U.S. Department of Transportation
Federal Highway Administration

ZERO IS OUR GOAL
A SAFE SYSTEM IS HOW WE GET THERE

Themes featured in this case study:

- ✓ Considering Safety Prior to NEPA
- ✓ Public and Stakeholder Engagement
- ✓ Safety in Purpose and Need
- ✓ Safety in Mitigation

# Colorado's I-25 South Gap

## Environmental Assessment

## Introduction

Interstate 25 (I-25) is the only north-to-south interstate route in Colorado, connecting the State's largest population centers, providing access to recreation and cultural amenities, and accommodating $60 billion of freight movement annually. Informally known as "The Gap," the I-25 project corridor is an 18-mile stretch from the Town of Castle Rock in the north to the Town of Monument in the south. Providing only two travel lanes per direction, the Gap creates a bottleneck for I-25 travel as it is the only four-lane section of I-25 between Denver and Colorado Springs. The corridor links major urban areas, but it is also valued for its protected open spaces, scenic vistas, and rural setting.

At an elevation of 7,352 feet (ft), the crest of Monument Hill near the southern limits of the Gap corridor is the highest point on I-25 through Colorado. Grades steadily climb in the southbound direction of the corridor, where over the course of approximately 15 miles, the elevation increases approximately 1,000 ft. Over the years, congestion, crashes, and delays have increased due to population and traffic growth. Improving I-25 through the Gap became a top statewide priority, and this case study presents how the Colorado Department of Transportation (CDOT) was able to incorporate safety as part of the NEPA process to rapidly address a major transportation need for the State (figure 1).


*Figure 1. Steps of the NEPA process covered by this case study.*
*Source: FHWA*



FHWA-SA-22-044

## Project Background and Timeline

The Gap was part of a broader 34-mile planning and environmental linkages (PEL) study initiated by CDOT in summer 2016. At the beginning of the PEL Study, CDOT did not have funding identified for corridor improvements. However, a need for safety, mobility, incident management, and travel reliability improvements for the I-25 South Gap segment between Monument and Castle Rock (figure 2) became apparent to CDOT staff. Funding became available as public and stakeholder interest grew, including political interest from the State's governor, as well as Federal and State lawmakers.

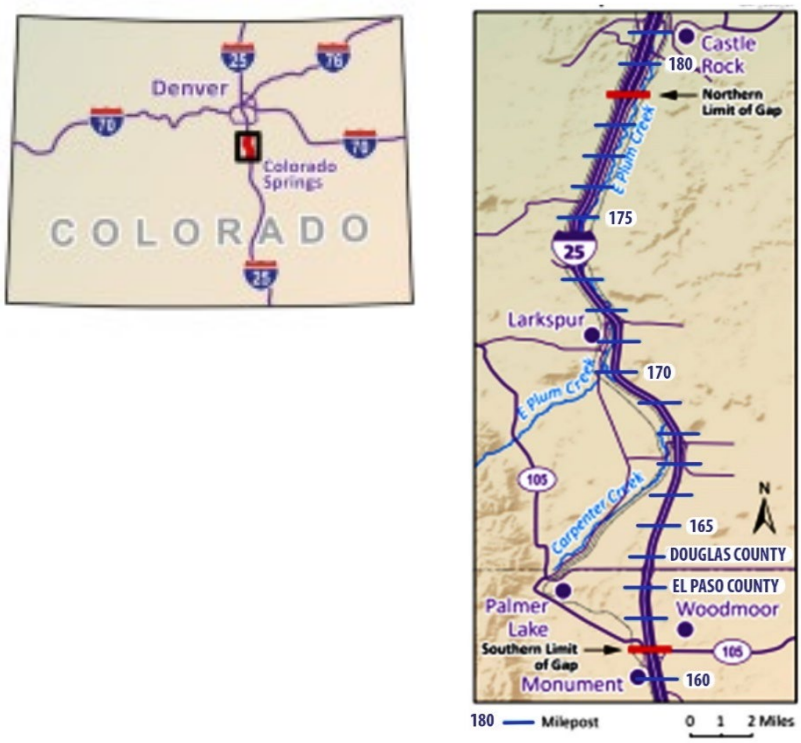


*Figure 2. Graphic. I-25 project study area.*
*Source: CDOT, 2018.*

Available funding from the State of Colorado and CDOT's funding partners (Douglas County, El Paso County, and the Pikes Peak Rural Transportation Authority), prompted CDOT and the Federal Highway Administration (FHWA) to accelerate survey, design, and detailed environmental studies for the Gap improvements to occur concurrently with the broader PEL Study. These detailed studies started in the summer of 2017. This timing was essential to initiate construction in the fall of 2018 before the onset of poor winter weather common in the Gap.

The PEL study identified this part of the 34-mile corridor as having the most severe safety issues that needed immediate attention. CDOT progressed the design for the I-25 South Gap Project based on conceptual improvements identified in the PEL Study. The following timeline represents the key project milestones (figure 3).

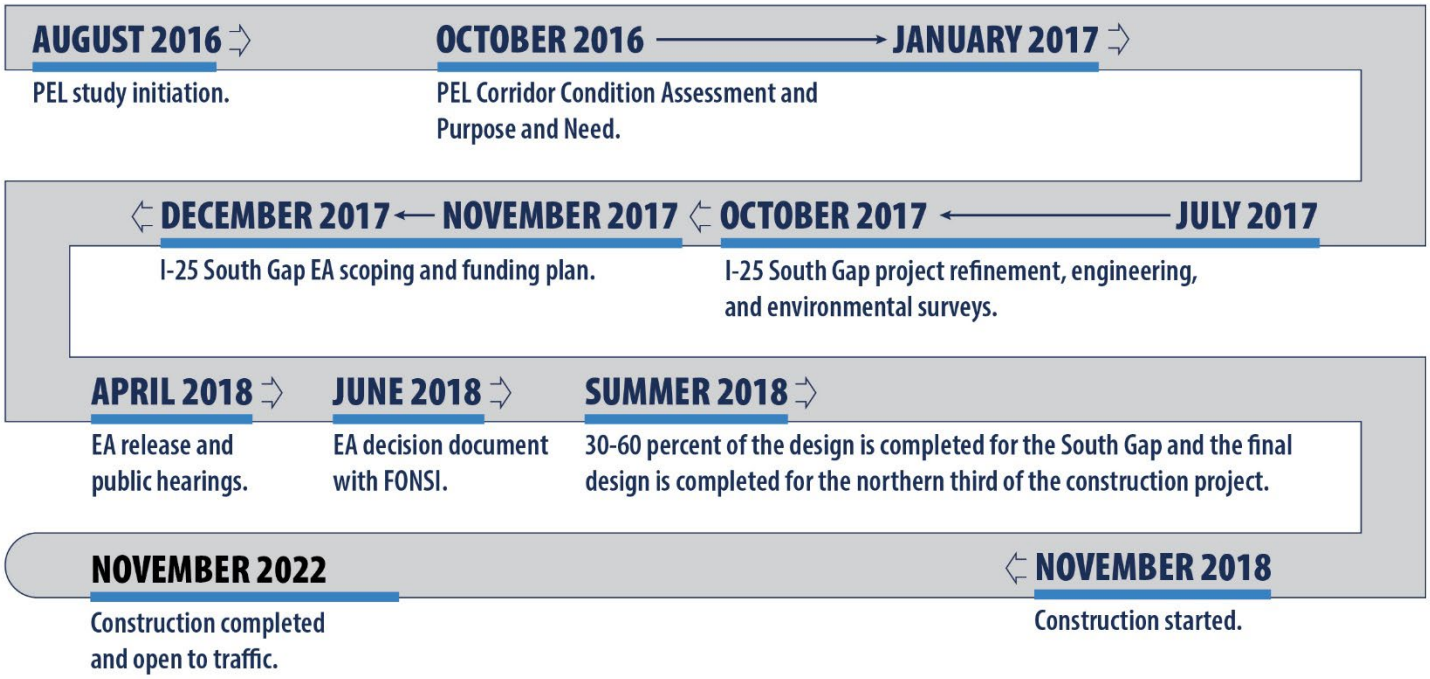


*Figure 3. Graphic. I-25 South Gap project development process.*

# Project Summary

The I-25 South Gap EA incorporates elements of safety in each stage of the NEPA process. The following sections document how CDOT considered safety in relation to other project needs.

## Safety in Pre-NEPA Studies

CDOT, in cooperation with FHWA, conducted a PEL study to establish a long-term vision and strategic plan for future transportation improvements on a 34-mile segment of the I-25 corridor between Monument (State Highway 105) north to the interchange with Colorado Highway 470 (C-470) and E-470 (C/E-470). The PEL study identified transportation priorities in advance of securing construction funding, positioning CDOT to accelerate the environmental analyses and expedite project implementation when construction funds became available. The PEL study laid the groundwork for future improvements on I-25 by:

- Defining and prioritizing projects in the corridor.
- Determining project costs, funding, financing, and delivery options.
- Engaging with local corridor communities, regional travelers, and other interested stakeholders about corridor issues and priorities.
- Identifying significant environmental constraints that may influence design options and/or delay project development with lengthy environmental reviews.
- Supporting an efficient transition to the NEPA processes, final design, and construction.

The PEL study followed FHWA and CDOT guidance (CDOT, 2022)[1] regarding the integration of transportation planning and the NEPA process; this guidance encourages the use of planning studies to provide

[1] Note that CDOT completed the I-25 PEL study using a previous version of the guidance, Version 2.

information for incorporation into future NEPA documents.[2] FHWA promotes the use of PELs, largely to integrate environmental issues and public involvement with project planning and shorten the time required to take projects from planning to implementation.

The four key steps in the PEL study process are described on figure 4.

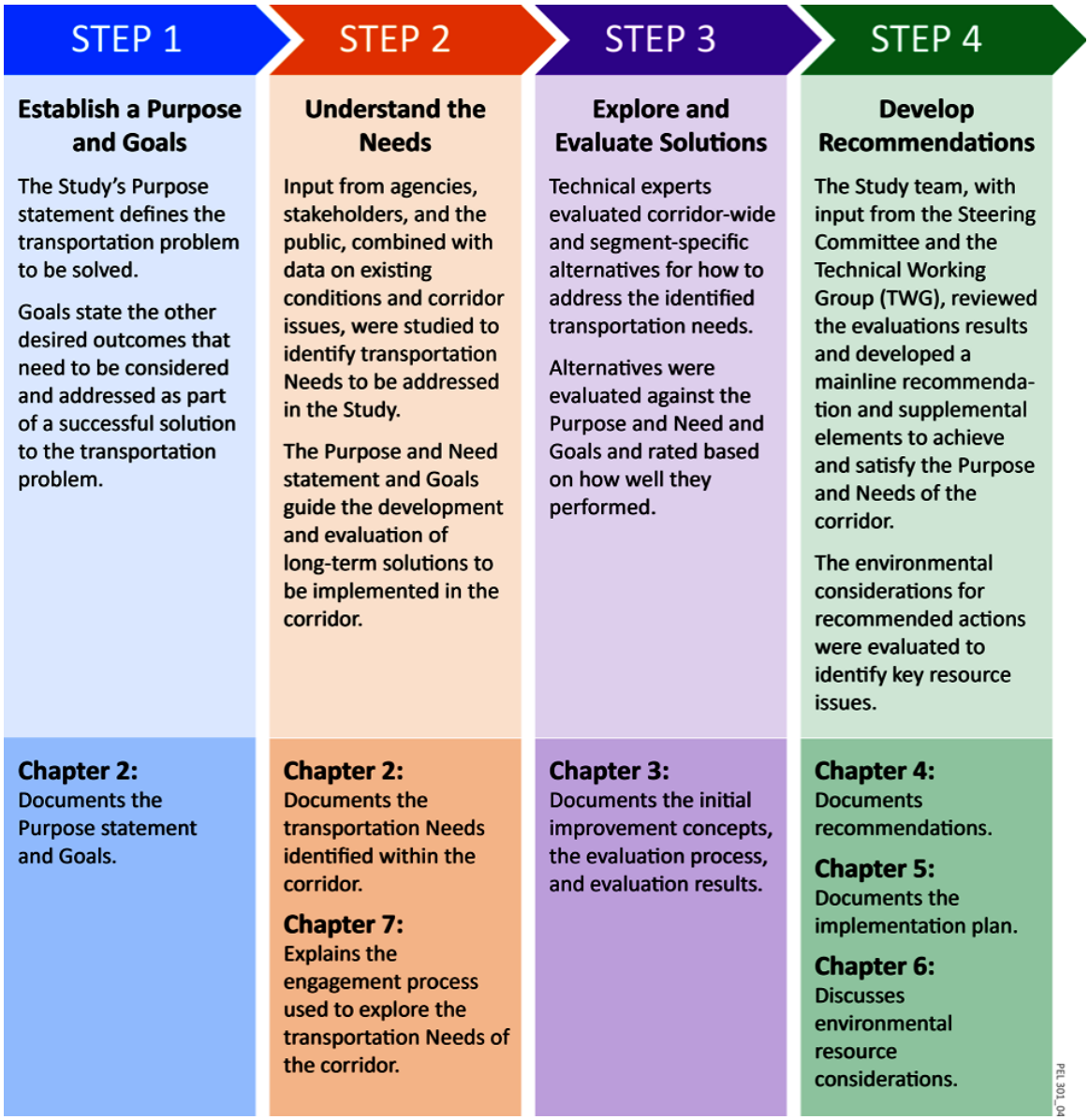


*Figure 4. Graphic. Key steps in the PEL study recommendation development process.*
*Source: CDOT, 2019.*

[2] This guidance builds on 23 U.S.C §168 that enables transportation agencies to integrate "planning products" into environmental review. Sections 2.1 (*Legal and Regulatory Background*) and 2.3 (*Legal Requirements*) discuss the requirements for a PEL study to be incorporated or referenced in NEPA documentation (CDOT, 2022).

During the PEL study, CDOT evaluated safety issues by reviewing the existing infrastructure along the corridor and analyzing crash data over the most recent 5-year period for which data were available (2011 through 2015). CDOT produced a Safety Assessment Report (SAR) that investigated the magnitude of historical safety problems on the corridor. This approach used State-specific safety performance functions (SPFs) to determine the Level of Service of Safety (LOSS; figure 5).

The LOSS methodology is one of the network screening performance measures described in the American Association of State Highway Transportation Officials' (AASHTO) *Highway Safety Manual* (HSM; 2010). LOSS compares a roadway segment's observed crash frequency and severity to the average crash frequencies and severities predicted for similar sites using an SPF (i.e., the typical number of crashes one might expect for a segment or intersection with similar characteristics). There are four LOSS categories that indicate the potential for crash reduction:

- LOSS-I – Indicates low potential for crash reduction.
- LOSS-II – Indicates low to moderate potential for crash reduction.
- LOSS-III – Indicates moderate to high potential for crash reduction.
- LOSS-IV – Indicated high potential for crash reduction.

CDOT determined there was a moderate to high potential to reduce crashes and improve safety with a LOSS-III designation for 16.1 miles of the corridor and a high potential to reduce crashes and improve safety with a LOSS-IV designation for the remaining 1.9 miles of the corridor. The SAR indicated that safety issues on I-25 were primarily related to congestion, physical roadway conditions (i.e., narrow shoulders, poor lighting, steep grades, etc.), wildlife vehicle collisions (WVCs), and incident management.

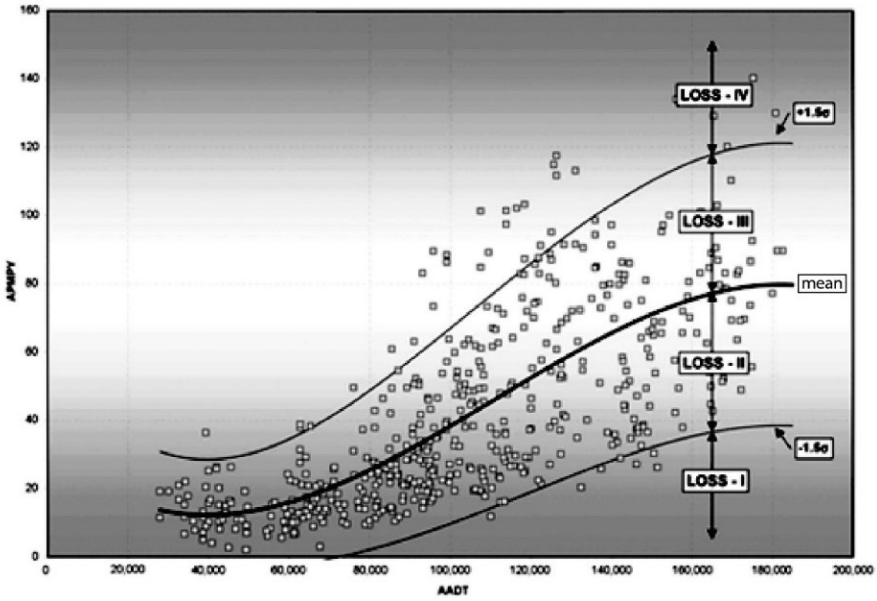


*Figure 5. Graphic. Example distribution of sites relative to the SPF prediction ("mean") by LOSS.*
*Source: FHWA, 2011a.*

## Safety in Project Scoping

CDOT conducted extensive outreach with corridor communities and stakeholders to understand the most pressing travel issues and highest priority improvements through over 30 public meetings, hearings, and listening sessions during the PEL study and formal EA scoping. Public involvement during the PEL study included 8 public meetings, 3 telephone town halls, and numerous listening sessions. Public involvement during the EA comprised 2 public meetings and 2 public hearings, although Steering Committee meetings during the EA process were open to the public as well. Over the course of the combined PEL study and EA phase of the project, CDOT conducted 22 Technical Working Group meetings and 16 Regulatory Agency Group meetings along with numerous Steering Committee meetings. The deaths of two Colorado State Troopers in the Gap (2014 and 2015) outside of their vehicles while on duty served as a

catalyst to jumpstart the safety discussion at many of the stakeholder and public meetings. As a result, the stakeholder groups concluded that safety concerns were paramount.

> *"Expanding I-25 between Castle Rock and Monument is crucial to meet the national security, public safety, and economic needs for southern Colorado in the years to come. Waiting is no longer an option. We must move this project forward now"- El Paso County Commissioner Mark Waller (CDOT, 2018).*

Coordination with emergency responders identified the lack of ability for responders to reach an incident, as well as difficulty transporting injured persons from an incident scene. CDOT quickly identified the need for widened shoulders and law enforcement pull-off areas based on focused meetings with emergency responders. These recommendations moved forward from the earlier PEL meetings, and CDOT incorporated wider inside shoulders into the project's design.

## Safety in Project Purpose and Need

The project purpose was to enhance safety, reduce delays, and improve travel time reliability on I-25 through the 18-mile Gap section. As noted in the EA: "The I-25 South Gap Project is needed to improve safety, reduce crashes, and improve incident management; reduce delays; and improve travel reliability on I-25 through the Gap" (CDOT, 2018; p. 2-1). CDOT's safety analysis indicated the entire length of the 18-mile Gap segment had the potential for safety to be improved, particularly in the areas of vehicular safety, WVCs, and incident response.

A high number of crashes occurred on the corridor during the study period (2011 to 2015)—averaging one each day. The majority of the crashes in the Gap were rear-ends, followed by sideswipe in same direction and fixed-object crashes. Rear-ends and sideswipe same direction crashes can be indicative of volatility or turbulence in traffic. Many factors contributed to turbulence in the Gap segment, including:

- Volume demand.
- Transitions between two- and three-lane segments.
- Interchange influence areas.
- Speed changes.
- Lack of passing opportunities with slower moving vehicles negotiating steep grades.
- Non-regular weekend drivers who may not be familiar with the corridor's challenges.

There are 55 square miles of protected open space on either side of I-25 through the Gap that supports healthy herds of deer, elk, and bighorn sheep, as well as robust populations of mountain lions and black bears. Wildlife collisions represented 10 percent of the reported corridor crashes (CDOT, 2018). Both carcass removal (CDOT Maintenance) and official crash data (CDOT Traffic and Safety Section) noted considerable peaks at the south and north ends of the Gap (figure 6).

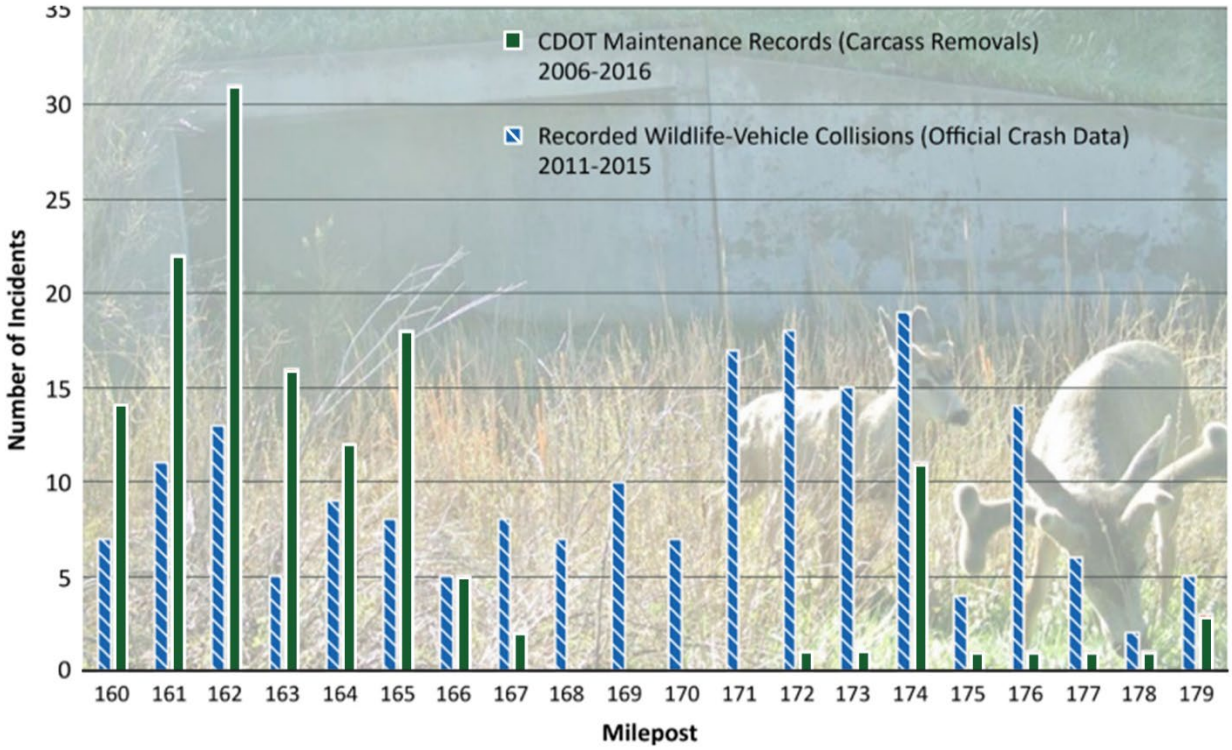


*Figure 6. Graphic. Locations of reported wildlife collisions in the Gap (2006-2016). Source: CDOT, 2018.*

As part of the PEL and EA coordination, the project team conducted numerous interviews with emergency responders and CDOT Maintenance staff to better understand the severity of WVCs in the Gap. The project team learned that potential WVCs were underestimated by at least 50-60 percent based on official records; meaning that at least one WVC occurred every day in the spring and fall (heavy movement seasons for the herds).

Safety concerns along the Gap corridor involved primary crashes, but additional issues also included other special events, maintenance, speed differentials, weather, and resulting secondary crashes. Due to the difficulty of clearing crashes or other disabled vehicles, the Gap experienced increased exposure for secondary crashes (i.e., crashes that occur in the congested conditions resulting from an initial crash). This presented safety concerns for both disabled vehicle occupants and emergency responders. FHWA estimated the likelihood of a secondary crash increases by 2.8 percent for each minute the primary incident continues to be unattended (FHWA, 2016b).

The factors that affected the ability for emergency equipment to reach crashes and for incidents to be cleared were narrow paved shoulders (2-4 ft) coupled with guardrails, long distances between interchanges, lack of alternative routes, lack of emergency parking, lack of emergency crossovers caused by split grades, and lack of closure gates and messaging signs warning travelers of incidents. Lane or full highway closures often resulted as crashes were investigated and cleared. Highway maintenance workers and law enforcement officers faced similar safety issues as others responding to crashes while conducting operations in the corridor with narrow shoulders next to high-speed interstate traffic. Furthermore, the narrow shoulders did not provide space for through traffic to maneuver around crashes, preventing emergency responders from reaching the scene. Due to the lack of suitable shoulders (figure 7), Colorado State Patrol (CSP) had limited ability to conduct law enforcement operations and interactions with drivers; this was highlighted by the deaths of two on-duty officers prior to the EA.

*Figure 7. Photograph. Example of split grade and narrow shoulders in the Gap (2006-2016).*
*Source: Attardo, 2020.*

## Safety in Alternatives Analysis

CDOT initially developed and evaluated alternative concepts in the PEL study process. CDOT evaluated information and concepts from the PEL study during the EA process, and CDOT refined the alternatives as the project advanced through the NEPA process. CDOT formally incorporated safety in the project purpose and need; that allowed CDOT to justify alternatives that included design elements which addressed overall safety along the I-25 South Gap corridor. Specific elements included widened shoulders, wildlife underpasses, bridge replacements, curve realignment, pavement resurfacing, reducing speed differentials by adding a 4-mile climbing lane, *Dark Skies* compliant LED lighting, Intelligent Transportation Systems (ITS) and signage, new auxiliary lanes, and other ancillary features. To address the underlying need to increase the two-lane bottleneck through the Gap to a three-lane, CDOT considered two alternatives for the operation of the third lane (in each direction), a managed express lane and a general-purpose lane.

### Express Lane Alternative

The broader PEL study identified travel time reliability as a key need for the I-25 South Gap Project, and this recommendation reinforced the justification for a managed lane alternative. This alternative would add a new 12-ft tolled express lane with a 4-ft painted buffer to separate the express lane from the existing general purpose (i.e., non-tolled) lanes. These would be added in both directions of travel along I-25 through the Gap. The express lane would function as a high-occupancy toll (HOT) lane and provide travel reliability for CDOT's regional bus service, Bustang. Travelers would be able to travel in the express lanes by paying a toll, or for free if they ride with three or more people (with a switchable transponder). The existing two general purpose lanes would remain toll-free in both directions.

### General Purpose Lane Alternative

This alternative would add a new 12-ft general-purpose lane in each direction along I-25 through the Gap, providing 3 general-purpose (i.e., non-tolled) lanes in each direction.

## Safety in the Preferred Alternative

The alternatives analysis identified the express lane alternative as the preferred alternative. Although safety was not a major deciding factor between either alternative, CDOT added safety-related features to each design to address possible concerns. The preferred alternative addressed key safety issues identified in the project purpose and need:

> *Vehicular Safety:* CDOT developed several design decisions that targeted the types of crashes noted during the EA process. These improvements included increased capacity, wider shoulders, improved drainage, improved signage, pavement markings and delineators, interchange lighting, and lengthened acceleration and deceleration lanes.
>
> *WVCs:* New wildlife underpasses would provide animals the opportunity to cross under I-25 rather than crossing the interstate at-grade. This would decrease the likelihood of a WVC. Additional wildlife fencing would promote the usage of the wildlife underpasses.
>
> *Incident Management:* The preferred alternative included design elements that would promote safety for maintenance, emergency response, and law enforcement workers. Wider shoulders and other features would provide room for responders and law enforcement officers to work on the roadside and reduce exposure to moving traffic. Likewise, safer, and more efficient incident management should also reduce the likelihood of secondary crashes. Although future applications are not yet determined as of this case study, the addition of variable message signs (VMS) along the corridor can also be used to alert drivers to changing or emergency conditions that should further improve incident management and other safety issues.

As a result of the NEPA process, CDOT and FHWA selected a preferred alternative with the following features:

- Six-lane Typical Section (figure 8)
  - Add a 12-ft express lane and a 4-ft buffer between express and general-purpose lanes in both directions.
  - Widen outside and inside shoulders to 12 and 15 ft, respectively.
- Rehabilitate structures and pavement, including replacing the I-25 bridges over Plum Creek, Greenland Road, and Upper Lake Gulch Road.
- Implement Wildlife Mitigation System
  - Provide 4 new wildlife underpasses and expand existing underpass.
  - Provide 28 miles of deer fence, 64 escape ramps, and 21 deer guards.
- Add median and retaining walls throughout the corridor to keep the improvements within CDOT right-of-way.
- Improve drainage and other features, such as lighting, signage, fencing.
- Open southbound rest area to allow for truck chain-up in inclement weather along with extended acceleration and deceleration lanes.
- Install tolling, communications, and power equipment for driver and vehicle communications.

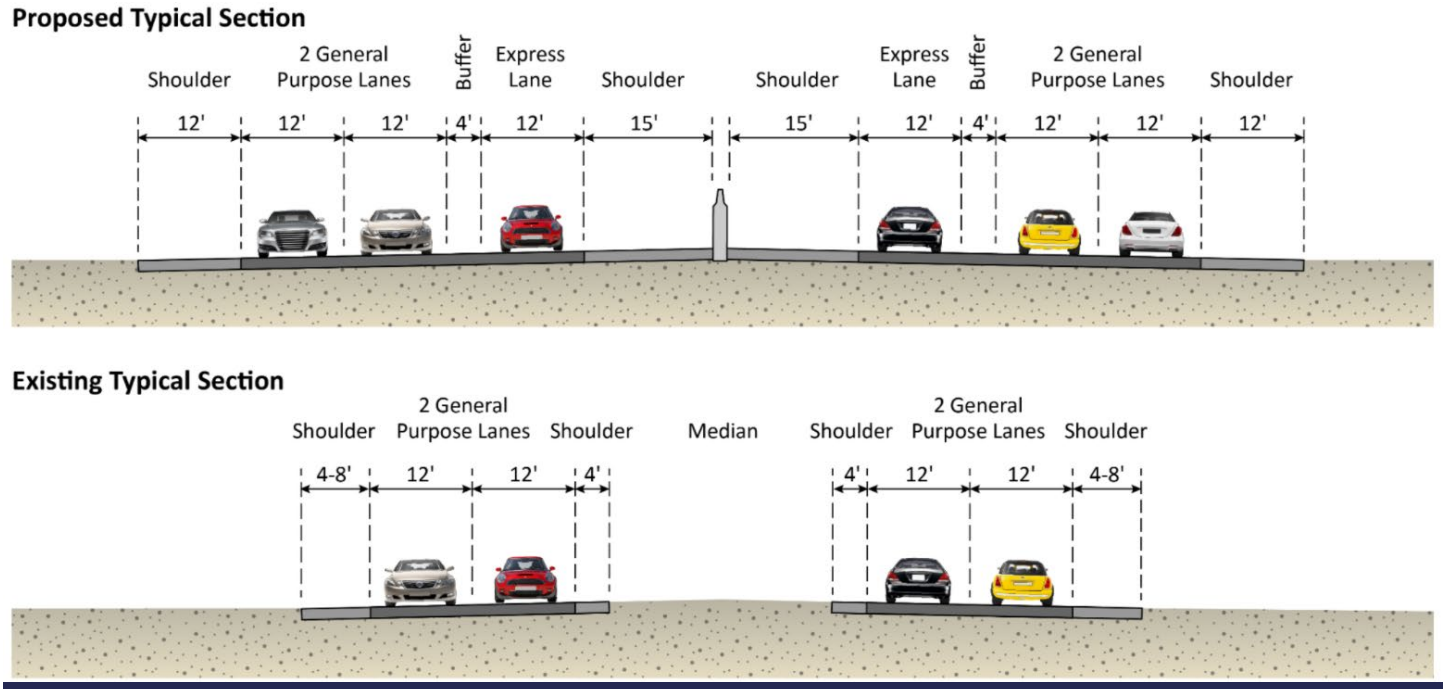


*Figure 8. Graphic. Existing typical section of the Gap compared to the preferred alternative. Source: CDOT, 2018.*

## Safety, the Affected Environment, and Environmental Consequences

CDOT assessed several elements that could be impacted by the project during the EA process. These elements include:

- Wildlife movement.
- Threatened and endangered species.
- Wetland/Waters of the United States.
- Floodplains.
- Water quality.
- Paleontological resources.
- Vegetation and habitat.
- Noxious weeds.
- Socioeconomic resources.
- Visual resources.
- Recreational resources.

Although CDOT planned to widen the 18-mile I-25 South Gap corridor, the agency relied on design alternatives that stayed within the existing ROW (to the greatest extent possible). Staying within the existing ROW helped to reduce the direct impacts to streams, wetlands, parks/open space, and endangered and protected species habitats. CDOT mitigated the small impacts that occurred as part of the construction.

The presence of protected wildlife habitat on both sides of the corridor, lack of crossing opportunities for wildlife, and low-light conditions for drivers contributed to the high number of incidents involving wildlife. Due

to the high number of WVCs and quality of wildlife habitat in the area, Colorado Parks and Wildlife (CPW) identified the Gap corridor as one of the seven "high-risk" locations for WVCs statewide. CDOT developed a Wildlife Movement Technical Memorandum as part of the project documentation, and the analysis supported the investment and construction of a wildlife mitigation system as part of the I-25 South Gap Project.

The preferred alternative addressed the lack of wildlife connectivity and the potential to reduce the number of WVCs by adding 4 additional wildlife underpasses at strategic locations and doubling the size of an existing crossing from 150 ft to 300 ft. Although the preferred alternative would impact other environmental resources as a result of a wider footprint, incorporating wildlife crossings would satisfy a key environmental need of the project by potentially reducing wildlife exposure to traffic and therefore the total number of WVCs (figure 9).

*Figure 9. Photograph. Example wildlife underpass.*
*Source: Attardo, 2020.*

The wildlife crossings work together with 8-ft wildlife exclusion fence, deer guards, and escape ramps that function together as a Wildlife Mitigation System. CDOT installed wildlife fencing (28 miles) along both sides of I-25 to encourage deer and other animals to use the new underpasses and deter them from crossing the interstate. CDOT also constructed wildlife escape ramps/jump-outs that would allow animals that enter I-25 through openings in the fence to escape, and deer guards that would deter animals from entering I-25 where gaps in the wildlife fencing are unavoidable (e.g., interchange on-ramps and emergency access points). CDOT completed the Wildlife Mitigation System implementation in 2021. A three-year joint CDOT and CPW research project is monitoring the system with action triggered cameras.

## Safety in Mitigation, Environmental Commitments, and Post-NEPA

CDOT monitored environmental commitments using a tracking summary sheet in the EA. Documented and tracked commitments included safety-related measures such as proposed construction of wildlife underpasses and installation of wildlife fencing aimed at minimizing WVCs and improving roadway safety. Environmental

related specifications and special provisions were incorporated into the construction documents. Environmental monitors tracked and monitored environmental commitments during construction. Monthly environmental commitments and mitigation tracking reports were prepared and rolled up into annual reports. The final environmental monitoring report noted that CDOT met (i.e., did not exceed) all of its prescribed impact levels during the construction process.

### Project Documentation

CDOT completed an EA with FHWA approval of the Finding of No Significant Impact (FONSI) in June 2018. Once the EA and FONSI were completed, CDOT re-initiated the larger 34-mile PEL study and completed it in October 2019.

## Project Themes

The I-25 South Gap EA touches on several themes noted in FHWA's *Integrating Road Safety into NEPA Analysis: A Practitioner's Primer* guidance (FHWA, 2011b). These themes are also key takeaways for future NEPA studies that plan to effectively incorporate safety early in the NEPA and project development processes.

### Considering Safety Prior to NEPA

CDOT evaluated safety issues prior to NEPA during the initial stages of the PEL study. This included a review of the existing infrastructure in the corridor and an analysis of crash data during the most recent 5-year period for which data were available. CDOT produced a SAR that looked at the magnitude of safety problems on the corridor using CDOT's SPFs and LOSS derived from HSM methodologies. Safety issues on I-25 were primarily related to congestion, physical roadway conditions, and incident management, although animal crashes and carcass locations helped inform NEPA recommendations. CDOT determined there was a moderate to high potential to reduce crashes and improve safety along a majority of the corridor. The PEL study was the first step to analyze and address safety, travel reliability and mobility issues along I-25, and laid the groundwork for the NEPA process to identify and prioritize the I-25 South Gap Project.

### Public and Stakeholder Outreach

Outreach formed a key mechanism for including safety in purpose and need. CDOT conducted extensive outreach with corridor communities and stakeholders during both the PEL study and for the EA to understand the most critical travel issues and highest priority improvements. Discussions with law enforcement and emergency services also revealed key bottlenecks with the existing design that created safety concerns for responders and significantly slowed post-crash response efforts. Improving safety, travel times and reliability, and WVCs through the Gap corridor represented the highest priorities. Public involvement during the PEL study included 8 public meetings, 3 telephone town halls, and numerous listening sessions. Public involvement during the EA comprised 2 public meetings and 2 public hearings, although Steering Committee meetings during the EA process were open to the public as well. Over the course of the combined PEL study and EA phase of the project, CDOT conducted 22 Technical Working Group meetings and 16 Regulatory Agency Group meetings along with numerous Steering Committee meetings.

### Safety in Purpose and Need

Safety was paramount in the project purpose statement, as well as in the documentation of project needs within the EA. CDOT clearly articulated and discussed safety needs as a result of preliminary safety analyses

through the PEL study, which indicated that the 18-mile Gap corridor had the potential for safety improvements, particularly in the areas of roadway safety, WVCs, and incident response.

## Safety in Mitigation

CDOT monitored environmental commitments and mitigation measures using the agency's mitigation commitments tracking summary sheet. The most important safety-related commitment involved the proposed wildlife underpasses and other wildlife safety improvements.

# References & Additional Information


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- Phone Interview on January 19, 2022, with Chuck Attardo (CDOT).
- Phone Interview on April 18, 2022, with Chuck Attardo (CDOT).


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