pledge to drive within the speed limit, let pedestrians cross, and walk or use alternative modes of transportation when they can. These drivers can then calm other drivers and encourage safer behaviors (Neuman et al., 2009).

#### *3.3.1.3 Safe Community Programs*

The Safe Community program model was developed by the National Highway Traffic Safety Administration (NHTSA). This model promotes traffic injury prevention by involving citizens in addressing key problem areas identified with data using the 4 ‘E’ approach (Education, Enforcement, Engineering, and EMS) (Neuman et al., 2009). Safe Community programs can be implemented at various levels and have been found to be successful statewide, at the county level, and for individual communities.

#### *3.3.1.4 Conventional Speed Enforcement*

Conventional speed enforcement is a speed management countermeasure that has been successful in many locations. Enforcement efforts can be increased at locations where reviews of current travel speeds, crash history, and officer and public input suggest opportunities for improvement, thereby promoting greater compliance (Neuman et al., 2009). However, it is important to consider that once the enforcement is removed, the effect will be reduced. Additionally, enforcement may discourage drivers from using the route with enforcement or slow down only where the enforcement is present before increasing their speeds.

### 3.3.1.5 *Speed Safety Cameras*

Officers are not able to enforce speed limits on all roads at all times, but automated enforcement technologies offer the opportunity for increasing enforcement efforts in a wider area (Neuman et al., 2009). Speed cameras can increase the public perception that speeding citations are likely, increasing compliance. A study in Garland, Utah saw a reduction of 14 MPH in average travel speeds as well as reduced collisions in a school zone after installing speed cameras in conjunction with media coverage (Neuman et al., 2009). Upfront costs are typically paid for by system vendors, and there is potential for other costs to be covered by revenue. However, because the ultimate goal is to reduce the number of speeding offenders, it is important that agencies do not rely on this additional revenue.

Speed cameras can be used in a variety of locations and are appropriate for all levels of volume and number of lanes. No physical changes are required to the roadway, and their installation does not affect surface maintenance, EMS operations, transit, or drainage. This measure can reduce speeds with no other roadway changes and has been found to have an average 54 percent reduction in crashes and 65 percent reduction in the proportion of vehicles speeding (UDOT, 2023b). In Utah, the use of speed cameras is restricted to specific locations, namely school zones or areas with a posted speed limit of 30 MPH or less, and with a police officer present with the photo radar unit. There is also potential for significant public and political pushback with the implementation of speed cameras, and additional education of the benefits of speed management may be necessary in areas where their use is being considered.

### 3.3.2 Deflection

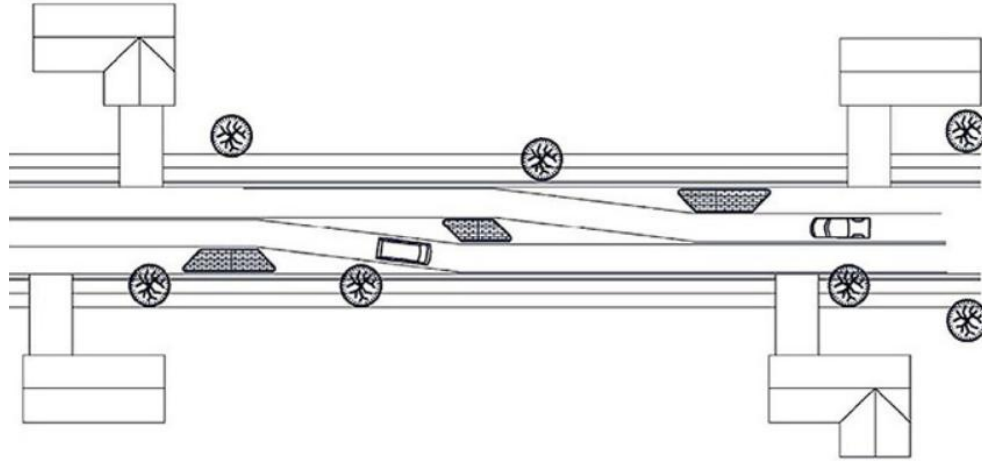
Another category of countermeasures from the “Speed Limit Setting Handbook” is deflection. These measures involve moving the driver horizontally or vertically within the path of travel (Schroeder et al., 2025). These shifts physically encourage drivers to slow down for them to maintain their level of comfort while driving. In locations subject to frequent snowplow use, vertical deflection countermeasures may require design modifications to accommodate plowing or seasonal deployment with temporary materials. Examples of deflection countermeasures are detailed in the following sections and summarized in Table 3.3.

**Table 3.3 Deflection Countermeasure Summary**

<b>Countermeasure</b>	<b>Speed Benefits</b>	<b>Access Category</b>	<b>Speed Range (MPH)</b>	<b>Cost</b>
Lateral Shift	Reduces speeds by 2-10 MPH	5,6,7,8,9,10	25-65	\$-\$\$\$
Chicane	Lowers speeds to 20-30 MPH	8,9	20-30	\$-\$\$
Roundabout	Reduces speeds significantly	5,6,7,8,9,10	25-65	\$\$\$
Small Modern/ Mini-Roundabout	Reduces speeds by 40%	7,8,9	25-35	\$-\$\$
Traffic Circle	Reduces speeds by 5-13 MPH	9	25-30	\$-\$\$
Speed Hump	Lowers 85 <sup>th</sup> percentile speeds to 15-20 mph	9	15-20	\$
Speed Cushion	Lowers 85 <sup>th</sup> percentile speeds to 15-20 MPH	9	15-20	\$
Speed Table/Offset Speed Tables	Lowers 85 <sup>th</sup> percentile speeds to 25-35 MPH	7,8,9	25-35	\$
Raised Crosswalk	Lowers 85 <sup>th</sup> percentile speeds to 20-30 MPH	8,9	20-30	\$
Raised Intersection	Lowers 85 <sup>th</sup> percentile speeds to 25-35 MPH	7,8,9	25-35	\$-\$\$
Realigned Intersection	Reduces speeds by 5-13 MPH	8,9	15-25	\$-\$\$
Diagonal Diverter	Reduces 85 <sup>th</sup> percentile speeds by 1 MPH	9	25-35	\$-\$\$

*3.3.2.1 Lateral Shift*

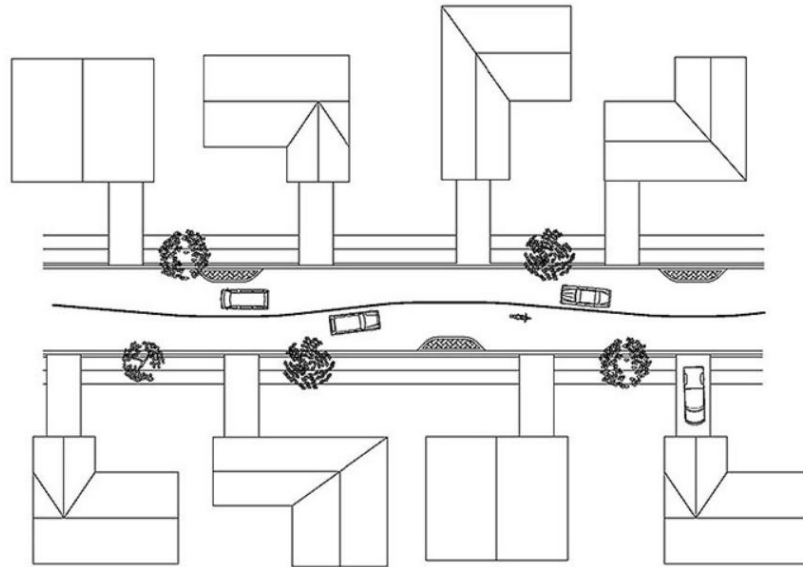
Lateral shifts are a physical countermeasure that move drivers horizontally in the path of travel, as shown in Figure 3.2. Use of lateral shifts has been seen to reduce speed by 2 to 10 MPH (UDOT, 2023b). Because lateral shifts are a physical treatment, effectiveness does not wear off with time, and they can easily be combined with other measures such as gateway treatments. Costs can vary depending on whether only striping is used or if temporary (or permanent) curbs or landscaped medians are installed. There is typically minimal impact to snowplow or agricultural equipment use and this countermeasure can be an effective cue in transition areas when entering a community where lower speeds are required (FHWA, 2018a). Lateral shifts are best used with low to moderate speeds and volumes and are typically only one lane. They are appropriate for collector or local roads and are typically used on straight roadway segments, not at intersections (FHWA, 2018b). This countermeasure may require increased maintenance and additional right-of-way (ROW), making the installation a substantial project.



**Figure 3.2 Lateral Shift (FHWA, 2018b)**

### 3.3.2.2 Chicane

A chicane is a series of lateral shifts on a roadway that divert drivers horizontally multiple times in a row, as shown in Figure 3.3. As a physical treatment, the effects do not wear off with time. When only pavement markings are used, costs are typically lower, depending on the length of the segment; however, adding curbs would increase the cost (FHWA, 2018b). Effects on speed will depend on the length of the alignment shift and the volume and distribution of traffic, but will typically lower speeds to around 20 to 30 MPH. A median island may be necessary to prevent motorists from cutting a straight path across the center line when opposing volumes are low. Chicanes are less ideal for transition zones and may be more difficult for large trucks and snow plows to navigate; however, they are appropriate within the community where lower speeds prevail (FHWA, 2018a).



**Figure 3.3 Chicane (FHWA, 2018b)**

### 3.3.2.3 Roundabout

A roundabout is a circular intersection where traffic moves counterclockwise around a central island, yielding to traffic already in the circle, as shown in Figure 3.4. Roundabouts are a form of horizontal deflection used at intersections that create fewer conflict points and are safer than conventional stop- or signal-controlled intersections. The alteration in vehicle path necessitates major reductions in speed, and roundabouts have been seen to reduce fatal and serious injury crashes by 88 percent (UDOT, 2023b). Additionally, roundabouts can handle a wide range of mainline and turning traffic volumes with 1 to 2 lanes and improve pedestrian safety. Roundabouts can be designed to allow for snowplows and larger vehicles but often require more ROW to install. Costs are typically high for implementation; however, temporary roundabouts made with striping and other temporary traffic control devices can have a lower cost (FHWA, 2018b).



**Figure 3.4 Roundabout (FHWA, 2018b)**

#### *3.3.2.4 Small Modern Roundabout and Mini-Roundabout*

A small modern roundabout and a mini-roundabout are raised islands within an unsignalized intersection around which traffic circulates, as shown in Figure 3.5 and Figure 3.6, respectively. Both are designed to fit into the existing ROW of a normal intersection, and Yield signs are used for each approach. The center island of a mini-roundabout is fully traversable and can be easily mounted by large trucks and snowplows; however, they are typically more appropriate for local roads. Small modern roundabouts have a center island that is not traversable and can be landscaped. Additional geometric features, such as splitter islands or lateral shifts, are often used for both measures to ensure drivers deflect horizontally (FHWA, 2018a). Mini roundabouts can reduce speeds by up to 40 percent compared to speeds observed 350 feet away from the intersection. Additionally, an average 29 percent reduction in volume can occur. Installation costs are moderate, depending on specific features and whether it is permanent or temporary (FHWA, 2018b).



**Figure 3.5 Small Modern Roundabout (FHWA, 2018b)**



**Figure 3.6 Mini-Roundabout (FHWA, 2018b)**

### *3.3.2.5 Traffic Circle*

A traffic circle is a circular intersection around which traffic circulates that lacks one or more key elements of a modern roundabout; an example is shown in Figure 3.7. Splitter islands are not typically used, and either Stop or Yield signs can be used on the approaches. The circle can be painted or raised and landscaped, mountable to the degree necessary for design vehicles to

safely traverse the intersection. Traffic circles require a very slow approach speed and are typically appropriate for residential or commercial areas. Speeds are typically reduced by 5 to 13 MPH in the circle and between 1 and 6 MPH within 200 feet of the circle (FHWA, 2018b). Costs are generally lower when additional ROW is not required.



**Figure 3.7 Traffic Circle (FHWA, 2018b)**

#### *3.3.2.6 Speed Hump*

A speed hump is an elongated raised pavement feature on the roadway surface that extends the full width of the road, as shown in Figure 3.8. A speed hump is typically 3 inches high and 12 feet long along the travel path. These horizontal deflection treatments provide sufficient discomfort for drivers to discourage speeding and can encourage slower speeds upstream, downstream, and immediately over the treatment. Speed humps have been shown to reduce 85<sup>th</sup> percentile speeds by 6 to 13 MPH. Driving speeds will lower to the range of 15 to 20 MPH to maintain driver comfort. The speed reduction effects decrease at a rate of about 0.5 to 1 MPH every 100 feet beyond the 200 feet approach and exit of a speed hump, so a series of speed humps may be needed to retain slower speeds. When used in series, volume reductions of 20 percent are typically observed. Additionally, speed humps have been seen to reduce crashes between 33 percent and 48 percent. This treatment is typically inappropriate for transition zones with high variability of vehicle speeds. They also may impact snow removal and other large

vehicles, including delaying emergency services. However, speed humps are appropriate for residential and local streets with considerations for potentially increased noise. Typical unit costs are low (FHWA, 2018b).



**Figure 3.8 Speed Hump (FHWA, 2018b)**

#### *3.3.2.7 Speed Cushion*

A speed cushion consists of two or more raised areas on a roadway with a height and length comparable to a speed hump, as shown in Figure 3.9. Gaps, or cutouts, are provided between the raised areas wide enough for large vehicles, such as emergency vehicles, to pass through without significantly slowing down. This means they can be appropriately placed along primary emergency vehicle or bus transit routes. The profile of a speed cushion also tends to be gentler than a speed hump and can be comfortably traversed at 20 to 25 MPH. A reduction of between 5 and 7 MPH for 85<sup>th</sup> percentile speeds has been seen with the use of speed cushions. This lowers speeds to 15 to 20 MPH, with effects declining at a rate similar to speed humps. Speeds over a speed cushion will typically be slightly higher than over speed humps because motorists can pass over the cushion with one wheel in the gap. If used in series, there is also often an average 20 percent volume reduction after implementation. Speed cushions are especially appropriate for emergency access, and the cost for this treatment is low and varies depending on material; both asphalt and rubber are available (FHWA, 2018b).



**Figure 3.9 Speed Cushion (FHWA, 2018b)**

#### *3.3.2.8 Speed Table and Offset Speed Tables*

A speed table is a raised area that extends across the roadway but is typically 22 feet long with a 10-foot flat top, as shown in Figure 3.10. The longer depth in the direction of travel is less jarring for motorists while still encouraging slower speeds on local and collector streets (FHWA, 2018b). Effects seen when implemented in a Minnesota study included a 28 percent reduction in 85<sup>th</sup> percentile speed, a 15 percent reduction in average speed, and a 28 percent decrease in auto collisions (FHWA, 2018a). Other sources have seen a 36 percent to 64 percent reduction in crashes and reductions of 85<sup>th</sup> percentile speeds between 4 and 11 MPH when crossing, with effects declining further from the speed table. Operating speeds will typically lower to 25 to 35 MPH to maintain comfort. This treatment is generally not appropriate for emergency or transit routes and can cause minimal delays; however, offset speed tables, as shown in Figure 3.11, or designs with longer plateaus can also be used to accommodate these vehicles. When used in series, a 20 percent reduction in volumes may occur. Although this treatment requires more material than speed humps, typical unit costs remain low (FHWA, 2018b).



**Figure 3.10 Speed Table (FHWA, 2018b)**

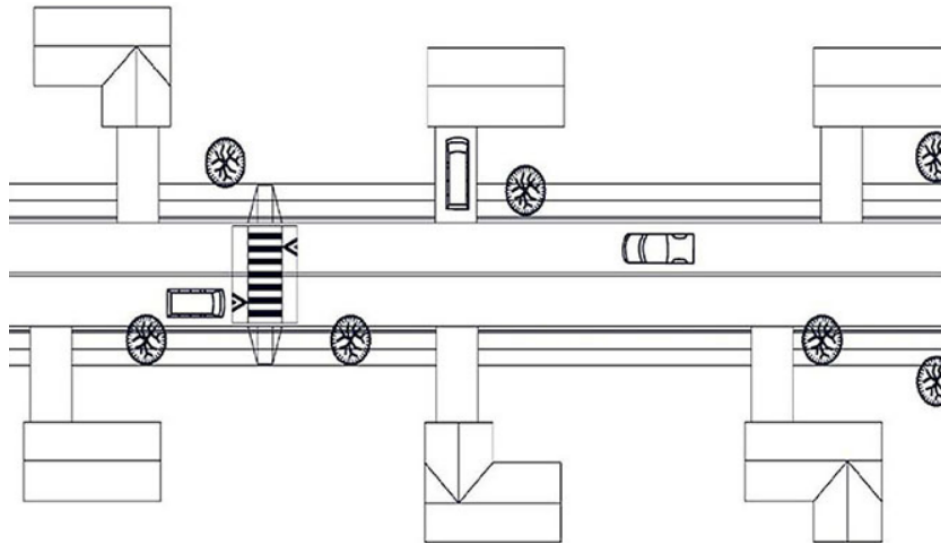


**Figure 3.11 Offset Speed Tables (FHWA, 2018b)**

### *3.3.2.9 Raised Crosswalk*

Raised crosswalks combine vertical deflection with marked pedestrian crossings; they span the width of the roadway but are specifically designed to improve pedestrian safety as well, as shown in Figure 3.12. The flat top on a typical speed table would conform to the desired crosswalk width and have appropriate markings and signage. The vertical deflection causes vehicles to slow down before passing over the crosswalk and places pedestrians higher than the

roadway, making them more visible to drivers. This treatment is appropriate where lower speeds prevail and can be used midblock or at an intersection at locations where pedestrians typically cross (FHWA, 2018a). Implementation cost is similar to a speed table, and 85<sup>th</sup> percentile speeds are typically lowered to the range of 20 to 30 MPH, with the effects declining at the rate of approximately 0.5 to 1 MPH every 100 feet beyond the 200-foot approach and exit of the treatment (FHWA, 2018b).



**Figure 3.12 Raised Crosswalk (FHWA, 2018b)**

#### *3.3.2.10 Raised Intersection*

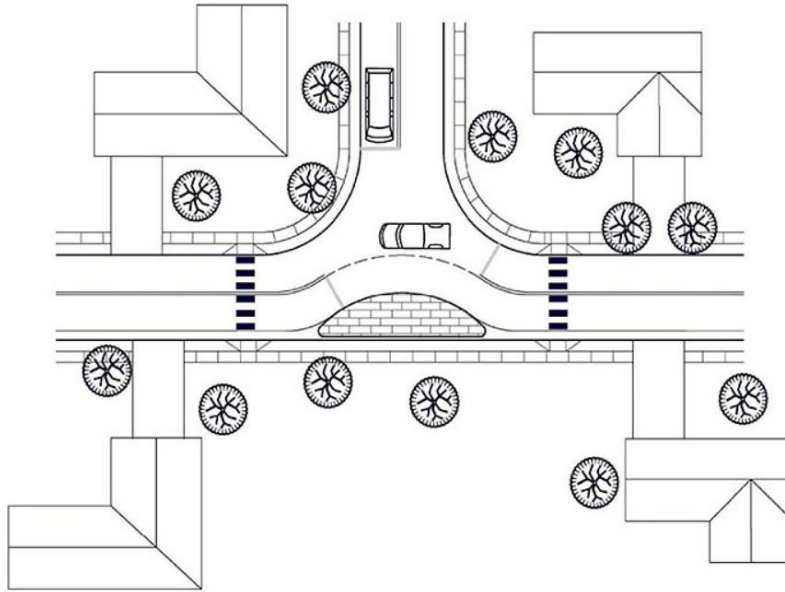
A raised intersection is an expanded version of a raised sidewalk or speed table where an entire intersection, including the crosswalks, is raised to the level of the sidewalk, as shown in Figure 3.13. This countermeasure improves pedestrian safety and visibility and calms two streets at once. It is well suited for dense urban areas at signal-controlled or all-way stop intersections with low vehicle volumes and high pedestrian volumes (FHWA, 2018a). The 85<sup>th</sup> percentile speeds are typically lowered to the range of 25 to 35 MPH in the intersection. Costs can range from low to moderate, depending on the width of the intersection and effects on drainage systems (FHWA, 2018b).



**Figure 3.13 Raised Intersection (FHWA, 2018b)**

#### *3.3.2.11 Realigned Intersection*

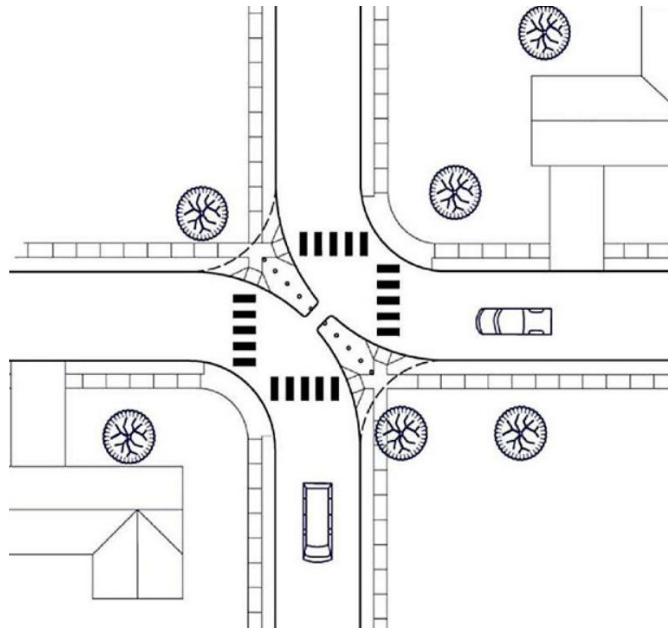
A realigned intersection is a three-leg T-intersection that has been reconfigured from perpendicular to having skewed approaches or travel paths through the intersection, as shown in Figure 3.14. This treatment is typically used in low-speed residential areas and can be designed with adequate radii to allow for emergency service and transit access. The horizontal deflection in a realigned intersection has been seen to reduce speeds within the intersection limits by 5 to 13 MPH and by 1 to 6 MPH in the vicinity. Installation costs are typically moderate (FHWA, 2018b).



**Figure 3.14 Realigned Intersection (FHWA, 2018b)**

### 3.3.2.12 Diagonal Diverter

A diagonal diverter is a physical barrier placed diagonally across a four-way intersection, creating two unconnected intersections, as shown in Figure 3.15. Traffic is restricted to one receiving leg, rather than three, reducing volume by preventing straight-through movements and decreasing speeds by creating a sharp curve to negotiate. A gap or channel can be provided in the diverter to allow at-grade bicyclist movement between all four legs; while pedestrians can be accommodated as well. To enable emergency vehicle access, breakaway or lockable bollards or gates can be used for the diverter, or a gap with signage can be used. Implementing diagonal diverters has been seen to result in an average 1 MPH reduction for 85<sup>th</sup> percentile speeds (FHWA, 2018b). Costs are typically low, though the potential shift in traffic demand to other streets should be considered before implementation.



**Figure 3.15 Diagonal Diverter (FHWA, 2018b)**

### 3.3.3 Enclosure

The roadway environment can influence a driver’s perceived speed. A driver’s perceived speed becomes more accurate the closer objects on the roadway are to them. Enclosure is the idea that the physical environment can be engineered to “create a sense of confinement, which encourages drivers to slow down and drive more cautiously” (Schroeder et al., 2025). This can be done through various enclosure design features, which will be described in the following sections and summarized in Table 3.4.

**Table 3.4 Enclosure Countermeasure Summary**

Countermeasure	Speed Benefits	Access Category	Speed Range (MPH)	Cost
Landscaping	Reduces speeds by 0-4 MPH	All	25-65	\$
Median Island	Reduces speeds by 1-5 MPH	2,3,4,5,6,7,8,9,10	25-65	\$\$-\$\$\$
Curb Extensions	Not measured	5,6,7,8,9	25-40	\$\$-\$\$
Roadway Narrowing	Reduces speeds by 0-3 MPH	5,6,7,8,9	25-40	\$\$-\$\$\$
Road Diet	Reduces speeds by 1-5 MPH	3,4,5,6,7,8,9	25-50	\$\$-\$\$\$
On-Street Parking	Reduces speeds by 1-5 MPH	9	15-30	\$\$-\$\$\$

### 3.3.3.1 Landscaping

Landscaping, often incorporating elements like trees, is integrated with other traffic calming treatments such as raised medians, islands, chokers, roundabouts, and chicanes, as shown in Figure 3.16. Its purposes are to enhance the attractiveness of traffic calming measures and to convey to drivers that a slower speed is advisable (FHWA, 2018a). In transition zones, planting alongside the road can signal a change from rural to urban, creating the perception of a narrower “optical width” and a “tunnel effect,” which should encourage drivers to slow down. Trees are generally the most effective form of landscaping for traffic calming due to their size and ability to provide this optical narrowing effect, however using trees requires contextual consideration of required clear zones and site distance. Landscaping is most effective on roads with speeds of 25 to 65 MPH and is appropriate for any number of lanes in each direction. It is not clear from research whether landscaping alone is sufficient to calm traffic without other physical treatments or enforcement; however, speed reductions of 0 to 4 MPH have been observed. Because this countermeasure is typically implemented in conjunction with other measures, it is difficult to estimate the exact cost, but costs are generally low (UDOT, 2023b). Landscaping typically requires regular maintenance, which could add an additional recurring cost.



**Figure 3.16 Landscaping (UDOT, 2023b)**

### 3.3.3.2 Median Island

A median island is a physical or painted island located along the street centerline that reduces the width of the travel lanes at that point, as shown in Figure 3.17. The required change

in alignment and the visual effect of narrowed lanes encourage most motorists to reduce their speed (FHWA, 2018a). Medians can serve various purposes, including being part of a lateral shift in a transition zone or providing a pedestrian refuge island at a crosswalk in a town center. Landscaping is often incorporated into raised median islands, contributing to roadway aesthetics and environmental sustainability. Medians are best applied on roads with speeds of 25 to 65 MPH, and can be applicable for all traffic volumes and any number of lanes (UDOT, 2023b). A landscaped median island can reduce speeds from 1 to 5 MPH and reduce crashes by up to 71 percent. Back-to-back curb medians without landscaping have not been shown to reduce travel speeds. Average installation costs are dependent on the length of the median and can be moderate to high per mile.

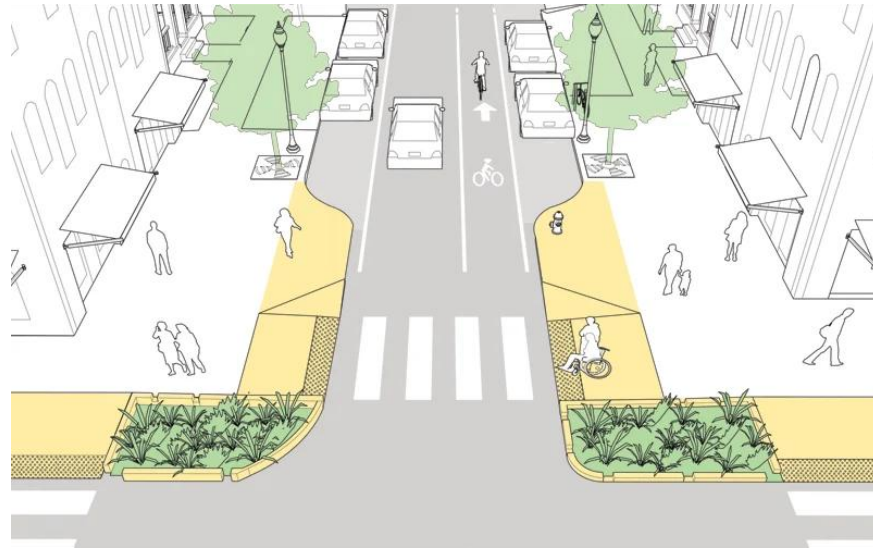


**Figure 3.17 Median Island (FHWA, 2026c)**

### *3.3.3.3 Curb Extensions*

Curb extensions, also known as bulb-outs, widen the sidewalk or curb line into the roadway at intersections or mid-block crossings, as shown in Figure 3.18. They primarily benefit pedestrians by shortening crossing distances and improving visibility, but they also have a traffic calming effect by requiring more driver attention and potentially causing speed reduction, especially for turning movements (Caltrans, 2023). This countermeasure is most effective on roads with speeds of 25 to 40 MPH, with low to moderate volumes and 1 or 2 lanes in each direction (UDOT, 2023b). Curb extensions are typically implemented on corridors with on-street

parking, intersections with pedestrian activity, and where there are a small number of turning vehicles. Chokers are a type of roadway narrowing created by curb extensions or roadside islands that reduce the street width along a segment. The typical cost for four curb extensions is low; however, if drainage is an issue, the cost can increase to moderate.



**Figure 3.18 Curb Extensions (NACTO, 2026)**

#### 3.3.3.4 Roadway Narrowing

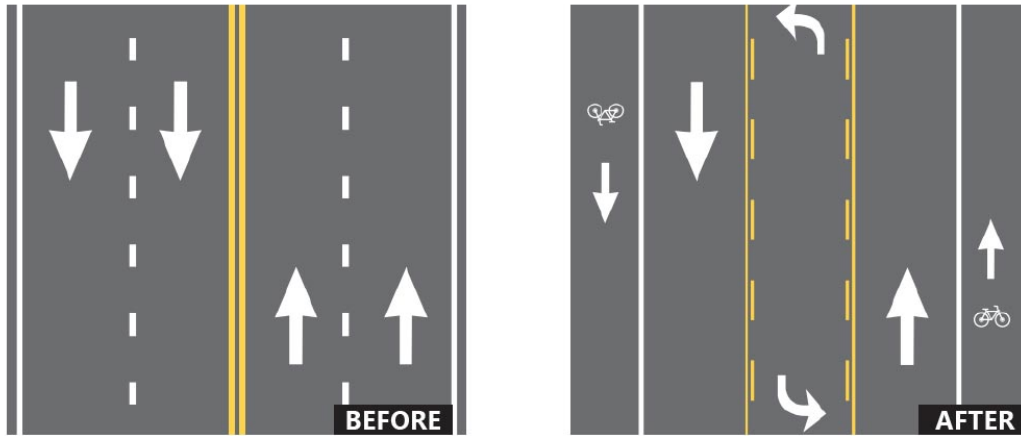
Roadway narrowing involves physical changes to the traveled way, such as modifying the number or width of lanes, or separating travel directions (FHWA, 2018a), as shown in Figure 3.19. This can be achieved through permanent installations like medians or curbing, or through the use of pavement markings or removable traffic control devices. The purpose is to encourage motorists to slow down by decreasing the speed they feel comfortable maintaining. The visual appearance of narrower lanes or the required change in alignment encourages speed reduction. Roadway narrowing is most appropriate on roadways with speeds between 25 and 40 MPH, low to moderate traffic volumes, and 1 to 3 lanes in each direction (UDOT, 2023b). The measured effect on speed reduction is low if made with no other changes, typically 0 to 3 MPH. The cost of roadway narrowing is relatively low per mile if only striping is implemented; however, the cost can increase if more physical measures are used.



**Figure 3.19 Roadway Narrowing (FHWA, 2018a)**

#### *3.3.3.5 Road Diet*

A road diet is a reconfiguration of the roadway to make it more community-focused, commonly done by converting an undivided four-lane road into a three-lane road with one through lane in each direction and a center two-way left-turn lane (FHWA, 2018a), as shown in Figure 3.20. Other reconfigurations are also possible. The primary goal is to create a safer multimodal environment by reallocating lane space for other uses like bike lanes, sidewalks, on-street parking, median islands, or a two-way left-turn lane. This modification is intended to encourage slower operating speeds and improve safety and facilities for all users, and especially VRUs. When implementing a road diet, a capacity analysis may be necessary to evaluate potential impacts on roadway capacity. Road diets can reduce speed from 1 to 5 MPH (UDOT, 2023b). They are most appropriate on roads with speeds between 25 and 50 MPH, with low to moderate traffic volumes, and 2 to 4 lanes of traffic in each direction. The cost of a road diet can vary greatly depending on how the roadway is reconfigured, but it is typically a moderate cost per mile when limited to striping.



**Figure 3.20 Road Diet (FHWA, 2026c)**

### 3.3.3.6 On-Street Parking

The presence of on-street parking can contribute to achieving lower operating speeds by creating increased “side friction,” which affects a driver's perception and comfort level (Caltrans, 2023). It constricts the perceived driver experience and an example is shown in Figure 3.21. On-street parking can also serve to separate bikeways from the traveled lane, enhancing bicyclist comfort while providing traffic calming. It can be implemented on either side, both sides, or alternating sides of the street, and can be combined with other traffic calming measures. It is most appropriate on urban roads with speeds between 15 and 30 MPH and typically reduces speeds by 1 to 5 MPH. The cost is relatively low when just considering the striping; however, it can greatly increase if physical changes must be made or ROW must be acquired (FHWA, 2018b).



**Figure 3.21 On-Street Parking (Caltrans, 2023)**

#### 3.3.4 Engagement

Engagement uses visual and auditory inputs to encourage drivers to be more aware of their speed and thus make more conscious decisions about their speed while driving (Schroeder et al., 2025). These visual and auditory inputs can enhance driver attention by prompting greater focus on the roadway environment. As drivers take more time to process this sensory information, they are more likely to slow down to a speed that allows for safe and deliberate interpretation of their surroundings. Some examples of how greater engagement can be encouraged are described in the following sections and summarized in Table 3.5.

**Table 3.5 Engagement Countermeasure Summary**

<b>Countermeasure</b>	<b>Speed Benefits</b>	<b>Access Category</b>	<b>Speed Range (MPH)</b>	<b>Cost</b>
Wayfinding, Signage, and Street Lights	Not measured	9	25-35	\$-\$\$
Optical Speed Bars	Reduces speed by 0-3 MPH	4,5,6,7,8,9,10	25-65	\$
Pavement Speed Limit Marking	Reduces speed by 1-2 MPH	All	All	\$
Transverse Rumble Strips	Reduces speed by 1-5 MPH	1,2,3,4,10	45-70	\$
Wider Striping	Not measured	1,2,3,4,10	>45	\$-\$\$
Roadside Gateway Features	Not measured	2,5,6,8,9	25-50	\$-\$\$\$
Signal Progression	Not measured	3,5,6	40-60	\$\$-\$\$\$
Variable Speed Limits	Not measured	2,3,4,5,6,10	>40	\$-\$\$\$

*3.3.4.1 Wayfinding, Signage, and Street Lights*

Wayfinding is the process of navigating through a space, supported by environmental cues such as signs or landmarks (ODOH, 2023), as shown in Figure 3.22. Wayfinding elements, signage, and street lights, especially decorative street lights, can be designed on a human scale in order to serve as gateway features that indicate to motorists that they are entering a community space with increased pedestrian, bicyclist, and vehicular activity, thereby encouraging slower speeds (FHWA, 2018a). These countermeasures are most applicable on roads with speeds between 25 and 35 MPH, all traffic volumes, and with 1 to 3 lanes of traffic in each direction (UDOT, 2023b). They are most effective in locations with pedestrian and bicyclist activity, as well as on-street parking. While speed reduction has not been precisely quantified, these features support other traffic calming strategies. The overall cost of signage and lighting is largely determined by the quantity installed.



**Figure 3.22 Wayfinding, Signage, and Decorative Lighting (UDOT, 2023b)**

### 3.3.4.2 Optical Speed Bars

Optical speed bars are a type of pavement marking placed transversely across the travel lanes (Caltrans, 2023), as shown in Figure 3.23. These markings are spaced with progressively reduced spacing to create a visual illusion for drivers that they are accelerating or moving faster than they are. This perceptual effect is intended to encourage drivers to instinctively slow down. They are considered a passive measure. Optical speed bars are typically used on unexpected curves or when entering rural communities. They are most applicable on roads with speeds between 25 and 65 MPH, with low to moderate traffic volumes, and with only 1 to 2 lanes of traffic in each direction (UDOT, 2023b). They have been observed to reduce speeds by 0 to 3 MPH. The average installation cost is low; however, optical speed bars are subject to wear and tear from tires and snowplows, increasing the cost of maintenance.



**Figure 3.23 Optical Speed Bars (UDOT, 2023b)**

#### *3.3.4.3 Pavement Speed Limit Marking (Horizontal Striping)*

Pavement speed limit markings, also known as horizontal striping, involve applying speed-related messages directly onto the pavement surface, such as “SLOW” or specific speed limit numbers like “XX MPH” (FHWA, 2018a), as shown in Figure 3.24. These markings serve to supplement existing roadside signs and provide a more dramatic visual cue to drivers to reinforce speed compliance. They can be used in transition zones to alert motorists entering a community or within town centers, particularly near areas sensitive to speed, like schools or playgrounds. They reduce speeds between 1 to 2 MPH and result in a 50 percent or more reduction in vehicles traveling more than 10 MPH over the speed limit (UDOT, 2023b). They are appropriate for all roadway speeds, traffic volumes, and numbers of lanes. The average installation cost is low, but it is important to consider that snowplows can cause damage to the pavement markings.



**Figure 3.24 Pavement Speed Limit Markings (UDOT, 2023b)**

#### *3.3.4.4 Transverse Rumble Strips*

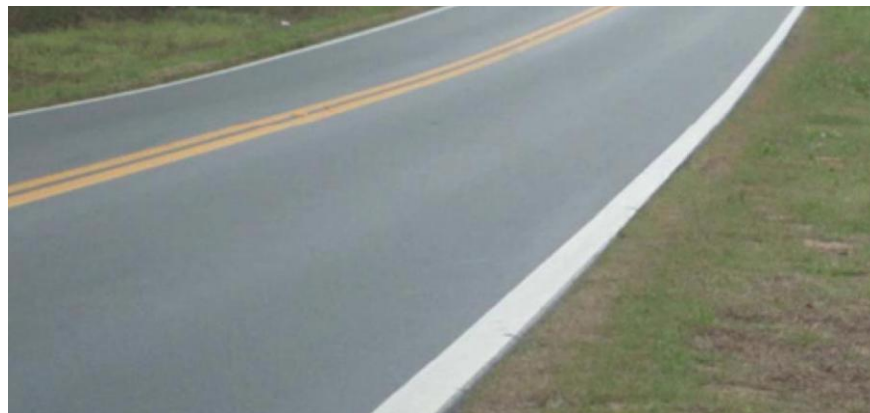
Transverse rumble strips are patterns, which can be either raised or grooved, installed across the travel lanes of a roadway (Caltrans, 2023), an example of which is shown in Figure 3.25. Their purpose is to create a physical vibration and audible noise when vehicles drive over them, serving as a tactile and auditory warning to drivers. They are used to alert motorists to upcoming changes in road conditions or hazards, such as approaching curves, intersections, or transitions into lower-speed areas. While primarily a warning device, they can also contribute to speed reductions of 1 to 5 MPH (UDOT, 2023b). They are most applicable for speeds between 45 and 70 MPH, all traffic volumes, and any number of lanes. The cost is relatively low, and installation can be done quickly. They can be implemented as in-pavement grooves or raised thermoplastic markings.



**Figure 3.25 Transverse Rumble Strips (UDOT, 2023b)**

#### *3.3.4.5 Wider Striping*

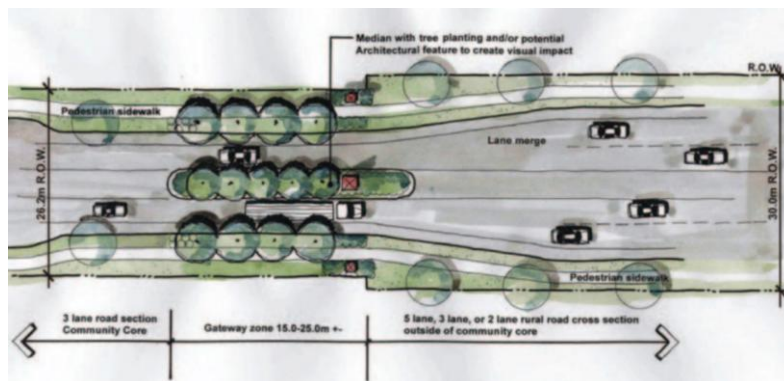
Wider striping, particularly on the outer edge of a roadway, increases visibility, which can help minimize roadway departures, as shown in Figure 3.26. Pavement lines are considered “wider” when the width is increased from 4 inches to 6 or 8 inches (FHWA, 2026c). This countermeasure applies to all facility types but is particularly beneficial on rural two-lane highways. They are proven to result in a 22 percent reduction in fatal and serious injury crashes on rural freeways (UDOT, 2023b). Wider striping is most appropriate for roads with speeds above 45 MPH, all traffic volumes, and roads with 1 to 2 lanes of traffic in each direction. The installation is relatively quick. Costs are typically low but depend on the length of the striping.



**Figure 3.26 Wider Striping (FHWA, 2026c)**

### 3.3.4.6 Roadside Gateway Features

Roadside gateway features are treatments located typically at the entrance to a community that combine elements like signage, landscaping (including street trees), lighting, banners, and public art (FHWA, 2018a). An example is shown in Figure 3.27. These features serve to visually indicate to drivers that they are leaving a higher-speed rural area and entering a community environment where pedestrian and vehicle activity will become more varied. The change in visual character and the presence of these features are intended to communicate that slower speeds are necessary. It is most appropriate for roads with speeds between 25 and 50 MPH and any number of lanes. The resulting speed reduction is dependent on the scale of the design (UDOT, 2023b). The cost of this countermeasure is also dependent on scale and materials.



**Figure 3.27 Roadside Gateway Features (UDOT, 2023b)**

### 3.3.4.7 Signal Progression

Signal progression involves timing signals along a corridor to a lower target speed that can help reduce overall travel speeds. While signal progression is primarily used to manage the flow of traffic, it may also be used to help manage the speed of traffic along certain corridors (FHWA, 2017). There is little information on the measurable impact this can have on speed; however, it is known to reduce collisions along a corridor between 10 to 20 percent. Signal progression is typically implemented along urban arterial roadways with speeds between 40 and 60 MPH. The cost of implementing signal coordination can vary depending on the number of intersections involved and the complexity of the system. It can be very expensive for entire

system installations; however, adjusting timings for existing systems is relatively moderate in cost (WSDOT, 2026).

### 3.3.4.8 Variable Speed Limits

Variable speed limits use electronic speed limit signs to dynamically adjust the posted speed limit for motor vehicles, as shown in Figure 3.28. The posted speed limit may change slightly depending on information about the roadway, such as traffic speed, traffic volumes, weather, and road surface conditions (FHWA, 2026c). Variable speed limits have been proven to result in a 34 percent decrease in total crashes and a 51 percent decrease in fatal and serious injury crashes. They are most applicable on urban and rural freeways and high-speed arterials, particularly with a posted speed limit of greater than 40 MPH. Costs vary depending on the type and extent of implementation, but are generally moderate to high (Kirley et al., 2023).



**Figure 3.28 Variable Speed Limit Signs (FHWA, 2026c)**

## 3.4 Case Studies: Cities

Several cities throughout the United States have adopted Vision Zero policies and have begun implementing speed management countermeasures following the Safe System Approach principles. Specifically, Fremont, California; New York City, New York; and Portland, Oregon have seen successful outcomes from their efforts to reduce speeds and fatal and serious injury crashes on the city-owned streets in their respective jurisdictions. These cities were evaluated because clear and accessible information was available on their implemented strategies, and each

city represented a distinct approach with documented implementation results. Case studies of the lessons learned and measurable outcomes for each of these cities will be discussed in the following sections.

#### 3.4.1 Fremont, California

In Fremont, California, a Vision Zero speed management program with several countermeasures was adopted in 2015, and an action plan was created in 2016 (Kumfer et al., 2023). The city adopted a Safe and Complete Streets program as part of this initiative that included reducing lane widths to 10 feet from the original 12 to 15 foot widths. Additionally, the number of speed humps was increased from 200 to 250. The posted speed limit was also lowered on over 50 different street segments, and a community campaign, “Drive Slowly, Be Healthy,” was launched that advocated 20 MPH advisory speeds on all neighborhood streets. Along with these systemic improvements to prevent future crashes, the city of Fremont also implemented specific improvements at crash hotspots. The hotspot response improvements included countermeasures such as buffered bike lanes, medians, and quick-build crosswalk improvements.

Speed surveys were conducted on approximately 100 street segments citywide before and after the implementation of these countermeasures (Kumfer et al., 2023). As a result of these changes, there was a 45 percent reduction in the number of fatal and serious injury crashes across all modes and a 44 percent decrease in total crashes involving speeding. Additionally, at one of the hotspots addressed, no fatal and serious injury crashes have occurred since the improvements were made. These accomplishments were achieved with no new funding commitments or staff positions but instead by reallocating existing resources away from projects that did not directly serve the Vision Zero goals. The city was able to redirect \$2.5 million in funding that allowed work on these projects to start immediately. The next plan for the city includes encouraging State legislation for safer speeds by enabling speed safety cameras, as well as continuing local actions by managing speeds using signal timing and enforcement.

#### 3.4.2 New York City, New York

In New York City, New York, after adopting a Vision Zero policy in 2014, a speeding solutions toolkit was created to address speed management with a variety of approaches (Kumfer

et al., 2023). Implementing this policy began with lowering the citywide default speed limit to 25 MPH and reducing posted speed limits by 5 MPH or more on more than 70 miles of roadway. The city also installed more than 5,000 new speed limit signs, 2,200 speed humps, and 40 speed cushions. The city also increased traditional police enforcement alongside speed camera installation in 750 school speed zones. They also adopted a Street Improvement Projects program that involved implementing physical countermeasures at locations with high rates of serious pedestrian injuries and fatalities. These countermeasures include reducing lane width, converting lanes for pedestrian and cyclist use, adding markings and plastic bollards for turn calming, and rubber speed bumps. The city also worked with the New York City Police Department to combine education and enforcement, increasing community outreach and information about safety and Vision Zero efforts. Public education campaigns through television, radio, billboards, and bus stop advertisements have also had an emphasis on speeding.

Several positive outcomes resulted from these changes, identified through before-after analysis (Kumfer et al., 2023). The speeding at school zone camera locations dropped 72 percent, and in these areas, there was a 3 percent reduction in total crashes, an 8 percent reduction in crashes with injury, and a 20 percent reduction in injury resulting from bicycle and pedestrian crashes with children. At 1,637 speed hump locations, analysis showed a 9 percent reduction in injuries, and at 9 speed cushion locations there was a 17 percent reduction in injuries. In an evaluation of 107 intersections where turn-calming treatments were implemented, a 33 percent reduction in pedestrian fatalities and serious injuries was shown. Additionally, twenty-eight road segments that had received road diet treatments were also evaluated, and a 28 percent reduction in pedestrian fatalities and serious injuries was demonstrated. The speed camera program had about \$156 million in operating costs and \$94.5 million in capital costs from 2014 to 2020.

### 3.4.3 Portland, Oregon

The city of Portland, Oregon adopted a Vision Zero policy in 2015 with a large focus on speed management (Kumfer et al., 2023). The city reduced speed limits from 25 to 20 MPH on most residential streets. Approximately 76 percent of non-freeways now have a 20 MPH posted speed limit, and more than 90 percent of non-freeway streets in Portland have speed limits no higher than 30 MPH. The city also began working with Oregon DOT to update the target speed

limit setting methodology for speeds greater than 25 MPH that incorporates context and modes. In 2020, the Oregon DOT adopted these revised speed limit setting rules for all urban areas to incorporate a more balanced consideration of safety for all users and decreased reliance on speed distribution data. Street redesigns were used in several locations, often including a road diet that reduced the number of vehicular travel lanes and improved pedestrian and bicyclist travel. In response to approximately 20 percent of pedestrian crashes resulting from left-turning drivers failing to yield at signalized intersections, intersection left-turn calming was implemented at 42 locations. Temporary devices such as rubber bumps, delineator posts, and thermoplastic striping were used to harden center lines and create small bulb-outs or “wedges” to encourage slower turning speeds (PBOT, 2020). Speed safety cameras were also allowed to be used on High Crash Network streets, with eight being installed. Portland also began a citywide Struck Speed Campaign to educate citizens of the risks associated with high speeds.

Several speed reduction results were found as an outcome of the implementation of these speed reduction measures (Kumfer et al., 2023). Following the speed limit reduction in residential areas, Portland found a 34 percent reduction in the observed speeds greater than 30 MPH and a 50 percent reduction in the observed speeds greater than 35 MPH. The street redesigns also showed a reduction in vehicle speeds with no significant changes to travel times, volumes, or speeds on nearby neighborhood streets. The left-turn calming at intersections also showed a reduction of vehicular turning speeds by 13 percent. As a result of installing speed safety cameras, speeding in those areas dropped 71 percent, and speeding more than 10 MPH over the speed limit has dropped 94 percent. Equity was also considered with the placement of the speed safety cameras so that they are not concentrated in any one community, and there are options to tier camera fines based on income and ability to pay.

### **3.5 Case Studies: States**

Several state DOTs have adopted Safe System Approach principles and implemented related policies and programs that focus on speed management. These include Washington State, Nevada, Massachusetts, Minnesota, and California, among others. The states analyzed were selected because several are neighboring or peer states, clear documentation of their efforts is available, and each has implemented Safe System Approach principles related to speed

management in a distinct manner. The following sections will discuss the experiences of these state DOTs and some of the specific changes these agencies have made to align with the Safe System Approach and progress closer to a goal of zero fatalities.

### 3.5.1 Washington State DOT

In 2020, the Washington Injury Minimization and Speed Management Policy and Guidelines Workgroup, a group of engineers from Washington State DOT (WSDOT) and other representatives from local agencies, prepared a report titled “Washington State Injury Minimization and Speed Management Policy Elements and Implementation Recommendations” (Beagle et al., 2020). The report encourages all owners of public roads, streets, and highways in Washington State to use this document to help create, adopt, and implement Injury Minimization and Speed Management Policies and other changes that may be applicable.

Seven recommended elements of an Injury Minimization and Speed Management Policy are outlined in the report (Beagle et al., 2020). First is adopting and implementing an injury minimization speed-setting approach that focuses on minimizing injury severity should a crash occur. This involves setting appropriate target speeds using categories; adopting target speeds within 5 MPH of operating speeds; using an engineering study, iterative speed limits, and speed management measures when operating speeds exceed target speeds by 5 MPH; and making incremental adjustments of 5 MPH or more following motorist response to speed management to reach target speed. The second element suggests adopting a broader Safe System Approach to identify locations to prioritize, using a systemic approach that uses context, crash data, crash potential, and roadway characteristics to find areas that have a high possibility of fatal and serious injury crashes.

The third element recommends considering injury minimization and speed management in all transportation investments, regardless of funding source. These goals should be included in all project phases. The fourth element is collaborating with neighboring jurisdictions and working together to develop and improve the transportation network while striving to achieve the State Target Zero goal. The fifth element requires training on injury minimization and speed management techniques for everyone working on transportation projects, including designers, planners, and consultants. The sixth element is adopting access control, access management

policies, and land-use development policies, ordinances, and practices that, instead of focusing on existing speeds, consider target speeds as well. The final element recommends adopting a Washington State “Target Zero” or “Vision Zero” safety goal.

The “Washington State Injury Minimization and Speed Management Policy Elements and Implementation Recommendations” report then gives several implementation recommendations that can support an Injury Minimization and Speed Management Policy (Beagle et al., 2020). Further information on target speed setting is provided, including suggesting sources such as 50<sup>th</sup> percentile speeds, 10 MPH pace speeds, crash history, number of speeding tickets issued, and speed variance from posted speeds when determining proper target speeds and necessary speed management treatments. Design and geometric recommendations are also outlined, describing potential physical speed management countermeasures such as deflection, access control, or road diets, which focus on multimodal operation and injury minimization concepts. Additionally, recommendations for traffic operations are given. The document suggests traffic safety cameras to improve compliance, prioritizing roundabouts, using radar feedback signs, and considering signal timing to manage target speeds. Further recommendations about professional development and training, funding, site design, and land use planning are also described.

Finally, the “Washington State Injury Minimization and Speed Management Policy Elements and Implementation Recommendations” report discusses several issues that are specific to rural roads that need to be considered when implementing speed management treatments (Beagle et al., 2020). On rural roads, motorists tend to have an expectation for high speeds due to a history of higher posted speeds, longer segments between access points, traveling longer distances between destinations, and the wide, clear areas with less natural visual friction. This makes speed management more challenging, but operating speed is an important factor in many common rural fatal and serious injury crash types, such as run-off-the-road crashes or vehicles hitting a fixed object. Recommended speed management treatments that have been effective on rural roads are roundabouts, speed feedback signs, school-zone flashing beacons, and decreasing the number of travel lanes through road reconfigurations. Additional treatments that may be used with further engineering judgment and consideration of context are speed humps and bumps, pinch points, and narrowing the travel lane width.

WSDOT has also begun mandating the Safe System Approach through their Target Zero Plan (Millar, 2024). Part of this plan includes adopting a “roundabout first” policy when planning and designing intersections to promote reduced speeds and fewer conflict points. Additionally, roadside safety devices are installed to decrease the severity of injuries in locations where running off the road is likely to occur from driver error. Speed safety cameras have also been allowed by the legislature on State highways, providing another tool to promote lower speeds. Within the pedestrian and bicyclist networks on the State system, they have also identified gaps that will be addressed through Complete Streets projects to reduce the vulnerability of active transportation users. WSDOT has also become the first state DOT to add a safe land use policy that helps reduce exposure to crashes by shortening distances between where people typically travel, so that a vehicle does not have to be the default option.

### 3.5.2 Nevada DOT

In June of 2022, the Nevada DOT (NDOT) published their Speed Management Action Plan, characterizing Nevada’s speeding-related safety problems and speed management issues, identifying potential countermeasures and strategies, and outlining actions that NDOT and partner agencies can take to improve in these areas (NDOT, 2022). The plan focuses on having a proactive, comprehensive, and systematic approach to the implementation of strategies and countermeasures. Seven specific strategies and related action items are identified from best speed management principles and provide the framework for a sustainable speed management program.

The first strategy is communication and education (NDOT, 2022). Choosing to frame speeding and speed-related safety problems in the best way can help build support and be useful in leveraging funding as well as improving the effectiveness of enforcement and engineering countermeasures. Action items with this strategy include seeking support for technologies that allow for further enforcement reach and effectiveness and improving communications regarding the safety reasons for speed management efforts to increase support. Issues to be addressed through this strategy are a lack of support for appropriate speed limits, enforcement strategies, or engineering strategies; widespread speeding; policies that may limit speed enforcement; lack of resources; challenges to enforcement in certain areas; and legal or other barriers to using automated enforcement.

The second strategy is setting speed limits (NDOT, 2022). A task force can be developed to engage in target speed and speed limit setting and safety. Action items include developing procedures for setting more uniform speed limits based on context, developing a collaborative speed limit setting process among State and local stakeholders, conducting outreach or training to decision-makers or practitioners, and providing outreach on the impact of speeds and speed limits on safety. Potential issues can be speeds that are too high or low for local priorities and concerns; a mismatch between road design, speed limits, and user needs; varied methods and outcomes in setting speed limits which may affect safety; difficulty enforcing speed limits where inferred or actual design speeds are higher; and a lack of agreement among jurisdictions about appropriate speed limits for similar types of roads.

The third strategy is to plan and design for speed management (NDOT, 2022). By developing an inter-agency speed and safety assessment process to review plans, designs, and implementation, new projects can be ensured to meet speed management design and operation principles for the land use and intended purpose of the road. Action items include prioritizing speed-managing designs that will have long-term effects; conducting speed and safety reviews of all new and pending plans and designs to ensure that they elicit speeds close to the intended speed limit and that operational features are also coordinated with target speeds; setting or revising speed limits early in the design process; and considering specific designs to apply to similar road types throughout the State to encourage self-explaining designs. Issues may be operating speeds that are incompatible with operations or geometry; designs that are incompatible with user needs and land use; a reactive approach to safety, which is less effective than an initial good design; and a lack of self-enforcing or self-explanatory roadway designs. A self-enforcing roadway is a roadway that encourages road users to use operating speeds consistent with the posted speed limit through the planning and design, often using geometric elements (Donnell et al., 2018).

The fourth strategy is systemic actions and strategies in high-crash corridors (NDOT, 2022). This can be done through the development and implementation of a systematic speed and safety treatment prioritization process. Action items include conducting network screening to prioritize roadway elements with potential speeding-related safety issues, taking advantage of maintenance and operations opportunities to implement improvements to reduce speed, applying

consistent countermeasures to similar locations, and implementing appropriate countermeasures for corridors with speeding issues. This approach should be used for each problem area identified through a network screening to prioritize appropriate treatments for the identified safety issues.

The fifth strategy is enforcement and publicity on high-crash corridors (NDOT, 2022). Areas of the network where fatal and serious injury crashes occur can be targeted by developing and implementing a sustainable, high-visibility enforcement (HVE) and adjudication program. Action items include supporting HVE efforts for aggressive driving and speed and implementing automated enforcement with civil penalties in areas where supplemental or continuous enforcement is needed. Issues to be addressed are widespread speeding, resource limitations that lead to difficulty maintaining special or enhanced enforcement programs, insufficient enforcement resources, and challenges with enforcing in certain areas or times.

The sixth strategy is systemic speed review within the HSIP and other safety programs (NDOT, 2022). This is achievable through implementing speed and safety reviews within the HSIP and coordinating with other transportation safety plans. Action items include implementing corridor or area-wide speed reviews and countermeasures to supplement spot safety improvements and coordinating with law enforcement before engineering measures can be implemented to supplement or provide enhanced enforcement. Issues that can be addressed are speeding at intersections, roadway and lane departure crashes related to speeding, pedestrian and bicycle safety and mobility problems, inappropriate speeds in pedestrian areas with few safe crossings, difficulty for bicyclists to share higher speed roads, and spot safety problems related to speeding.

The seventh strategy is using speed and speeding-related data (NDOT, 2022). Identifying opportunities to improve the available speed and speeding-related data can make the data more useful. Action items include identifying how data from Fatality Analysis Reporting Systems (FARS) can be incorporated into the Nevada Citation and Accident Tracking System dataset to close the gap in reporting speeding-related fatal crashes and determining best methods to track and monitor speed along corridors. Problems that can be addressed are the disparity of speeding-related crash data between FARS and the Nevada tracking system and understanding where speeding is an issue to prioritize improvements.

Several speed management countermeasures are additionally provided in the NDOT document, separated by use along roadways or at intersections, to be used to achieve the desired operating speeds (NDOT, 2022). The countermeasures are generally more effective when multiple are used in combination with one another. Several factors should be considered when selecting countermeasures to implement: the roadway environment, desired operating speed, existing operating speed, existing and future community needs, existing and future multimodal needs, safety of roadway users, and emergency response vehicles. Target speeds and roadway environments where the varying countermeasures can be used are also provided in the NDOT document.

### 3.5.3 Massachusetts DOT

The Massachusetts DOT (MassDOT) has provided a website about speed management, which offers information and resources for setting target speeds, lowering speed limits, and implementing speed management countermeasures (MassDOT, 2026). They suggest not relying on 85<sup>th</sup> percentile speeds for determining speed limits, but instead considering land use, road users, and safety. Additionally, MassDOT recently began offering an opt-in policy for jurisdictions that lowers statutory speed limits from 30 to 25 MPH in urban areas. The website provides a speed management toolkit that gives examples of countermeasures and speed treatments that have been successful in the State, as well as recommended locations for use. MassDOT aims to work closely with municipalities to help them conduct speed studies and implement speed management. They also sign official speed limits into law but cannot enforce speed limits. The goal is to design self-enforcing roadways and encourage raising awareness and creating a community-wide safe-speed culture.

### 3.5.4 Minnesota DOT

The Minnesota DOT (MnDOT) has published a report titled “Guidelines for Determining Speed Limits on Municipal Roadways” (Miner and Arvidson, 2023). This report emphasizes that there is no evidence that lowering speed limits results in lower travel speeds, but instead that changes to the roadway environment, as well as increased enforcement, will have a greater impact. The report focuses on decreasing fatal and serious injury crashes with pedestrians and bicyclists, using a systematic approach since there are not typically hotspots with these crashes.

Strategies that have been proven not to be effective when implemented alone include marked crosswalks, traffic signals, reduced urban speed limits, and on-road bike lanes. Strategies that have been proven to be effective include sidewalks, median crossings and refuge islands, crosswalk lighting, road diets, pedestrian hybrid beacons, rapid rectangular flashing beacons, leading pedestrian intervals, and countdown timers. The report recommends implementing proven alternative strategies instead of relying solely on lowering speed limits as a solution. It also emphasizes the importance of addressing citizen concerns and opening a dialogue with citizens to help understand the perceived and actual safety issues of the public.

### 3.5.5 California DOT

The California DOT (Caltrans) has published a report that presents several city- and state-level case studies about implementing the Safe System Approach, documents correspondence with various agencies, and provides nine specific recommendations that California could implement (Akber, 2023). The first recommendation is to expand the specificity of local context used in current law to add sub-categories based on specific land uses. Doing so would assist in evaluating location context on a hyper-local level when determining the appropriateness of speed limits. The second recommendation is to include more descriptive special definitions for certain communities to assist in identifying which options are relevant and applicable, for example, in rural communities. The third recommendation is to consider using a speed limit setting methodology that is systemic, beginning with people and vulnerable groups and the locations that serve those users, then continuing to locations based on context and built environment.

The fourth recommendation is to maintain a level of consistency in speed limit setting that is easily communicated and memorable in its context, so that everyday users can understand—it does not need to be city-wide. The fifth recommendation is to allow for the use of temporary speed limits simultaneously with other countermeasures and if the added countermeasures change the context. The sixth recommendation is to use complementary countermeasures to reduce speeds. These countermeasures do not need to be limited to engineering design, but can include human enforcement and automated enforcement, for example, red-light cameras combined with signal timing modifications.

The seventh recommendation is to prepare a list of ready countermeasures that can be implemented to complement speed limit modifications at relatively low cost, depending on context. Countermeasures that are not strictly speed-related can also be implemented to support a Safe System, such as right-turn-on-red restrictions, more speed limit signs, and leading pedestrian intervals. The eighth recommendation is to identify the root cause of speed-related collisions in an area using collision and traffic stop data. Root causes could include unnecessarily high speed limits, unaware drivers, or drivers who choose not to follow the speed limit. Agencies can coordinate with law enforcement to collect this data. The ninth recommendation is to use customized, memorable, and relatable community-specific informational signage and educational campaigns about speed limits anchored in Safe System Approach goals to help the public understand the reasoning for the interventions and become accustomed to the modifications.

### **3.6 Summary**

The Safe System Approach is already being adopted in Utah and throughout the United States by agencies at both city- and state-levels. Learning about policies, programs, and countermeasures that have been successfully implemented in other similar locations can be beneficial in determining actions to take here in Utah. This section covered Utah's policies that align with the Safe System Approach, 32 speed management countermeasures, and case studies of the efforts from various agencies to influence safe speeds in cities and states. These practices can be evaluated to understand what lessons can be learned and applied by UDOT to help them progress in reaching their goal of Zero Fatalities.

## **4.0 EVALUATION AND SUMMARY**

### **4.1 Overview**

Based on feedback from the TAC on the best way to evaluate the countermeasures and case studies presented in Chapter 3, this chapter will sort the speed management countermeasures by roadway type and timeline and provide a summary of the case studies, looking at the speed and crash reduction effects seen in city case studies and the speed management countermeasure approaches taken in the city and state case studies. Each of these sections will include an explanation of the summary criteria, a table outlining the results of the summary, and an evaluation of the results. Additionally, an evaluation of current UDOT practices will be included with discussion of how current practices align with the speed management countermeasures used in the case studies with a focus on the state-level approaches.

### **4.2 Countermeasures by Roadway Type and Timeline**

Chapter 3 presented a range of speed management countermeasures that can be used to reduce crash risk, improve safety for all road users, and support context-sensitive roadway design. These treatments vary in complexity, cost, and permanence (e.g., pavement markings to full reconstruction projects) and can be strategically phased based on available resources and corridor needs. Organizing these countermeasures by implementation timeline and applicable roadway type helps agencies prioritize near-term actions while planning for long-term system improvements. This framework offers a practical lens through which agencies can identify, evaluate, and apply speed management strategies that align with operations and safety outcomes.

Table 4.1 provides a summary of the countermeasures introduced in Chapter 3, organized by implementation timeline—categorized as quick wins, mid-range treatments, and long-term strategies—and by roadway type (i.e., rural arterial, urban arterial, rural collector, urban collector, local road, and transition zones). Where relevant, UDOT access categories are also noted with the roadway type. Some countermeasures appear under multiple roadway types since they can be applied in different contexts. The timeline categorization assumes a complete project build, though in practice many countermeasures could be delivered more quickly through

temporary or quick-build measures. Conversely, factors such as funding availability or ROW acquisition may lengthen timelines beyond what is shown. Quick wins have the shortest implementation timeline with consideration of cost, design, and construction. The mid-range treatments and long-term strategies then have progressively longer timelines associated with the projects, considering the same factors. Roadway type assignments were based on characteristics such as recommended speed ranges, number of lanes, and the traffic volumes each countermeasure can accommodate. It is important to note that this table is not exhaustive; project-specific context should always guide the selection of appropriate countermeasures.

**Table 4.1 Countermeasures by Roadway Type and Timeline**

Roadway Type (Access Category)	Timeline		
	Quick Wins	Mid-Range Treatments	Long-Term Strategies
Rural Arterial (2,4)	<ul style="list-style-type: none"> <li>• Increase public awareness</li> <li>• Neighborhood street watch</li> <li>• Safe Community programs</li> <li>• Conventional speed enforcement</li> <li>• Landscaping</li> <li>• Optical speed bars</li> <li>• Pavement speed limit marking</li> <li>• Transverse rumble strips</li> <li>• Wider striping</li> </ul>	<ul style="list-style-type: none"> <li>• Speed safety cameras</li> <li>• Median island</li> <li>• Roadside gateway features</li> </ul>	<ul style="list-style-type: none"> <li>• Road diet</li> <li>• Variable speed limits</li> </ul>
Urban Arterial (3,5)	<ul style="list-style-type: none"> <li>• Increase public awareness</li> <li>• Neighborhood street watch</li> <li>• Safe Community programs</li> <li>• Conventional speed enforcement</li> <li>• Landscaping</li> <li>• Optical speed bars</li> <li>• Pavement speed limit marking</li> <li>• Transverse rumble strips</li> <li>• Wider striping</li> </ul>	<ul style="list-style-type: none"> <li>• Speed safety cameras</li> <li>• Median island</li> <li>• Roadside gateway features</li> </ul>	<ul style="list-style-type: none"> <li>• Lateral shift</li> <li>• Roundabout</li> <li>• Road diet</li> <li>• Signal progression</li> <li>• Variable speed limits</li> </ul>

**Table 4.1 (continued)**

<b>Roadway Type (Access Category)</b>	<b>Timeline</b>		
	<b>Quick Wins</b>	<b>Mid-Range Treatments</b>	<b>Long-Term Strategies</b>
Rural Collector (7)	<ul style="list-style-type: none"> <li>• Increase public awareness</li> <li>• Neighborhood street watch</li> <li>• Safe Community programs</li> <li>• Conventional speed enforcement</li> <li>• Landscaping</li> <li>• Optical speed bars</li> <li>• Pavement speed limit marking</li> </ul>	<ul style="list-style-type: none"> <li>• Speed safety cameras</li> <li>• Small modern/mini-roundabout</li> <li>• Speed table/offset speed tables</li> <li>• Median island</li> <li>• Curb extensions</li> <li>• Roadway narrowing</li> </ul>	<ul style="list-style-type: none"> <li>• Lateral shift</li> <li>• Roundabout</li> <li>• Raised intersection</li> <li>• Road diet</li> </ul>
Urban Collector (6,8)	<ul style="list-style-type: none"> <li>• Increase public awareness</li> <li>• Neighborhood street watch</li> <li>• Safe Community programs</li> <li>• Conventional speed enforcement</li> <li>• Landscaping</li> <li>• Optical speed bars</li> <li>• Pavement speed limit marking</li> </ul>	<ul style="list-style-type: none"> <li>• Speed safety cameras</li> <li>• Small modern/mini-roundabout</li> <li>• Speed table/offset speed tables</li> <li>• Raised crosswalk</li> <li>• Median island</li> <li>• Curb extensions</li> <li>• Roadway narrowing</li> <li>• Roadside gateway features</li> </ul>	<ul style="list-style-type: none"> <li>• Lateral shift</li> <li>• Chicane</li> <li>• Roundabout</li> <li>• Raised intersection</li> <li>• Realigned intersection</li> <li>• Road diet</li> <li>• Signal progression</li> <li>• Variable speed limits</li> </ul>
Local Road (9)	<ul style="list-style-type: none"> <li>• Increase public awareness</li> <li>• Neighborhood street watch</li> <li>• Safe Community programs</li> <li>• Conventional speed enforcement</li> <li>• Landscaping</li> <li>• Wayfinding, signage, and decorative street lights</li> <li>• Optical speed bars</li> <li>• Pavement speed limit marking</li> </ul>	<ul style="list-style-type: none"> <li>• Speed safety cameras</li> <li>• Small modern/mini-roundabout</li> <li>• Traffic circle</li> <li>• Speed hump</li> <li>• Speed cushion</li> <li>• Speed table/offset speed tables</li> <li>• Raised crosswalk</li> <li>• Median island</li> <li>• Curb extensions</li> <li>• Roadway narrowing</li> <li>• On-street parking</li> <li>• Roadside gateway features</li> </ul>	<ul style="list-style-type: none"> <li>• Lateral shift</li> <li>• Chicane</li> <li>• Roundabout</li> <li>• Raised intersection</li> <li>• Realigned intersection</li> <li>• Diagonal diverter</li> <li>• Road diet</li> </ul>

**Table 4.1 (continued)**

Roadway Type (Access Category)	Timeline		
	Quick Wins	Mid-Range Treatments	Long-Term Strategies
Transition Zones	<ul style="list-style-type: none"> <li>• Increase public awareness</li> <li>• Neighborhood street watch</li> <li>• Safe Community programs</li> <li>• Conventional speed enforcement</li> <li>• Landscaping</li> <li>• Pavement speed limit marking</li> <li>• Optical speed bars</li> <li>• Transverse rumble strips</li> <li>• Wider striping</li> </ul>	<ul style="list-style-type: none"> <li>• Speed safety cameras</li> <li>• Median island</li> <li>• Roadside gateway features</li> </ul>	<ul style="list-style-type: none"> <li>• Road diet</li> <li>• Variable speed limits</li> </ul>

Several countermeasures are available for use on all roadway types with proper design. Road diets and medians are both longer timeline countermeasures that can be used on all roadways because of the flexibility in design that can accommodate a variety of speeds and volumes. Optical speed bars, pavement speed limit markings, and landscaping also provide the flexibility to be used on a variety of roadway types and can be implemented more quickly. Additionally, most programs can be implemented quickly and are applicable to all roadways since they are not physical countermeasures. Similarly, both automated and conventional enforcement can be used on all roadways; however, the implementation of speed safety cameras may take longer.

Most physical countermeasures that include deflection are more appropriate for collectors or local roads since they typically have lower speed limits. This includes measures such as speed humps/cushions/tables and lateral shifts or chicanes. Areas with these roadway types will also often have higher volumes of VRUs which support the use of raised crosswalks/intersections and curb extensions. The use of these and all the countermeasures in Table 4.1 should focus on creating a roadway environment that encourages safe operating speeds that align with target speeds for all road users.

### 4.3 Case Study Evaluation

In addition to individual physical design strategies, Chapter 3 highlighted the importance of supportive policies and programs that enable and accelerate effective speed management through peer examples. As stated in Chapter 3, these cities and states were chosen because they each had published results about implementing Safe System Approach-inspired measures. City- and state-level policies (e.g., context-based speed-setting guidance, statewide action plans, and integration of Safe System Approach principles into existing programs) can provide the institutional framework necessary to scale countermeasure deployment and sustain long-term safety improvements. The following sections draw on the real-world examples from peer cities and states, comparing them and offering a snapshot of what is already working, where it is working, and how it is working. These resources help inform strategic direction and practical implementation, providing models that can be adapted to meet the unique needs of agencies like UDOT.

#### 4.3.1 City Case Study Comparison

In Chapter 3, case studies in the cities of Fremont, California; New York City, New York; and Portland, Oregon (Kumfer et al., 2023) were presented. Table 4.2 summarizes the outcomes of these three studies, including reductions in vehicle speeds and changes in crash frequency and severity. Additionally, all the countermeasures implemented in each case study are listed. Reviewing results at the city-level offers clear advantages, as the smaller geographic scale allows for more consistent data collection, greater control over variables, and a more direct connection between countermeasures and observed outcomes. This focus makes it easier to identify patterns and evaluate the effectiveness of specific strategies before considering broader applications. Many of the countermeasures used in the city case studies align with those outlined in Chapter 3, although some represent modified or alternative versions of the policies and programs previously discussed.

**Table 4.2 City Case Study Comparison**

<b>Case Study</b>	<b>Effects</b>	<b>Countermeasures</b>
Fremont, CA	<ul style="list-style-type: none"> <li>• 45% reduction in crashes with serious injury and fatality</li> <li>• 44% reduction in crashes involving speeding</li> </ul>	<ul style="list-style-type: none"> <li>• Roadway narrowing</li> <li>• Safety action plan</li> <li>• Speed hump</li> <li>• Complete Streets program</li> <li>• Lower speed limits</li> <li>• Community campaign</li> <li>• Vision Zero policy</li> <li>• Road diet</li> <li>• Median island</li> </ul>
New York City, NY	<ul style="list-style-type: none"> <li>• School zone camera locations: <ul style="list-style-type: none"> <li>• 72% reduction in speeding</li> <li>• 3% reduction in total crashes</li> <li>• 8% reduction in crashes with injuries</li> <li>• 20% reduction in injury from VRU crashes with children</li> </ul> </li> <li>• 9% reduction in injury at speed hump locations</li> <li>• 17% reduction in injury at speed cushion locations</li> <li>• 33% reduction in VRU serious injury and fatality at intersections with turn-calming</li> <li>• 28% reduction in VRU serious injury and fatality at road diet locations</li> </ul>	<ul style="list-style-type: none"> <li>• Speed management toolkit</li> <li>• Vision Zero policy</li> <li>• Lower speed limits</li> <li>• Installed new speed limit signs</li> <li>• Speed hump</li> <li>• Speed cushion</li> <li>• Conventional speed enforcement</li> <li>• Speed safety cameras</li> <li>• Street improvement projects</li> <li>• Roadway narrowing</li> <li>• Road diet</li> <li>• Speed bump</li> <li>• Community campaign</li> </ul>
Portland, OR	<ul style="list-style-type: none"> <li>• Residential locations: <ul style="list-style-type: none"> <li>• 34% reduction in observed speeds greater than 30 MPH</li> <li>• 50% reduction in observed speeds greater than 35 MPH</li> </ul> </li> <li>• No significant changes to travel times, volumes, or speeds on streets nearby road diet locations</li> <li>• 13% reduction in turning speeds at turn-calming locations</li> <li>• Speed safety camera locations: <ul style="list-style-type: none"> <li>• 71% reduction in speeding</li> <li>• 94% reduction in speeding more than 10 MPH</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Vision Zero policy</li> <li>• Lower speed limits</li> <li>• Context-based speed limit setting</li> <li>• Road diet</li> <li>• Curb extensions</li> <li>• Speed safety cameras</li> <li>• Community campaign</li> </ul>

Several clear trends emerge from the comparison of these city case studies. All three cities implemented a combination of countermeasures, including road diets, reduced speed limits, Vision Zero policies, and community outreach campaigns. In addition to these common strategies, each city employed a mix of both physical and policy-based measures tailored to its

local context. These strategies reinforce the principle outlined in the Safe System Approach—that creating safer roadways requires a comprehensive, layered strategy. A single countermeasure applied in isolation is unlikely to produce substantial change, whereas a coordinated set of interventions can generate more meaningful and sustained results. However, the concurrent application of multiple strategies also makes it challenging to isolate the individual impact of each countermeasure when determining the most effective combination for a given setting.

The observed outcomes across the three cities were similarly consistent. All locations reported notable reductions in vehicle speeds where interventions were applied, accompanied by declines in both crash frequency and severity. In the two cities that deployed speed cameras, speeding decreased by more than 70 percent at treated locations, with even greater reductions in excessive speeding. It is also likely that additional secondary benefits occurred following implementation in each case study, though these were not all formally documented.

#### 4.3.2 State Case Study Comparison

In Chapter 3, case studies from DOTs in Washington State (Beagle et al. 2020; Millar 2024), Nevada (NDOT, 2022), Massachusetts (MassDOT, 2026), Minnesota (Miner and Arvidson, 2023), and California (Akber, 2023) were presented. Table 4.3 provides a summary of the approaches adopted or recommended by each agency. Unlike city-level studies which often emphasize localized countermeasures and measurable short-term outcomes, the state-level perspective is generally more policy-driven and systematic in nature, with a focus on long-term goals and broad implementation frameworks. Because many of these strategies are still in the process of being applied, detailed outcome data are not yet available. However, comparing the policies and initiatives pursued by peer DOTs offers valuable insight into potential strategies that may be adapted and implemented in Utah. Many of the state-level strategies reflect the concepts introduced earlier, though they are often implemented as broader adaptations or refined versions of those policies and programs.

**Table 4.3 State Case Study Comparison**

<b>DOT Case Study</b>	<b>Approach</b>
Washington State	<ul style="list-style-type: none"> <li>• Injury minimization and speed management policy</li> <li>• Context-based speed limit setting</li> <li>• Systemic prioritization</li> <li>• Collaboration with other jurisdictions and non-traditional partners</li> <li>• Train everyone working on transportation projects in Safe System Approach techniques</li> <li>• Access management and land use policies that consider target speeds</li> <li>• Vision Zero policy</li> <li>• Roundabout first policy</li> <li>• Safe land use planning</li> <li>• Complete Streets policy</li> <li>• Regular monitoring and evaluation</li> </ul>
Nevada	<ul style="list-style-type: none"> <li>• Speed Management Action Plan</li> <li>• Community campaign</li> <li>• Context-based speed limit setting</li> <li>• Plan and design for speed management</li> <li>• Systemic prioritization</li> <li>• Conventional enforcement and publicity on high-crash corridors</li> <li>• Systemic speed review</li> <li>• Using speed and speeding-related data</li> </ul>
Massachusetts	<ul style="list-style-type: none"> <li>• Context-based speed limit setting</li> <li>• Speed management toolkit</li> <li>• Collaboration with other jurisdictions</li> <li>• Self-enforcing roads</li> </ul>
Minnesota	<ul style="list-style-type: none"> <li>• Self-enforcing roads</li> <li>• Systemic VRU focus</li> <li>• Speed management toolkit</li> </ul>
California	<ul style="list-style-type: none"> <li>• Additional land use sub-categories</li> <li>• Specific descriptions of context in unique communities</li> <li>• Context-based speed limit setting</li> <li>• Systemic VRU focus</li> <li>• Consistent speed limit setting</li> <li>• Temporary speed limits for changing road contexts</li> <li>• Complementary speed reduction countermeasures</li> <li>• Speed management toolkit</li> <li>• Using speed and speeding-related data</li> <li>• Community campaign</li> </ul>

The state DOT approaches analyzed closely reflect the principles of the Safe System Approach and align well with the cyclical stages of the Safe System Approach for Speed Management Framework described in Chapter 2. These stages include:

1. Establishing a Vision and Building Consensus;
2. Collecting and Analyzing Speed and Safety Data;
3. Proactively Prioritizing Locations;
4. Selecting Appropriate Countermeasures; and
5. Ongoing Monitoring, Evaluation, and Adjustment (Kumfer et al., 2023).

Each of the reviewed states demonstrated progress across these stages. Many adopted vision-setting initiatives, such as Vision Zero policies or community engagement campaigns. Several incorporated data-driven processes, including the use of speeding-related metrics and context-based speed limit setting. All the DOTs analyzed employed some form of systemic prioritization—often with additional emphasis on VRUs—to guide investment decisions. They also developed speed management toolkits and coordinated with partner agencies to identify and implement effective countermeasures. Finally, the reports indicate that each state is actively tracking implementation results and refining its strategies over time. Additional state-specific actions were also pursued by each DOT as needed to support unique local goals.

#### **4.4 UDOT Alignment**

To evaluate how Utah’s transportation safety policies align with national best practices, it is useful to compare case study countermeasures against existing UDOT strategies. Countermeasures considered in this analysis were chosen based on their relevance to UDOT’s existing practices and the extent to which UDOT’s approach diverges. This section discusses countermeasures including safety action plans, Vision Zero policies, speed safety cameras, community campaigns, context-based speed limit setting, low-cost speed-reduction strategies, and the use of data to identify the causes of speed-related collisions. They are sorted by the stages of the Safe System Approach for Speed Management Framework mentioned previously in Section 4.3.2.

##### **4.4.1 Establishing a Vision and Building Consensus**

Several of the case studies analyzed include an emphasis on Safe System Approach principles and Vision Zero in safety action plans and other policies. These are helpful in establishing a consistent vision for the agency. Utah’s SHSP was last updated in 2025 and

includes a focus on the Safe System Approach (UDOT, 2025). This plan connects the Safe System Approach and the goal of Zero Fatalities to the Five E's: engineering, education, emergency response, enforcement efforts, and everyone. Additionally, UDOT has a pedestrian safety action plan that focuses on policies and procedures that promote VRU safety in road design (UDOT and UDPS, 2016).

Additionally, UDOT has been successful in creating a Zero Fatalities outreach program in partnership with the Utah Department of Public Safety (UDPS). This program creates public awareness campaigns that highlight eliminating fatalities by improving driving behavior and culture on Utah roadways through education (Zero Fatalities, 2026). In addition, UDOT has become very active on social media by creating informational videos about current projects and explaining other transportation processes (McKellar, 2025). The use of humor and authenticity in combination with essential and trustworthy information has helped in educating viewers while reaching different demographics in a way that fosters trust.

#### 4.4.2 Collecting and Analyzing Speed and Safety Data

With a vision set, an emphasis on collecting and analyzing speed and safety data is important in speed management. UDOT has recently updated their policy for establishing speed limits on state highways that incorporates more context into the decision-making process (UDOT, 2023a). The 85<sup>th</sup> percentile operating speeds are still used for access category 1 and are also used to determine whether additional countermeasures would be needed to support road users in travelling at target speeds. Information sheets with proven countermeasures are also available as a toolkit for speed management projects (UDOT, 2023b). Speed studies are also required when setting speed limits, encouraging the use of spot speed data and crash data to inform the decision (UDOT, 2023c).

#### 4.4.3 Proactively Prioritizing Locations

Once speed and safety data have been collected and analyzed, the next step is to proactively prioritize locations for further speed management projects. UDOT's current project prioritization framework emphasizes investments that advance four key outcomes: good health, strong economy, connected communities, and better mobility (UDOT, 2026). Some of these

objectives align with core principles of the Safe System Approach. For example, the “good health” objective reinforces the recognition that humans are vulnerable in traffic environments and that death and serious injury are unacceptable. Similarly, the focus on “connected communities” can reflect the Safe System Approach principle that responsibility for safety is shared across agencies and disciplines.

#### 4.4.4 Selecting Appropriate Countermeasures

Careful consideration must be used in selecting appropriate countermeasures for use in speed management projects. Utah’s speed management info sheets are a helpful tool for identifying a variety of proven countermeasures (UDOT, 2023b). The use of speed safety cameras in Utah is currently limited to school zones and corridors with a speed limit of 30 MPH or less (Utah State Legislature, 2005). A peace officer must be present at all times, and signs must be clearly posted. Additionally, the use must be approved by the governing body, and a photo must be provided with the citation. However, these restrictions do not apply when information is gathered for use in highway safety research or when warning citations are issued that do not include a fine, court appearance, or affect a person’s driving record.

#### 4.4.5 Ongoing Monitoring, Evaluation, and Adjustment

Utah’s SHSP is a systematic way to continually monitor, evaluate, and adjust its policies and programs based on performance (UDOT, 2025). According to this SHSP, the ultimate measure of success is saving lives. As such, evaluation methods focus on achieving goals based on reducing fatalities which aligns with Safe System Approach principles. To track the progress of each of the safety areas set by the SHSP, UDOT has put together Safety Area Groups with members that represent each area as experts and advocates for safety. These groups will be able to clearly track progress and identify opportunities for improvement based on data and information that is gathered. Using specific, data-based metrics allows UDOT to accurately evaluate its current programs based on how effectively they are reaching their set goals.

### **4.5 Summary**

This chapter evaluates speed management countermeasures by organizing strategies according to roadway type and implementation timeline. The framework for countermeasures

highlights the range of treatments, from quick, low-cost measures like pavement markings to costly, long-term projects, such as road diets. This approach allows agencies to phase improvement strategically, according to individual needs and ability.

This chapter also summarizes case studies at the city- and state-levels, assessing how UDOT aligns with national best practices. City case studies from Fremont, CA; New York City, NY; and Portland, OR demonstrate the effectiveness of targeted interventions, showing measurable reductions in speeding and crash severity. State DOT case studies were examined from WSDOT, NDOT, MassDOT, MnDOT, and Caltrans. State-level comparisons emphasize policy-driven approaches, such as context-based speed setting, systemic prioritization, and Vision Zero integration. These examples provide models for broader, long-term safety improvements following the Safe System Approach for Speed Management.

Both the state DOT case studies and UDOT's current practices were evaluated according to the Safe System Approach Speed Management Framework discussed in Chapter 2. This allowed an objective comparison on how well UDOT's practices align with other state DOTs' implementation of the Safe System Approach. UDOT's practices, including its SHSP, pedestrian safety action plan, the Zero Fatalities program, updated speed-setting policies, and emphasis on community education, show significant alignment with these strategies and the Safe System Approach for Speed Management Framework. However, there are still some limitations with how UDOT policies, such as the policy on speed safety cameras, align with national best practices, suggesting opportunities for further alignment with Safe System principles. Overall, this chapter highlights the importance of strategically implemented countermeasures, informed by data, context, and best practices, to increase transportation safety.

## **5.0 CONCLUSIONS**

### **5.1 Summary**

The purpose of this research was to build upon previous research conducted by Brigham Young University for UDOT to evaluate the Safe System Approach for intersections by expanding the research to include the Safe System Approach for speed management. Case studies of locations that have implemented the Safe System Approach were analyzed, with a focus on speed management. Further measures and policies recommended by the ITE and the FHWA were discussed. This research also investigated how other state DOTs are applying the Safe System Approach to speed management. The following sections identify common findings from the analysis of case studies that relate to implementing the Safe System Approach for speed management. Note that some of the findings emphasize adopting the Safe System Approach generally rather than specifically for speed management. The last section identifies limitations and challenges of the research.

### **5.2 Findings**

Different jurisdictions implemented the Safe System Approach generally and with speed management in a variety of ways. In researching how the Safe System Approach was adopted, common trends were identified. The identified trends are implementing strategies, integrating high-quality data, setting a clear vision, and utilizing tools for implementing the Safe System Approach for speed management. These trends are described in the following subsections.

#### **5.2.1 Implementing Strategies**

A Safe System Approach to speed management requires coordinated use of multiple strategies rather than isolated interventions. Case studies from cities and state DOTs demonstrate that meaningful reductions in operating speeds and crash severity are achieved when engineering, policy, enforcement, and education measures are implemented together. Single countermeasures are less effective on their own, reinforcing the Safe System Approach principle that safety outcomes depend on a redundant, layered, systemwide approach.

There is a wide range of potential measures that can be implemented for speed management which align with the Safe System Approach. Innovation continually leads to more countermeasures being identified and proven. Each is unique and provides the opportunity to choose a measure that best fits the specific context of a location.

### 5.2.2 Integrating High-Quality Data

Integrating high-quality data into context-based and injury-minimization speed setting practices better aligns roadway design with safety outcomes than traditional speed-setting methods. Approaches relying solely on driver behavior metrics, such as the 85<sup>th</sup> percentile speed, can perpetuate unsafe operating speeds. Jurisdictions that incorporate land use, roadway function, crash severity risk, and human tolerance to impact forces are better positioned to set target speeds that reduce fatal and serious injuries.

High-quality, integrated speed and safety data enable proactive speed management. Diverse data sources (e.g., speed distributions, fatal- and serious-injury crash data, and roadway context) can be used to identify systemwide risks and prioritize interventions. Jurisdictions that use data to guide preventative speed management decisions are better able to align speed limits, roadway design, and safety goals before severe crashes occur.

### 5.2.3 Setting a Clear Vision

Clear vision-setting, communication, and interagency collaboration are essential to successful implementation. Agencies that establish explicit safety visions (e.g., Vision Zero), coordinate across jurisdictions, and engage both traditional and nontraditional partners are more effective in building public and institutional support for speed management policies. This consensus-building is especially important for implementing lower speed limits, design changes, and emerging enforcement technologies.

### 5.2.4 Tools for Implementing the Safe System Approach for Speed Management

Many resources are available that offer practical, structured guidance for integrating Safe System Approach principles into speed-related policies, planning, and project development. When paired with supporting documents such as peer DOT examples, these tools enable

agencies to move beyond traditional practices and adopt consistent, evidence-based approaches without developing entirely new frameworks from scratch. The resources that are available include the following:

1. FHWA Safe System Approach for Speed Management (Kumfer et al., 2023)
2. FHWA Speed Limit Setting Handbook (Schroeder et al., 2025)
3. FHWA Safe System Approach resources (FHWA, 2026b)
4. FHWA USLIMITS2 (FHWA, 2020)
5. FHWA Road Diet Guide (Knapp et al., 2014)
6. FHWA Self-Enforcing Roadways Guidance Report (Donnell et al., 2018)
7. FHWA Speed Safety Cameras Report (FHWA, 2021)
8. FHWA Proven Countermeasures (FHWA, 2026c)
9. NCHRP Report 966 (Fitzpatrick et al., 2021)
10. NACTO City Limits Guide (NACTO, 2020)
11. SS4A (USDOT, 2022a)
12. State DOT examples and resources (Akber, 2023; Beagle et al., 2020; MassDOT, 2026; Miner and Arvidson, 2023; NDOT, 2022; WSDOT, 2024)

### **5.3 Limitations and Challenges**

Several limitations were identified during this research. The analysis relied exclusively on published sources that reported outcomes for the evaluated countermeasures and city case studies. In addition, many of the policies and initiatives implemented by peer DOTs are relatively recent, and their full impacts have not yet been established. Several key resources in this study were published relatively recently, which limits the availability of long-term outcome data. As a result, findings related to these newer approaches are limited, as their long-term effectiveness is not yet fully understood.

## **6.0 RECOMMENDATIONS AND IMPLEMENTATION**

### **6.1 Overview**

This chapter includes recommendations, or suggestions for action, and an implementation plan for how UDOT can implement the Safe System Approach for speed management. Recommendations for further research are also included in this chapter along with concluding remarks.

### **6.2 Recommendations**

This section reviews the recommendations, or suggestions for action, for how UDOT can further align with the Safe System Approach for speed management based on the evaluation of the state of the practice. The following subsections outline recommended actions, organized by the stages of the FHWA Safe System Approach for Speed Management Framework (Kumfer et al., 2023):

1. Establishing a Vision and Building Consensus;
2. Collecting and Analyzing Speed and Safety Data;
3. Proactively Prioritizing Locations;
4. Selecting Appropriate Countermeasures; and
5. Ongoing Monitoring, Evaluation, and Adjustment.

#### **6.2.1 Establishing a Vision and Building Consensus**

The following recommendations are designed to help UDOT establish a clear vision for speed management and build consensus among stakeholders. Grounded in the Safe System Approach, they emphasize aligning agency goals, policies, and practices while fostering understanding and support among internal staff, partner agencies, elected officials, and the public. By clarifying objectives, communicating effectively, and coordinating across jurisdictions and community partners, UDOT can create a unified framework that guides speed management decisions and advances the goal of eliminating fatalities and serious injuries on Utah roadways. The following sections outline recommendations related to documentation and

vision, communication and community outreach, active transportation and complete streets initiatives, safe land use planning, integration into planning, self-enforcing design strategies, interagency collaboration, collaboration with non-traditional partners, and support for strategies and enforcement.

#### *6.2.1.1 Documentation and Vision*

It is recommended that UDOT continue to create a clear vision that aligns with the Safe System Approach. This includes updating the SHSP to emphasize Safe System Approach principles and elements, as well as clarifying goals to unify policies and practices. Additionally, it is recommended that UDOT develop a Speed Management Action Plan, similar to Nevada's, to provide speed-specific goals and guidance grounded in the Safe System Approach framework (NDOT, 2022).

#### *6.2.1.2 Communication and Community Outreach*

It is recommended that UDOT implement a coordinated communication strategy to deliver consistent, accessible messages about speed management. Outreach materials should promote proper road-use behavior, explain the rationale for the injury minimization methodology, frame lower speed limits to reduce road-rage responses, highlight operational and safety benefits, and reinforce progress toward Vision Zero. One-page summaries tailored for cities and counties can be developed to clarify the relationship between Safe System Approach principles, speed management, and related policies such as Complete Streets (Beagle et al., 2020).

Engaging public health partners, traffic safety organizations, insurance groups, and community influencers can strengthen public understanding and support. Outreach materials should follow multicultural communication principles and be integrated into driver education, school curricula, and public campaigns. Clear guidance should also be provided to elected officials to support adoption of Safe System Approach-based policies.

#### *6.2.1.3 Active Transportation and Complete Streets Initiatives*

It is recommended that UDOT align speed management with active transportation and Complete Streets initiatives. Policies should ensure that roadway design accommodates all users

(i.e., pedestrians, cyclists, transit riders, and drivers) and prioritize lower speeds in context with VRUs. Design decisions such as curb extensions, road diets, protected crossings, and other multimodal infrastructure should be coordinated with speed management goals to improve safety for all users (WSDOT, 2024).

#### *6.2.1.4 Safe Land Use Planning*

It is recommended that UDOT integrate land use planning into roadway safety strategies in coordination with local governments. Compact, mixed-use development reduces travel distances, increases access to essential destinations, and makes active transportation more viable, reducing reliance on private vehicles and lowering crash exposure. Land use decisions can address the form and scale of development, including block lengths, street connectivity, and placement of schools, senior housing, and community services to support safe, multimodal trips (WSDOT, 2024).

Equitable access is essential. Investments can prioritize underserved communities to provide protected bike lanes, wide sidewalks, safe crossings, and reliable transit service. Infill development and town centers can be emphasized over greenfield expansion to create environments that encourage active transportation and transit use.

#### *6.2.1.5 Integration into Planning*

It is recommended that UDOT embed speed management considerations into all transportation and safety planning efforts. This includes Safety Action Plans, long-range transportation plans, corridor studies, and project development processes. Joint review of project concepts and design alternatives ensures that target speeds, safety goals, land uses, and community needs are aligned. Early coordination can prevent inconsistencies between roadway function, design, and operating speeds (NDOT, 2022).

#### *6.2.1.6 Self-Enforcing Design Strategies*

It is recommended that UDOT prioritize self-enforcing and self-explaining roadway designs in new construction and reconstruction projects. Treatments such as roundabouts, road diets, lane narrowing, alignment shifts, and consistent design standards for similar roadway types help produce predictable operating speeds and reduce reliance on enforcement. Setting or

revising speed limits at the outset of project development reinforces alignment among design speeds, user behavior, and safety goals (NDOT, 2022).

#### *6.2.1.7 Interagency Collaboration*

It is recommended that UDOT strengthen collaboration with state and local agencies to ensure consistent, statewide speed management approaches. Formal mechanisms (e.g., interagency working groups, regional coordination teams, or a statewide Safe Speed Task Force) can align practices, share data, define shared safety goals, and facilitate joint implementation of countermeasures. A statewide Safe Speed Task Force can also provide technical assistance, develop policy guidance, and produce shared resources for speed setting, public education, and design strategies (NDOT, 2022; WSDOT, 2024).

#### *6.2.1.8 Collaboration with Non-Traditional Partners*

It is recommended that UDOT engage non-traditional safety partners (e.g., community-based organizations, public health agencies, schools, employers, and advocacy groups) to expand outreach and public engagement. These partners can help build support for speed management initiatives, reinforce safety messaging, and ensure that policies reflect community priorities and perspectives (WSDOT, 2024).

#### *6.2.1.9 Support for Strategies and Enforcement*

It is recommended that UDOT proactively frame speeding and speed-related safety concerns to build support for comprehensive strategies and funding. Recommended actions include seeking support for technologies that expand enforcement capacity, such as automated enforcement or safety cameras, and improving communications about the safety rationale behind speed management decisions. These efforts help address barriers such as public resistance, limited enforcement resources, policy restrictions, and legal constraints. Targeted, transparent messaging ensures greater acceptance and more effective implementation of speed management programs (NDOT, 2022).

## 6.2.2 Collecting and Analyzing Speed and Safety Data

Reliable, comprehensive speed data is fundamental to effective speed management and supports consistent, evidence-based decision making across the state. Establishing clear standards for data collection, integration, and accessibility ensures that agencies share a common understanding of existing conditions and can accurately identify locations where speed contributes to heightened safety risks. Improving the quality and usability of speed data also strengthens transparency and supports a more coordinated statewide approach. These recommendations can enhance the consistency, completeness, and strategic application of speed data to better inform planning, design, and enforcement activities. The following sections outline recommendations related to an injury minimization speed setting framework, context-based speed limit reviews, data systems for proactive speed management, and accuracy and consistency of speeding-related crash data.

### *6.2.2.1 Injury Minimization Speed Setting Framework*

It is recommended that UDOT establish a Safe System Approach-based speed setting process that uses context, land use, roadway function, crash types, and human injury tolerance as core inputs. This requires collecting high-resolution speed and safety data at the system level to determine where operating speeds, crash patterns, and roadway conditions are out of alignment with Safe System Approach principles. Speed surveys can incorporate not only the 85<sup>th</sup> percentile but also the 50<sup>th</sup> percentile and 10 MPH pace, with results used to identify the degree of speed reduction needed rather than justify higher limits. Additionally, procedures for speed studies can be updated to reflect this approach, including clear guidance on when to establish low speed default limits (e.g., 20 MPH) in residential or business districts and when engineering studies may support limits as low as 10 to 15 MPH for shared streets (Beagle et al., 2020; MassDOT, 2026).

### *6.2.2.2 Context-Based Speed Limit Reviews*

It is recommended that UDOT create a routine, data-driven process to reassess posted speed limits when land use, roadway design, traffic composition, or user needs have changed. This should include establishing a target speed based on roadway context first (i.e., urban, suburban, rural, village, or mixed-use) and then using data to determine where target speeds and

existing posted speeds are misaligned. If a speed zoning process produces limits higher than the desired target speed, it is recommended that UDOT use collected data to guide physical design changes and re-evaluate speeds iteratively until alignment is achieved (MassDOT, 2026).

#### *6.2.2.3 Data Systems for Proactive Speed Management*

It is recommended that UDOT expand the range of datasets used to identify corridors most in need of intervention. This includes integrating crash history focused on fatal and serious injuries, speed survey results, citation data, and actual variance from posted limits. These datasets can be used together to identify system-wide patterns to enable proactive rather than reactive safety improvements. These patterns may look like recurring high-severity crashes, excessive speeding above the pace range, or corridors with mismatched design and operating speeds. To support this work, it is recommended that UDOT refine the elements required in speed-setting engineering studies and clarify how those datasets can be used in a Safe System Approach (Beagle et al., 2020; NDOT, 2022).

#### *6.2.2.4 Accuracy and Consistency of Speeding-Related Crash Data*

To address potential discrepancies among datasets, it is recommended that UDOT evaluate opportunities to link statewide crash databases with federal datasets and identify methods to more accurately and consistently code and track speeding-related severe crashes. Improved data integration will allow for better measurement of the true impact speed plays in severe crashes and strengthen the evidence supporting speed management policy and investments (NDOT, 2022).

### 6.2.3 Proactively Prioritizing Locations

Proactively approaching speed management requires acknowledging that limited funding, availability, and implementation capacity make it necessary to prioritize certain locations for treatment. Effective prioritization should balance addressing locations with demonstrated safety risks and proactively identifying corridors and areas where systemic improvements can be made to prevent future crashes. By using data and context to guide decision-making, agencies can direct resources to locations where speed management strategies will have the greatest potential

to reduce fatal and serious injury crashes. The following sections outline recommendations related to a systemic project prioritization framework and VRU-focused prioritization.

#### *6.2.3.1 Systemic Project Prioritization Framework*

It is recommended that UDOT use an inventory of existing locations where operating speeds are not consistent with established goals for speed and injury minimization. Furthermore, an equity analysis can be performed based on demographic data to prioritize locations and communities that are particularly at risk. This can be done on a systemic level by coordinating with maintenance and operations projects to simultaneously implement engineering improvements. Additionally, when several locations have similar characteristics, and some exhibit problems, implementing the same countermeasures at all such locations can help proactively mitigate speed management issues (Beagle et al., 2020; NDOT, 2022).

#### *6.2.3.2 Systemic Vulnerable Road User-Focused Prioritization*

The methods used to prioritize locations for speed management can be similarly implemented with a focus on VRUs. It is recommended that UDOT do this by analyzing VRU crash data to identify shared characteristics and screening the entire network to find all locations with those characteristics. Then, those locations can be ranked based on characteristics that are consistent with vulnerable populations, such as land use, transit, or VRU volumes. Applicable countermeasures can be chosen and applied on a system-wide level. It is recommended that UDOT also integrate VRU prioritization into policy, such as slower default speeds near schools, transit corridors, or neighborhoods with vulnerable populations (Akber, 2023; Miner and Arvidson, 2023).

#### 6.2.4 Selecting Appropriate Countermeasures

This research report includes many proven speed management countermeasures, but it is crucial that appropriate countermeasures are chosen based on the characteristics of the location in question. This ensures that treatments are targeted, effective, and aligned with the Safe System Approach. Advancements in technology and innovation lead to the creation of new methods of speed management, which have the potential to have an impact on transportation safety. The following subsections outline recommendations related to expanding and applying proven

countermeasures, advocating for speed safety cameras, conventional enforcement and publicity on high-crash corridors, and incorporating redundancy.

#### *6.2.4.1 Expanding and Applying Proven Countermeasure Toolkit*

As more methods of speed management are discovered and studied, it is recommended that UDOT remain up to date on the latest methods and update the UDOT Speed Management Info Sheets accordingly. It is recommended that UDOT also implement countermeasures that are included on the Info Sheets that are not applied very often within the state. Additionally, to encourage the utilization of context-appropriate countermeasures, countermeasures can be categorized by type, as was done in Chapter 3 of this report, and chosen based on the needs and characteristics of the specific roadway (Akber, 2023; MassDOT, 2026).

#### *6.2.4.2 Advocating for Speed Safety Cameras*

It is recommended that UDOT extend support toward additional legislation authorizing the expanded use of speed safety cameras in Utah. Future research or pilot programs on this countermeasure are needed to further understand the potential safety benefits within the state of Utah. The creation of these pilot programs should have an emphasis on Safe System Approach principles (Beagle et al., 2020; WSDOT, 2024).

#### *6.2.4.3 Conventional Enforcement and Publicity on High-Crash Corridors*

It is recommended that UDOT develop and maintain a comprehensive HVE program that prioritizes corridors with a history of fatal or serious-injury crashes to maximize the safety impact. This program can be supported by broad, multi-channel public outreach efforts. This messaging can communicate the risks of speeding and aggressive driving to encourage driver compliance. In locations where continuous or supplemental coverage is needed, such as school zones, work zones, and areas where traditional enforcement is challenging, it is recommended that UDOT implement automated enforcement (NDOT, 2022).

#### *6.2.4.4 Incorporating Redundancy*

To better align with Safe System Approach principles, it is recommended that UDOT implement multiple countermeasures simultaneously. When selecting appropriate countermeasures to implement, the roadway environment, desired operating speed, existing

operating speed, existing and future community needs, existing and future multimodal needs, safety of roadway users, and emergency response vehicles should be considered.

Countermeasures are generally more effective when multiple measures are used in combination, so that if part of the system fails, there are multiple safeguards in place to protect human life (NDOT, 2022).

### 6.2.5 Ongoing Monitoring, Evaluation, and Adjustment

Ongoing monitoring, evaluation, and adjustment are essential to ensuring that speed management strategies remain effective, responsive, and aligned with Safe System Approach goals. As conditions, land uses, and travel behaviors change, agencies must move beyond one-time interventions and adopt processes that support continuous learning and improvement. The following subsections outline recommendations related to evaluating current efforts, statewide processes for continuous speed monitoring, and performance measures for speed management.

#### *6.2.5.1 Evaluating Current Efforts*

It is recommended that UDOT conduct regular evaluations of speed management efforts to identify the most effective efforts. These evaluations can be performed toward the end of the SHSP implementation period so that the results of the evaluation can be communicated with both policy makers and the public through the updated SHSP. For locations that require immediate improvements, coordination with law enforcement can provide quick, temporary enforcement while long-term engineering solutions are being developed (NDOT, 2022).

#### *6.2.5.2 Statewide Process for Continuous Speed Monitoring*

It is recommended that UDOT explore methods to track and monitor speeds along key corridors on an ongoing basis rather than relying solely on periodic studies. This may include permanent speed cameras, portable radar devices, connected vehicle data, or emerging technologies that can provide real-time operating speed information. Continuous monitoring improves the ability to identify problem areas quickly, evaluate whether interventions are working, and prioritize enforcement and engineering strategies more effectively (Beagle et al., 2020).

### *6.2.5.3 Performance Measures for Speed Management*

It is recommended that UDOT develop statewide performance measures for Safe System Approach speeds and create a data collection plan to evaluate progress. These measures should track how well roadway segments support target speeds aligned with Safe System Approach principles. Performance metrics could include operating speed distributions, reductions in excessive speeding, and changes in the proportion of system mileage operating at injury-minimizing speeds. Establishing these measures can allow UDOT to evaluate program effectiveness over time and communicate progress transparently (Beagle et al., 2020).

## **6.3 Implementation Plan**

The FHWA Safe System Approach for Speed Management Framework will serve as a primary resource for guiding UDOT in integrating Safe System Approach principles into agency policies and practices. Reviewing how other DOTs have applied these principles will further refine direction by offering practical examples and adaptable strategies, especially WSDOT's SHSP (WSDOT, 2024) and "Washington Injury Minimization and Speed Management Policy Elements and Implementation Recommendations" (Beagle et al., 2020), NDOT's Speed Management Action Plan (NDOT 2022), MassDOT speed management resources (MassDOT, 2026), MnDOT's "Guidelines for Determining Speed Limits on Municipal Roadways" (Miner and Arvidson, 2023), and Caltrans' "A Safe System Approach to Speed Limit Setting" (Akber, 2023). The UDOT Traffic and Safety Division will assess the study's recommendations and determine which actions align with agency priorities and available resources. These recommendations may be applied to implement the Safe System Approach for speed management specifically or to support broader organizational integration of the Safe System Approach.

## **6.4 Concluding Remarks**

The Safe System Approach provides a comprehensive framework for improving road safety by acknowledging human error and vulnerability. It employs a multifaceted strategy to create a safer and more resilient transportation system, with the goal of reducing crash severity

and managing impact forces so that collisions do not result in fatal or serious injuries (FHWA, 2024b). This approach has been implemented in jurisdictions around the world, and a growing set of tools and guidance has been developed to support agencies in adopting Safe System Approach principles, including those specific to speed management.

By applying these tools, UDOT can continue to strengthen its safety culture and clearly communicate the importance of safe operating speeds across the state roadway system. Future research could build on this work by exploring topics such as safe land use planning, broader integration of the Safe System Approach across all project types, self-enforcing roadway design, contextual factors influencing operating speeds, default speeds in areas with VRUs, automated speed enforcement, and refined methods for monitoring and evaluation.

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