Twin Tunnels Environmental Assessment

Water Resources Technical Memorandum

May 2012

Twin Tunnels Environmental Assessment
Idaho Springs/Clear Creek County

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Acronyms and Abbreviations

BAT	Best Available Technology
BMPs	Best Management Practices
CCC	Colorado Climate Center
CDOT	Colorado Department of Transportation
CDPHE	Colorado Department of Public Health and Environment
CWA	Clean Water Act of 1977
DM	daily maximum standard
EA	Environmental Assessment
^{O}F	Fahrenheit
FHWA	Federal Highway Administration
NRC	National Response Center
PEIS	I-70 Mountain Corridor Programmatic Environmental Impact Statement
SCAP	Sediment Control Action Plan
SWEEP	Stream and Wetland Ecological Enhancement Program
TDMLs	total maximum daily loads
TSS	total suspended solids
TP	total phosphorus

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Section 1. Purpose of the Memorandum

The Federal Highway Administration (FHWA), in cooperation with the Colorado Department of Transportation (CDOT), is preparing an Environmental Assessment (EA) for proposed changes to the eastbound lanes of I-70 and the eastbound bore of the Twin Tunnels between MP 241 and MP 244 in Clear Creek County, Colorado. The Twin Tunnels area is one of the most congested locations along the I-70 Mountain Corridor. Improvements are necessary to improve safety, operations, and travel time reliability in the eastbound direction of I-70 in the project area. Additionally, the improvements will be consistent with the I-70 Mountain Corridor Programmatic Environmental Impact Statement (PEIS) Record of Decision, I-70 Mountain Corridor Context Sensitive Solutions process, and other commitments of the PEIS.

This technical memorandum discusses the regulatory setting and describes the affected environment and the impacts of the Proposed Action on water resources within the identified study area. The memorandum also documents mitigation measures, including applicable measures identified in the I-70 Mountain Corridor PEIS, which would reduce any impacts during construction and operation. The I-70 PEIS identified comprehensive improvements for the corridor. The Proposed Action would immediately address safety, mobility, and operations in the eastbound direction at the Twin Tunnels, but would not address all of the needs in the Twin Tunnels area. The Proposed Action would not preclude other improvements needed and approved by the I-70 PEIS ROD.

Section 2. How Does the Analysis Relate to the Tier 1 PEIS?

Water resources in the segment of I-70 associated with the Twin Tunnels project were fully evaluated for all PEIS alternatives. Stream water quality and flow data was collected during the PEIS from Clear Creek at Twin Tunnels (milepost 242) and downstream at Kermitts (milepost 244). These results were evaluated and updated through 2009 (CDOT, 2011a) and are further updated through 2011 for this EA.

The Twin Tunnels project falls within the 6-lane widening (55 mph) alternative in the PEIS, with the primary difference of eastbound only improvements rather than both lane directions. As such, the impact analysis provided in the PEIS can be applied to the Twin Tunnels Proposed Action.

2.1.1 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.
- Further Analysis of permanent storm water 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.

> 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.

- 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.

Section 3. What Process Was Followed to Analyze Water Resources?

3.1 Methodology

The affected environment was described in the PEIS. Water resources issues within the Corridor area were identified by collecting available data and information, and through public and agency coordination. General water resource information and data were acquired through federal, state, and local agency coordination and through the development of various programs designed to assemble the data necessary for describing existing conditions and evaluating potential impacts, but which were not available through other sources.

In particular, CDOT established three corridor-specific programs during the PEIS to gather information on water resources within the Corridor: 1) a program entitled Stream and Wetland Ecological Enhancement Program (SWEEP) to identify water-related issues, with immediate attention given to the Clear Creek portion of the Corridor; 2) the I-70 Storm Water Quality Monitoring Program to sample and quantify existing impacts; and 3) the Sediment Control Action Plan (SCAP) for Black Gore Creek and Straight Creek to develop mitigation strategies for these two streams that are listed as water quality impaired from I-70 total maximum daily loads (TMDLs). More recently, a SCAP study is underway for Clear Creek.

The methodology used to assess potential impacts to water resources associated with the Twin Tunnels/Hidden Valley highway improvement alternatives are summarized as follows:

- Determine project extents and drainage design considerations
- Document existing water resource conditions

- Assess changes that may occur during and after construction
- Evaluate potential mitigation strategies

Preliminary maps and design drawings were reviewed to determine the extent of the proposed project and its potential effects on drainage and erosion. Several coordination meetings were conducted between members of the project design team and consultants developing the SCAP for Clear Creek. Preliminary SCAP recommendations were developed for the Twin Tunnels segment to assist in preliminary drainage design and erosion control measures.

The existing water resource conditions were documented by field surveys of drainage features and erosion conditions and through review of water quality data for the segment. The highway drainage system, sediment deposition and active erosion areas were documented with GPS photographs. Existing water quality data for the segment was compiled, analyzed, and reported.

Potential changes anticipated during and after construction were evaluated. Construction Best Management Practices (BMPs) requirements are included in CDOT Erosion Control and Stormwater Quality Guide. Post-construction changes include the addition of impervious surface area and highway runoff and maintenance of permanent water quality BMPs.

Potential mitigation strategies for water resource impacts were evaluated by considering SCAP recommendations for the proposed project. Water quality protection from erosion and sedimentation caused by highway runoff was considered in the project design. The development and implementation of a routine maintenance plan for permanent water quality BMPs was considered.

3.2 Study Area

The study area covers the three mile segment of I-70 from the east Idaho Springs interchange (milepost 241) to the west base of Floyd Hill (milepost 244). Clear Creek is the primary water resource in the study area. Clear Creek flows immediately adjacent to I-70 through the length of the study segment and receives runoff from I-70. Small ephemeral drainages flow under I-70 from north to south during wet periods.

This highway segment is characterized by a steep canyon environment with hill slopes at the angle of repose and near vertical rock outcrops in several areas. I-70 was constructed on the north side of Clear Creek by cut and fill methods in most areas, with fill material placed on the north bank of Clear Creek. Clear Creek is constricted by the narrow canyon and was channelized by fill material from I-70 in many areas. The cut and fill slopes have largely stabilized over the past 50 years. Annual application of traction sand and deicer salts is required to maintain safe mobility during winter.

3.3 Data Sources

Data sources used in this assessment include the following:

- CDOT PEIS information and modeling
- CDOT I-70 water quality monitoring program data
- CDOT winter maintenance material usage data
- Upper Clear Creek Watershed Association flow and water quality data
- Stream water quality regulation standards
- Preliminary Clear Creek SCAP documentation

3.4 Regulations

This section identifies the relevant federal, state, regional, and local regulations, guidelines, and/or laws that apply to water resources. Under the federal Clean Water Act of 1977 (CWA), as amended by the Water Quality Act of 1987, the Environmental Protection Agency has established a framework for protecting and improving the nation's water quality. The broad purpose of the CWA is "to restore and maintain the chemical, physical, and biological integrity of the Nation's waters". Its emphasis is to declare unlawful the unregulated discharge of pollutants into all waters of the United States. The CWA makes the States and EPA jointly responsible for identifying and regulating both point and non-point sources of pollution. Point sources are controlled by a permit-based system (National Pollutant Discharge Elimination System permits to meet in-stream water quality standards), while nonpoint sources are approached with a technology-based management strategy (treatment processes and best management practices).

Each state is required to develop and adopt water quality standards that enumerate the designated uses of each water body, as well as specific criteria necessary to protect or achieve those designated uses. State water quality programs are required to integrate three components into water quality management planning (1) a designation of uses for all state waters (2) numeric or narrative criteria to meet those uses, and (3) an antidegradation policy for waters that meet or exceed criteria for existing uses.

The Colorado Department of Public Health and Environment (CDPHE), Water Quality Control Commission, C.R.S. 1973, 25-8-101, as amended, promulgates regulations specifying classifications and numeric water quality standards for Colorado by river basin. The I-70 mountain corridor covers two river basins in Colorado as defined by CDPHE; the South Platte River Basin and the upper Colorado River Basin. Water quality is regulated for the South Platte River Basin under Regulation No. 38, and for the upper Colorado River Basin under Regulation No. 33 (CDPHE, 2011). Each river basin is divided into regions related to watershed divisions. The I-70 mountain corridor east of the Continental Divide is located in Region 3 and includes Mount Vernon Creek and Clear Creek. The I-70 mountain corridor west of the Continental Divide is in Region 12 and includes Straight Creek, Tenmile Creek, and Gore Creek. Water bodies are further divided into stream segments according to waste load allocations.

Surface waters of the state are classified according to the uses for which they are presently suitable or intended to become suitable. At a minimum, for all state surface waters existing classified uses and the level of water quality necessary to protect such uses must be maintained and protected. No further water quality degradation is allowable which would interfere with or become injurious to these uses. The classified uses shall be deemed protected if the narrative and numerical standards are not exceeded (CDPHE, 2011).

3.4.1 Water Quality Stream Classifications, Standards, and Impaired Streams

The designated use classifications for the Twin Tunnels reach of Clear Creek (Segment 11 extending from Argo Tunnel in Idaho Springs to Farmers Highline in Golden) are water supply, aquatic life cold, recreation 1, and agriculture. Numeric water quality standards apply for protection of these designated uses. Stream standards for nutrients, chloride, and trace metals are in effect for Segment 11. Where applicable, the I-70 stream water quality monitoring results are compared to these standards to assess water quality exceedences for this EA. This comparison is provided in Table 1.

Clear Creek Segment 11 is designated as use-protected. The Colorado Water Quality Control Commission has determined these are waters that do not warrant the special protection provided by the outstanding waters designation or the antidegradation review process. Waters are designated by the Commission use-protected if any of the criteria below are met, except that the Commission may determine that those waters with exceptional recreational or ecological significance should be undesignated, and deserving of the protection afforded by the antidegradation review provisions:

- The use classifications of the waters include aquatic life cold
- The existing quality for at least three of the following parameters is worse than that specified in Tables I, II and III for the protection of aquatic life class 1, recreation class 1 and (for nitrate) domestic water supply uses:
  - » Table I: dissolved oxygen, pH, fecal coliform or E. coli
  - » Table II: chronic un-ionized ammonia, nitrate
  - » Table III: chronic cadmium, chronic copper, chronic lead, chronic manganese, chronic selenium, chronic silver, and chronic zinc
- The water body is subject to significant existing point source discharges and the quality currently is maintained better than standards only because the treatment achieved by the existing dischargers exceeds requirements of federal and state law and might not be maintained at that level in the future.

Several streams adjacent to I-70 have been identified as water quality impaired streams. Segments identified as impaired are those in which one or more classification or standard has not, or may not be, fully achieved. As necessary for the protection of the water resource, TMDLs are established to set the maximum amount of pollutant that may be allowed while still complying with water quality standards.

TMDLs are implemented and regulated through the issuance of permits for point sources (such as wastewater treatment plants) and the use of BMPs for nonpoint sources (such as highway runoff). Clear Creek Segment 11 is listed as impaired for cadmium related to historic mining, with a high priority ranking (CDPHE, 2010).

TABLE 1
Creek Storm Event/Snowmelt Mean Concentrations (mg/L)
I-70 Mountain Corridor – 2000 to 2009

Stream Segment	Number of Samples	Suspended Solids	Phosphorus Total	Chloride	Sodium Diss.	Magnesium Diss.	Hardness as CaCO3	Cadmium Diss.	Copper Diss.	Manganese Diss.	Zinc Diss.
Standard*			***0.11***	***230***				***0.0003***	***0.008***	***0.050***	***0.094***
Clear Creek CC-1 (Seg.1)	124-131	200	0.27	48.8	19.3	5.5	63	0.0009	0.004	0.031	0.010
Standard*			***0.11***	***230***				***0.0015***	***0.008***	***0.050***	***0.353***
Clear Creek CC-2** (Seg.2a)	28-38	10	0.03	11.2	6.2	5.1	58	0.0008	0.003	0.008	0.080
Standard*			***0.11***	***230***				***0.0014***	***0.017***	***0.050***	***0.229***
Clear Creek CC-3** (Seg.11)	25-32	221	0.33	9.2	12.2	4.7	65	NA	0.006	0.221	0.120
Clear Creek CC-4** (Seg.11)	33-52	264	0.44	9.3	12.6	4.5	61	0.0011	0.006	0.154	0.097
I-70 Highway Runoff	65-72	953	0.87	137	71	16.1		NA	0.012	0.50	0.16

*Standards effective June 30, 2011 (standard for total phosphorus is proposed)
Trace metal standards based on 61 mg/L hardness; acute standards except chronic cadmium
**Data from 2000-2005 – no event samples collected after 2005; ambient cadmium data taken from UCCWA database
Note: Cadmium was not modeled in the PEIS but is chemically similar to zinc due to its oxidation state and is much less abundant in natural waters.

Section 4. Description of the Proposed Action

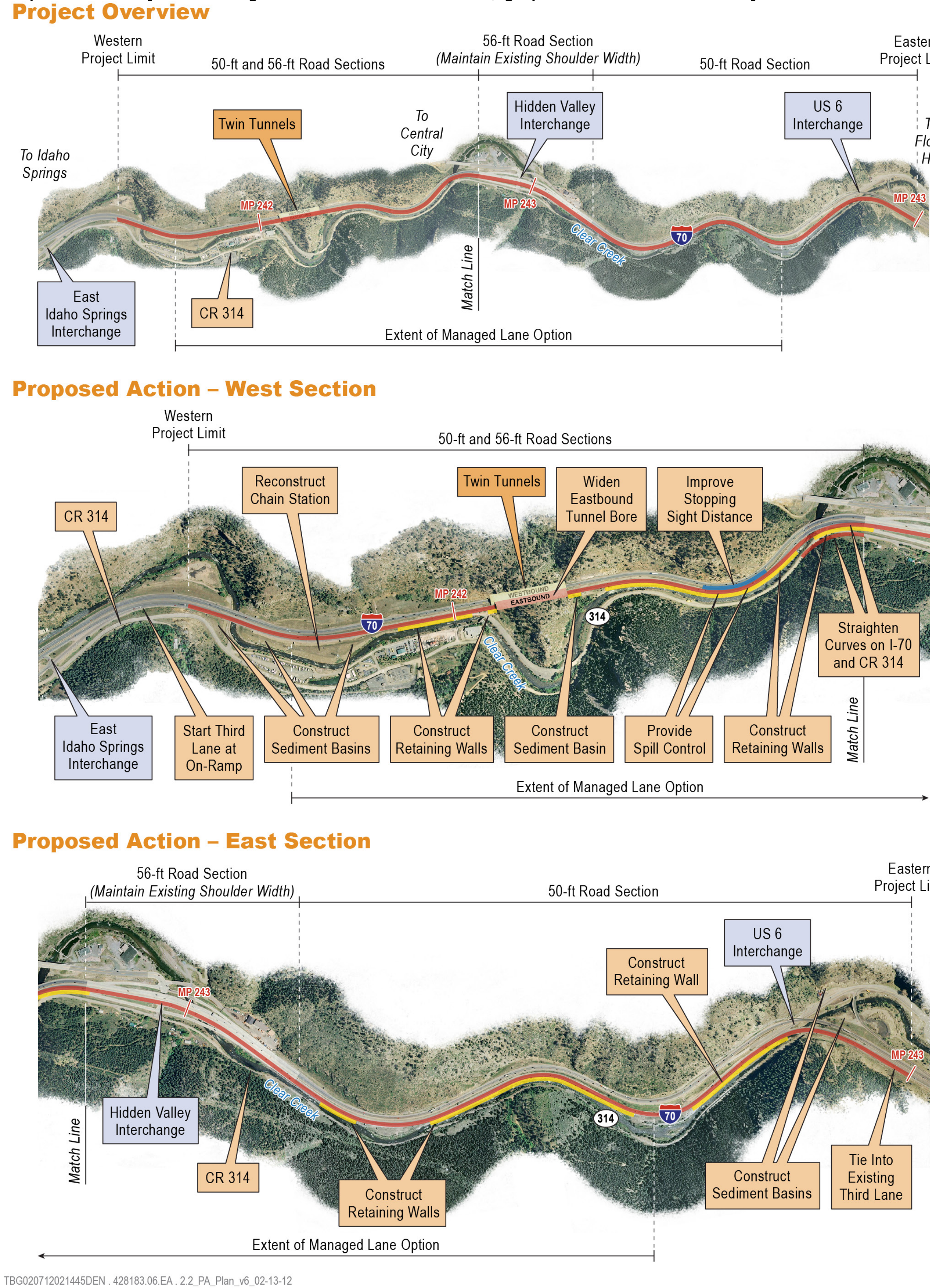
The Proposed Action would add a third eastbound travel lane and consistent 10-foot outside shoulder to the I-70 highway between the East Idaho Springs interchange and the base of Floyd Hill. The eastbound bore of the Twin Tunnels would be expanded to accommodate the wider roadway section, and the existing tunnel portal face would be removed and replaced. Additionally, the Proposed Action would straighten the curve west of the Hidden Valley interchange where the highest number and most serious crashes occur. This curve reconstruction also involves replacing a bridge on I-70 over Clear Creek.

Other proposed improvements include reconstructing the chain station west of the Twin Tunnels, constructing and operating new sediment basins throughout the study area to treat stormwater runoff, installing wildlife fencing, and constructing retaining walls. Figure 1 illustrates the project limits and the proposed changes.

CDOT is considering a range of widths between 4 and 10 feet for the inside shoulder between the west project limits and the Hidden Valley interchange. A 4-foot inside shoulder would be provided east of Hidden Valley. A range of tunnel widths, corresponding to the variations in the inside median, is being evaluated.

CDOT is also considering whether the additional capacity will operate exclusively as a general purpose lane or as a tolled lane during peak periods (also called a managed lane).

FIGURE 1
Proposed Action [note: managed lane extents are not set, graphic below is an estimate]



Section 5. What Are the Water Resources in the Study Area?

5.1 What are the current conditions of water resources in the study area?

5.1.1 Climate and Hydrology

Interstate 70 traverses several watersheds through the mountain corridor extending from east to west at approximately 39.5 degrees north latitude. The climate is temperate, with warm summers generally extending from May to September and cold winters from October to April. The I-70 corridor is classified as a high mountain continental climate strongly influenced by elevation and aspect.

Elevations range from approximately 6,000 ft-MSL near Golden, to over 11,000 ft-MSL at Eisenhower Tunnel and Vail Pass. The elevation in the Twin Tunnels segment is approximately 7,300 ft-MSL. Altitude has the effect of changing temperature at the adiabatic lapse rate of 3.6 degrees Fahrenheit (^{O}F) for each 1,000-ft change in elevation. At this rate a temperature of 38 ^{O}F in Golden would correspond to a temperature of 20 ^{O}F at the Eisenhower Tunnel. Climate is a major factor with respect to the operation and maintenance of I-70 within the corridor during the winter months, when ice and snow accumulation is prevalent.

The seasonal temperature and precipitation distribution for the town of Idaho Springs is shown in Figure 2 (CCC, 2001.ccc.atmos.colostate.edu/cgi-bin/monthlydata.pl). This area shows the temporal trend in mean temperature with below freezing conditions in winter (November to March) and maximum temperatures in July each year. The average annual temperature in the study area is 43 ^{O}F at Idaho Springs.

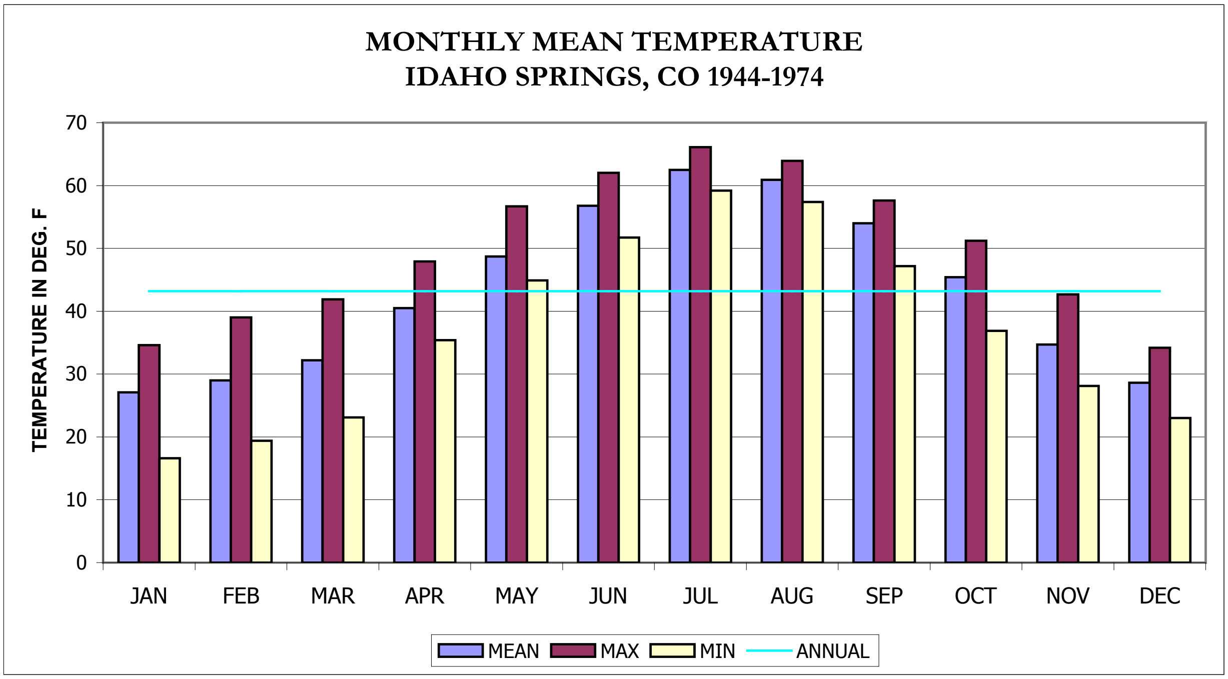
The elevation and season determine the form and temporal distribution of precipitation. Precipitation is dominated by rainfall during the summer months and snowfall during winter. Snow can remain on the north-facing slopes (where shaded) through the winter, while snow is removed from the highway to maintain safe mobility.

Precipitation amounts are moderate to low during winter and spring, with higher precipitation during the summer monsoon period (July-August), and a dry period in fall and early winter. Lower temperatures in winter result in most of the precipitation occurring as snowfall. However, significant snow accumulation does not typically occur in the Twin Tunnels area as it does at the higher elevations of the I-70 corridor through the winter months.

The seasonal precipitation pattern determines highway runoff and stream flow conditions in the Twin Tunnels study corridor. Other factors that can influence the natural hydrology include transmountain water diversions, storage reservoirs, and increases in impervious surfaces resulting from urban, commercial, industrial, and highway development.

The streamflow hydrograph showing the seasonal flow by water year (Oct 1 to Sep 30) in Clear Creek in the Twin Tunnels study area is provided in Figure 3. Snow that accumulates over the winter at elevations greater than approximately 9,000-ft melts in the spring, generating peak flows in Clear Creek. Streamflow generally recedes over the summer and fall, with increases resulting from rainfall-runoff events. Minimum flows occur in winter. All I-70 corridor streams show minimum flows during the fall and winter and peak flows in spring resulting from snowmelt runoff. The streamflow at Twin Tunnels (Station CC-3) is similar to downstream Kermitts (Station CC-4) because there are no significant tributary inflows between these stations. The seasonal flow pattern and volumes are similar or identical at these two stations as represented by CC-4 (CDOT, 2008).

FIGURE 2
Monthly Mean Temperature and Precipitation



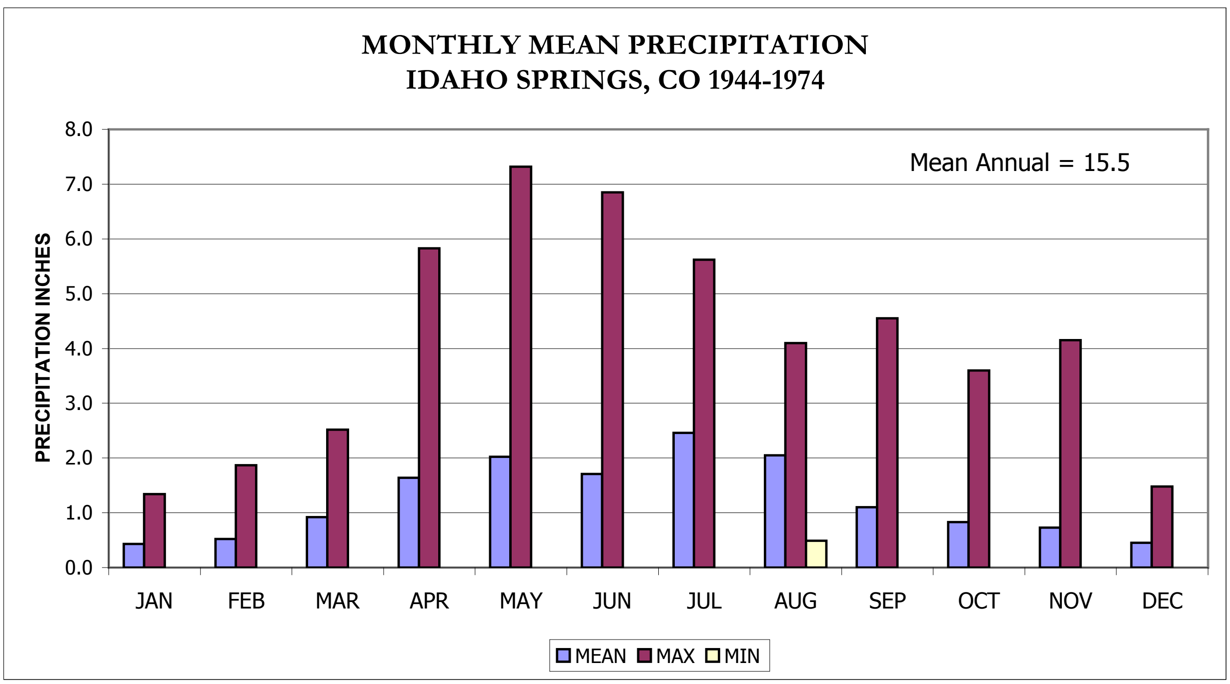
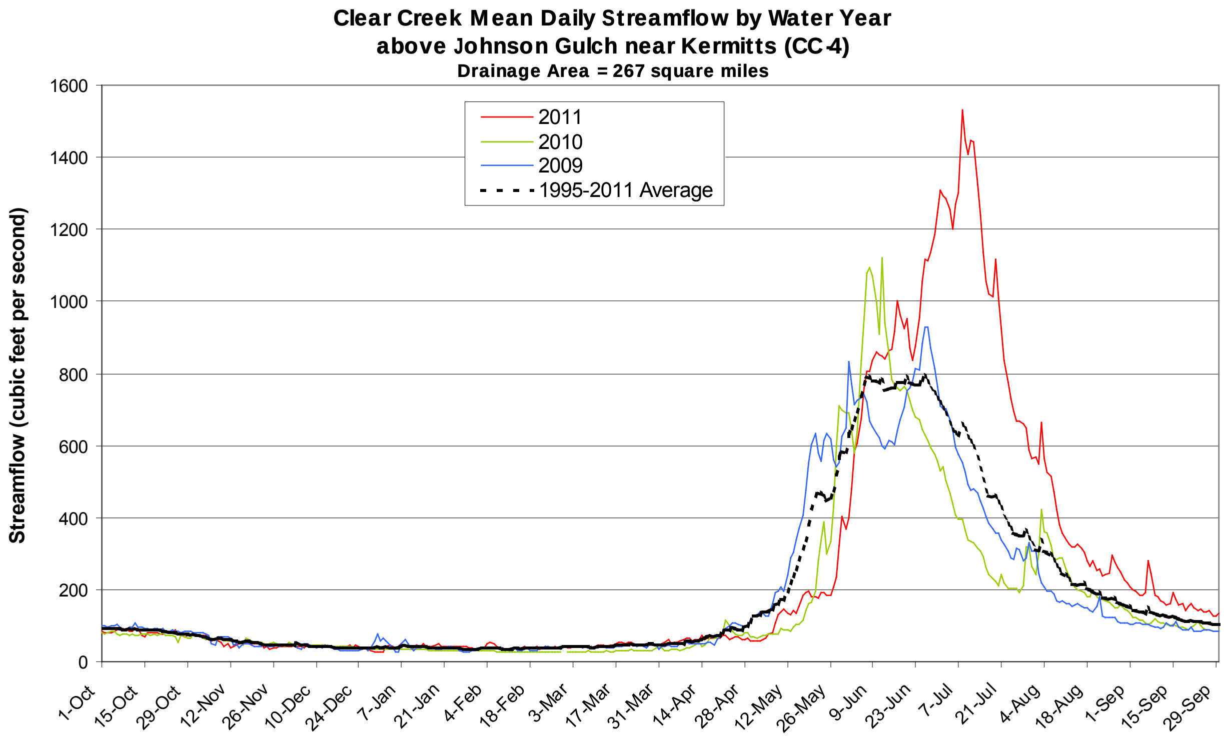


FIGURE 3
Clear Creek Mean Daily Streamflow



5.1.2 Channelization and Stream Flow

Several areas of localized channel disturbances related to construction and operation of I-70 and U.S. Highway 6&40 have affected the local morphology of streams. These areas are located primarily along Clear Creek, where up to 35 percent of the channelization caused by the construction of I-70 occurs (PEIS). Most of lower Clear Creek is constrained in a narrow valley or canyon environment with bedrock control. However, the construction of US 6/40 and I-70 has resulted in additional channel constriction/channelization, stream bank erosion, changes in the natural stream gradient, and channel scour and depositional areas. Transmountain diversions of additional water into the Clear Creek basin may also cause channel erosion and alterations by increasing flows above historic levels.

5.1.3 Water Quality

Stream data collected since the PEIS supports the original contention that sediment and chloride are the primary water quality parameters of concern for I-70 expansion. The assumption in the PEIS that these will continue to be the primary issues has been validated by recent (2008-2011) data as provided in this Technical Memorandum. Receiving streams are sensitive to the type and volume of material used for highway winter maintenance. The water resources impact analysis is supported by a robust data set (2000-2011) that can be used to develop strategies to mitigate water quality impacts associated with I-70 with a high level of confidence.

A series of CDOT reports are available that present the results of an ongoing monitoring study of the effects of I-70 on receiving stream water quality in the mountain corridor. Four separate reports entitled "Data Evaluation Report, Interstate 70 Mountain Corridor Storm Event/Snowmelt Water Quality Monitoring" have been issued by CDOT covering the period 2000-2009 (CDOT, 2011a). These reports provide the basis for documenting water quality conditions in the Twin Tunnels segment of I-70.

The lower Clear Creek area is affected by water quality changes from tributary inflow unrelated to I-70. Therefore, CDOT monitoring locations were chosen to isolate specific segments of I-70 by using a paired station design to focus on areas of potential I-70 influence. For Twin Tunnels, paired stations CC-3 and CC-4 represent upstream and downstream, respectively, of the two-mile segment of I-70 in the Hidden Valley area. There are only minor tributary sources that influence water quality in this stream reach.

Stream water quality can be affected by highway winter maintenance material (sand and salt) that is constantly changing based on weather conditions and mobility demands of the traveling public. Ongoing stream monitoring is needed to assess these changing conditions.

CDOT Winter Maintenance

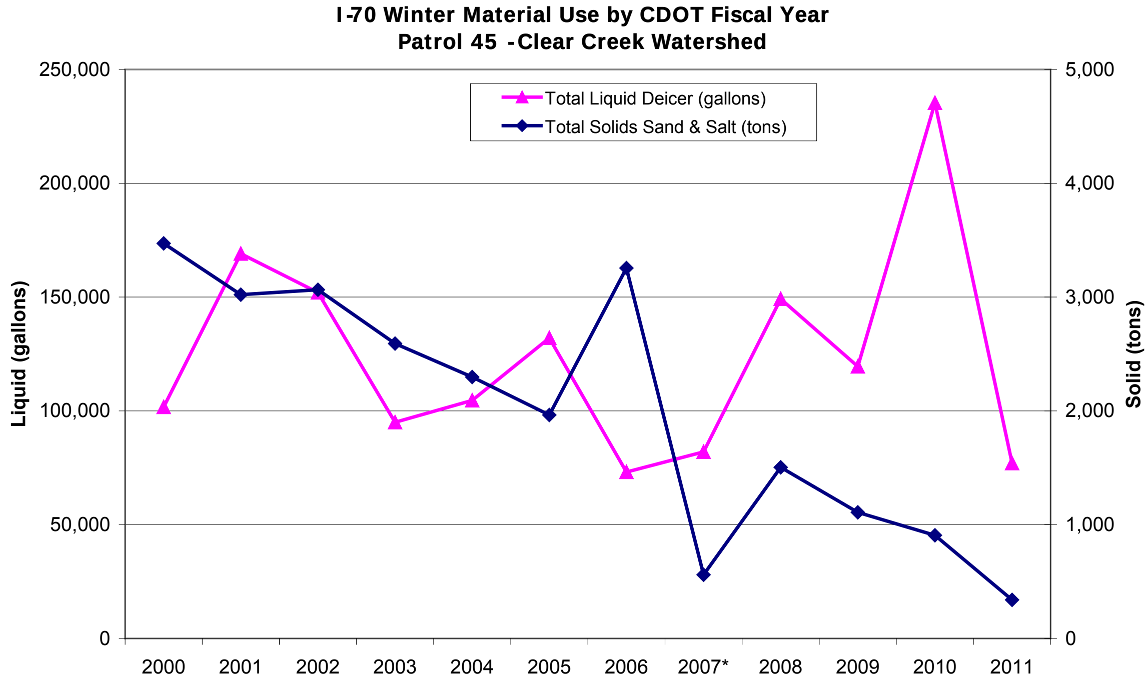
The highway can contribute surface runoff directly to receiving streams during snowmelt or rainfall runoff conditions. Snow is removed from the travel lanes and traction sand or deicers are applied to maintain winter mobility. A mixture of traction sand and salt accumulates along the highway shoulders over the winter in the Twin Tunnels area. Both snowmelt and rainfall-runoff can mobilize dissolved and particulate contaminants from I-70 to receiving streams.

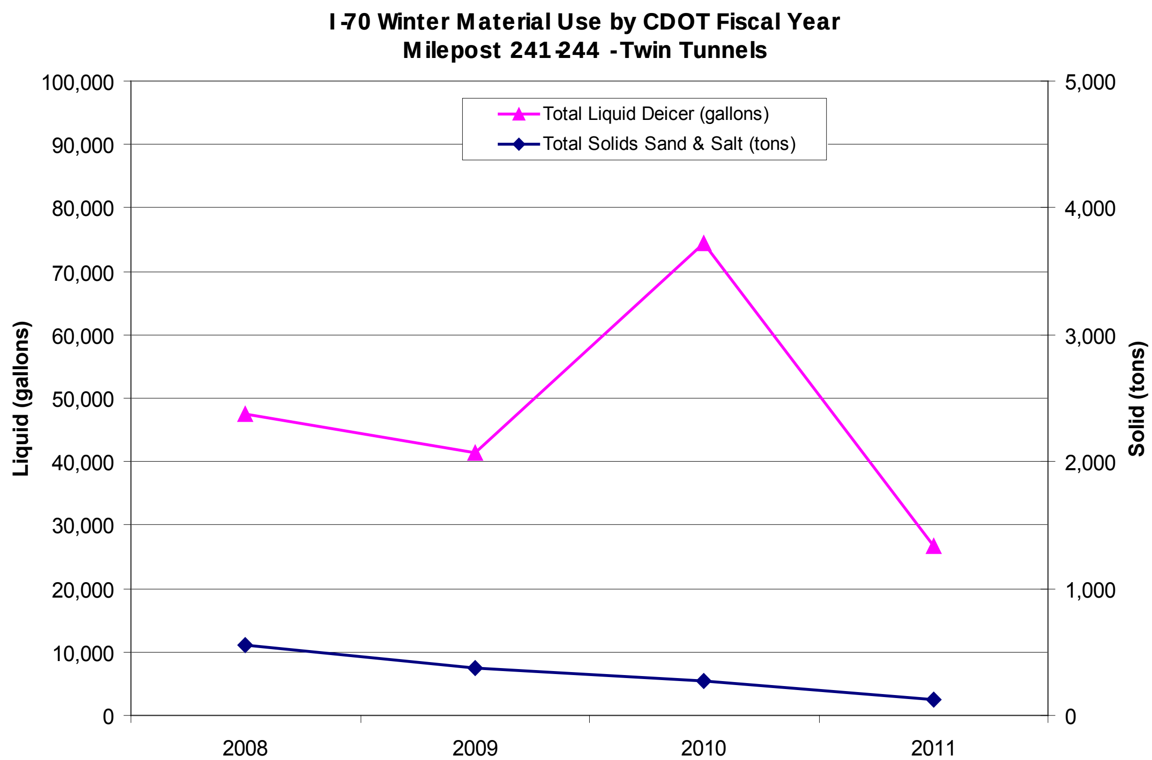
The winter maintenance material usage data for I-70 is compiled by CDOT according to maintenance patrol. The Twin Tunnels/Hidden Valley segment falls within Patrol 45 (Figure 4a), which extends from milepost 241 (east Idaho Springs) to 252 (El Rancho). This 11-mile segment of I-70 includes Floyd Hill, which requires substantially more winter maintenance material than the 3-mile Twin Tunnels/Hidden Valley segment due to the steep grades and higher elevation on Floyd Hill.

The winter sand and salt usage data for CDOT fiscal year 2000 to 2011 is plotted in Figure 4b. The fiscal year extends from July 1 to June 30, including the entire winter period each year. For example, Fiscal Year 2011 spans July 1, 2010 to June 30, 2011. While the sand and salt use varies from year to year according to snowfall amounts, the type of material used has changed significantly in recent years.

Traction sand and salt (solids) use in Patrol 45 has decreased from over 3,000 tons to less than 1,000 tons in recent years. Over the same 12-year period liquid deicer use has remained the same and increased in proportion to solids. These data show that liquid deicer salts are now the dominant material used in Patrol 45. This has important implications for receiving stream water quality.

FIGURE 4A
I-70 Winter Material Use by Fiscal Year





Source: CDOT SAP, 2011
**Total solids may be under reported in 2007 due to transition from MMS to SAP*

Figure 4b. I-70 Winter Material Use by Fiscal Year

SEGMENT (MP 241-144)				PROJECT		APPLIED PRODUCTS				MAINTENANCE BMPs							
Fiscal Year (FY)	Winter Season	Snowfall Total (Inches)	Plow Miles	Maintenance Project	Subaccount	Snow & Ice Control Abrasives (Tons) (sand/salt material)	Liquid De-Icer Solution (Gallons)	Solid De-Icer (ice-slicer) tons	*Cost of Applied Products*	Guardrail and Ditch Cleaning (SCL tons) by CDOT Mtce. Act.Code #207	Guardrail & Ditch Cleaning by Contract (tons)	Road and Ditch Sweeping (Code #221)	Sed. basin/traps clean-out by CDOT Mtce. (tons) Act. Code #202,#206,#210	Sed. basin/traps clean-out by contract (tons)	*Cost of BMP Maintenance by CDOT Mtce. Forces*	*Cost of BMP Maintenance by Contract*	*Total Cost of BMP Maintenance*
FY 08	2007-2008		9,037			552	47,554	0	$43,946	108		66			$8,056		
FY 09	2008-2009		6,516			370	41,467	11	$42,578	48		150	619		$16,495		
FY 10	2009-2010		6,853			270	74,476	3	$62,716	7		195			$10,845		
FY 11	2010-2011		4,604			122	26,770	0	$22,124	9		19			$3,4[illegible]7		
TOTAL			27,010			1,314	190,267	14	171,364	172		430	619		$ 38,832		
Average			**6,753**			**329**	**47,567**	**4**	**42,841**	**43**		**108**			**$ 9,708**		

Notes:

From 07/01/2007-first full fiscal year using SAP.

Any items recorded as cubic yards are multiplied by 1.5 for conversion from cubic yards to tons.

Snow totals obtained from Colorado Avalanche Information Center (Loveland Basin) Nov. - April

Percentage of Twin Tunnel lane miles in relation to total Patrol 45 lane miles is 15.3% (10.5 lane miles out of 68.56 total lane miles).

Patrol 45 totals multiplied by percentage of each work order in SAP. Since work order miles vary, SAP adjusts the percentage for each one.Solid de-icers are not included in Snow & Ice Control abrasives due to the melting nature of these materials that leave no solid matter to reclaim (e.g., ice slicer)

SCL (sand clean-up) = cost of BMP maintenance; includes manhours & equipment to do the work. (Prior to FY09 Benefits were not included.)

Sediment Removal (tons)	Studies & Water Monitoring	New facilities	Revegetation (acres)	Wetland Restoration (acres)	Sed. Basin Constructed (ea.)	Clean Water Diversion (lin. ft.)	Repair Sediment Basin (ea.)	Shoulder/ditch Paving (lin. ft.)	*Total Capital Costs*		Capital BMP columns are empty because they do not exist. However, they are included in case future BMPs are planned for construction as part of the Twin Tunnels EA.
											#221 is estimated for miles swept; #210 includes cleanup of rock slide.

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Winter Chloride Salts

The Twin Tunnels/Hidden Valley Clear Creek monitoring Stations CC-3 and CC-4 are at elevations of 7,330 and 7,220 feet, respectively. There is no significant seasonal snow depth accumulation along I-70 in this area during winter and hence, minimal spring snowpack melting from the highway. However, because Clear Creek is adjacent to I-70 in this segment and both solid and liquid deicer salts are used, monitoring results indicate that salt runoff from the highway can affect stream conductivity during winter applications.

The results for stream electrical conductivity and temperature monitoring in the Twin Tunnels Clear Creek segment were updated with two additional years since the PEIS. The past 3 years (2009-2011) are shown in Figure 5.

Electrical conductivity provides a robust measure of chloride concentrations (r^2=0.96) in I-70 mountain streams (CDOT, 2011a). Twin Tunnels Station CC-3 shows a seasonal conductivity pattern with values near 100 uS during peak snowmelt increasing to baseflow values of about 200 uS in fall. Basin-wide snowmelt from higher elevations causes a large decrease in Clear Creek conductivity in May and June indicating significant dilution of dissolved salts.

Conductivity increases steadily to over 300 uS through the winter months with occasional values exceeding 400 uS. Stream flow is low during this period at annual minimum flow conditions. As such, there is little available dilution with stream data showing higher conductivity and concentrations of dissolved salts. Conductivity at CC-3 is also influenced by dissolved salts from mine drainage and the Argo Mine Drainage Treatment Facility which adds calcium sulfate to the stream. However, values over 400 uS may also be the result of highway maintenance salts that enter the stream in winter.

The maximum daily specific conductance from 2006 to 2011 is shown in Figure 6. The duration of these maximums is typically less than a few hours. The conductivity data for Stations CC-2, CC-3, and CC-4 are compared to evaluate differences in these lower Clear Creek locations. While the seasonal changes are similar, the extreme conductivity spikes at CC-4 do not occur at CC-3 suggesting salt loading in Clear Creek from the Twin Tunnels/Hidden Valley segment of I-70.

The dates when conductivity was greater than 600 uS at CC-4 range from November 28 to April 18, all during the winter when deicer salts are applied to I-70. Conductivity spikes exceeding 600 uS are common in the winter months at CC-4, the likely result of salt runoff from highway winter maintenance.

The chloride regression equation (Figure 6) developed for Clear Creek (CDOT, 2011a) was applied to the CC-3 and CC-4 conductivity data to evaluate stream chloride trends. The results are illustrated in the chloride trend plots in Figure 7. A linear trend line was applied which shows a slight increasing trend in wintertime chloride concentrations (period 2006 to 2011) at Clear Creek Station CC-3. However, chloride concentrations at CC-3 were less than water quality standard limits.

At CC-4, the linear trend line also indicates an increasing trend in wintertime chloride concentrations (period 2004 to 2011). Chloride concentration spikes approach or exceed water quality standards for short periods each winter from 2006 to 2010 at Clear Creek CC-4. These data show the effects of winter maintenance chloride salts on Clear Creek water quality in the Twin Tunnels segment of I-70.

FIGURE 5
Clear Creek at Twin Tunnels Conductance and Temperature

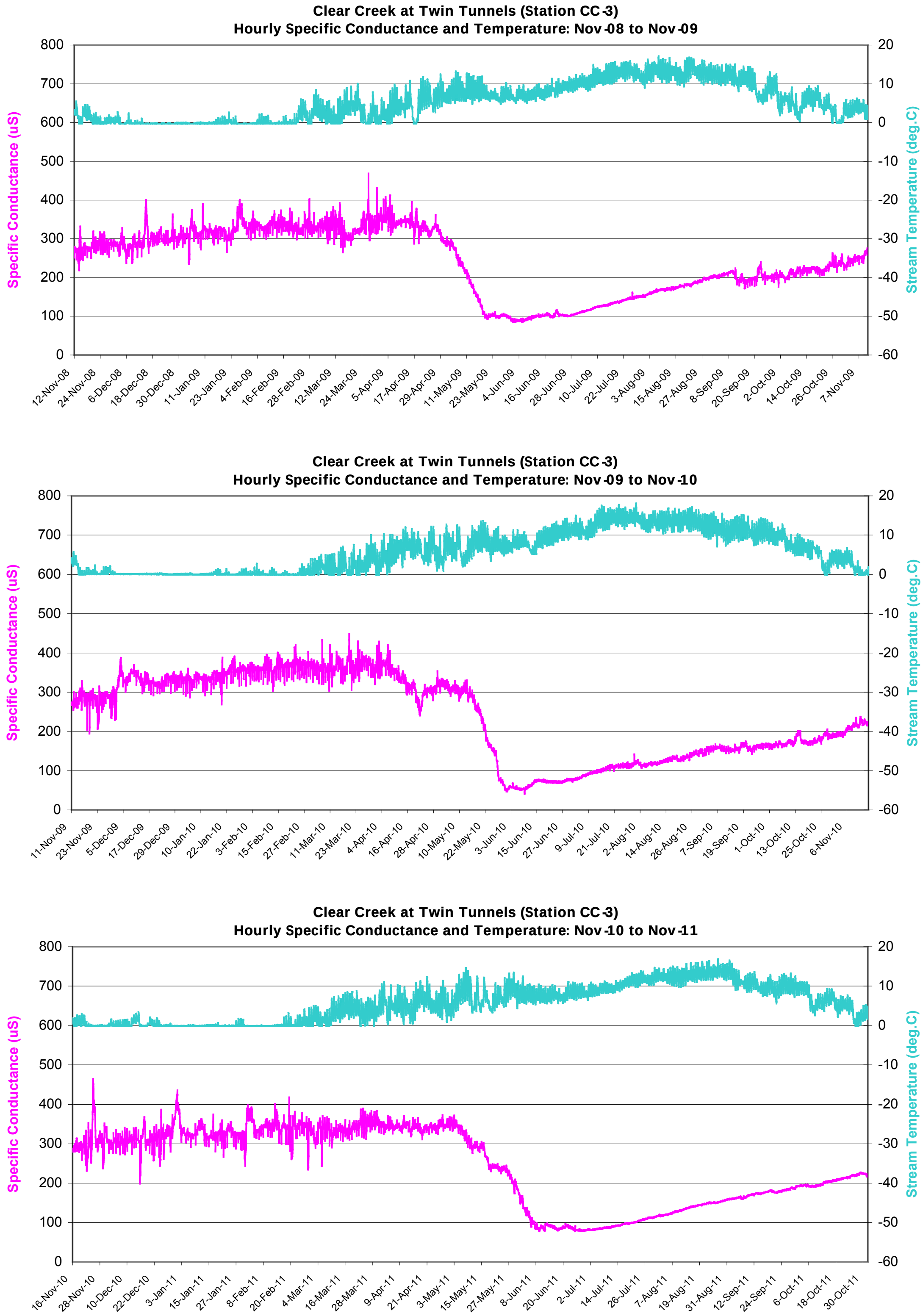
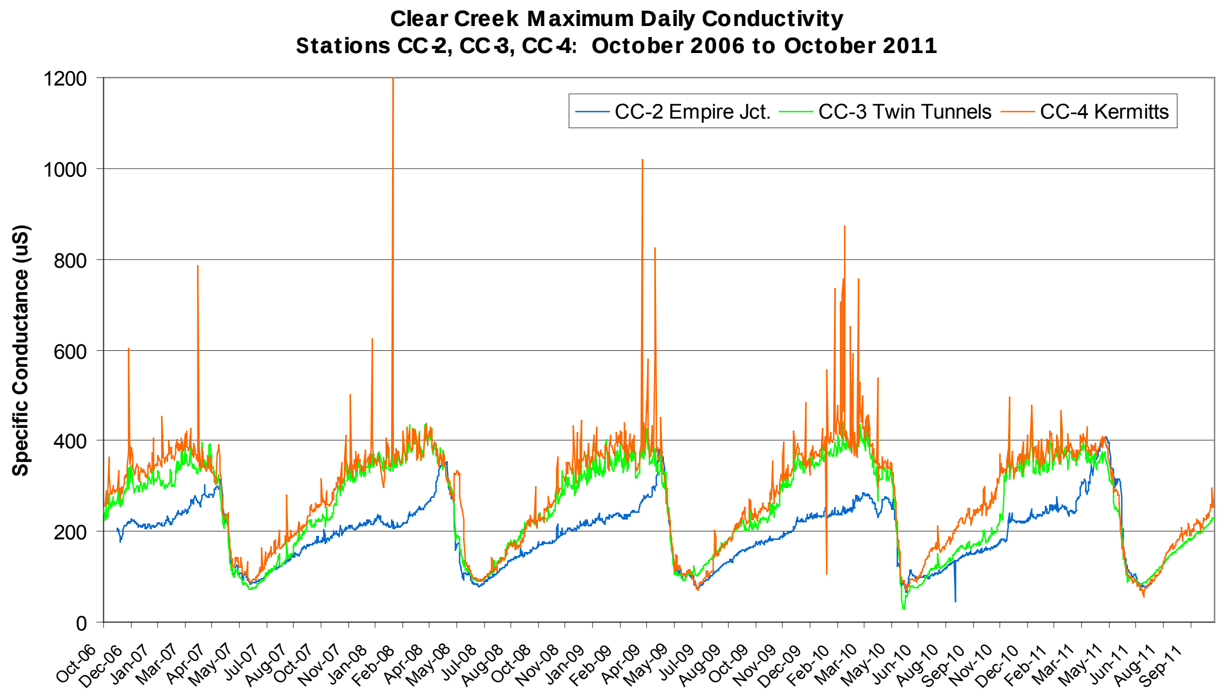


FIGURE 6
Clear Creek Maximum Daily Conductivity and Chloride Correlation



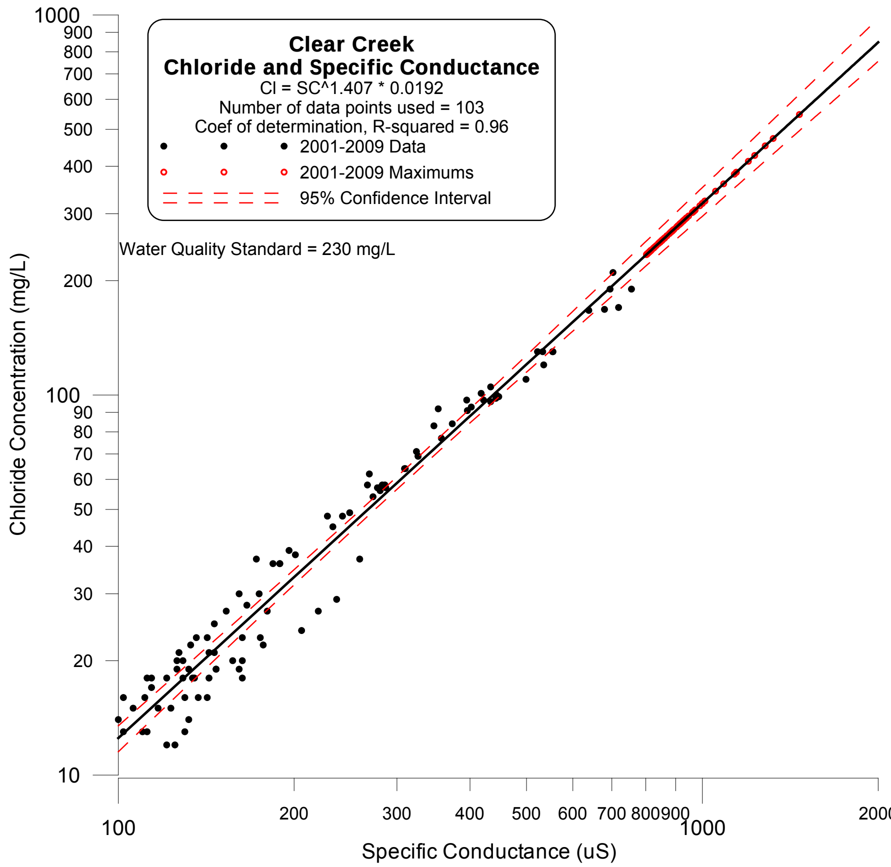
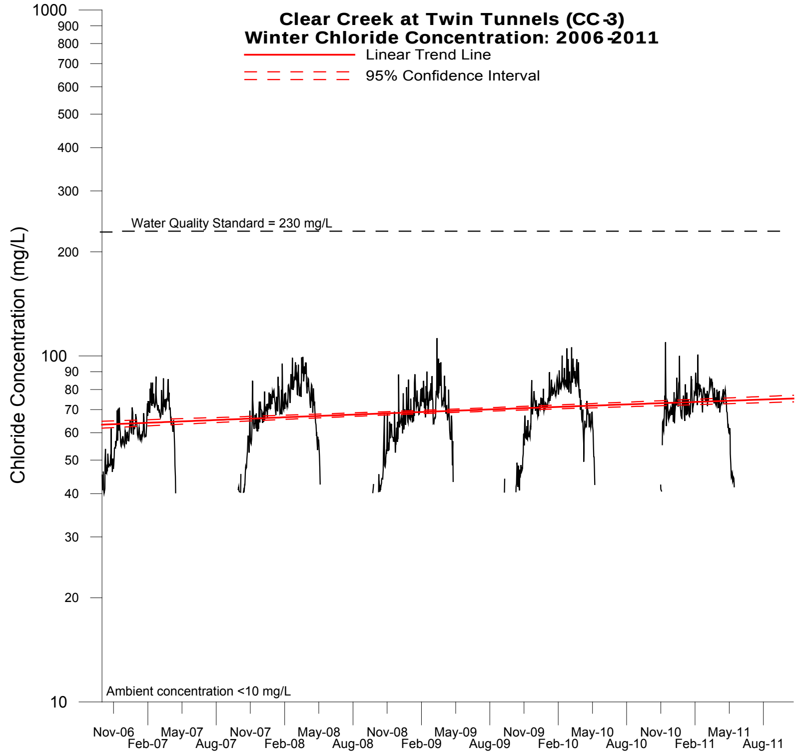
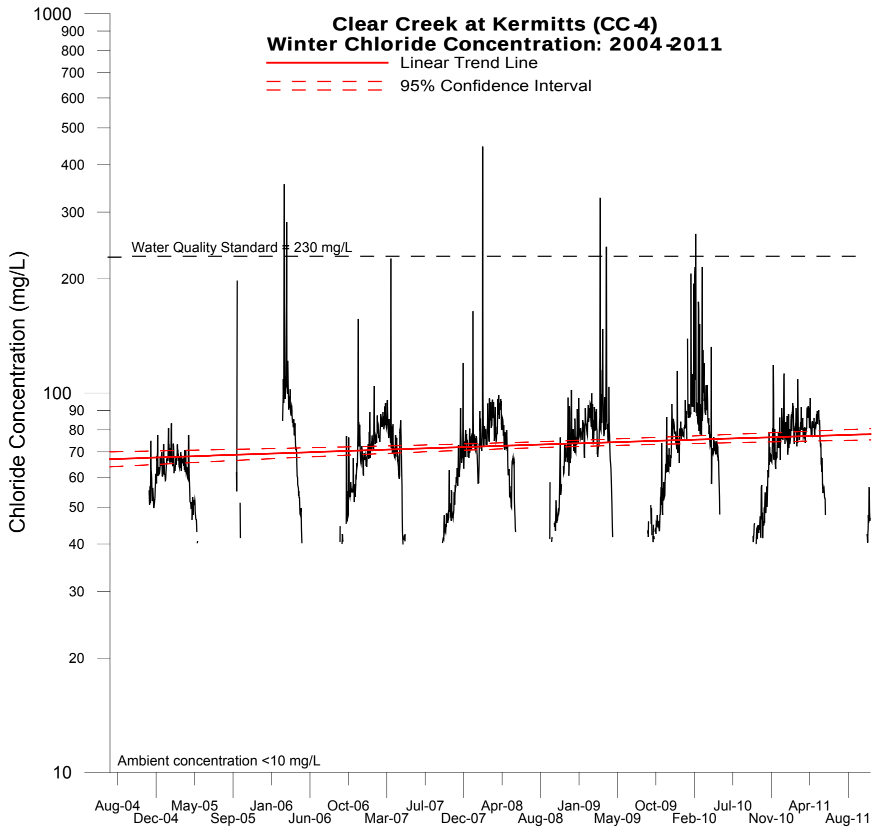


FIGURE 7
Clear Creek Winter Chloride Concentrations





Stream Temperature and Storm Event Water Quality

Stream Temperature

Summertime maximum stream temperatures are important in a cold water fishery such as Clear Creek. Concerns were expressed during the PEIS regarding the effects of highway runoff that could be warmer than ambient stream temperature. Highway runoff events are restricted to the summer months, so June to September data are compared to the daily maximum standard (DM) of 21.2 ^{O}C for Clear Creek.

The daily maximum Clear Creek temperature data for the Twin Tunnels segment (Stations CC-3 and CC-4) is shown in Table 2 for the period 2002-2011. These data show maximum stream temperatures ranging from 16 to 18 ^{O}C during August in most years. Stream temperatures exceeded 20 ^{O}C at lower Clear Creek Station CC-4 in August 2002 and September 2004. These were both the lowest flow years for the period of record.

Maximums approach or exceed 18 ^{O}C each summer and were typically higher at Station CC-4 than at CC-3. Maximum stream temperatures were caused by a combination of high ambient air temperatures and low stream flows. Detailed storm event data shows that overcast skies, and cooler air temperatures associated with highway runoff events generally had the effect of reducing stream temperatures at lower Clear Creek stations (CDOT, 2011a).

TABLE 2
Clear Creek Maximum Daily Stream Temperature June to September 2002-2011 (Degrees Centigrade)

Clear Creek Station	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Jun-Sep DM Standard	21.2	21.2	21.2	21.2	21.2	21.2	21.2	21.2	21.2	21.2
CC-2 (above West Fork)	22.1	17.1	17.8	16.7	18.3	16.8	15.7	16.5	22.2	NA
CC-3 (at Twin Tunnels)	19.8	17.7	17.7	17.4	18.7	16.7	16.4	17.3	18.3	17.0
CC-4 (at Kermitts)	20.5	18.6	21.8	17.6	19.9	18.4	16.9	17.2	18.5	17.1

Highway Storm Water Runoff

Rainstorm activity during the summer monsoon period can cause relatively high energy rainfall-induced runoff and erosion/transport of material from I-70. This results in mobilization of both dissolved and particulate material from the roadway, as well as erosion of unconsolidated traction sand and soil. Receiving stream water quality can change dramatically under these conditions.

The snowmelt and rainfall conditions that influence contaminant transport from the highway are often independent of the stream hydrologic conditions in the I-70 corridor. For example, Clear Creek stream flow was above the long-term average in 2011, while the frequency of runoff producing storm events and contaminant transport from I-70 was low.

Data shows that sediment transport from the highway is relatively low during the early snowmelt period because the flow energy is typically not great enough to cause erosion and transport large quantities of sediment downstream though the system (CDOT, 2011a). Instead, material is deposited at the bottom of slopes and in the stream channel where gradients (and velocity) are too low for further transport. Data results show that higher stream sediment transport rates occur during the “first flush” of basin-wide snowmelt flows in the spring (May-June) and during summer rainstorms. During these periods the energy condition (velocity) is high enough to erode material from highway sources and transport in-stream deposits downstream through the system.

The depth and duration of rainfall (intensity) is the determining factor for storm water runoff in the I-70 corridor during the summer (July through September). Continuous recording rainfall intensity gauges are utilized at stream monitoring locations to measure rainfall intensity. Rainfall-runoff volume is influenced by infiltration losses determined by factors such as antecedent soil moisture conditions, vegetation cover, soil type, and impervious surfaces associated with roadways and urban development.

Each stream monitoring station is located near I-70 to measure the effects of highway runoff. The paved surface of both I-70 travel lanes and shoulders ranges in width from about 72 to 100 feet in most locations of the corridor. The paved surface is nearly impervious, resulting in minimal infiltration losses and high runoff rates during intense rainfall events. The same holds true for urbanized areas within the corridor where roads and buildings result in low infiltration and higher runoff rates.

Total Suspended Solids and Phosphorus

While there is currently no total suspended solids (TSS) standard for Clear Creek, a median, annual total phosphorus (TP) standard of 0.11 mg/L has been proposed (CDPHE, 2011). The purpose of the standard is to protect water quality in downstream lakes supplied by Clear Creek. Although sample results indicate only minor changes in TSS/TP in the Twin Tunnels/Hidden Valley segment of I-70, concentrations can change rapidly during runoff.

Synoptic storm event samples were collected at both CC-3 and CC-4 to isolate the Twin Tunnels/Hidden Valley segment of I-70 (CDOT, 2008). The CDOT TSS and TP results show that concentrations were similar at CC-3 and CC-4 during most events, with minor increases and decreases that could be attributable to sample variance. Mean concentrations of TSS and TP were slightly greater at CC-4 when compared to CC-3 (Table 1). The sample concentration covariance was relatively high at both stations (CV=2.3).

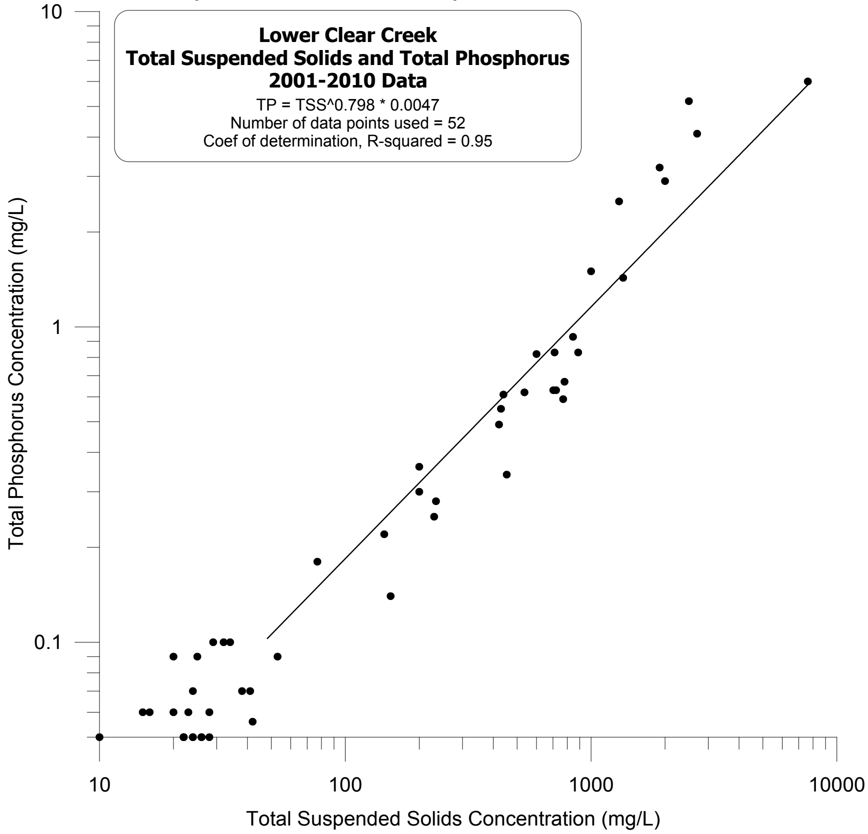
Total phosphorus concentrations are positively correlated with suspended solids in Clear Creek (UCCWA, 2011). Storm event sample results from 50 data pairs for lower Clear Creek show a strong positive correlation (r^2=0.95) between TSS and TP (Figure 8). The highest TP concentrations (2.5 to 5.2 mg/L) were associated with the highest TSS concentrations (1,300 to 2,500 mg/L), while lower TSS concentrations resulted in lower TP. Dissolved phosphorus concentrations in storm event samples were typically two orders of magnitude lower, ranging from <0.01 to 0.07 mg/L with a mean of 0.02 mg/L in lower Clear Creek runoff samples.

The available CDOT storm water sample data for Clear Creek Stations CC-3 and CC-4 were compared to the 1994-2005 average ambient data collected at CC-4 by the Upper Clear Creek Watershed Association. Results show that TSS concentrations in Clear Creek were greater during storm water runoff conditions (mean=264 mg/L) when compared to ambient conditions (mean=2 mg/L). Likewise, data also show that TP concentrations at CC-4 during storm water runoff conditions (mean=0.44 mg/L) were greater than ambient conditions (mean=0.02 mg/L) measured by UCCWA.

The total phosphorus load at paired stations CC-3 and CC-4 was compared for the 2000-2005 runoff events sampled (CDOT, 2008). These data indicate that most of the phosphorus load is already present in Clear Creek upstream of the Twin Tunnels/Hidden Valley I-70 reach (above CC-3). Results show no consistent pattern of change in concentration within this segment of I-70. The total (particulate) phosphorus load in Clear Creek is dependent on the TSS concentration rather than stream flow.

Trace metal concentrations at Clear Creek Stations CC-3 and CC-4 were higher than upstream stations (Table 2). These were largely attributable to mine drainage. Sample data show that mean storm event concentrations of dissolved manganese and zinc decreased between CC-3 and CC-4, indicating the I-70 did not contribute appreciable trace metals to Clear Creek in the Twin Tunnels/Hidden Valley reach. Dissolved copper or cadmium concentrations did not change appreciably in this reach.

FIGURE 8
Lower Clear Creek Total Suspended Solids and Phosphorus



Water Supply Intakes

The City of Black Hawk operates an in-stream water supply diversion from Clear Creek within the project limits (Hidden Valley). Water is withdrawn from Clear Creek and treated for municipal use. The City of Golden operates and in-stream water supply diversion from Clear Creek in Golden. Water is withdrawn from Clear Creek and treated for municipal use. These are the first two municipal water supply intake locations downstream of the project that can be affected by water quality upsets in Clear Creek.

Several other water supply intakes exist on Clear Creek downstream of the project including Farmers Highline Canal, Church Ditch, Molson-Coors, and Croake Canal. Diverted water is utilized for domestic, agricultural, and industrial uses.

5.2 What are the anticipated future conditions of water resources in the study area?

Clear Creek will continue to be in high demand as a drinking water supply for water users in the Denver Metropolitan area (Table 3). Transmountain diversions into Clear Creek will continue to increase with demand, thereby increasing in-stream flow conditions during certain times of the year. Variations in annual climatic conditions will continue to result in both low and high flow years in Clear Creek.

Water quality protection will continue to be a high priority for water users. New regulations aimed at protecting water quality will result in more stringent standards in the future. Clear Creek water quality is threatened by a myriad of conditions including erosion from historic mines, mine drainage, runoff from urban development, population growth, secondary roadway runoff, and Interstate 70. An overall lack of mitigation for many of these water quality impacts in the past suggests that opportunities exist for future water quality improvements.

TABLE 3
Population Projections

County	Population Projections			Average Annual Growth Rate [2009 estimates]	
	2000	2025	2035	2000-2025	2025-2035
Clear Creek	9,386	12,667	14,843	1.2%	1.6%
Eagle	43,355	77,865	94,803	2.4%	2.0%
Garfield	44,263	105,087	133,272	3.5%	2.4%
Gilpin	4,776	7,015	8,146	1.5%	1.5%
Grand	12,885	22,409	27,260	2.2%	2.0%
Lake	7,906	15,770	19,742	2.8%	2.3%
Park	14,698	32,910	39,613	3.3%	1.9%
Pitkin	15,914	23,751	28,341	1.6%	1.8%
Summit	25,727	43,943	53,216	2.2%	1.9%
Nine-County Total	**178,910**	**341,417**	**419,236**	**2.6%**	**2.1%**

Source: Colorado Department of Local Affairs, 2009
** Represents an early forecast for Park County, which has been refined since 2002*

5.3 Is the future of water resources considered to be at-risk?

In the context of stream flow, minimum flows are typically the determining factor for impacts to aquatic life and water supplies. It is likely that transmountain diversions into Clear Creek (from the West Slope) will continue to increase in the future, resulting in more water flow than would normally be in the basin. In the absence of large climatic fluctuations, Clear Creek flow is not considered to be at risk.

Water quality is currently at risk and will continue to be a major concern in the future. The National Response Center (NRC) data show that every stream in the I-70 Corridor has received a major hazardous waste spill from I-70 truck accidents within the last 10 years, with at least three large petroleum spills in lower Clear Creek. Refer to the hazardous waste section for more detail. Clear Creek will remain at risk with a very high potential for contamination from of hazardous substance spill incidents that threaten water supplies.

Diligent implementation and maintenance of BMPs and Best Available Technology (BAT) would control the risk to water quality.

5.4 What agencies were involved in this analysis and what are their issues?

The following agencies participated in providing input and information on issues pertaining to water resources and water quality within Clear Creek in the area of and downstream from the proposed action.

- United States Fish and Wildlife Service
- United States Forest Service
- U.S. Army Corps of Engineers

- U.S. Environmental Protection Agency
- Colorado Department of Public Health and Environment
- Colorado Parks and Wildlife
- Trout Unlimited
- Representatives from the Clear Creek watershed, Clear Creek County and Idaho Springs

These agencies were represented at the SWEEP committee meetings. The SWEEP committee was established during the development of the I-70 Mountain Corridor PEIS to propose and support future improvements to enhance aquatic resources, throughout the I-70 Mountain Corridor as opportunities arise including site-specific projects such as the Twin Tunnels project. SWEEP identified numerous issues relating to water quality wetlands, and aquatic habitat. The aquatic habitat and wetland issues are addressed in their respective sections of this EA. In general, these agencies raised general concerns regarding contaminants coming from the I-70 highway, including the possible release of contaminants from past mining activity during future highway construction.

Specific issues identified by the SWEEP committee included:

Potential for exposing mineralized rock during construction activity and the associated impacts to water quality, including an increase in metals loading, dissolved solids, and suspended solids within Clear Creek.

Sediment control during construction and operation of the highway.

Control of spills resulting from events such as freight vehicle accidents that could release contaminants into Clear Creek.

Increase in heavy metals loading, particularly cadmium, since this segment of Clear Creek is on the Section 303(d) list for cadmium.

Dewatering of Clear Creek by intercepting groundwater flow during the expansion of the tunnel.

Section 6. What Are the Environmental Consequences?

6.1 How does the No Action Alternative affect water resources?

As discussed in Section 5, I-70 can currently affect water quality in Clear Creek in terms of sediment, nutrient, and chloride concentrations. Accidental spills that occur along the highway each year also affect water quality and threaten downstream water supplies.

As the I-70 infrastructure and drainage system continues to surpass design life and deteriorate, erosion of cut and fill slopes and sediment transport from the highway will become worse under the No Action alternative. This is a gradual process that has developed over the past 50 years and will continue under No Action.

The emphasis on use of deicer salts to maintain safe winter mobility is likely to continue. Salt inputs into Clear Creek will vary from year to year depending on winter maintenance (snow conditions), but the trend towards higher stream chloride concentrations is likely to continue under the No Action alternative.

Accidental spills of hazardous materials will continue to be a major water quality concern under the No Action alternative.

6.2 How does the Proposed Action affect water resources?

Direct impacts on water resources related to the Proposed Action include increases in impervious surface area/roadbed expansion, new construction disturbances, potential stream channelization, the impedance or blockage of cross-slope streams, impacts from disturbance of historic mine waste materials, and possible impacts from transportation system maintenance operations. Changes in impervious surface and roadbed expansion are considered permanent impacts, whereas construction impacts are usually temporary.

Increased impervious surface could lead to increased runoff, affecting stream water quality, public water supplies, and aquatic life. No additional stream infilling or channelization is anticipated and changes in stream morphology are unlikely.

Although the Twin Tunnels project falls within a Clear Creek segment designated as impaired for metals from historic mining, there was very little mining in the project area. Therefore, it is unlikely that Clear Creek would be impacted from construction disturbance of mining waste. The area is within the EPA-designated Clear Creek/Central City Superfund Area, but no operable units have been identified for cleanup. A description of the tunnel rock composition and voids beneath I-70 related to placer mining is provided in Yeh, 2012.

Rock excavated from the eastbound tunnel bore will be removed from the project area and should not pose a threat to water quality. Groundwater flow intercepting the tunnel is very low (<1 gallon per minute) and does not report as surface water to Clear Creek. It is unlikely that the Proposed Action will result in a significant change in the volume of water from the tunnel and no impacts to water resources are anticipated.

The direct impact assessment approach for water resources evaluates potential changes from existing I-70 conditions. Changes primarily include differences in the impervious surface area of the highway template and associated changes in winter maintenance materials usage. Potential stream water quality changes were evaluated for the PEIS using a probabilistic dilution model. In this model the highway runoff water quality is input along with the highway impervious surface and total disturbance areas. The model produces a once in 3-year stream concentration for each physical or chemical parameter evaluated. These are illustrated as a percentage increase from existing I-70 conditions.

6.2.1 Water Quality Impacts

Impacts from highway runoff have been estimated by quantifying increased impervious surface area and winter maintenance material usage (increases in sand and deicer salts). Highway stormwater runoff and associated increases in water quality pollutant concentrations and loads in streams were quantified using the Federal Highway Administration (FHWA, 1996) water quality model (see PEIS Appendix G for a discussion of the FHWA Driscoll stormwater model).

Winter maintenance calculations incorporate an assumption that the average application rate per unit area for sand and deicer salts would remain the same as the existing condition. Although the No Action alternative may include some additional sand and deicer usage, such amounts are considered minimal in comparison with the Proposed Action. The increase in material usage would reflect 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. Therefore, the percentage change from existing conditions will remain the same for the alternatives previously evaluated in the PEIS.

The Proposed Action is assumed to be similar to the 6-lane widening (55 mph) alternative evaluated in the PEIS, but with widening in the eastbound direction only. Therefore, potential water quality changes in the Twin Tunnels segment would be approximately 50 percent of those predicted in the PEIS. In addition, since this area is not within the mining district and no new rock cuts are anticipated, metal concentrations are expected to be low. Therefore, model predictions for this area are based on results for I-70 outside the mining district (e.g., Beaver Brook). Table 4 summarizes the predicted sediment, chloride, and metal concentrations resulting from the Proposed Action, with no mitigation.

TABLE 4
Summary of Water Quality Changes with No Mitigation

Water Quality Parameter	Percent Change in Concentration	
	PEIS (both lane directions)	Proposed Action
Suspended Solids	10%	5%
Total Phosphorus	10%	5%
Chloride	10%	5%
Dissolved copper	3%	1.5%
Dissolved zinc	1%	0.5%

Note: Cadmium was not modeled in the PEIS but is chemically similar to zinc due to its oxidation state and is much less abundant in natural waters.

These estimated changes (based on PEIS modeling) are relatively small and are unlikely to create any exceedence of water quality standards. Highway widths of 48 or 50 feet for the Proposed Action would fall within these ranges.

It is important to consider that while increases in water quality constituents are possible, permanent sediment control BMP structures planned as part of the Proposed Action are expected to remove significant amounts of sediment, metals, and particulate phosphorous. This could result in no change in water quality from the Proposed Action.

Direct stream disturbance impacts are expected to be minimal based on review of footprints and construction disturbance zones. Preliminary design indicates that no bridge abutments will be located within the 100-year flood plain. No permanent stream channel impacts are anticipated if disturbance is avoided and there is no further infilling.

Improvements in traffic safety as a goal of the Proposed Action should result in a reduction in accidental spills of hazardous materials into Clear Creek.

6.2.2 What are the direct effects of the Proposed Action with a managed lane?

The manner in which traffic is managed will not have significantly different affects on water resources.

6.2.3 How does the Proposed Action change without tolling?

Tolling will not have significantly different affects on water resources.

6.3 What indirect effects are anticipated?

Indirect water quality impacts are related to the induced growth that the project may bring the area. These impacts include:

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

The proposed action has the 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 Corridor area has undergone considerable growth and development since the construction of I-70 during the 1960s. Continued growth in area population and in tourism is expected in the future. These influences have resulted in increased sedimentation, alterations in water quality, changes in the morphology (form and structure) of rivers and streams, and loss of wetlands within the Corridor. Development factors that affect water resources include runoff and hydrologic modification of stream channels, waste water discharges, eutrophication, and water supply/drinking water development.

6.4 What effects occur during construction?

Disturbance and erosion of underlying soil, stockpiles, and access roads during construction can contribute to water quality degradation in Clear Creek. Runoff from staging areas may create temporary water quality impacts. Accidental spills from machinery, drilling activities, and storage tanks can affect water quality during construction.

The City of Black Hawk water supply at Hidden Valley could be directly impacted if construction-related contaminants are allowed to enter Clear Creek.

The increased use of winter maintenance materials (sand and salt) required for the Frontage Road detour will have temporary water quality impacts during the construction phase. However, the detour impacts are not expected to be significantly different from the current operation and maintenance of eastbound I-70.

Section 7. What Mitigation Is Needed?

7.1 Tier 1 Mitigation Strategies

The mitigation offered for water resources impacts in the PEIS is summarized below.

- 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 how to minimize the use of sand or deicers while maintaining safe roadway conditions would help reduce use 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.

7.2 Twin Tunnels Mitigation

TABLE 5
Construction Mitigation Commitments

Activity	Location	Impact	Mitigation[1]
Runoff from construction.	Throughout the Proposed Action study area.	Impacts to water resources as a result of water quality degradation.	CDOT will implement appropriate BMPs for erosion and sediment control according the CDOT Erosion Control and Storm Water Quality Guide (CDOT, 2002), develop a stormwater management plan, which includes water quality monitoring, and use adaptive mitigation identified in the Upper Clear Creek Sediment Control Action Plan, which allows for flexibility in the number, sizing, type, and locations of BMP structures, while controlling all drainage entering Clear Creek, where feasible.
Long-term erosion impacts from soil disturbance that occurred during construction.	Throughout the Proposed Action study area.	Erosion, leading to increased sedimentation.	CDOT will achieve permanent stabilization through revegetation and permanent erosion controls and through maintenance of temporary erosion controls and plantings to stabilize non-rocky areas.
Exposure of mineralized rock.	During tunnel excavation and subsequent handling of excavated rock.	Impacts to water resources due to the introduction of mineralized materials, which can increase loading of metals, dissolved solids, and suspended solids.	As needed, mineralized rock will be removed from the project area to an appropriate disposal site or encapsulated, away from groundwater, as fill beneath the roadway pavement.
Ongoing water quality monitoring.	Throughout the Proposed Action study area.	Ongoing changes to water quality of Clear Creek due to implementation of the Proposed Action. This includes impacts resulting from construction and roadway operations.	The I-70 Clear Creek water quality monitoring program (conducted from 2001-2005) in the Twin Tunnels/Hidden Valley reach will be re-started and operated before, during, and after construction to monitor water quality conditions. The duration of post-construction monitoring will be determined by CDOT. The water quality monitoring program will sample both ambient and runoff event (snowmelt or rainstorm) flows.

[1] Mitigation is not necessary if impact can be avoided through changes in the design or construction of the Proposed Action (i.e., the activity is avoided).

TABLE 6
Operation Mitigation Commitments

Activity	Location	Impact	Mitigation[1]
Runoff from roadway during operation.	Throughout the Proposed Action study area.	Impacts to water resources as a result of water quality degradation due to contaminant runoff.	Hazardous spill containment structure locations have been identified and BMPs will be installed to reduce hazardous waste discharge to Clear Creek. CDOT will implement the adaptive mitigation identified in the Preliminary Upper Clear Creek Sediment Control Action Plan, which allows for flexibility in the number, sizing, type, and locations of BMP structures, while controlling all drainage entering Clear Creek. Three different drainage inlet sediment trap concept designs have been developed to accommodate various drainage conditions anticipated for the Proposed Action. These traps will be installed as part of the drainage system in locations where surface water is discharged to Clear Creek. Locations for surface sediment basins have also been identified in the plan and will be constructed as part of the drainage system.
Winter roadway maintenance	Throughout the Proposed Action study area.	Elevated sediment and chloride levels in Clear Creek due to use of traction sand and liquid and solid deicer salts.	Structural BMPs, such as detention ponds, will be constructed to capture winter roadway maintenance materials. Non-structural BMPs will include ongoing training of Maintenance Staff in the application of winter roadway maintenance materials.
Ongoing water quality monitoring.	Throughout the Proposed Action study area.	Ongoing changes to water quality of Clear Creek due to implementation of the Proposed Action. This includes impacts resulting from construction and roadway operations.	The I-70 Clear Creek water quality monitoring program (conducted from 2001-2005) in the Twin Tunnels/Hidden Valley reach will be re-started and operated before, during, and after construction to monitor water quality conditions. The duration of post-construction monitoring will be determined by CDOT. The water quality monitoring program will sample both ambient and runoff event (snowmelt or rainstorm) flows.

[1] *Mitigation is not necessary if impact can be avoided through changes in the design or construction of the Proposed Action (i.e., the activity is avoided).*

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Section 9. Resource Maps

The following maps illustrate the location of the water resources within the study area.

Map 1.