



I-70 Vail Pass Safety and Operations Improvements

INFRA APPLICATION • RURAL

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COLORADO
Department of Transportation



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February 25, 2020

The Honorable Elaine Chao, Secretary
US Department of Transportation
1200 New Jersey Ave, SE
Washington, DC 20590

Dear Secretary Chao:

The Colorado Department of Transportation (CDOT) is pleased to submit an FY 2020 Nationally Significant Freight and Highway Projects (INFRA) grant application for the Interstate 70 (I-70) Vail Pass Safety and Operations Improvements project. This application addresses the Vail Pass corridor, which is on the National Highway Freight Corridor and is a critical piece of rural infrastructure that impacts economic vitality throughout the state of Colorado and the rest of the nation.

Vail Pass was initially constructed in 1940 as part of US Highway 6 and then with the passage of the Federal Interstate Highways Act, the route became what we now know as I-70 between Baltimore and Utah, passing through Denver and connecting both sides of the Continental Divide. Vail Pass as we know it today was completed in 1979. Since then, Colorado's population and traffic volume have increased significantly and I-70 has struggled to keep up. The road is currently two lanes which can cause significant safety challenges and regularly forces a complete closure of I-70 to respond to incidents.

This project has many components including adding five miles of eastbound auxiliary lane, reconstructing two curves to improve substandard geometry, installing signage to assist with safety, upgrading a truck escape ramp, and installing wildlife mitigation safety measures -- all needed to prevent crashes, fatalities, and closures that have occurred all too frequently on this highway. CDOT's share of this project is \$79.7 million.

Interstate 70 is a key economic driver in the state of Colorado. It's heavily used by trucks, a gateway to recreation, and connects travelers east and west of the Continental Divide. Based on historical and projected population and employment levels, both passenger and freight traffic volumes will continue to increase and impact I-70. This project will address many of the physical constraints on this road which will improve safety for the traveling public and enhance connectivity to the rest of the freight network in the United States.

This application is supported by elected officials, regional and local government agencies, and all of the communities along the I-70 mountain corridor. Together with our partners and the USDOT, CDOT is committed to delivering this critical project providing much-needed freight and safety improvements to this corridor.

Sincerely,

A handwritten signature in blue ink, appearing to read "Shoshana M. Lew".

Shoshana M. Lew,
Executive Director

APPLICATION TABLE

I-70 VAIL PASS SAFETY AND OPERATIONS IMPROVEMENTS PROJECT

<i>Project Sponsor</i>	Colorado Department of Transportation and the Federal Highway Administration
<i>Was an INFRA application for this project submitted previously? (If Yes, please include title)</i>	No

PROJECT COSTS

<i>INFRA Request Amount</i>	\$60,700,000
<i>Estimated Federal Funding (excluding INFRA)</i>	\$4,500,000
<i>Estimated Non-Federal Funding</i>	\$75,200,000
<i>Future Eligible Project Cost (sum of previous three rows)</i>	\$140,400,000
<i>Previously Incurred Project Costs (if applicable)</i>	\$0
<i>Total Project Cost (sum of 'Previously Incurred' and 'Future Eligible')</i>	\$140,400,000
<i>Are matching funds restricted to a specific project component? If so, which one?</i>	\$39,700,000 from the Colorado Bridge Enterprise is restricted to the bridge reconstruction sub-project.

PROJECT ELIGIBILITY

<i>Approximately how much of the estimated future eligible project costs will be spent on components of the project currently located on National Highway Freight Network (NHFN)?</i>	\$140,400,000 (100 percent)
<i>Approximately how much of the estimated future eligible project costs will be spent on components of the project currently located on the National Highway System (NHS)?</i>	\$140,400,000 (100 percent)
<i>Approximately how much of the estimated future eligible project costs will be spent on components constituting railway-highway grade crossing or grade separation projects?</i>	\$0
<i>Approximately how much of the estimated future eligible project costs will be spent on components constituting intermodal or freight rail projects, or freight projects within the boundaries of a public or private freight rail, water (including ports), or intermodal facility?</i>	\$0

PROJECT LOCATION

<i>State(s) in Which Project is Located</i>	Colorado
<i>Small or Large Project</i>	Large Project
<i>Urbanized Area in which project is located, if applicable</i>	N/A - Project is rural
<i>Population of Urbanized Area (According to 2010 Census)</i>	N/A - Project is rural
<i>Is the project located (entirely or partially) in an Opportunity Zone?</i>	No

IS THE PROJECT CURRENTLY PROGRAMMED IN THE...

<i>TIP?</i>	Not applicable, not in a TIP area
<i>STIP?</i>	Yes, SR36607.028 / SIN7021
<i>MPO Long Range Transportation Plan?</i>	Not applicable, not in an MPO area
<i>State Long Range Transportation Plan?</i>	Yes
<i>State Freight Plan?</i>	Yes

PROJECT DESCRIPTION

The Colorado Department of Transportation (CDOT), in coordination with the Intermountain, Gunnison Valley, and Northwest Transportation Planning Regions (TPR), and the Grand Valley Metropolitan Planning Organization (MPO)/TPR, is pleased to submit an application seeking \$60.7 million in funding from the USDOT's Nationally Significant Freight and Highway Projects (INFRA) grant program. The candidate project of **Interstate 70 (I-70) Vail Pass Safety and Operations Improvements** comprises nine main components on Vail Pass with the aim of improving the safety and efficiency of operations for passenger and freight vehicles, as well as enhancing quality of life on this important east/west corridor that is paramount for Colorado's economy and for moving goods from coast to coast. The project is also supported by the I-70 Coalition, the Colorado Motor Carriers Association, the Colorado Freight Advisory Council, the Colorado Wyoming Petroleum Marketers Association, and the Colorado Transportation Commission, an 11 member gubernatorial appointed commission that oversees CDOT's policies and budget.

The I-70 mountain corridor is a critical lifeline for Colorado, connecting Colorado's Front Range, including tourists who arrive at Denver International Airport, with our mountain communities, recreational areas, and resorts that are all primary economic drivers for the state. Further, I-70 is critical for the movement of freight from east to west, and vice versa, linking economies from coast-to-coast and providing the only contiguous route that brings goods and materials to Colorado's mountain and Western Slope communities. Given that I-70 is Colorado's only east/west National Highway System interstate, it is critical to keep the interstate safe and in good operating condition to minimize disruptions to the transport of goods and people. Further, when travel detours are necessary, not only do these detours average one to three hours of additional travel time, they are costly, with an economic impact estimated at \$1 million per hour.¹ Improving safety and operations on Vail Pass will not only save lives but also provide a more continuous connection between the Front Range and mountain communities with increased travel time reliability and minimized impacts on local, state, and national economies.

¹ <https://www.i70solutions.org/files/4114/2982/4933/Impact-I-70-Congestion-on-Colorado.pdf>

Infrastructure safety and operations improvements include:

- Addition of an auxiliary lane and widened inside shoulders that allow improved traffic movement to alleviate the impacts of speed differentials and by providing additional area for maintenance and emergency response;
- Widened outside shoulders in select locations, which provide an additional eight feet of pavement to allow space for breakdowns/mechanical issues and incident management flexibility;
- Curve modifications to improve geometry and design deficiencies, including widened inside shoulders;
- Bridge replacement of current structurally deficient bridge; and
- Reconstruction of the lower truck ramp to improve geometry by eliminating curves.

Technology safety and operations improvements include:

- Improved signage that includes LED-lit chevrons to warn drivers of upcoming curves, indicate to drivers when approaching at unsafe speeds and an additional variable message sign (VMS), combined with existing VMSs to form an Active Traffic Management (ATM) system;
- Installation of variable speed limit signs that can be adjusted to accommodate changing weather and road conditions;
- Automated highway closure system to quickly and efficiently close the highway when necessary; and
- Fixed Automated Spray Technology (FAST) Anti-icing system to reduce pavement icing and freezing during inclement weather.



Vail Pass is one of the state’s highest transportation priorities, affecting millions of Colorado residents, tourists, and the movement of freight. The project is enthusiastically supported in a bipartisan manner by Colorado’s governor, senators, congressmen, and state senators and representatives. Vail Pass is the lifeline linking the eastern side of the Continental Divide with the west and vital for rural Colorado. Improvements to Vail Pass are essential to increasing safety and decreasing vehicular crashes and deaths, ensuring the region can provide for improved freight movement, and planning for a future that enables successful growth and economic health.

Vail Pass was completed in 1979, a time when the state’s population was 2.2 million. Since then, the state has grown to 5.8 million and traffic on Vail Pass has increased accordingly, with an average annual daily traffic of 22,000 vehicles - 11.6 percent of which is truck traffic - and peak summer daily averages surpassing 32,900 vehicles. With this increased pressure on the interstate, crashes of varying severity occur with regularity. In fact, **the crash rate on Vail Pass is the highest for all of I-70 per million vehicle miles traveled**, with 558 crashes from 2014 to 2016. Even though freight makes up only 11.6 percent of total corridor traffic, over 16.6 percent of crashes involve a commercial motor vehicle (CMV). Reducing this rate is a major goal of the project.

When crashes occur, emergency responders close the lane of travel in which the incident occurred plus one additional lane known as a “lane + 1 strategy.” This provides a level of safety for responders and those involved in the crash by providing a buffer to reduce the chance of those involved being hit by another vehicle. While “lane + 1” provides a level of safety on one end, it does frequently cause full closures given that there are only two lanes of travel and thus all lanes are blocked. Further, as traffic backs up down the pass, the chances of secondary accidents increase.

The components of this grant, that add an auxiliary lane, widen shoulders, correct geometric issues, and provide better signage for safety, will not only reduce the overall number of incidents, but also reduce the number of full closures required when an incident does occur. This will save lives, improve travel reliability, and decrease loss of property due to accidents, and also be a boon for the economy as freight and the traveling public will encounter fewer delays and detours.

“Vail Pass as we know it today was completed in 1979 but since then Colorado’s population and traffic volume have increased significantly and I-70 has struggled to keep up.”

Shoshana Lew
CDOT Executive Director



Project at a Glance

Purpose: Improve safety, freight efficiency, and economic vitality along the only contiguous east/west interstate in Colorado.

Solution: Auxiliary lane construction, shoulder widening, and curve geometry improvements, along with state of the art signage and warnings to improve safety and travel time reliability.

Request: \$60.7 million INFRA grant for \$140.4 million project.

PROJECT LOCATION

The Interstate 70 Vail Pass Safety and Operations Improvements Project is comprised of nine projects along the I-70 mountain corridor in Eagle County between milepost (MP) 180 and 190. An auxiliary lane is planned for eastbound (EB) I-70 between MP 185 to the Vail Pass Rest Area at MP 190. Shoulder widening will take place throughout the corridor EB and westbound (WB), as well as two curve reconstructions between MP 185.6-188.9. At MP 185, there will be a complete bridge reconstruction and the lower truck ramp at MP 182.5 will also be reconstructed. The project will also include signage improvements, installation of a Variable Speed Limit System, an innovative Automated Highway Closure System, as well as an automated anti-icing system.

The nine discrete components comprising the I-70 Vail Pass Safety and Operations Improvements project are listed below, as shown in **Table 1** and **Figure 2** (next page):

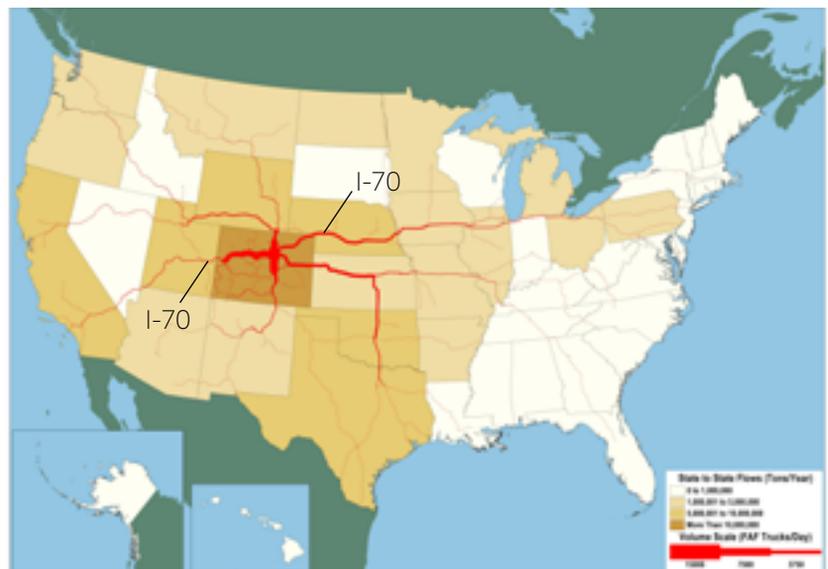
- Auxiliary lane widening
- Widened inside and outside shoulders
- Curve reconstructions
- Bridge reconstruction
- Lower truck ramp reconstruction
- Signage improvements
- Variable speed limit system
- Automated highway closure system
- Fixed automated spray technology (FAST) anti-icing



The project corridor has high national and regional significance as shown in **Figure 1**. I-70 in the Colorado mountain corridor is the only east/west interstate in the 500 miles between I-40 in New Mexico and I-80 in Wyoming. It is a backbone of the Rocky Mountain region and is designated as part of the Primary Highway Freight System. I-70 runs for 2,151 miles through 10 states and connects Baltimore on the east coast with the important agricultural states of the Midwest and onward to the Rocky Mountain states of Colorado and Utah. It provides continuity and resilience to the national system, while being the main corridor for intra-state travel within Colorado. It is the highest priority in the region, according to the four transportation planning regions (TPRs) in the area, three of which are willing to forgo projects in their own regions to complete this project.

Backbone of the Rocky Mountain Region:
I-70 is the only contiguous east/west highway in Colorado. Travel detours are long and costly: estimated economic impact is \$1 million / hour I-70 is closed.

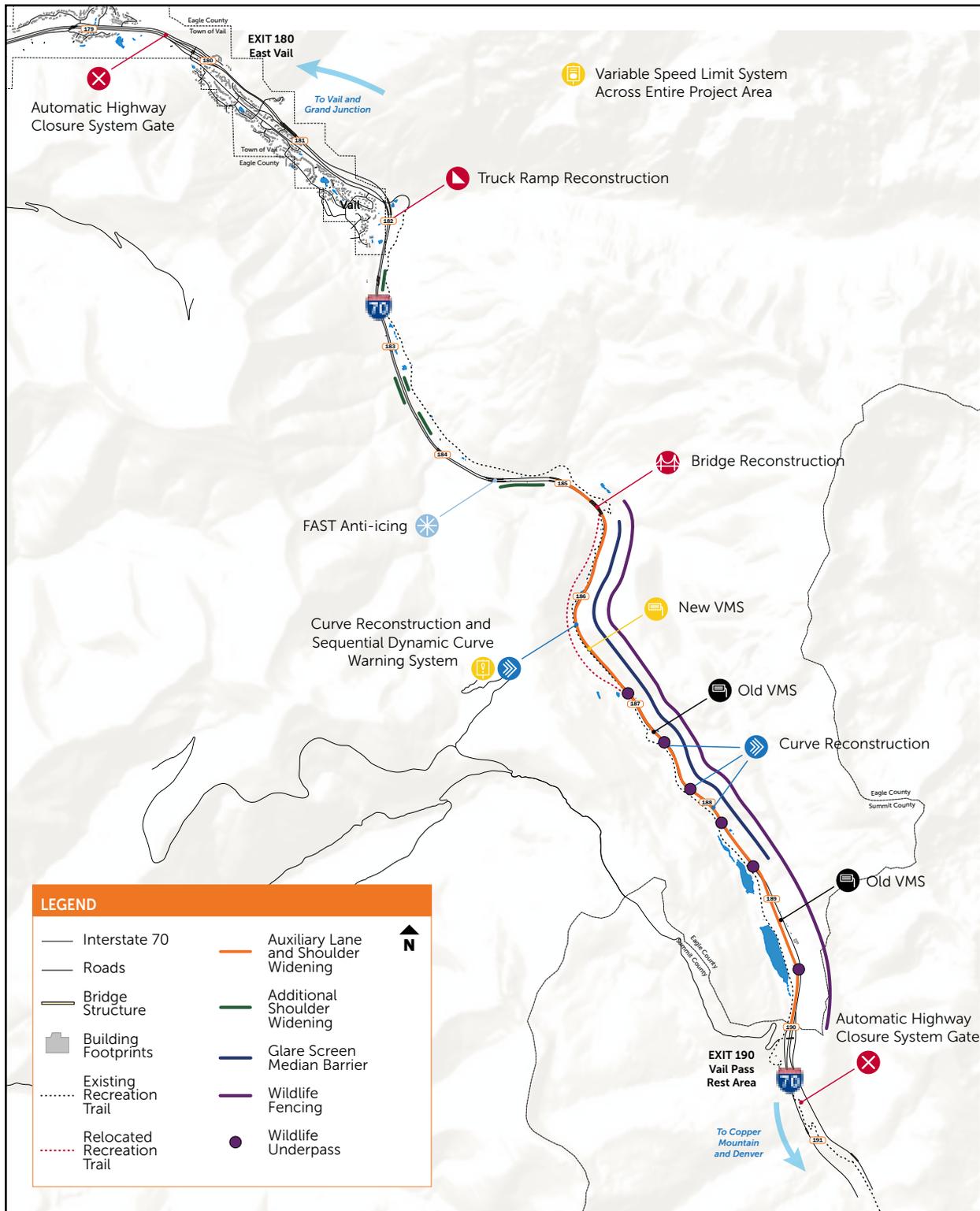
FIGURE 1: MAJOR TRUCK FLOWS TO, FROM, AND IN COLORADO



Note: Major flows include domestic and international freight moving by truck on highway segments with more than twenty five FAF trucks per day and between places typically more than fifty miles apart.
Source: U.S. Department of Transportation, Federal Highway Administration, Office of Freight Management and Operations, Freight Analysis Framework, version 4.3, 2017.



FIGURE 2: MAP OF PROJECT AREA



The I-70 corridor:

- Connects seven of the top 22 farm states, producing \$81.4 billion of agriculture goods, 21 percent of the US total of all commodities;¹
- Is the vital connector for all mountain and rural towns in expanding central and western Colorado (employment growth was 3.1 percent regionally in 2019²), creating freight access to deliver vital goods such as food and natural resources, and minimizing prices;
- Has one of the highest rural and mountain Average Annual Daily Truck Traffic (AADTT) counts in Colorado at 2,600 per day, 11.6 percent of overall Average Annual Daily Traffic (AADT) of 22,000 and 32,900 during busy summer months;
- Provides access to mountain tourism and winter sports, which supports 43,000 jobs in Colorado and produce at least \$5 billion in economic impacts to the state, 1/4 of the total national winter sports impact.³ Winter sports is responsible for 3.3 percent of state Gross Domestic Product (GDP);⁴ and
- Improves efficiency and reliability to increase global economic competitiveness by supporting the multi-state transportation backbone for agriculture producing states.

Component 1: Auxiliary Lane Widening

The I-70 Vail Pass Auxiliary Lane project includes widening I-70 in the EB direction to provide a third lane between MP 185 and MP 190 (Vail Pass Rest Area), including six foot inside and standard eight foot outside shoulder widths, pavement resurfacing for five miles, wildlife fencing and underpasses, a glare screen median barrier, and a bridge reconstruction. The auxiliary lanes will improve operations, mobility, and safety by providing an additional lane for passing vehicles to alleviate the impacts of speed differentials and

1 <https://thestacker.com/stories/3183/states-biggest-agriculture-industry#36>

2 <https://leg.colorado.gov/sites/default/files/images/decforecast.pdf>

3 <https://scholars.unh.edu/cgi/viewcontent.cgi?article=1190&context=ersc>

4 <https://www.bea.gov/news/2019/outdoor-recreation-satellite-account-us-and-prototype-states-2017>

TABLE 1: PROJECT AREA BY MILE POST

Components	Mile Post (MP)
EB auxiliary lane, with inside and outside shoulder widening, wildlife underpasses, glare screen median, and trail relocation	185-190
Wildlife fencing	185.2-190
Additional outside shoulder widening	EB 183.3-183.5 EB 184.6-184.8 WB 182.4-182.5 WB 183.3-183.4 WB 183.6-183.7
WB curve reconstruction 1, inside shoulder widening	185.6-186.5
WB curve reconstruction 2, inside shoulder widening	187.3-188.9
Bridge reconstruction with EB auxiliary lane and shoulder widening	185-185.6
Lower truck ramp reconstruction	182
Signage improvements	WB 186-190
Variable speed limit system	180-190
Automated highway closure system	180-190
FAST Anti-icing	184.3-184.5

by providing an additional area for maintenance and emergency response. The auxiliary lane will be added to the longest section with the steepest grade of the corridor, serving as a climbing lane for slow-moving and freight vehicles while providing two lanes of capacity for other vehicles. This area is a prime breakdown area for large vehicles. The freight community (see Letters of Support, **Appendix B**) welcomes a climbing lane along this corridor.

Benefits include improved traffic operations with more area for drivers to maneuver uphill travel, reduced number of full closures when “lane + 1” is in use (43 full closures due to crash incidents between 2014-2017, with at least 112 crashes EB between 2014-2016), and reduced impacts to vehicles passing breakdowns, spin-outs, and crashes in the area. The auxiliary lane provides more area for slow/disabled vehicles while keeping two travel lanes open. This sub-project will create a 35 percent potential reduction in all crashes EB on the Vail Pass corridor.

Wildlife Fencing

The first sub-project of the auxiliary lane includes installation of wildlife fencing along the upper half of the EB I-70 corridor from MP 185.2 - 190, as well as constructs six wildlife underpasses, two of which are for large animals (MPs 187.4 and 188.3) and four for small to medium animals (MPs 186.9, 187.8, 188.7, and 189.7). This five mile stretch currently has no wildlife connectivity, as noted in the I-70 Mountain Corridor Programmatic Environmental Impact Statement (PEIS). To address this deficiency, the PEIS includes a memorandum of understanding (MOU) between CDOT, FHWA, US Fish & Wildlife Service, US Forest Service, US Bureau of Land Management, and Colorado Parks & Wildlife (CPW) which outlines CDOT's responsibilities for implementing a landscape-based ecosystem approach for considering wildlife needs and conservation measures, and the measures to improve wildlife connectivity across the I-70 mountain corridor. The new wildlife fencing and underpasses will reconnect crucial wildlife migration patterns, reduce animal-related crashes on the corridor, reduce the amount of wildlife put in danger, and promote the safe passage of wildlife under I-70. The proposed underpass locations are the result of stakeholder collaboration during the Context Sensitive Solutions (CSS) process. Colorado is home to several federally-listed, high elevation animals which need to cross I-70 to repopulate their native range; a single Canada lynx would need to cross Vail Pass several times in its lifetime to produce enough young to successfully migrate north. Fencing will also reduce wildlife-related crashes by 80 percent while reducing operational impacts from wildlife crossings.

Trail Relocation

The second sub-project is the relocation of the Vail Pass Recreation Trail for approximately two miles from MP 185.2 - MP 186.9 due to direct impacts from the addition of the EB I-70 auxiliary lane. Currently, the trail is located directly next to I-70. Due to this close proximity, drivers often park on the trail when their vehicles break down, mistaking the trail for the shoulder. The trail relocation will result in improved operations and a more pleasant experience for trail users who will no longer be next to interstate traffic, substantially enhancing quality-of-life. There is also a reduction in the risk of vehicle-pedestrian/bicyclist crashes.

Glare Screen Median Barrier

The third sub-project is the installation of a glare screen median barrier along the corridor from MP 185.5-188.7 where the median is relatively narrow. The glare screen median barrier will be 56 inches tall above the pavement surface, whereas the typical median barrier is 36 inches tall. The barrier will reduce the impacts of headlight glare at night and create safer conditions for drivers. There were 54 night-time crashes reported in the area of the glare screen barrier from 2014-2016, and there will be a 15 percent potential reduction in night-time crashes once installed.



Component 2: Outside Shoulder Widening

Widened outside shoulders resulting in eight additional feet of pavement are identified in the project to provide areas for vehicles to move off the roadway due to breakdowns and mechanical issues, weather concerns, brake cool-down, and other issues. Wider outside shoulders also provide more emergency management flexibility with additional pavement width to move traffic should there be a lane closure, in accordance with CDOT's Heavy Tow program. Heavy Tow strategically positions heavy duty wreckers along I-70 during inclement weather, weekends, and holidays to safely and efficiently remove big trucks from the flow of traffic. This added flexibility will reduce partial and full closures and allow incidents to be cleared more quickly, resulting in shorter closures. CDOT expects an 18.3 percent potential reduction in crashes from wider outside shoulders. The following areas are proposed for widened outside shoulders:

- EB I-70 (uphill) MP 183.3 – 183.5 (12 partial closures from 2014-2017)
- EB I-70 (uphill) MP 184.6 – 184.8 (7 partial and 4 full closures)
- WB I-70 (downhill) MP 182.4 – 182.5 (2 partial closures)
- WB I-70 (downhill) MP 183.3 – 183.4 (2 partial closures)
- WB I-70 (downhill) MP 183.6 – 183.7 (2 partial closures)

Widening these outside shoulders will be an early-action item on the project to provide quick, direct benefits to the traveling public.

Component 3: Curve Reconstructions

Curve reconstructions are identified in both EB and WB directions. Data shows these curves have the highest crash patterns through this section of I-70. Reconstructions will improve curve geometry and current design deficiencies. Curve reconstructions, including wider shoulders, will contribute to overall crash reductions. Safety benefits may be higher than anticipated, as compound curves (i.e. design issues) are typically not considered as a primary cause during incident investigations and thus current data under-reports incidents.

The interstate will be realigned to the ultimate configuration at the following curves as shown in **Table 2**.

As part of the curve reconstructions, inside shoulders will be widened, from four feet to six feet, on select stretches. Widening inside shoulders will reduce crashes by 18.3 percent in these areas. Areas of widened inside shoulders are proposed in the following areas, which have patterns of off-left/center median crashes (2014-2016):

- EB I-70 MP 184.2 – 184.5, approaching the Black Gore Creek bridge (16 crashes)
- WB I-70 MP 185.8 – 186.1, in transition area between the two curve radii (15 crashes)
- WB I-70 MP 187.6 – 187.8, along inside of curve (16 crashes)
- WB I-70 MP 188.8 – 189.0 (13 crashes)

TABLE 2: CURVE RECONSTRUCTIONS

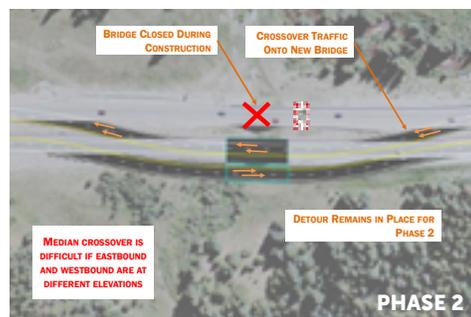
Milepost	Partial Closures Reported (2014-2017)	Full Closures Reported (2014-2017)	Crashes Reported (2014-2016)	Expected Crash Reduction (%)
184.5-185.2 (reconstruct 184.4-185.6)	53	15	73	9%
186 (reconstruct 185.6-186.5)	25	11	46	13%
Series of curves (187.3-188.2)	24	7	60	11%
Totals	102	33	179	



Component 4: Bridge Reconstruction

A crucial part of the auxiliary lane addition is the reconstruction of the bridge at MP 185.2. This bridge, constructed in 1978, carries traffic on I-70 EB over Polk Creek and is located on a steep incline leading to the top of Vail Pass. The current bridge is located on a curve that does not meet geometric criteria and needs realignment to improve safety for the traveling public. The bridge qualifies for state bridge funding due to its “poor” and “structurally deficient” conditions and because it is vital to both the interstate system and regional traffic patterns. The current bridge has dozens of fatigue cracks. Failure of the bridge will result in debilitating travel delays for both freight and the traveling public. Reconstruction is set at \$39.7 million and is one of the most important components in this grant application. The reconstructed bridge, including an auxiliary lane, will have a service life of 100 years. During reconstruction, traffic will continue normally as shown in **Figure 3**, helping maintain mobility on the corridor.

FIGURE 3: TRAFFIC IMPACTS ON TEMPORARY BRIDGES



Component 5: Lower Truck Ramp Reconstruction

The I-70 Vail Pass Project includes a lower truck ramp reconstruction of the existing truck ramp located along WB I-70 at MP 182. The ramp will be reconstructed to improve geometry by eliminating curves. Further improvements include additional signage on WB I-70, first at the top of the pass before trucks begin to descend and also approaching the truck ramp. This component both reduces negative operation impacts and better protects drivers using the ramp. Most trucks that use the ramp overturn due to the grade and curve. Not only is this dangerous for drivers, but should the truck be carrying hazmat, it could necessitate remediation. The truck ramp at MP 182 was used 14 times between 2016-2018.

Component 6: Signage Improvements

Intelligent Transportation System (ITS) signage improvements are included in the I-70 Vail Pass Project, as evaluated and recommended in an I-70 WB Vail Pass Narrows (MP 186) Evaluation (February 2017). The recommended signage improvements include replacing the existing static median barrier-mounted chevron alignment signs along WB I-70 (downhill) with a sequential dynamic curve warning system consisting of LED-lit chevron alignment signs that illuminate when oncoming vehicles approach at unsafe speeds. An additional overhead variable message sign (VMS) will also be installed at approximately MP 186.5, upstream of the Vail Pass narrows. This VMS will be combined with the existing two variable message signs to form an Active Traffic Management (ATM) system to convey lane use, incident/queue warning, and speed limit information to motorists traveling downhill. Ten median-mounted signs, one VMS, and necessary power and communications infrastructure are assumed with the early-action project.

Additional signage improvements also include large static overhead signs along WB I-70 warning drivers of the upcoming downhill grades and curves. Signs will be located at the top of the pass (MP 190) and approaching the Vail Pass narrow curves at MP 186.

Benefits include reduced travel speeds and speed differentials for traffic approaching downhill curves and potential hazards. This will also reduce erratic lane changing maneuvers, ultimately reducing congestion on the corridor. Safety of workers during future construction periods will also improve with VMS. Due to the Dynamic Curve Warning System, the corridor is expected to see a 10 percent reduction in lane departure-related crashes (7-10 fewer crashes over 20 years at MP 186-186.5). This component produces high benefits with limited costs.

Component 7: Variable Speed Limit System

As evaluated and recommended in regional studies, the project includes the installation of a variable speed limit system throughout the project corridor from MP 180-190. The system will include shoulder-mounted dynamic signs and necessary power and communications infrastructure. The system can be updated quickly to respond to real-time weather and traffic conditions along the corridor (with 495 crashes from 2014-2016). This is particularly important in areas adjacent to chain stations and truck parking as it allows almost immediate lowering of speeds which will in turn provide upwards of a 20 percent reduction in crashes and also will prevent injuries and fatalities.

Component 8: Automated Highway Closure System

Automated lane closure signage will be installed approaching the East Vail exit on EB I-70 (MP 180) and approaching the WB I-70 Vail Pass Rest Area exit (MP 190) to quickly and efficiently close the interstate, when needed. The closure system at each entry to the corridor includes two road closure gates, two overhead VMSs, and four ground-mounted VMSs. The combination of the overhead and ground mounted VMSs combine to form an Active Traffic Management (ATM) system to convey lane use, incident/queue warnings, and speed limit information, in addition to full interstate closures.

TABLE 3: VAIL PASS CLOSURES

Year	Full Closures	Partial Closures	Closure Duration (hours)
2014	15	25	400.0
2015	33	98	476.7
2016	71	144	307.9
2017	91	163	363.5
Totals	210	430	1548.1

Operational benefits include the ability to quickly and efficiently implement full interstate closures on a stretch of highway with quick-changing and severe weather. There were 210 full interstate corridor closures in four years (2014-2017) as shown in **Table 3**. The ability to more efficiently close the pass will create improved emergency response times and reduce the duration of full closures. The automated highway closure system will generate many safety benefits including a reduction of freight and passenger vehicles stranded on the pass during closures, as well as improved safety for emergency and maintenance staff who are implementing closures and responding to incidents.

Component 9: Fixed Automated Spray Technology (FAST) Anti-icing

A FAST Anti-icing system will be installed on an eastbound bridge at MP 184.4 to reduce pavement icing and freezing during inclement weather. This stretch of highway is the beginning of a steep climb on a tight curve with a high crash rate. The FAST system monitors the pavement surface with sensors and sprays the pavement with anti-icing solution when activated by freezing temperatures. Anti-icing will provide traction to travelers driving to the top of Vail Pass and reduce the number of spin-outs. Safety analyses of CDOT FAST systems reveal a reduction in the number of annual crashes on rural interstates by 31-57 percent. Overall, CDOT FAST systems have reduced crash severities at many sites, resulting in safety benefits of \$196,428 per winter season during the “after deployment” study period, and further reduced cost of winter maintenance.

PROJECT PARTIES

The Colorado Department of Transportation is the applicant for INFRA grant funding and will contribute all of the non-federal funding match. Stakeholder collaboration is the foundation for good transportation on which all CDOT projects are based. CDOT conducted a “Project Priority Programming Process” (4P) as a guide for the development of Colorado’s Statewide Transportation Improvement Program (STIP). The stakeholders have consistently emphasized that I-70 Vail Pass is a priority corridor. The following agencies and industries have worked with CDOT on other regional projects and have written letters of support for the I-70 Vail Pass Safety and Operations Improvements Project, which can be found in **Appendix B**:

- Governor of Colorado, Jared Polis
- Speaker of the House, Colorado State Representative KC Becker
- Colorado State Senator Dennis Hisey, Senate District 2
- Colorado State Senator Bob Rankin, Senate District 8
- Colorado State Representative Dylan Roberts, House District 26
- Moffat County
- Summit County
- Town of Vail
- Intermountain TPR
- Gunnison Valley TPR
- Grand Valley MPO / TPR
- Northwest Regional Planning Commission
- I-70 Coalition
- Colorado Motor Carriers Association
- Colorado Wyoming Petroleum Marketers Association
- Colorado Freight Advisory Council

While the project most directly impacts the town of Vail and Summit and Eagle Counties, the Intermountain, Gunnison Valley, and Northwest TPRs and the Grand Valley MPO/TPR all have a stake in the completion of the project. The I-70 mountain corridor has seen significant growth in population during the past several decades, as well as an increase in tourism and truck traffic along the corridor. Traffic has significantly impacted safety and travel times on I-70 Vail Pass. The entire corridor, from the Front Range to the Colorado Utah border, has a vested interest in seeing the highway modernized for efficiency and safety. During the Environmental Assessment (EA), CDOT included stakeholders such as the I-70 Coalition, Northwest Colorado Council of Governments, Colorado Motor Carriers Association, Colorado Snowmobile Association, Bicycle Colorado, and Colorado Parks & Wildlife.

The project’s right-of-way is an easement from the US Forest Service (USFS,) as such CDOT will continue to maintain the close working relationship already established during the environmental review process and also collaborate with the Federal Highway Administration (FHWA), the US Army Corp of Engineers, ECO Trails, and US Fish & Wildlife.

The program manager is Karen Berdoulay, Resident Engineer, CDOT Region 3, and the grant administrator is Jeff Sudmeier, CDOT’s Chief Financial Officer.



GRANTS, FUNDS, & SOURCES

Project Costs

CDOT is requesting \$60.7 million in INFRA discretionary grant funding for the \$140.4 million project. CDOT is drawing on \$79.7 million in state funding sources for local match: \$39.7 million from the Colorado Bridge Enterprise, \$33.5 million of state bonding capacity from Senate Bill 17-267, \$2.0 million in CDOT Region 3 Regional Priority Program funding, and \$4.5 million from the National Highway Freight Program. CDOT has far-reaching plans on this corridor, including adding auxiliary lanes EB and WB along the entire 10-mile stretch from MP 180-190, other curve modifications, shoulder widening, freight chain-up stations, truck parking, and numerous other initiatives. An INFRA grant award will accelerate project funding and construction for this corridor.

Project funding sources are shown in [Table 4](#). An overview of the project costs associated with each of the individual segments of the I-70 Vail Pass Project is shown in [Table 5](#).

CDOT is committed to funding \$13.5 million in match from SB 17-267. A memo from the Transportation Commission funding an additional \$20 million match (for a total of \$33.5 million in funds from Senate Bill 17-267), and a memo from the Bridge Enterprise funding a \$39.7 million match are both in [Appendix B](#). A more detailed overview of the project costs for each of the sub-projects can be found in [Appendix C](#).

Use of Funds

This grant application is focused on the development of the nine components of the I-70 Vail Pass corridor from MP 180-190. Approximately 73% of the project's \$140.4 million capital costs is associated with construction; the remainder is for design, engineering, construction management and project management. As the auxiliary lane and shoulders will be built within CDOT's easement with the USFS, there are no costs associated with the temporary or permanent acquisition of right-of-way or utilities relocation. At the time of application, \$3 million of the local match has already been expended on the EA for the project.

TABLE 4: FUNDING SOURCES

Funding Source and Type	Total Amount (\$M)	Total Percentage (%)
State of Colorado / CDOT: Bridge Enterprise	\$39.7	28.3%
CDOT: Senate Bill 17-267	\$33.5	23.9%
CDOT: Regional Priority Program	\$2	1.4%
Total Non-Federal Match	\$75.2	53.6%
Colorado National Highway Freight Program	\$4.5	3.2%
Federal Funds Sought (INFRA Ask)	\$60.7	43.2%
Total Federal Funding (Committed + INFRA)	\$65.2	46.4%
Total Project Cost	\$140.4	100%

TABLE 5: TOTAL PROJECT COSTS

Sub-Project	Total Cost (\$M)	Federal Grant Share (\$M)	Other Federal Funds (\$M)	Non-Federal Share (\$M)
EB Auxiliary lane	\$73.5	\$60.7	\$0	\$12.8
Outside shoulder widening	\$1.5	\$0	\$0	\$1.5
WB Curve modification 1	\$3.4	\$0	\$0	\$3.4
WB Curve modification 2	\$9.4	\$0	\$0	\$9.4
Bridge reconstruction	\$39.7	\$0	\$0	\$39.7
Lower truck ramp reconstruction	\$4.7	\$0	\$4.5	\$0.2
Signage improvements (WB)	\$1.2	\$0	\$0	\$1.2
Variable speed limit system	\$2.4	\$0	\$0	\$2.4
Highway closure system	\$3.4	\$0	\$0	\$3.4
FAST Anti-icing	\$1.2	\$0	\$0	\$1.2
Total Project Cost	\$140.4	\$60.7	\$4.5	\$75.2

MERIT CRITERIA

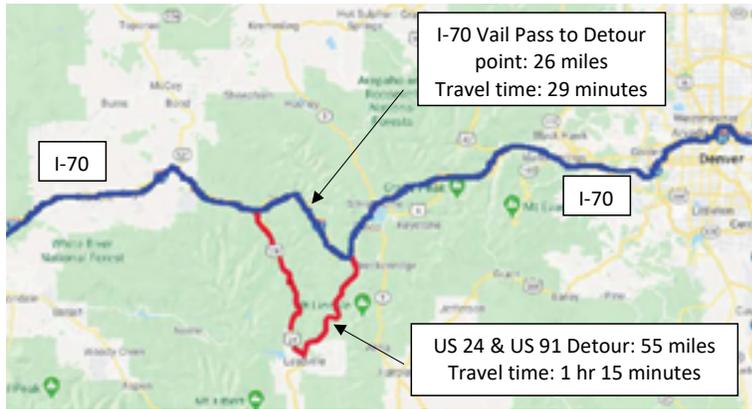
The delivery of I-70 Vail Pass Safety and Operations Improvements Project will generate benefits and impacts which align directly with several of the sought-after outcomes and merit criteria of the INFRA program. I-70 Vail Pass is a designated freight corridor for both the state of Colorado and the National Highway Freight Network, and it plays an important role in the regional, state, and national economy. Vail Pass is critical to the inter-regional, intra-state, inter-state, and national freight movement, with commercial trucks making up 11.6 percent of all traffic along this corridor.

Support for National and Regional Economic Vitality

The Vail Pass Project will provide regional, state, and national economic benefits along I-70, the only contiguous east/west interstate in Colorado on the National Highway Freight Network. These benefits include closure reduction; reduced

fatalities and crash-associated delays; travel time savings for both passenger and freight vehicles; improved connectivity to a major, multi-season tourism area; and improved quality of life.

Interstate 70 is the primary connection between the Front Range and the Western Slope of Colorado as well as the local communities of Eagle and Summit Counties. When I-70 Vail Pass is closed, the 30 minute, 26 mile trip between the towns of Copper Mountain and Vail becomes a one hour 15 minute, 55 mile detour along winding, mountainous secondary roads as shown in **Figure 4** (next page). These lengthy and potentially unsafe detours do not only impact the movement of community members, but also delay freight carriers and tourists. From 2014 to 2017, there were 210 full closures and 430 partial closures of I-70 Vail Pass, leading to 1,548 hours of closure. The economic impact from substantial backups and delays resulting from I-70 closure is estimated at \$1 million an hour.

FIGURE 4: I-70 VAIL PASS DETOUR ROUTE (MILES AND TIME)


When a crash occurs along I-70 Vail Pass, emergency responders use a “lane + 1” strategy, where the lane the incident occurred in and one additional lane are closed to prevent secondary crashes. This strategy frequently causes full closures given the existing two lane width. The additional auxiliary lane will allow the interstate to remain open more often. There are three lanes along a similar stretch of I-70 from Eisenhower Tunnel to Silverthorne, also known as West Straight Creek, with almost 50 percent more vehicles a day on average than Vail Pass, but 40 percent fewer crashes. Wider shoulders in areas where heavy vehicles frequently break down will better allow for heavy tow staging and reduce partial closures. Collisions occur so frequently in this area of Vail Pass that during severe weather conditions, the Colorado State Patrol will enact accident alert. Under accident alert, due to the high volume of accidents and a finite number of troopers available to respond, only the most severe crashes will receive emergency response. As a result, many crashes go unreported and collisions occur more often than our data reports. Wildlife-vehicle collisions also contribute to operational expenses and delays. As assessed in the benefits-cost analysis (BCA), the project’s annual benefit of reducing crash-related delay is estimated at 152.9 hours each year over the benefit analysis period.

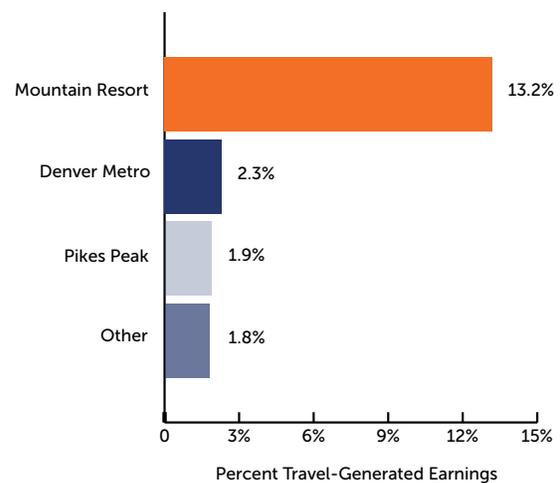
The nine components detailed in this application will generate significant travel time savings for both passenger and freight vehicles. By adding a five mile EB auxiliary lane, vehicles will have more space to manage speed differentials while maneuvering up the steepest sections of the corridor. This additional lane also improves mobility for freight by reducing turbulent traffic flow caused

by slower-moving vehicles. Geometric corrections to steep grades and tight curves will improve truck speeds and travel time for all vehicles. Combined with the ATM system and widened shoulders along five segments, the project also allows greater incident management flexibility, which will improve safety and reduce response time and expenses for emergency responders.

While the AADTT on Vail Pass is only 2,600 (11.6%), this AADTT is still in the top seven percent of all Colorado highways and appears

lower due to the large share of tourism traffic, with an AADT of 22,000 and 32,900 in peak summer months. Further, the US DOT and FHWA freight analysis projections show the AADTT on this portion of I-70 will exceed 8,500 by 2045.¹ In a 2015 measurement, the US DOT and FHWA also report some of the slowest truck speeds in the nation along I-70 from Denver to Glenwood Springs, less than 45 miles per hour. Improving travel speeds for freight is beneficial for the local, state, and national economy, as well as to the freight haulers.

1 https://www.bts.dot.gov/sites/bts.dot.gov/files/docs/FFF_2017.pdf

FIGURE 5: TRAVEL-GENERATED EARNINGS BY REGION AS A PERCENTAGE OF TOTAL EARNINGS BY REGION¹


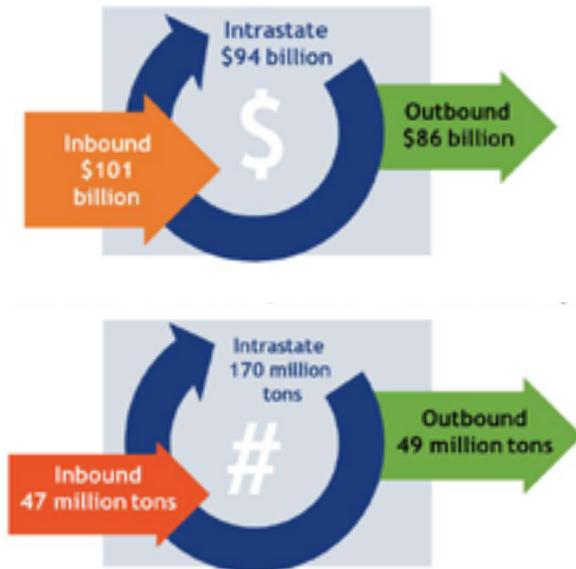
1 http://www.deanrunyan.com/doc_library/COImp.pdf

Colorado’s primary tourism area is clustered both east and west of the proposed improvements of the project. The state is home to 25 ski resorts, 19 of which I-70 provides access to, and attracts more skiers than any other state.² Summer tourism is substantial as well and many businesses depend on the recreation trail. The corridor’s highest AADTs occur from June to September. The tourism dollars I-70 facilitates are so critical to western Colorado, that four TPRs prioritized this project. Travel-generated earnings make up a much higher percentage of total earnings for the mountain resort region, 13.2 percent, versus 2.3 percent for the Denver Metro region and 1.8 percent for other regions in the state,³ as shown in **Figure 5** (previous page).

Transit operations also rely on this segment of I-70. CDOT’s West Line, one of eight inter-regional bus routes known as Bustang, runs four round trips daily: three from Vail to Denver and one from Grand Junction to Denver. Snowstang, a weekend service from Denver to three ski resorts,

2 <https://choosecolorado.com/wp-content/uploads/2016/06/CO-Tourism-and-Outdoor-Rec-Profile.pdf>
3 http://www.deanrunyan.com/doc_library/COImp.pdf

FIGURE 6: TOTAL GOODS MOVEMENT IN, OUT, AND WITHIN COLORADO BY TONNAGE AND VALUE¹



1 FHWA, Freight Analysis Framework, 2015

is an essential step to begin relieving weekend congestion on the corridor and is especially important for increasing mobility and safety for tourists who may not have access to properly equipped vehicles or knowledge to safely drive on winter mountain roads. Closures and delays negatively impact the travel time reliability and overall success of this statewide transit effort.

Denver International Airport is the hub of an extensive freight network which relies primarily on I-70, one of the country’s primary east/west commercial routes. I-70 also connects seven of the top 22 farm states and 21 percent of the US total of all commodities, as well as provides critical freight access to deliver goods to mountain communities and access to mountain tourism and winter sports.

Quality of life significantly improves for this area through the improvements that will be realized with the completion of the I-70 Vail Pass Project. The project provides a number of mobility benefits, including a reduction in travel time, improved safety, improved transit performance, reduced conflicts for cyclists and pedestrians on the recreation trail, and fewer wildlife conflicts resulting from wildlife fences and underpasses. A 2018 survey found 27 percent of respondents would prefer more distance between the recreation trail and I-70. As shown in the BCA, approximately 17,490 additional riders would make use of the relocated trail and gain the physical and mental health benefits associated with biking. Expected improvements in travel times should modestly lower emissions and improve air quality. Wildlife preservation adds long-term security to the tourism sector and the area’s ecological health.

As shown in **Table 6** (next page), the I-70 Vail Pass Safety and Operations Improvements Project would deliver a BCA of 1.75. The greatest benefit is reduced roadway fatalities and crashes, with each component except the automated highway closure system producing an expected 18 percent crash reduction factor or greater. The BCA calculated significant travel time savings from both a reduction in closures and congestion, with an annual travel time savings of 2,950 person-hours in year one (2026). Much of the infrastructure on Vail Pass is still original construction from the late 1970’s and deteriorating; components like curve modifications and bridge reconstruction will have a useful life of 50-75 years or longer. Detailed analyses of the BCA can be found in **Appendix A**.

TABLE 6: BENEFITS-COSTS ANALYSIS SUMMARY

COST-BENEFIT ANALYSIS	7% Discount Rate
COSTS (2020 \$M)	
Capital Costs	\$100,562,495
Work Zone Delay	-\$72,125
Total Costs	\$100,490,369
BENEFITS (2020 \$M)	
Safety Benefits	
Reduced Roadway Fatalities and Crashes	\$76,508,553
Economic Competitiveness Benefits	
Travel Time Savings (Crash Reduction)	\$23,006,920
Travel Time Savings (Congestion Reduction)	\$1,261,001
Vehicle Operating Cost Savings	\$241,509
Sub-Total	\$24,509,430
Other Benefits	
Maintenance and Operations Savings	\$13,080,469
Wildlife Mitigation Savings	\$8,481,699
Quality of Life Savings	\$48,465,186
Residual Value	\$5,191,693
Sub-Total	\$75,219,047
Total Benefits	\$176,237,030
OUTCOME	
Benefit-Cost Ratio	1.75

Leverage Federal Funding

CDOT has committed approximately \$80 million of state-controlled funds toward the project. Of this, \$13.5 million has been allocated by the Transportation Commission. Showing their strong support for the project, the Transportation Commission will allocate another \$20 million should this INFRA grant be awarded. The Colorado Bridge Enterprise Board, a government-owned business within CDOT, has agreed to allocate \$39.7 million. Components of this project are currently planned by CDOT to occur within the next four years. The INFRA grant would not only expedite the I-70 Vail Pass Safety and Operations Improvements Project, but also serve as a catalyst for other needed safety and operations improvements in the corridor.

Potential for Innovation

Technological Innovation

The FAST Anti-icing System addresses one of the biggest operational challenges on Vail Pass: CMVs stalling out due to steep seven percent grades and ice. Sensor technology monitors the pavement surface and activates the system when pavement approaches the freezing point and precipitation is present, spraying the pavement with the anti-icing solution. This proactive approach to pavement maintenance prevents collisions and closures due to icy conditions and reduces maintenance costs.

The project will install three innovative highway safety technologies: a sequential dynamic curve warning system, an ATM system combining new and old VMSs, and an automated highway closure system. The sequential dynamic curve warning system, as shown in **Figure 7** (next page), uses radar to detect vehicles approaching curves at unsafe speeds and subsequently illuminates LED lights on chevrons along the curve to warn drivers to lower their speed. ATM systems are an innovative solution to communicate a variety of messages, while also managing speed and lane use of vehicles on the corridor. The ATM can be combined with the automated highway closure system to expedite the closure process and keep all drivers well-informed.

The project also constructs six wildlife underpasses, two of which are for large animals and four for small to medium animals. These underpasses improve connectivity to natural habitats and reduce wildlife-vehicle collisions. Wildlife crossing structures are becoming a best practice conservation strategy and international sources note CDOT and the Colorado Wildlife and Transportation Alliance as leaders for efforts to preserve the diverse ecosystems that drive our tourism and national culture. Colorado's Western Slope is home to several of the largest herds of migratory elk and mule deer in North America. Traditionally, wildlife have simply used elements of existing roadway structures, like an opening beneath a bridge; however, there are no bridges along this upper stretch of Vail Pass. This unique solution not only improves safety by reducing animal-vehicle collisions, but tailors the underpass location and size to species to maximize population health.

Innovation in Finance

In 2009, former Colorado Governor Bill Ritter signed into law the first new dedicated and sustainable funding source for Colorado transportation infrastructure in nearly 20 years: SB 09-108, Funding Advancement for Surface Transportation and Economic Recovery, otherwise known as FASTER. A portion of the funding designated as the "Bridge Safety Surcharge" is imposed on vehicle registration, based on vehicle weight, and ranges from \$13 to \$32. Revenues from the surcharge are dedicated specifically for Colorado's most deficient bridges (bridges rated "poor") and by statute cannot be used for other CDOT purposes. To focus on the state's crumbling bridge infrastructure, Colorado created the Colorado Bridge Enterprise (CBE). The CBE is a government-owned business within CDOT, established to "finance, repair, reconstruct, and replace any designated bridge in the state" per C.R.S. 43-4-805 (2) (b). In fiscal year 2019, Bridge Safety Surcharge revenues were \$105.7 million.

The Transportation Commission, CDOT's governing body, has provisionally approved an additional \$20 million match, should the INFRA grant be awarded.

Innovation in Project Delivery

CDOT will use innovative project delivery methods to deliver the project in a timely manner, on or under budget. To achieve this, CDOT will procure the development of all project segments under a single contract using Construction Manager/General Contractor (CM/GC) project delivery. To add a level of transparency and accountability to the process of selecting a CM/GC, CDOT created a Procedural Directive 508.2 detailing the process used to make scores on contractor proposals public. In doing so, CDOT is keeping its pledge

to be fastidious stewards of public funds while also providing much appreciated information to contractors that can help inform their future proposals on subsequent CDOT projects. The process of working with industry partners will not only add transparency but provide education in the sector about best practices in alternative delivery.

Performance and Accountability

The life cycle for improvements to Vail Pass, as shown in [Table 7](#) (next page), was calculated for a 30-year time span. The BCA assumes a ten-year pavement maintenance cycle where the right lane is overlaid in the third and sixth year, and the full width is overlaid in the tenth year. The build option skips the first cycle. Overlay costs are based on past overlay projects on Vail Pass. If this project is not constructed, the BCA estimates that maintenance over the 30 year period, to maintain the road at a B level of service (LOS), will cost more than \$67 million. If this project is constructed, operations and maintenance will cost approximately \$47 million.

The build option includes \$95,000 per year to account for maintenance of the highway closure gates, variable speed limit signs, anti-icing system, and wildlife fencing. This budget is included in the benefit-cost analysis. Should the project be funded, CDOT commits to maintaining this corridor using the funds identified. CDOT is committed to project transparency and developed a "Dashboard of Major Projects" interface, which informs the public about spending and progress of projects. This dashboard is an important accountability tool that will help CDOT stay on track and meet construction goals for the project.

FIGURE 7: SEQUENTIAL DYNAMIC CURVE WARNING SYSTEM

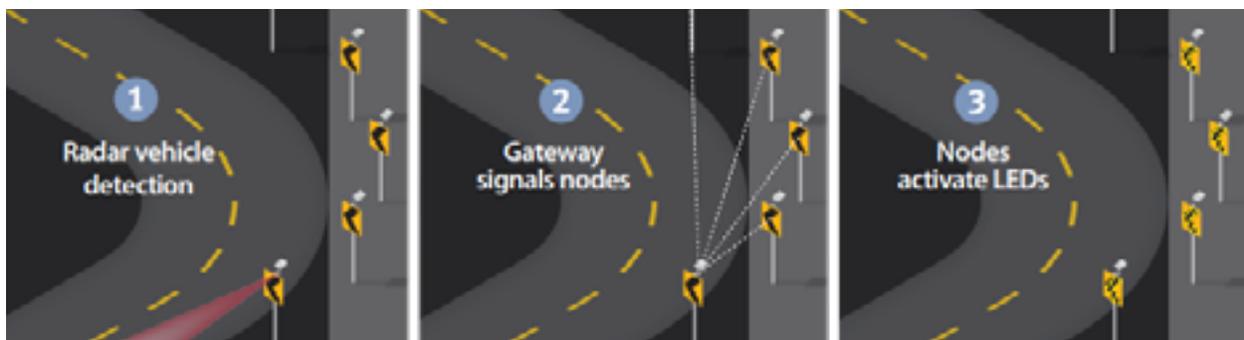


TABLE 7: LIFE CYCLE COSTS

	No-Build (\$)	Build (\$)
Bridge rehabilitation and maintenance costs	\$5,476,000	\$0
Regular maintenance costs	\$17,264,000	\$9,659,000
Delay costs due to maintenance	\$369,000	\$270,000
Total life-cycle maintenance cost	\$23,136,000	\$9,929,000

This project is key to improving safety and maintaining economic vitality along the corridor. The auxiliary lanes and widened shoulders will give emergency responders more access to crashes and allow vehicles to be removed from the roadway without causing a full shut down. Every hour the corridor is closed over \$1 million in economic productivity is lost which has far reaching consequences on the movement of freight and local communities. This project will reduce closures and increase mobility which will have a positive impact on the reliability of freight traffic as well as allowing the public to access the mountain communities.

The EA is expected to be completed by the fall of 2020. Design of the selected project will start in 2021 with construction starting by July of 2022 with final acceptance of work in December of 2024.

Safety

This project is prioritized in the State Transportation Safety Plan. The greatest safety benefit provided is the reduction of fatalities. I-70 Vail Pass had four fatalities from 2014 to 2019. As mentioned, the crash rate on I-70 Vail Pass is the highest for all of I-70 per million vehicle miles traveled, with 558 crashes from 2014 to 2016. Reducing crashes is a major goal of the project. Even though freight makes up only 11.6 percent of total corridor traffic, over 1/6 of crashes involve a commercial motor vehicle (CMV). Vail Pass

was closed for 1,548 hours from 2014-2017, or 16.1 days each year. Colorado's population is expected to grow more than 37.7 percent over the next 30 years⁴ – casualties and crashes will continue to increase if safety issues on this corridor are not addressed. Widened inside and outside shoulders provide greater incident management flexibility and reduce crashes by 37.4 percent and 18.3 percent, respectively. The auxiliary lane and curve modifications encourage safe passing and will reduce crashes. As mentioned previously, West Straight Creek, another steep mountain pass within 24 miles of the project, has 60 percent as many crashes as I-70 Vail Pass, but a much higher volume of traffic. As shown in **Table 8**, the only substantive difference between these two sections of I-70 is that Straight Creek has six lanes, while Vail Pass has only four. Freight especially benefits from improved geometry and reconstruction of the truck ramp, which was used 14 times from 2016 to 2018. Signage improvements will reduce departure-related crashes and the ATM system will inform drivers of appropriate lane usage and expedite the highway closure process. The trail relocation will protect cyclists and pedestrians and the wildlife underpasses have the potential to reduce animal-vehicle collisions by 80 percent. As previously mentioned, FAST Anti-icing will reduce crashes by 31 to 57 percent.

⁴ <https://data.colorado.gov/d/q5vp-adf3/visualization>

TABLE 8: COMPARISON TO SIMILAR ROADWAY WITH THIRD LANE

	West Vail Pass	West Straight Creek
AADT (2019)	22,000	31,700
Lanes	4	6
Elevation	8,320-10,660 ft	9,035-11,013 ft
Average Grade	3.4 percent	4.6 percent
Full Closures (2017)	91	19
Crashes (2014-2016)	558	335

PROJECT READINESS

I-70 Vail Pass is a priority in the 2019-2022 STIP and currently in the EA phase. This project was selected for funding under CDOT's Regional Priority Program as it is critical to the safety and mobility needs of the corridor. INFRA grant funding will enable CDOT to complete a vital section of need identified on Vail Pass, enabling earlier implementation of crucial safety and operations improvements.

Technical Feasibility

The I-70 Vail Pass Safety and Operations Improvements Project will be ready to begin construction within 18 months of receipt of INFRA grant allocation. The EA is on track for completion by fall 2020 and funds have been obligated for design of the project in 2021.

The project design is based on preliminary engineering and topographic survey information, detailed maps and analysis, which can be found in **Appendix D**. The cost estimate is based on experience in similar projects and historical cost data from CDOT's Engineering Estimates & Market Analysis branch. At this stage of design, there is a 15 percent or greater contingency for each component based upon level of associated risk.



Statement of Work

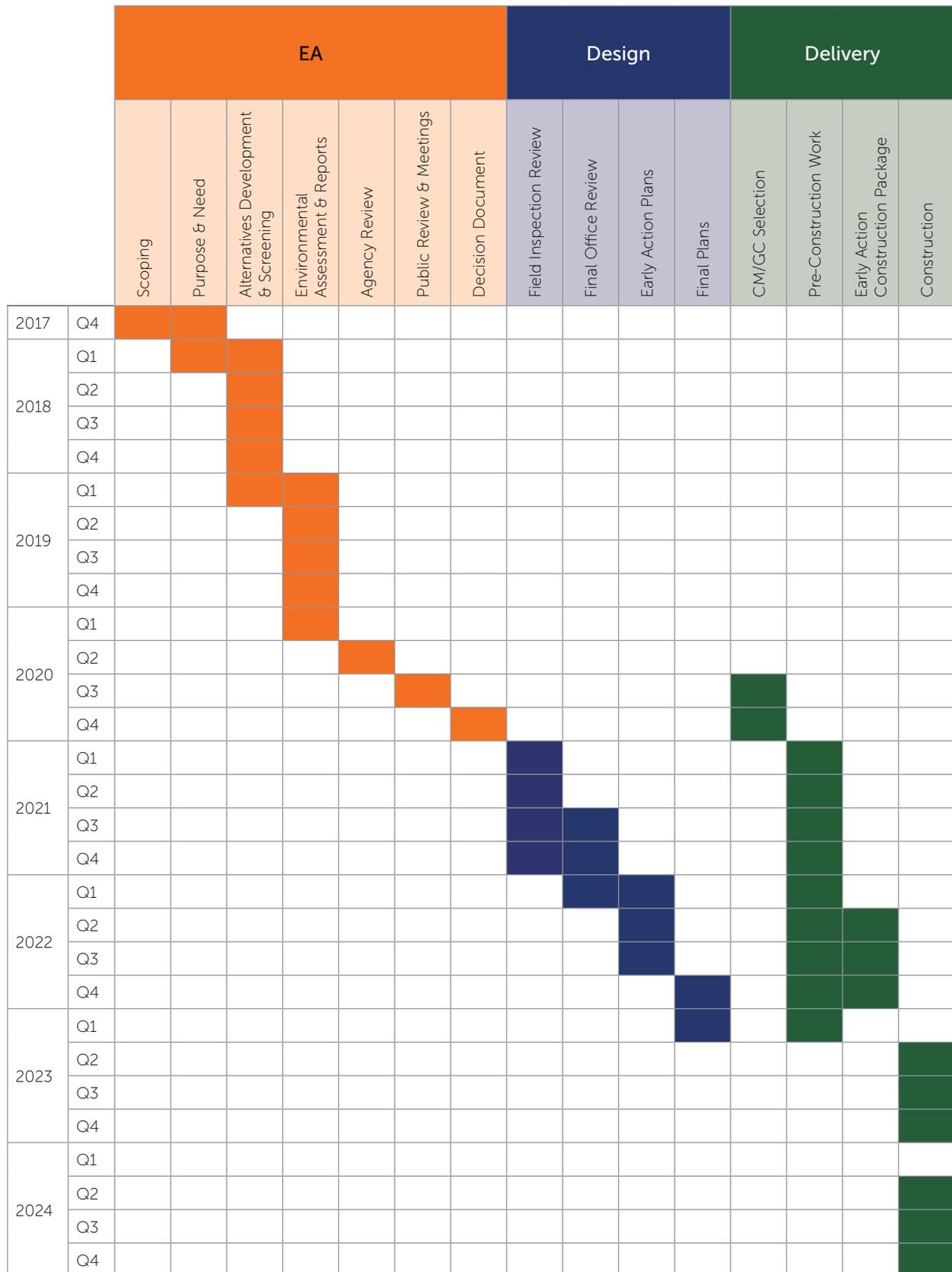
The I-70 Vail Pass Safety and Operations Improvements Project seeks to improve safety and traffic operations on EB and WB I-70 Vail Pass. The project is needed to address safety concerns and operational issues due to geometric conditions (steep grades and tight curves) and interactions that result from speed differentials between vehicles, leading to inconsistent and slow travel times along the corridor. The preferred recommended alternative selected for the corridor is constructing EB and WB auxiliary lanes with full shoulders, curve modifications, and Intelligent Transportation System (ITS) improvements. The specific project constructed as part of the INFRA grant includes:

- EB auxiliary lane from MP 185 - 190;
- Wildlife fencing from MP 185.2 - 190 and installation of six wildlife underpasses at MPs 186.9, 187.4, 187.8, 188.3, 188.7, and 189.7;
- Recreation trail relocation from MP 185.2 - 186.9;
- Glare screen median barrier from MP 185.5 - 188.7;
- Widened outside shoulders from EB MP 183.3 - 183.5, EB MP 184.6 - 184.8, WB MP 182.4 - 182.5, WB MP 183.3 - 183.4, WB MP 183.6 - 183.7;
- WB curve modification at MP 185.6 - 186.5 and MP 187.3 - 188.9;
- Replacement of the EB bridge at MP 185.2;
- Lower truck ramp reconstruction WB at MP 182;
- Signage improvements WB MP 186 - 190;
- Automated highway closure system and variable speed limit system MP 180 - 190; and
- FAST Anti-icing at EB MP 184.4 - 184.5.

Project Schedule

The project is currently in the EA process. It is expected that design will begin in 2021, with construction of selected segments to begin in July 2022. The construction window is fairly short in this location, May-October, due to weather. The project's estimated completion is December 2024.

A project schedule is shown in **Figure 8** (next page).

FIGURE 8: PROJECT SCHEDULE


Project Delivery

CDOT has significant experience with the design, construction, and delivery of similar improvements along I-70 and regional highways. CDOT has successfully delivered similar large-scale construction projects on I-70, such as the Twin Tunnels and Peak Period Shoulder Lanes projects, both of which involved bridge construction and roadway widening in mountain corridors.

Project Delivery Method Selection

CDOT is experienced in utilizing alternative delivery contracting methods and utilized its Project Delivery Selection Matrix (PDSM) tool to determine the preferred method of project delivery. The most common systems are Design-Bid-Build (DBB), Design-Build (DB), and Construction Manager/General Contractor (CM/GC). Each project must be examined individually to determine how it aligns with the attributes of each available delivery method. The PDSM was used to select CM/GC as the preferred method of project delivery. The CM/GC will provide input on project innovations, constructability, estimating, and risk reduction. Allowing this input during the pre-construction phase will reduce plan errors and discrepancies, save money, and reduce impacts to the traveling public. CM/GC has been used with considerable success in the mountain corridor. This method allows for contractor innovation during the design phase, while still facilitating considerable stakeholder control that may not remain in a DB method. As mentioned, CM/GC dovetails nicely with CSS, another process critical to recent successes in the corridor.

Another tool CDOT will use to limit impacts to the public is a regional Lane Closure Strategy (LCS) that defines allowable lane closure times based on month and day of the week. One key element prioritizes use of new alignments or temporary bridges to keep the existing two lanes of traffic flowing on I-70 Vail Pass. The LCS is taken into account when designing the project and the alternative delivery contracting method is expected to identify additional ways to reduce impacts due to construction.

Project Approvals

Right-of-way

The entirety of the project's location lies on an easement from the USFS in the White River National Forest. The conditions of this easement are governed by a Federal Lands MOU between the Bureau of Land Management, USFS, CDOT, and FHWA. CDOT is working very closely with the USFS as a partner agency on the EA and the USFS supports the project. The project will need additional easement areas from the USFS, but no challenges are expected at this time.

Environmental Readiness

CDOT is currently completing the project's EA, which is a Tier 2 NEPA analysis based on the Tier 1 I-70 Mountain Corridor Programmatic Environmental Impact Statement Record of Decision in 2011. This process has been highly collaborative and stakeholders were engaged through a variety of project and technical meetings. Once the EA is complete, it will be released to the public for review and comment and the Decision Document is expected to be signed in the fall of 2020. CDOT has institutionalized several environmental review innovations from FHWA's Every Day Counts toolkit to expedite environmental review:

- **Implementing Quality Environmental Documents:** CDOT has developed templates for EAs. This has streamlined the NEPA review process by reducing costs and review times, while maintaining document quality.
- **Programmatic Agreements:** CDOT has agreements with the EPA, Colorado Parks & Wildlife, US Fish and Wildlife Service, Colorado Department of Public Health & Environment, US Army Corp of Engineers, US Forest Services, Bureau of Land Management, Federal Highway Administration, and the State Historic Preservation Office. All establish streamlined approaches for handling routine environmental requirements, reducing review times, and accelerating project delivery.
- **NEPA 404 Merger:** Integrating NEPA and the permitting process seeks to transform how agencies and stakeholders conduct concurrent, synchronize environmental and permitting reviews, saving time and cost for the agencies involved.

Agency Coordination

CDOT is coordinating with multiple agencies as mentioned in the Project Parties section and also indicated by the letters of support in Appendix A. Agencies include TPRs, city and county governments, and the CMCA. This project does not require the approval of these agencies, but their input and support for the project is essential to project delivery and success. CDOT invited local agencies throughout the mountain corridor to participate in the CSS process. This stakeholder engagement effort went beyond the requirements of NEPA to maximize community support and minimize disruptions during construction.

Risk Identification and Mitigation

Overall, there are low risks associated in the delivery of the I-70 Vail Pass Safety and Operations Improvements Project to schedule and to cost: the EA process is in its third year; right-of-way discussions are beginning early and remain cooperative; and the proposed procurement process will be competitive. A table of risks and mitigation strategies is shown in [Table 9](#).



TABLE 9: PROJECT RISK ASSESSMENT

Risk	Risk Category	Mitigation Strategy
Getting a qualified contractor available to construct the project	Low	The market is competitive due to the limited availability of work, in part due to constrained transportation funding by the state.
Obtaining the quantum of funding required to carry out the entire project	Low	If full funding is not available, the project can be scaled as necessary, with certain areas or construction elements prioritized over others.
Environmental regulatory approvals, permitting, and clearances	Low	CDOT is on track for completing the EA in fall 2020. With FHWA as a partner on the project, no issues are expected with easement and right-of-way conversations with the USFS.
Construction schedule	Low	CDOT will set specific schedule parameters to maximize construction and build in phases if needed. Utilizing CM/GC will allow CDOT to jointly develop an accurate schedule with the contractor during final design.
Cost overruns	Low	If cost overruns materialize, the project can be scaled as necessary, with certain segments or construction elements prioritized over others. Additionally, a contingency amount is budgeted for each component.

LARGE PROJECT REQUIREMENTS

TABLE 10: LARGE PROJECT DETERMINATION

Large Project Requirements	I-70 Vail Pass Project
Does the project generate national or regional economic, mobility, or safety benefits?	I-70 connects 11 states and is the only east/west interstate in Colorado. I-70 is the lifeline for transport of freight and mobility of east/west travelers in Colorado. Vail Pass closures due to weather and crashes produce long detours of 1-3 hours. Over 300,000 hours in travel time are due to be saved upon completion of the project. Safety benefits are massive, with a 35-45% reduction in crashes producing over \$6.1 million in benefits in year one of the project, \$99.5 million over 30 years. See Support for National and Regional Economic Vitality in the Merit Criteria section.
Is the project cost effective?	The cost-benefit analysis illustrates a 1.75 benefit/cost ratio, as the safety and mobility benefits on the corridor outweigh expected costs for this project.
Does the project contribute to one or more of the Goals listed under 23 USC 150?	Yes, the project contributes to the following national goals as demonstrated in the following sections: 1. Safety - See Safety in Merit Criteria. 2. Infrastructure condition - See National and Regional Economic Vitality in Merit Criteria. 3. Congestion reduction - See National and Regional Economic Vitality in Merit Criteria. 4. System reliability - See National and Regional Economic Vitality in Merit Criteria. 5. Freight movement and economic vitality - See National and Regional Economic Vitality in Merit Criteria. 6. Environmental sustainability - See Environmental Readiness in Project Readiness. 7. Reduced project delivery delays - See Project Schedule and Risk Identification and Mitigation in Project Readiness.
Is the project based on the results of preliminary engineering?	Yes, see Technical Feasibility in Project Readiness.
With respect to non-federal financial commitments, does the project have one or more stable and dependable funding or financing sources to construct, maintain, and operate the project?	Yes, see Grant Funds, Sources, and Use of Funds.
Are contingency amounts available to cover unanticipated cost increases?	Yes, contingency of at least 15% has been added to each component.
Is it the case that the project cannot be easily and efficiently completed without other Federal funding or financial assistance available to the project sponsor?	Yes, an INFRA award would bridge a funding gap between the total project cost and available sources of funding. See Grant Funds, Sources, and Use of Funds.
Is the project reasonably expected to begin construction not later than 18 months after the date of obligation of funds for the project?	Yes, the project is expected to begin construction by July 2022.