



I-70 Floyd Hill to Veterans Memorial Tunnels



Vegetation and Noxious Weeds Technical Report

May 2021

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List of Acronyms

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| amsl | above mean sea level |
| BMP | Best Management Practice |
| CDA | Colorado Department of Agriculture |
| CDOT | Colorado Department of Transportation |
| CNHP | Colorado Natural Heritage Program |
| CMGC | Construction Manager/General Contractor |
| CPW | Colorado Parks and Wildlife |
| CR | County Road |
| CRS | Colorado Revised Statutes |
| CSS | Context Sensitive Solution |
| EA | Environmental Assessment |
| EO | Executive Order |
| EPA | U.S. Environmental Protection Agency |
| FHWA | Federal Highway Administration |
| GIS | Geographic information systems |
| I-70 | Interstate 70 |
| MEXL | Mountain Express Lanes |
| MP | Milepost |
| NEPA | National Environmental Policy Act |
| NHD | National Hydrography Dataset |
| NLCD | National Land Cover Database |
| OTIS | Online Transportation Information System |
| PEIS | Programmatic Environmental Impact Statement |
| ROD | Record of Decision |
| SB 40 | Senate Bill 40 |
| SWEEP | Stream and Wetland Ecological Enhancement Program |
| TESP | Terrestrial Ecological System Patches |
| U.S. | United States |
| US 6 | U.S. Highway 6 |
| US 40 | U.S. Highway 40 |
| USFS | U.S. Forest Service |
| USFWS | U.S. Fish and Wildlife Service |
| USGS | U.S. Geological Survey |

1. Introduction and Purpose of this Report

The Colorado Department of Transportation (CDOT) and the Federal Highway Administration (FHWA), in cooperation with local communities and other agencies, are conducting the Interstate 70 (I-70) Floyd Hill to Veterans Memorial Tunnels Environmental Assessment (EA) to advance a portion of the program of improvements for the I-70 Mountain Corridor identified in the 2011 Tier 1 *Final I-70 Mountain Corridor Programmatic Environmental Impact Statement* (PEIS) and approved in the 2011 *I-70 Mountain Corridor Record of Decision* (ROD). The EA is a Tier 2 National Environmental Policy Act (NEPA) process and is supported by resource-specific technical reports.

The purpose of this technical report is to document the existing conditions, impacts, and mitigation for vegetation and noxious weeds. This report also includes a description of applicable laws and regulations and a summary of the resource analysis and mitigation framework from the PEIS and ROD.

More detailed information on wetlands and waters of the U.S., general fish and wildlife, and threatened and endangered species is provided in the *I-70 Floyd Hill to Veterans Memorial Tunnels Aquatic Resources Technical Report* (CDOT, 2020a), *I-70 Floyd Hill to Veterans Memorial Tunnels Terrestrial Wildlife and Aquatic Species Technical Report* (CDOT, 2020b), and the *I-70 Floyd Hill to Veterans Memorial Tunnels Threatened and Endangered Species Technical Report* (CDOT, 2020c), respectively.

2. Proposed Action and Alternatives

2.1. Description of Proposed Action and Alternatives

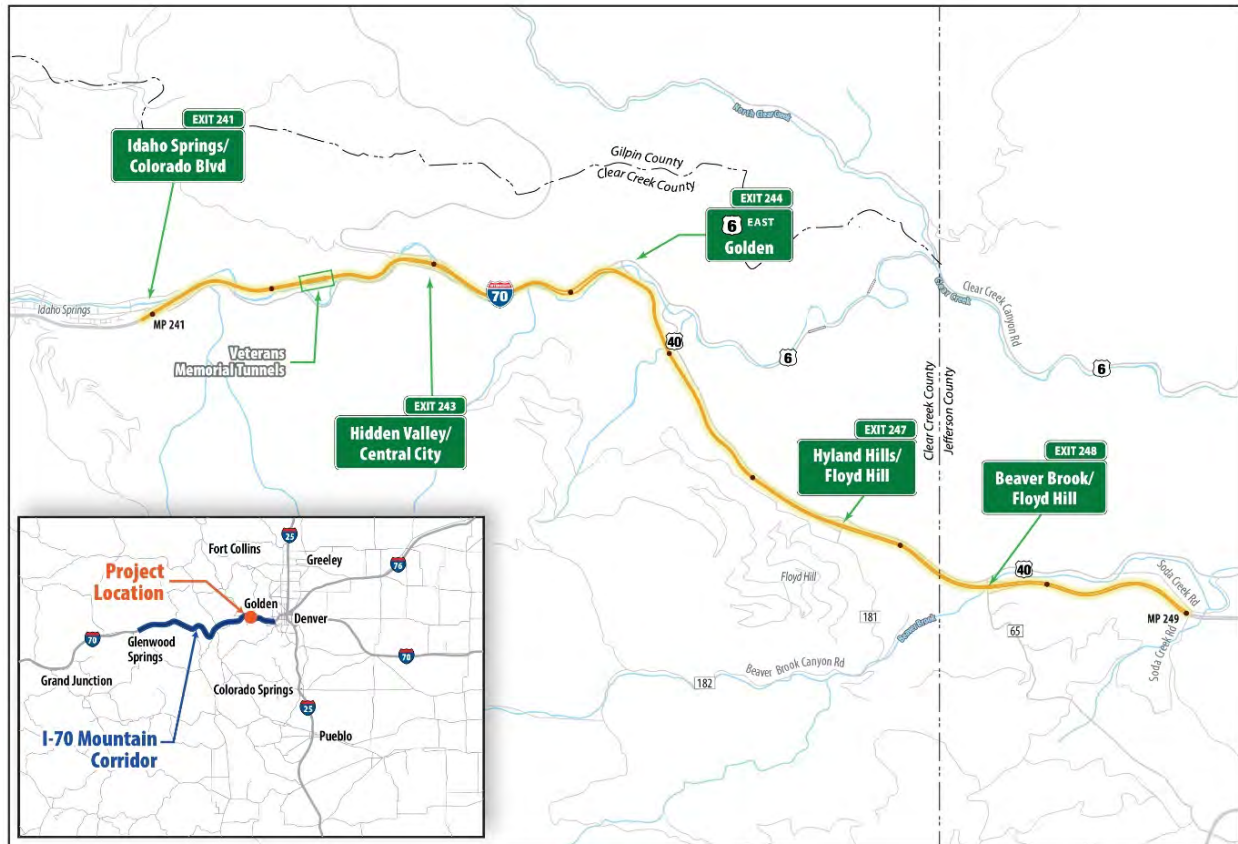
CDOT and FHWA propose improvements along approximately 8 miles of the I-70 Mountain Corridor from the top of Floyd Hill through the Veterans Memorial Tunnels to the eastern edge of Idaho Springs. The purpose of the Project is to improve travel time reliability, safety, and mobility, and address the deficient infrastructure through this area.

The major Project elements include:

- Adding a third westbound travel lane to the two-lane section of I-70 from the current three-lane to two-lane drop (approximately milepost (MP) 246) through the Veterans Memorial Tunnels
- Constructing a new frontage road between the U.S. Highway 6 (US 6) interchange and the Hidden Valley/Central City interchange
- Improving interchanges and intersections throughout the Project area
- Improving design speeds and stopping sight distance on horizontal curves
- Adding an eastbound auxiliary lane to I-70 on Floyd Hill between the US 6 interchange and the Hyland Hills/Floyd Hill interchange
- Improving the multimodal trail (Clear Creek Greenway) between US 6 and the Veterans Memorial Tunnels
- Reducing animal-vehicle conflicts and improving wildlife connectivity with new and/or improved wildlife overpasses or underpasses
- Providing two permanent air quality monitors at Floyd Hill and Idaho Springs to collect data on local air quality conditions and trends
- Coordinating rural broadband access with local communities, including providing access to conduits and fiber in the interstate right-of-way

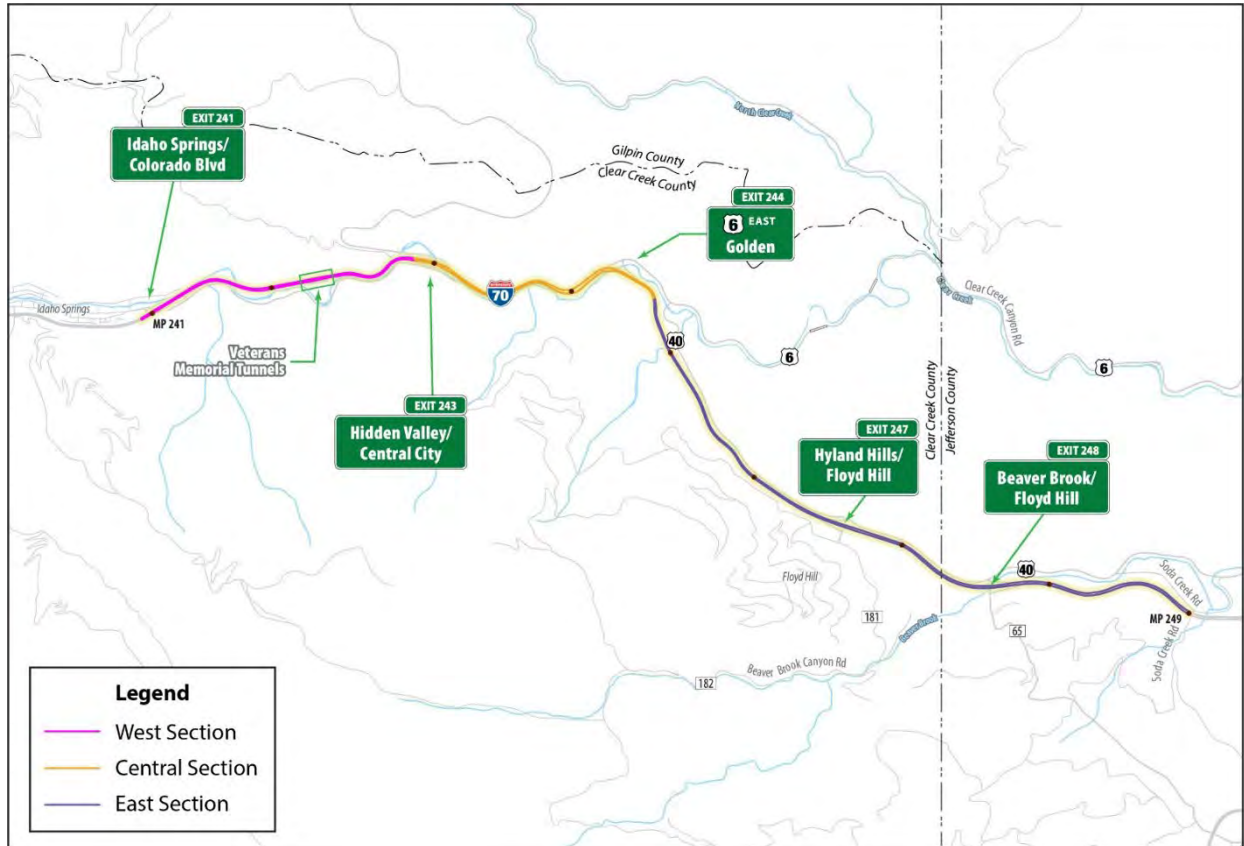
The Project is located on I-70 between MP 249 (east of the Floyd Hill/Beaver Brook interchange) and MP 241 (Idaho Springs/Colorado Boulevard), west of the Veterans Memorial Tunnels. It is located mostly in Clear Creek County, with the eastern end in Jefferson County (see Exhibit 1). The primary roadway construction activities would occur between County Road (CR) 65 (the Floyd Hill/Beaver Brook interchange) and the western portals of the Veterans Memorial Tunnels (MP 247.6 and MP 242.3, respectively), with the Project area extended east and west to account for signing, striping, and fencing.

Exhibit 1. Project Location



Three alternatives are being evaluated in the EA: (1) No Action Alternative, (2) Tunnel Alternative, and (3) Canyon Viaduct Alternative. The Project improvements are grouped into three geographic sections: (1) East Section (top of Floyd Hill to US 6 interchange), (2) Central Section (US 6 interchange to Hidden Valley/Central City interchange), and (3) West Section (Hidden Valley/Central City interchange through Veterans Memorial Tunnels) (see Exhibit 2).

Exhibit 2. East, Central, and West Project Sections



The action alternatives—the Tunnel Alternative and Canyon Viaduct Alternative—include the same improvements in the East Section and West Section to flatten curves, add a third westbound travel lane (the new lane would be an Express Lane), provide wildlife and water quality features, and improve interchange/intersection operations.

Through the Central Section between the US 6 interchange and the Hidden Valley/Central City interchange, the action alternatives vary in how they provide for the third westbound I-70 travel lane and frontage road connections, as follows:

- The **Tunnel Alternative** would realign westbound I-70 to the north (along the curve between MP 244.3 and MP 243.7) through a new 2,200-foot-long tunnel west of US 6. Eastbound I-70 would be realigned within the existing I-70 roadway template to flatten curves to improve design speed and sight distance. This alternative also would include two design options for the alignment of the new frontage road—north or south of Clear Creek. The Clear Creek Greenway trail would be reconstructed in its current location on the south side of Clear Creek.
- The **Canyon Viaduct Alternative** would realign approximately one-half mile of both the westbound and eastbound I-70 lanes (along the curve between MP 244 and MP 243.5) on viaduct structures approximately 400 feet south of the existing I-70 alignment on the south side of Clear Creek Canyon. Through the realigned area, the frontage road would be constructed under the viaduct on the existing I-70 roadway footprint north of Clear Creek. The Clear Creek Greenway would be reconstructed in its current location on the south side of Clear Creek. The viaduct would cross above Clear Creek and the Clear Creek Greenway twice.

Additional information regarding the alternatives evaluated in the EA can be found in *the I-70 Floyd Hill to Veterans Memorial Tunnels Alternatives Analysis Technical Report* (CDOT, 2020d).

2.2. No Action Alternative

The No Action Alternative includes ongoing highway maintenance. In addition, due to its poor condition, the westbound I-70 bridge at the bottom of Floyd Hill is programmed to be replaced regardless of whether CDOT moves forward with one of the action alternatives. Therefore, replacing the bridge in kind (as a two-lane bridge) is part of the No Action Alternative. Under the No Action Alternative, the bridge would be replaced in its current location but would need to be designed to current standards, with a 55 mile-per-hour (mph) design speed and improved sight distance with wider shoulders.

2.3. Action Alternatives: East Section

In the East Section between the top of Floyd Hill and the US 6 interchange, the action alternatives are the same. Through this section, westbound I-70 would be widened to the south to accommodate a third travel lane, which is planned as an Express Lane. The typical section would include an additional 12-foot travel lane and inside and outside shoulders of varying widths, depending on sight distance needs around curves. The proposed footprint would include a 4-foot buffer between the new Express Lane and the existing (general purpose) lanes.

In the eastbound direction, the three travel lanes would be retained but the roadway would be realigned where needed to accommodate westbound widening or curve modifications to improve sight distance and safety. An approximately one-mile-long eastbound auxiliary (climbing) lane would be added in the uphill direction from the bottom of Floyd Hill to the Floyd Hill/Hyland Hills interchange (Exit 247). Water quality features would be added along the south side of the eastbound lanes.

At the Floyd Hill/Beaver Brook and Floyd Hill/Hyland Hills interchange systems, the split-diamond interchange configuration (with on- and off-ramps connected by U.S. Highway 40 [US 40]) would remain, and no new accesses would be provided. However, roundabout intersections constructed on US 40 as part of a separate project address immediate issues with traffic flow and delays at the Floyd Hill neighborhood ingress and egress.

Wildlife fencing would be added along the north and south sides of I-70 between the Floyd Hill/Hyland Hills interchange on the west and Soda Creek Road on the east to reduce wildlife-vehicle collisions.

2.4. Action Alternatives: Central Section

The Central Section of the Project involves the most substantial improvements—including realigning curves, adding a third westbound travel lane, improving the Clear Creek Greenway, and providing the frontage road connection. These improvements occur within the most-constrained section of the Project area, where the existing I-70 footprint and planned roadway improvements are located between canyon rock walls north and south of existing I-70 and Clear Creek. Because of these constraints, the action alternatives within this section include the same improvements but differ with respect to the I-70 mainline and frontage road alignments and the relationship of the roadway improvements to the rock walls and the creek. The Clear Creek Greenway would be reconstructed generally along its existing alignment under both action alternatives, but the Clear Creek Greenway's location to the creek and roadway infrastructure would differ.

2.4.1. I-70 Mainline

The I-70 mainline through this section continues the same roadway typical section from the East Section. Both alternatives would provide an additional westbound 12-foot travel lane; inside and outside shoulders of varying widths, depending on sight distance needs around curves; and a 4-foot buffer between the new planned Express Lane and the existing (general purpose) lanes.

Under the Tunnel Alternative, approximately one mile of westbound I-70 would be realigned to the north near the US 6 interchange. A portion of the realignment would extend through a 2,200-foot-long tunnel that would tie in to the existing westbound I-70 alignment and elevation just east of the Hidden Valley/Central City interchange. The three eastbound I-70 lanes through this area would remain within the existing roadway prism but would be realigned, moving approximately 100 feet north into the rock face adjacent to the existing westbound lanes to flatten horizontal curves and improve the design speed and sight distance.

Under the Canyon Viaduct Alternative, the westbound I-70 alignment would shift to the south on a new 5,300-foot-long viaduct beginning at approximately MP 245 east of the exit ramp to US 6 and it would rejoin the existing alignment about one-half mile east of the Hidden Valley/Central City interchange at approximately MP 243.5. Through this area, eastbound I-70 also would be realigned on a separate viaduct structure next to westbound I-70 from MP 243.4 east to just beyond MP 244.3. Both viaduct structures would cross Clear Creek and the Clear Creek Greenway twice near MP 243.9 and MP 243.5 (approximately 60 feet above ground level).

2.4.2. Frontage Road

Both alternatives include a new approximately 1.5-mile-long frontage road connection between the Hidden Valley/Central City interchange and the US 6 interchange. The frontage road would run from the intersection of CR 314 and Central City Parkway (south of the I-70 eastbound off-ramp at the Hidden Valley/Central City interchange where CR 314, which acts as a frontage road from east Idaho Springs, terminates) to the US 6/I-70 ramp terminal. The roadway section for the frontage road would consist of two 11-foot lanes (one in the eastbound direction and one in the westbound direction) with consistent 2-foot shoulders. The design speed would be 30 mph and the roadway would be constructed to comply with Clear Creek County local access standards.

The Tunnel Alternative includes two design options for this frontage road:

- **North Frontage Road Option** would provide the new frontage road connection between the two interchanges mostly on the north side of Clear Creek. The I-70 mainline would be realigned north into the mountainside, requiring substantial rock cuts (150 feet high) to make room for the frontage road between the creek and existing I-70. The Clear Creek Greenway would be reconstructed along its current alignment north of Clear Creek. In the Sawmill Gulch area where the existing trail's grade does not meet Americans with Disabilities Act (ADA) standards, the Greenway trail would be lowered to meet grades.
- **South Frontage Road Option** would provide the new frontage road connection between the two interchanges mostly on the south side of Clear Creek. Moving the frontage road to the south side of the creek would require new rock cuts on the south side of Clear Creek Canyon and less substantial rock cuts on the north side of I-70. The Clear Creek Greenway would be reconstructed generally along its current alignment south of Clear Creek; in the Sawmill Gulch area, an approximately 1,500-foot new section of the Greenway trail would be constructed

across the creek to the north (with two pedestrian bridge crossings of the creek) to be ADA compliant, and the existing trail would remain in place but not be resurfaced. The Clear Creek Greenway would be located closer to the frontage road than under the North Frontage Road Option; although the design seeks to maximize horizontal and vertical separation between the facilities and includes a new section of trail to meet ADA compliance, the alignment of the frontage road nearer to the Greenway and between the Greenway and creek is not supported by Clear Creek County, Idaho Springs, community members, or the Project Technical Team because it diminishes the recreational experience.

Under the Canyon Viaduct Alternative, the existing I-70 pavement under the elevated structures would be repurposed for the frontage road; excess right of way would be available for other uses—presumably, creek and recreation access—through this approximately one-mile area of the canyon.

2.5. Action Alternatives: West Section

The West Section between the Hidden Valley/Central City interchange and the Veterans Memorial Tunnels continues the widening of the interstate to add the third westbound travel lane and to flatten the S-curve in this location. Improvements in this section are the same under both action alternatives. The curve modifications require realigning both the I-70 mainline and frontage road through this section. The I-70 mainline alignment would shift south approximately 100 feet around the first curve from the Hidden Valley/Central City interchange, then north around the second curve approximately 50 feet, continuing a slight (25 foot) shift north before tying in to the existing alignment at the Veterans Memorial Tunnels. Much of CR 314 would be realigned south between the Doghouse Rail Bridge over Clear Creek near the Veterans Memorial Tunnels east portal and the Hidden Valley/Central City interchange. A small section of CR 314 (between MP 242.6 and MP 242.7) would remain and connect to the reconstructed portions west and east.

These alignment shifts result in substantial rock cuts on both the north and south sides of the canyon. On the north side, rock cuts up to 160 feet high would be required next to the I-70 westbound lanes (along the curve in the area where CR 314 is not reconstructed). To realign CR 314 south, rock cuts from 70 feet to 100 feet high are required on the south side of the canyon. Additionally, a 1,200-foot section of Clear Creek, which is located between I-70 and CR 314, would need to be relocated south near MP 242.5.

The Hidden Valley/Central City interchange would not be reconstructed, and the I-70 bridges would remain because they are wide enough to accommodate the widened I-70 footprint without being replaced. All the on- and off-ramps for the interchange would be reconstructed, but the bridges over Clear Creek for the I-70 westbound off-ramp and I-70 eastbound on-ramp also can be retained. New bridges over Clear Creek to the west would be needed for the I-70 westbound on-ramp and I-70 eastbound off-ramp to accommodate the curve flattening and shift of I-70 to the south in this location. The CDOT maintenance facility would need to be relocated.

No changes are required west of the Veterans Memorial Tunnels. Within the westbound tunnel, the roadway would be restriped for the third lane (the expansion of the tunnel to accommodate the third lane was completed in 2014). After the tunnel, restriping and signing would continue west to the next interchange at Idaho Springs/Colorado Boulevard (Exit 241), where the third lane would terminate. The Express Lane would operate in conjunction with the westbound Mountain Express Lane (MEXL) during peak periods (winter and summer weekends).

2.6. Construction of Action Alternatives

CDOT is planning to use a Construction Manager/General Contractor (CMGC) delivery method for construction of the Project. This contracting method involves a contractor advising in the design phases to better define Project technical requirements and costs, improve design quality and constructability, and reduce risks through the construction phase. This method promotes innovation and aligns well with the multidisciplinary Context Sensitive Solutions process. It was used successfully on the Twin Tunnels projects to reduce environmental impacts and accommodate community values in the design and construction project development phases.

Construction of the action alternatives is anticipated to be complex and take four to five years but could occur generally within the proposed right of way. CDOT would work with the CMGC to refine the construction details and develop a plan that promotes safety and minimizes disruption to the traveling public and nearby residents and businesses.

The Tunnel Alternative would take approximately one year longer to build than the Canyon Viaduct Alternative; most of the additional time would be needed for the tunnel rock blasting and construction that could take place without disrupting traffic. However, in addition to the tunnel rock blasting, the Tunnel Alternative has considerable rock cuts at the tunnel portals and along the north side of I-70 to realign curves, widen the highway, and add the frontage road connection. Rock cuts, staging for the excavation of the tunnel portals, and haul of waste rock are major construction activities that are likely to interrupt traffic on I-70 due to increased construction equipment traffic on the highway and the proximity of construction to live traffic, the need for temporary lane closures and detours, and closures for blasting. The North Frontage Road Option has significantly larger (taller and longer) rock cuts than the South Frontage Road Option.

The Canyon Viaduct Alternative has substantially less rock cuts and blasting compared to the Tunnel Alternative but would require more work in the existing highway right of way. Bridge construction over and pier placement within the highway template will need to be carefully coordinated. However, construction of some elements, such as the bench portion of the viaduct, are separated from the existing I-70 alignment and could be constructed offline similarly to the tunnel excavation.

Specific construction methods and phasing will be determined with contractor input and could affect the duration and/or physical requirements for construction activities. The focus of environmental impact analysis during the NEPA process is to identify resources and locations sensitive to construction impacts and incorporate reasonable mitigation measures, including the potential to avoid impacts by avoiding sensitive areas, to inform the contractor's plans. Final design and construction plans will consider changes in resource impacts, and reevaluations will be completed as needed during final design.

3. Applicable Laws, Regulations, and Guidance

Federal, state, and local regulations and guidance pertaining to the protection of native vegetation habitats and the control of noxious weeds and/or invasive species are summarized below.

3.1. Federal Noxious Weed Act

The Federal Noxious Weed Act (1975) established a federal program to control the spread of noxious weeds. It has the authority to declare plant species as noxious weeds; limit interstate spread of noxious weeds without a permit; inspect, seize, and destroy products that contain noxious weeds; and quarantine areas to contain and limit the spread of noxious weeds.

3.2. Executive Order 13112, “Invasive Species”

This Executive Order (EO), signed by President Clinton in 1999, provides guidance on how to regulate and minimize the introduction of invasive species and provides guidance for their control and to minimize the economic, ecological, and human health impacts that invasive species cause.

3.3. FHWA Guidance on Invasive Species

This guidance, developed in 1999, presents FHWA’s response to EO 13112. It provides guidelines for addressing roadside vegetation management issues for construction activities and maintenance programs.

3.4. Colorado Noxious Weed Act

The Colorado Noxious Weed Act (2003) requires the control of the 83 plant species designated by the Colorado Department of Agriculture (CDA) as “noxious weeds.” Noxious weeds are plants that reduce agricultural productivity, lower real estate values, endanger human health and well-being, and damage scenic values (CDA, 2003 & 2019; Colorado Weed Management Association [CWMA], 2013).

These species have been divided into three groups: List A, List B, and List C (Clear Creek County, 2015). List A species have limited to no distribution in Colorado but are designated for immediate eradication. List B species are locally common and actively managed to stop continued spreading. List C species are widespread and not managed but have been identified for additional education, research, and biological control.

3.5. Clear Creek County Noxious Weed Management and Enforcement Plan (Ordinance 11-A)

This plan (Clear Creek County, 2013) details the management of noxious weeds in unincorporated areas of Clear Creek County, which adheres to the Colorado Noxious Weed Act requirements. This allows the Board of County Commissioners to inspect and enforce management of noxious weeds in unincorporated areas (public and private) within the county.

3.6. Senate Bill 40 Wildlife Certification

Senate Bill 40 (SB 40) is a state statute (Colorado Revised Statute 33-5-101-107, 1969, as amended in 1973) that protects riparian habitat for wildlife species. It requires any agency of the state to obtain wildlife certification from the Colorado Parks and Wildlife (CPW) Department when the agency plans construction in any stream or on any stream bank within the jurisdiction of SB 40. A formal agreement between CPW and CDOT is designed to protect and preserve fish and wildlife habitat resources (primarily trees and shrubs) associated with streams that intersect state and federal highways in Colorado (CDOT & CPW, 2013a; CDOT & CPW, 2013b). An SB 40 Wildlife Certification is obtained from CPW when construction occurs in or adjacent to jurisdictional SB 40 streams, including banks or tributaries.

Jurisdictional SB 40 streams typically are associated with the following:

- All perennial streams represented by solid blue lines on U.S. Geological Survey (USGS) 7.5-foot quadrangle maps or in the National Hydrography Dataset (NHD)
- Segments of ephemeral and intermittent streams providing flowing water beneficial to fish and wildlife
- Segments of streams that are comprised of riparian vegetation dependent on groundwater or overbank flooding
- Segments of streams having wetlands present upstream or downstream of the Project

4. Vegetation and Noxious Weeds in the Tier 1 PEIS

4.1. Context

The I-70 Mountain Corridor contains a diversity of vegetation types that correspond to changes in elevation (approximately 11,200 feet above mean sea level [amsl] at the west side of the Eisenhower-Johnson Memorial Tunnels to 6,000 feet amsl at C-470), as well as geographic variability along the 144-mile Corridor. The 1999 Colorado Gap Analysis Project and 1997 United States Forest Service (USFS) geographic information systems (GIS) data were used to map vegetation communities in the Tier 1 PEIS Corridor. The PEIS documented the following vegetation communities in the Corridor: Alpine Meadows-Tundra, Lodgepole Pine (*Pinus contorta*) Forest, Aspen (*Populus* spp.) Forest, Mountain Shrubland, Barren Land, Piñon-Juniper Forest, Douglas-Fir (*Pseudotsuga menziesii*) Forest, Ponderosa Pine (*Pinus ponderosa*) Forest, Sagebrush Shrubland, Grass/Forb Meadows, and Spruce-Fir Forest.

The Tier 1 PEIS also identified wetlands and associated riparian areas as important vegetation communities within the Corridor. Wetlands and riparian areas that are composed of unique vegetation are found along the I-70 Mountain Corridor and serve important ecological functions. These areas serve as buffer zones to rivers and streams and are home to unique wildlife species, including protected species.

To address wetland and stream health, the lead agencies formed the Stream and Wetland Ecological Enhancement Program (SWEET) Issues Task Force, which is comprised of representatives from federal and state agencies, watershed associations, Clear Creek County, and special interest groups, to identify and address environmental issues related to wetlands, streams, aquatic species, and fisheries in the I-70 Mountain Corridor (CDOT and FHWA, 2011a). This program resulted in a Memorandum of Understanding, including an implementation matrix focused on improving stream and wetland health in the I-70 Mountain Corridor for future projects in the Corridor.

The Tier 1 PEIS identified direct and indirect impacts on vegetation. Direct impacts were expected to result from removal of vegetation during construction of new roadways or transit infrastructure, resulting in a decrease of the natural landscape function and removal of wildlife habitat. Loss of habitat results in a loss of foraging, nesting, resting, and denning areas for wildlife, which includes protected species. Indirect impacts were expected to result from winter roadway maintenance associated with deicer salts that can damage the needles and photosynthetic tissue of coniferous trees and result in lower germination rates. Also, land disturbance caused by construction and increased traffic within the Corridor creates favorable conditions for the introduction and farther spread of noxious weeds into adjacent lands. The indirect impacts are greatest nearest the highway, but splash, runoff, and aerial drift can affect vegetation more than 300 feet from the highway. The Tier 1 PEIS also identified temporary disturbance to vegetation that is expected to occur during construction. The temporary removal of vegetation may result in some small animal mortality and big game or bird species leaving the area. Forested lands will take the longest to return to their original state and grasslands will recover the most quickly. The PEIS identified mitigation strategies to offset impacts, discussed in Section 7.1.

The Tier 1 PEIS also identified two threats to vegetation communities within the Project Corridor, including noxious weeds and the ongoing pine beetle infestation. Noxious weeds have increased along the I-70 Mountain Corridor as a result of human activity (CDOT, 2011a). In response, counties along the I-70 Mountain Corridor have implemented weed-control programs and have listed noxious weeds designated for management. The mountain pine beetle epidemic, generally affecting lodgepole pines

at higher elevations in the I-70 Mountain Corridor, has caused a substantial loss of timber and the resulting effect to many other resources (such as vegetation, wildlife habitat, visual quality). The USFS noted that the ongoing pine beetle infestation is changing conditions on the ground, but that the extent and breadth of change are not yet necessarily predictable, and that the most appropriate time to address these changing conditions is during Tier 2 studies (CDOT and FHWA, 2011a).

4.2. Analysis in Tier 2 Processes

Lead agencies are required to conduct further analysis of direct and indirect impacts on vegetation resources and noxious weeds during project-specific Tier 2 processes, including the following actions:

- Fulfill responsibilities set forth in the SWEEP Memorandum of Understanding.
- Discuss the influence of the mountain pine beetle on the forested communities and its effects on vegetation and noxious weeds, in coordination with the U.S. Fish and Wildlife Service (USFWS) and USFS.
- Adhere to any new or revised laws or regulations pertaining to vegetation resources and noxious weeds.
- Develop specific best management practices (BMPs) for each project.
- Develop specific and more-detailed mitigation strategies and measures.
- Consider opportunities for enhancement on a project-by-project basis.
- Include analysis of sensitivity zones, terrestrial impacts, and cumulative impacts in Tier 2 biological impact assessments.

Four Tier 2 NEPA studies have been conducted on the I-70 Mountain Corridor near or within the Floyd Hill area. These projects include the Eastbound Twin Tunnels Environmental Assessment (CDOT, 2011b), the Westbound Twin Tunnels Categorical Exclusion (CDOT, 2014a), the Eastbound Peak Period Shoulder Lane Categorical Exclusion (CDOT, 2014b), and the Westbound Peak Period Shoulder Lane Categorical Exclusion (CDOT, 2018).

Vegetation communities identified in the Twin Tunnels project area included ponderosa pine (*Pinus ponderosa*) woodlands; deciduous scrublands with mountain mahogany (*Cercocarpus montanus*); Douglas fir (*Pseudotsuga menziesii*) forests; and small areas of riparian habitat associated with Clear Creek. The area surrounding the project area is open rocky/steep habitat intermixed with low shrubs and trees.

The Twin Tunnels EA identified five CDA noxious weeds species within the project area, four List B species and one List C species, and the Westbound and Eastbound I-70 Peak Period Shoulder Lane Projects identified 10 List B species and two List C species (see Section 3.4 of this document for definitions of List B and List C species).

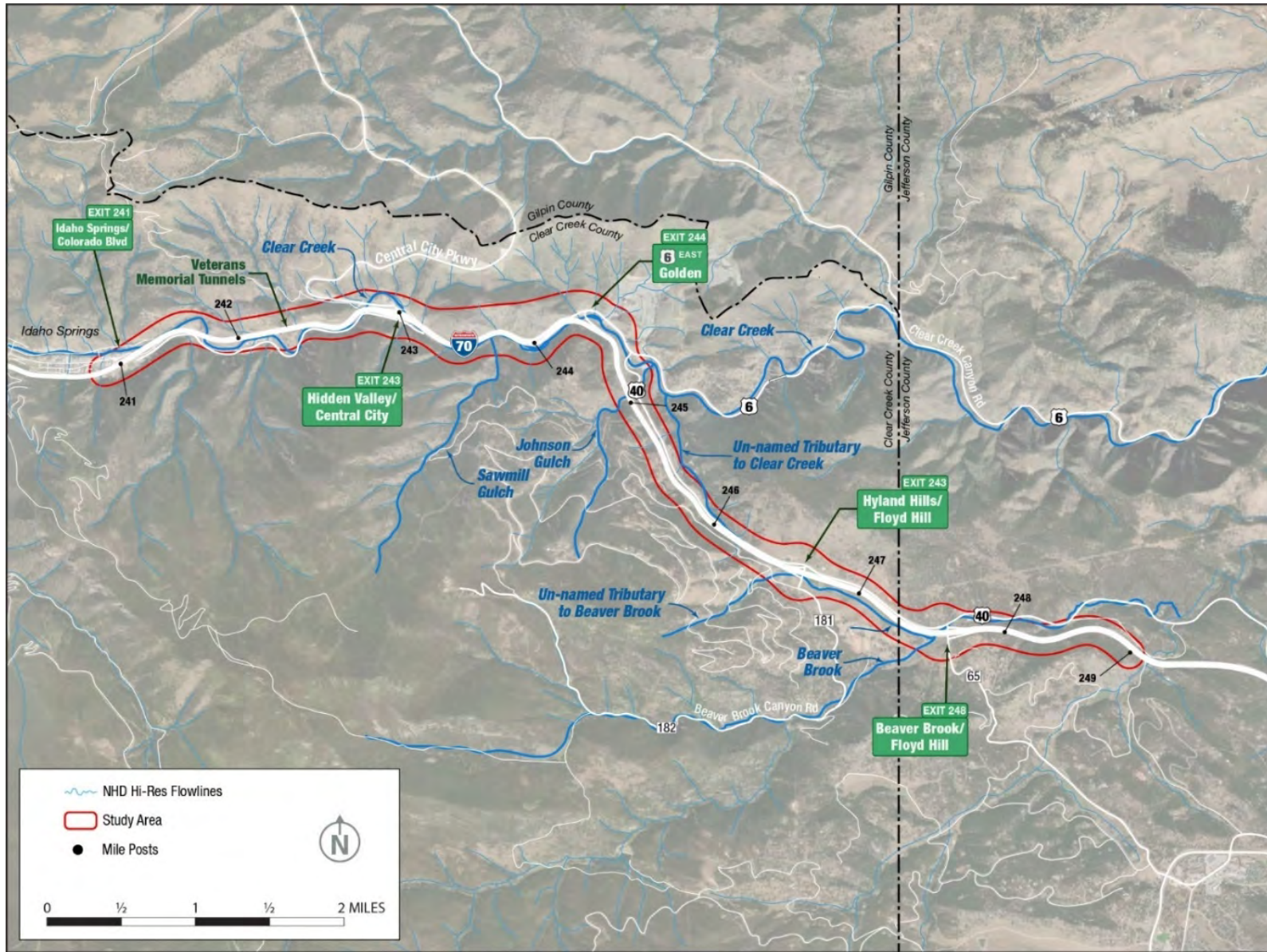
5. Affected Environment

5.1. Vegetation Study Area

The Vegetation and Noxious Weeds Study Area (Study Area) was delineated by creating a 600-foot buffer around the I-70 Floyd Hill to Veterans Memorial Tunnels Project limits identified in Section 2.1 of this document (see Exhibit 3). It varies in elevation from approximately 7,100 feet to 7,900 feet and is located within the Crystalline Mid-Elevation Forests Level IV Ecoregion (EPA, 2013).

The Crystalline Mid-Elevation Ecoregion is partially glaciated with low mountain ridges and slopes and moderate to high gradient perennial streams with boulder, cobble, and bedrock substrates (EPA, 2013). It is located predominantly in the eastern portion of the Rockies between 7,000 feet and 9,000 feet amsl. Vegetation in this region varies according to elevation. The lower elevations are characterized by grass or shrub cover that often is heavily grazed. Middle elevations are characterized by moderate grazing and a variety of vegetation communities, including Douglas fir, ponderosa pine, aspen, and juniper-oak (*Juniperus* spp. and *Quercus* spp.) woodlands. Higher elevations are dominated largely by coniferous forests and have little grazing activity. The natural vegetation includes aspens, ponderosa pine, Douglas fir, and areas of lodgepole pine and limber pine (*Pinus flexilis*). There is a diverse understory of shrubs, grasses, and wildflowers in this region. Land use includes wildlife habitat, livestock grazing, logging, mineral extraction, recreation, and residential developments.

Exhibit 3 Vegetation and Noxious Weeds Study Area



5.2. Methodology

Existing conditions within the Study Area were characterized through a desktop review of publicly available information. The review included previous biological studies completed in the Floyd Hill area, USGS's National Land Cover Database (NLCD) (USGS, 2017), Colorado Natural Heritage Program (CNHP) Terrestrial Ecological System Patches (TESP) (CNHP, 2011), CDA Noxious Weed List (CDA, 2019), CDOT Online Transportation Information System (OTIS) Database (CDOT, 2017), and Google Earth aerial imagery (Google, 2020). Additionally, a field reconnaissance of the Study Area was conducted from public right of way in Summer 2017 and a field survey along Beaver Brook occurred in Summer 2018 (see Appendix A for site photographs). Private property within the Study Area was not walked. Vegetation on these lands was documented only if easily observed and identified from CDOT right of way.

Land cover was analyzed by reviewing the NLCD and TESP, which are the best available datasets for vegetation within the Study Area. The TESP data have a higher resolution than the NLCD; however, TESP data only covered the Jefferson County portion of the Study Area. Therefore, the NLCD was used to map the dominant vegetative communities within the Study Area. This database has a resolution of 30-meter x 30-meter pixels and is not very accurate; therefore, it was supplemented with data gathered during site visits and by reviewing Google Earth aerial imagery. Land cover within the Study Area has been classified into the following categories:

- **Developed, High Intensity**—Highly disturbed areas with 80 percent to 100 percent impervious surfaces or mining impacts. Also includes previous rock cut areas devoid of vegetation.
- **Developed, Medium Intensity**—Disturbed areas, sparsely vegetated, small amount of impervious surface areas with a mixture of constructed materials and vegetation.
- **Developed, Low Intensity**—Low-density residential areas with native vegetation throughout. Includes agricultural lands that have been tilled or heavily managed. Impervious surfaces between 20 percent and 49 percent of total cover.
- **Developed, Open Space**—Areas with manicured lawns (ex: parks).
- **Evergreen Forest**—Areas dominated by evergreen trees generally greater than 16 feet tall, with greater than 20 percent of total vegetation cover. More than 75 percent of the tree species maintain their leaves all year. Canopy is never without green foliage.
- **Deciduous Forest**—Areas dominated by deciduous trees generally greater than 16 feet tall, with greater than 20 percent of total vegetation cover. More than 75 percent of the tree species shed foliage simultaneously in response to season change.
- **Mixed Forest**—Areas with a mixture of evergreen and deciduous trees.
- **Grassland**—Natural landscapes having greater than 80 percent graminoid or herbaceous vegetative cover. Does not include agricultural lands that have been tilled or heavily managed.
- **Open Water**—Creeks, ponds, and other water sources.
- **Shrub/scrub**—Areas with shrubs, grasses, and herbaceous plants.
- **Wetlands**—Areas that contain both herbaceous and woody wetland areas.

5.3. Land Cover

Approximately 519 acres (42 percent) of the Study Area is developed (see Exhibit 4. Interstate 70 and other transportation facilities make up most of these developed areas. There also are commercial and residential developments and sparsely developed single-family residences at the eastern end of the Project and a large rock quarry on the north side of I-70 at the bottom of Floyd Hill (approximately MP 244.6). Between the US 6 interchange and the Veterans Memorial Tunnels, developed areas include a

small number of commercial businesses, residences, a CDOT maintenance yard, and the Black Hawk City Water Plant. West of the Veterans Memorial Tunnels developed areas are located south of I-70. Limited native vegetation occurs within these developed areas.

5.3.1. Vegetation Communities

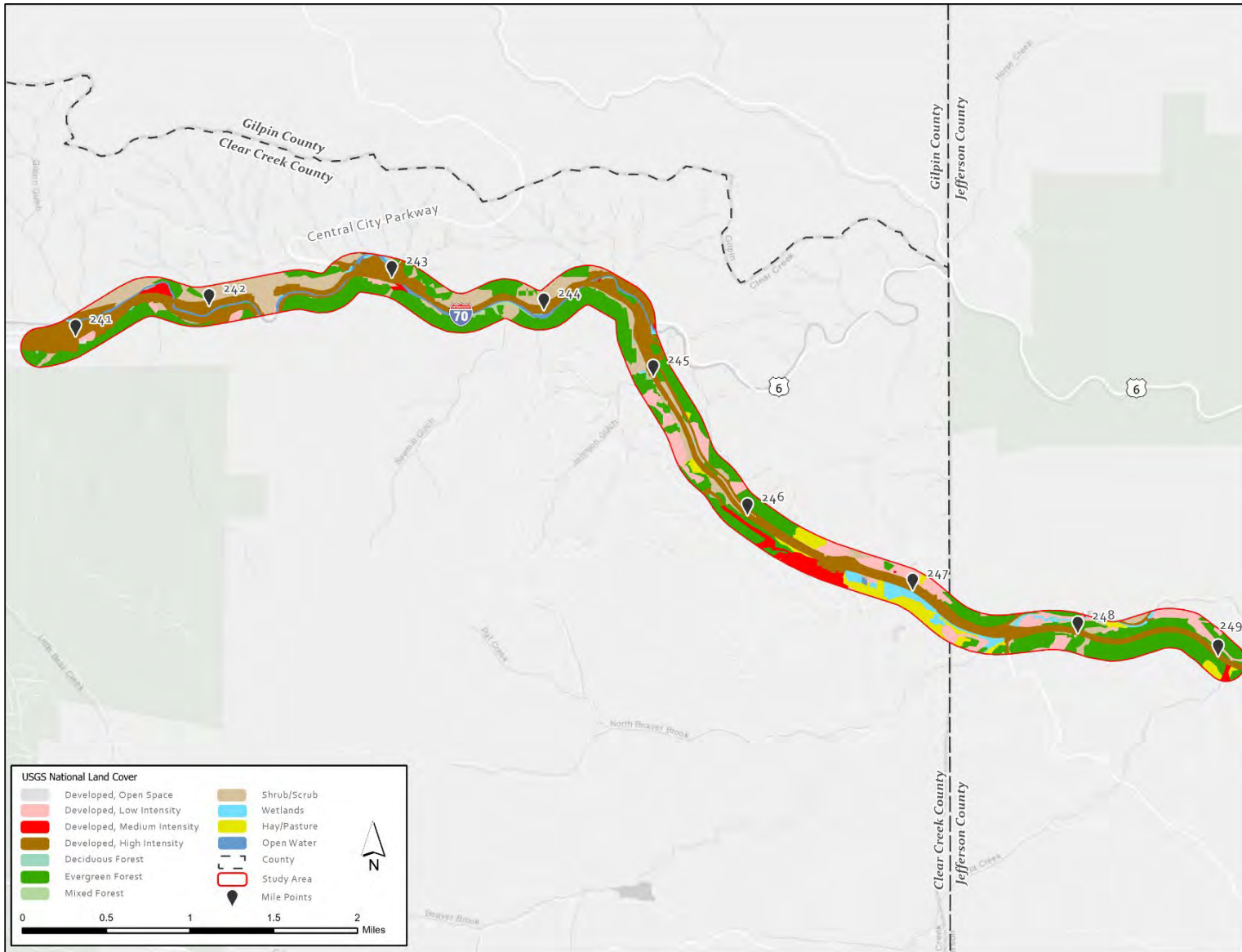
Approximately 732 acres (58 percent) of the Study Area are classified as having native vegetation (see Exhibit 4). Approximately 431 acres (34 percent) consist of evergreen forests, 178 acres (14 percent) of shrub/scrub, 53 acres (4 percent) of grasslands, 32 acres (3 percent) of wetlands, 29 acres (2 percent) of open water, and 9 acres (less than 1 percent) of deciduous and mixed forest communities.

Vegetation communities identified in the Study Area included ponderosa pine woodlands, deciduous scrublands with mountain mahogany, Douglas fir forests, and mixed forests. Trees are denser on north-facing slopes than south-facing slopes and shrub/scrub is denser on south-facing slopes. Dominant grasses identified in the I-70 right-of-way were smooth brome (*Bromus inermis*) and western wheatgrass (*Pascopyrum smithii*).

Riparian habitat occurs along Clear Creek, an unnamed tributary to Clear Creek, Beaver Brook, an unnamed tributary to Beaver Brook, Johnson Gulch, and Sawmill Gulch (see Exhibit 3). Clear Creek is heavily channelized with steep riprapped banks, which limits the establishment of riparian vegetation. Vegetation identified in the other drainages includes narrowleaf cottonwood (*Populus angustifolia*), thinleaf alder (*Alnus incana*), river birch (*Betula fontinalis*), numerous willow species (*Salix spp.*), Engelmann spruce (*Picea engelmannii*), and snowberry (*Symphoricarpos spp.*).

Please see Appendix B for a complete list of vegetation documented in the Study Area.

Exhibit 4 Land Cover and Vegetation Communities within the Study Area



Source: USGS, 2017; Google, 2020.

Exhibit 5 Summary of Land Cover in the Study Area

| Land Cover | 2.23 | Percent of Study Area |
|-------------------------------|--------------|-----------------------|
| Developed Areas | | |
| Developed, Open Space | 1 | < 1 |
| Developed, Low Intensity | 111 | 9 |
| Developed, Medium Intensity | 38 | 3 |
| Developed, High Intensity | 370 | 30 |
| Subtotal | 520 | 42 |
| Vegetation Communities | | |
| Deciduous Forest | 4 | < 1 |
| Evergreen Forest | 431 | 34 |
| Grasslands | 53 | 4 |
| Wetlands | 32 | 3 |
| Mixed Forest | 5 | < 1 |
| Shrub/Scrub | 178 | 14 |
| Open Water | 29 | 2 |
| Subtotal | 732 | 58 |
| TOTAL | 1,252 | 100 |

Source: USGS, 2017; Google, 2020.

5.3.2. Noxious Weeds

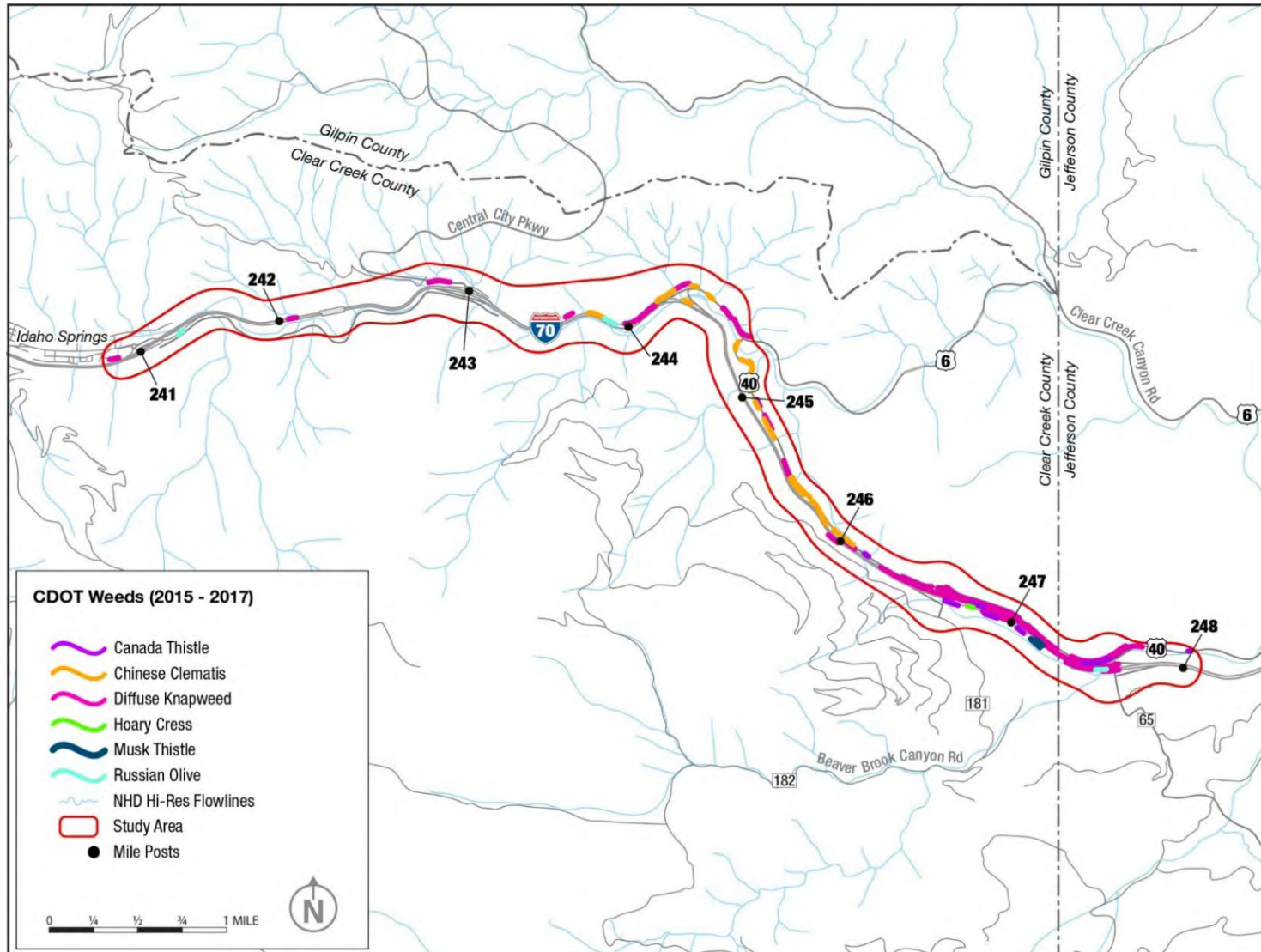
Nine noxious weed species have previously been documented in the Project Area (see Exhibit 6) (CDOT, 2017). Three of the nine species, common burdock (*Arctium minus*), common mullein (*Verbascum Thapsus*), and field bindweed (*Convolvulus arvensis*) are widespread throughout Colorado and not actively managed. The remaining six species, Canada thistle (*Cirsium arvense*), Chinese clematis (*Clematis orientalis*), diffuse knapweed (*Centaurea diffusa*), hoary cress (*Cardaria draba*), musk thistle (*Carduus nutans*), and Russian olive (*Elaeagnus angustifolia*) require active management. The distribution of these six species occurs mostly in the East Section of the Project Area (see Exhibit 7).

Exhibit 6 Noxious Weeds in the Study Area

| Common Name | Latin Name | CDA List | Presence within the Study Area |
|------------------|-------------------------------|----------|--------------------------------|
| Canada Thistle | <i>Cirsium arvense</i> | B | Common |
| Chinese Clematis | <i>Clematis orientalis</i> | B | Scattered |
| Common Burdock | <i>Arctium minus</i> | C | Scattered |
| Common Mullein | <i>Verbascum thapsus</i> | C | Common |
| Diffuse Knapweed | <i>Centaurea diffusa</i> | B | Common |
| Field Bindweed | <i>Convolvulus arvensis</i> | C | Common |
| Hoary Cress | <i>Cardaria draba</i> | B | Common |
| Musk Thistle | <i>Carduus nutans</i> | B | Scattered |
| Russian Olive | <i>Elaeagnus angustifolia</i> | B | Scattered |

Source: CDOT, 2017.

Exhibit 7 Noxious Weed Distribution of Species Requiring Management within the Study Area



Source: CDOT, 2017

6. Impacts

This section describes the potential direct and indirect impacts of the proposed action alternatives and the No Action Alternative on vegetation and noxious weeds in the Study Area. Direct impacts occur when plants are physically impacted by activities associated with the proposed action alternatives. Indirect impacts occur later in time, after construction has been completed, and result from changes made to plant habitats, such as increased shading or maintenance activities.

Direct impacts can be permanent or temporary in nature. Permanent impacts occur when existing vegetated areas are permanently replaced by impervious surfaces. Temporary impacts occur when vegetated areas are disturbed or cleared during construction but revegetated and restored to pre-construction conditions before the Project is closed.

6.1. Methodology

The vegetation impact assessment was based on the following spatial data sets:

- Proposed edge of pavement
- Proposed structures
- Existing edge of pavement
- Project design footprint

Permanent impacts were calculated by taking the proposed edge of pavement and proposed structures design files and extracting areas that overlapped with the existing edge of pavement and existing structures. The remaining surface areas were identified as permanent impact areas.

Temporary impacts were calculated by extracting the proposed and existing edges of pavement from the Project design footprint. The remaining locations were identified as temporary impact areas.

In addition, portions of the existing roadway pavement that did not overlap with the boundaries of the proposed roadway pavement, were identified as reclamation areas. The existing pavement in these areas would be removed and the area would be reseeded with native species.

Impacts associated with installation of wildlife fencing and roadway signs were not included in the calculations described above because they are expected to be minimal in nature, would be the same for each action alternative, and the same mitigation measures would be applied as for other areas of temporarily disturbed vegetation. The impacts and associated mitigation measures for the No Action, Tunnel, and Canyon Viaduct Alternatives are discussed in more detail below.

6.2. No Action Alternative Impacts

As described in Section 2.2 of this document, the No Action Alternative would include ongoing highway maintenance and replacement of the westbound I-70 bridge at the bottom of Floyd Hill. The new bridge would be constructed in the same location; it would maintain two westbound travel lanes but would be wider than the existing bridge with wider shoulders to improve sight distance. The bridge replacement area is classified as a high-intensity developed area that is dominated by impervious surfaces, including I-70, US 6, and the Clear Creek Greenway Trail. Several areas at the interchange also are heavily disturbed and lacking vegetation, including parking areas, dirt piles, and the riprapped banks of Clear Creek. Vegetation in the remaining areas consists of herbaceous plants along the roadside and bridge abutments and a few small trees and shrubs (see Photo 1).

Construction activities would cause temporary direct impacts to sparse vegetation in this area; however, impacts would be minor, and the area would be revegetated after construction was complete.

Soil disturbance during construction would create favorable conditions for the introduction and spread of noxious weeds. This would be curtailed by CDOT's ongoing highway maintenance activities, which include control of noxious weeds. Additional maintenance activities that could result in direct or indirect impacts to vegetation include mowing, winter plowing, use of deicer, and other minor improvements.

For a more detailed description of impacts to riparian vegetation, refer to the *I-70 Floyd Hill to Veterans Memorial Tunnels Aquatic Resources Technical Report* (CDOT, 2020a) and the *I-70 Floyd Hill to Veterans Memorial Tunnels Terrestrial and Aquatic Wildlife Technical Report* (CDOT, 20Tunnel Alternative Impacts



Photo 1. I-70 Westbound Bridge—Bottom of Floyd Hill

6.3. Tunnel Alternative

6.3.1. East Section

Project elements in the East Section that have potential to impact vegetation include:

- Adding a third westbound I-70 lane
- Adding an eastbound auxiliary lane from the bottom of Floyd Hill to the Hyland Hills/Floyd Hill interchange
- Constructing a span bridge between MP 245 and MP 244 to modify curves and improve sight distance and safety

Temporary direct impacts would result from construction activities, staging areas, and access for heavy construction equipment.

6.3.1.1. Direct Impacts

The Study Area within the East Section of the Project consists of approximately 298 acres (44.4 percent) of developed land and approximately 372 acres (55.5 percent) of vegetated lands (see Exhibit 8). Approximately 245 acres (36.6 percent) consist of evergreen forest, 41 acres (6.1 percent) of shrub/scrub, 29 acres (4.3 percent) of wetlands, 3 acres (0.5 percent) of deciduous forest, and 1 acre (0.1 percent) of open water. The action alternatives would impact a small fraction of these areas, as detailed in Exhibit 8.

Exhibit 8 Direct Impacts to Land Cover, Tunnel Alternative, East Section

| Land Cover | Total Habitat | | Permanent Impacts | | Temporary Habitat | |
|-------------------------------|---------------|--------------------|-------------------|--------------------|-------------------|--------------------|
| | Acres | Percent Study Area | Acres | Percent Study Area | Acres | Percent Study Area |
| Developed Areas | | | | | | |
| Developed, Open Space | — | — | — | — | — | — |
| Developed, Low Intensity | 102 | 15.2 | — | — | — | — |
| Developed, Medium Intensity | 31 | 4.6 | — | — | < 1 | < 1 |
| Developed, High Intensity | 165 | 24.6 | 11 | 1.6 | 6 | 0.9 |
| Subtotal | 298 | 44.4 | 11 | 1.6 | 6 | 0.9 |
| Vegetation Communities | | | | | | |
| Deciduous Forest | 3 | 0.5 | — | — | — | — |
| Evergreen Forest | 245 | 36.6 | < 1 | < 1 | < 1 | < 1 |
| Grasslands | 53 | 7.9 | < 1 | < 1 | 1 | 0.1 |
| Wetlands | 29 | 4.3 | — | — | — | — |
| Mixed Forest | — | — | — | — | — | — |
| Shrub/Scrub | 41 | 6.1 | < 1 | < 1 | 1 | 0.1 |
| Open Water | 1 | 0.1 | — | — | — | — |
| Subtotal | 372 | 55.5 | < 1 | < 1 | 2 | 0.2 |
| TOTAL | 670 | 100 | 11 | 1.6 | 8 | 1.1 |

Source: USGS, 2017.

Less than 1 acre of vegetated land (less than 1 percent of the East Section Study Area) would be permanently incorporated into the transportation facility and approximately 2 acres (less than 1 percent of the East Section Study Area) would be temporarily impacted during construction (see Exhibit 8). However, 11 acres of “Developed—High Intensity” areas that have some existing vegetation would be impacted.

Permanent direct impacts to vegetated areas would result from increased pavement required for the additional westbound and eastbound lanes, and construction of span bridges. Temporary direct impacts would result from general clearing and grubbing activities and staging or access areas.

To construct the I-70 eastbound auxiliary lane and the third westbound lane, additional pavement would be added to the south side of I-70 between the Highland Hills/Floyd Hill interchange and MP 245. A large portion of this area lacks vegetation due to the cut slopes from the construction of I-70 (see Appendix A, Photos 6, 7, 11, and 12) and is classified as having a Disturbed, High Intensity land cover.



The roadway expansion to the south would require cutting into adjacent rock outcrops in three locations on the south side of I-70. These areas are classified as shrub/scrub. The outcrops vary in height between 100 and 200 feet; however, the rock cuts would only be approximately 15 feet tall. So, a small portion of the herbaceous vegetation at the bottom of the rock outcrop, as shown in Photo 2, would be impacted.



Photo 2. 200-Foot Tall Rock Outcrop, South Side of I-70

Exhibit 9 Vegetation Impact Areas within the East Section of the Project, MP 247.5 to MP 246

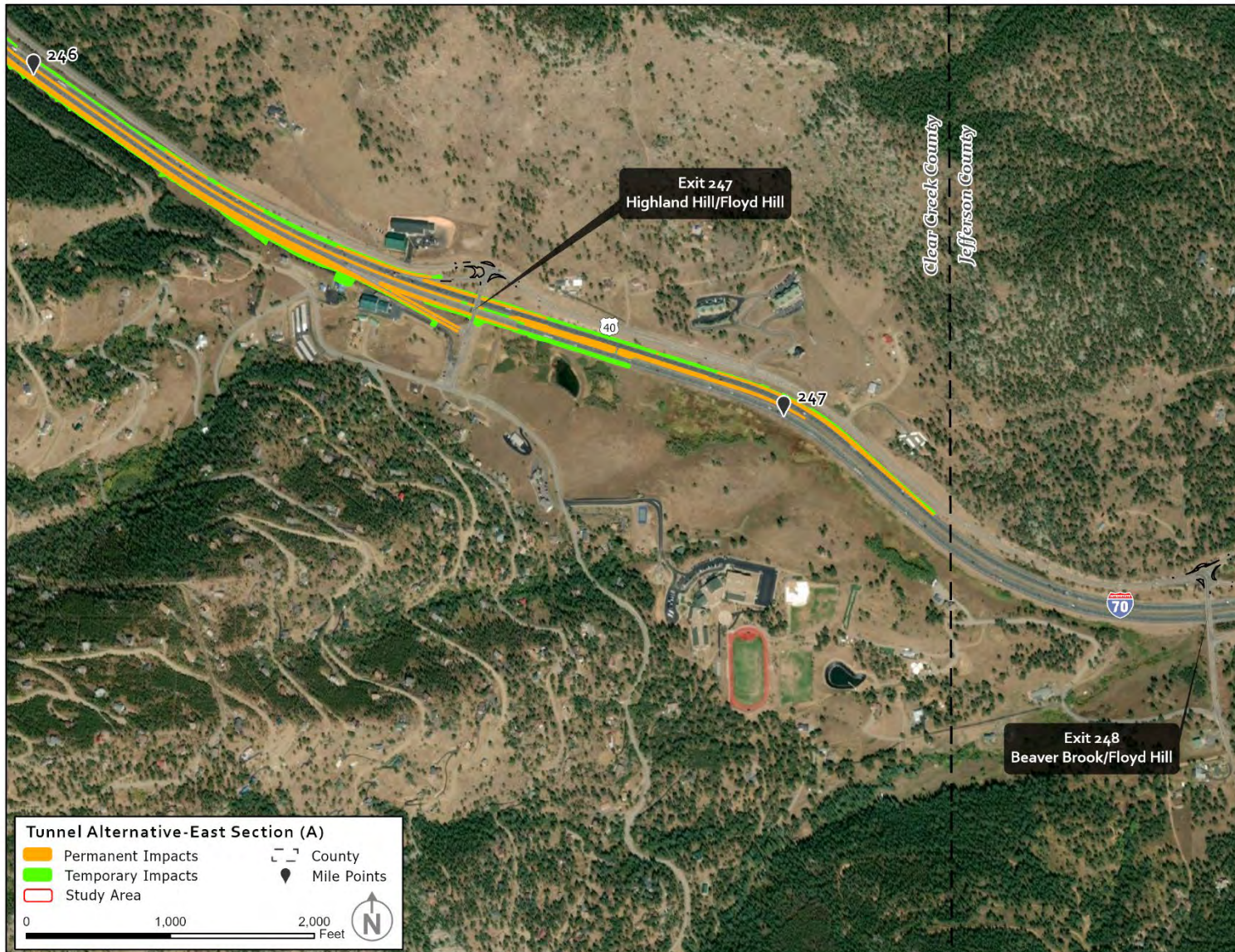
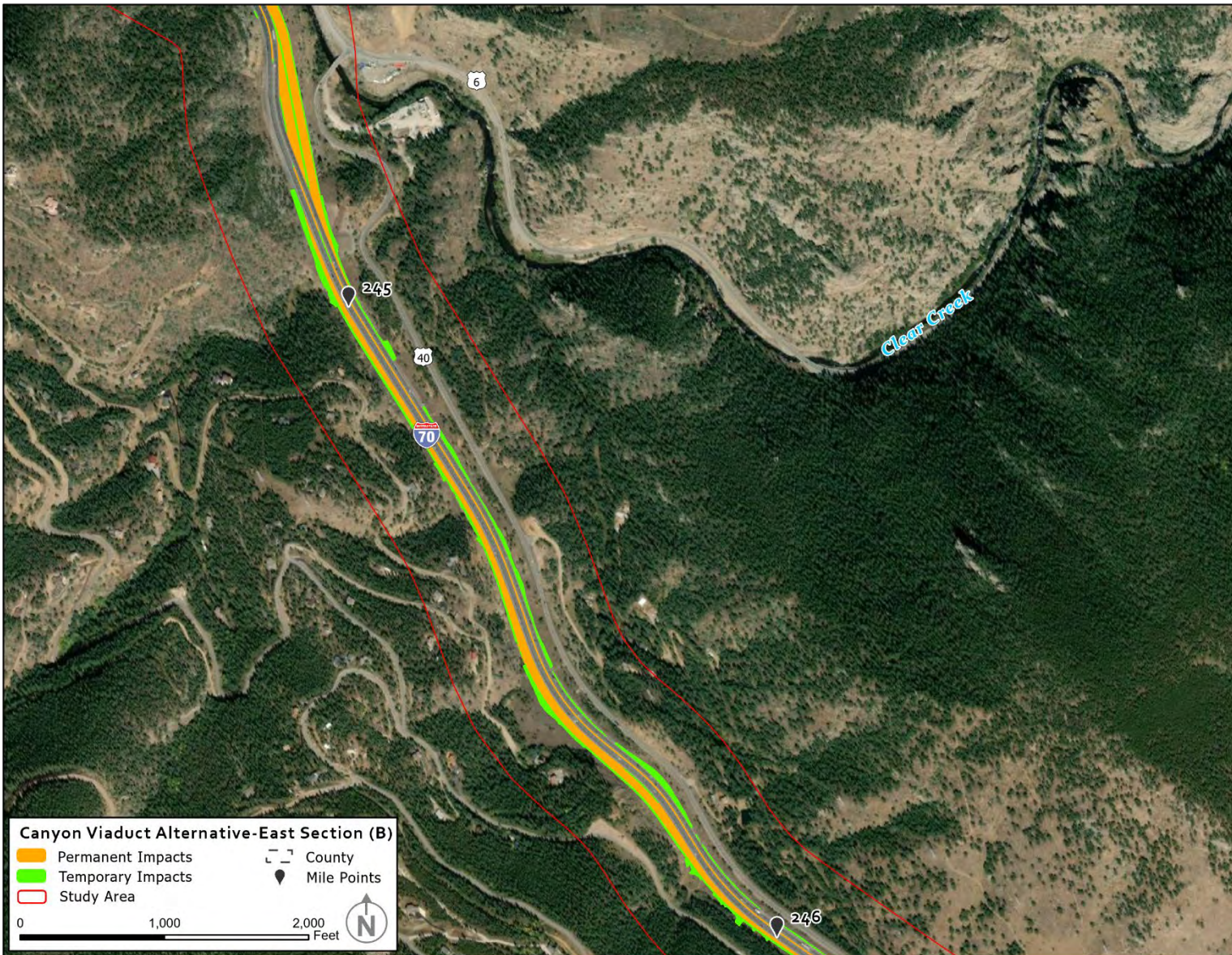


Exhibit 10 Vegetation Impact Areas within the East Section of the Project. MP 246 to MP 244.7



Additionally, construction of the tunnel approach bridge between MP 245 and the US 6 interchange would require removal of vegetation on the roadway embankment on the north side of the highway between I-70 and US 40. Most of this area is classified as having a “Developed—High Intensity” land cover because it was previously disturbed during the creation of the existing I-70 roadway embankment. Vegetation in these areas includes herbaceous plants and scattered shrubs/small trees. There also is a patch of Evergreen Forest by the US 6 interchange.

Beyond direct vegetation removal, temporary impacts to vegetation could result from accidental chemical spills, such as leaking fuel. Construction vehicles (if uncleaned) could carry noxious weed seeds into the Project Area. Elevated dust levels could affect a plant’s ability to photosynthesize by shading the leaf surface, thereby increasing leaf temperature and plugging the stomata. Additionally, exposed soil during construction has a higher chance of eroding during rain events.

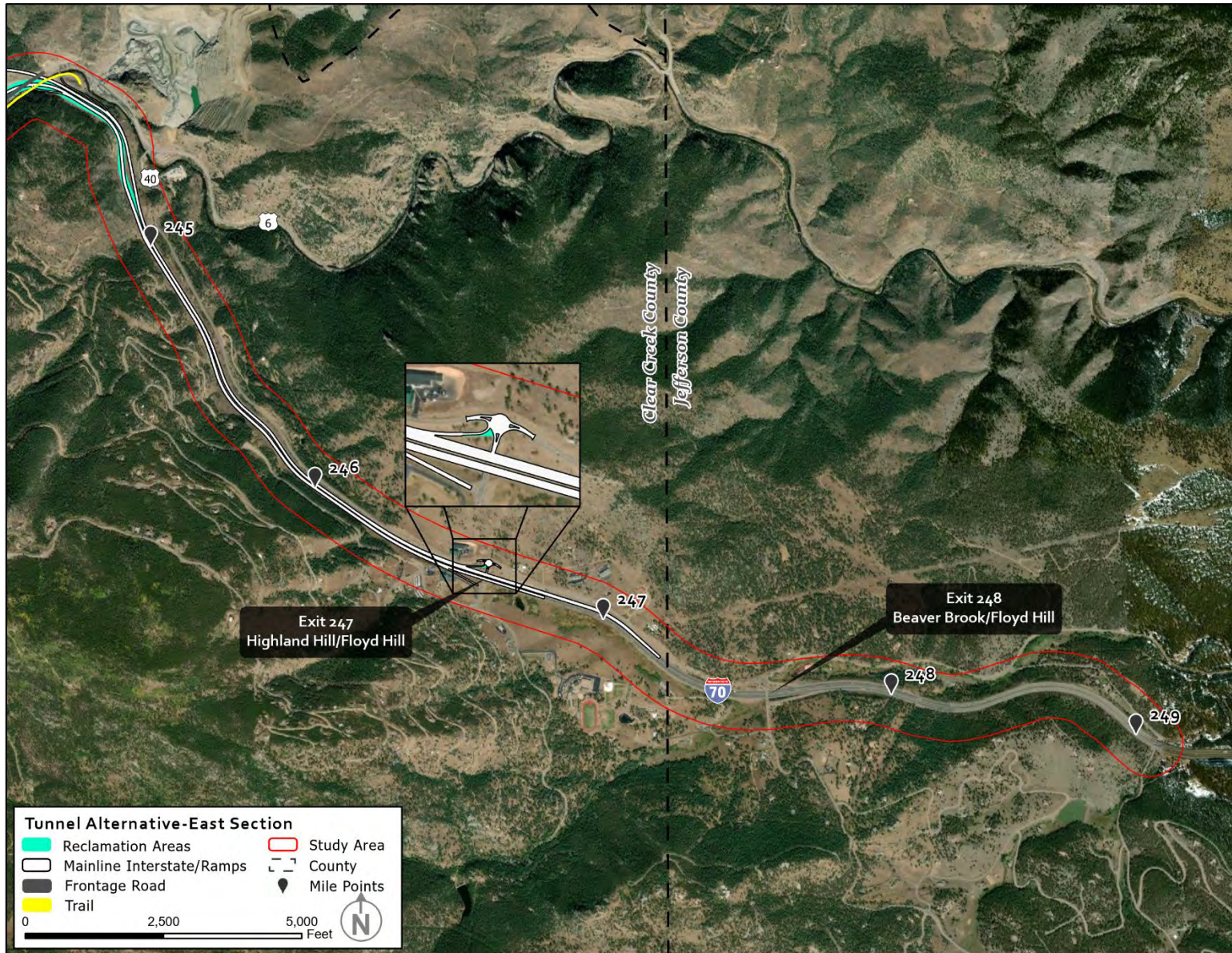
To offset the impacts listed above, approximately 1 acre to 2 acres of existing pavement would be reclaimed and reseeded with native species. Most of the reclamation areas would occur between MP 245 and the US 6 interchange, within the I-70 median, and along the southern edge of the roadway, in areas classified as “Developed—High Intensity” and “Shrub/Scrub” (see Exhibit 11).

6.3.1.2. Indirect Impacts

Construction activities would expose soils and create opportunities for the introduction and spread of noxious weeds with potential to out-compete native vegetation. There is potential for loss of the native plant seed bank in areas where excavation or extensive fill is required.

Areas that currently receive a high level of direct sunlight may become shaded by structures or walls, which in those shaded areas would change habitat conditions and suitability for most species. Vegetation removal could result in a loss of pollinator species and the additional travel lanes could result in increased levels of harmful chemicals (i.e., deicer and petroleum-based products) that impact roadside vegetation.

Exhibit 11. Reclamation Areas in the East Section of the Project



6.3.2. Central Section

The Project elements in the Central Section that would directly impact vegetation include:

- Continuation of the additional third I-70 westbound travel lane
- Realigning horizontal curves at MP 244 and MP 243.5
- Clear Creek Greenway improvements
- New frontage road between the Hidden Valley/Central City interchange and the US 6 interchange

Temporary direct impacts would result from construction activities, staging areas, and access for heavy construction equipment.

6.3.2.1. Direct Impacts

The Study Area within the Central Section of the Project consists of approximately 86 acres (31.6 percent) of developed land and approximately 186 acres (68.4 percent) of vegetated lands. Approximately 108 acres (39.7 percent) of the land is evergreen forest, approximately 58 acres (21.3 percent) are shrub/scrub, approximately 14 acres (5.2 percent) are open water, approximately 5 acres (1.8 percent) are mixed forest, and approximately 1 acre (less than 1 percent) is wetlands (see Exhibit 12). The frontage road Design Options have varying impacts to these vegetative communities, as noted in Exhibit 12, primarily related to the increased impact to forested areas on the south side of Clear Creek under the South Frontage Road Option.

Exhibit 12 Direct Impacts to Land Cover, Central Section, Tunnel Alternative, North and South Frontage Road Design Options

| Land Cover | Total Cover | | North Frontage Road Option | | | | South Frontage Road Option | | | |
|-------------------------------|-------------|--------------------|----------------------------|--------------------|-------------------|--------------------|----------------------------|--------------------|-------------------|--------------------|
| | | | Permanent Impacts | | Temporary Impacts | | Permanent Impacts | | Temporary Impacts | |
| | Acres | Percent Study Area | Acres | Percent Study Area | Acres | Percent Study Area | Acres | Percent Study Area | Acres | Percent Study Area |
| Developed Areas | | | | | | | | | | |
| Developed, Open Space | — | — | — | — | — | — | — | — | — | — |
| Developed, Low Intensity | 2 | 0.7 | — | — | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 |
| Developed, Medium Intensity | 2 | 0.7 | — | — | — | — | < 1 | < 1 | < 1 | < 1 |
| Developed, High Intensity | 82 | 30.2 | 9 | 3.3 | 8 | 2.9 | 10 | 3.7 | 6 | 2.2 |
| Subtotal | 86 | 31.6 | 9 | 3.3 | 8 | 2.9 | 10 | 3.7 | 6 | 2.2 |
| Vegetation Communities | | | | | | | | | | |
| Deciduous Forest | — | — | — | — | — | — | — | — | — | — |
| Evergreen Forest | 108 | 39.7 | --- | --- | --- | --- | 5 | 1.8 | 2 | 0.7 |
| Wetlands | 1 | 0.4 | — | — | — | — | — | — | — | — |
| Mixed Forest | 5 | 1.8 | < 1 | < 1 | < 1 | < 1 | 1 | 0.4 | < 1 | < 1 |
| Grassland/Pasture | — | — | — | — | — | — | — | — | — | — |
| Open Water | 14 | 5.2 | < 1 | < 1 | — | — | — | — | — | — |
| Shrub/Scrub | 58 | 21.3 | 6 | 2.2 | 6 | 2.2 | 1 | 0.4 | 3 | 1.1 |
| Subtotal | 186 | 68.4 | 6 | 2.2 | 6 | 2.2 | 7 | 2.6 | 5 | 1.8 |
| TOTAL | 272 | 100 | 15 | 5.5 | 14 | 5.1 | 17 | 6.3 | 11 | 4.0 |

Source: USGS, 2017

North Frontage Road Option

The North Frontage Road Option would permanently incorporate slightly more than 6 acres of vegetated land (2.2 percent of the Central Section Study Area) into the transportation facility and temporarily impact an additional approximately 6 acres (2.2 percent of the Central Section Study Area) (see Exhibits 12 and 13).

At the US 6 interchange, the eastbound and westbound I-70 bridges would be replaced, a new US 6 to I-70 east on-ramp would be constructed, and the existing US 6 to I-70 west on-ramp would be reconstructed on a flyover ramp. The area is classified as a high-intensity developed area because it is dominated by impervious surfaces, including I-70, US 6, and the Clear Creek Greenway Trail. Several areas at the interchange also are heavily disturbed and lacking vegetation, including parking areas, dirt piles, and the riprapped banks of Clear Creek. Vegetation in the remaining areas consists of herbaceous plants along the roadside and bridge abutments and a few small trees and shrubs (see Photo 1).

Additionally, construction of the tunnel into the adjacent hillside (see Photo 3) would occur at the US 6 interchange. The hillside, classified as shrub/scrub, has a sparse cover of herbaceous plants and a few small shrubs.

Farther west, the North Frontage Road Option would cut into the northern hillside in two locations, at MP 244 and between approximately MP 243.7 and MP 243.2, to reduce curve sharpness and accommodate the third westbound lane, as it emerges from the tunnel. The vegetation at MP 244 is classified as shrub/scrub and occurs on a rock outcrop (see Photos 4 and 5). The eastern portion of the rock cut area (Photo 4) is lacking vegetation because it was previously cut during construction of the existing I-70 lanes. The western side of the rock cut area (Photo 5) has shrubs and herbaceous vegetation. The vegetation between MP 243.7 and MP 243.2 also is classified as shrub/scrub (see Photo 6).



Photo 3. Location of Westbound Entrance of Proposed Tunnel



Photo 4. Rock Cut Area, MP 244, Looking West

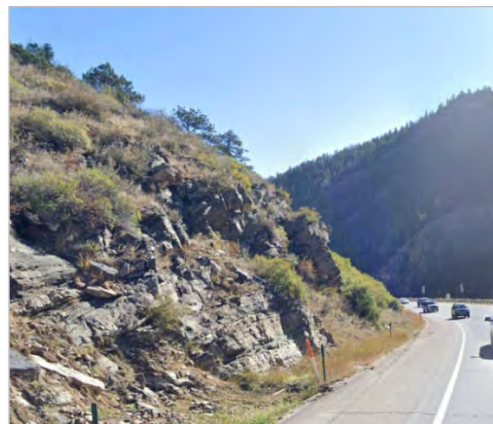


Photo 5. Rock Cut Area, MP 244, Looking East

The frontage road would be constructed on the existing eastbound I-70 lanes. To connect CR 314 on the west side of the Hidden Valley/Central City interchange to the existing I-70 eastbound lanes on the east side of the interchange, a bridge would be constructed over Clear Creek. In this location, the banks of Clear Creek are riprapped and confined by I-70 on the north and CR 314 on the south (see Photo 7). The top of the southern bank is used as a pull-off for accessing Clear Creek and is heavily disturbed and lacking vegetation.



Photo 6 Rock Cut Area, MP 243.5

Construction impacts to vegetation could result from accidental chemical spills, such as leaking fuel. Construction vehicles (if uncleaned) could carry noxious weed seeds into the Project Area. Elevated dust levels could affect a plant's ability to photosynthesize by shading the leaf surface, thereby increasing leaf temperature and plugging the stomata. Additionally, exposed soil during construction has a higher chance of eroding during rain events.

Approximately 7 acres of existing pavement in realignment areas would be abandoned and could be reclaimed and reseeded with native species (see Exhibit 14). Reclamation areas would occur in the median between the proposed I-70 eastbound lanes (existing westbound lanes) and the proposed frontage road alignment (existing eastbound lanes) from approximately MP 244.1 to MP 243.4; vegetation in these areas would provide minimal biological value. Additional reclamation would occur in the US 6 interchange area where the existing bridges would be removed.



Photo7. Location of Proposed Frontage Road Bridge over Clear Creek

Exhibit 13 Vegetation Impact Areas, Tunnel Alternative, North Frontage Road Design Option, Central Section

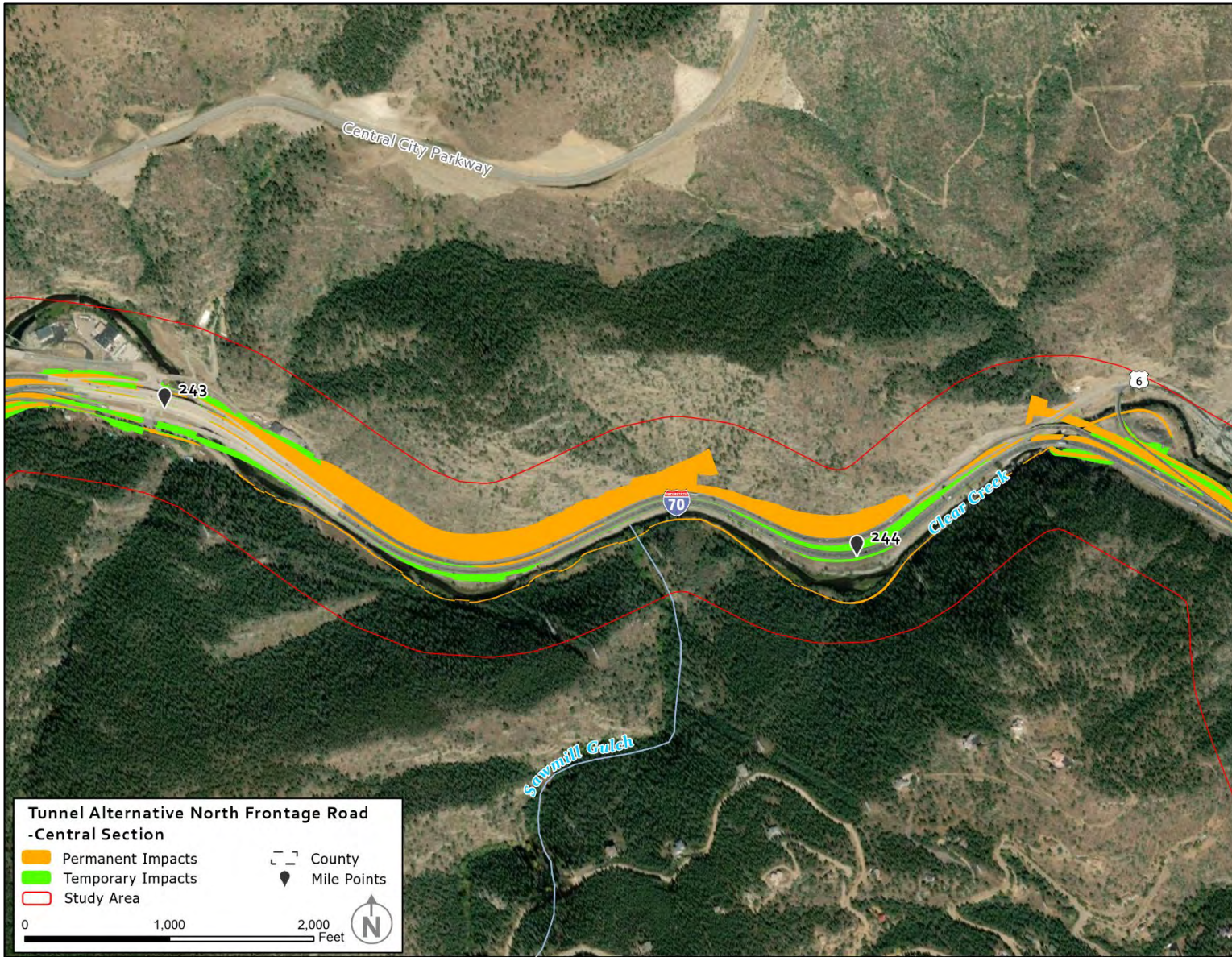
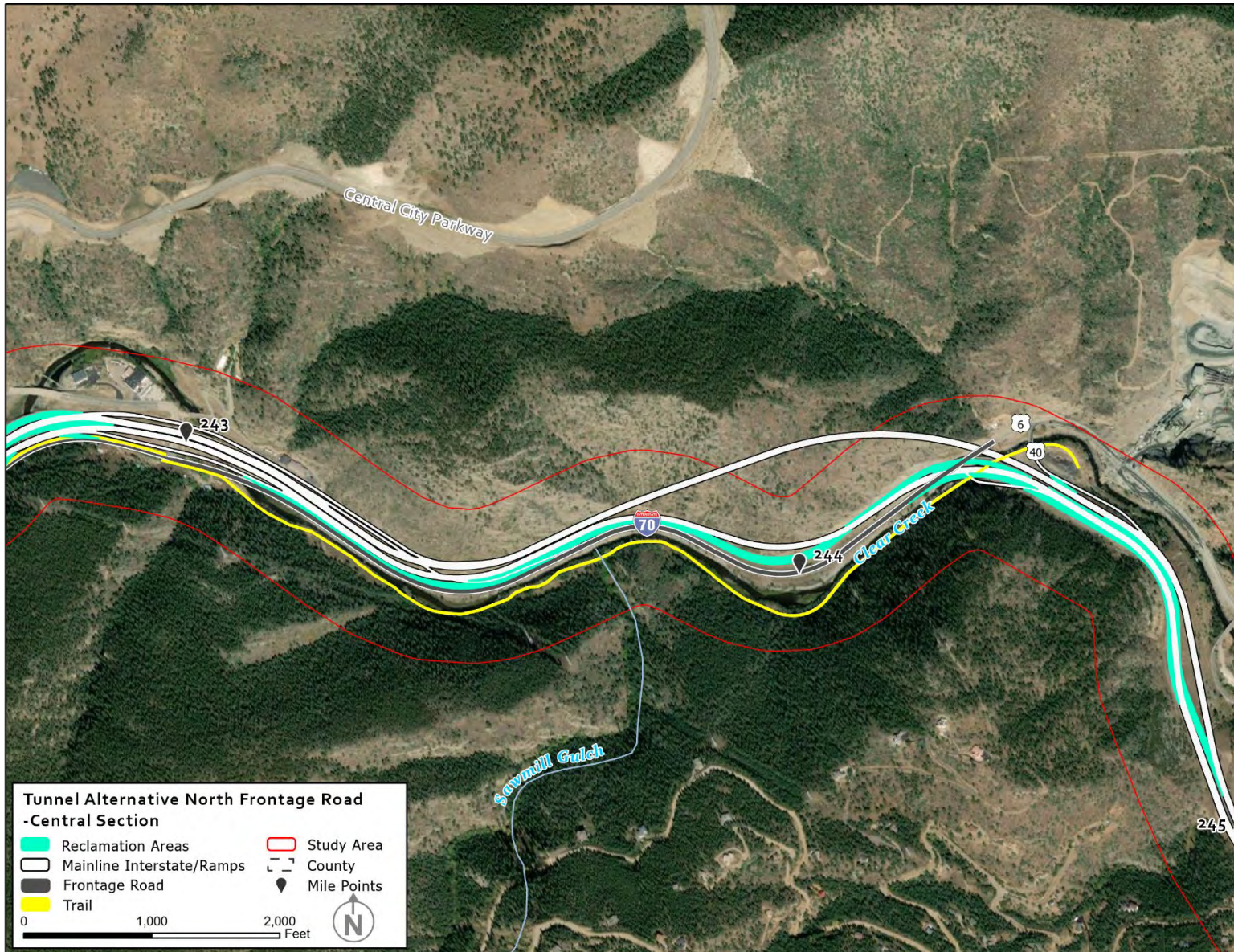


Exhibit 14 Reclamation Areas, Tunnel Alternative, North Frontage Road Option, Central Section



South Frontage Road Option

The South Frontage Road Option would permanently incorporate approximately 7 acres of vegetated land (2.6 percent of the Central Section Study Area) into the transportation facility and temporarily impact approximately 5 acres (1.8 percent of the Central Section Study Area) (see Exhibits 12 and 15).

Impacts at the US 6 interchange would be the same as those described for the North Frontage Road Option. However, impacts on the north side of I-70 would be much less than those of the North Frontage Road Option because I-70 would not be constructed as far north. Exhibit 16 shows a visual simulation comparing rock cut size for the North and South Frontage Road Options.

With the South Frontage Road Option, the frontage road would be constructed on the south side of Clear Creek and permanently impact approximately 5 acres of evergreen forest, 1 acre of mixed forest and less than 1 acre of shrub/scrub (see Photo 8). The area would be excavated, and trees removed for construction of the frontage road, Scott Lancaster Memorial Trail, and slope stabilization walls that would vary in height between 15 and 45 feet. The landscape would change from a dense evergreen forest to one dominated by transportation facilities.



Photo 8. Location of New Frontage Road, South Side of Clear Creek

Two bridges, one at MP 243.8 and another at MP 243.5, would be constructed over Clear Creek. Vegetation at the MP 243.8 bridge location consists of conifer trees on the north side of Clear Creek and deciduous trees and riparian vegetation on the south side (see Photo 9 and Photo 10, below). Vegetation at the MP 243.5 bridge location also has deciduous forest and riparian vegetation on the south side of the creek (see Photo 11 and Photo 12, below). Proposed improvements would occur outside of the Clear Creek channel and would not impact associated wetland and riparian areas (CDOT, 2020b).

In addition to temporary vegetation removal, construction impacts to vegetation could result from accidental chemical spills, such as leaking fuel. Construction vehicles (if uncleaned) could carry noxious weed seeds into the Project Area. Elevated dust levels could affect a plant's ability to photosynthesize by shading the leaf surface, thereby increasing leaf temperature and plugging the stomata. Additionally, exposed soil during construction has a higher chance of eroding during rain events.



Photo 9. Location of Frontage Road Bridge at MP 243.8



Photo 10. Ground-Level View of Proposed Frontage Road Bridge Location, MP 243.8



Photo 11. Location of Proposed Westbound Frontage Road to Westbound I-70 Ramp, MP 243.5



Photo 12. Ground-Level View of Proposed Westbound Frontage Road to Westbound I-70 Ramp Location, MP 243.5

Exhibit 15 Vegetation Impact Areas, Tunnel Alternative, South Frontage Road Design Option, Central Section

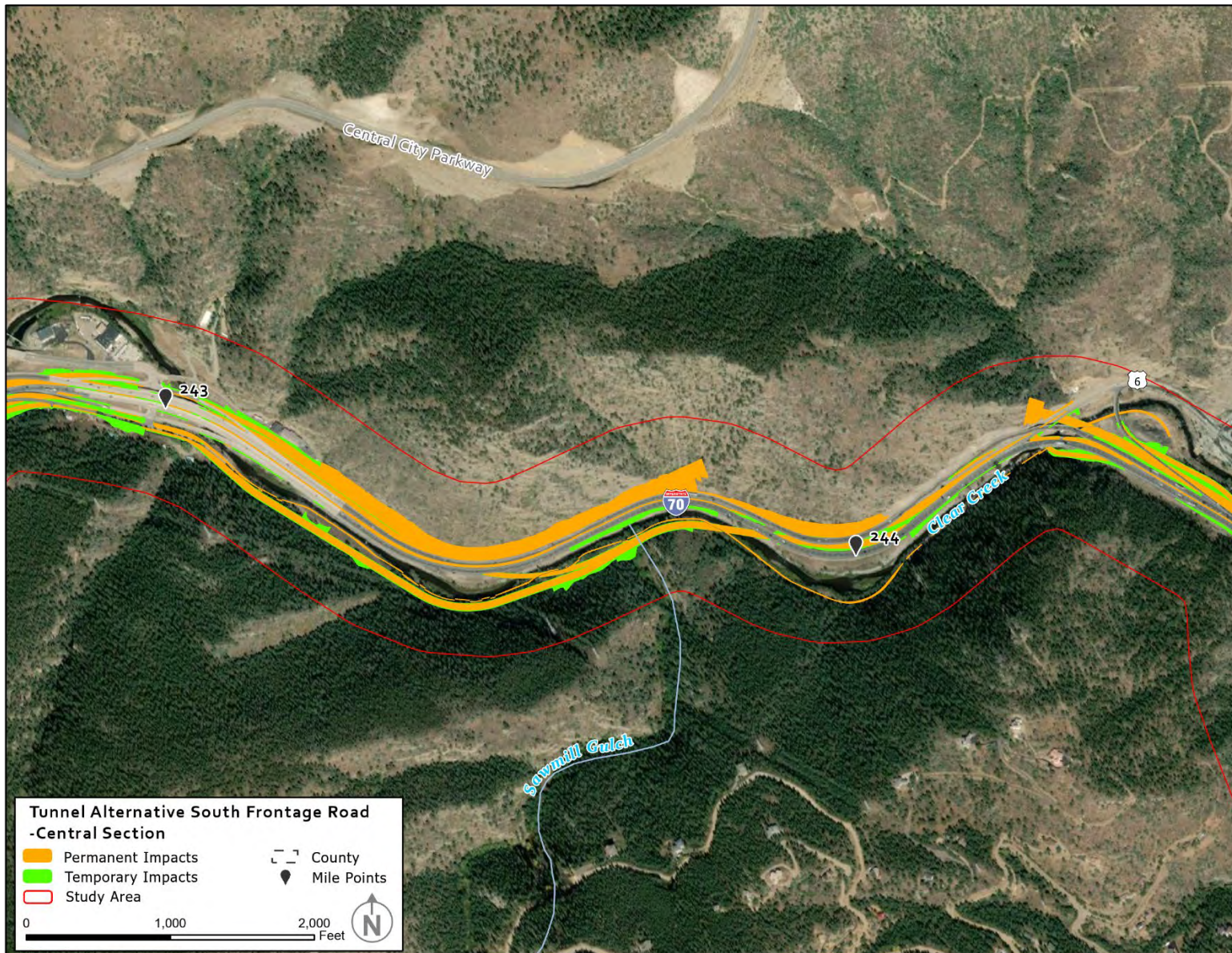


Exhibit 16 Visual Simulation of Northern Rock Cuts at MP 244, Tunnel Alternative, North and South Frontage Road Design Options*

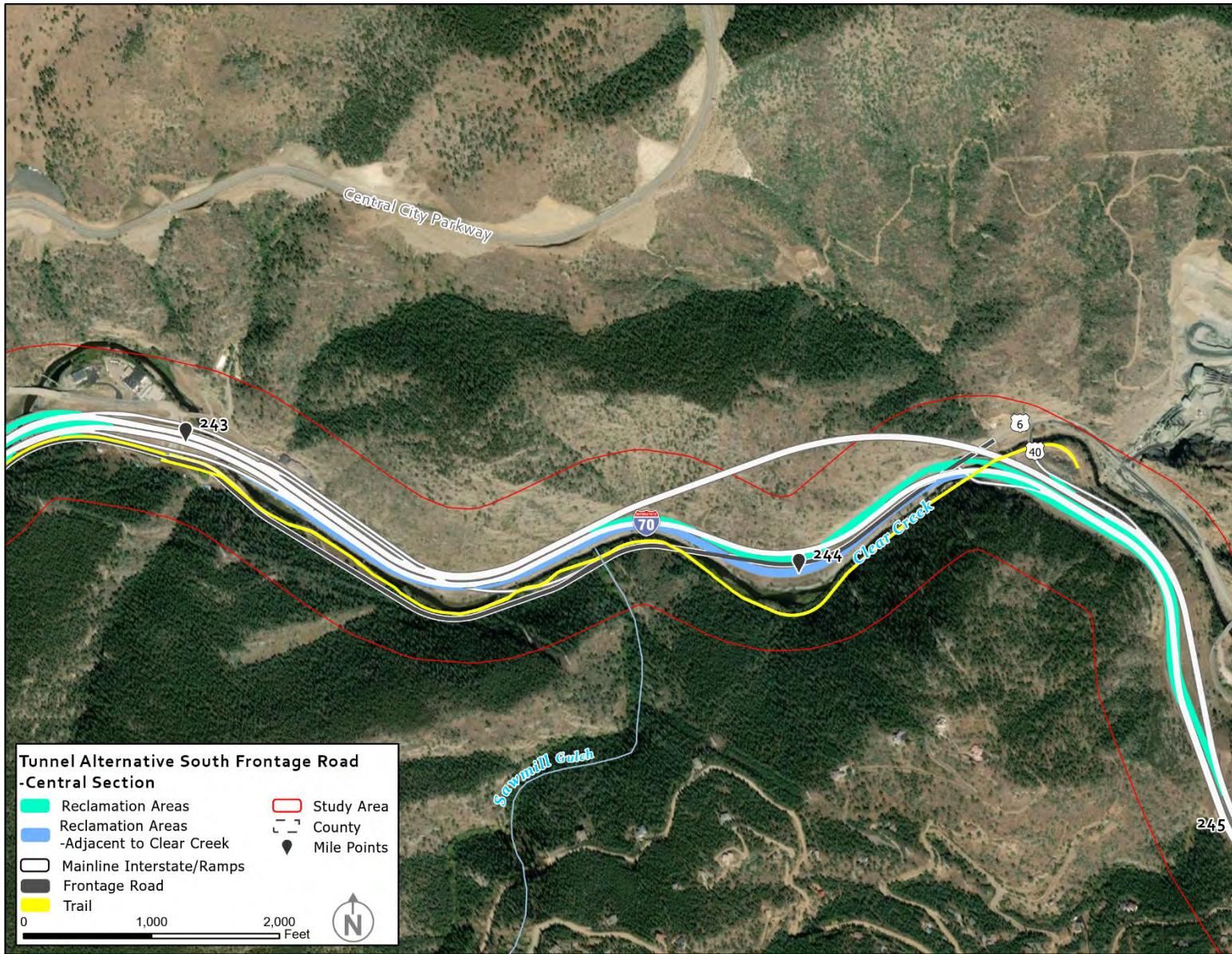


*Red = North Frontage Road Rock Cut Area
*Blue = south Frontage Road Rock Cut Area

To offset the impacts discussed above, approximately 9 acres of existing pavement would be reclaimed and reseeded with native species. Reclamation would occur at the US 6 interchange, where existing bridges and westbound I-70 lanes would be removed, and between MP 243 and MP 244.9, where the existing eastbound I-70 lanes would be removed (see Exhibit 17). The most important reclamation areas are the approximately 4 acres adjacent to Clear Creek because they provide an opportunity to improve riparian habitat along the north side of the creek. Willows, cottonwood trees, and other riparian vegetation could be planted at these locations that would help filter and remove roadside contaminants before reaching the creek. The restored area along Clear Creek would provide higher quality habitat than the restored areas under the North Frontage Road Option, which would primarily be within the highway median.

In summary, the South Frontage Road Option would impact approximately one more acre of vegetation than the North Frontage Road Option, but it would reclaim two more acres than the North Frontage Road Option would. However, the South Frontage Road Option would impact more than 6 acres of forest on the south side of the creek, where vegetation is much denser than vegetation on the north side of I-70. Therefore, the South Frontage Road Option would impact a greater number of plants and trees than the North Frontage Road Option.

Exhibit 17 Reclamation Areas, Tunnel Alternative, South Frontage Road Option, Central Section



6.3.2.2. Indirect Impacts

Types of indirect impacts would be the same for both Frontage Road Design Options; however, the South Frontage Road Option would have greater impact levels than the North Frontage Road Option. The South Frontage Road Option would require more excavation than the North Frontage Road Option and result in increased opportunities for the introduction and spread of noxious weeds and loss of the native plant seed bank.

The South Frontage Road Option would construct two bridges over Clear Creek and the North Frontage Road Option would construct one bridge. This would result in a larger area becoming shaded and changing habitat conditions, impacting suitability for more species.

The South Frontage Road Option would result in Clear Creek being bordered by I-70 on the north and the frontage road on the south. The use of deicers to treat roadways on both sides of Clear Creek increases exposure of riparian vegetation to chlorides, which has been correlated with long-term stress to plants and trees. Additionally, roadways on both sides of the creek increase the potential for harmful chemicals (e.g., petroleum-based products or hazmat spills) to impact riparian habitat along Clear Creek.

6.3.3. West Section

Project elements in the West Section that have potential to impact vegetation include:

- Widening the interstate between the Hidden Valley/Central City interchange and the Veterans Memorial Tunnels to accommodate the third westbound travel lane
- Realigning a 1,200-foot section of Clear Creek to the south, which also requires realigning the Scott Lancaster Memorial Trail and the frontage road
- Rock cuts on the north side of I-70 and the south side of the frontage road, east of the Veterans Memorial Tunnels
- Replacement of the eastbound and westbound I-70 bridges over Clear Creek

Temporary direct impacts would result from construction activities, staging areas, and access for heavy construction equipment.

6.3.3.1. Direct Impacts

The Study Area within the West Section of the Project consists of approximately 136 acres (44 percent) of developed land and approximately 173 acres (56 percent) of vegetated lands (see Exhibit 18). Approximately 79 acres (25.6 percent) are evergreen forest and 79 acres (25.6 percent) are shrub/scrub. The remaining 15 acres (4.8 percent) of vegetated lands are composed of deciduous forest, open water, and wetland plant communities.

Exhibit 18 Direct Impacts to Land Cover, Tunnel Alternative, West Section

| Land Cover | Total Habitat | | Permanent Impacts | | Temporary Impacts | |
|-------------------------------|---------------|--------------------|-------------------|--------------------|-------------------|--------------------|
| | Acres | Percent Study Area | Acres | Percent Study Area | Acres | Percent Study Area |
| Developed Areas | | | | | | |
| Developed, Open Space | | | | | | |
| Developed, Low Intensity | | | | | | |
| Developed, Medium Intensity | | | | | | |
| Developed, High Intensity | | | | | | |
| Subtotal | 136 | 44.0 | 2 | 0.6 | 3 | 1 |
| Vegetation Communities | | | | | | |
| Deciduous Forest | 1 | 0.3 | — | — | < 1 | < 1 |
| Evergreen Forest | 79 | 25.6 | < 1 | < 1 | 1 | 0.3 |
| Shrub/Scrub | 79 | 25.6 | < 1 | < 1 | 1 | 0.3 |
| Mixed Forest | — | — | — | — | — | — |
| Open Water | 13 | 4.2 | < 1 | < 1 | 1 | 0.3 |
| Wetlands | 1 | 0.3 | — | — | — | — |
| Subtotal | 173 | 56.0 | <1 | < 1 | 3 | 0.9 |
| TOTAL | 309 | 100 | 2 | 0.6 | 6 | 1.9 |

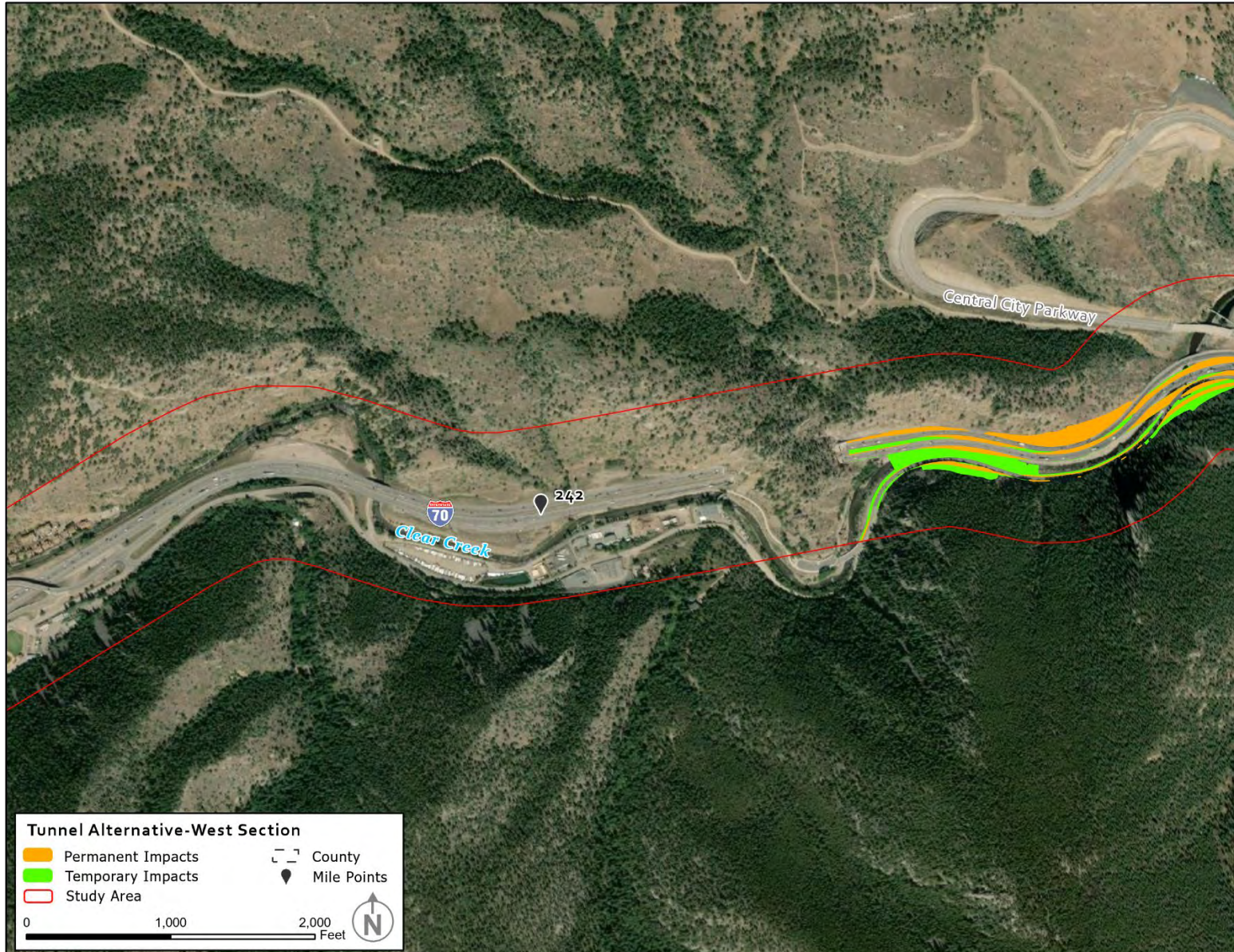
Source: USGS, 2017

Less than 1 acre of vegetated habitat (less than 1 percent of the West Section Study Area) would be permanently incorporated into the transportation facility and approximately 3 acres (0.9 percent of the West Section Study Area) would be temporarily impacted during construction (see Exhibits 18 and 19).

Permanent direct impacts to vegetation would result from:

- Increased pavement for the additional I-70 westbound lane between the Hidden Valley/Central City interchange and the Veterans Memorial Tunnels
- Realigning Clear Creek and the frontage road on the east side of the Veterans Memorial Tunnels
- Improvements to the Scott Lancaster Memorial Trail
- Rock blasting on the north and south sides of I-70

Exhibit 19 Vegetation Impact Areas, Tunnel Alternative, West Section



Temporary direct impacts would result from construction, staging areas, and access for heavy construction equipment.

To accommodate the third westbound lane and reduce I-70 curve sharpness, rock cuts would be needed on the north side of I-70. These areas are sparsely vegetated (see Photo 13) and classified as “Developed—High Intensity” and “Shrub/scrub.” Rock cuts also are required on the south side of the frontage road in areas with a bit more vegetation classified as “Developed—High Intensity” and “Evergreen Forest” (see Photo 14).



Photo13. Rock Cut Area, North Side of I-70

The realignment of Clear Creek and reconstruction of the frontage road and Scott Lancaster Memorial Trail would impact herbaceous species and a few small shrubs between Clear Creek and the frontage road. However, Clear Creek is heavily channelized with riprapped banks and lacks riparian vegetation in this area (see Photo 15). Additionally, the Scott Lancaster Memorial Trail has an asphalt surface and is located between the creek and the roadway, so vegetation is very sparse.



Photo 14. Rock Cut Area, South Side of I-70

Construction impacts to vegetation could result from accidental chemical spills, such as leaking fuel. Construction vehicles (if uncleaned) could carry noxious weed seeds into the Project Area. Elevated dust levels could affect a plant’s ability to photosynthesize by shading the leaf surface, thereby increasing leaf temperature and plugging the stomata. Additionally, exposed soil during construction has a higher chance of eroding during rain events.



Photo 15. Clear Creek Realignment Area

To offset the impacts discussed above, approximately 3 acres of existing pavement would be reclaimed and reseeded with native species. Reclamation would occur in the median between the westbound and eastbound I-70 lanes and along the shoulder of I-70 and the frontage road (see Exhibit 20).

Additionally, mitigation measures would be incorporated into project design to compensate for the impacts associated with the creek realignment. The location in

which the creek would be realigned is very narrow and confined between the frontage road and I-70;

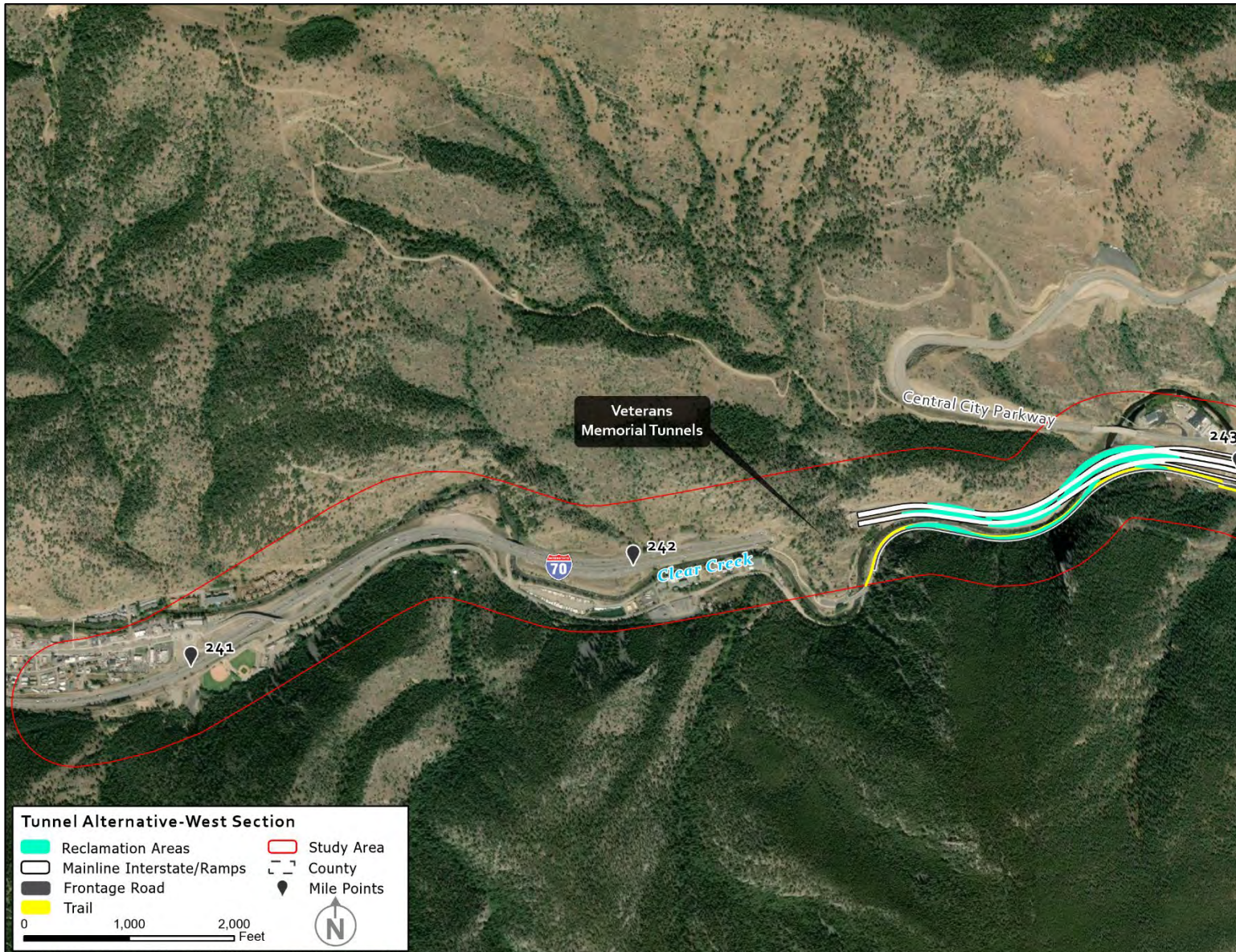


therefore, restoration activities would occur further downstream, within the Central Section of the Project Area. Mitigation would be developed through consultation with USACE and CPW. For more information please see the *I-70 Floyd Hill to Veterans Memorial Tunnels Aquatic Resources Technical Report* (CDOT, 2020a).

6.3.3.2. Indirect Impacts

Indirect impacts would be the same as those listed for the East and Central Sections of the Project. Please see Section 6.3.1.2 and Section 6.3.2.2 of this document for more information.

Exhibit 20 Reclamation Areas, Tunnel Alternative, West Section



6.4. Canyon Viaduct Alternative Impacts

6.4.1. East Section

The Canyon Viaduct Alternative's proposed changes in the East Section of the Project are the same as those described for the Tunnel Alternative. Therefore, impacts would be the same as those discussed for the Tunnel Alternative. See Section 6.3.1 of this document for more detail.

6.4.2. Central Section

In the Central Section of the Project Area, the Canyon Viaduct Alternative would construct eastbound and westbound I-70 on viaducts approximately 60 feet to 70 feet above ground level. The existing westbound I-70 pavement under the elevated structures would be repurposed for the frontage road. The eastbound lanes would be removed, and the area would be restored to natural conditions. The subsections below discuss the potential direct and indirect impacts associated with these project elements and provides more detail on restoration opportunities.

6.4.2.1. Direct Impacts

As discussed for the Tunnel Alternative, the Central Section of the Study Area consists of approximately 86 acres (31.6 percent) of developed land and approximately 186 acres (68.4 percent) of vegetated lands (see Exhibit 21). Approximately 116 acres (42.6 percent) of the land is evergreen forest, approximately 50 acres (18.4 percent) are shrub/scrub, approximately 14 acres (5.2 percent) are open water, approximately 5 acres (1.8 percent) are mixed forest, and approximately 1 acre (less than 1 percent) is wetlands.

Approximately 6 acres of vegetated land (2.3 percent of the Central Section Study Area) would be permanently incorporated into the transportation facility and approximately 4 acres (1.4 percent of the Central Section Study Area) would be temporarily impacted during construction (see Exhibit 21), which is less than both Tunnel Alternative Frontage Road Design Options. However, impact calculations for the Canyon Viaduct Alternative do not include permanent and temporary impacts resulting from caisson construction because specific caisson locations were not known at the time this report was written.

Most impacts would occur in the Sawmill Gulch area due to construction of I-70 on the southern hillside (see Exhibit 22). Permanent impacts would occur to the shrub/scrub and evergreen forest plant communities at the top of the hill. Fewer permanent impacts would occur to the mixed forest plant community along Sawmill Gulch because a bridge would be constructed over the gulch to avoid impacts to waters of the U.S. Also, impacts would occur on the canyon floor, due to caisson construction, and on the north side of I-70 where the viaduct would touch back down to ground level.

Construction impacts to vegetation could result from accidental chemical spills, such as leaking fuel. Construction vehicles (if uncleaned) could carry noxious weed seeds into the Project area. Elevated dust levels could affect a plant's ability to photosynthesize by shading the leaf surface, thereby increasing leaf temperature and plugging the stomata. Additionally, exposed soil during construction has a higher chance of eroding during rain events.

Reclaimed areas for the Canyon Viaduct Alternative would be greater than both Tunnel Alternative Frontage Road Design Options (see Exhibit 23). The I-70 eastbound lanes would be removed from approximately MP 243.5 to MP 244.5. Approximately 8 acres of pavement in this sensitive area along Clear Creek (3 acres more than the Tunnel Alternative, South Frontage Road Option) would be removed and restored to natural conditions. Much of the reclaimed area would be restored to native riparian habitat along the north side of Clear Creek. Willows, cottonwood trees, and other riparian vegetation

could be planted at these locations that would help filter and remove roadside contaminants before reaching the creek. The restored riparian area would be higher quality habitat than the reclaimed area under the Tunnel Alternative North Frontage Road Option, which would be primarily within the highway median.

Exhibit 21 Direct Impacts to Land Cover, Canyon Viaduct Alternative, Central Section

| Land Cover | Total Habitat | | Permanent Impacts | | Temporary Impacts | |
|-------------------------------|---------------|--------------------|-------------------|--------------------|-------------------|--------------------|
| | Acres | Percent Study Area | Acres | Percent Study Area | Acres | Percent Study Area |
| Developed Areas | | | | | | |
| Developed, Open Space | — | — | — | — | — | — |
| Developed, Low Intensity | 2 | 0.7 | < 1 | < 1 | < 1 | < 1 |
| Developed, Medium Intensity | 2 | 0.7 | < 1 | < 1 | < 1 | < 1 |
| Developed, High Intensity | 82 | 30.2 | 11 | 4.0 | 4 | 1.5 |
| Sub Total | 86 | 31.6 | 11 | 4.0 | 4 | 1.5 |
| Vegetation Communities | | | | | | |
| Deciduous Forest | — | — | — | — | — | — |
| Evergreen Forest | 116 | 42.6 | 3 | 1.1 | 2 | 0.7 |
| Wetlands | 1 | 0.4 | < 1 | < 1 | < 1 | < 1 |
| Mixed Forest | 5 | 1.8 | 1 | 0.4 | < 1 | < 1 |
| Grassland/Pasture | — | — | — | — | < 1 | < 1 |
| Open Water | 14 | 5.2 | — | — | — | — |
| Shrub/Scrub | 50 | 18.4 | 2 | 0.7 | 2 | 0.7 |
| Sub Total | 186 | 68.4 | 6 | 2.3 | 4 | 1.4 |
| TOTAL | 272 | 100 | 17 | 6.3 | 8 | 2.9 |

Source: USGS, 2017

Exhibit 22 Vegetation Impact Areas, Canyon Viaduct Alternative, Central Section

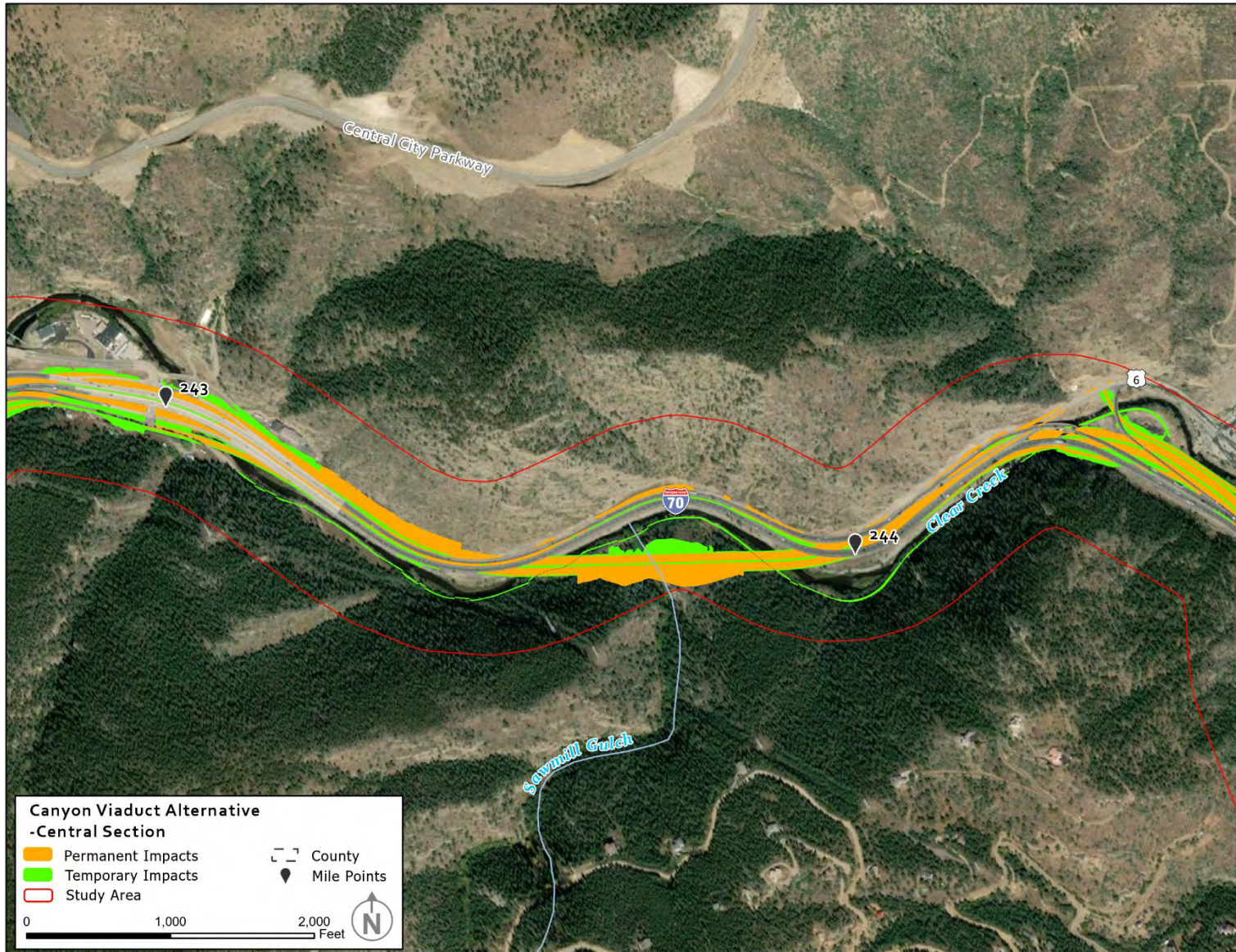
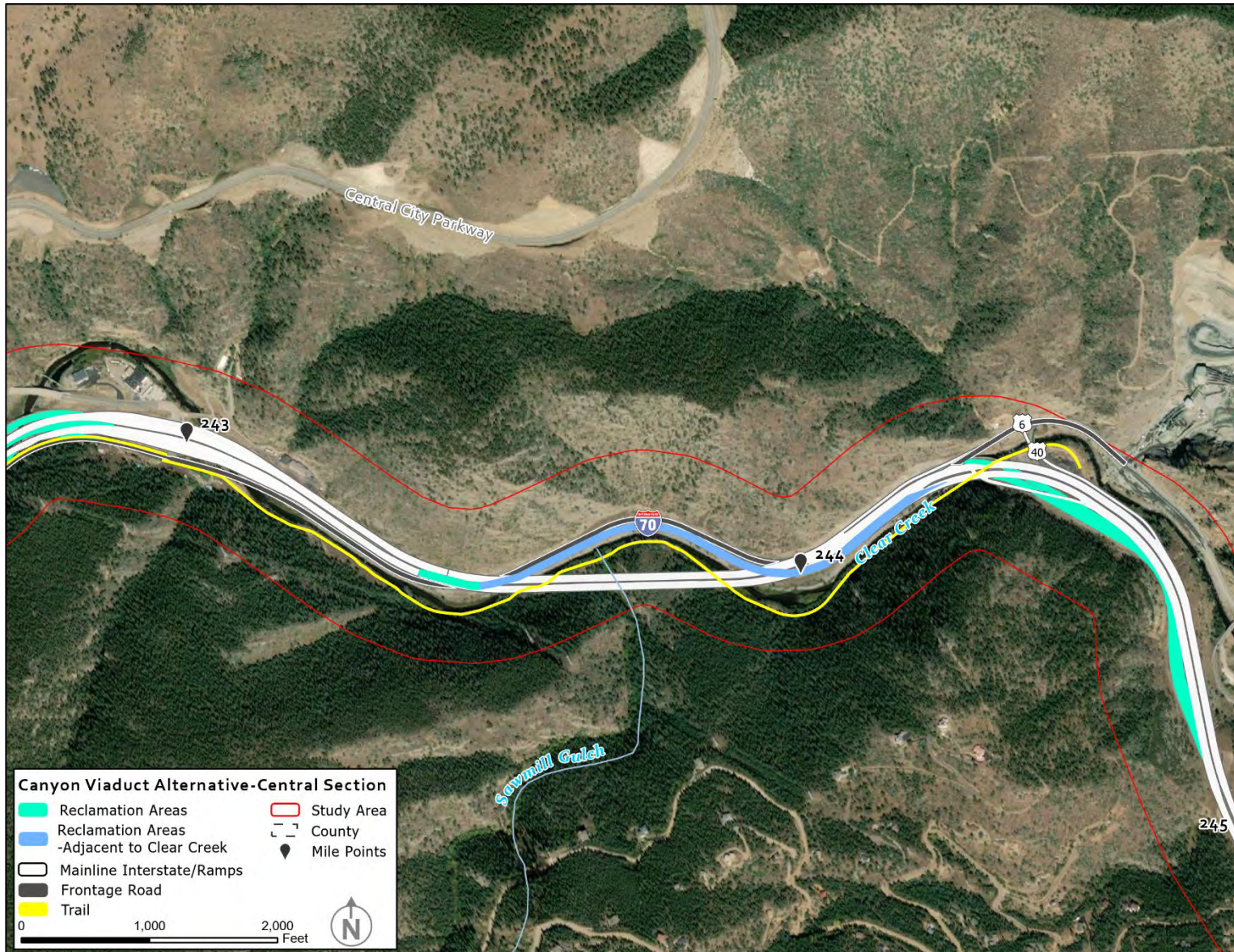


Exhibit 23. Reclamation Areas, Canyon Viaduct Alternative, Central Section





6.4.2.2. Indirect Impacts

The presence of a viaduct throughout the canyon could result in higher levels of roadway contaminants reaching the ground. Bridges freeze faster than the ground, so a greater amount of deicer may be required on I-70 in the winter months. The presence of the viaduct could change the amount of sunlight that reaches vegetation in the canyon; however, the viaduct would be much higher than the bridges constructed for the North and South Frontage Road Options, approximately 60 to 70 feet tall, and sunlight would be able reach areas under the viaduct throughout the day.

The Canyon Viaduct Alternative would require more excavation than the North Frontage Road Option but less than the South Frontage Road Option, which correlates with the potential for each alternative to introduce noxious weeds and potential loss of the native plant seed bank.

6.4.3. West Section

The Canyon Viaduct Alternative's proposed changes in the West Section of the Project Area are the same as those described for the Tunnel Alternative. Therefore, impacts would be the same as those discussed for the Tunnel Alternative. See Section 6.3.3 of this document for more detail.

7. Mitigation

Mitigation measures are recommended to address permanent and temporary adverse impacts of the Project alternatives. Impacts identified in Section 6 are summarized in tabular format, by alternative, in this section to align with recommended mitigation.

7.1. Relevant Tier 2 Mitigation

Mitigation strategies outlined in the PEIS and ROD include:

- Manage the clearing and earth-moving operations to minimize the potential for weeds to infest new areas and/or increase in abundance through the construction disturbance area. This includes the application of BMPs to all construction sites to manage open soil surfaces and topsoil stockpiled for reuse, including landscape and planning designs that incorporate the use of native vegetation and integrated noxious weed controls.
- Prepare and implement Noxious Weed Management Plans for all projects, which usually are completed just prior to construction so they reflect the most recent federal and local noxious weed lists and guidance. Noxious Weed Management Plans will identify the status and location of noxious weed infestations in and near individual study areas and identify control methods (e.g., herbicides) and BMPs that will be used to eradicate or control weeds during and after construction. These BMPs generally include, but are not limited to:
 - Minimizing soil disturbance
 - Using native species in seeding and revegetation plans
 - Using weed-free hay
 - Managing topsoil
 - Cleaning and managing equipment
 - Coordinating with relevant stakeholders, such as County Weed Supervisors
 - Incorporating mitigation measures identified by the SWEEP task force
 - Minimizing impacts to vegetation from the use of deicer
 - Mitigating impacts to vegetation from winter maintenance activities
- Limit the effects of winter maintenance by controlling the runoff of chemicals and winter maintenance materials to the greatest extent possible.
- Continue to refine the approach to winter maintenance in an effort to decrease the use of deicers and traction sand.

The *I-70 Floyd Hill to Veterans Memorial Tunnels Drainage and Water Quality Report* (CDOT, 2020e) details considerations for winter maintenance and water quality for the Project, as well as presenting a discussion of how recent Tier 2 projects addressed these issues.

7.2. Tunnel Alternative: North Frontage Road Design Option

7.2.1. Mitigation for Permanent Adverse Impacts

Permanent adverse impacts would be mitigated by incorporating CDOT standard specifications for earth work into project design (CDOT, 2019). These mitigation measures are summarized in Exhibit 24 for direct and indirect impacts of the Tunnel Alternative, North Frontage Road Design Option. Mitigation for impacts to riparian habitat is discussed in the *I-70 Floyd Hill to Veterans Memorial Tunnels Terrestrial and Aquatic Wildlife Technical Report* (CDOT, 2020b).

**Exhibit 24 Recommended Mitigation Measures for Permanent Impacts of the Tunnel
 Alternative: North Frontage Road Design Option**

| Location | Activity | Impact | Mitigation |
|-----------------------|---|--|--|
| Within Project limits | Removal of existing roadway infrastructure and replacement with smaller roadway footprint | Reclamation of existing roadway that would not be incorporated into the Proposed Action. | <ul style="list-style-type: none"> • Prior to construction, a landscape plan will be developed for all reclamation areas and approved by a CDOT landscape architect. • Reclaimed areas will be re-vegetated with native species to replicate or enhance native vegetative communities. |

7.2.2. Mitigation for Temporary Impacts

Exhibit 25 summarizes the mitigation measures for temporary impacts that are anticipated during construction of the Tunnel Alternative, North Frontage Road Design Option.

**Exhibit 25 Recommended Mitigation Measures for Temporary Impacts of the Tunnel
 Alternative: North Frontage Road Design Option**

| Location | Activity | Impact | Mitigation |
|-----------------------|--|--|---|
| Within Project limits | Excavation and earth-moving activities | Clearing and removal of vegetation exposes soils to erosion and disturbs habitat | Temporarily disturbed areas will be re-vegetated and stabilized. |
| Within Project limits | Excavation and earth-moving activities | Potential to introduce noxious weeds or contribute to the spread of noxious weeds. | Prior to construction, CDOT will conduct a noxious weed survey to map existing weeds within the Project area. An Integrated Noxious Weed Management Plan then will be developed to prevent the spread of noxious weeds into temporarily disturbed areas. Implement measures to control noxious weed spread, such as: <ul style="list-style-type: none"> • Salvage weed-free topsoil for use in seeding • CDOT Standard Specification Section 217—Herbicide Treatment will be incorporated into the Project Specifications |

7.3. Tunnel Alternative: South Frontage Road Design Option

7.3.1. Mitigation for Permanent Adverse Impacts

Permanent adverse impacts would be mitigated by incorporating CDOT standard specifications for earth work into project design (CDOT, 2019). These mitigation measures are summarized in Exhibit 26 for direct and indirect impacts of the Tunnel Alternative, South Frontage Road Design Option.

Exhibit 26 Recommended Mitigation Measures for Permanent Impacts of the Tunnel Alternative: South Frontage Road Design Option

| Location | Activity | Impact | Mitigation |
|-----------------------|---|--|--|
| Within Project limits | Removal of existing roadway infrastructure and replacement with smaller roadway footprint | Reclamation of existing roadway that would not be incorporated into the Proposed Action. | <ul style="list-style-type: none"> • Prior to construction, a landscape plan will be developed for all reclamation areas and approved by a CDOT landscape architect. • Reclaimed areas will be re-vegetated with native species to replicate or enhance native vegetative communities. |

7.3.2. Mitigation for Temporary Impacts

Exhibit 27 summarizes the mitigation measures for temporary impacts that are anticipated during construction of the Tunnel Alternative, South Frontage Road Design Option.

Exhibit 27 Recommended Mitigation Measures for Temporary Impacts of the Tunnel Alternative: South Frontage Road Design Option

| Location | Activity | Impact | Mitigation |
|-----------------------|--|--|--|
| Within Project limits | Excavation and earth-moving activities | Clearing and removal of vegetation exposes soils to erosion and disturbs habitat | Temporarily disturbed areas will be re-vegetated and stabilized. |
| Within Project limits | Excavation and earth-moving activities | Potential to introduce noxious weeds or contribute to the spread of noxious weeds. | <p>Prior to construction, CDOT will conduct a noxious weed survey to map existing weeds within the Project area. An Integrated Noxious Weed Management Plan then will be developed to prevent the spread of noxious weeds into temporarily disturbed areas. Implement measures to control noxious weed spread, such as:</p> <ul style="list-style-type: none"> • Salvage weed-free topsoil for use in seeding |

| Location | Activity | Impact | Mitigation |
|----------|----------|--------|--|
| | | | <ul style="list-style-type: none"> CDOT Standard Specification Section 217—Herbicide Treatment will be incorporated into the Project Specifications |

7.4. Canyon Viaduct Alternative

7.4.1. Mitigation for Permanent Adverse Impacts

Permanent adverse impacts would be mitigated by incorporating CDOT standard specifications for earth work into project design (CDOT, 2019). These mitigation measures are summarized in Exhibit 28.

Exhibit 28 Recommended Mitigation Measures for Permanent Impacts of the Canyon Viaduct Alternative

| Location | Activity | Impact | Mitigation |
|-----------------------|---|--|--|
| Within Project limits | Removal of existing roadway infrastructure and replacement with smaller roadway footprint | Reclamation of existing roadway that would not be incorporated into the Proposed Action. | <ul style="list-style-type: none"> Prior to construction, a landscape plan will be developed for all reclamation areas and approved by a CDOT landscape architect. Reclaimed areas will be re-vegetated with native species to replicate or enhance native vegetative communities. |

7.4.2. Mitigation for Temporary Impacts

Exhibit 29 summarizes mitigation measures for the temporary impacts that are anticipated during construction of the Canyon Viaduct Alternative.

Exhibit 29 Recommended Mitigation Measures for Temporary Impacts of the Canyon Viaduct Alternative

| Location | Activity | Impact | Mitigation |
|-----------------------|--|--|--|
| Within Project limits | Excavation and earth-moving activities | Clearing and removal of vegetation exposes soils to erosion and disturbs habitat | Temporarily disturbed areas will be re-vegetated and stabilized. |
| Within Project limits | Excavation and earth-moving activities | Potential to introduce noxious weeds or contribute to the spread of noxious weeds. | Prior to construction, CDOT will conduct a noxious weed survey to map existing weeds within the Project area. An Integrated Noxious Weed Management Plan then will be developed to prevent the spread of noxious |

| Location | Activity | Impact | Mitigation |
|----------|----------|--------|--|
| | | | weeds into temporarily disturbed areas. Implement measures to control noxious weed spread, such as: <ul style="list-style-type: none"> • Salvage weed-free topsoil for use in seeding • CDOT Standard Specification Section 217—Herbicide Treatment will be incorporated into the Project Specifications |

8. Agency Coordination

The lead agencies, CDOT and FHWA, have coordinated with and are continuing to coordinate with CPW, USFS, Clear Creek County, Jefferson County, and USFWS on issues related to vegetation during the NEPA process.

SWEEP meetings are ongoing and described in more detail in the *I-70 Floyd Hill to Veterans Memorial Tunnels Aquatic Resources Technical Report* (CDOT, 2020a) and the *I-70 Floyd Hill to Veterans Memorial Tunnels Threatened and Endangered Species Technical Report* (Atkins, 2020c), respectively.

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Appendix A. Site Photographs

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Photo 1. Looking southwest from the south side of I-70 at the eastern end of the Study Area near the top of Floyd Hill at MP 247 during the Summer of 2017.



Photo 2. Looking southwest from the south side of I-70 at the eastern end of the Study Area. An unnamed tributary to Beaver Brook is adjacent to the highway at this location near MP 246.5 during the Summer of 2017.



Photo 3. Picture of the Beaver Brook channel and riparian corridor northeast of the I-70 Beaver Brook/Floyd Hill interchange looking east near MP 248 during the Summer of 2018.



Photo 4. Picture of the Beaver Brook channel and riparian corridor northeast of the I-70 Beaver Brook/Floyd Hill interchange looking east at the property boundary for Adam's Acres buffalo ranch near MP 248 during the Summer of 2018.



Photo 5. Picture looking east from the culvert that connects Beaver Brook on either side of I-70. The Adams Acres building is in the background.



Photo 6. Looking west from the east side of the Beaver Brook/Floyd Hill interchange bridge over I-70 during the Summer of 2017.



Photo 7. Looking east from the west side of the Hyland Hills/Floyd Hill interchange bridge in the I-70 highway right of way near MP 246.5 during the Summer of 2017.



Photo 8. Looking south from the I-70 highway right of way, east of the Hyland Hills/Floyd Hill interchange. A large water quality pond is shown that drains into Beaver Brook to the east near MP 247 during the Summer of 2017.



Photo 9. Picture of a Black-billed Magpie observed in the Study Area adjacent to Clear Creek near MP 244.5 during the Summer of 2017.



Photo 10. Evidence of a deer roadkill found adjacent to I-70 in the highway right of way near MP 247 during the Summer of 2017.



Photo 11. Looking west. Example vegetation and topography found in/adjacent to the I-70 Mountain Corridor in the Study Area. The bottom of Floyd Hill is in the background near MP 244 during the Summer of 2017.



Photo 12. Looking east from the bottom of Floyd Hill at the vegetation and topography leading to the top of Floyd Hill near MP 245 during the Summer of 2017.



Photo 13. Example of slopes and drop-off of several gulches (Sawmill and Johnson) that intersect I-70 in the Study Area near MP 245 during the Summer of 2018.



Photo 14. Evidence of deer that have movement patterns that parallel or intersect the highway. This track was photographed in the I-70 highway right of way near MP 245 during the Summer of 2018.



Photo 15. Photo of a quaking aspen stand that is present on the north side of I-70 on the west side of Floyd Hill near MP 245.8 during the Summer of 2018.



Photo 16. An example of Clear Creek and its narrow riparian corridor. Photo taken at the west end of the Study Area near MP 243 during the Summer of 2018.



Photo 17. Photo looking east at the US 6/Golden interchange, with Clear Creek on the left near MP 244.5 during the Summer of 2017.



Photo 18. Picture looking east from the Valero Gas Station at the Hidden Valley/Central City interchange near MP 243 during the Summer of 2017.



Photo 19. Picture looking west along the East Idaho Springs Road/I-70 Frontage Road, south of I-70 and the Veterans Memorial Tunnels near MP 242.3 during the Summer of 2017. This ridge is a large rock outcrop in the Project Corridor.



Photo 20. Photo looking west along East Idaho Springs Road west of the Veterans Memorial Tunnels near MP 242 during the Summer of 2017. Shows how close Clear Creek (middle) is to I-70 (right), the narrow riparian corridor, and the steep banks separating the highway and Clear Creek.



Photo 21. Looking east, from the Game Check Area Park, at Clear Creek and sparsely vegetated slopes south and east of the Veterans Memorial Tunnels near MP 242.3 in May of 2020.



Photo 22. Looking east from East Idaho Springs Road/I-70 Frontage Road at the forested southern slopes with retaining walls. Very little vegetation present in a grassy area between the road and the Clear Creek Greenway. Near MP 242.5 in May 2020.



Photo 23. Looking west along the East Idaho Springs Road/I-70 Frontage Road, south of I-70 and east of the Veterans Memorial Tunnels near MP 242.6 in May 2020. Example of sparsely vegetated slopes north of I-70 and more forested slopes south of I-70 and Clear Creek. Narrow vegetated buffers exist between the frontage road and the Clear Creek Greenway and Clear Creek.



Photo 24. Picture looking east along East Idaho Springs Road west of the Hidden Valley/Central City interchange near MP 242.7 in May of 2020. Shows the narrow riparian corridor and the steep riprapped banks.



Photo 25. Picture looking east at the Central City Parkway Bridge over Clear Creek near MP 242.8 north of I-70. Example of the narrow riparian corridor adjacent to Clear Creek.



Photo 26. Picture looking east from the east side of the Central City Parkway Bridge over Clear Creek near MP 242.8 in May of 2020. Example of sparsely vegetated slopes and narrow riparian corridor north of I-70.



Photo 27. Picture looking west along the Clear Creek Greenway, south of I-70 and Clear Creek near MP 243.3 in May of 2020.



Photo 28. Photo looking west from the Clear Creek Greenway near MP 243.5 in May of 2020. Shows where the riparian corridor has more space for overflow events and wider wetland bench areas.



Photo 29. Picture looking east from the Clear Creek Greenway near MP 243.5 south of I-70. Example of the narrow riparian corridor and forested north-facing slopes south of I-70.



Photo 30. Picture looking west from the Clear Creek Greenway near MP 243.7 in May of 2020. Example of sparsely vegetated slopes and narrow riparian corridor south of I-70. The several straight sections of Clear Creek in the "W" section of the highway provide rapids preferred by local white-water rafting companies.



Photo 31. Picture looking east along the Clear Creek Greenway, south of I-70 and Clear Creek near MP 244 in May of 2020. Example of sparsely vegetated south-facing slopes north of I-70, narrow riparian corridor, and forested north-facing slopes south of Clear Creek.



Photo 32. Picture looking west from the Clear Creek Greenway near MP 244.3 in May of 2020. Shows the slope/ridge where the tunnel alternative would start.

Appendix B. Vegetation Documented in the Study Area

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During field visits in the Summer of 2017 and 2018, plant species observed within the Study Area were documented (see Table B-1). For information on wetland plant species in the Study Area, refer to *I-70 Floyd Hill to Veterans Memorial Tunnels Aquatic Resources Technical Report* (CDOT, 2020a).

Table B-1. Observed Flora

| Common Name | Species Name |
|-----------------------------|-------------------------------|
| Woody Plants | |
| Blue spruce | <i>Picea pungens</i> |
| Engelmann spruce | <i>Picea engelmannii</i> |
| Lodgepole pine | <i>Pinus contorta</i> |
| Mountain mahogany | <i>Cercocarpus montanus</i> |
| Narrowleaf cottonwood | <i>Populus angustifolia</i> |
| Quaking aspen | <i>Populus tremuloides</i> |
| Peachleaf willow | <i>Salix amygdaloides</i> |
| Ponderosa pine | <i>Pinus ponderosa</i> |
| Rubber rabbitbrush | <i>Ericameria nauseosa</i> |
| Russian olive* | <i>Elaeagnus angustifolia</i> |
| Sandbar willow | <i>Salix interior</i> |
| Wax currant | <i>Ribes cereum</i> |
| Willow species | <i>Salix</i> spp. |
| Herbaceous Plants | |
| Blackeyed Susan | <i>Rudbeckia hirta</i> |
| Canada thistle* | <i>Cirsium arvense</i> |
| Cattail species | <i>Typha</i> spp. |
| Chinese clematis* | <i>Clematis orientalis</i> |
| Common dandelion | <i>Taraxacum officinale</i> |
| Common mullein* | <i>Verbascum thapsus</i> |
| Common sunflower | <i>Helianthus annuus</i> |
| Curlycup gumweed | <i>Grindelia squarrosa</i> |
| Curly dock | <i>Rumex crispus</i> |
| Diffuse knapweed* | <i>Centaurea diffusa</i> |
| Downy brome* | <i>Bromus tectorum</i> |
| Engelmann's spikerush | <i>Eleocharis engelmannii</i> |
| Evening primrose | <i>Oenothera</i> spp. |
| Fairy trumpet/Scarlet gilia | <i>Ipomopsis aggregata</i> |
| Field bindweed* | <i>Convolvulus arvensis</i> |
| Field pennycress | <i>Thlaspi arvense</i> |
| Foxtail barley | <i>Hordeum jubatum</i> |
| Fringed sage | <i>Artemisia frigida</i> |
| Hoary cress* | <i>Cardaria draba</i> |
| Japanese brome | <i>Bromus japonicus</i> |

| Common Name | Species Name |
|--------------------------|------------------------------|
| Jim Hill mustard | <i>Sisymbrium altissimum</i> |
| Lambsquarters/Goosefoot | <i>Chenopodium</i> spp. |
| Musk thistle* | <i>Carduus nutans</i> |
| Purple lupine | <i>Lupinus argenteus</i> |
| Reed canarygrass | <i>Phalaris arundinacea</i> |
| Rocky Mountain goldenrod | <i>Solidago multiradiata</i> |
| Rocky Mountain juniper | <i>Juniperus scopulorum</i> |
| Rush species | <i>Juncus</i> spp. |
| Sedge species | <i>Carex</i> spp. |
| Scotch thistle* | <i>Onopordum acanthium</i> |
| Showy milkweed | <i>Asclepias speciosa</i> |
| Smooth brome | <i>Bromus inermis</i> |
| Western wheatgrass | <i>Pascopyrum smithii</i> |
| Yarrow | <i>Achillea millefolium</i> |
| Yellow sweetclover | <i>Melilotus officinalis</i> |
| Yellow toadflax* | <i>Linaria vulgaris</i> |
| Yucca species | <i>Yucca</i> spp. |

*Noxious weed species