

# Appendix A. DESIGN INNOVATIONS EVALUATION AND CSS DECISION MAKING PROCESS FOR THE CMGC REFINED PREFERRED ALTERNATIVE



December 2022

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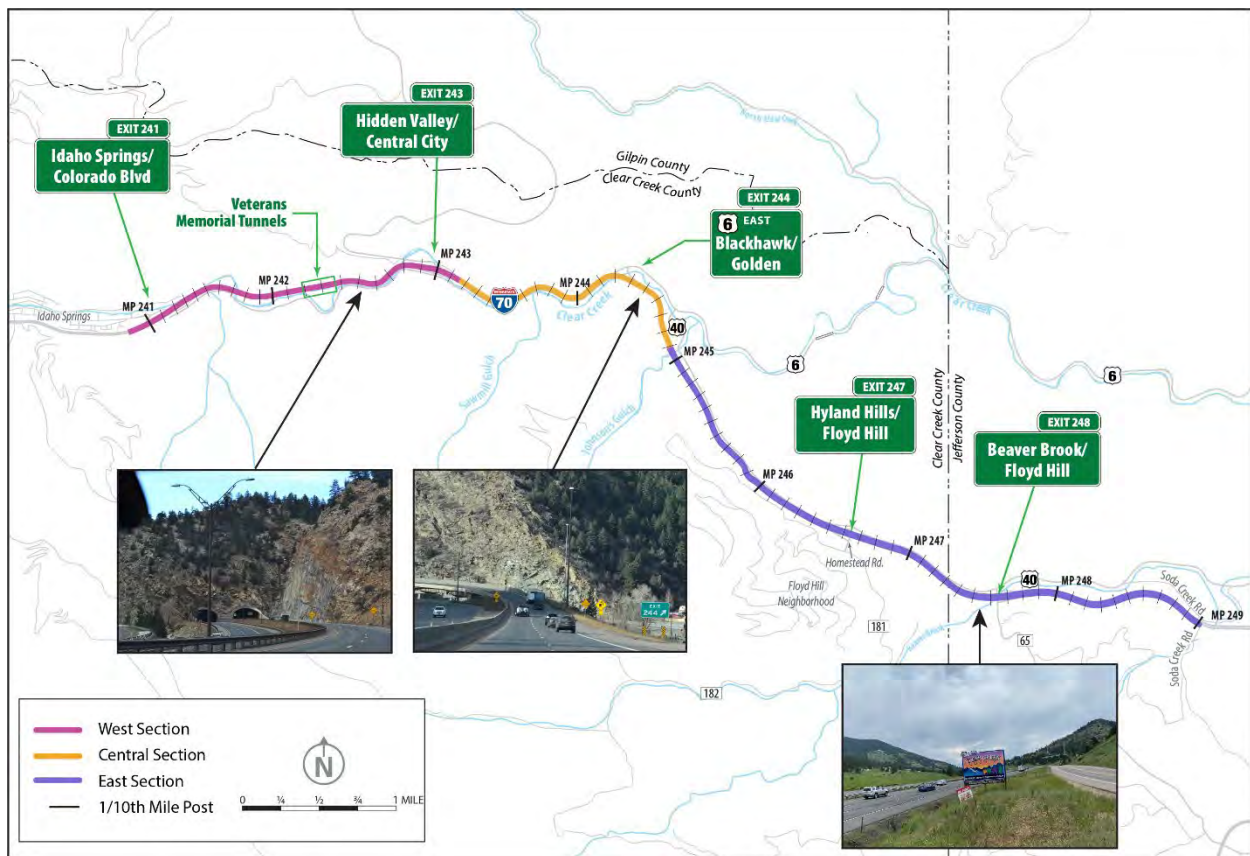
## Acronyms

CDOT	Colorado Department of Transportation
CMGC	Construction Manager / General Contractor
CR	County Road
CSQT	Colorado Stream Quantification Tool
CSS	Context Sensitive Solutions
EA	Environmental Assessment
EB	eastbound
FHWA	Federal Highway Administration
FONSI	Finding of No Significant Impact
I-70	Interstate 70
ITF	Issue Task Force
MP	milepost
NEPA	National Environmental Policy Act
PEIS	Programmatic Environmental Impact Statement
PILT	Public Information Leadership Team
PLT	Project Leadership Team
Project	I-70 Floyd Hill to Veterans Memorial Tunnels Project
ROD	Record of Decision
SWEEP	Stream and Wetland Ecological Enhancement Program
TT	Technical Team
US 6	United States Highway 6
US 40	United States Highway 40
WB	westbound

# 1 Introduction and Purpose of this Report

The Colorado Department of Transportation (CDOT) and the Federal Highway Administration (FHWA) completed the Interstate 70 (I-70) Floyd Hill to Veterans Memorial Tunnels Environmental Assessment (EA) in August 2021. This Tier 2 National Environmental Policy Act (NEPA) process advances a portion of the program of improvements for the I-70 Mountain Corridor identified in the 2011 Tier 1 *Final I-70 Mountain Corridor Programmatic Environmental Impact Statement* (PEIS) (CDOT, 2011a) and approved in the 2011 *I-70 Mountain Corridor Record of Decision* (ROD) (CDOT, 2011b). The Project limits include 8 miles of I-70 from west of Evergreen in the Floyd Hill area through the Veterans Memorial Tunnels to the eastern edge of Idaho Springs (approximately milepost [MP] 249 to MP 241) (Exhibit 1).

Exhibit 1 Project Location



Major elements of the Project include adding a third westbound (WB) travel lane on I-70, constructing a missing frontage road connection; adding an eastbound (EB) auxiliary lane to the uphill section of Floyd Hill; improving interchanges and intersections; improving design speeds and stopping sight distance on horizontal curves; improving the Clear Creek Greenway trail, an important regional multimodal path through Clear Creek County; and implementing environmental mitigation for wildlife connectivity, air and water quality, stream conditions, and recreation.

## 1.1 Construction Manager/General Contractor Delivery

Since the release of the EA, CDOT conducted a project delivery review and completed a Project Delivery Selection Matrix to determine the type of delivery (design and construction procurement) for the Project. Through this process, CDOT determined that a Construction Manager / General Contractor (CMGC) procurement process best fit the Project context and goals. Project conditions that differentiated CMGC over other alternative delivery methods, like Design-Build, or traditional Design-Bid-Build delivery included:

- Specialized work for viaducts, rock blasting, maintenance of traffic, and phasing
- Need for contractor input on design concept, optimization, and constructability
- Better ability to identify, assign, and mitigate Project risks
- Compatibility with the I-70 Mountain Corridor Context Sensitive Solutions (CSS) process with community participation in design and innovation review
- Ability to respond to potential incremental funding

CDOT conducted an extensive Request for Proposals process and held several industry informational events before the CMGC design and construction manager contracts were advertised in October 2021. In December 2021, three firms were shortlisted for final interviews for each contract, and in January 2022, CDOT selected the CMGC team of Atkins Global for Design Engineering services and Kraemer North America for Construction Manager services.

## 1.2 Design Innovations Review Schedule and Process

In April 2022, the CMGC team initiated a process to develop design and construction innovations for the EA Preferred Alternative, the Canyon Viaduct Alternative. Between April and September 2022, CDOT, FHWA, and the CMGC consultants engaged the Project’s Technical Team (TT) to review the innovations following a condensed 6-step CSS process (see Chapter 2). As a result, several design refinements or innovations were recommended to the EA Preferred Alternative and incorporated into the CMGC Refined Preferred Alternative, which was endorsed as the Project’s Preferred Alternative selected in the Finding of No Significant Impact (FONSI). Exhibit 2 summarizes the evaluation, which is documented in the meeting notes hyperlinked in Exhibit 2 and included in Attachment 1 of this report.

### Exhibit 2 Design Innovation Evaluation Summary and Decisions

Meeting	Date	Agenda	Decisions
Project Leadership Team ( <a href="#">PLT</a> )	3/14/2022	Discussion of CSS process, context statement, core values and critical success factors, PLT and TT membership, potential ITFs, and draft schedule	Confirmation of PLT membership, recommended ITFs should have representation on TT, identification of the need for PILT, Resiliency should be added as core value

Meeting	Date	Agenda	Decisions
<u>PLT</u>	4/6/2022	PLT Charter, confirm TT and ITF representatives, Critical Success Factors, PILT, and Early Projects	Homestead Road early project recommended to move to different location, both PLT members and alternates can be active members at each PLT meeting, Greenway and Open Space Park and operations are separate success factors, ITF membership updated
<u>TT</u>	4/15/2022	TT Charter, TT roles and responsibilities, innovation evaluation process, evaluation criteria and measures of success	Confirmation of EA Preferred Alternative Concept, inclusion of construction measures related to safety, mobility, accessibility and implementability, need for improved communication during construction, minor changes to evaluation criteria and updates to Charter.  Agreement that the Tunnel Alternative would not be pursued and that refinements would focus only on the Canyon Viaduct Alternative.
<u>ITF</u>	4/20/2022	CSS considerations flow chart	Reviewed and reformatted CSS flow chart to clarify appropriate measures for design innovations review
<u>TT</u>	4/29/2022	Confirm ITFs, review of CSS flowchart, introduction of major alignment innovations for Central and West Sections, review measures of success, confirmation of section limits	General agreement on TT charter. Confirmed and refined measures of success.
<u>TT</u>	5/13/2022	Review of the EA Preferred Alternative and major alignment innovations for the Central Section (recreation and emergency response) and measures of success, discussion of Hidden Valley Open Space Park, and review of Section alignment innovations and participant perspectives	Adoption of TT charter. Recording of Clear Creek County's objection to the Tunnel Alternative and the southern alignment of the frontage road. Removal of non-differentiating measures of success and endorsement of the revised CSS flow chart.
<u>ITF</u>	5/24/2022	Central Section innovations	Comparative evaluation between EA Preferred Alternative, Braided Bridges, and Eastbound and Down Options. Braided Bridges (Terraced Alignment) recommended for further evaluation to the TT.
<u>TT</u>	5/27/2022	Review of West Section Alignment and Central Section evaluation matrix	TT showed general preference for Braided Bridges option (contingent on ITF input)

Meeting	Date	Agenda	Decisions
<a href="#"><u>ITF</u></a>	6/8/2022	Maintenance ITF. Review of design innovations and discussion of maintenance issues and concerns.	Recommended Central Section Terraced Alignment. Provided input on snow plowing and deicing operations.
<a href="#"><u>ITF</u></a>	6/8/2022	West Section Innovations. Evaluation of EA Preferred Alternative, Middle Option and North Option.	West Section North Option recommended to TT for further evaluation
<a href="#"><u>TT</u></a>	6/10/2022	TT's recommendations for Central Alignment, review of West Section major alignment innovations (Middle Option and North Option), and ITF recommendations	Recommended Central Section Terraced Alignment (Braided Bridges) Option. Recommended West Section North Option. Eliminated Eastbound and Down Option from further consideration.
<a href="#"><u>ITF</u></a>	6/17/2022	Emergency Response ITF	No fatal flaws identified with major innovations, specific mitigation recommendations to reduce fire hazards, identify turnaround locations, and request for ladder access on the walls
<a href="#"><u>TT</u></a>	6/24/2022	Central and West Section major alignment updates, update on Emergency Response and Maintenance ITFs, and introduction of Central Section - East End innovations	EA Preferred Alternative renamed to "PA21" and new alignment "RPA22," confirmation by Emergency Response ITF to advance recommendations for "Terraced Alignment (Braided Bridges)" (Central Section) and "North Option" (West Section)
<a href="#"><u>ITF</u></a>	7/1/2022	Evaluation of "Hillside" and WB US 6 on-ramp innovations	Comparative Evaluation between the EA Preferred Alternative and Bottom of the Hill Options. Bottom of the Hill Option recommended for further evaluation by the TT.
<a href="#"><u>TT</u></a>	7/8/2022	Discussion of "Bottom of the Hill" Alignment (Central Section) and WB US 6 on-ramp innovations	TT recommends "Bottom of Hill" Option for further development based on ITF recommendations
<a href="#"><u>TT</u></a>	7/22/2022	Review of "Narrows Section" innovations (connect "Bottom of the Hill" and "Terraced Bridges" [formerly "Braided Bridges"]) and evaluation of WB US 6 on-ramp innovations	Recommendation by the TT to carry forward Version 2 of Narrows Section innovation
<a href="#"><u>ITF</u></a>	07/25/2022	SWEEP ITF. Project updates, roles and responsibilities of SWEEP, and updates on impacts and mitigation approaches	Confirmed SWEEP's role and responsibilities in the CMGC process. Discussed impacts and mitigation approaches for waters and water quality, wetlands and riparian areas, and floodplains. Confirmed next steps, including site visit.

Meeting	Date	Agenda	Decisions
<u>TT</u>	8/5/2022	Confirmation of innovations made to date, "West Saddle" refinement (move EB to the south side of the creek and on grade through open space area), WB on-ramp discussion, and discussion of Aesthetic Guidelines	Recommendations to bring the West Saddle refinement to an ITF for further consideration. Recommend pursuing removal of the US 6 WB on-ramp
<u>ITF</u>	8/12/2022	Evaluation of "Central Section West Saddle" Refinement	Recommendation to retain previously endorsed alignment and reject West Saddle refinement
<u>ITF</u>	8/18/2022	Greenway Site Visit	Identification of important aspects of the existing Greenway to be maintained and incorporated into the new Greenway trail alignment including historic features, noise and riparian areas, connectivity, and recreation
<u>ITF</u>	08/26/22	Stream and Wetland Ecological Enhancement Program (SWEEP) ITF Site Visit	Confirmed Project impacts and mitigation opportunities. Reviewed past mitigation projects and best practices. Agreed on Colorado Stream Quantification Tool (CSQT) parameters and Section 404 permitting approach.
<u>TT</u>	9/2/2022	Evaluation of Creek and Greenway impacts to inform future design	Concern that additional pavement on either side of the creek could lead to greater fire hazards; recommendation to convene Issue Task Force (ITF) about watershed impacts
<u>PLT</u>	9/16/2022	Review TT recommendations for CMGC Refined Preferred Alternative, discuss public involvement process, and review next steps	Support CMGC Refined Preferred Alternative with TT endorsed design innovations. Recommend TT review project delivery schedule and determine approach and topics for future meetings in the design phase. Develop a Public Information Leadership Team (PILT) to guide public information in project development.
<u>PLT</u>	10/14/2022	Review post-NEPA design process, discuss and recommend public information practices	Update project website with refined design information; send public information notices to mailing lists.
<u>TT</u>	10/14/2022	Review aesthetic guidelines, discuss bridge and wall aesthetics, review inventory of Greenway and creek data	Incorporate additional creek access recommendations from Trout Unlimited and Clear Creek Rafting.
ITF	10/17/2022	SWEEP site visit to discuss potential recreational conflicts with creek access, particularly fishing and rafting	Documented areas for recommended improved or changed river accesses.



Meeting	Date	Agenda	Decisions
<u>II</u>	10/28/2022	Continue review of structure and Greenway elements, introduce rock cut and retaining wall requirements in East Section	Continue discussion of wall aesthetics.
<u>II</u>	11/11/2022	Continued discussion of aesthetics, including shade study and sound wall; East Section retaining wall, rock cut, drainage elements	Continue discussion of wall aesthetics.

## 2 Design Refinements through the Innovations Review

The evaluation of design innovations through the CMGC process followed the I-70 Mountain Corridor CSS 6-Step decision making process. This collaborative process follows consistent and sequential steps that was used to recommend design innovations and refinements to the EA Preferred Alternative. This report and the environmental reevaluation in Chapter 4 of the FONSI document the decisions, recommendations, and changes through this process. Exhibit 3 provides a timeline of the process.

### Exhibit 3 Timeline of 6-Step Decision Making Process for Design Innovation Reviews

<b>Define Desired Outcomes</b>	<b>March - April 2022</b>
<ul style="list-style-type: none"> <li>Reviewed Project goals and scope of design innovation review</li> <li>Reviewed context statement, core values, and critical success factors</li> <li>Confirmed PLT and TT members</li> </ul>	
<b>Endorse Process</b>	<b>March - April 2022</b>
<ul style="list-style-type: none"> <li>Chartered PLT and TT</li> <li>Clarified roles and responsibilities</li> <li>Confirmed context statement, core values, and critical success factors</li> <li>Reviewed and endorsed CSS considerations flow chart and process</li> </ul>	
<b>Establish Criteria</b>	<b>April 2022</b>
<ul style="list-style-type: none"> <li>Reviewed evaluation criteria and measures of success</li> <li>Modified CSS considerations flow chart</li> <li>Clarified measures of success applicable to design innovations</li> </ul>	
<b>Develop Design Options</b>	<b>April - August 2022</b>
<ul style="list-style-type: none"> <li>Reviewed CMGC design innovations in each Project Section</li> <li>Presented initial design concepts</li> <li>Refined and revised design concepts based on TT and ITF feedback</li> </ul>	
<b>Evaluate &amp; Recommend Design Options</b>	<b>May - September 2022</b>
<ul style="list-style-type: none"> <li>Presented design innovation concepts</li> <li>Reviewed innovations against criteria and CSS flow chart</li> <li>Prepared evaluation matrices documenting considerations</li> <li>Recommended innovations to incorporate into the CMGC Refined Preferred Alternative</li> </ul>	
<b>Finalize Documentation &amp; Review Process</b>	<b>September - October 2022</b>
<ul style="list-style-type: none"> <li>Presented TT recommendations to PLT</li> <li>Reviewed CSS process and effectiveness</li> <li>Prepared recommendations for CSS considerations in design phase</li> </ul>	

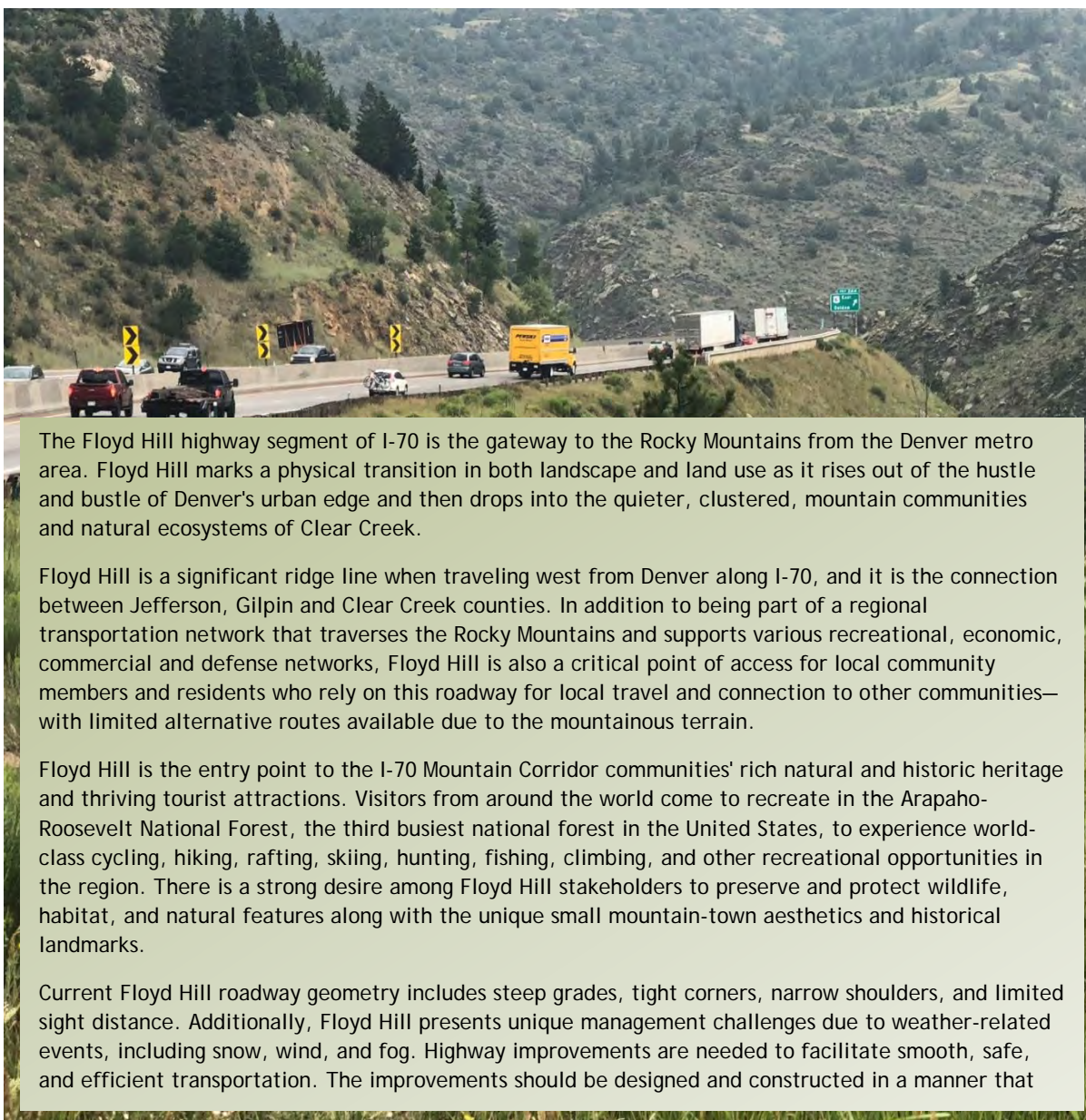
In November and December 2022, the TT continued to review design options, particularly focused on the East Section design and aesthetic considerations regarding walls and rock cuts.

## 2.1 Desired Outcomes and Endorsement of the CSS Process

The innovations review phase was initiated with a rechartering of the PLT and TT. The PLT agreed to follow a similar CSS process followed during the EA by expanding on the tools developed in the EA and concept development process, such as the CSS considerations flow chart. CSS participants were affirmed, roles and responsibilities for the design innovations review were clarified, and the CSS process was endorsed.

The PLT and TT reviewed the Project context statement (Exhibit 4) and core values and determined that both were relevant to the design innovation review. Additional critical issues related to the core values were identified, and performance measures and critical success factors were refined based on decisions already made in the EA phase.

### Exhibit 4 Context Statement



While the PLT and TT agreed that the context statement did not need to be updated, Clear Creek County provided the following observations about the Project area to be considered in design review:

- Clear Creek County has a lot of pride in its mineral history, and protecting the cultural and historic resources of the area is important.
- I-70 acts as main street for much of the county and as such needs to serve local needs as well as interstate travel.
- Clear Creek County, and particularly the project area, is like an hourglass with demand coming from both directions. The waist of the hourglass (the county) suffers a lot of the impacts serving the economic needs of the state.

The Core Values are the same as identified in the EA phase:

- Safety
- Mobility and accessibility
- Implementability
- Community
- Recreation
- Environment
- Engineering Criteria and Aesthetics
- Sustainability
- Historic Context
- Decision Making

The PLT identified resiliency as an additional critical issue but agreed that the core values encompassed this issue.

## 2.2 Evaluation Criteria and Measures of Success

The CSS considerations flow chart developed during the EA was the starting point for establishing evaluation criteria and measures of success for the design innovations. The TT held an initial meeting to brainstorm and review measures of success, then held an ITF to refine and formalize the input and revise the flow chart. The ITF reformatted the flow chart, removing or consolidating duplicative evaluation questions and focusing on the issues relevant to the design innovation review, including drawing on the expertise of the Construction Manager to better understanding of construction impacts (Exhibit 5). The TT approved the flow chart at its April 29, 2022 meeting, and the flow chart became the basis for evaluation matrices that documented TT and ITF input into the design innovations.

Exhibit 5 CSS Considerations Flow Chart

Critical Issues	Evaluation Criteria Questions (Does the alternative...)	Measures of Success
Core Value—Safety		
<ul style="list-style-type: none"> <li>• Emergency operations</li> <li>• Community operations/preference</li> <li>• Design considerations</li> <li>• Truck operations</li> <li>• Traffic conflicts</li> <li>• Traffic operations</li> </ul>	Accommodate emergency access and response?	<ul style="list-style-type: none"> <li>• Emergency truck parking</li> <li>• Response time</li> <li>• High school evacuation</li> <li>• Resident evacuation</li> <li>• Access to creek</li> </ul>
	Address safety needs of non-vehicular traffic?	<ul style="list-style-type: none"> <li>• Reduction in auto conflicts with bicycles, pedestrians, rafting, fishing</li> <li>• Number of multi-use opportunities with Greenway, Central City Parkway, US 40</li> <li>• Mitigation of impacts for non-vehicular traffic during construction</li> </ul>
	Address safety of the traveling public and the community?	<ul style="list-style-type: none"> <li>• Neighborhood traffic movements</li> <li>• Wildlife vehicle collisions</li> <li>• Impacts of sun glare</li> </ul>
	Address safety of the traveling public and trucks?	<ul style="list-style-type: none"> <li>• Number and severity of variances</li> <li>• Correlate with Incident Management and Fire Mitigation Plans</li> </ul>
	Improve traffic operations at interchanges?	<ul style="list-style-type: none"> <li>• Measure taken to reduce number of neighborhood traffic conflicts</li> <li>• Hidden Valley businesses and CDOT maintenance building</li> <li>• Reduce truck and multimodal conflicts</li> </ul>
Core Value—Mobility and Accessibility		
<ul style="list-style-type: none"> <li>• Local mobility</li> <li>• Traffic conflicts</li> <li>• Regional mobility</li> <li>• Recreation access</li> <li>• Traffic management</li> </ul>	Improve mobility and reliability?	<ul style="list-style-type: none"> <li>• Ease of circulation on roadway network, including local businesses, residents, and regional travel</li> <li>• Integration with WB MEXL</li> <li>• Access to trails and creek for recreation, including rafting</li> <li>• Final alignment meets driver expectation</li> <li>• Avoid negative impacts or unintended consequences for Idaho Springs</li> <li>• Communication of corridor conditions (front range and interstate travelers)</li> <li>• Support AGS and corridor multimodal improvements</li> <li>• Support ease of freight movement</li> </ul>

Critical Issues	Evaluation Criteria Questions (Does the alternative...)	Measures of Success
Core Value—Implementability		
<ul style="list-style-type: none"> <li>Constructability</li> <li>Construction impact</li> </ul>	Create infrastructure investments that are reasonable to construct and provide the best value for their life cycle, function, and purpose?	<ul style="list-style-type: none"> <li>Estimated cost/predicted life cycle and consistency with CSS values</li> <li>Construction operations are communicated to set and meet driver expectations</li> <li>Ease of safe implementation</li> <li>Opportunities to reduce GHG and other air pollutants</li> </ul>
	Minimize construction impacts to the community and traveling public?	<ul style="list-style-type: none"> <li>Duration of construction</li> <li>Community access during construction</li> <li>Impacts to existing roadway networks</li> <li>Economic impacts to businesses during construction</li> <li>Ability to separate construction activities and the traveling public</li> <li>Communications are both digital and traditional to accommodate all audiences</li> </ul>
Core Value—Community		
<ul style="list-style-type: none"> <li>Land Use</li> <li>Community</li> </ul>	Maintain economic vitality for current and future land use?	<ul style="list-style-type: none"> <li>Recreation economy impacts</li> <li>How is future land use accommodated</li> </ul>
	Meaningful community engagement?	<ul style="list-style-type: none"> <li>Effective CSS process and function</li> <li>Adequate community and public involvement</li> <li>Reduction in neighborhood traffic conflicts</li> <li>Community is engaged in decision making process</li> </ul>
Core Value—Recreation		
<ul style="list-style-type: none"> <li>Community preference</li> <li>Multi use</li> <li>Recreation access</li> </ul>	Support/enhance quality recreation access and facilities by meeting local/ regional standards/objectives?	<ul style="list-style-type: none"> <li>Multi-use including: Greenway, bicycle, pedestrian, fishing, rafting, US 40, truck parking</li> </ul>
	Highway improvements ensure that recreation facilities and highway act in concert; support expanded recreation opportunities?	<ul style="list-style-type: none"> <li>New or additional recreation opportunities created</li> <li>Current recreation opportunities are enhanced</li> </ul>

Critical Issues	Evaluation Criteria Questions (Does the alternative...)	Measures of Success
Core Value—Environment		
<ul style="list-style-type: none"> <li>• Hazard</li> <li>• Preservation / Restoration</li> <li>• Water Quality</li> <li>• Wildlife</li> </ul>	How to / opportunities to reduce GHG emissions during construction?	<ul style="list-style-type: none"> <li>• Duration of construction</li> <li>• Amount of haul/count of vehicles</li> <li>• Number of blasts/time spent idling</li> <li>• Number of traffic stops</li> <li>• Opportunities for advanced technology and greener materials</li> </ul>
	Minimize conflicts with geological and wildfire hazards during and after construction?	<ul style="list-style-type: none"> <li>• Minimize impacts of: rockslide, mining and mill waste, debris flow, wildfire and forest health, cut bank erosion, rockfall, Clear Creek salinity, stormwater, mineral leaching</li> <li>• Number of locations where hazardous conditions are reduced</li> <li>• Sufficient fire prevention protocols during construction</li> </ul>
	Protect Clear Creek, the fishery resource and water quality?	<ul style="list-style-type: none"> <li>• Meet SWEEP recommendations</li> <li>• Area of wetlands impacted/replaced</li> <li>• Water quality maintained/enhanced</li> </ul>
	Protect/enhance wildlife?	<ul style="list-style-type: none"> <li>• Meet ALIVE and Colorado Parks and Wildlife recommendations</li> <li>• Improve vegetation/ecosystem resiliency</li> <li>• Enhance or improve wildlife movement corridors</li> <li>• Improve noise conditions for recreation (decibel reduction, opportunities to reduce and buffer noise impacts)</li> </ul>
Core Value—Engineering Criteria and Aesthetics Guidelines		
<ul style="list-style-type: none"> <li>• Aesthetics</li> <li>• Design Considerations</li> </ul>	Meet I-70 Design Criteria and Aesthetics Guidance?	<ul style="list-style-type: none"> <li>• Minimize CSS engineering variances</li> <li>• Meet aesthetic guidelines</li> </ul>
Core Value—Sustainability		
<ul style="list-style-type: none"> <li>• Sustainability</li> </ul>	Meet the needs of the present without compromising the future?	<ul style="list-style-type: none"> <li>• Environmental improvements vs status quo</li> <li>• Mitigate transportation impacts</li> <li>• Make resilient infrastructure choices</li> <li>• Compatibility with local sustainability plans</li> <li>• Ability to perform maintenance</li> <li>• Long-term operations and maintenance</li> </ul>
Core Value—Historic Context		
<ul style="list-style-type: none"> <li>• Preservation / restoration</li> </ul>	Protect historic and archaeological resources?	<ul style="list-style-type: none"> <li>• Identify and protect historic resources throughout the project</li> </ul>

Critical Issues	Evaluation Criteria Questions (Does the alternative...)	Measures of Success
Core Value—Decision Making		
<ul style="list-style-type: none"> <li>• Adhere to past agreements</li> <li>• Land use</li> <li>• Design considerations</li> </ul>	Adhere to the previous plans, studies, and agreements?	<ul style="list-style-type: none"> <li>• Consistency with plans</li> <li>• Support ROD</li> <li>• Evaluation of CSS process effectiveness</li> </ul>

## 2.3 Develop and Review Design Options

The CMGC team developed some initial refinements of the EA Preferred Alternative (the Canyon Viaduct Alternative) to discuss with the TT. The initial refinements were high-level concepts, and the TT provided direction as to whether the innovations were worth pursuing further. The TT confirmed that the EA Tunnel Alternative was not preferred and would not be refined further. The TT was open to all concepts related the EA Preferred Alternative and articulated concerns the team should address when refining the concepts for consideration. The refinements followed an iterative process where concepts were presented, discussed, refined, and recommended or rejected. Meeting summaries and evaluation matrices are contained in Attachment 1 and described here by Project Section.

## 2.4 East Section Refinements

The EA defined the East Section from the top of Floyd Hill at the Beaver Brook/Floyd Hill interchange with County Road (CR) 65 (and east to the wildlife fencing at Soda Creek Road) to the west at the bottom of Floyd Hill at the US 6 interchange. The CMGC team recommended shortening the limits of the East Section to integrate design of the US 6 interchange with the Central Section because of the relationship of the roadway alignments in this area and because the complexity of design of those elements would be better suited for a later construction package. The design of the shortened East Section from the top of Floyd Hill to Johnson’s Gulch advanced, but no major alignment innovations were developed or considered.



## 2.5 Central Section Refinements

The Central Section is the most complex portion of the Project and was the focus of most of the CMGC innovations. The physical setting of the Central Section with the narrow canyon and proximity of existing I-70 to Clear Creek and the Clear Creek Greenway, coupled with the need to provide a frontage road connection through this section, presents numerous constructability and design challenges. Some of the difficulties include construction access and maintenance of traffic, long bridge spans, skewed bridge alignments, bridge pier placement, work in and around Clear Creek, and recreational use and access to the Greenway and creek. Despite the challenges, the Central Section design will be transformative for highway users, local travel, recreation, and the Greenway and creek. Elevating and removing the highway from the canyon floor restores and improves recreational and environmental conditions for people and wildlife, and highway users above will experience scenic vistas of the Floyd Hill ridgeline as travelers enter the quiet, clustered, mountain communities and natural ecosystems of Clear Creek County. The refinements to the EA Preferred Alternative are sensitive to this context and further the benefits of the viaduct concept, while also improving constructability by reducing traveler disruption, improving construction safety, minimizing risks, and increasing cost efficiency. The innovations recommended in the Central Section reduce geotechnical hazards, create a better fit for the geometry of the canyon, optimize viaduct alignment angles, reduce disruption to existing roadways, and increase overall constructability. Exhibit 6 presents a plan view comparison of the CMGC Refined Preferred Alternative and the EA Preferred Alternative in the Central Section.

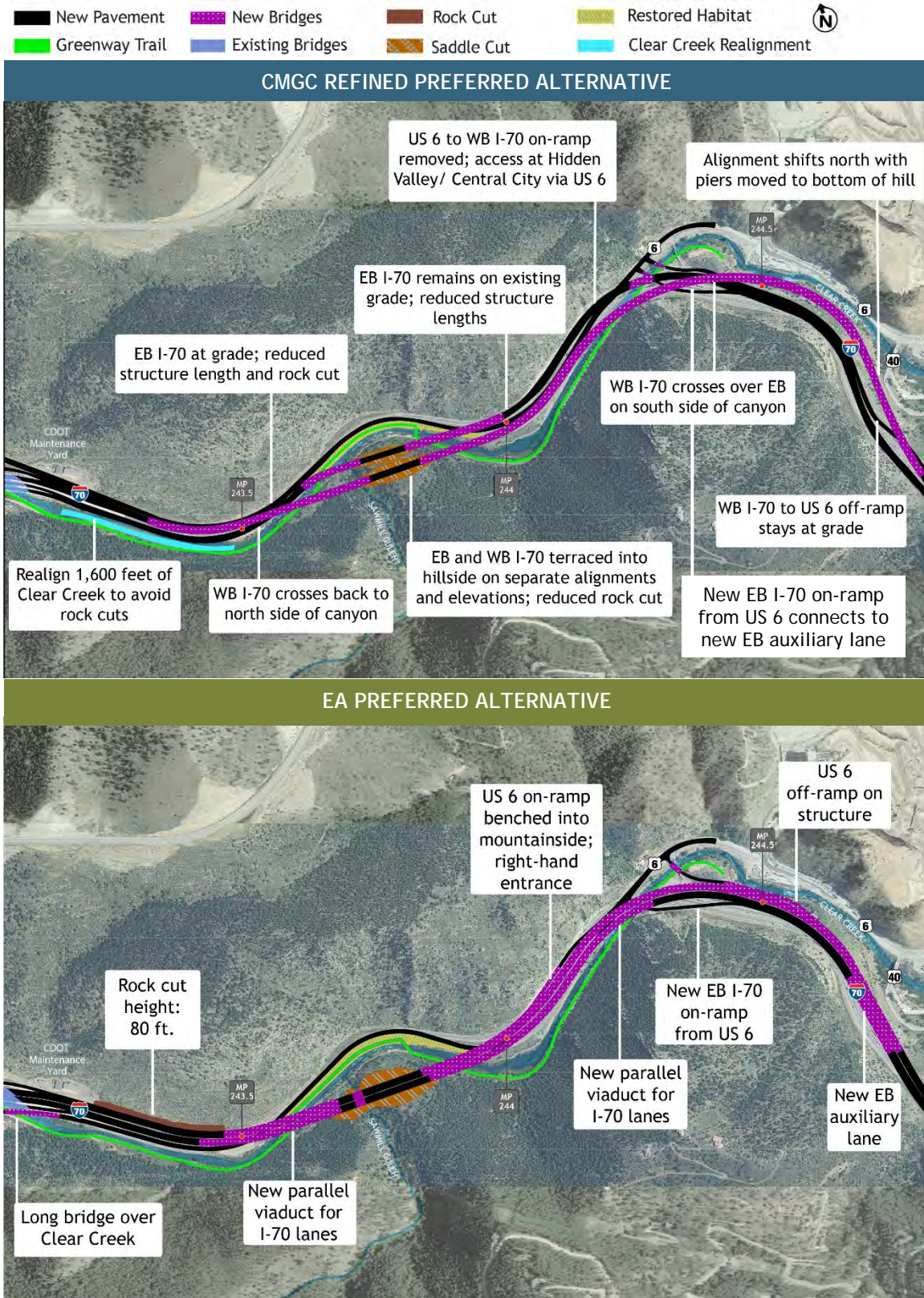
### Notable changes of the CMGC Refined Preferred Alternative from the EA Preferred Alternative in the Project's Central Section

- ✓ Shifts I-70 westbound alignment north to bottom of existing slope (closer to US 40 and Clear Creek) to improve construction access.
- ✓ Relocates US 6 access to westbound I-70 to Hidden Valley/Central City Parkway interchange.
- ✓ Realigns eastbound and westbound elevated portions of I-70 over Clear Creek Canyon to separate alignments with a terraced hillside cut, rather than parallel viaducts with a larger hillside cut. Eastbound I-70 is still elevated but lower than the EA concept and returns to existing grade near US 6.
- ✓ Realigns an approximately 1,600-foot section of Clear Creek south near the Hidden Valley/Central City Parkway interchange (instead of a similar creek realignment in West Section).



*The CMGC Refined Preferred Alternative will reconstruct intersections at the Hidden Valley/Central City interchange (view from I-70 WB off-ramp) and relocate westbound I-70 on and eastbound I-70 off movements from US 6.*

Exhibit 6 Comparison of the CMGC Refined Preferred Alternative and EA Preferred Alternative, Central Section



## 2.5.1 I-70 Alignment

The CMGC Refined Preferred Alternative includes four major alignment modifications to the EA Preferred Alternative through the Central Section. Attachment 1 provides meeting notes and matrices documenting the review.

### Bottom of the Hill

Approximately halfway down Floyd Hill at approximately Johnson's Gulch (MP 245) where the elevated portion of the WB alignment begins, the WB I-70 alignment is shifted north, moving the bridge pier and foundation locations to the bottom of the hill closer to US 40 (Exhibits 7, 8, 9, and 10). Compared to the EA Preferred Alternative, the alignment improves the geometry of the curve at the bottom of the hill and reduces the need for retaining walls. It also greatly improves access for construction equipment and girder erection (from US 40), reducing the duration of construction and having less impact to I-70 and frontage road traffic.

### Terraced Alignment

The Terraced Alignment option (initially referred to as the Braided Bridges option) separates WB and EB I-70 on independent vertical and horizontal alignments compared to the EA Preferred Alternative, which had WB and EB I-70 on parallel, side-by-side viaducts through Clear Creek Canyon between the US 6 and Hidden Valley/Central City interchanges (see Exhibit 6). Evaluation of the terraced alignment occurred over more than a 3-month period with the TT and involved several ITFs.

This refinement elevates WB I-70 from the bottom of Floyd Hill, crossing over EB I-70 to the south side of the canyon at approximately MP 244.6 and remains on the south side, elevated an average of 80 feet above Clear Creek. WB I-70 then crosses back to the north side of the canyon at approximately MP 234.5 and ties back in at grade just east of the CDOT Maintenance Facility at approximately MP 243.6. EB I-70 is also elevated but lower than WB, approximately 30 feet above Clear Creek. The large bench or saddle cut in the EA Preferred Alternative is replaced by a terraced cut with WB approximately 50 feet above EB. Exhibits 11 and 12 illustrate the differences of the designs.

Under the Terraced Alignment modification, WB I-70 crosses over EB I-70 at two locations. These crossovers, also referred to as braided bridges, allow EB and WB bridges to be stacked in the narrow geometry of the canyon. However, because of the constraints in the narrow areas where the bridges cross, several design options were evaluated for both the east and west crossovers. The east crossover area was referred to as the Narrows, and the west crossover was referred to as the West Saddle. In both cases, the endorsed design keeps EB I-70 north of Clear Creek.

Innovations that would have moved one or both of these crossovers south were considered to improve traffic separation during construction. Through several iterations of design refinements, the team could not engineer a solution that mitigated the impacts of moving the roadway to the south side of the creek, and the CMGC Refined Preferred Alternative keeps the I-70 EB alignment north in the canyon and north of Clear Creek.

Another design option, Eastbound Down, that would leave EB I-70 in the canyon and not elevated was also considered but was not recommended because many of the benefits of the EA Preferred Alternative of removing the interstate from the canyon floor could not be realized with EB I-70 in its existing alignment.

Exhibit 7 Comparison of Bottom of the Hill design, view toward US 6 from mid-way down Floyd Hill



Exhibit 8 Comparison of Bottom of Hill design, view toward Sawmill Gulch from  
Two Bears Tap and Grill



Exhibit 9 Comparison of Bottom of Hill, bird's eye view



Exhibit 10 Comparison of Terraced Alignment Designs, view west toward Sawmill Gulch

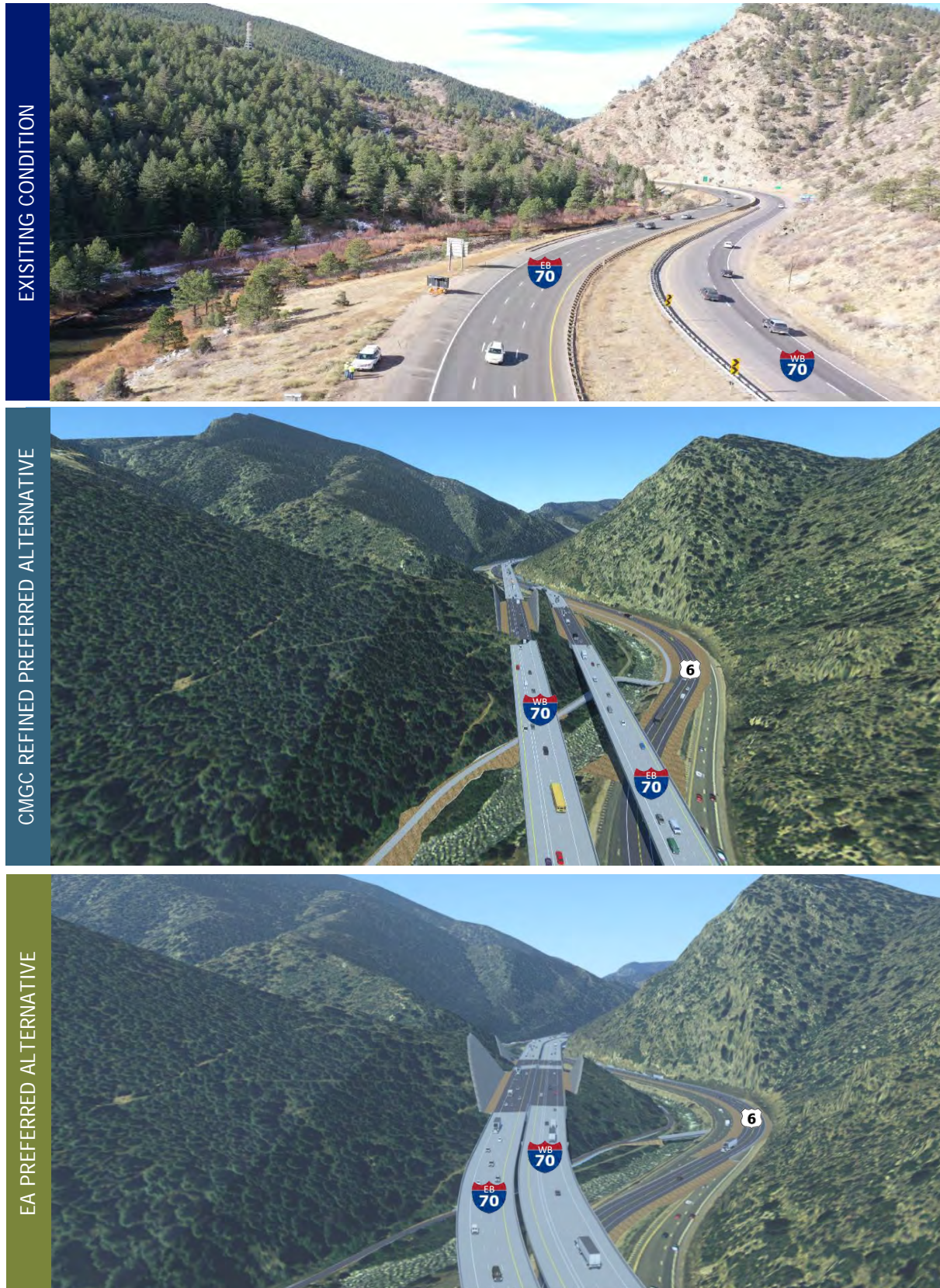


Exhibit 11 Comparison of Terraced Alignment Designs, bird's eye view south



### 2.5.2 US 6 interchange

The existing US 6/I-70 interchange provides three movements: a lefthand WB entrance to I-70 from US 6 and a lefthand EB exit from I-70 to US 6, as well as a WB exit from I-70 to US 6. All ramps are located at the bottom of Floyd Hill at the US 6 interchange.

The CMGC Refined Preferred Alternative has two movements at the bottom of Floyd Hill at the US 6 interchange: the WB off-ramp from I-70 to US 6 and a new US 6 to EB I-70 on-ramp. Movements for US 6 to WB I-70 and EB I-70 to US 6 would be provided through the Hidden Valley/Central City interchange via the new frontage road/US 6 extension. Both the WB off and EB on ramp terminals have been



refined from the EA Preferred Alternative design to improve intersection and ramp geometry and reduce structure lengths. The new US 6 to EB I-70 movement is connected to an uphill EB auxiliary lane to near the Hyland Hills/Floyd Hill EB off-ramp.

A WB I-70 on-ramp from US 6 at the bottom of Floyd Hill was included in the EA Preferred Alternative but reconsidered through the CMGC process after traffic analysis suggested that the WB US 6 traffic could be accommodated at the reconstructed Hidden Valley/Central City interchange. Removing infrastructure at the bottom of the hill reduces rock cuts, allows better connection to the bottom of the hill alignment, reduces structure lengths and costs, and is more aesthetically desirable with the narrower highway footprint and reduced rock cuts. The TT recommended this modification, pending final approval by FHWA in the Interchange Access Request, which is required for any changes to interstate accesses. FHWA has indicated preliminary support for this modification, agreeing with the rest of the TT of the merits of reduced infrastructure in this location.

## 2.6 West Section

The CMGC Refined Preferred Alternative incorporates one major alignment modification to the EA Preferred Alternative—shifting I-70 north—through the West Section. The evaluation is described in meeting notes and evaluation matrices (Attachment 1).

Contractor innovations in the West Section, particularly related to rock excavation assumptions, significantly improved the design and constructability of this section and vastly reduced impacts of construction disruptions to local communities, recreationalists, emergency responders, and I-70 travelers. During the EA phase, the design sought to minimize rock cuts while flattening the low-design speed curves in this area. Rock cuts were included on both the north and south side of the canyon due to the constraints identified with the curves. The CMGC team, in reviewing the EA Preferred Alternative, recommended concentrating rock cuts on the north side, rather than balancing rock cuts on both sides of the canyon. This recommendation was based on their expertise with construction of projects in the area and understanding of the rock structure from similar rock cuts conducted for the Twin Tunnels projects. The contractor and geotechnical engineers also had concerns about the stability of rock on the south side of the canyon and potential for ongoing slope maintenance, the desire to keep CR 314 open during construction, and desire to avoid impacts to and costs of reconstructing recently constructed retaining walls and other infrastructure on CR 314. The TT overwhelmingly supported the CMGC Refined Preferred Alternative as a substantial improvement to the EA Preferred Alternative. The TT further noted that the north shift opened a new area along the north bank of Clear Creek for riparian restoration and potential river access by grading steep embankments, as well as avoiding the realignment of Clear Creek, as benefits of the innovation. Exhibits 12 and 13 show the differences in the designs. Exhibit 14 simulates the rock cuts and riparian restoration area of the CMGC Refined Preferred Alternative.

### Notable changes of the CMGC Refined Preferred Alternative from the EA Preferred Alternative in the Project's West Section

- Concentrates widening for the new westbound travel lane on north side of Clear Creek Canyon. More rock excavation next to westbound I-70 but no rock excavation on south side of Clear Creek Canyon.
- Avoids impacts to County Road 314 and Clear Creek. County Road 314 will remain open during construction.
- New impacts to an archaeological site, which will require a treatment plan with the State Historic Preservation Office and a Supplement to the I-70 Mountain Corridor PA

Exhibit 12 West Section Project Elements

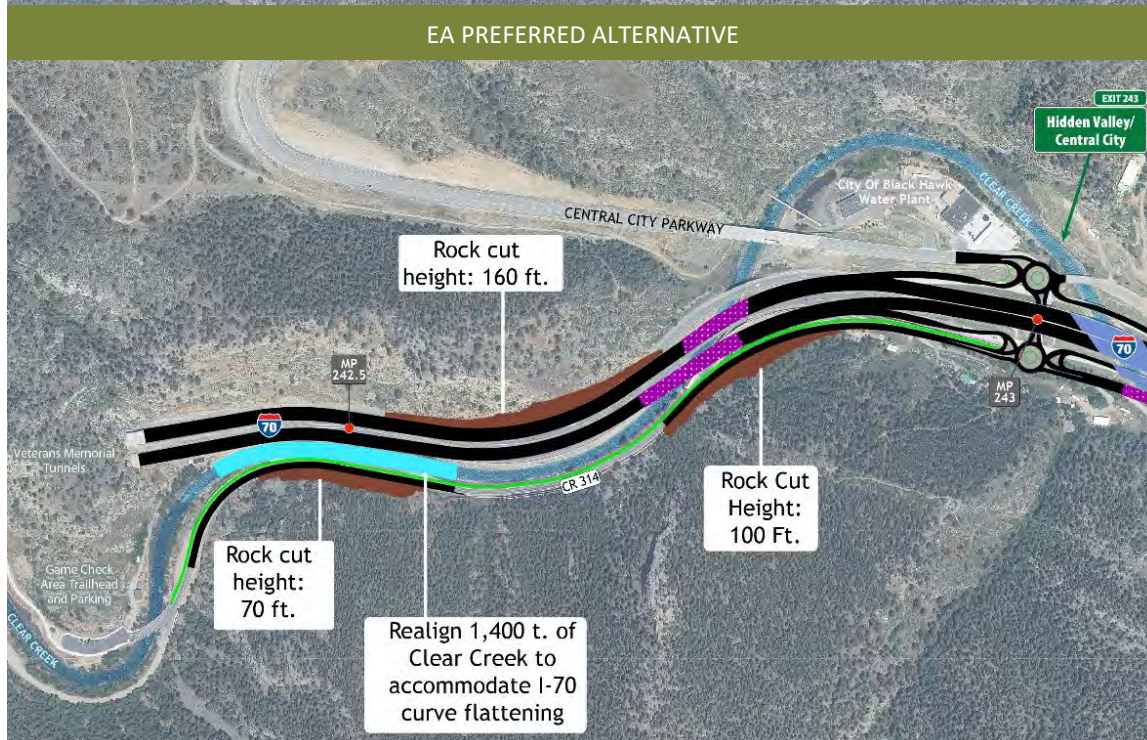
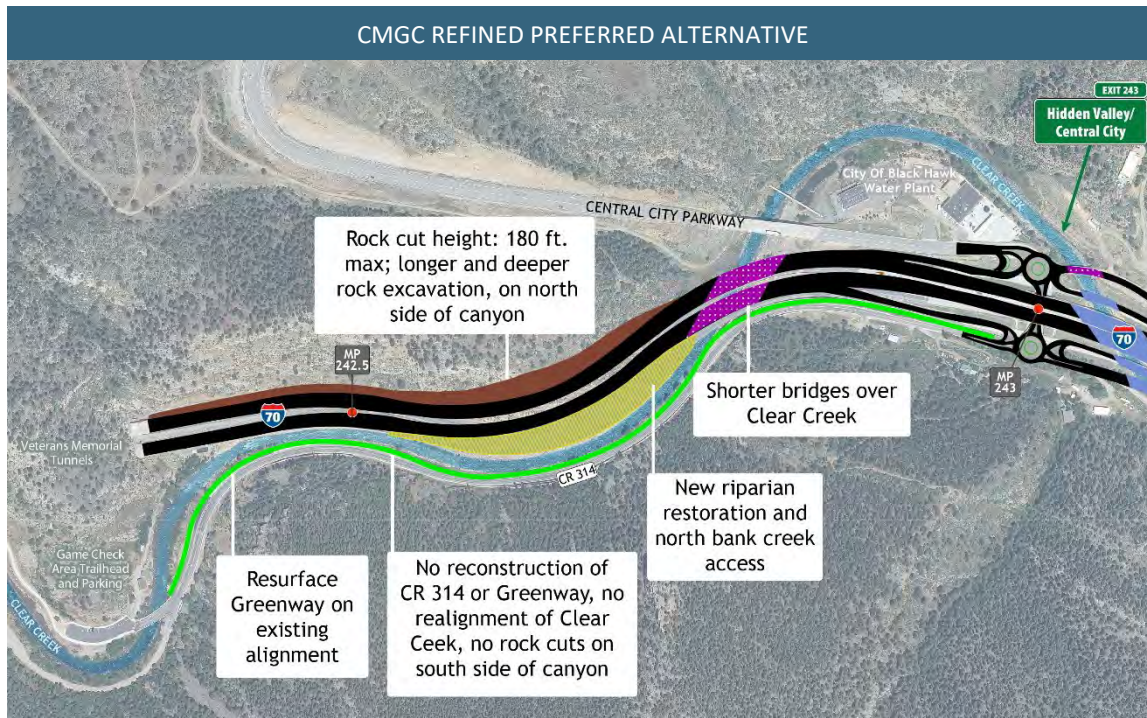
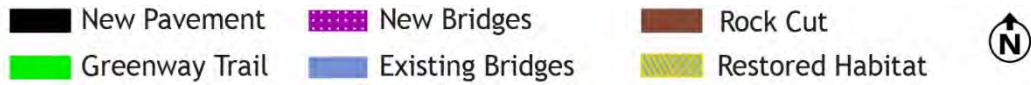


Exhibit 13 West Section Comparison of Existing Conditions, CMGC Refined Preferred Alternative, and the EA Preferred Alternative

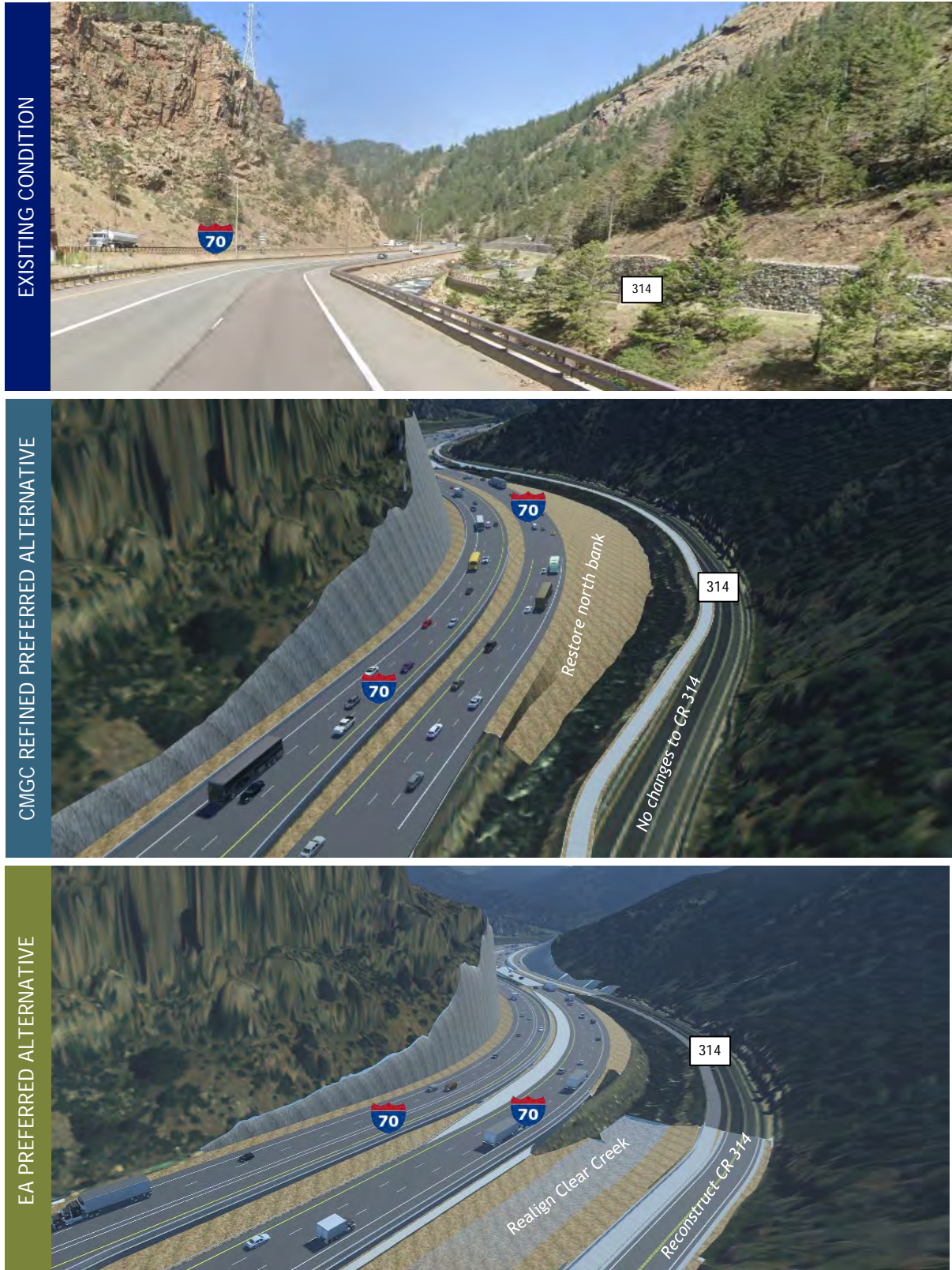


Exhibit 14 CMGC Refined Preferred Alternative Simulation East from Veterans Memorial Tunnels



*Simulation of the CMGC Refined Preferred Alternative (top) looking east from the Veterans Memorial Tunnels compared to the existing condition (bottom)*

## 2.7 Frontage Road, Clear Creek Relocation, and Greenway Design

The CMGC Refined Preferred Alternative modifies the alignment of the frontage road, location of the planned creek realignment, and advances the Greenway design. The refinements do not change the Project elements, impacts, or benefits.

### 2.7.1 Frontage Road

Through the West Section, the CMGC Refined Preferred Alternative maintains the existing CR 314 alignment and does not require its reconstruction, as was envisioned in the EA Preferred Alternative. Through the Central Section, the frontage road alignment shifts north compared to the EA Preferred Alternative and follows the existing WB I-70 travel lanes. This modification was made possible by the braiding of bridges and moving of WB I-70 to the south side of the canyon, allowing EB I-70 to generally remain on its current alignment until the Hidden Valley/Central City interchange, where WB and EB I-70 lanes braid back to their positions on the north and south sides of the canyon, respectively.

### 2.7.2 Creek Realignment

The CMGC Refined Preferred Alternative requires relocation of an approximately 1,600-foot section of Clear Creek and the Greenway near the intersection of CR 314 and Central City Parkway (south of the Hidden Valley/Central City interchange). It avoids relocation of an approximately 1,400-foot section Clear Creek in the West Section of the Project required under the EA Preferred Alternative. The realignment will be designed to maintain existing functions, both ecological and recreational, for the relocated reach of the creek. This modification will require an Individual Permit under Section 404 of the Clean Water Act. The Project includes commitments for in-stream and riparian enhancements throughout the reaches of Clear Creek in the Project area; these enhancements will also require a Section 404 Permit but will not require compensatory mitigation because the impacts are solely for the purpose of enhancing stream functions and health. The U.S. Army Corps of Engineers, U.S. Environmental Protection Agency, and the rest of the SWEEP ITF reviewed the proposed modification and will continue to be engaged through final design and permitting.

### 2.7.3 Clear Creek Greenway

The elements and goals of the Greenway design are unchanged from the EA though more is now known about the opportunities and constraints. Once the roadway alignments were agreed upon, the TT began considering the Greenway design. Through a series of office meetings and site visits, the team inventoried existing features and identified areas of interest along the full stretch of the Greenway between the Veterans Memorial Tunnels and US 6. The Project is committed to integrating the Greenway design with creek improvements to expand and enhance recreational opportunities, wildlife and aquatic habitat, and water quality. The design will advance using the collaborative CSS process to balance priorities.

## 2.8 Future design and construction refinements

The TT will be involved throughout the design phase. The CMGC team is developing a schedule for design reviews and issue tracking, which will evolve as the Project progresses. It is anticipated that the TT will meet bi-weekly to monthly, on average, through the design phase in 2023 and into May 2024 as the design is refined (Exhibit 15). The TT is responsible to consider the core values, aesthetic guidelines, and CSS design criteria as the design progresses. The TT will also track issues through design and construction and monitor the CSS considerations developed through the early planning and preliminary design phases of the Project development.

Some design elements are less developed, such as the Greenway and creek design, or require more information to make decisions, such as geotechnical data that may affect rock cuts or structure design

to inform pier placement. In these cases, CDOT will continue to review environmental impacts and mitigation requirements and conduct reevaluations as necessary.

**Exhibit 15 Roadmap of design and construction schedule**



### 3 Stakeholder Involvement and Public Information

CDOT has updated the Project website with information on the design refinements, including interactive computer models (Lumen models) of the refined design, and a summary of the major innovations described in this report.

The Project website provided regular updates as the Project evolved, and the Project email and telephone hotline were available throughout the Project development and fielded numerous inquiries. Project updates were also sent to the Project email subscribers (more than 2,200) at milestones throughout the design refinement process. CDOT also briefed local organizations on the design refinements and other Project updates.

Exhibit 16 summarizes the project update presentations, email updates, and other outreach conducted since the EA; CSS meetings during the CMGC design process are summarized in Exhibit 2. Including outreach conducted during the EA, as summarized in Exhibit 5-1 of the EA, CDOT held nearly 100 Project meetings and events, in addition to numerous notifications through email blasts, postcards, and website updates. The recent outreach focused on design modifications for the CMGC Refined Preferred Alternative and other Project updates, such as the CMGC procurement and funding updates. Exhibit 17 summarizes these efforts after the EA release. Attachment 1, available electronically in attached USB flash drive, contains meeting notes from the PLT, TT, and ITF meetings referenced in Exhibit 17.

#### Exhibit 16 Public, and Agency Meetings During the CMGC Process

Activity	Date	Topic
Email blast	8/2/2021	Notice of EA availability and virtual public engagement
Email blast	8/24/2021	Project update
Email blast	9/27/2021	EA comment period reminder
Email blast	10/1/2021	Notice to industry regarding contracting for the CMGC procurement
Colorado Transportation Commission meeting	11/18/2021	Project status update
Colorado Transportation Commission meeting	1/19/2022	Project status update
Email blast	2/23/2022	Floyd Hill roundabouts and parking project update
Colorado Transportation Investment Office Board of Directors meeting	5/5/2022	Project update
Idaho Springs City Council presentation	5/9/2022	Project update
I-70 Coalition quarterly meeting	7/14/2022	Project update, review of design refinements
Board of Clear Creek County Commissioners meeting	8/2/2022	Project update, review of design refinements
National Public Lands Day booth	9/24/2022	Project information at Clear Creek Trail Cleanup event

Activity	Date	Topic
I-70 Collaborative Effort meeting	9/28/2022	Project update, review of design refinements
Groundbreaking	10/19/2022	Public and media event to commemorate the groundbreaking of the US 40 roundabouts and Genesee wildlife crossing Early Projects
Email blast	11/09/2022	Project update and notice of additional website content describing the design innovations for the CMGC Refined Preferred Alternative
Mailed postcards	11/09/2022	Project update and notice of additional website content describing the design innovations for the CMGC Refined Preferred Alternative
Idaho Springs City Council	11/14/2022	Project update, review of design refinements



## Attachment 1: PLT, TT, and ITF Meeting Summaries and Evaluation Matrices

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Available electronically in attached USB flash drive.