

CO-DEVELOPMENT, MULTI-MODAL MOUNTAIN CORRIDOR PROJECT I-70

"Confidential"

Date: August 15, 2012

CDOT Project No. 18958



Part 1_Technical Appendix

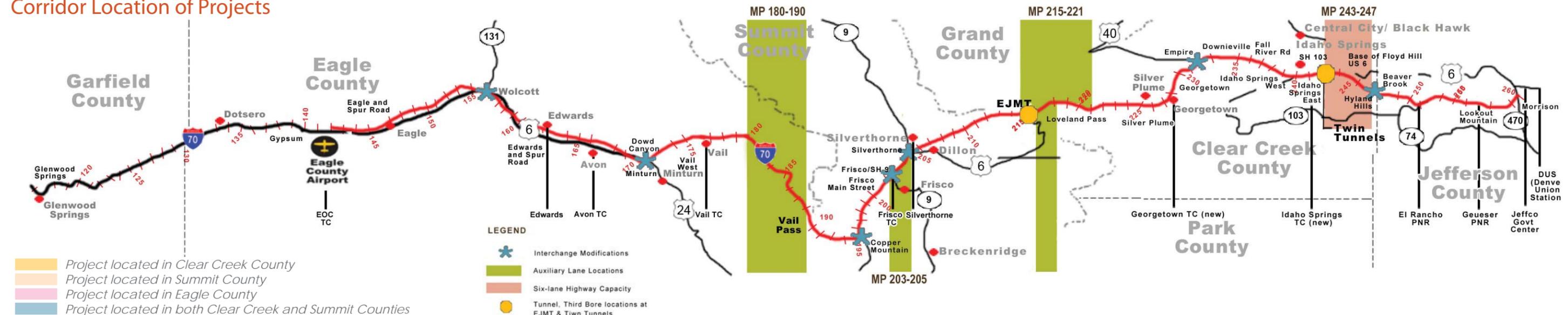
In this issue:

HDR will Provide CDOT and HPTE with "Out-of-the-Box" Thinking that is Balanced with Practical Reality Demanded for the I-70 Mountain Corridor.

An Approach that Respects the I-70 Mountain CSS Principles while Focusing on Program Delivery.

HDR

Figure 1_I-70 Mountain Corridor Location of Projects



ID	Project	Min./ Max. Program	Total Project Cost (\$M)	Scope of Project
0	Toll Collection Facilities and Rehabilitation Existing EJMT	HDR Proposed	\$18	Implement toll collection on existing EB/WB EJMT to fund rehabilitation of existing tunnels including ventilation retrofit to accommodate hazardous trucks
1	SH 131 Wolcott Junction Interchange	Minimum	\$1	Implement toll collection on existing SH 131 EB on-ramp to fund safety improvements to SH 131 Interchange including signalization of ramp intersections
2	Dowd Canyon Curve Safety US 24 Minturn Interchange	Minimum	\$129	Implement toll collection on I 70 Dowd Canyon EB/WB and SH 24 on-ramps to fund curve safety improvements on I 70 and reconstruction of US 24 interchange
3	SH 91 Copper Mountain Interchange	Minimum	\$1	Implement toll collection on existing SH 91 EB and WB on-ramps to fund operational and safety improvements to SH 91 Interchange including extension of accel/decel lanes on I 70
4	SH 9 Frisco Intrchnng (incl toll implmntation at Frisco Main St Intrchnng)	Minimum	\$9	Implement toll collection on existing SH 9 and Main St. EB and WB on-ramps to fund operational and safety improvements to SH 9 Interchange including extension of accel/decel lanes on I 70
5	SH 9 Silverthorne Interchange	Minimum	\$18	Implement toll collection on existing SH 9 EB and WB on-ramps to fund reconstruction of SH 9 interchange and widening of I 70 bridges
6	EJMT Third Bore	Minimum	\$800	Toll collection on existing EJMT to be expanded to fund design and construction of new EJMT third bore. Implement toll collection on new third bore once it comes on line.
7	US 40 Empire Interchange	Minimum	\$7	Implement toll collection on existing US 40 EB and WB on-ramps to fund operational and safety improvements to US 40 Interchange including extension of accel/decel lanes on I 70 and new US 40 bridge over I 70
8	WB Twin Tunnel to Top of Floyd Hill Curve Safety, East of Twin Tunnels US 6 Clear Creek Interchange	Minimum (1)	\$223	Implement toll collection on I 70 EB at Twin Tunnels and WB at Floyd Hill to fund widening of existing WB to 3-lanes through the Twin Tunnel to top of Floyd Hill. Also includes curve safety improvements to I 70 and reconstruction of US 6 Clear Creek interchange.
9	EB/WB Aux Lanes Vail Pass	Minimum	\$216	Design and construction of new auxiliary lanes on I 70 EB and WB to accommodate trucks and heavy vehicles
10	EB Aux Lanes, Frisco to Silverthorne	Minimum	\$9	Design and construction of new auxiliary lanes on I 70 EB between Frisco and Silverthorne to accommodate traffic volumes
11	EB Aux Lane, EJMT to Hermann Gulch WB Aux Lane EJMT to Bakerville	Minimum	\$66	Design and construction of new auxiliary lanes on I 70 EB and WB to accommodate trucks and heavy vehicles. I 70 EB/WB inside lanes to be converted to managed lanes during periods of peak traffic demand and to address lane balance at EJMT EB/WB/third bore tunnels
12	WB Peak Period Shoulder Lane, Bakerville to Twin Tunnels	Minimum	\$33	Reconfigure I 70 WB lanes between Bakerville and Twin Tunnels and convert existing I 70 WB inside shoulder to PPSL to be operated as a managed lane during periods of peak traffic demand.
13	Traffic Operations Center	HDR Proposed	\$30	New traffic operations control center to manage I 70 toll collection and ITS/ATMS/ATS infrastructure
14	ITS/ATMS/ATTS	HDR Proposed	\$10	New ITS/ATMS/ATS infrastructure including VMS to inform motorists of toll and congestion pricing along the I 70 corridor.



PROJECT: Project #1 - S.H. 131 Wolcott Interchange
LOCATION/LENGTH: MP 156.5
JURISDICTION: Eagle County

Project Profile

Design Concept



DESIGN ELEMENTS:

The PEIS identified minor operational deficiencies associated with the ability of the existing unsignalized ramp intersections to meet future traffic demand. The proposed improvements include the implementation of signalized ramp intersections. This interchange will serve as one of the proposed gateways and user fees generated at this location will help fund the proposed improvements.

KEY ENVIRONMENTAL ISSUES:

- Carpool Lot
- LIZ
- Aesthetics
- Geologic Hazards
- Water Quality

KEY CSS ISSUES:

- PLT
- ALIVE

ESTIMATED COSTS:

- PE/NEPA: \$100K
- FD/Construction: \$550K
- Total: \$650K

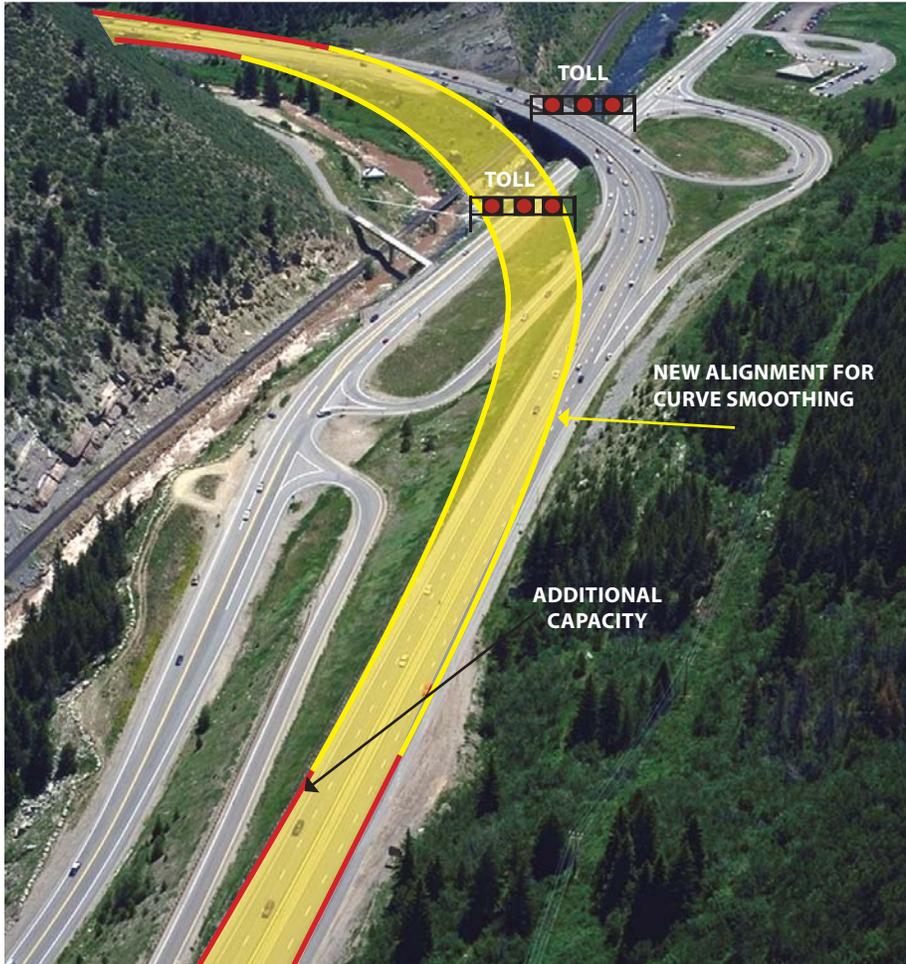
SCHEDULE:

- PE/NEPA: 6 months
- FD/Construction: 15 months
- Total: 21 months

PROJECT: Project #2 - Dowd Canyon Curve Safety/U.S. 24 Minturn Interchange
LOCATION/LENGTH: MP 170 to 173 = 3 miles
JURISDICTION: Eagle County

Project Profile

Design Concept



KEY ENVIRONMENTAL ISSUES:

- Aesthetics
- Aquatic Resources
- Recreation
- Geologic Hazards
- Water Quality
- Potential Section 4(f)
- LIZ
- Wetlands

KEY CSS ISSUES:

- PLT
- ALIVE
- SWEEP

ESTIMATED COSTS:

- PE/NEPA: \$8M
- FD/Construction: \$120M
- Total: \$128M

SCHEDULE:

- PE/NEPA: 12 months
- FD/Construction: 24 months
- Total: 36 months

DESIGN ELEMENTS:

Dowd Canyon was identified in the PEIS as a high hazard location needing curve safety improvements. The existing horizontal alignment of I-70 at this location and sharp curves will only accommodate a design speed of 50 MPH. The existing U.S. 24 Minturn interchange also suffers from many operational and safety deficiencies. The sharp horizontal curves on I-70—combined with the steep profile grades, and the proximity of the UP Railroad, the Eagle River and Gore Creek—constrain the ability to expand the interchange. The PEIS identified capacity issues with the EB on and off ramps. The proposed interchange configuration (attached) was developed by HDR for CDOT Region 3 in 2010. The design involves the construction of new direct EB on- and off-ramps and reconfiguration of the WB on- and off-ramps via U.S. 6. This interchange will serve as one of the proposed gateways and user fees generated at this location will help fund the proposed improvements.

STRUCTURE	YEAR CONSTRUCTED	AGE (YRS)	INVENTORY RATING (TONS)	INVENTORY PERCENT ADEQUATE
I-70 over U.S. 24 and the Eagle River west of Vail	1970	42	30	83.33%

PROJECT: Project #3 - S.H. 91 Copper Mountain Interchange
LOCATION/LENGTH: MP 195.2
JURISDICTION: Summit County

Project Profile

Design Concept



DESIGN ELEMENTS:

The PEIS identified safety issues related to adverse weather conditions at the S.H. 91 Interchange, particularly the EB on-ramp. The proposed improvements include safety modifications to the existing interchange, on- and off-ramps and accel/decel lanes. This interchange will serve as one of the proposed gateways and user fees generated at this location will help fund the proposed improvements.

STRUCTURE	YEAR CONSTRUCTED	AGE (YRS)	INVENTORY RATING (TONS)	INVENTORY PERCENT ADEQUATE
S.R. 91 over I-70 at Copper Mountain	1977	35	34	94.44%

KEY ENVIRONMENTAL ISSUES:

- Aquatic Resources
- Recreation
- Section 4(f)
- LIZ
- Geologic Hazards
- Wetlands
- Water Quality
- Aesthetics

KEY CSS ISSUES:

- PLT
- SWEEP
- ALIVE
- ITFs

ESTIMATED COSTS:

- PE/NEPA: \$100K
- FD/Construction: \$1.4M
- Total: \$1.5M

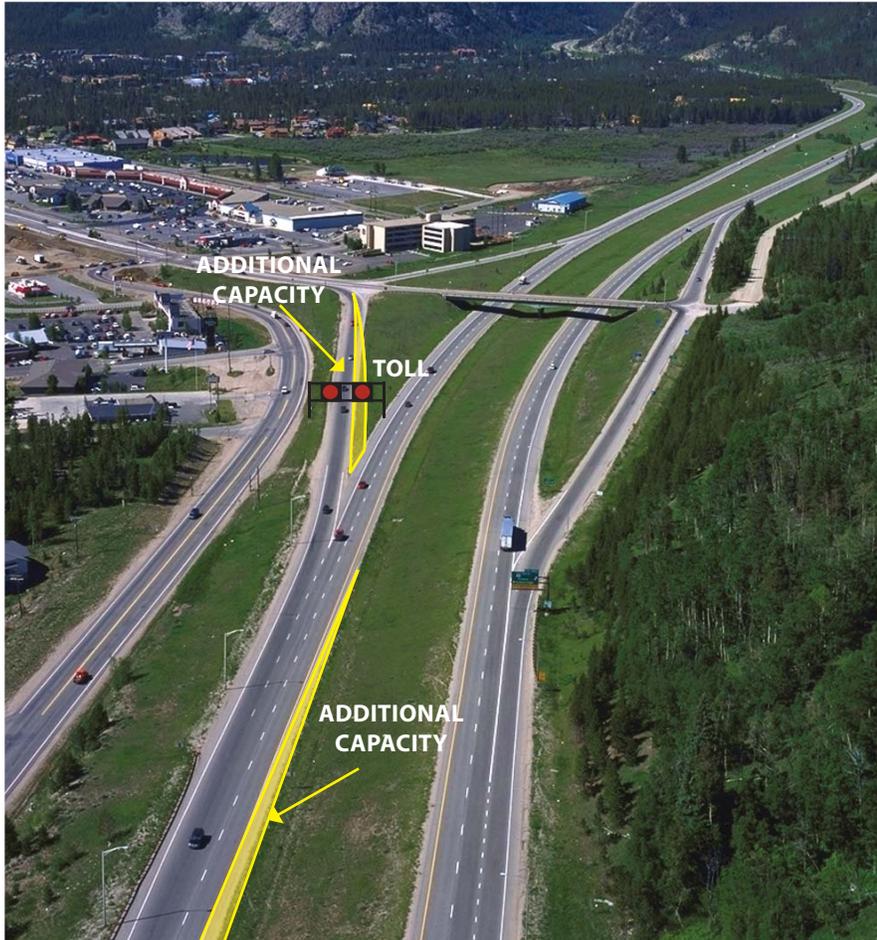
SCHEDULE:

- PE/NEPA: 12 months
- FD/Construction: 18 months
- Total: 30 months

PROJECT: Project #4 - S.H. 9 and Main Street Frisco Interchanges
LOCATION/LENGTH: MP 201.0 and 202.4 = 1.4 miles
JURISDICTION: Summit County

Project Profile

Design Concept



KEY ENVIRONMENTAL ISSUES:

- Aesthetics
- Recreation
- Access
- Water Quality

KEY CSS ISSUES:

- PLT
- ITFs

ESTIMATED COSTS:

- PE/NEPA: \$530K
- FD/Construction: \$8.25M
- Total: \$8.78M

SCHEDULE:

- PE/NEPA: 6 months
- FD/Construction: 18 months
- Total: 24 months

DESIGN ELEMENTS:

There are several operational problems associated with the existing S.H. 9 and Main Street Frisco Interchanges. The unsignalized ramp intersections at the Main Street Interchange cannot accommodate the traffic demand, and traffic currently backs up along the ramp and onto I-70. There are also operational problems associated with the single lane EB on-ramp and WB off-ramp, and the EB acceleration lane and the ramp at the S.H. 9 Interchange contribute to severe congestion on S.H. 9. Proposed improvements at the Main Street Interchange include signalized ramp intersections. Proposed improvements at the S.H. 9 Interchange include a two-lane EB on-ramp and extension of the EB accel lane. Operational improvements are also proposed for the WB off-ramp decel lane. The S.H. 9 Interchange combined with the Main Street Interchange will serve as one of the proposed gateways and user fees generated at this location will help fund the proposed improvements.



PROJECT: Project #5 - S.H. 9 Silverthorne
LOCATION/LENGTH: MP 205.4
JURISDICTION: Summit County

Project Profile

Design Concept



DESIGN ELEMENTS:

The PEIS identified the existing S.H. 9 Silverthorne Interchange for improvements. Land development adjacent to the interchange has contributed to interchange congestion. In addition, there are operational problems associated with inadequate left-turn capacity at ramp intersections, spacing of signalized intersections and access points. There are also drainage issues associated with the bridge at Blue River and safety issues associated with the steep profile grades on I-70. The interchange is presently the focus of an ongoing study by CDOT, and design concepts have been developed for diamond, single point urban and diverging diamond interchange alternatives. In order to accommodate three lanes on I-70 EB and WB, it will be necessary to widen the existing I-70 bridge over S.H. 9. This interchange will serve as one of the proposed gateways and user fees generated at this location will help fund the proposed improvements.

KEY ENVIRONMENTAL ISSUES:

- Recreation
- Wetlands
- Aquatic Resources
- Geologic Hazard
- Water Quality
- Section 4(f)

KEY CSS ISSUES:

- PLT
- SWEEP

ESTIMATED COSTS:

- PE/NEPA: \$120K
- FD/Construction: \$18M
- Total: \$19M

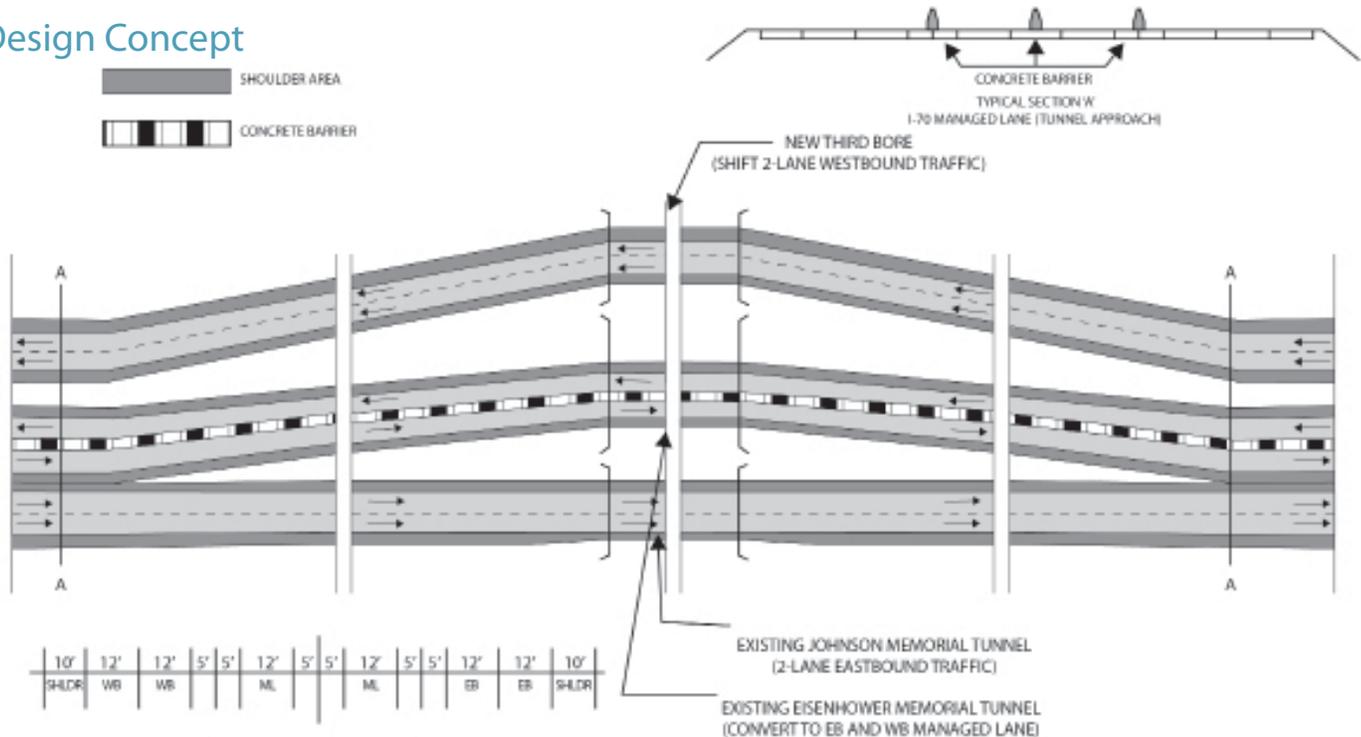
SCHEDULE:

- PE/NEPA: 6 months
- FD/Construction: 24 months
- Total: 30 months

PROJECT: Project #6 - EJMT Third Bore
LOCATION/LENGTH: Third Bore @ 3.2 miles
JURISDICTION: Clear Creek / Summit Counties

Project Profile

Design Concept



DESIGN ELEMENTS:

Opened to traffic in 1973 and 1979, the Eisenhower-Johnson Memorial Tunnel (EJMT) carries two lanes of I-70 traffic in each direction across the continental divide. Due to constructability issues, it is not possible to widen either of these tunnels; a third tunnel bore is required to increase mobility and maintain lane balance on the east and west sides of the continental divide. The proposed third bore will accommodate two traffic lanes and will be designed so that it can accommodate transit or AGS in the future. It is anticipated that the new third bore will be constructed to the north of the existing EJMT and will be approximately 3.2 miles in length. In order to maintain lane balance at the east and west approaches to the tunnel, it will be necessary to shift the I-70 WB traffic lanes to the new north bore and utilize the existing WB (Eisenhower) bore to accommodate two reversible lanes for bus/HOV and managed lanes during periods of peak demand. EJMT is identified as Gateway #3 in the program. It's anticipated that tolls will be implemented on the existing tunnel system as an early action project to generate revenue to construct the third tunnel bore.

KEY ENVIRONMENTAL ISSUES:

- Section 4(f)
- Water Quality
- Recreation
- Geological Hazards

KEY CSS ISSUES:

- ALIVE
- PLT
- SWEEP

ESTIMATED COSTS:

- PE/NEPA: \$49M
- FD/Construction: \$751M
- Total: \$800M

SCHEDULE:

- PE/NEPA: 24 months
- FD/Construction : 36 months
- Testing/Startup: 6 months
- Total: 66 months



PROJECT: Project #7 - U.S. 40 Empire Interchange
LOCATION/LENGTH: MP 231.5 to 233.0 = 1.5 miles
JURISDICTION: Clear Creek County

Project Profile

Design Concept



KEY ENVIRONMENTAL ISSUES:

- Aesthetics
- Water Quality

KEY CSS ISSUES:

- PLT

ESTIMATED COSTS:

- PE/NEPA: \$420K
- FD/Construction: \$6.5M
- Total: \$7M

SCHEDULE:

- PE/NEPA: 9 months
- FD/Construction : 15 months
- Total: 24 months

DESIGN ELEMENTS:

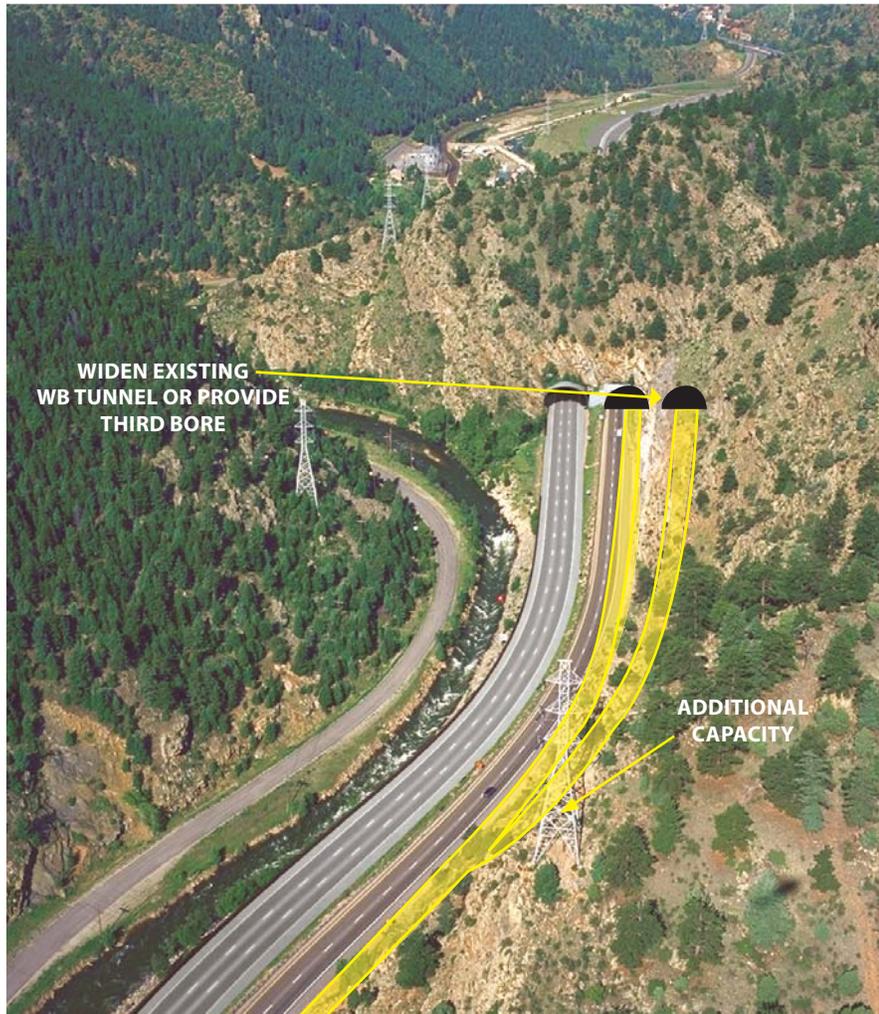
This project involves the reconstruction of the deceleration lane for the I-70 EB off-ramp to WB U.S. 40, and the acceleration lane for the I-70 EB on-ramp from U.S. 40 EB. This will extend the deceleration and acceleration lengths, bring the ramps up to standard in order to accommodate the heavy EB I-70 traffic movement, and improve safety for merging traffic. The project also includes reconstructing the EB U.S. 40 bridge over I-70. The U.S. 40 Empire Interchange is identified as Gateway #2 in the program. Toll collection systems will be implemented at the I-70 WB off ramp to U.S. 40 WB and at the I-70 EB on-ramp from U.S. 40 EB.

STRUCTURE	YEAR CONSTRUCTED	AGE (YRS)	INVENTORY RATING (TONS)	INVENTORY PERCENT ADEQUATE
U.S. 40 over I-70 at the Empire Interchange	1965	47	33	91.67%

PROJECT: Project #8A - Twin Tunnels to Floyd Hill
LOCATION/LENGTH: MP 242.1 to 246.0 = 3.9 miles
JURISDICTION: Clear Creek County

Project Profile

Design Concept



KEY ENVIRONMENTAL ISSUES:

- LIZ
- Recreation
- Geologic Hazards
- Wildlife Movement
- Aquatic Resources
- Wetlands
- Aesthetics

KEY CSS ISSUES:

- PLT
- SWEEP
- ALIVE
- 106 Committee

ESTIMATED COSTS:

- PE/NEPA: \$11M
- FD/Construction: \$177M
- Total: \$188M

SCHEDULE:

- PE/NEPA: 24 months
- FD/Construction: 36 months
- Total: 60 months

DESIGN ELEMENTS:

The existing I-70 Twin Tunnels located immediately east of Idaho Springs are considered major pinch points along the I-70 Mountain Corridor and one of CDOT's top priorities to mitigate. Project 1A involves widening EB I-70 from two to three lanes through the EB tunnel and approximately two miles east to the base of Floyd Hill, where it will match the existing three-lane section. This project, which is being funded independently by CDOT, is presently under design; construction should begin by the end of 2012, and the project should be open to traffic by 2014. Project 1E involves the widening of the WB I-70 from two to three lanes through the WB tunnel and approximately four miles east to the top of Floyd Hill, where it will match the existing three-lane section. The widening east of the tunnel is dependent upon the completion of Project 1G U.S. 6 Clear Creek Interchange in order to accommodate the proposed three-lane section over Clear Creek. The HDR program also includes the implementation of toll collection at the Twin Tunnels as each phase of Projects 1A and 1E is completed and open to traffic.

PROJECT: Project #8B - U.S. 6 Clear Creek Interchange
LOCATION/LENGTH: MP 243.9 to 244.6 = 0.7 miles
JURISDICTION: Clear Creek County

Project Profile

Design Concept



DESIGN ELEMENTS:

The I-70/U.S. 6 Clear Creek Interchange suffers from several operational and safety deficiencies. The existing horizontal alignment of I-70 is constrained due to the proximity of Clear Creek and the adjacent rock faces of the canyon walls. The design speed is limited to 50 MPH through this area. The PEIS Minimum Program of Improvements includes recommendations for interchange modifications to reconfigure the existing left-hand EB off-ramp and WB on-ramp to conventional right-hand on- and off-ramps. In order to accommodate a 55 MPH posted speed and the WB widening to a three-lane section, it will be necessary to reconstruct the existing I-70 mainline bridges over Clear Creek, which were originally constructed in 1959 and 1974. The HDR program of improvements includes reconstruction of the I-70 mainline bridges, realignment of approximately two miles of I-70 mainline to meet 55 MPH posted speed and reconstruction of the U.S. 6 Interchange ramps in accordance with the PEIS recommendations. This is a priority project necessary to correct significant existing safety deficiencies and accommodate three-lane WB widening and continuity of lane balance through the WB Twin Tunnel.

KEY ENVIRONMENTAL ISSUES:

- Aesthetics
- Recreation
- Section 4(f)
- Aquatic Resources
- Water Quality
- Geological Hazards
- LIZ
- Wetlands

KEY CSS ISSUES:

- PLT
- ALIVE
- SWEEP
- ITFs

ESTIMATED COSTS:

- PE/NEPA: \$2M
- FD/Construction: \$33M
- Total: \$35M

SCHEDULE:

- PE/NEPA: 24 months
- FD/Construction : 36 months
- Total: 60 months

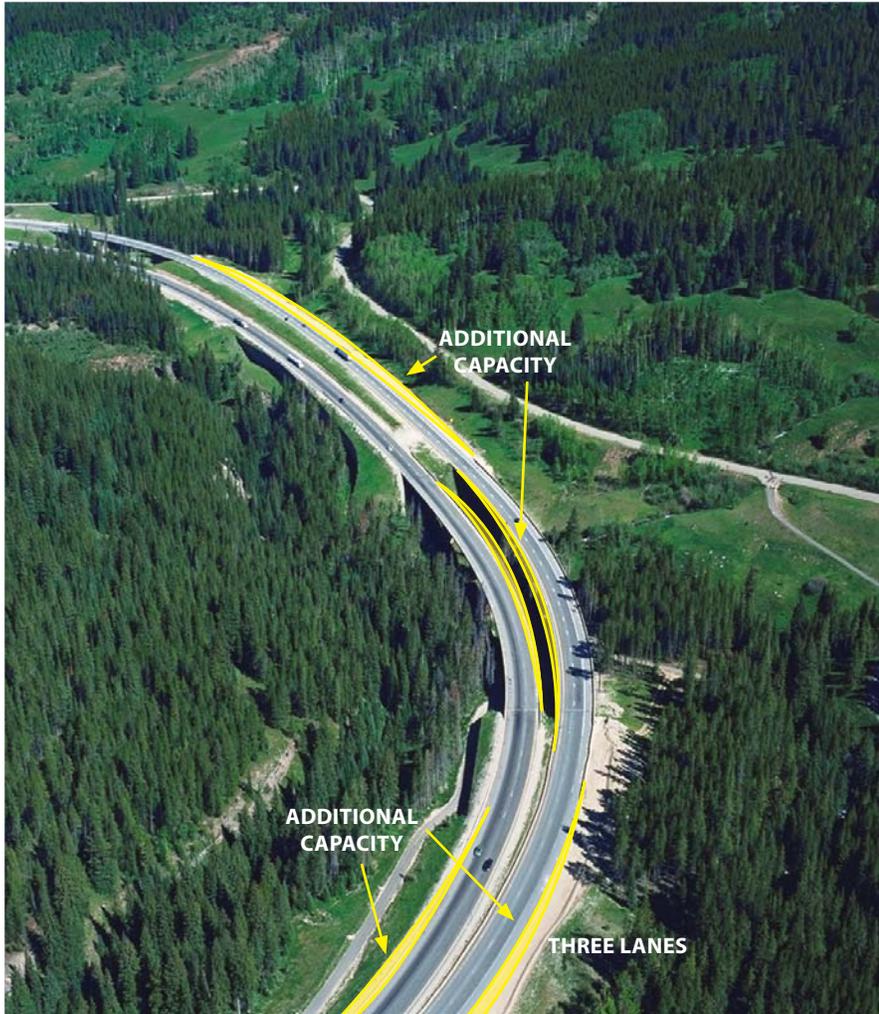
STRUCTURE	YEAR CONSTRUCTED	AGE (YRS)	INVENTORY RATING (TONS)	INVENTORY PERCENT ADEQUATE
I-70 Bridge over Clear Creek at the Interchange with U.S. 6	1959	53	27	75.00%



PROJECT: Project #9 - EB/WB Auxiliary Lanes Vail Pass
LOCATION/LENGTH: MP 180 to 190 = 10 miles
JURISDICTION: Eagle County

Project Profile

Design Concept



KEY ENVIRONMENTAL ISSUES:

- LIZ
- Aesthetics
- Wetlands
- Water Quality

KEY CSS ISSUES:

- PLT
- ITFs
- Section 4(f)
- ALIVE
- SWEEP

ESTIMATED COSTS:

- PE/NEPA: \$13M
- FD/Construction: \$203M
- Total: \$216M

SCHEDULE:

- PE/NEPA: 12 months
- FD/Construction: 24 months
- Total: 36 months

DESIGN ELEMENTS:

The PEIS identified safety and operational issues associated with the seven-percent grades in both the EB and WB directions on Vail Pass. Significant volumes of trucks and other slow-moving vehicles are reducing the capacity of the inside lane in the uphill EB direction and creating safety issues with heavy vehicles in the WB downhill direction, particularly during inclement winter weather. Proposed improvements include the addition of outside auxiliary lanes in both directions to better accommodate truck traffic.



PROJECT: Project #10 - EB Auxiliary Lane, Frisco to Dillon
LOCATION/LENGTH: MP 202.7 to 205.1 = 2.4 miles
JURISDICTION: Summit County

Project Profile

Design Concept



KEY ENVIRONMENTAL ISSUES:

- Recreation
- Aquatic Resources
- Wetlands
- Aesthetics

KEY CSS ISSUES:

- PLT
- SWEEP

ESTIMATED COSTS:

- PE/NEPA: \$1M
- FD/Construction: \$8M
- Total: \$9M

SCHEDULE:

- PE/NEPA: 6 months
- FD/Construction: 18 months
- Total: 24 months

DESIGN ELEMENTS:

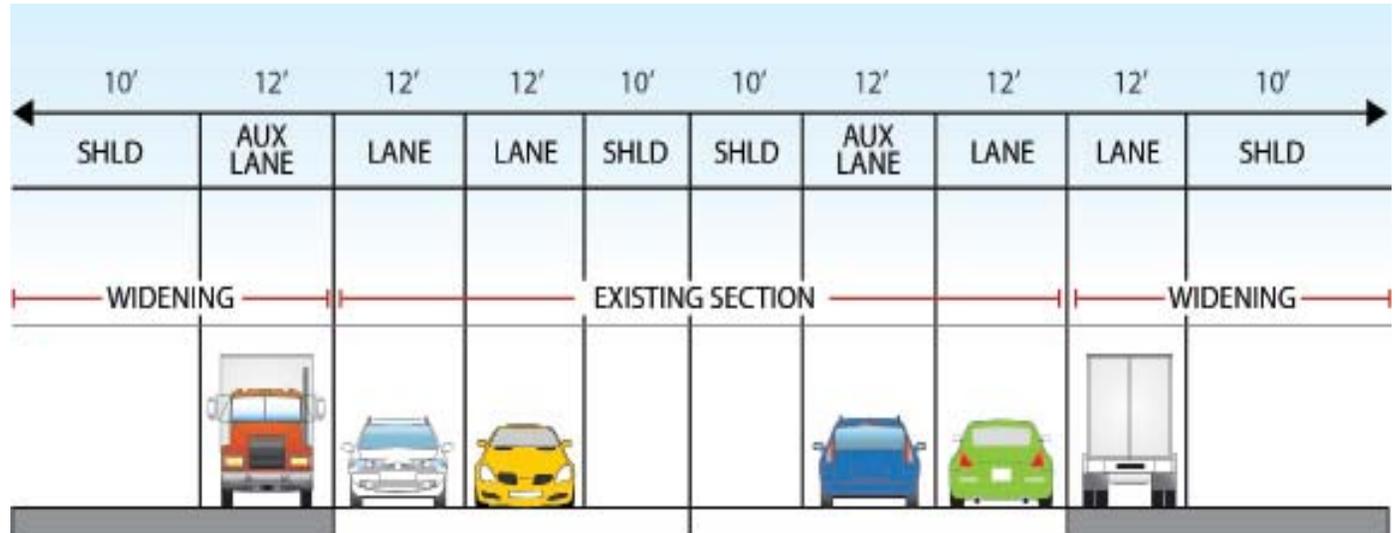
The existing TWO-lane section of I-70 between Frisco and Dillon is not adequate to accommodate traffic volumes in this segment, particularly during peak travel demand periods. The proposed improvement involves the addition of an EB auxiliary lane similar to the existing WB section.



PROJECT: Project #11 - EB/WB Auxiliary Lanes, East Approach to EJMT
LOCATION/LENGTH: EB MP 215 to 218, NB MP 215 to 221 (3 & 6 miles)
JURISDICTION: Clear Creek County

Project Profile

Design Concept



DESIGN ELEMENTS:

The PEIS identified safety and operational issues associated with the steep grades approaching the EJMT from the east. Existing lane balance issues in the EB downhill direction and substandard shoulder widths warrant the addition of an auxiliary lane. In the WB uphill direction, significant volumes of trucks and other slow-moving vehicles reduce the capacity of the inside lane and contribute to a high incidence of rear-end collisions. Proposed improvements include the addition of outside auxiliary lanes in both directions.

KEY ENVIRONMENTAL ISSUES:

- Wetlands
- Recreation
- Section 4(f)
- Geologic Hazards
- Water Quality
- LIZ
- T&E

KEY CSS ISSUES:

- PLT
- SWEEP
- ALIVE

ESTIMATED COSTS:

- PE/NEPA: \$4M
- FD/Construction: \$62M
- Total: \$66M

SCHEDULE:

- PE/NEPA: 15 months
- FD/Construction: 21 months
- Total: 36 months



PROJECT: Project #12 - WB Peak Period Shoulder Lanes
LOCATION/LENGTH: MP 214 to 241 = 27 miles
JURISDICTION: Clear Creek County

Project Profile

Design Concept



DESIGN ELEMENTS:

A cost-effective method of addressing peak period traffic volumes that is gaining wide acceptance in other parts of the United States and in Europe is the use of “Peak Period Shoulder Lanes.” The concept involves converting the existing roadway shoulder to serve as a through-traffic lane during periods of peak travel demand. CDOT is presently analyzing this concept to address traffic congestion on EB I-70 from the EJMT to the Twin Tunnels during peak hours on weekends. The existing 38-foot-wide, two-lane paved section of EB I-70 would be restriped to accommodate three traffic lanes, with shoulders reduced on a temporary basis and only minimal widening of the highway section in areas of reduced width such as bridges. The proposed improvement involves the implementation of PPSL in the WB direction during weekend peak periods Friday to Sunday.

KEY ENVIRONMENTAL ISSUES:

- LIZ
- Recreation
- Aesthetics
- Aquatic Resources
- Water Quality
- Noise
- Air Quality

KEY CSS ISSUES:

- PLT
- SWEEP
- ALIVE

ESTIMATED COSTS:

- PE/NEPA: \$2M
- FD/Construction: \$31M
- Total: \$33M

SCHEDULE:

- PE/NEPA: 12 months
- FD/Construction: 18 months
- Total: 30 months



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