# 3.4 Water Resources

## 3.4.1 What are water resources and why are they important?

Water resources in the I-70 Mountain Corridor include the watersheds—and the rivers, streams, and creeks fed by those watersheds—that run to, and along, the I-70 highway and ultimately continue flowing away from the Corridor to downstream users. These water resources are protected by the following regulations:

- The Clean Water Act
- State water quality standards
- The Source Water Assessment and Protection program, which assesses potential water quality issues for public water supplies mandated by the Safe Drinking Water Act

*A water quality evaluation study*

These regulations protect surface and groundwater quality for drinking water, recreation, agriculture, and aquatic life. Water quality is protected to minimize siltation of lakes and reservoirs and to minimize the loss of wetlands that help filter the water system in natural ways.

## 3.4.2 What study area and process was used to analyze water resources?

For water resources, the Colorado Department of Transportation (CDOT) used the intersecting watersheds of the Corridor for context, with adjacent streams along the Corridor providing the more specific study area for impacts. The Colorado Department of Transportation coordinated with federal, state, and local agencies and asked for public input to identify water resources in the Corridor. Additionally, CDOT established the following three programs to gather information on water resources within the Corridor:

- The *Stream and Wetland Ecological Enhancement Program (SWEEP) Memorandum of Understanding* (included in **Appendix D, SWEEP Memorandum of Understanding**) identifies aquatic resource issues and outlines the process for the SWEEP committee to identify stream and wetland mitigation opportunities in the Corridor.
- The *I-70 Storm Event/Snowmelt Water Quality Monitoring Program* (Clear Creek Consultants, Inc., 2008) conducted sampling from 2000 to present to quantify existing water quality conditions from I-70 highway runoff.
- *The Sediment Control Action Plan (SCAP) for Black Gore Creek and Straight Creek* (CDOT, 2002) outlines mitigation strategies for the two streams listed as impaired waters under the Clean Water Act. A summary of these findings is in this section; additional information is in the *I-70 Mountain Corridor PEIS Water Resources Technical Report* (CDOT, March 2011). Additionally, a Sediment Control Action Plan is under development for Clear Creek.

The Colorado Department of Transportation estimated impacts from highway runoff by quantifying increased impervious surface area and winter maintenance material usage (increases in sand/salt and liquid deicer). Highway stormwater runoff and associated increases in water quality pollutant concentrations and loads in streams were quantified using the Federal Highway Administration's (FHWA) water quality model. The three-year storm event—the average maximum precipitation event that would occur within the time period specified—was used in the model. Stream disturbance impacts were estimated quantitatively in terms of Action Alternative footprints, estimated by adding 30 feet beyond the edge of the project design to allow for some final design adjustment as well as room for construction equipment to move around the site. Although construction impacts are discussed in this document, Tier 2

processes will be necessary to identify more specific impacts on water resources (including impacts on specific water supplies, wastewater facilities, fisheries, and impaired waters that have limited Total Maximum Daily Loads of certain pollutants such as sediments and heavy metals because of the existing levels that are already negatively affecting the water resource), as well as specific mitigation activities. Areas of potential concern include existing impaired segments resulting from I-70 highway runoff (Black Gore Creek, Straight Creek, and Upper Clear Creek) and impaired segments resulting from historic mining in Lower Clear Creek. Construction disturbance of mining waste and mineralized rock (mercury and other minerals releases from mining tailings could impact water quality and biological resources, such as macroinvertebrates and the fish that feed on them, that live in these waters), and long-term operation of the transportation Corridor could potentially affect some I-70 highway segments.

### 3.4.3 What agencies have CDOT and FHWA coordinated with and what are their relevant issues?

The Colorado Department of Transportation and FHWA consulted the following agencies regarding their issues and concerns with implementing a project along the Corridor:

- United States Fish and Wildlife Service
- United States Forest Service
- U.S. Army Corps of Engineers (USACE)
- Environmental Protection Agency
- Colorado Department of Public Health and the Environment (CDPHE)
- U.S. Bureau of Land Management
- Colorado Division of Wildlife
- Representatives from the watersheds, counties, and cities along the Corridor

For water quality issues, agencies raised general concerns regarding contaminants coming from the I-70 highway, including the possible release of contaminants within the Corridor from past mining activity during future highway construction and long-term indirect effects on water quality from induced growth caused by the project. The following specific concerns also were raised:

- Agencies are concerned about the stormwater run-off and drainage from the I-70 highway into Georgetown. The Upper Clear Creek Monitoring Station upstream from Georgetown is designed to quantify water quality from upstream sources in the vicinity of the Eisenhower-Johnson Memorial Tunnels, I-70 highway, and US 6. See Table 2 in the *I-70 Mountain Corridor PEIS Water Resources Technical Report* (CDOT, March 2011) for details. This monitoring station records concentrations of total suspended solids, total phosphorus, dissolved salts, and manganese, which were elevated above those found in background levels. Sources of sediment and dissolved salts include highway traction sand/salt accumulations along the I-70 and US 6 highways, and potential erosion of dirt parking lots at Loveland Ski area. Sedimentation from the I-70 highway impairs Straight Creek and Black Gore Creek water quality. Trace metals found are attributable to mining rather than I-70 highway runoff except in highly mineralized rock cuts such as along Upper Clear Creek.
- Agencies are concerned about I-70 highway contaminants flowing into Straight Creek that provides the domestic water supply to Dillon and Dillon Valley. A monitoring station above the Dillon Water Supply Diversion Structure indicates an elevated level of sediments, and chloride exists in the stream from unconsolidated traction sand (from winter maintenance activities) deposited along the I-70 highway, along with highway cut-and-fill slope erosion. *The Sediment Control Action Plan (SCAP) for Black Gore Creek and Straight Creek* (CDOT, 2002) stresses the importance of providing best management practices at the source to reduce transport of sediment and chloride in roadway stormwater runoff in Straight Creek.

## 3.4.4 What are the water resources of interest identified in the Corridor?

The I-70 Mountain Corridor crosses four watersheds (from west to east):

- Eagle River
- Blue River
- Clear Creek
- Bear Creek

The Corridor includes 11 identified waterways adjacent to the I-70 highway (from west to east):

- Eagle River
- Gore Creek
- Black Gore Creek
- West Tenmile Creek
- Tenmile Creek
- Straight Creek
- Upper/Middle/Lower Clear Creek
- Beaver Brook
- Mount Vernon Creek

*West Tenmile Creek monitoring station above Copper Mountain*

The Corridor also includes two reservoirs along the way (Lake Dillon and Georgetown Reservoir). Clear Creek County proposes several future reservoirs for water storage along the I-70 highway and Clear Creek. **Figure 3.4-1** shows the watersheds and stream segments within the I-70 Mountain Corridor.

The Four Bay Excel Plant is the drinking water supply for Georgetown. More information about water resources, watersheds, and adjacent streams/rivers is available in the *I-70 Mountain Corridor PEIS Water Resources Technical Report* (CDOT, March 2011). All of these streams/rivers have regulated limits on what is allowed to enter these water systems to protect these intended uses (including water supply, aquatic life, recreation, and agricultural uses) or to help improve the water quality of impaired or use-protected streams. Heavy metals contamination related to historic mining activities (copper, zinc, and cadmium) has an impact on Middle and Lower Clear Creek (two stretches of Clear Creek). Black Gore Creek and Straight Creek are monitored for sedimentation input from the I-70 highway runoff. They have been placed on the 303(d) list of water quality impaired streams for sediment, which requires monitoring and evaluation to meet stream water quality targets or goals. The 303(d) identifies threatened or impaired waters that may require a Total Maximum Daily Loads limit for pollutants of concern for that stretch of water. Additionally, the Colorado River Glenwood Canyon area is going through the designation process for a Wild and Scenic River, which affords it protection under the Wild and Scenic Rivers Act.

The macroinvertebrate community structure is a good indicator of stream quality. Macroinvertebrates (such as larvae) reside within the same area of a stream throughout their lifecycle and thus are exposed to both constant and/or periodic introduction of pollutants to their stream environment. These stressors impact the proportion of pollution-tolerant to pollution-intolerant species within the community and thereby provide a reliable metric to gauge environmental impacts.

Most of the impacts on water quality in the Corridor streams are the result of planned urban and rural development that increases both point and nonpoint source loads of total phosphorus. The phosphorus loads are expected to increase as a result of these planned land use changes through 2025 by 34 percent in the Eagle River Watershed, by 7 percent in the Blue River Watershed, and by 28 percent in the Clear Creek Watershed (estimated from the Environmental Protection Agency's Better Assessment Science

Integrating Point and Nonpoint Sources [BASINS] model). County planning does not have substantially different projections beyond 2025 so there is no need to project out to 2035 for this phosphorous load estimate. Impacts from the existing I-70 highway are generally included in the changes from existing to planned development in the BASINS modeling study.

Stream appearance in the Corridor has been altered over time in negative ways. Streams have been interrupted by man-made features, such as the I-70 highway, and channelized so that the flows are quicker and more erosive that further affect the banks of the streams, stream bottom, and stream bank shape.

Changes caused by these man-made features affect the stream's ability to support fisheries as well as the overall function of the stream habitat for macroinvertebrates. Macroinvertebrates are animals without backbones that are larger than the size of a pencil dot. These animals live on rocks, logs, sediment, debris, and aquatic plants during some period in their life and include crayfish, clams and snails, aquatic worms, and the immature forms of aquatic insects such as stonefly and mayfly nymphs.

## 3.4.5 How do the Action Alternatives potentially affect water resources?

Past and current activities, such as those described below, in the Corridor have affected water resources:

- Trail, road, and railroad construction in stream valleys has affected water resources due to the otherwise steep challenging terrain and the maintenance of these features (such as winter maintenance with deicers and sand)
- Mining activities have left mining tailings containing and exposing the heavy metals and acids to surface runoff
- Settlement and urbanization of the Corridor has increased the amount of impervious surface, thereby increasing stormwater runoff volumes and exposure to sedimentation during construction. Potential pollutants such as fertilizers, pesticides, petroleum, and trash have been introduced into the riverine system. An additional demand on water supply for drinking water has created a need to import water to the creeks, causing flows to increase beyond historical levels.
- Channelization (i.e., moving and/or straightening) of stream beds has (1) increased the speed of water flow and the erosive force and sediment load of these flows; (2) modified stream habitat characteristics making them less desirable to aquatic species such as fish; and (3) impacted wetlands so they cannot properly function to help filter out sediments and other contaminants
- The transport of hazardous materials and the effects of subsequent spills into nearby waterways have affected water resources

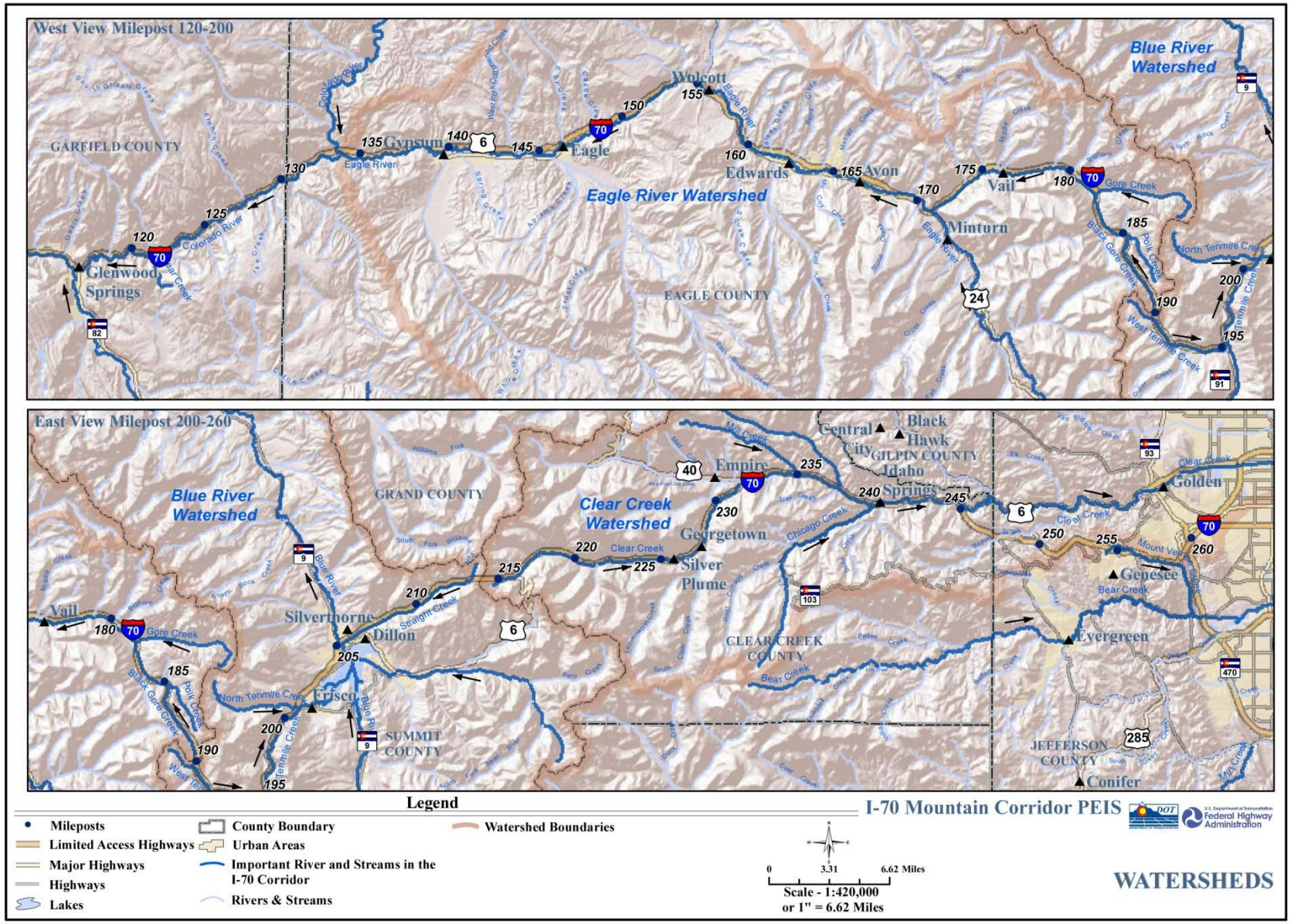
Ice and snow accumulation in the winter, as well as heavy snowmelt and rainfall events that occur in the mountains in the spring and summer, further impact water resources. These conditions loosen and move sediments off the steep hillsides and flush contaminants from human activities and settlements down the Corridor. The Action Alternatives complicate this water system.

The Action Alternatives potentially affect water resources both directly and indirectly to various degrees.

Direct impacts include impervious surface area/roadbed expansion, new construction disturbances, additional stream channelization, further impedance or blockage of cross-slope streams, impacts from disturbance of historic mine waste materials, and impacts from transportation system operations and maintenance of the new facilities. Changes in impervious surface and roadbed expansion are permanent impacts, while construction impacts are considered temporary.

Indirect or secondary water quality impacts come from possible induced growth, more localized to areas of Eagle and Summit counties, and vary with specific Action Alternatives.

**Figure 3.4-1. I-70 Corridor Watersheds**



## How do the alternatives directly affect water resources?

The Action Alternatives directly affect water resources through the introduction of sediments and other contaminants into the stream channels, as well as by physically affecting stream length by placing the road or its supports next to or in the stream channel.

At the request of CDPHE and the Environmental Protection Agency, a monitoring program conducted since 2000 measured actual direct snowmelt and stormwater runoff contaminants from the I-70 highway and their impacts on receiving streams. The data are explained in the *Data Evaluation Report Interstate 70 Mountain Corridor, Storm Event/Snowmelt Water Quality Monitoring 2000-2006* (Clear Creek Consultants, Inc. 2008). In addition, the results are described in the *Water Quality Modeling, I-70 PEIS Direct Impact Analysis* (Clear Creek Consultants, Inc., 2010), which includes 2010 updates to the monitoring data. The following selected pollutants were monitored:

- Suspended solids (such as sediments that can carry other pollutants)
- Phosphorus (found in sediment and winter maintenance materials used on the I-70 highway and in fertilizers)
- Chloride (from rock salt and liquid magnesium chloride deicers)
- Copper (from moving engine parts, brake linings and fungicides/insecticides)
- Zinc (from tire wear, motor oil, and grease)

The monitoring of existing conditions provides an estimate for future impacts from additional roadway capacity improvements. Current CDOT maintenance data indicate a major change in winter maintenance material usage in the recent years. There is a trend away from sand/salt toward more widespread use of sand/slicer mixture (a solid deicer that is more concentrated than rock salt) and liquid deicer salts. This shift decreases sediment and phosphorus loading in the high-elevation streams receiving I-70 highway runoff and increases chloride concentrations and loads in recent years exceeding the long-term aquatic life chloride standard.

Direct impacts on water resources related to the Action Alternatives include:

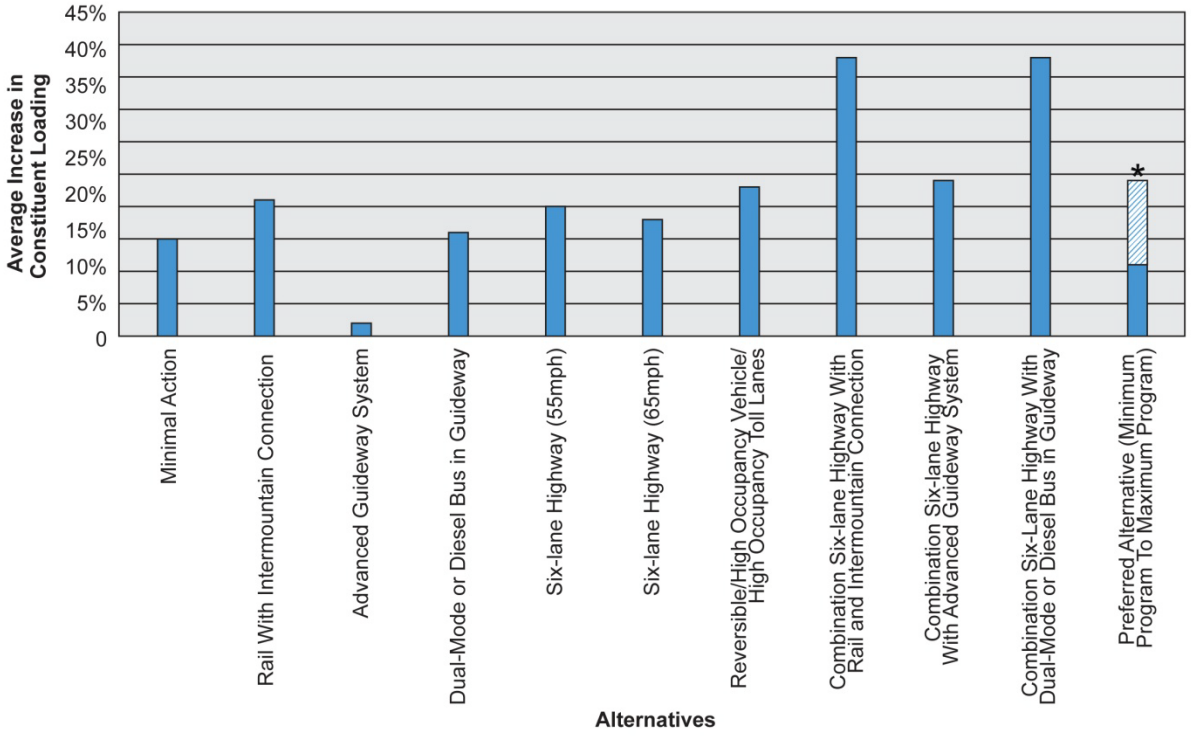
- Increases in impervious surface area/roadbed expansion
- New construction disturbances
- Stream channelization
- Impedance or blockage of cross-slope streams
- Impacts from disturbance of historic mine waste materials, and impacts from transportation system operations and maintenance

Changes in impervious surface and roadbed expansion are considered long-term impacts due to the continued winter maintenance activities required to keep this roadway operational. Winter maintenance activities that add sand and anti-icing products to the road surface to minimize vehicular sliding on the ice cause sedimentation and sodium/magnesium sources of contamination into the adjacent streams during snow melt and spring stormwater runoff. Construction impacts are temporary and short-term because the soil-disturbances causing potential pollutants to be exposed and easily transported during precipitation events are managed by temporary soil stabilization and sediment control best management practices (BMP's) until the disturbed areas can be permanently stabilized. Sedimentation is often used as a surrogate for other water quality issues because other pollutants often accompany sedimentation into the waterways.

**Chart 3.4-1** shows the result of a sediment stream loading model run comparing the performance of the Action Alternatives. The No Action Alternative is not included in **Chart 3.4-1** because sediment and hydrologic mitigations are not associated with this alternative. As a result, the No Action Alternative has a continuing impact on water quality over time. The Preferred Alternative has impacts within the range of

the other Action Alternatives, with impacts associated with the Minimum Program of Improvements, which contains fewer highway components, being among the lowest; if fully implemented, the impacts of the Maximum Program of Improvements would be in the mid-range of the Action Alternatives.

**Chart 3.4-1. Predicted Corridor Stream Loading Impacts by Alternative**




* Impacts of the Preferred Alternative are presented as a range, with the solid and hatched bars together representing the full implementation of the Preferred Alternative. The solid bar represented implementation of the Minimum Program of Improvements only. The hatched area is presented as a range because the adaptive management component of the Preferred Alternative allows it to be implemented based on future needs and associated triggers for further action. Section 2.7.2 describes the triggers for implementing components of the Preferred Alternative. For NEPA documentation and analysis purposes and based on information available today, the Preferred Alternative must be fully implemented to meet the 2050 purpose and need. The Minimum Program of Improvements does not meet the 2050 purpose and need.

Note: Stream water quality loading increases were calculated using the FHWA water quality model. The load changes are based on stream concentrations and highway runoff from impervious surfaces. **Chart 3.4-1** does not show an increase in sediment loading for the No Action Alternative (because it does not include transportation improvements); indirect increases from land use changes and population growth are expected to cause an increase in sediment loading. None of these columns include mitigation as part of the measure, which greatly reduces the sediment loading of any Action Alternative including the Preferred Alternative. Mitigation is not included for the No Action Alternative and this alternative, therefore, likely results in the highest level of sediment loading of all of the alternatives after mitigation is considered.

*Bar Chart Source: Water Quality Modeling, I-70 PEIS Direct Impact Analysis,* February 2004 with March 2010 Addendum, *Clear Creek Consultants, Inc. 2010*

Possible disturbance of historic mine waste is discussed in **Section 3.6, Regulated Materials and Historic Mining** of this document and the *I-70 Mountain Corridor PEIS Regulated Materials and Historic Mining Technical Report* (CDOT, March 2011). Tier 2 processes will be necessary to identify specific water quality impacts from disturbance of historic mine waste and associated avoidance/mitigation measures. Total phosphorus loads are expected to increase along the Corridor as a result of planned land use changes by 2050, and the Action Alternatives could further increase phosphorus and other pollutant loadings from old mining waste, but the sediment catchment basins will help trap these phosphorus and other pollutant loads and keep them from entering the waterways.

Winter maintenance calculations assume that the average application rate per unit area for sand and chemical deicers remains the same for all alternatives. This assumption is based on existing data that incorporate historic weather conditions and maintenance procedures for both four-lane and six-lane I-70 highway segments (Straight Creek and Mount Vernon/Beaver Brook). Projects under the No Action Alternative include some additional sand and deicer usage but amounts are considered minimal in comparison with the Action Alternatives. The increase in material usage reflects the increase in the number of highway lanes and quantity of impervious surface. Although the absolute material volumes may change, these changes are proportional to the surface disturbance of the alternative.

Most of the impacts on water quality in Corridor streams result from planned urban and rural development that would occur under all but the No Action Alternative and Minimal Action Alternative, both of which have little effect on induced growth. This type of development increases point and nonpoint source loads of total phosphorus and affects water quality. For information on cumulative effects of actions planned in the area on water quality, see **Chapter 4, Cumulative Impacts Analysis**. The following differences are noted in water quality impacts among Action Alternatives:

- The Advanced Guideway System Alternative results in fewer water quality impacts than other Transit alternatives because the system requires little additional impervious pavement and is planned to be primarily elevated and constructed on piers that require less excavation that might loosen sediments.
- The Bus in Guideway Alternatives result in fewer impacts than the Rail with Intermountain Connection Alternative because they are largely contained in the median (a previously disturbed area) and require minimal excavation.
- The strategy for winter maintenance of highway lanes for the Highway and Combination alternatives minimizes the additional deicers needed for the additional roadway.
- The Rail with Intermountain Connection Alternative likely has the greatest impact to mining sites because its large footprint requires more cuts into mine waste areas and mineralized rock by the roadway along the Middle and Lower Clear Creek stretches.
- The Combination Six-Lane Highway with Rail and Intermountain Connection Alternative probably has the greatest direct impacts on water quality because of its greater impervious surface and potential to disturb historic mine waste materials because of its footprint width.
- The Combination Six-Lane Highway with Advanced Guideway System has a more limited footprint than other Combination alternatives due to the Advanced Guideway System being on piers.
- The Preferred Alternative has the lowest impacts of the Combination alternatives primarily because it includes the Advanced Guideway System transit component, which has fewer impacts than other Transit alternatives.

Channelizing, moving, or placing piers in waterways impacts water resources. **Table 3.4-1** summarizes the miles of stream channel impacts by alternative and watershed. **Table 3.4-1** shows that the impacts of the Combination alternatives, including the Preferred Alternative, are higher than the single-mode

alternatives, primarily because the footprints of these alternatives are larger and thus encroach more on waterways. Impacts to stream channels from all Action Alternatives are greatest in the Clear Creek watershed, largely because this area is most constrained. Of the Combination alternatives, the Preferred Alternative has the lowest impacts in each watershed, even with full implementation of the Maximum Program of Improvements. Impacts presented in **Table 3.4-1** are based on the overall footprint area of Action Alternatives and do not assume any mitigation or avoidance potential.

**Table 3.4-1.Summary of Stream Channel Impacts (Miles)**

| Alternative | Clear Creek Watershed | Blue River Watershed | Eagle River Watershed | Total Impacts |
|---|---|---|---|---|
| No Action | 0.0 | 0.0 | 0.0 | 0.0 |
| Minimal Action | 3.0 | 0.3 | 0.7 | 4.0 |
| Rail with IMC | 5.0 | 0.6 | 0.7 | 6.3 |
| AGS | 3.8 | 0.3 | 0.5 | 4.6 |
| Dual-Mode Bus in Guideway | 4.0 | 0.5 | 1.1 | 5.6 |
| Six-Lane Highway (55 mph) | 4.9 | 0.3 | 0.7 | 5.9 |
| Six-Lane Highway (65 mph) | 5.2 | 0.3 | 0.3 | 5.8 |
| Reversible/HOV/HOT Lanes | 5.5 | 0.3 | 0.7 | 6.5 |
| Combination Six-Lane Highway with Rail and IMC | 6.8 | 0.6 | 1.2 | 8.6 |
| Combination Six-Lane Highway with AGS | 6.5 | 0.3 | 0.9 | 7.7 |
| Combination Six-Lane Highway With Diesel Bus in Guideway | 6.2 | 0.5 | 1.2 | 7.9 |
| Preferred Alternative[1] | 2.6 to 6.8 | 0.3 to 0.3 | 0.7 to 0.9 | 3.6 to 8.0 |

*[1]The Preferred Alternative is presented as a range because the adaptive management component allows it to be implemented based on future needs and associated triggers for further action. Section 2.7.2 of this document describes the triggers for implementing components of the Preferred Alternative.*

Key to Abbreviations/Acronyms

IMC = Intermountain Connection
AGS = Advanced Guideway System
HOV = High Occupancy Vehicle
HOT = High Occupancy Toll
mph = miles per hour

The following differences are noted in stream length impacts among Action Alternatives:

- The Advanced Guideway System Alternative results in fewer water quality impacts than other Transit alternatives because the system requires little additional impervious pavement and is planned to be elevated and constructed on piers that require less excavation that might loosen sediments. Additionally, although not specifically calculated for this analysis, constructing on piers provides better opportunity to avoid impacts than on-grade systems.
- The Bus in Guideway Alternatives result in fewer impacts than the Rail with Intermountain Connection Alternative because it largely is contained in the median (a previously disturbed area) and requires minimal expansion to the outside of the I-70 highway where the streams are located.
- The Highway alternatives have similar overall impacts due to comparable footprints.
- The Combination alternatives have greater direct impacts on stream lengths because of wider footprints.

Of the Combination alternatives, the Preferred Alternative has fewer impacts because it includes the Advanced Guideway System as a transit component, which has fewer impacts than the other transit systems considered, and because it includes an adaptive management component that allows improvements to be implemented incrementally in response to needs.

## How do the alternatives indirectly affect water resources?

Indirect water quality impacts are related to the induced growth that the completed project will bring to the area and include:

- Increased impervious surface area causing additional runoff
- Increased importation of water adding an unnatural volume to the waterways below
- Increased use of fertilizers and other chemicals that can be a source of contamination

The No Action Alternative is expected to have the fewest indirect impacts, with the Minimal Action Alternative expected to have the next fewest indirect impacts. However, neither of these alternatives meets the purpose and need for the project.

Alternatives that include tunnels (Transit, Highway, and Combination) have considerable potential for indirect impacts related to highway operation and maintenance activities, as well as construction disturbance of geological substrate that could release pollutants into the waterways.

The Combination alternatives have the greatest amount of indirect impacts through induced growth, partly because of their effectiveness at moving more people through the Corridor.

**Table 3.4-1** summarizes sediment loading impacts on water resources directly correlating with phosphorus loading by alternative. See the *I-70 Mountain Corridor PEIS Water Resources Technical Report* (CDOT, March 2011). There is not a measurable difference in heavy metal loading among the alternatives so it is not described in **Chart 3.4-1**. However, heavy metal loading correlates to the Clear Creek Watershed sedimentation impacts.

Indirect water quality impacts from possible induced growth are more localized to areas of Eagle and Summit counties and vary with specific alternatives. Transit alternatives (including the Preferred Alternative with the adaptive management approach) may induce growth in urban areas with transit centers, including Eagle, Avon, and Vail, and increase stormwater runoff, phosphorus loading and sedimentation from these areas. Highway and Combination alternatives may induce more dispersed growth in rural areas, possibly leading to the greatest cumulative impacts on water quality from new development activities.

Coordination with planners in Garfield, Eagle, and Summit counties resulted in the following assumptions regarding the distribution of induced growth as it relates to the alternatives being considered:

- Transit alternatives concentrate induced growth in urban areas surrounding transit centers in areas of existing or planned urban development, primarily in Eagle County.
- Highway alternatives distribute growth based on existing trends for urban/rural development in each county, resulting in increased densities in rural areas of the Eagle and Blue River watersheds.
- Combination alternatives distribute growth equally between the above transit and highway distribution scenarios, resulting in increased pressure in both urban and rural areas in Eagle and Summit counties.
- The Preferred Alternative induces growth in a manner similar to the Transit alternatives, under the Minimum Program, and concentrates growth in urban areas surrounding transit centers,

primarily in Eagle County. If the Maximum Program is implemented, it induces growth in a manner more similar to the Combination alternatives where growth pressures occur in both urban and rural areas in Eagle and Summit counties.

### How does construction of the Action Alternatives affect water resources?

Construction disturbance constitutes temporary sedimentation impacts on streams and water bodies caused by work that may be required in the stream and temporary crossing of the streams during construction activities. The use of best management practices along the edge of the streams will minimize other sediments from entering the stream from adjacent earth-moving activities. In some areas, such as along Lower Clear Creek where heavy metals are natural in the soil, these construction-related earth moving activities release these metals into the sediments so that temporary heavy metal loads could enter the stream with the other sediments from the project. Having equipment working close to, and possibly within, the streams may temporarily release oils and other petroleum products into the waters. Stormwater runoff from freshly poured concrete areas could slightly increase the alkalinity (this is the opposite of acidity) of the stream temporarily. Although the project design minimizes permanent impacts on stream channels, additional channelization of the stream banks or pier placement for bridges within the stream flow may be required during construction.

### What are the project effects on water resources in 2050?

By 2050, streams could receive higher than-normal flows due to increased water importation and increased stormwater runoff due to increased impervious surface, caused by land use changes and population growth in the area. These changes in natural flows of the creeks and rivers may increase water scour of the waterways, further adding sediment and soil minerals to the waterways system while not allowing these sediments and nutrients to settle out. Climate change could also have a negative impact on water resources by contributing to deforestation already started by the mountain pine beetle epidemic. The loss of trees could increase sedimentation of aquatic habitat along the Corridor during rain and snow-melt events due to lack of vegetative cover that holds the soil in place. Existing Sediment Control Action Plans for Black Gore and Straight Creeks do not protect all of the areas from increased sedimentation that could be affected by the alternatives. Implementation of Action Alternatives includes sediment control through SWEEP and also helps to address and correct the impacted hydrologic system of the watershed. Over time, the Action Alternatives improve water resources by helping the waterways manage sedimentation from some natural or man-made events in the Corridor. For more on cumulative effects, see **Chapter 4, Cumulative Impacts Analysis** of this document.

## 3.4.6 What will be addressed in Tier 2 processes?

Some of the water quality impacts cannot be assessed fully until additional details are known about design, pier placement, and roadway cuts. The following types of impacts could result from the Action Alternatives and will be investigated in detail during Tier 2 processes:

- Phosphorus concentrations in highway runoff impacts water quality.
- A decrease in stream flow caused by drought conditions lowers the stream's ability to dilute contaminants and might lower the amount of acceptable pollutants allowed in the stream.

In Tier 2 processes, it can be determined whether a stream channel will be affected by the proposed alignment and what kinds of mitigations could offset this impact. Likewise, the placement of permanent water quality features such as catchment basins could benefit the Corridor by repairing stream health and minimizing impacts of the projects.

- Further analysis of permanent stormwater best management practices along the Corridor could verify that potential reductions to stream concentrations of priority constituents could be achieved by the alternatives beyond existing annual conditions.
- Potential water quality issues arising from disturbance of mine tailings and therefore, metal loading, analyzed as part of detailed Regulated Materials and Historic Mining analysis.
- Evaluation and identification of permanent mitigation measures for specific issues could include structural controls (beyond the Black Gore Creek and Straight Creek Sediment Control Action Plan and the Clear Creek Sediment Control Action Plan that is currently under development).
- Specific identification of stream disturbance during construction, including construction disturbance areas, channelized segments, pier placement, and structural modifications (for example, embankment walls, cantilevered sections, or elevated structural segments and bridges). The USACE requires compliance with the Clean Water Act that requires Section 404 permitting of temporary and permanent impacts on stream flow and channels. Each Tier 2 process will determine the need for a Section 404 permit for the site-specific project being constructed under that process.
- Tunnel discharges are typically considered point source discharges under the Clean Water Act and require a Section 401 permit for dewatering. Further study will be necessary during Tier 2 processes to identify if any new tunnels will require permits and/or water treatment systems. Water rights issues must also be considered in the context of water law for new groundwater discharges or depletions of groundwater wells.
- Impacts associated with washout of sand onto bike paths.
- Impacts from Straight Creek runoff on the Blue River.
- How mitigation strategies developed by the SWEEP Committee will be incorporated in the project design will be specified.
- Additional data on subsurface conditions will be collected and analyzed to assess various construction techniques, particularly for tunnels, and their potential effects on groundwater sources.

## 3.4.7 What are the approaches to programmatic mitigation planning for water resources?

The Colorado Department of Transportation will incorporate the following strategies to minimize and avoid potential environmental impacts on water resources from the proposed project. A more comprehensive discussion of mitigation strategies is found in the *I-70 Mountain Corridor PEIS Water Resources Technical Report* (CDOT, March 2011).

- Water resource mitigation recommendations developed by the SWEEP Committee will be integrated into Tier 2 processes.
- The Colorado Department of Transportation will work cooperatively with various local, state, and federal agencies and local watershed groups to avoid further impacts on and possibly improve Clear Creek water quality, including management of impacted mine waste piles and tunnels within the Corridor and through the use of appropriate best management practices during stormwater permitting. For additional information on minimizing water quality effects from disturbing mine waste, tailings, and drainage tunnels, see discussion of regulated materials and historic mining in **Section 3.6, Regulated Materials and Historic Mining**.

- Local watershed initiatives will be incorporated into site-specific Action Alternative mitigation strategies, and mitigation will consider the goals of the local watershed planning entity. Detention basins for the collection of sediment as outlined in the Sediment Control Action Plans developed for the Black Gore Creek and Straight Creek corridors (the Clear Creek Sediment Control Action Plan is under development) will be part of the mitigation strategy for this Corridor. Sediment Control Action Plans could be implemented concurrently with development of an Action Alternative and will consider drinking water source protection.
- The Colorado Department of Transportation is looking into ways to mitigate for winter maintenance activities beyond the implementation of SWEEP that will provide for sediment and stormwater catchment basins. Better training for snowplow staff so they know when they can minimize the use of sand or deicers if the roadway conditions do not need as much as for other times would help minimize the introduction of these contaminants over time.
- The Colorado Department of Transportation will manage construction impacts through the implementation of Stormwater Management Plans, which provide detailed guidance on the location, installation, and maintenance of stormwater best management practices for erosion and sediment control. A Stormwater Management Plan will be prepared for each construction project within the Corridor in accordance with the CDOT Standards and Specifications for Road and Bridge construction, specifically subsection 208 Erosion Control. The best management practices identified in the Stormwater Management Plan will be installed prior to commencement of construction activity and maintained throughout construction until the site has achieved stabilization and vegetation has been established. Efforts will be included in further design phases to minimize impacts on water quality and other water resources by refining placement of roadway and road piers to avoid impacts when feasible.

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