



SH 82

GRAND AVENUE BRIDGE

Environmental Assessment

## **Appendix A: The Process, Identification, and Evaluation of Alternatives**



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## The Process, Identification, and Evaluation of Alternatives

This appendix describes the process used to identify, evaluate, and screen alternatives for the proposed SH 82 Grand Avenue Bridge project. Chapter 2.0 *Alternatives* of the *SH 82 Grand Avenue Bridge Environmental Assessment* summarizes this process and its results.

### 1.1 DECISION-MAKING PROCESS

Three project groups helped guide and provide input into the study: the Project Working Group (PWG), Project Leadership Team (PLT) and the Stakeholder Working Group (SWG). The PLT was formed by CDOT to champion the CSS process. It was not a decision-making body; its primary charge was to make sure the study team followed a CSS process to complete the study. The SWG was formed to provide feedback to the PWG on the community values that were used to refine and screen bridge alternatives. The PWG was a technical team of agency representatives from CDOT, Federal Highway Administration (FHWA), City of Glenwood Springs (City), and the consultant team that executed the process. More information about these groups and their roles can be found in Chapter 5.0 *Agency Coordination and Public Involvement* of the *SH 82 Grand Avenue Bridge Environmental Assessment*.

The PWG and PLT – members of which are shown in Table 1 – established a decision-making process for alternatives development and screening. This process was developed to meet National Environmental Policy Act (NEPA) requirements and be consistent with the Colorado Department of Transportation’s (CDOT’s) I-70 Mountain Corridor Context Sensitive Solutions (CSS) process.

**TABLE 1. PROJECT WORKING GROUP (PWG) AND PROJECT LEADERSHIP TEAM (PLT) MEMBERS)**

PWG	PLT	
CDOT	CDOT	Eagle County
FHWA	FHWA	Pitkin County
City of Glenwood Springs (staff)	City of Glenwood Springs (Council representatives)	Glenwood Hot Springs
Colorado Bridge Enterprise	Colorado Bridge Enterprise	Glenwood Springs Chamber Resort Association
Consultant Team	Garfield County	Historic Preservation Commission
	Consultant Project Manager	Downtown Development Authority

The alternatives evaluation, or screening process used to develop, evaluate, eliminate (screen), and refine alternatives involved the following steps:

- ❖ Identify potentially feasible alternatives based on an assessment of the existing conditions in the study area, project Purpose and Need, and public and agency input.
- ❖ Conduct Level 1 Fatal Flaw screening and eliminate those alternatives that could not meet the Purpose and Need or were not constructible.
- ❖ Conduct an initial qualitative comparison screening (Level 2) of the remaining alternatives to identify those that were most practical or feasible from a technical, economic, and environmental standpoint.

- ❖ Evaluate and compare the remaining alternatives with each other through a more detailed comparative and quantitative screening (Level 3).

Alternatives were identified from:

- ❖ Ideas from the scoping and visioning process.
- ❖ Ideas generated by the SWG and PWG.
- ❖ Concepts initiated by the study team that responded to the project Purpose and Need, Project Goals, and community values.
- ❖ Concepts generated during an Independent Peer Review at the end of Level 2 screening. Similar to a Value Engineering Workshop, this identified potential modifications to the alternatives or additional alternatives that had not yet been evaluated.

The number of alternatives was reduced through successive levels of screening, as shown in Figure 1. At each step, stakeholders provided input to the study team that helped shape the alternatives and the results of the evaluations. The PWG made decisions about which alternatives to screen out at each level, with the endorsement of the PLT.

The study team applied the screening process to all of the alternatives, regardless of which stage of the process the alternative was developed. For example, during Level 2 screening, several alternatives were proposed by stakeholders that had not yet been considered. Each of them underwent the screening process, starting with a Level 1 Fatal Flaw analysis, and continuing until they were eliminated from consideration or became part of the Build Alternative.

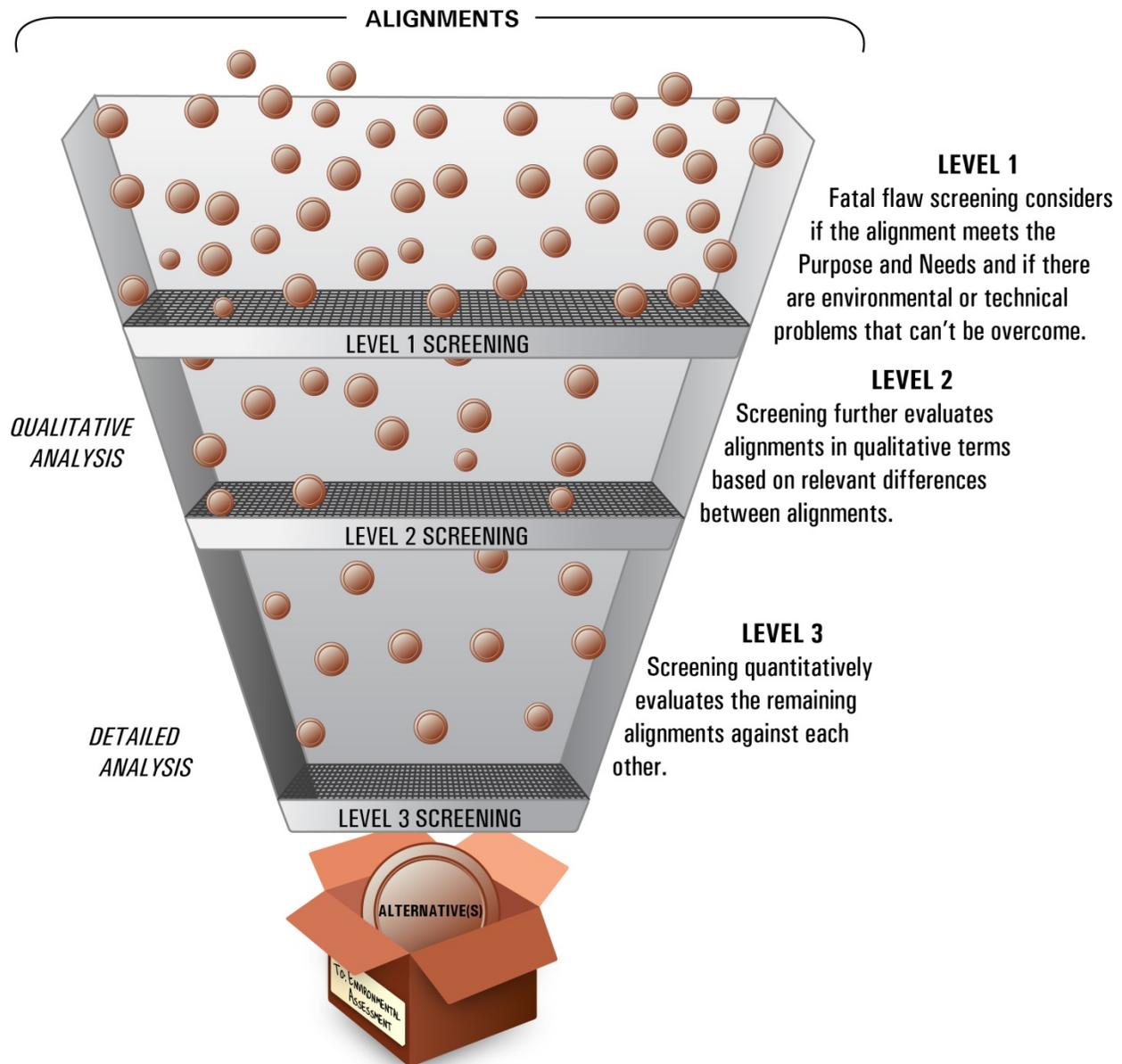
### 1.1.1 Context Sensitive Solutions Process

The Federal Highway Administration defines Context Sensitive Solutions as follows:

*Context Sensitive Solutions is a collaborative, interdisciplinary approach that involves all stakeholders to develop a transportation facility that fits its physical setting and preserves scenic, aesthetic, historic, and environmental resources, while maintaining safety and mobility. CSS [Context Sensitive Solutions] is an approach that considers the total context within which a transportation improvement project will exist. CSS principles include the employment of early, continuous and meaningful involvement of the public and all stakeholders throughout the project development process.*

The principles of CSS aim to bring the full range of stakeholder values to the table and actively incorporate them into the design process and final results. The Grand Avenue Bridge Environmental Assessment (EA) CSS process provided a framework to consider the total context of the proposed project – not just the study’s physical boundaries. From these guidelines, the process illustrated in Figure 2 was used as the starting point. These steps are intended to result in a process that is fair and understandable. The order of the steps is as important as the activities within each step.

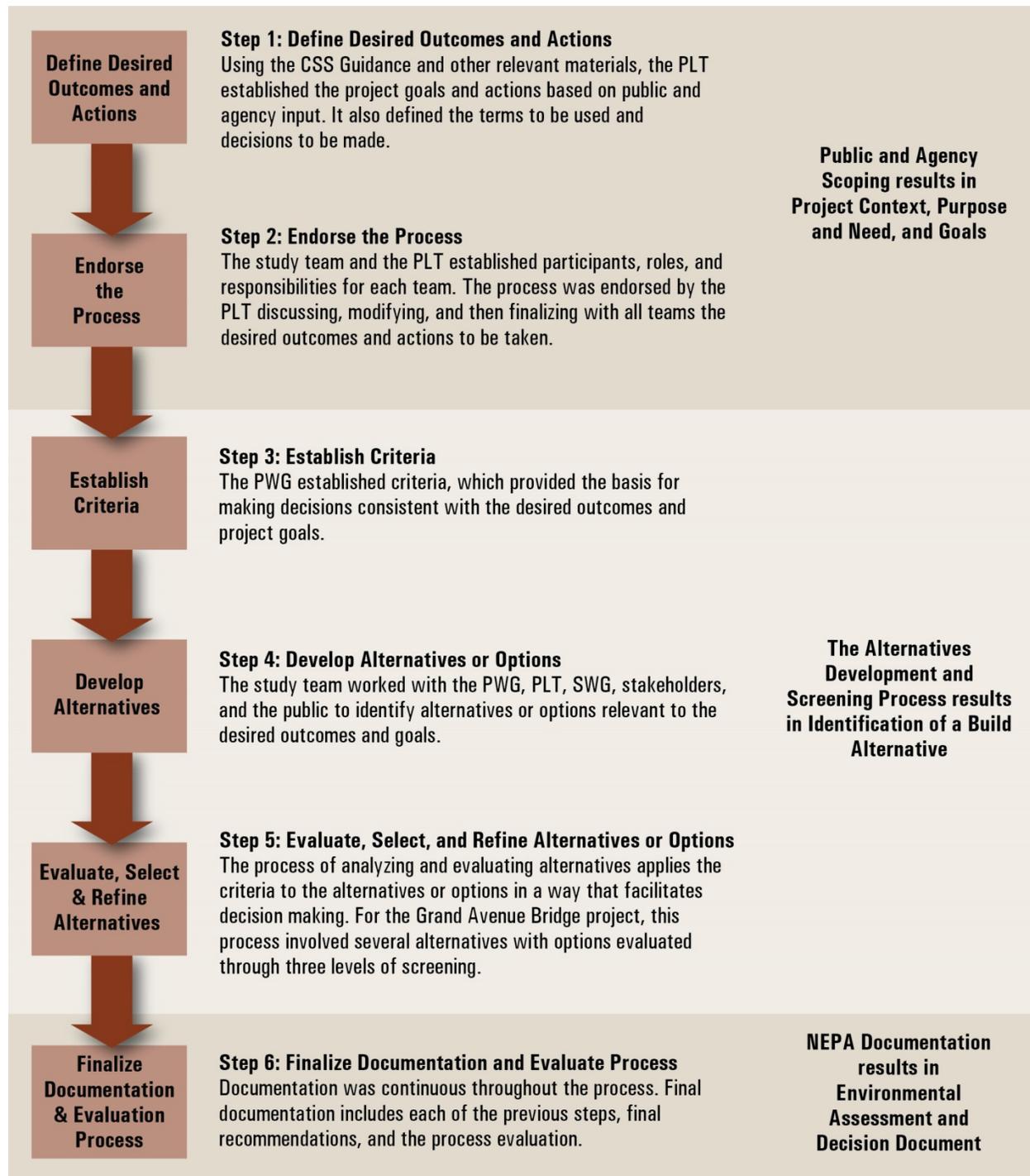
FIGURE 1. ALTERNATIVES DEVELOPMENT AND SCREENING PROCESS



Early in the EA process, the study team identified different stakeholder groups with specific roles related to the alternatives development and screening process (Chapter 5.0 *Agency Coordination/Public Involvement* of the *SH 82 Grand Avenue Bridge Environmental Assessment* has additional details). Each of these groups provided input throughout each step of the process:

- ❖ Project Leadership Team (PLT)
- ❖ Project Working Group (PWG)
- ❖ Stakeholder Working Group (SWG)

FIGURE 2. CSS PROCESS FOR THE SH 82 GRAND AVENUE BRIDGE PROJECT



- ❖ The general public
- ❖ Elected officials
- ❖ CDOT/Resource Agencies/FHWA
- ❖ Consultant study team

The study team, in coordination with the PLT, developed a draft Context Statement and Critical Success Factors that were presented at scoping meetings with resources agencies and the public and a Visioning Session. This process is described in Section 1.1.2 *Scoping and Visioning*. The input received at the scoping and visioning meetings helped shape the project's Purpose and Need Statement, the project goals, and the criteria for alternatives evaluation and screening.

Subsequent to the scoping and visioning meetings, the PWG and PLT agreed on Project Goals, evaluation criteria, and Measures of Effectiveness (MOE) associated with the criteria, which the PWG used to develop, evaluate, and screen alternatives. This process is described in Section 1.1.3 *Project Goals and Evaluation Criteria*.

During development of the EA, the PWG developed alternatives and conducted the alternatives evaluation and screening process. The PLT ensured the study team followed the CSS guidelines to complete the process, and provided input into the evaluation and screening of alternatives.

Both the PWG and the PLT met monthly or at key milestones to identify actions and decisions to establish goals, implement steps needed to resolve issues, and facilitate formal actions required by councils or boards. A Stakeholder Working Group formed after the Visioning Workshop also provided input to the alternatives, typically at the same time as the Public Open Houses.

### 1.1.2 Scoping and Visioning

Steps 1, 2, and 3 of the process were accomplished during scoping and visioning. During the scoping and visioning process, the study team reached out to various stakeholders through the following meetings that are described further in Chapter 5.0 *Agency Coordination/Public Involvement of the SH 82 Grand Avenue Bridge Environmental Assessment*.

- ❖ PLT Meetings
- ❖ Agency Scoping Meeting
- ❖ Public Scoping Open House
- ❖ Visioning Session

The study team used the input received at these meetings to develop the project Context Statement, project Purpose and Need, and project Critical Success Factors.

### **Context Statement**

The study team worked with the PLT to develop a Context Statement that was reviewed throughout the visioning and scoping process:

*The Grand Avenue Bridge over the Colorado River, Interstate 70 and the railroad tracks, connects north and south Glenwood Springs, I-70 and State Highway 82, and the historic districts of downtown and the Glenwood Hot Springs.*

*The bridge stands as a gateway to the city of Glenwood Springs, Glenwood Canyon, the Roaring Fork Valley, and Colorado's western slope communities. It serves local, regional and state travel, local commuters, emergency response, bicyclists and pedestrians.*

*The soaring walls of Glenwood Canyon; the rich history of Glenwood Springs, built at the confluence of the Colorado and Roaring Fork Rivers; mining; tourism and recreation define a splendid and vivid context for the Grand Avenue bridge.*

### **Purpose and Need**

The study team worked with the PLT and PWG to develop the project Purpose and Need. The project Purpose and Need is summarized in Chapter 1.0 *Purpose and Need of the SH 82 Grand Avenue Bridge Environmental Assessment*.

### **Critical Success Factors**

The study team worked with the PLT to develop a list of Critical Success Factors that was reviewed throughout the visioning and scoping process:

- ❖ Meet current design standards
- ❖ Safety
- ❖ Pedestrian, bicycle, and ADA access
- ❖ Iconic structure
- ❖ Promote appropriate speeds
- ❖ Connection to 6th Street
- ❖ Minimize construction impacts
- ❖ Solve problems into the future
- ❖ Provide for activities and vibrant street life under the bridge
- ❖ Avoid and minimize environmental impacts
- ❖ Accommodate traffic flow and demand
- ❖ Design for sustainability
- ❖ Looks like it grew out of the history of Glenwood Springs
- ❖ Positive economic impact, short and long-term
- ❖ Invigorates activity on Wing Street
- ❖ Accommodates traffic flow on I-70
- ❖ Maintain and enhance recreation on the river
- ❖ Affordable
- ❖ Doesn't impact aquifer and hot springs
- ❖ Source of community pride
- ❖ Engaged public and community

### 1.1.3 Project Goals and Evaluation Criteria

#### Project Goals

The Project Goals were used in alternatives evaluation to supplement the project Purpose and Need. These goals helped the study team identify and evaluate differences between the various alternatives and options proposed to meet the transportation needs and, therefore, helped guide the alternatives development and screening process. While the needs must be addressed by the project, the goals provide a framework by which the proposed improvements can exceed those requirements.

The Project Goals are:

- ❖ Meet design standards as practical to improve connectivity between the south side of the Colorado River (downtown Glenwood Springs) and the north side of the river (historic Glenwood Hot Springs area and I-70).
- ❖ Maintain consistency with City planning regarding transportation and land use.
- ❖ Accommodate multimodal transportation, including buses, pedestrians, and bicycles.
- ❖ Meet transportation safety needs of all users – auto, truck, bus, pedestrian, and bicycle.
- ❖ Reduce and minimize construction impacts to businesses, transportation users, and visitors.
- ❖ Provide effective access for existing and future economic activity.
- ❖ Avoid and minimize environmental impacts to scenic, aesthetic, historic, and natural resources.
- ❖ Provide practical and financially realistic transportation improvements for the 2035 planning horizon and a structure that will be sound for a minimum of 30 years.
- ❖ Maintain or improve transportation (traffic and pedestrian/bicycle operations in the project area.
- ❖ Incorporate sustainable elements into the design. Sustainable design elements are those elements of design that are viewed as better for society, the environment, and the economy in the long term and for future generations.
- ❖ Provide an aesthetically appropriate solution that is in harmony with the context of the natural and built environment.
- ❖ Avoid or minimize proximity, economic, and right-of-way impacts and relocations to adjacent properties.
- ❖ Incorporate CSS into the planning and design, including such community-based issues as urban design and aesthetics.

**Evaluation Criteria and Measures of Effectiveness**

The Purpose and Need and the Project Goals became the basis for the evaluation criteria by which potential alternatives were compared. For each criterion, the PWG developed MOEs to provide the basis for comparative evaluation of the alternatives at each level of screening. Table 2 shows evaluation criteria and corresponding MOEs for screening at Levels 1, 2, and 3.

**TABLE 2. EVALUATION CRITERIA AND MEASURES OF EFFECTIVENESS**

Criteria	Level 1	Level 2	Level 3
<b>Measures to Address Purpose and Need Elements</b>			
<i>Improve connectivity between downtown Glenwood Springs and the Roaring Fork Valley with the historic Hot Springs pool area and I-70.</i>	The improvement meets the Purpose and Need.	<ol style="list-style-type: none"> <li>1. Relative ability to provide good connectivity for Glenwood residents and visitors between downtown Glenwood Springs/ Grand Avenue and historic Glenwood Hot Springs area/ I-70.</li> <li>2. Relative ability to provide good connectivity for through traffic between Grand Avenue and I-70.</li> </ol>	<ol style="list-style-type: none"> <li>1. Connectivity for local traffic (ability to connect between downtown Glenwood Springs and the historic Hot Springs pool area).</li> <li>2. Connectivity for regional traffic (ability to connect between the Roaring Fork Valley and I-70).</li> </ol>
<i>Address the functional and structural deficiencies of the bridge to improve public safety, including emergency service response, and reliability as a critical transportation route.</i>	The improvement is not part of the No Action Alternative.	<ol style="list-style-type: none"> <li>1. Relative ability to minimize risk of bridge closure.</li> <li>2. Relative ability to address existing functional deficiencies.</li> <li>3. Relative ability to address existing structural deficiencies.</li> <li>4. Relative bridge life.</li> <li>5. Relative ability to improve emergency access across the bridge.</li> </ol>	<ol style="list-style-type: none"> <li>1. List of functional deficiencies.</li> <li>2. List of structural deficiencies.</li> <li>3. Anticipated bridge life in years.</li> <li>4. Emergency vehicle travel time across bridge.</li> <li>5. Variability of emergency vehicle travel time across bridge.</li> </ol>
<b>Measures to Address Project Goals</b>			
<i>Minimize environmental impacts to scenic, aesthetic, historic, and natural resources.</i>	The improvement does not have irresolvable environmental impacts.	Relative effect on environmental resources, including: <ul style="list-style-type: none"> <li>▪ Historical resources</li> <li>▪ Parks and recreation resources</li> <li>▪ Visual / aesthetics</li> <li>▪ Water and aquatic resources</li> <li>▪ Noise and air quality</li> </ul>	Effect on all potentially impacted environmental resources: <ul style="list-style-type: none"> <li>▪ Historical resources – number, location, and amount of impact</li> <li>▪ Parks and recreation resources – number and type of properties, number of acres, location, and level of impact</li> <li>▪ Visual / aesthetics – viewsheds, renderings of key views</li> <li>▪ Water and aquatic resources – description of impacts</li> <li>▪ Noise – noise levels at adjacent receivers</li> <li>▪ Air quality – Level of congestion at adjacent intersections.</li> <li>▪ Wetland (if any) – number and acres impacted</li> </ul>
<i>Is the project in harmony with the community?</i>	Not applicable	<ol style="list-style-type: none"> <li>1. Ability of the alternative to provide a CSS.</li> <li>2. Ability of the alternative to address the Project Context Statement.</li> <li>3. Ability of the alternative to satisfy the Project visioning.</li> </ol>	

**TABLE 2. EVALUATION CRITERIA AND MEASURES OF EFFECTIVENESS**

Criteria	Level 1	Level 2	Level 3
<b>Measures to Address Project Goals</b>			
<i>Provide a practical and financially realistic alternative.</i>	The improvement does not have exorbitant costs or use unproven technology.	<ol style="list-style-type: none"> <li>1. Relative cost of the alternative.</li> <li>2. Relative ability to construct.</li> <li>3. Relative bridge life.</li> </ol>	<ol style="list-style-type: none"> <li>1. Cost estimate of the alternative.</li> <li>2. Ability to construct – description.</li> <li>3. Bridge life.</li> </ol>
<i>Reduce and minimize construction impacts to the businesses, transportation users, and visitors.</i>	The improvement is constructible.	<ol style="list-style-type: none"> <li>1. Relative construction impacts to businesses.</li> <li>2. Relative construction impacts to traffic.</li> <li>3. Relative construction impacts to pedestrians and bicyclists.</li> <li>4. Relative construction impacts to visitors.</li> </ol>	<ol style="list-style-type: none"> <li>1. Construction impacts to businesses. <ul style="list-style-type: none"> <li>▪ Change in access.</li> <li>▪ Approximate length of construction.</li> <li>▪ Change in visibility.</li> </ul> </li> <li>2. Construction impacts to traffic. <ul style="list-style-type: none"> <li>▪ Delay during construction.</li> </ul> </li> <li>3. Relative construction impacts to pedestrians and bicyclists. <ul style="list-style-type: none"> <li>▪ Change in routes.</li> <li>▪ Closures.</li> </ul> </li> <li>4. Relative construction impacts to visitors. <ul style="list-style-type: none"> <li>▪ Change in access.</li> <li>▪ Noise.</li> <li>▪ Length of construction.</li> <li>▪ Extent of construction.</li> <li>▪ Congestion.</li> </ul> </li> </ol>
<i>Minimize private property impacts.</i>	Not applicable	<ol style="list-style-type: none"> <li>1. Relative physical impact on private property.</li> <li>2. Relative economic impact on private properties.</li> </ol>	<ol style="list-style-type: none"> <li>1. Physical impact on private property. <ul style="list-style-type: none"> <li>▪ Number and location of impacts.</li> <li>▪ Number and location of relocations.</li> </ul> </li> <li>2. Relative economic impact on private properties in range of dollars.</li> </ol>
<i>Safely accommodate transportation users.</i>	Not applicable	<ol style="list-style-type: none"> <li>1. Ability of the alternative to improve traffic safety on the Grand Avenue Bridge.</li> <li>2. Ability of the alternative to provide for safe pedestrian and bicycle use across the Colorado River.</li> <li>3. Ability of the alternative to meet design standards.</li> </ol>	<ol style="list-style-type: none"> <li>1. Ability of the alternative to improve traffic safety on the Grand Avenue Bridge. <ul style="list-style-type: none"> <li>▪ Deviations from design standards based on safety.</li> <li>▪ Projected accidents as available for conditions.</li> </ul> </li> <li>2. Ability of the alternative to provide for safe pedestrian and bicycle use across the Colorado River. <ul style="list-style-type: none"> <li>▪ Deviations from design standards based on safety.</li> <li>▪ Separation from vehicle traffic.</li> </ul> </li> </ol>
<i>Maintain and improve multimodal connections for buses, pedestrians, and bicycles.</i>	Not applicable	<ol style="list-style-type: none"> <li>1. Ability of alternative to improve connections for buses.</li> <li>2. Ability of alternative to improve connections for pedestrians.</li> <li>3. Ability of alternative to improve connections for bicycles.</li> </ol>	
<i>Provide an alternative that is consistent with city planning.</i>	Not applicable	<ol style="list-style-type: none"> <li>1. Is the alternative consistent with the goals and objectives of SH 82 Corridor plans? (If not, why?)</li> <li>2. Is the alternative consistent with City of Glenwood plans? (If not, why?)</li> </ol>	<ol style="list-style-type: none"> <li>1. Consistency with the goals and objectives of SH 82 Corridor plans – describe.</li> <li>2. Consistency with City of Glenwood plans – describe.</li> </ol>

**TABLE 2. EVALUATION CRITERIA AND MEASURES OF EFFECTIVENESS**

Criteria	Level 1	Level 2	Level 3
<b>Measures to Address Project Goals</b>			
<i>Incorporate sustainable elements into the design.</i>	Not applicable	<ol style="list-style-type: none"> <li>1. Is the alternative compatible with local sustainability plans? (yes/no)</li> <li>2. Does the alternative preserve future transportation options? (yes/no)</li> </ol>	<ol style="list-style-type: none"> <li>1. Compatibility with local sustainability plans – describe.</li> <li>2. Ability of alternative to preserve future transportation options – describe.</li> <li>3. Ability of alternative to reduce maintenance costs – describe and include estimated maintenance costs as available.</li> </ol>
<i>Maintain or improve transportation operations in the project area.</i>	Not applicable	1. Relative ability of the alternative to maintain or improve transportation operations in the project area.	<ol style="list-style-type: none"> <li>1. Hours of delay within project area.</li> <li>2. Average travel time on SH 82 within project area.</li> </ol>
Not applicable – these criteria were not used during Level 1 screening.			

## 1.2 ALTERNATIVES DEVELOPMENT AND EVALUATION RESULTS

The remainder of this appendix describes the results of the alternatives evaluation process that culminated in the identification of a Build Alternative for evaluation in this EA. The alternatives evaluation process included three levels of screening that culminated in the identification of a Build Alternative for evaluation in the EA. Level 1 screening primarily focused on selection of an alignment for the Build Alternative. Subsequent screening levels became more focused, and evaluated the following components:

- ❖ Alignments.
- ❖ Cross-sections.
- ❖ Intersections, including improvements to existing intersections near the I-70 interchange area, Glenwood Hot Springs area, and in downtown Glenwood Springs.

In addition, a separate screening process was performed, using the same Purpose and Need and Project Goals, to evaluate pedestrian and bicycle connectivity. As a result of the screening processes, the combination of elements deemed best became the Build Alternative.

The alternatives were laid out on aerial photography and discussed with the SWG, PWG, PLT, and the public.

### 1.2.1 Level 1 Screening (Fatal Flaw Analysis)

Level 1 screening identified alignments and evaluated them based on Fatal Flaws – basically, would they address the Purpose and Need and could they be built? Level 1 screening evaluated whether the proposed alignment would:

- ❖ Meet the Purpose and Need.
- ❖ Not have irresolvable environmental impacts.
- ❖ Not have exorbitant (excessive or unreasonable) costs.
- ❖ Not use unproven technology.

- ❖ Be constructible.
- ❖ Not be part of the No Action Alternative.

To help identify differences between alternatives, the study team began with “families” of alternatives for Level 1, described below:

- ❖ **Alignments.** Options for routing a bridge that connects downtown Glenwood Springs across the Colorado River and I-70 to the historic Glenwood Hot Springs Area. The analysis focused on potential alignments exclusive of number of lanes and other cross-section elements. These included the alignments that landed at Colorado, Grand, Cooper Avenue or 9th Street on the south, and at Laurel Street, Maple, or Pine Street on the north. Figure 3 shows the alignments considered.

The following alignments were screened out for not meeting the fatal flaw criteria:

- ◆ Alignments that didn’t connect to existing streets in downtown (i.e., that connected to alleys, create new alignments) because they would not meet Purpose and Need to provide a connection from downtown Glenwood Springs to the historic Glenwood Hot Springs area.
- ◆ Alignments east of Cooper Avenue and, therefore, east of downtown Glenwood Springs, because it would not meet Purpose and Need to connect downtown to Glenwood Hot Springs Area and I-70. The assumed definition for “downtown” was generally the area bounded by Colorado and Cooper Avenues on the south. Alignments east of Cooper Avenue would also result in considerable impacts to residential areas.
- ◆ Cross below the railroad and, therefore, would not provide a practical and financially realistic alternative, which is an evaluation criterion.
- ◆ Cross the railroad at grade and, therefore, impede traffic flow and not improve public safety (including emergency service response) or reliability as a critical transportation route. These are evaluation criteria for addressing Purpose and Need elements.

### **Relocation Alignment Alternatives**

Throughout the EA process, the study team received input from various stakeholders calling for the consideration of “SH 82 bypass” alignments, which would relocate SH 82. The PWG and PLT did consider proposed relocation alignments and recognized there was a desire by some in the community for rerouting SH 82 onto an alignment different from Grand Avenue. These alignments were screened out during Level 1 Screening for the following reasons:

- ❖ The Grand Avenue Bridge needs to be replaced to address safety and operational problems and funding through the Colorado Bridge Enterprise is specifically dedicated to addressing the state’s poor-rated structures. A relocation of SH 82 is a completely separate transportation issue, and any motivation to study it will be in

- response to traffic and safety on SH 82, as well as local support through the regional transportation planning process. It addresses a different set of problems. The existing poor-rated highway bridge requires replacement to address safety and operational issues. For these reasons, a SH 82 bypass would not improve connectivity from downtown Glenwood Springs with the historic Hot Springs pool area and I-70 or fix the functional and structural deficiencies of the bridge, and therefore would not meet the project Purpose and Need.
- ❖ Relocation of SH 82 is related to mobility, whereas the Grand Avenue Bridge project is needed to address safety and operational problems of the bridge. Therefore, a bypass would not address the bridge's functional and structural deficiencies or improve public safety (including emergency service response), as defined by the project Needs and MOEs.
  - ❖ The 2010 *SH 82 Corridor Optimization Plan* (City of Glenwood Springs, Colorado Department of Transportation, Garfield County, Roaring Fork Transportation Authority, 2010) indicates the need for four lanes on the Grand Avenue Bridge even if a relocated SH 82 were to be constructed. Improved connectivity between the Hot Springs Pool area and downtown Glenwood Springs is important to the vitality of Glenwood Springs and is being addressed by the Grand Avenue Bridge project.
  - ❖ Relocating SH 82 would cost five to ten times as much as the available funding for the Grand Avenue Bridge project. Furthermore, there is no funding source. The Grand Avenue Bridge project is being funded by the Colorado Bridge Enterprise (CBE). Therefore, it would not be a practical and financially realistic alternative as defined by the project MOEs.

The replacement or rehabilitation of the Grand Avenue Bridge would not preclude the consideration of a SH 82 relocation in the future as part of another study. Indeed, the *Glenwood Springs Comprehensive Plan* (City of Glenwood Springs, 2011) calls for the continued pursuit of both the replacement of the Grand Avenue Bridge and planning for a bypass.

- ❖ **Cross-Sections.** Items and dimensions that would be part of a new or rehabilitated bridge cross-section. These included number of lanes, lane widths, sidewalks or bike lanes, shoulders, barriers, turn lanes, and medians.  
  
Cross-sections on SH 82 with only two through lanes were screened out because they would not meet Purpose and Need to improve connectivity.
- ❖ **Vertical Alignments.** Options to raise or lower vertical profile compared to existing, which consisted of crossing the railroad above grade, at grade, or below grade.  
  
Vertical alignments above grade were carried forward. The following vertical alignments were screened out for not meeting the fatal flaw criteria:
  - ◆ Alignments that cross the railroad at grade because they would not meet Purpose and Need to improve connectivity, because SH 82 would be subject to delay caused by train crossings; and they almost certainly would not be allowed by railroad or by Colorado Public Utilities Commission (not constructible).

- ◆ Alignments that cross below the railroad because they would have exorbitant costs, and irresolvable impacts, including potential for flooding.

Figure 3 shows two-way traffic alignments that were evaluated, where north- and southbound traffic would travel on parallel, adjacent lanes. All of these alignments were carried forward into Level 2 screening.

**FIGURE 3. LEVEL 1 TWO-WAY ALIGNMENTS CARRIED FORWARD TO LEVEL 2 SCREENING**

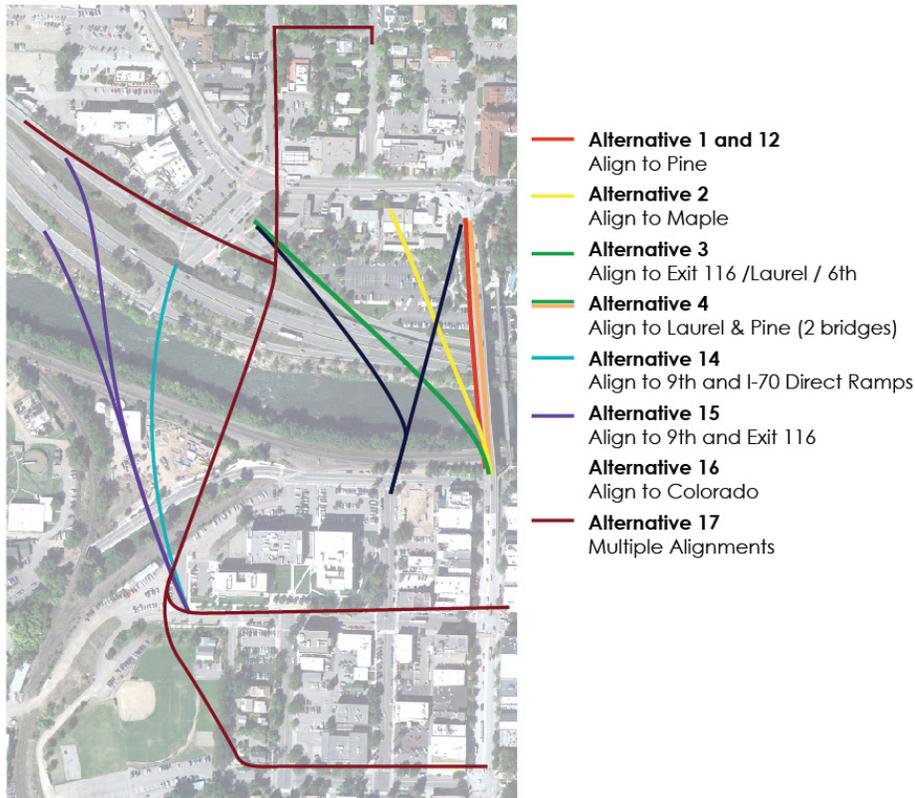


Figure 4 shows one-way couplet alternatives using Colorado Avenue and Grand Avenue, where north- and southbound traffic would travel on separate, non-adjacent lanes. Northbound traffic would use Grand Avenue to access the bridge. Southbound traffic would touch down at Colorado Avenue upon crossing the river, accessing Grand Avenue using either 8th Street or 9th Street. All of these alignments were carried forward into Level 2 screening.

**FIGURE 4. ONE-WAY COUPLET (PAIRED) ALIGNMENTS CARRIED FORWARD TO LEVEL 2 SCREENING: GRAND AVENUE AND COLORADO AVENUE**

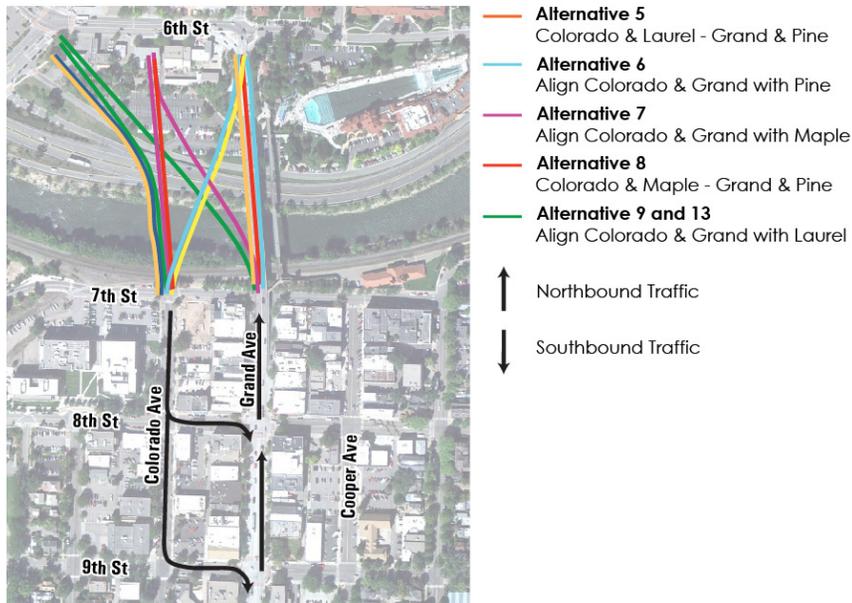
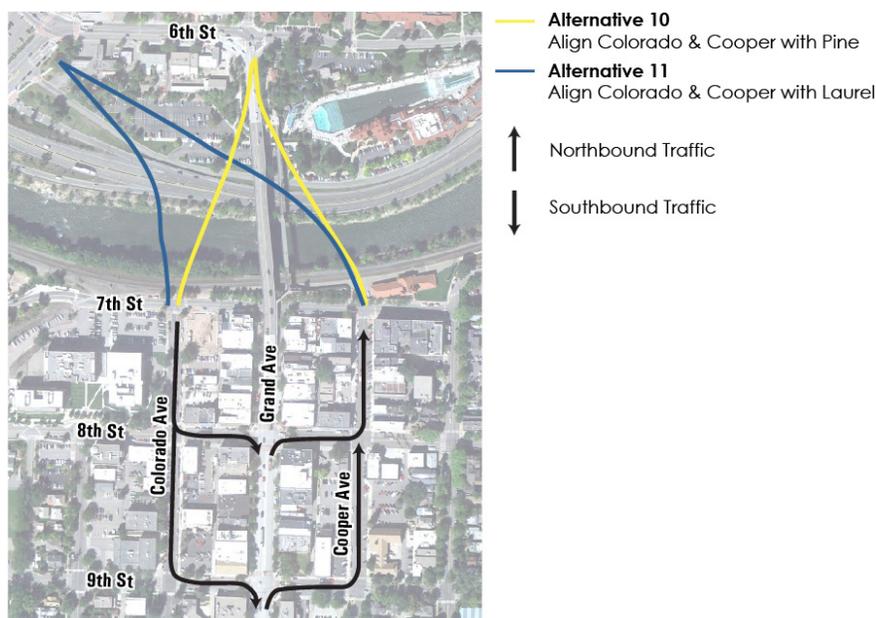


Figure 5 shows one-way couplet alternatives using Cooper Avenue and Colorado Avenue, where north- and southbound traffic would travel on separate, non-adjacent lanes. Northbound traffic would use Cooper Avenue to access the bridge. Southbound traffic would touch down at Colorado Avenue and access Grand Avenue as described above. All of these alignments were carried forward into Level 2 screening.

**FIGURE 5. ONE-WAY COUPLET (PAIRED) ALIGNMENTS CARRIED FORWARD TO LEVEL 2 SCREENING: COOPER AVENUE AND COLORADO AVENUE**



### 1.2.2 Level 2 Screening (Comparative Analysis)

Level 1 screening resulted in 17 alignments that were carried forward to Level 2 screening, including the Rehabilitation Alternative (Alternative 12) and alternatives identified by the public. Level 2 of the screening process involved a qualitative comparison of alternatives that were further developed and refined after the Level 1 screening. In addition to alignments, Level 2 screening also evaluated various cross-sections and intersections. Level 2 screening eliminated alternatives that did not meet the project needs and goals, or did not rank as well as other alternatives. In general, evaluations were based on MOEs where relevant differences between alternatives could be determined. Evaluations were based on the information available at that time for each of the criteria.

During Level 2 screening, the study team determined that additional information was needed about some of the evaluation criteria before alternatives could be evaluated and screened. Therefore, Level 2 screening was split into two sub-levels, 2A and 2B. Those alternatives that were not screened at Level 2A were taken into Level 2B for more detailed evaluation.

#### Rehabilitation Alternative

The Rehabilitation Alternative would fix the existing bridge by repairing or replacing many of the known functional and structural deficiencies as shown on Figure 6. However, it was determined that some deficiencies could not be fixed without rebuilding large parts or all of the bridge. For example, while the bridge could be widened to accommodate standard lane widths on the bridge, the piers that create safety hazards for I-70 traffic and river runners could not be replaced without taking out the piers and, therefore, the bridge. As a result, the Rehabilitation Alternative would still result in a functionally obsolete bridge.

**FIGURE 6. IMPROVEMENTS PROPOSED UNDER REHABILITATION ALTERNATIVE**



Further, rehabilitation of the bridge might not actually save money. Because so much of the bridge needs work, the rehabilitation would be a massive undertaking, requiring extensive analysis, design, and major reconstruction. It is also likely that the rehabilitation might uncover other needs, making the costs highly variable.

The Rehabilitation Alternative would have similar disruptive traffic impacts during construction to all the build alternatives. Replacing parts of the deck and some of the girders would require long-term lane closures or even full bridge closures when replacing critical structural elements.

Under the Rehabilitation Alternative, the bridge would still stand on its original piers and foundations. Therefore, it would have a shorter design life (approximately 30 years) than a new bridge, which would have a design life of 75 years.

For these reasons, the Rehabilitation Alternative did not compare favorably to other build alternatives and was screened out.

### **Alignment Screening**

With input from the various stakeholders and public, the study team performed evaluation and screening on 17 alignment variations.

At different points in the alternatives process, stakeholders proposed additional alignment alternatives. The PWG determined that these merited a Level 1 Fatal Flaw Screening and a comparative Level 2 evaluation. Figure 7 shows all alignments considered, and the results of their evaluation.

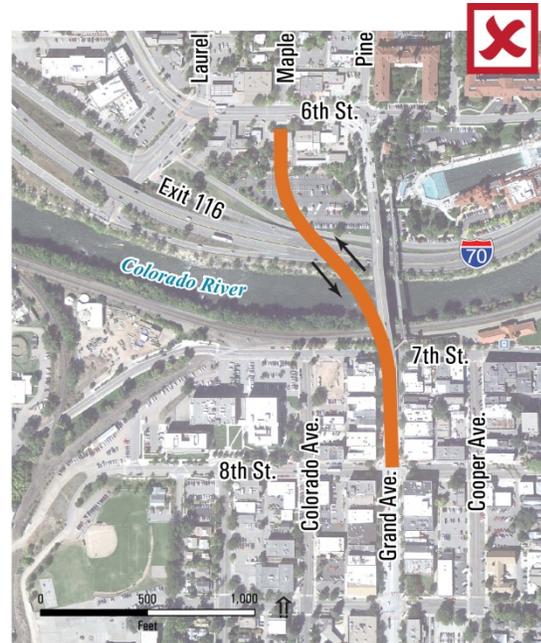
FIGURE 7. RESULTS OF LEVEL 2A SCREENING



*Alternative 1 - Replacement of the bridge on the existing alignment, landing at Grand Avenue on the south and Pine Street on the north.*

**CARRIED FORWARD**

- ❖ Least amount of right-of-way needed, least amount of physical and economic impacts to private property
- ❖ Least amount of environmental impact
- ❖ Accelerated bridge construction (ABC) techniques could make this option less disruptive to traffic flow than couplet construction
- ❖ Better aesthetic potential than alternatives with two bridges



*Alternative 2 - Replacement of the bridge with a single bridge, landing at Grand Avenue on the south and Maple on north.*

**SCREENED OUT**

- ❖ More right-of-way impacts than Alternative 1, resulting in more physical and economic impacts to private property, yet no improvement in traffic flow and transportation operations

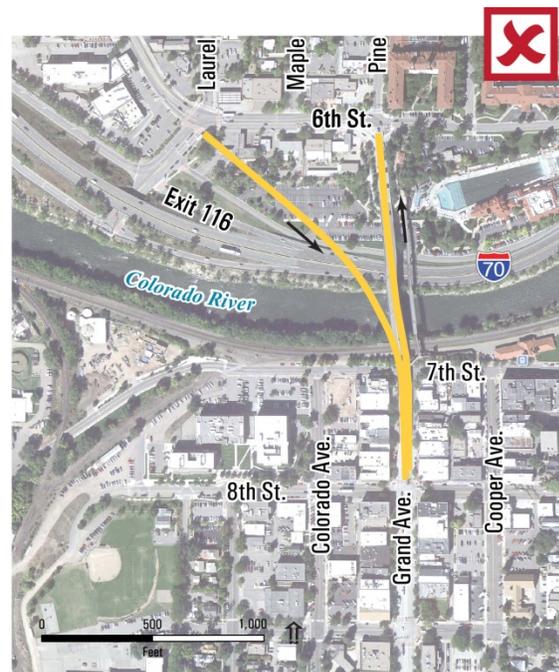
FIGURE 7. RESULTS OF LEVEL 2A SCREENING



*Alternative 3 - Replacement of the bridge with a single bridge landing at Grand Avenue on the south and 6th Street/Laurel Street on north.*

**CARRIED FORWARD**

- ❖ Likely improves traffic flow and transportation operations near Exit 116
- ❖ Improves 6th Street multimodal connections
- ❖ Relatively good phasing, most of bridge can be built off site, improving ability to construct and minimizing costs and construction impacts to businesses, pedestrians and cyclists, and visitors



*Alternative 4 - Replacement of the bridge with two one-way bridges landing at Grand Avenue on the south and Pine and 6th Street/Laurel Street on north.*

**SCREENED OUT**

- ❖ No improved connection to I-70 (project purpose to provide connectivity from the Roaring Fork Valley to Glenwood Hot Springs area)
- ❖ Partial right-of-way impact to Shell station, resulting in more physical and economic impacts to private property

FIGURE 7. RESULTS OF LEVEL 2A SCREENING



*Alternative 5 - Replacement of the bridge with two one-way bridges landing at 6th Street/Laurel Street and Pine on north and Colorado Avenue and Grand on south.*

**SCREENED OUT**

- ❖ Steep climbing grade (6%) for inbound alignment to get over I-70 and railroad is difficult to construct and design to standards
- ❖ More environmental impacts
- ❖ More transportation operations impacts
- ❖ April 4 meeting and other public input showed limited support for couplet alternatives
- ❖ Partial right-of-way impact to Shell station, resulting in more physical and economic impacts on private property



*Alternative 6 - Replacement of the bridge with two one-way bridges landing at Pine on north and Colorado Avenue and Grand on south.*

**SCREENED OUT**

- ❖ Worse traffic flow with more transportation operations impacts
- ❖ Increased traffic in residential areas on Colorado Avenue, resulting in increased environmental (historic, scenic, noise) impacts

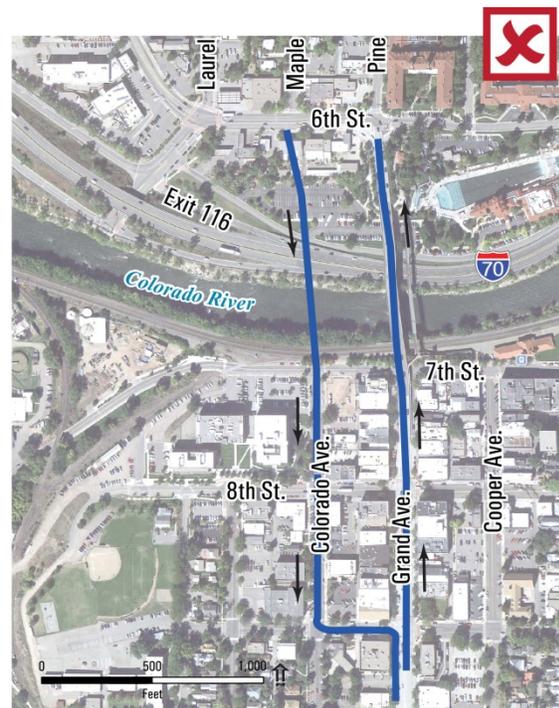
FIGURE 7. RESULTS OF LEVEL 2A SCREENING



*Alternative 7 - Replacement of the bridge with two one-way bridges landing at Maple on north and Colorado Avenue and Grand on south.*

**SCREENED OUT**

- ❖ Greater transportation operations impacts
- ❖ Increased traffic in residential areas on Colorado Avenue resulting in increased environmental (historic, scenic, noise) impacts and greater transportation operations impacts (increased congestion on Colorado Avenue and 9th Street)
- ❖ April 4 meeting and other public input showed limited support for couplet alternatives



*Alternative 8 - Replacement of the bridge with two one-way bridges landing at Maple and Pine on north and Colorado Avenue and Grand on south.*

**SCREENED OUT**

- ❖ Screened out for the same reasons as Alternative 7

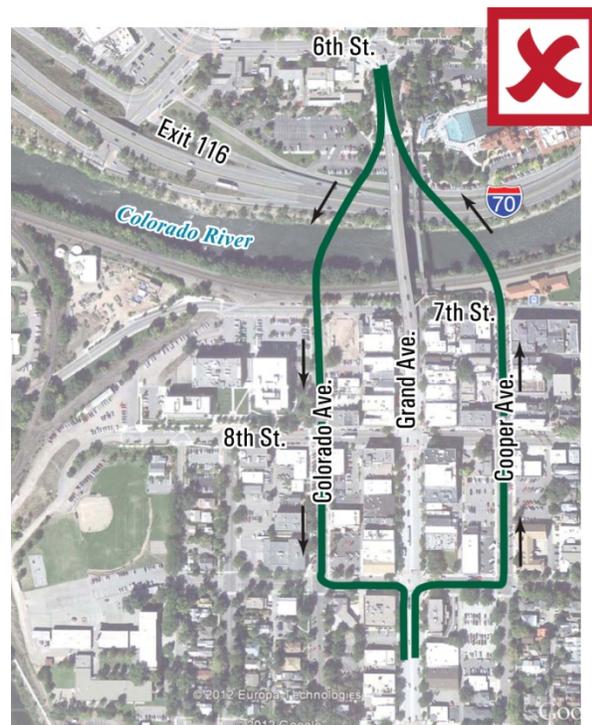
FIGURE 7. RESULTS OF LEVEL 2A SCREENING



*Alternative 9 - Replacement of the bridge with two one-way bridges; landing at 6th Street/Laurel Street on north and Colorado Avenue and Grand on south.*

**SCREENED OUT**

- ❖ Steep climbing grade (6%) is difficult to construct and design to standards
- ❖ Similar impacts to Alternatives 6-8
- ❖ Likely the 2nd highest cost of all the alternatives (Alternative 11 appears highest)
- ❖ April 4 meeting and other public input showed limited support for couplet alternatives



*Alternative 10 - Replacement of the bridge with two one-way bridges; landing at Pine on north and Colorado Avenue and Cooper Avenue on south.*

**SCREENED OUT**

- ❖ Both directions of traffic on SH 82 have S-curves, worst for traffic flow and transportation operations impacts
- ❖ Substantial business impacts on Cooper Avenue from increased traffic
- ❖ Concerns for moving SH 82 closer to neighborhoods on both east and west; increased traffic in residential areas
- ❖ Need to remove existing pedestrian bridge and rebuild or provide links to road bridges resulting in no improvement to multimodal connections

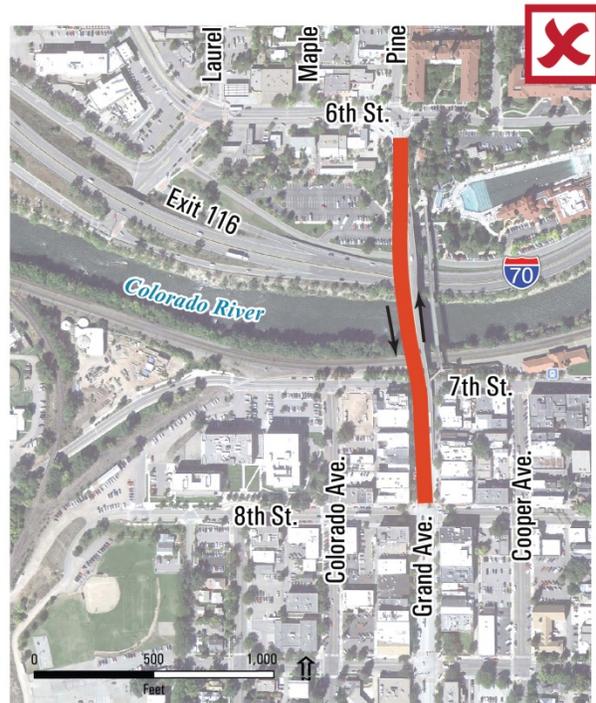
FIGURE 7. RESULTS OF LEVEL 2A SCREENING



*Alternative 11 - Replacement of the bridge with two one-way bridges; landing at 6th Street/Laurel Street on north and Colorado Avenue and Cooper Avenue on south.*

**SCREENED OUT**

- ❖ Screened out for same reasons as Alternative 10 plus steep grade and highest cost



*Alternative 12 - Rehabilitation of the Grand Avenue Bridge.*

**SCREENED OUT**

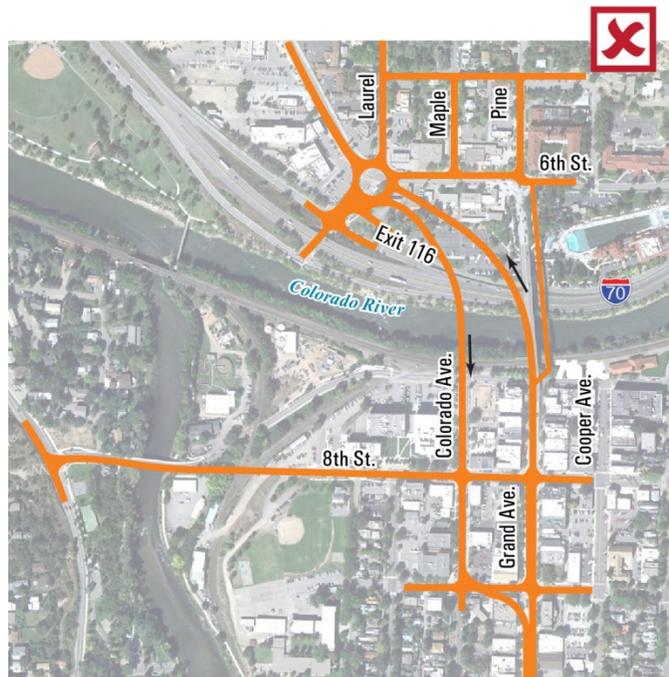
- ❖ Alternative 12 was renamed the Rehabilitation Alternative, discussed previously under Section 1.2.2 Level 2 Screening (*Comparative Analysis*).

**FIGURE 8. ALTERNATIVES SUBMITTED BY STAKEHOLDERS**

**Alternative 13**

This alternative was submitted by a citizen. It was numbered as 13 and fully evaluated. This alternative is very similar to Alternative 9. Some key differences between the two include:

- ❖ It would have smoother curves from Colorado Avenue to Grand Avenue, which could improve traffic flow downtown.
- ❖ It would add an extension of 8th Street under the railroad “wye” area to connect to the existing bridge over the Roaring Fork River. This connection is part of the City’s transportation plan. It is uncertain, but unlikely, that the funding source for the Grand Avenue Bridge could also fund the permanent 8th Street connection.



**SCREENED OUT**

- ❖ Significantly higher costs than Alternative 9 because of the additional property impacts
- ❖ Steep grades are difficult to construct and design to standards
- ❖ Additional physical and economic impacts to private property

**Alternative 14**

This alternative was submitted by a citizen. It was numbered as 14 and fully evaluated. This Alternative would connect to the I-70 interchange on the north and downtown at 9th Street, similar to Alternative 14. I-70 would be lowered to about the elevation of existing River Road and the ramp to go under the new bridge, and a new urban interchange configuration would be constructed.

**SCREENED OUT**

This alternative would still require the reconstruction of the Grand Avenue Bridge because the new ramps at the interchange would need to be extended beyond the existing piers for the bridge, and the problems with the existing bridge would still need to be addressed.



**FIGURE 8. ALTERNATIVES SUBMITTED BY STAKEHOLDERS**

Because Alternative 14 would still require and result in the replacement of the Grand Avenue Bridge, the additional connectivity provided by Alternative 14 would be redundant.

Alternative 14:

- ❖ Has higher costs and results in greater impacts to downtown properties.
- ❖ Has greater potential for Section 4(f) impacts to both historic and park resources at the railroad and school, respectively.

In addition, the new connection with Exit 116 would not meet project Purpose to provide connectivity from downtown Glenwood Springs to Glenwood Hot Springs area.

**Alternative 15**

This alternative was submitted by a citizen. It was numbered as 15 and fully evaluated. This alternative would provide a direct connection to downtown to and from I-70 to the west, via one bridge or a pair of bridges connecting to either 8th Street or 9th Street near Bolitho Elementary School. It would almost certainly provide better traffic flow between 9th Street and the west side of I-70.

Because a new bridge would have to pass over the railroad “wye”, the alignment could not descend in time to connect to 8th Street, requiring it to touch down closer to 9th Street.

**SCREENED OUT**

Does not meet the project’s Purpose and Need because:

- ❖ Higher costs, greater impacts to downtown properties; potential impacts to historic and park resources.
- ❖ Does not address the functional and structural deficiencies of the Grand Avenue Bridge, which would still be in use for traffic traveling to or from the east on I-70. And, past studies conducted by CDOT and the City of Glenwood Springs have determined that Grand Avenue Bridge needs four lanes to accommodate traffic demand.
- ❖ The two new bridge structures to the west by themselves do not provide connectivity between downtown to the Hot Springs area. Because this would not address the Purpose of the project, the Grand Avenue Bridge would still require replacement. Combined with a replacement of the Grand Avenue Bridge these, two new structures would be redundant.



**FIGURE 8. ALTERNATIVES SUBMITTED BY STAKEHOLDERS**

*Alternative 16*

This alternative was proposed at the Independent Peer Review workshop held from June 26 to 28, 2012. The alternative would use the Colorado Avenue alignment on the south side for two-way traffic. The concept would include a 4-lane cross-section on Colorado Avenue to 9th Street, and S-curves at 9th Street to Grand Avenue. There are two options on the north side – connecting at 6th Street and Laurel Street, or connecting at 6th Street and Maple. The conceptual designs for these options are shown at right.

**SCREENED OUT**

Compared to alternatives on the Grand Avenue alignment, this alternative:

- ❖ Has higher costs.
- ❖ Has greater potential for community and historic impacts and historic impacts along Colorado Avenue (similar to Alternatives 6-8).
- ❖ Does not address Grand Avenue Bridge issues because existing bridge would remain in place.
- ❖ Does not address Purpose and Need.



**FIGURE 8. ALTERNATIVES SUBMITTED BY STAKEHOLDERS**

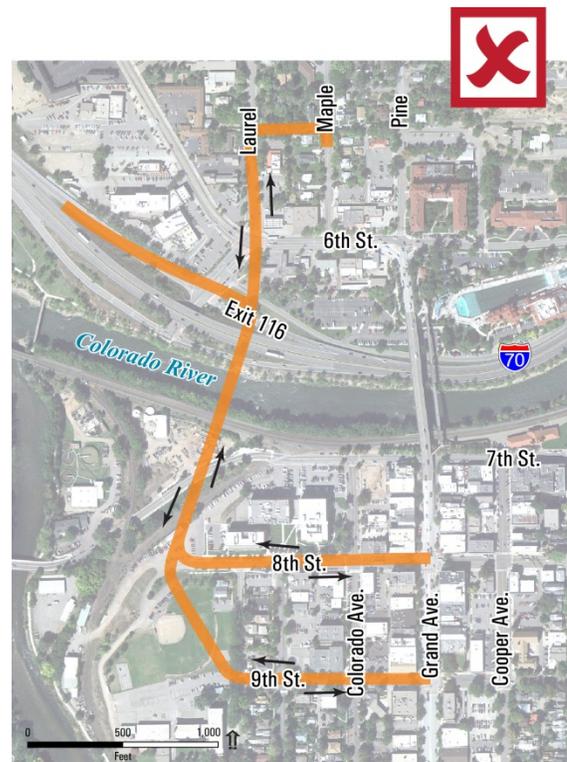
*Alternative 17*

This alternative was submitted by a citizen. It was numbered as 17 and fully evaluated. The alternative would remove the need for the Grand Avenue Bridge to accommodate SH 82 traffic. This alternative has four movements that overlap each other and require various bridges and connections that do not exist today.

**SCREENED OUT**

Compared to alternatives on the Grand Avenue alignment, this alternative:

- ❖ Has higher costs and results in greater impacts to downtown properties.
- ❖ Potential to result in more noise and air quality impacts than other alternatives.
- ❖ Has greater potential for Section 4(f) impacts to both historic and park resources at the railroad and school, respectively.
- ❖ Additional traffic along this route could have negative effects on the Safe Routes to School route along 9th Street.
- ❖ Has much more elevated structure through residential areas, which is inconsistent with community desires.
- ❖ Due to the total bridge area, is not considered to be as aesthetically appropriate.
- ❖ Has very circuitous traffic routes.
- ❖ Would require more right-of-way.
- ❖ Does not meet Purpose and Need as well as other alternatives because of more out-of-direction travel.
- ❖ Removes access from several properties along Laurel Street.



### **Alignments Summary**

In general, during Level 2 screening, alternatives that did not compare as favorably to other build alternatives at meeting the project Purpose and Need and other project criteria were screened out. For example:

- ❖ The Rehabilitation Alternative was screened out because some major issues cannot be fixed without replacing large parts or all of the bridge. This alternative may actually cost more and have more construction impacts to traffic than a new bridge replacement.
- ❖ Alternatives 10 and 11 that used Cooper Avenue were screened out because they would have additional negative impacts and would provide worse traffic operations than Grand Avenue alternatives.
- ❖ Alternatives 2 and 7 that landed at Maple Avenue on the north side were screened out because they would not provide traffic benefits and would have additional right-of-way impacts.
- ❖ All couplet alternatives (Alternatives 4, 5, and 6) were screened out because these alternatives would have many identified impacts as a result of adding new traffic on Colorado Avenue with few resulting benefits.
- ❖ Alternatives 5, 8, and 9 using two one-way bridges were screened out because of steep grades, worsened traffic operations, and additional impacts compared to other alternatives
- ❖ Alternatives submitted by stakeholders were screened out for various reasons, including higher costs, more environmental impacts, and failure to address the Purpose and Need (Alternatives 13, 14, 15, 16, and 17 screened out).

### **Cross-Sections**

Several cross-section options for the Grand Avenue Bridge were further developed and evaluated in Level 2 screening. The options and the results of the evaluations are presented in Figure 9.

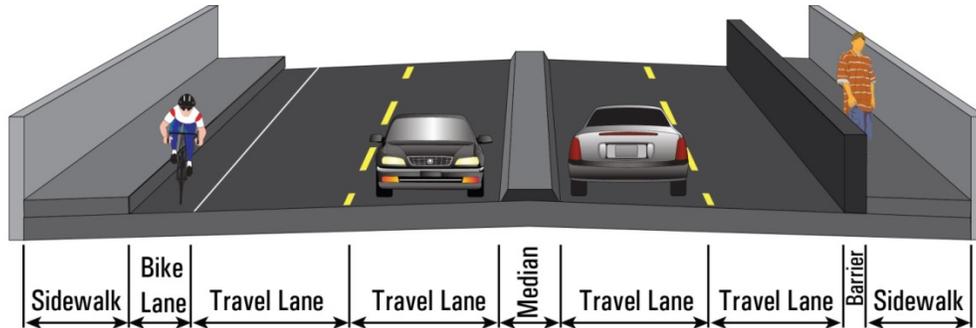
### **Intersections**

Different alignment options would touch down in different locations on the north side, which, in turn, led to options for intersection improvements or reconfigurations. Therefore, each alignment alternative in Level 2 had corresponding intersections options that were evaluated both north and south of the bridge landings.

For bridge alignments landing at Pine Street on the north (1, 6, and 10), only minor modifications to the existing 6th Street and Pine Street intersection (recently upgraded by CDOT) were considered.

For Alternative 3, three intersection options were considered during Level 2. Intersection Options A, B, and C are shown in Figure 10.

FIGURE 9. GRAND AVENUE BRIDGE CROSS-SECTIONS EVALUATED IN LEVEL 2



Cross-Section Element	Screened Out <input checked="" type="checkbox"/>	Carried Forward <input checked="" type="checkbox"/>
Number of Travel Lanes	<b>Two lanes</b> – would not improve connectivity <b>Six lanes</b> – no plans to widen Grand Avenue on either end of the bridge	<b>Four lanes</b>
Lane Width	<b>10-foot lanes</b> – would not meet design criteria, too narrow	<b>11-foot</b> <b>12-foot</b>
Median	<b>Barriers</b> – inconsistent with the context and would create sight distance issues	<b>Striped (painted)</b> <b>Raised</b>
Sidewalks	<b>Both sides</b> – additional width, additional impacts downtown; notably, narrower sidewalks along storefronts, and visual impacts	<b>No attached sidewalk</b>
Special Lanes	<b>Bike, Reversible, Transit, Emergency</b> – none existing or planned in study area, meaning lanes on the bridge would be isolated	<b>One side</b> <b>None</b>

FIGURE 10. 6th Street AND Laurel Street INTERSECTION OPTIONS A, B, AND C



Option A would carry SH 82 traffic directly from the I-70 interchange to the bridge; would include local circulation via two signals and a roundabout at 6th Street and Laurel Street.

Option A was **CARRIED FORWARD** with Alternative 3 because it:

- ❖ Provides better traffic efficiency than Option B.
- ❖ Moves all SH 82 traffic away from 6th Street and pedestrian corridor.
- ❖ Has fewer impacts/detours during construction compared to Option B.
- ❖ Option A also allows for variations that could further improve pedestrian and vehicle access and operations.

FIGURE 10. 6th Street AND Laurel Street INTERSECTION OPTIONS A, B, AND C



*This option would create a large roundabout.*



*This option would provide an overpass ramp for Grand Avenue to I-70 westbound traffic, and provide a roundabout for other movements.*

Option B was **SCREENED OUT** because:

- ❖ Having all outbound traffic go through the roundabout would require three lanes, and heavy SH 82 traffic would make the entire roundabout inefficient.
- ❖ Public stated concerns about pedestrian traffic at large roundabout.
- ❖ Pedestrian signals and metering signals would be required on most legs of roundabout.
- ❖ Would have more difficult and impactful construction phasing and detours than Option A.

Option C was **SCREENED OUT** because:

- ❖ It is likely the most expensive of all the options.
- ❖ Has an obvious traffic flow benefit, but Option A best meets traffic flow needs.
- ❖ There was negative public input about using a two-level interchange with flyover for Glenwood Springs.

### **Independent Peer Review**

At the end of Level 2 Screening, CDOT held an Independent Peer Review June 26 to 28, 2012. The review was facilitated by a Certified Value Specialist and followed a format similar to a Value Engineering Workshop. The participants included seven professionals with expertise in roadway, structural, traffic, bridge aesthetics, construction methods, and local issues who had not been involved in developing the alternatives. The participants reviewed the alternatives screening that had occurred, reviewed Alternatives 1 and 3, and developed one new alternative that underwent Level 1 and Level 2 screening as Alternative 16. Discussion focused on ideas and recommendations for those alternatives. The outcomes of the workshop were:

- ❖ Confirmation that Alternatives 1 and 3 appear viable and compare favorably to other alternatives.
- ❖ Generation of two new alternative concepts that the PWG evaluated, presented as Alternative 16 in Figure 8.
- ❖ Ideas to consider and use in refining alternatives about structure types, constructability, bridge aesthetics, traffic flow, pedestrian/bicycle access, utilities, and future development opportunities.

### 1.2.3 Level 3 Screening (Detailed Qualitative Evaluation)

Level 3 screening involved more detailed qualitative evaluation on the two primary remaining alignment alternatives – 1 and 3. This analysis comparably rated each of the alternatives based on MOEs developed for each of the project’s Needs and Goals, which can be referenced in Table 2. More detailed than the preceding Level 2 screening, this step eliminated alternatives that did not meet the project needs and goals as well as other criteria. Similar to Level 2, Level 3 considered the MOEs where discernible and relevant differences between alternatives could be determined.

Level 3 alternatives included the alignment alternatives, as well as the intersection and cross-section options that remained after Level 2 screening.

The study team refined the options associated with Alternatives 1 and 3, including intersection alternatives on both the north and south ends and pedestrian and bicycle connections. Also, Level 3 introduced the evaluation of different bridge types for the Grand Avenue Bridge.

#### Alignments

After developing Alternatives 1 and 3 to greater detail, the study team conducted outreach to identify the public’s preferences on these bridge alignments and design options (see Chapter 5.0 *Agency Coordination and Public Involvement of the SH 82 Grand Avenue Bridge*

*Environmental Assessment* for details on public involvement). On August 22, 2012, approximately 90 people attended a Public Open House and 30 people participated in a Stakeholder Working Group workshop. At the Public Open House, more than half of the attendees submitted comment sheets, which showed a clear preference for Alternative 3 over Alternative 1. Alternative 3 was favored almost 7 times more than Alternative 1 for traffic/access. Alternative 3 was favored about 6 times more than Alternative 1 for visual impacts. Alternative 3 was shown as a preference by more than a 2 to 1 margin for bike/pedestrian, and for land use, attendees favored Alternative 3 approximately three times more than Alternative 1. This is consistent with feedback received at previous Public Open Houses, the Stakeholder Working Group workshop, and the multiple meetings that were held during the screening process.

#### **PUBLIC INPUT**

When asked how Alternatives 1 and 3 compared for various criteria, attendees at a public open house overwhelmingly **favored Alternative 3.**

Subsequently, the study team completed the evaluation of the remaining two alternatives. The PWG met to compare the two alternatives against previously established criteria, taking into consideration additional technical evaluation and public input. The evaluation process was reviewed by the PLT, which concurred that the PWG had appropriately evaluated the alternatives against the project criteria and had considered public input when determining which alignment best met those criteria. Table 3 summarizes how the two alternatives compared against the project criteria.

**TABLE 3. ALIGNMENT ALTERNATIVES 1 AND 3 COMPARISON**

Criteria	Comparison
Purpose and Need: Improve connectivity between downtown and the Roaring Fork Valley, with the historic Hot Springs Pool area, and I-70	Both alternatives improve the connectivity. Alternative 1 provides connectivity more consistent with existing conditions. Alternative 3 provides improved connectivity particularly between downtown and the Roaring Fork Valley with I-70.
Purpose and Need: Address bridge deficiencies to improve safety and reliability	Both alternatives fix the problems with the bridge to improve safety and reliability.
Minimize environmental impacts (scenic, aesthetic, historic, natural resources)	Both have opportunities to incorporate aesthetics into the final design. Alternative 3 appears to impact fewer historic properties.
Harmony with the community	Both alternatives have a similar ability to address the project Context Statement, satisfy the project Vision, and provide a Context Sensitive Solution.
Practical and financially realistic	Both are financially feasible since the bridge replacement is funded. Both are practical and can be constructed with equal bridge life. Alternative 1 is estimated to have a lower cost.
Reduce and minimize construction impacts (businesses, traffic, bicyclists/pedestrians, visitors)	Overall construction impacts for Alternative 3 would be fewer because some of the structure over the river and the north side of the river can be built off site without directly affecting Grand Avenue traffic, keeping all four lanes open on SH 82 until just before the full closure. This reduces the amount of traffic delay, congestion, and noise; and the amount of time required for detours and closures.
Minimize private property impacts (physical, economic)	Alternative 3 requires more property acquisitions. Alternative 1 results in fewer economic changes to 6th Street businesses.
Improve multimodal connections for buses, pedestrians, and bicycles	Pedestrian connections and safety are better under Alternative 3 because sidewalks are on lower-traffic local streets with easier connections between the Hot Springs Pool area and US 6 businesses — primarily lodging. Bike connections are improved under both alternatives across the bridge, but they are better under Alternative 3 for local connections along US 6 and 6th Street. Bus connections are similar for both alternatives.
Consistency with City planning	City plans had not previously considered a new alignment for the Grand Avenue bridge. Feedback from businesses and affected stakeholders indicates a preference for Alternative 3.
Incorporate sustainability (local sustainability plans, future transportation options, maintenance costs)	Neither alternative would preclude future transportation improvements to local facilities. Both are consistent with objectives stated in the City's Comprehensive Plan. Maintenance costs of the entire system are lowered similarly for both alternatives.
Maintain or improve transportation operations	By separating SH 82 through traffic from local traffic north of I-70, Alternative 3 shows a substantial improvement in traffic operations in the study area by reducing overall delay.

The evaluation resulted in a recommendation that the Alternative 3 alignment be further developed and evaluated through the EA process. Alternative 1 was eliminated because it would impact more historic properties and have more construction impacts, more traffic delay, and fewer benefits related to bike and pedestrian connections compared to Alternative 3. As illustrated in Figure 11, Alternative 3 touches down on the north side of the river near the 6th Street and Laurel Street intersection and provides a direct connection to I-70, Exit 116. It also removes through SH 82 traffic from 6th Street and provides a new connection to US 6.

**6th Street/Laurel Street Intersection Options**

During Level 3 evaluation, the study team refined the intersection options associated with alignment Alternative 3.

In addition to Option A, which was carried forward from Level 2, the study team developed two additional options that were designed to avoid or minimize impacts or provide better operations, connectivity, or access. These included an option to provide access to Pine Street via a T-intersection on the bridge (Option D) and a variation of Option A that included signals instead of the roundabout (Option E). The Independent Peer Review resulted in the development of two other options that were evaluated and screened out early in Level 3 Screening – an elongated double-roundabout option (Option F) and a “diverging diamond” style intersection (Option G). These five options and the results of the screening process are displayed in Figure 11.

**FIGURE 11. RESULTS OF LEVEL 3 SCREENING**

*Alternative 1*

Single bridge at existing location aligned to Pine. **SCREENED OUT**



*Alternative 3*

Single bridge aligned to Exit 116/Laurel Street/6th Street **CARRIED FORWARD**



After screening out the other options, the study team evaluated Options A (roundabout) and E (signal) in greater detail because of their ability to reduce impacts and improve multimodal operations. These options are illustrated in Figure 12. This resulted in additional design detail considerations for these options and in further refinements to Option A. This process resulted in the selection of Option A to be part of the Build Alternative. The detailed evaluations of Options A and E are included in Table 4.

**FIGURE 12. 6th Street AND Laurel Street INTERSECTION OPTIONS**

*Option A - Roundabout at 6th Street & Laurel Street, signal at Laurel Street extension and Grand Avenue Bridge*

**CARRIED FORWARD**

Evaluation details are in Table 4.



*Option D - Signal at 6th Street & Laurel Street, T-intersection on the bridge near existing bridge alignment to provide access to 6th*

**SCREENED OUT**

The Level 3 evaluation resulted in the elimination of Option D for the following reasons:

- ❖ Higher costs.
- ❖ More visual impacts.
- ❖ More out-of-direction travel.
- ❖ Less support from stakeholders.
- ❖ More traffic adjacent to pedestrian and bicycle movements.

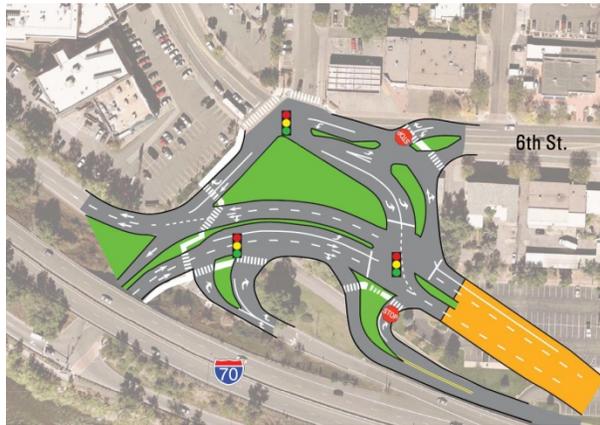


FIGURE 12. 6th Street AND Laurel Street INTERSECTION OPTIONS

*Option E - Signal at 6th Street & Laurel Street, signal at Laurel Street extension and Grand Avenue Bridge*

**SCREENED OUT**

Evaluation details are in Table 4.



*Option F - Roundabout at 6th Street & Laurel Street with "1/2" roundabout for local access east of Laurel Street*

**SCREENED OUT**

The Level 3 evaluation resulted in the elimination of Option F for the following reasons:

- ❖ Operations no better than Option A.
- ❖ Potential directional confusion with two adjacent roundabouts.

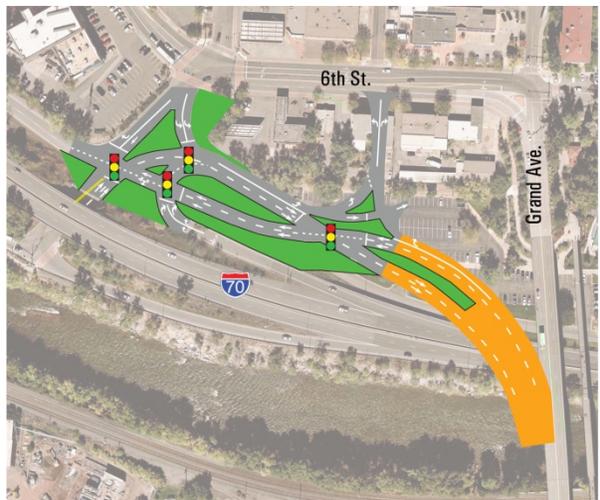


*Option G - Diverging Diamond style intersection for movements to/from I-70*

**SCREENED OUT**

The Level 3 evaluation resulted in the elimination of Option G for the following reasons:

- ❖ The traffic flow/capacity does not work when the two directions of SH 82 traffic cross each other.
- ❖ Concerns about wrong-way traffic movements, non-intuitive traffic movements.



**TABLE 4. DETAILED EVALUATION OF INTERSECTION OPTIONS A AND E**

Evaluation Criteria	Roundabout (Revised 3A)	Signalized Intersection (3E)
<p><b>Minimize environmental impacts to scenic, aesthetic, historic, and natural resources. Relative effect on environmental resources, including:</b></p> <ul style="list-style-type: none"> <li>▪ Historical resources</li> <li>▪ Parks and recreation resources</li> <li>▪ Visual / aesthetics</li> <li>▪ Water and aquatic resources</li> <li>▪ Noise and air quality</li> </ul>	<ul style="list-style-type: none"> <li>▪ Roundabout provides opportunities to modify travel behavior and provide enhanced aesthetics.</li> <li>▪ Reduces noise and air impacts by limiting stopping and idling at intersection</li> </ul>	<p>Signalized intersection consistent with current conditions</p>
<p><b>Is the project in harmony with the community?</b></p> <ul style="list-style-type: none"> <li>▪ Ability of the alternative to provide a CSS</li> <li>▪ Ability of the alternative to address the Project Context Statement</li> <li>▪ Ability of the alternative to satisfy the Project visioning</li> </ul>	<ul style="list-style-type: none"> <li>▪ Reduces right-of-way acquisition</li> <li>▪ Provides a contextually sensitive entry treatment to hotel district</li> <li>▪ Provides a design focal point for redevelopment of 6th Street</li> </ul>	<p>Requires additional right-of-way acquisition</p>
<p><b>Provide a practical and financially realistic alternative.</b></p> <ul style="list-style-type: none"> <li>▪ Relative cost of the alternative</li> <li>▪ Relative ability to construct</li> <li>▪ Relative bridge life</li> </ul>	<ul style="list-style-type: none"> <li>▪ Reduces cost of signal maintenance and operations over the life of the project</li> <li>▪ Trail underpass is shorter (lower cost)</li> </ul>	<p>6th Street and Laurel Street intersection lower cost and easier to construct – uses existing roadway for much of the intersection</p>
<p><b>Reduce and minimize construction impacts to the businesses, transportation users, and visitors.</b></p> <ul style="list-style-type: none"> <li>▪ Relative construction impacts to businesses</li> <li>▪ Relative construction impacts to traffic</li> <li>▪ Relative construction impacts to pedestrians and bicyclists</li> <li>▪ Relative construction impacts to visitors</li> </ul>	<p>More difficult to construct roundabout. Moderately higher level of impacts during construction.</p>	<p>Easier to construct than a roundabout. Moderately lower level of impacts during construction.</p>
<p><b>Minimize private property impacts.</b></p> <ul style="list-style-type: none"> <li>▪ Relative physical impact on private property</li> <li>▪ Relative economic impact on private properties</li> </ul>	<p>1 full acquisition (Shell)</p>	<p>2 full property acquisitions (Shell and Glenwood Adventure)</p>
<p><b>Safely accommodate transportation users.</b></p> <ul style="list-style-type: none"> <li>▪ Ability of the alternative to improve traffic safety on the Grand Avenue Bridge</li> <li>▪ Ability of the alternative to provide for safe pedestrian and bicycle use across the Colorado River</li> <li>▪ Ability of the alternative to meet design standards</li> </ul>	<ul style="list-style-type: none"> <li>▪ Provides for safe bike and pedestrian use</li> <li>▪ Increases vehicle safety</li> <li>▪ Reduces speed differentials through intersection</li> </ul>	<p>Provides for safe bike and pedestrian use</p>
<p><b>Maintain and improve multimodal connections for buses, pedestrians, and bicycles.</b></p> <ul style="list-style-type: none"> <li>▪ Ability of alternative to improve connections for buses</li> <li>▪ Ability of alternative to improve connections for pedestrians</li> <li>▪ Ability of alternative to improve connections for bicycles</li> </ul>	<ul style="list-style-type: none"> <li>▪ Enhances pedestrian access by eliminating waiting time for signal walk phase. The pedestrian route is broken up into 15 and 25 foot crossings, with all of them being comparatively low traffic volume.</li> <li>▪ Shorter trail underpass (better security &amp; better lighting)</li> </ul>	<p>Sidewalks result in pedestrian crossings at higher volume locations, although with the protection of signalized crosswalks. One of them is almost 100 feet long and takes 25-30 seconds to cross.</p>

**TABLE 4. DETAILED EVALUATION OF INTERSECTION OPTIONS A AND E**

Evaluation Criteria	Roundabout (Revised 3A)	Signalized Intersection (3E)
<p><b>Provide an alternative that is consistent with city planning.</b></p> <ul style="list-style-type: none"> <li>▪ Is the alternative consistent with the goals and objectives of SH 82 Corridor plans? (If not, why?)</li> <li>▪ Is the alternative consistent with City of Glenwood plans? (If not, why?)</li> </ul>	<p>Supports and enhances plans for improvements to 6th Street to support economic development</p>	<p>Consistent with plans</p>
<p><b>Incorporate sustainable elements into the design.</b></p> <ul style="list-style-type: none"> <li>▪ Is the alternative compatible with local sustainability plans? (yes/no)</li> <li>▪ Does the alternative preserve future transportation options? (yes/no)</li> </ul>	<p>Roundabouts are more sustainable than intersections as they require less maintenance and reduce electrical power demand</p>	<p>Less sustainable than roundabouts as they require more maintenance and greater electrical power demand</p>
<p><b>Maintain or improve transportation operations in the project area.</b></p> <ul style="list-style-type: none"> <li>▪ Relative ability of the alternative to maintain or improve multimodal transportation operations in the project area</li> </ul>	<p>Revised roundabout provides improved traffic operations, primarily in the ability to access/egress 6th Street.</p>	<p>Provides acceptable traffic operations</p>

### **8thStreet/Grand Avenue Intersection Options**

On the south side of the river, two main options for the Grand Avenue and 8th Street intersection were developed to best meet the Purpose and Need while minimizing impacts to downtown properties. The options considered, and the screening performed, are presented in Figure 13.

#### **1.2.4 Pedestrian and Bicycle Options**

The Purpose and Need for the project includes the need to improve multimodal connectivity. The existing pedestrian facilities are substandard, not meeting FHWA guidelines for accessibility for Pedestrian Access Routes, sometimes referred to as “ADA standards.” Therefore, in addition to the roadway bridge alternatives, several bicycle and pedestrian options were considered to improve pedestrian and bicycle connectivity.

#### **Location**

Three basic options were considered for connectivity between downtown Glenwood Springs and the area north of the river included placing a pedestrian and bicycle facility on or adjacent to the Grand Avenue Bridge, as follows.

- ❖ **Attached sidewalks along the Grand Avenue Bridge.** The PWG eliminated this from consideration because of the additional impacts of the required bridge width, as well as safety and user experience of the bicyclists and pedestrians. This option also had strong stakeholder opposition for the above reasons.
- ❖ **Using the existing pedestrian bridge.** The PWG eliminated this from consideration because a new bridge would better address the Purpose and Need and evaluation criteria by providing greater connectivity and reducing impacts. A new bridge would also reduce and minimize utility relocation costs.

FIGURE 13. SOUTH SIDE OPTIONS



*8th Street Right-In-Right-Out, no left turns, no signal*



*8th Street Signal with full movements*

#### SCREENED OUT

- ❖ This option would result in restricted movements at the 8th Street intersection, which was identified as a concern by stakeholders.

#### CARRIED FORWARD

- ❖ This option would best address the key issues for stakeholders, including providing for all movements at the intersection. This option is also consistent with the SH 82 Access Control Plan.
- ❖ **A new pedestrian bridge in the same location as the existing bridge.** The new pedestrian bridge option was developed during Level 3 screening for several reasons that became apparent as the evaluation progressed. These reasons included:
  - ◆ **Utility relocations.** Evaluation conducted regarding relocating utilities on the Grand Avenue Bridge indicated that the most effective option would be to move them to a new pedestrian bridge. The existing pedestrian bridge does not have adequate clearance, other nearby bridges have high construction risks because of the distances and costs involved, and using a temporary crossing would require moving utilities twice, increasing the cost and construction risk. Specifically, water, gas, phone and cable would be relocated to the new pedestrian bridge. In addition, the City would like to add electric to the pedestrian bridge.
  - ◆ **Potential to improve connections to existing facilities on the north end of the pedestrian bridge.** If a new pedestrian bridge were built, the north abutment area would be designed to best fit the context of the area, considering pedestrian/bicycle connections, as well as existing and future land uses. The north abutment area would also be designed to provide an improved connection

to Two-Rivers Park Trail, a connection deemed important by stakeholders that would otherwise worsen under the Alternative 3 alignment.

- ◆ **Clearances to future I-70 eastbound acceleration lane.** Improvements to the existing Exit 116 have been proposed, including a new eastbound acceleration lane. The existing pedestrian bridge structure conflicts with the required clearance area of an improved, new acceleration lane shoulder. A new pedestrian bridge would have the necessary clearance to accommodate this improvement.
- ◆ **Existing grade on pedestrian bridge.** The 5 percent grade on the existing pedestrian bridge meets minimum design standards, but because of the length of this grade, it is not considered desirable. A flatter grade on a new bridge could improve pedestrian connectivity across the Colorado River.
- ◆ **Aesthetics.** Input on aesthetics indicates that the existing pedestrian bridge would detract from the aesthetics of a new Grand Avenue Bridge. A new pedestrian bridge would enhance the new Grand Avenue Bridge with a design that is visually compatible.
- ◆ **CDOT Bike and Pedestrian Policy.** CDOT Policy Directive 1602.0 was codified into law in 2012 (state Statute C.R.S. 43-1-120 (2012)) and requires CDOT to include bicyclist and pedestrian needs in planning, design, and operation.

In comparing the new pedestrian bridge and existing pedestrian bridge, the PWG determined that a new pedestrian bridge better addressed the project's Purpose and Need and criteria. The purpose of the project is to provide a safe, secure, and effective connection from downtown Glenwood Springs across the Colorado River and I-70 to the historic Glenwood Hot Springs area. A new pedestrian bridge supports the project purpose and the project need to provide connectivity. Also, the PWG deemed a pedestrian bridge more favorable because it would:

- ❖ Reduce and minimize utility relocation impacts.
- ❖ Improve overall pedestrian and bicycle safety and multimodal connections. This would occur in both overall level of service and connectivity to existing facilities.

### **Type**

A range of pedestrian bridge types were initially considered and presented to the public. Based on input and evaluation, these were screened to three types:

- ❖ Arch bridge.
- ❖ Symmetric cable support bridge.
- ❖ Asymmetric cable supported bridge.

After stakeholder input and alternative refinement, a different bridge type was selected for this EA. The new pedestrian bridge would have constant depth girders and architectural treatments consistent with the historic character of Glenwood Springs. This bridge would be less vertically imposing than other bridge types considered and would complement the new roadway bridge better than the other options.

## Connections

### **From new pedestrian bridge to 7th Street:**

Because it was determined to not have a sidewalk on the vehicle bridge, ADA access from the new pedestrian bridge to 7th Street would need to be provided by another means. Three options were considered for ADA access – all with stairs to the new pedestrian bridge.

- ❖ **Attached sidewalk on the bridge between 7th and 8th Streets, connecting to the pedestrian bridge, similar to the existing condition, but designed to meet current design standards. Screened Out.** There was substantial feedback from the public that the added width of the structure for the sidewalk combined with the left turn lane at 8th Street would negatively impact businesses in this area. Also, emergency service providers were concerned that the wider structure would impair their access to the businesses in this area. For these reasons, this option was screened out during Level 3 screening.
- ❖ **A new ramp system between 7th Street and the railroad to provide accessible ADA access to the existing or new pedestrian bridge. Screened Out.** This option was screened out due to stakeholder opposition that the ramp would block views from the businesses across the Colorado River and negatively impact pedestrian space along the north side of 7th Street. The Build Alternative would not preclude an ADA ramp if needed in the future.
- ❖ **One or two elevators between 7th Street and the railroad to the existing or new pedestrian bridge. Carried Forward.** This option was selected for evaluation in this EA. Elevators received the greatest amount of City and stakeholder support through the process, particularly important because the City would have to maintain the elevators. An elevator system was deemed to have the fewest visual impacts. For this option, CDOT and the City will develop an intergovernmental agreement (IGA) that outlines the City's responsibilities to operate and maintain the elevators and comply with ADA requirements, including a contingency plan for ADA compliance.

It was determined that the existing pedestrian bridge provides an accessible route connecting to 6th Street on the north side of the river, so any replacement pedestrian bridge should maintain that access. The new pedestrian bridge would land on the north side of the Colorado River at an elevation higher than the existing pedestrian bridge, landing at nearly the elevation of the existing roadway. Since the existing roadway would ultimately be vacated based on the new alignment, a portion of this vacated roadway area would be used to complete the connection from the new pedestrian bridge to 6th Street. A sidewalk connection would continue north to the intersection of 6th Street and Pine Street, and the existing stairway would provide a direct connection to the Glenwood Hot Springs.

**From new pedestrian bridge to 6th Street.** The new pedestrian bridge would land on the north side of the Colorado River at an elevation higher than the existing pedestrian bridge, at nearly the elevation of the existing roadway. Because the existing SH 82 roadway would ultimately be vacated, a portion of this vacated roadway area would be used to complete the connection from the new pedestrian bridge to 6th Street. A

sidewalk connection would continue north to the intersection of 6th Street and Pine Street, and the existing stairway would provide a direct connection to the Glenwood Hot Springs.

**From new pedestrian bridge to existing Two Rivers Park trail system at Exit 116.**

Several options were developed and evaluated with stakeholder input, and are described below:

- ❖ **Keep existing bicycle/pedestrian connections. Screened out.** The existing connection includes a grade-separated trail under the existing bridge and at-grade crossings of the westbound off ramp and east bound on ramp. The new Grand Avenue Bridge alignment would remove the existing connections, requiring a new connection to be constructed.
- ❖ **New ramp and stairs from pedestrian bridge to Glenwood Hot Springs parking lot. Screened out.** Because of the large grade difference between the pedestrian bridge and the parking lot, the ramp would require additional right-of-way and result in splitting existing parcels owned by the Glenwood Hot Springs. It also would route public trail traffic through a private parking lot.
- ❖ **New stairs from pedestrian bridge down to Glenwood Hot Springs parking lot and ramp to Two Rivers Park Trail. Screened out.** This option also split existing parcels owned by the Glenwood Hot Springs and resulted in additional right-of-way.
- ❖ **Underpass under the new Grand Avenue Bridge north abutment in the Hot Springs parking lot connecting existing Two Rivers Park Trail and 6th Street. Screened out.** There were several drawbacks to this option. The sidewalk would have to be raised 8 feet above the Hot Springs parking lot to minimize grade changes, and the parking lot would need around 16 feet of vertical clearance. To achieve the required grades and vertical clearance, the path would have had sharp corners around the abutment, limiting sight-distance and reducing safety. The path would have steeper grades and increased potential for icing in the winter time. Additionally, the Grand Avenue vehicle bridge would need to be lengthened, adding costs.
- ❖ **New at-grade trail connection on west side of SH 82 at Exit 116 and a new at-grade crossing of US 6 at the new intersection with SH 82. Screened out.** This option would result in worse connectivity for multimodal connections and, therefore, did not meet the project's Purpose and Need. This connection would require two new at-grade crossings on the west side of Exit 116 underpass with higher traffic volumes than the existing at-grade crossings. It also would require a new at-grade crossing of US 6—a wide intersection because of the north leg skew angle. This would increase the potential for vehicle/pedestrian/bicycle conflicts. The introduction of the required pedestrian phase at this intersection would reduce traffic operations for all traffic. This connection also would require construction of a new retaining wall under the west side of the existing I-70 bridges, adding additional cost. A new sidewalk on the east side of Village Inn would move all improvements to the east. Because of the tight right-of-way in this area, this could result in additional right-of-

way takes. This option was strongly discouraged by the City's Transportation Commission, the City's River Commission, and City staff because of safety concerns.

- ❖ **Underpass under the new Grand Avenue Bridge north of the I-70 off ramp. Carried forward.** This option would create a more direct trail path and would result in moderate ADA grades to create a grade separation and path direction. The new grade-separated connection would provide safety and mobility benefits similar to the existing grade-separated connection under the existing Grand Avenue Bridge.

### 1.3 ALTERNATIVES EVALUATED IN THE EA

As a result of the evaluation process and input from the public and other affected stakeholders, a Build Alternative was identified, comprised of the components described above, for comparison to the No Action Alternative in the EA. These alternatives are described below.

#### 1.3.1 No Action Alternative

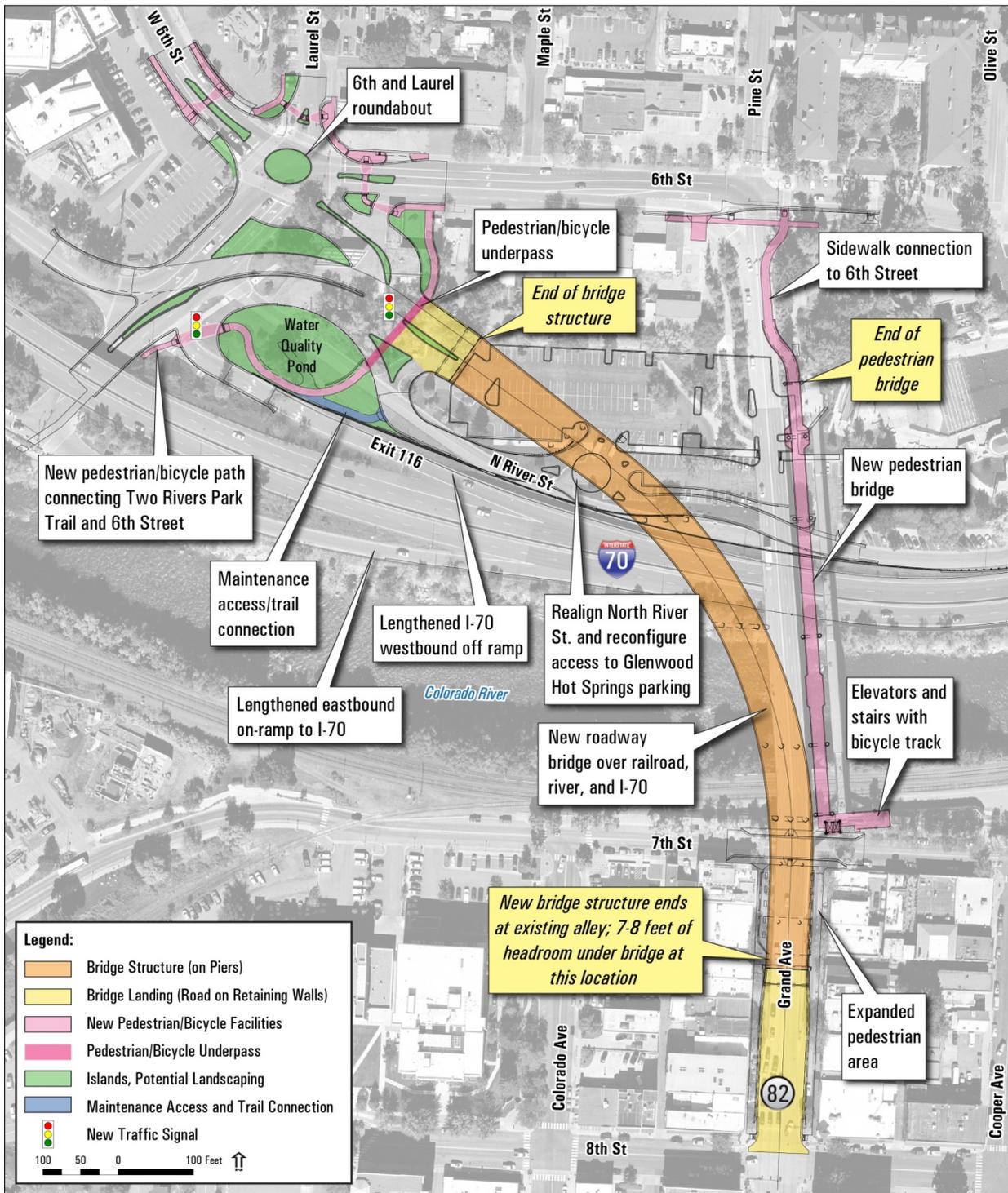
The No Action Alternative would not implement any projects beyond safety and operational improvements to keep SH 82 open. The No Action Alternative also assumes completion of those reasonably foreseeable projects that are already in progress, are programmed by CDOT or the City, or included in the fiscally constrained 2035 Intermountain Regional Transportation Plan. Currently, there are no such projects in the study area.

The No Action Alternative does not meet the Purpose and Need, but is fully evaluated and serves as a baseline for comparison for environmental analysis purposes.

#### 1.3.2 Build Alternative

The Build Alternative would consist of the elements described below and depicted in Figure 14. The existing four-lane SH 82/Grand Avenue highway bridge would be replaced with a new four-lane bridge on a modified alignment. The new bridge would start just north of the intersection of 8th Street and Grand Avenue, and continue on the existing SH 82/Grand Avenue alignment to 7th Street. At 7th Street, the alignment would begin a curve to the west as it crosses the Union Pacific Railroad (UPRR) and the Colorado River. It would touch down on the north side of the river on the west side of the Glenwood Hot Springs parking lot and southeast of the existing 6th Street and Laurel Street intersection. From the touchdown point, the alignment would curve southwest to the existing Exit 116 and access to I-70, and would connect to a new 6th Street and Laurel Street intersection just northeast of Exit 116 for local access. Bridge height clearances would meet current federal and American Railway Engineering and Maintenance of Way Association (AREMA) standards for road and railroad crossings. The crossing over the UPRR would have a minimum clearance of 23 feet 4 inches, which would meet these requirements as well as UPRR minimum guidelines.

FIGURE 14. BUILD ALTERNATIVE



Jacobs, 2014.

**Cross-sections**

The new bridge would include four 12-foot-wide travel lanes, consistent with AASHTO standards, to improve safety and mobility. A striped median was selected for the bridge because it would be more cost-effective and would better accommodate larger vehicles, thereby being practical and financially realistic, as required by the MOEs. The bridge would have two-foot shoulders on the east side and a four-foot shoulder on the west, with the additional width needed because of the bridge curvature and sight difference requirements. The southbound left turn lane to 8th Street would be lengthened. Lane widths would taper to 11 feet wide between 7th and 8th Streets into downtown to tie into the existing 11-foot lanes in downtown and minimize impacts in that area. No sidewalks or special lanes would be provided on the bridge.

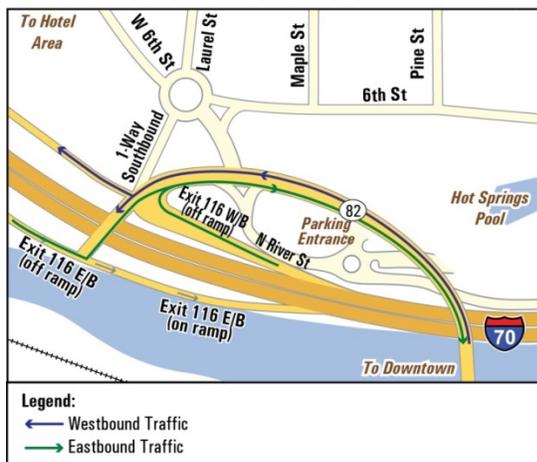
**Intersections**

**6th Street and Laurel Street Intersection.** A new one-lane five-leg roundabout at the 6th Street and Laurel Street intersection would help distribute traffic between I-70/ SH 82 and hotels west along W. 6th Street, the Hotel Colorado and Glenwood Hot Springs along 6th Street, and local businesses and residences along Laurel Street. The fifth leg would be a one-way southbound lane to the Exit 116 interchange using the existing SH 82 alignment. The major traffic movements are described and illustrated in Figure 15.

**8th and Grand Avenue Intersection.** A traffic signal would provide for all movements at the 8th and Grand Avenue intersection.

**FIGURE 15. 6th Street AND Laurel Street MAJOR TRAFFIC MOVEMENTS**

**I-70 to and from SH 82 and downtown**



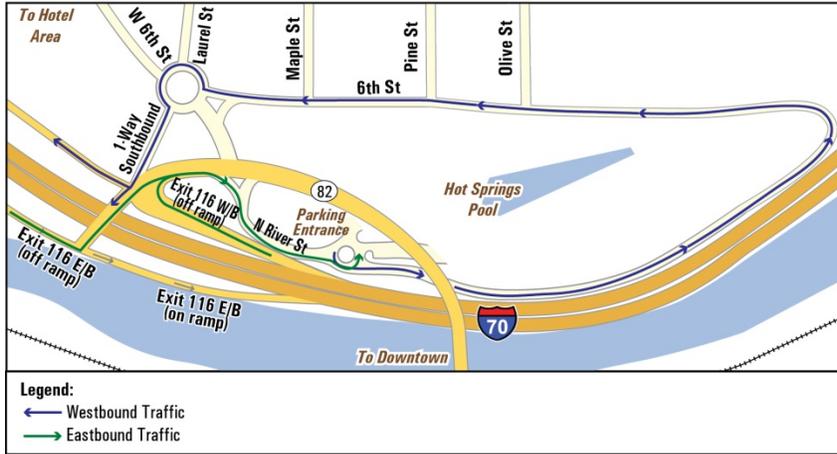
**The Build Alternative would maintain the same general movement as the existing intersection for regional traffic.**

The existing stop sign at the end of the westbound Exit 116 off ramp would be replaced with a signalized double-right onto SH 82/Grand Avenue. Motorists traveling from westbound I-70 to southbound SH 82 would exit I-70, turn right at a new signal onto SH 82/Grand Avenue to cross back over the river, through downtown and south to Aspen.

Motorists headed from Aspen to I-70 would follow the new SH 82/Grand Avenue alignment directly to the I-70 westbound on ramp or cross under I-70 to the I-70 eastbound on ramp.

FIGURE 15. 6th Street AND Laurel Street MAJOR TRAFFIC MOVEMENTS

**I-70 to and from Glenwood Hot Springs**

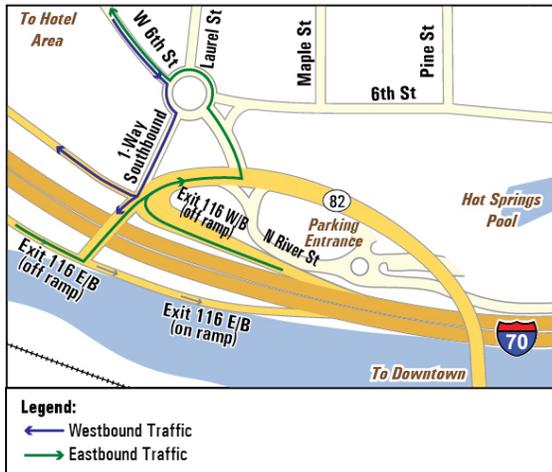


The Build Alternative would maintain the same general movement for westbound I-70 motorists after they exit I-70.

The same two right turns would be made in succession—ramp to SH 82, then SH 82 to North River Street to the Glenwood Hot Springs parking area. Eastbound I-70 motorists would cross under I-70 and take the first right onto North River Street.

For motorists leaving the Glenwood Hot Springs large parking lot, signs would direct them east following North River Street to where it intersects with 6th Street.

**I-70 to and from W. 6th Street hotel area**



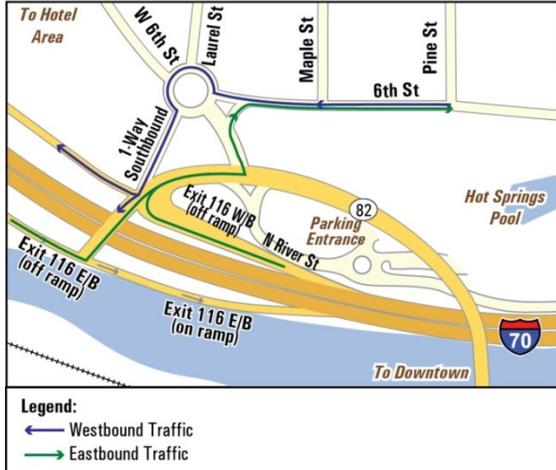
From I-70, the Build Alternative would be very similar to the travel pattern for regional traffic.

After exiting westbound I-70, motorists would take the designated right turn that would place them in the left turn lane to Laurel Street. Eastbound motorists would cross under I-70 to this same left turn lane. Motorists would turn left onto Laurel Street to the roundabout, then proceed through the roundabout to W. 6th Street and the hotel area.

To get back on to I-70, there would be no change to the existing route. Motorists on W. 6th Street would turn right at the roundabout and proceed right to the westbound I-70 on ramp or straight ahead under I-70 to the eastbound on ramp.

FIGURE 15. 6th Street AND Laurel Street MAJOR TRAFFIC MOVEMENTS

**I-70 to and from 6th Street hotel area (Hotel Colorado)**

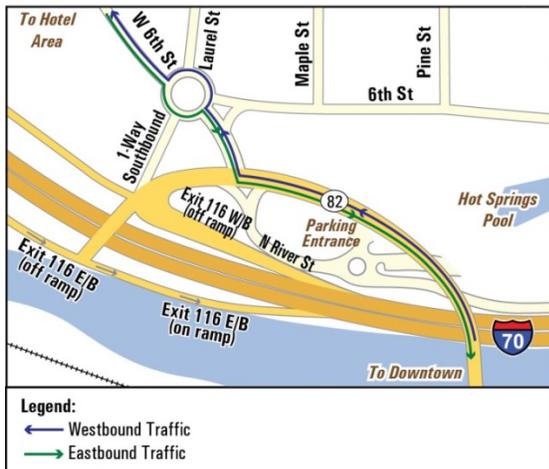


The Build Alternative would change the travel pattern for regional traffic.

After exiting westbound I-70, motorists would take the designated right turn that would place them in the left turn lane to Laurel Street. Eastbound motorists would cross under I-70 to this same left turn lane. Motorists would turn left onto Laurel Street to the roundabout, but would turn right onto 6th Street before reaching the roundabout.

To get back on to I-70, motorists would head west on 6th Street to the roundabout, exit the roundabout to Exit 116 and take a right to the westbound I-70 on ramp or straight ahead under I-70 to the eastbound on ramp.

**W. 6th Street hotel area to and from SH 82 and downtown**

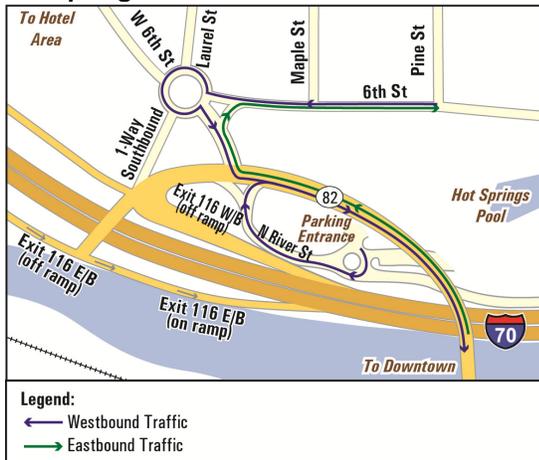


The Build Alternative would change the travel pattern for local and regional traffic.

From W. 6th Street, instead of taking 6th Street, motorists would proceed through the roundabout to SH 82/Grand Avenue, where they would turn left toward downtown and south to Aspen.

Motorists traveling northbound from downtown would no longer use the 6th Street Pine to Laurel Street segment to access W. 6th Street. They would cross the river on the new SH 82/Grand Avenue alignment and take a right onto Laurel Street to 6th Street and through the roundabout.

**SH 82 and downtown to and from Glenwood Hot Springs**



The Build Alternative would change the travel pattern for local and regional traffic.

Motorists on northbound SH 82 would travel the new SH 82/Grand Avenue alignment to Laurel Street, but would turn right onto 6th Street before reaching the roundabout. They would continue on 6th Street, connecting to North River Street, to the Glenwood Hot Springs parking areas on 6th Street and North River Street.

Motorists headed to downtown from the Glenwood Hot Springs large parking lot would take North River Street west to the intersection with SH 82/Grand Avenue, turn right, and continue south. From the parking areas on 6th Street, motorists would head west on 6th Street, travel through the roundabout to southbound Laurel Street headed to SH 82/Grand Avenue. They would turn left onto southbound SH 82/Grand Avenue.

### Pedestrian/Bicycle Facilities

**New Pedestrian Bridge.** The Build Alternative would replace the existing pedestrian bridge immediately east of the highway bridge with a new bridge that would also carry utility lines across the Colorado River. The location of this new pedestrian bridge would be between the existing pedestrian bridge and the existing highway bridge. The new pedestrian bridge would clear span the Colorado River and have architectural treatments consistent with the historic character of Glenwood Springs. It would be 16 feet wide with a reduced slope of approximately 4 percent and incorporate viewing areas from which pedestrians and bicyclists could pause to enjoy the Colorado River and surrounding areas. The following facilities would be built in conjunction with this bridge and other elements of the Build Alternative described above.

- ❖ **Connection to 7th Street.** A wider staircase with a bicycle track would take bicyclists and pedestrians to and from the south end of the new pedestrian bridge to 7th Street and downtown Glenwood Springs. In addition, to meet ADA requirements, the Build Alternative would include two elevators for redundancy and a back-up generator in case of an electrical power outage. CDOT and the City will develop an intergovernmental agreement (IGA) that outlines the City's responsibilities to operate and maintain the elevators and comply with ADA requirements, including a contingency plan for ADA compliance if the elevators are not operational. The Build Alternative would not preclude an ADA ramp if needed in the future.
- ❖ **Expanded Pedestrian Plaza Under Bridge near 7th Street.** In response to stakeholder desires, the bridge design would allow for an expanded open area under the new Grand Avenue Bridge south of 7th Street. The Grand Avenue wing street between 7th Street and 8th Street would be closed to vehicular traffic other than emergency vehicles and would be integrated as part of the expanded area under the bridge.
- ❖ **7th Street under the Grand Avenue Bridge** would be slightly reconfigured to accommodate the expanded space under the bridge, provide pedestrian space for at the landing of the pedestrian bridge, and provide an improved ADA crossing.
- ❖ **Connection to 6th Street.** The north end of the new pedestrian bridge would land adjacent to the existing SH 82 bridge lands; a sidewalk connection would continue north to the intersection of 6th Street and Pine Street; and the existing stairway would provide a direct connection to the Glenwood Hot Springs. The grade of this connection would meet ADA requirements for an accessible pedestrian route. A new sidewalk would be constructed on the southeast side of the 6th Street and Pine Street intersection.

**6th Street and Laurel Street Intersection.** New sidewalks would be installed on the north and south sides of 6th Street near the new roundabout. Pedestrian crossings would be improved on W. 6th Street west of the roundabout and Laurel Street north of the roundabout.

At-grade, designated 15- to 25-foot-long sidewalks would be provided for pedestrian/bicycle crossings of W. 6th Street and Laurel Street at the 6th Street/Laurel

Street roundabout. A signalized crossing with a crosswalk at the I-70 off ramp would be added.

**Pedestrian/bicycle path connecting the existing Two Rivers Park Trail and 6th Street.**

This new grade-separated path would start at the existing Two Rivers Park Trail just north of the I-70 underpass at Exit 116, cross the improved westbound I-70 off ramp, and continue north using an underpass/tunnel of the new SH 82/Grand Avenue Bridge alignment just west of the new bridge. The underpass/tunnel would be approximately 14 to 16 feet wide and 150 feet long. Both approaches to this underpass would be flared out to provide increased visibility and safety. The profile grade of this connection would meet ADA requirements for an accessible pedestrian access route.

A new maintenance access and trail connection would link the new trail north of the I-70 off-ramp to the on-road bicycle route on North River Street. This trail would be open to the public, but the slope would exceed five percent and it would not be an ADA-accessible route.

**Shielding**

The Build Alternative would include shielding on the Grand Avenue Bridge extending from just north of the railroad tracks to the intersection of Grand Avenue and 7th Street. The shielding would be used to prevent splash back from the bridge, with the added benefit of providing a noise reduction. The shielding would be approximately seven feet tall over the railroad tracks to meet railroad requirements. For the remaining south section, shielding would be located along the bridge near businesses. The exact shielding locations and dimensions to prevent splash back would be determined during final design with stakeholder input. Chapter 3 provides further discussion of the noise benefits provided by the shielding.

**Additional Roadway Improvements**

The Build Alternative would make improvements to existing facilities that would stay in place for the long term. These improvements were evaluated under this EA

**North River Street.** The west end of North River Street would be raised in profile to match the new SH 82 elevation where the two intersect and would be rebuilt in the project area to a more standard two-lane cross section. It would also be realigned slightly to avoid the new SH 82/Grand Avenue bridge piers. The intersection with SH 82/Grand Avenue would be moved to the east and become a right-in/right-out intersection, providing the connection to SH 82 southbound toward downtown.

A small roundabout would be built on North River Street at the entrance to the Glenwood Hot Springs parking lot. This roundabout would enable motorists heading west on North River Street to make a U-turn to access 6th Street, which would be required to access I-70. This would be particularly beneficial for larger vehicles, such as recreational vehicles. It would also provide good traffic control at the Glenwood Hot Springs parking lot entrance. Drivers continuing west past this roundabout would turn right at SH 82 and go south over the Grand Avenue Bridge.

**Exit 116 On and Off Ramps.** The I-70 eastbound on ramp and westbound off ramp at Exit 116 would be lengthened to meet current design standards after the existing Grand Avenue Bridge piers adjacent are removed. These improvements would be funded separately from the bridge project through Funding Advancements for Surface Transportation and Economic Recovery (FASTER) funds, but are planned to be constructed concurrently for cost and construction efficiency.

- ❖ **I-70 Exit 116 eastbound acceleration on ramp.** The ramp would be lengthened to upgrade it to current minimum acceleration lane and freeway merge criteria. The current ramp is 655 feet long; an additional 235 feet of ramp would be added, plus another 550 feet of acceleration lane.
- ❖ **I-70 Exit 116 westbound deceleration off ramp.** The existing ramp would remain; an additional lane would be added that is 1,150 feet long, creating a two-lane exit. The additional length would provide motorists enough space to decelerate safely before the end of any queue at the ramp.

#### 1.4 CONSTRUCTION

Construction could begin as early as spring 2015 and is anticipated to last approximately 18 to 24 months, including an approximately 90-day full bridge closure during the last 9 months.

Construction of the Build Alternative would involve the following activities:

- ❖ Construction of a highway and a pedestrian bridge with piers, retaining walls, road pavement, storm sewers, curb and gutter, sidewalks, and paths; and installation of traffic signals and other overhead traffic control, wayfinding and traffic signs, and landscaping.
- ❖ Demolition, which is the process of wrecking or tearing down an existing facility or structure by various methods, such as use of bulldozers or wrecking ball. The project would involve demolition of existing structures such as the Grand Avenue Bridge, pedestrian bridge, and buildings acquired for right-of-way.
- ❖ Excavation, which is the process of removing soil, rock, or other material from a site, typically with use of heavy earthmoving equipment such as excavators and bulldozers. Excavation would be necessary for construction of such project elements as bridge supports and storm sewers.
- ❖ Grading, which is the movement and shaping of earth to achieve a desired level or shape, with the use of heavy earthmoving equipment. Grading would be required for construction of project elements such as retaining walls, sidewalks and paths, curb and cutter, intersection improvements, and landscaping.
- ❖ Utility relocations, which involves the identification and relocation of utility facilities that may be in conflict with a proposed highway or bridge project.

### 1.4.1 Construction Phasing

The study team developed a construction phasing approach to accommodate accelerated bridge construction (ABC) that would minimize the duration of detours and total closures of the Grand Avenue Bridge, SH 82, and I-70. The approach involves building most bridge elements outside the existing SH 82 route during much of the construction phase, thereby allowing SH 82 to remain open as long as possible.

The construction phasing plan calls for removing the existing Grand Avenue Bridge and installing the new bridge within an approximately 90-day period, during which the Grand Avenue Bridge would be fully closed to traffic. Based on current traffic volumes and concerns voiced by the public, full closure would occur only during Spring or Fall, when traffic volumes and tourism are typically lower. In addition, a pedestrian connection would be maintained for access across the Colorado River, I-70, and the railroad at all times.

The main elements of the Grand Avenue Bridge project would be constructed in phases to minimize travel disruptions as much as possible. Specific details of each phase would be identified during project design, but in general, the phases would follow a logical sequence. Early in the project, a five-foot sidewalk with barrier would be built on or adjacent to the existing Grand Avenue Bridge. The existing pedestrian bridge would be removed and the new bridge built adjacent to the existing Grand Avenue Bridge. Concurrently or afterward, causeways for work pads would be built in the river, and the site at the 6th Street and Laurel Street intersection would be prepared, including removal of the Shell station. More preparatory work would follow, such as working on bridge piers and utilities and modifying existing streets as necessary. Meanwhile, segments of the new Grand Avenue Bridge would be constructed off site. Before the existing bridge is removed, the detours (described below) would be put in place, with changes to I-70 Exit 114, Midland Avenue, and 8th Street. Finally, the Grand Avenue Bridge would be constructed, the 6th Street and Laurel Street roundabout would be finished, new pedestrian connections would be finalized, and other associated activities would conclude the construction process.

### 1.4.2 Detours

Two detour routes are proposed during construction, one for I-70 traffic during short, nighttime closure periods, and a second for SH 82 traffic during the full closure of the Grand Avenue Bridge. These detours were evaluated in this EA.

#### I-70 Detour

Construction of the Grand Avenue Bridge and the pedestrian bridge would require full nighttime closures of I-70 approximately ten times for safety-critical overhead work, such as bridge demolition, construction of bridge components, and concrete installation. This would be planned to occur between the hours of 8:30 p.m. and 5:30 a.m., when current traffic volumes are generally between 50 and 150 vehicles per hour per direction on I-70, according to CDOT data. Detouring I-70 traffic to local streets is proposed to maintain emergency access to and from Glenwood Canyon and because a detour route along state highways would be very long.

Eastbound and westbound I-70 traffic would be rerouted onto 6th Street at a temporary break in the I-70 barrier near the Yampah Vapor Caves. The 0.5-mile detour would be repaved to handle the additional traffic. On the east end of the detour, both travel directions would be located on the north side of I-70. There would be two-way traffic on the westbound lanes until just west of No-Name tunnel, where eastbound traffic would cross over to I-70 eastbound lanes.

**FIGURE 16. I-70 DETOUR**



### **SH 82 Detour**

During the approximately 90-day full closure of the Grand Avenue Bridge between 8th Street south of the river and 6th Street north of the river, SH 82 traffic would be rerouted onto the designated SH 82 Detour. The temporary route for regional traffic would begin at Exit 114 on I-70 and proceed south on Midland Avenue to 8th Street across the Roaring Fork River, then along a new 8th Street connection into downtown. In the downtown grid, the traffic would be routed through a temporary “square about” for continuation south on SH 82/Grand Avenue to Aspen. The route is illustrated in Figure 17 and Figure 18.

Determination of the detour route and associated improvements included an analysis of the traffic carrying capacities of 8th Street, 9th Street, Colorado Avenue, and Midland Avenue to I-70 Exit 114. The analysis determined that motorists would experience unacceptable delay without some temporary improvements to intersections and roadways along the route, and a voluntary reduction of peak hour trips.

FIGURE 17. SH 82 DETOUR ROUTE



The components of the SH 82 Detour are described below, including the improvements necessary to accommodate traffic. The study team determined that the temporary improvements described below would only accommodate a portion of the demand for the Grand Avenue Bridge during construction. Further measures to reduce automobile demand are described in Section 3.2 *Transportation of the SH 82 Grand Avenue Bridge Environmental Assessment*.

**Temporary 8th Street Connection.** 8th Street in downtown Glenwood Springs currently terminates just west of School Street. The temporary 8th Street connection will connect the 8th Street Bridge over the Roaring Fork River along a new alignment that would cross land owned primarily by the City of Glenwood Springs and a small portion of land owned by RFTA. This land also contains an active railroad. The UPRR has a permanent exclusive freight rail easement across both properties. CDOT has coordinated with the UPRR on the detour.

FIGURE 18. SH 82 DETOUR ROUTE DOWNTOWN



The 8th Street connection will require construction of the following elements:

- ❖ Temporary removal of portions of four existing railroad tracks and railbed.
- ❖ Two 12-foot lanes on 8th Street with curb and gutter on both sides.
- ❖ Drainage and water quality infrastructure.
- ❖ Temporary grade modifications on 7th Street and the Vogelaar Park access road.
- ❖ Modifications at 7th Street/8th Street to maintain bicycle access from the Rio Grande Trail along the river to downtown and sidewalk on 7th Street.
- ❖ Increased turn radius at the northeast corner of the 8th Street and Midland Avenue intersection to accommodate larger vehicles. This change would be permanent.

CDOT will restore the area to pre-construction conditions and replace the railbed and railroad tracks.

**Downtown Grid.** A “square about” will consist of a temporary one-way loop on 8th Street, Colorado Avenue, 9th Street, and Grand Avenue. To address higher traffic volumes, the following measures will be put into place:

- ❖ A temporary signal will be installed at the intersection of 8th Street and Colorado Avenue to facilitate pedestrian crossings and higher traffic volumes.
- ❖ A temporary physical barrier will be placed at the intersection of 9th Street and

Colorado Avenue to force detour traffic to turn east toward Grand Avenue and keep detour traffic from continuing south on Colorado Avenue.

**Exit 114.** The improvements described below and shown in Figure 19 would be needed at Exit 114 to accommodate SH 82 Detour traffic during full closure of Grand Avenue Bridge, but would remain as permanent improvements.

- ❖ **I-70 eastbound off ramp at Exit 114.** The deceleration lane would be lengthened by about 800 feet, and the second lane of the two-lane approach to the roundabout would be lengthened by approximately 340 feet.
- ❖ **I-70 westbound on ramp at Exit 114.** The existing westbound on ramp has a short two-lane segment just past the roundabout. This two lane section would be lengthened about 500 feet to create a more standard two-lane merge onto I-70.
- ❖ **I-70 Exit 114 roundabouts.** Minor changes to the curb and gutter and signing and striping would be made on the two roundabouts at the exit to better accommodate the detour traffic volumes and larger trucks.

#### **Additional Temporary Improvements**

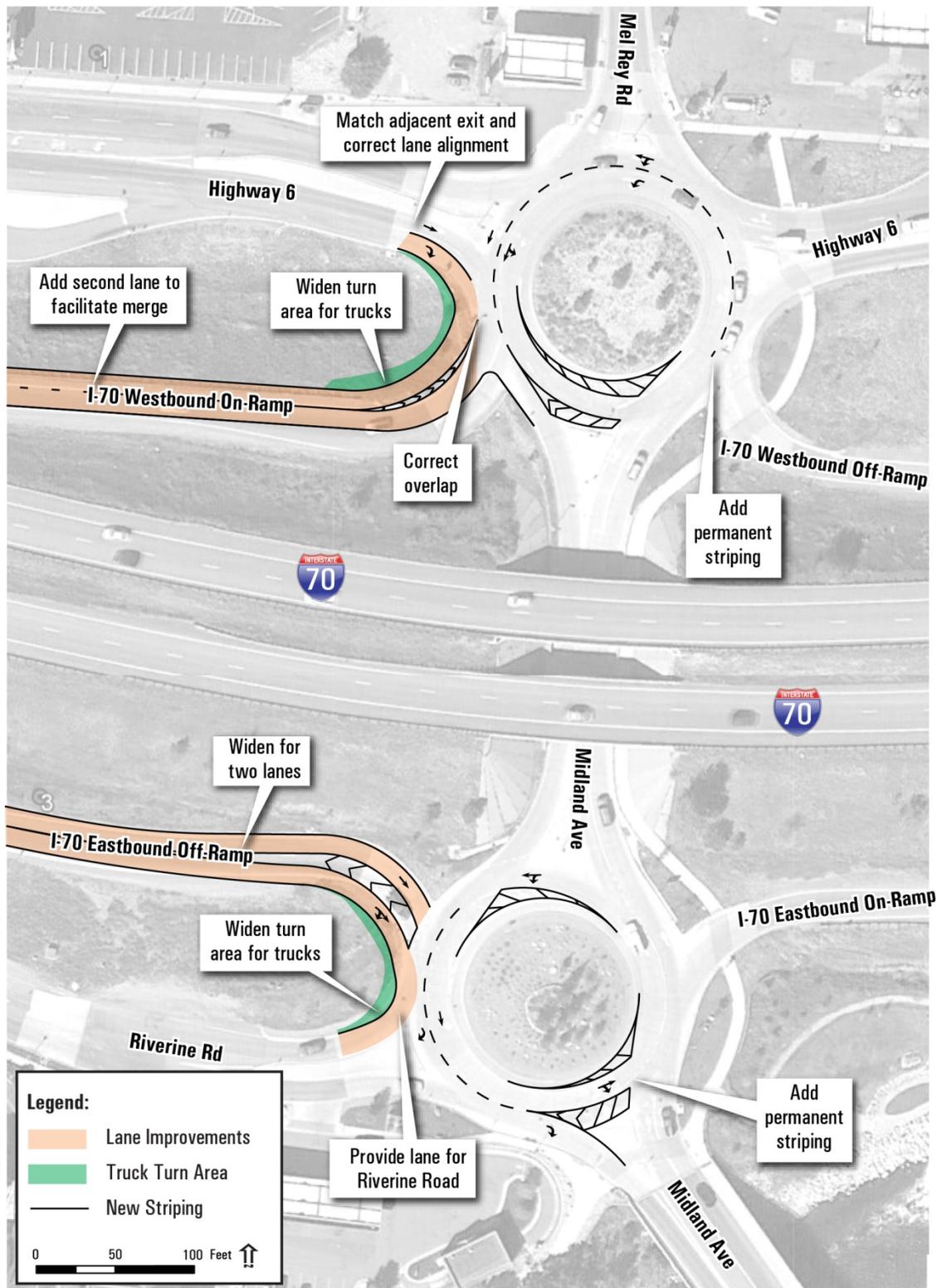
Some additional elements would be necessary to support the construction of the Build Alternative. These improvements are evaluated in this EA and would stay in place through the construction phases, including:

- ❖ **Construction staging areas.** Construction staging areas for materials and equipment would be located. These areas mainly would store construction equipment while not in use.



Example of causeways used on both sides of the river at the Dotsero bridge.

**FIGURE 19. EXIT 114 IMPROVEMENTS**



- ❖ **Temporary causeways in the Colorado River.** Bridge construction would require placement of temporary causeways (a raised road or working area built on low or wet ground) on both banks of the Colorado River upstream and downstream of the new bridges. Construction causeways are temporary, earthen platforms that would serve as work pad, allowing construction to occur without operating directly in the Colorado River. Causeways would also minimize the construction-equipment footprint by confining travel to a small area.
- ❖ The causeway on the north side of the Colorado River would be approximately 1,600 feet long, and the causeway on the south side would be approximately 600 feet long, totaling 1.33 acres of impacts below the Ordinary High Water Mark (OHWM). Side slopes would be constructed as required for stability. Cofferdams (shoring systems used to create a dry working space below the river's water surface) may also be used on and between the river banks to facilitate bridge pier demolition and construction.

**Access roads to the Colorado River.** Temporary construction access roads would be built on both the north and south sides of the Colorado River within the construction limits so construction equipment could be positioned to demolish the existing Grand Avenue Bridge and pedestrian bridge, construct the new bridges, and construct and remove cofferdams. These are shown on Figure 20.

The temporary access road on the north side of the river would be between I-70 and the river from Exit 116 to a location on I-70 400 feet east of the existing pedestrian bridge. The access road on the south side of the river would be between the UPRR tracks and the river from a location along the UPRR tracks 600 feet west of the existing Grand Avenue Bridge to a point 100 feet east of the existing pedestrian bridge. Part of this access road would require a temporary crossing of the UPRR tracks at grade west of the existing Grand Avenue Bridge.

**FIGURE 20. TEMPORARY CAUSEWAYS**



Upon construction completion, the access roads, causeways, staging areas, and railroad grade crossing would be removed and the areas returned to their pre-construction condition and appearance.

## 1.5 PROJECT FUNDING

Funding has been identified for this project primarily through CBE program, with other funds coming from local sources and other state funds. Ramp improvements will be completed prior to opening of the Grand Avenue Bridge project. CDOT estimates the total construction cost at approximately \$60 million.

**TABLE 5. OPINION OF PROBABLE COST**

Item	Opinion of Probable Cost*
<b>Construction</b>	
Grand Avenue Bridge and Approach Roadways	\$40.5 million
Pedestrian Bridge with Elevator	\$9.5 million
Construction Detour	\$5.5 million
Multimodal Connections and Underpass	\$1.5 million
Walls	\$3.0 million
<b>Construction Total</b>	<b>\$60.0 million</b>
<b>Preconstruction</b>	
NEPA and Design, Right-of-Way and Utilities	\$25.3 million

\*These costs do not include indirect costs associated with CDOT management, administration, etc., or other direct costs associated with procurement and review.

### 1.5.1 Project Implementation

As planned, CDOT will proceed with project development after completion of the NEPA process. Stages of project development include, in order, final design, right-of-way acquisition, and construction. Because of the anticipated complexity of the project's construction and the community's sensitivity to construction impacts, CDOT has engaged a Construction Manager/General Contractor (CM/GC) to help strategize phasing and constructability issues during the planning and design process.