

Water Quality Technical Memorandum

New Pueblo Freeway

CDOT Project No. IM 0251-156

Project Control No. 12831

Colorado Department of Transportation

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In some cases, information in this Environmental Technical Report may have been refined or updated as preparation of the DEIS advanced. In such cases, the information and conclusions presented in the DEIS supersede all previous background material included in this Technical Report.

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Project Description

The Federal Highway Administration (FHWA), in cooperation with the Colorado Department of Transportation (CDOT), is preparing an Environmental Impact Statement (EIS) for the New Pueblo Freeway project (project), a proposal to improve a 7-mile segment of Interstate 25 (I-25) through Pueblo, Colorado. Improvements are necessary to address an outdated roadway and bridges with inadequate geometrics, safety issues, and existing and future traffic demand.

Alternatives under consideration include taking no action (No Action Alternative), reconstruction of I-25 on essentially the existing alignment (Existing I-25 Alternative), and reconstruction of I-25 on existing and new alignments (Modified I-25 Alternative). The alternatives are further described as follows:

- **No Action Alternative** – This alternative provides only for minor improvements, repairs, and other maintenance actions. The existing four-lane highway will otherwise remain unchanged.
- **Existing I-25 Alternative** – This alternative consists of reconstructing I-25 to six lanes on essentially the same location, reconfiguring and eliminating access points to I-25 to improve safety, and providing other improvements to the local street system to enhance system connectivity and traffic movement near I-25.
- **Modified I-25 Alternative** – This alternative consists of rebuilding I-25 to six lanes and providing the other improvements included in the Existing I-25 Alternative, except the alignment would be shifted to accommodate different interchange configurations.

Transportation Management strategies and design variations of grade and alignment are incorporated into the Build Alternatives (Existing I-25 Alternative and Modified I-25 Alternative).

Methodology and Assumptions

This technical memorandum (TM) summarizes the Environmental Assessment performed for the project and specifically addresses water quality impacts on water resources in the project area. Two Build Alternatives have been considered and evaluated in this TM for potential water quality impacts. Data gathered as part of the Tier 1 Environmental Assessment for possible expansion/modifications of I-25 through Pueblo have been incorporated in this document.

The objective of this assessment is to estimate general water quality effects on the receiving watercourses adjacent to I-25 through Pueblo that are expected from highway runoff associated with the improvement alternatives. The water quality assessment utilized guidance developed by the FHWA to determine the impacts of highway improvement projects in accordance with National Environmental Policy Act (NEPA) guidelines. The initial analysis included determination of existing conditions or “baseline conditions.” Predicted conditions that would result from the proposed alternative were determined based on the preliminary design layouts for the two Build Alternatives that have incorporated initial effect avoidance efforts. The existing and predicted conditions were compared either qualitatively or quantitatively to determine impacts from the project.

Supplemental literature data was incorporated into the analysis to qualitatively and quantitatively estimate the highway runoff impacts from the project area. Sources of supplemental data are described in Appendix A.

Existing Conditions and Data Collection

Governing Regulations

The primary federal regulatory drivers for the current stormwater quality program are the Phase I and Phase II Stormwater Regulations under the Clean Water Act (CWA), which, among other requirements, require regulated entities to acquire a National Pollutant Discharge Elimination System (NPDES) Permit for their stormwater discharges. The United States Environmental Protection Agency's (USEPA) stormwater NPDES regulations specify that entities that are required to have municipal permits must comply with the requirement to control the discharge of pollutants to the maximum extent practicable. The Colorado Department of Public Health and Environment (CDPHE) has jurisdiction over the NPDES permit program in Colorado.

CDOT operates under its Colorado Discharge Permit System (CDPS) Permit for Municipal Separate Storm Sewer Systems (MS4), Permit No. COS-000005, which expired on December 31, 2011 and is currently in the renewal process. CDOT's permit covers "state and interstate highways and their right-of-ways within the jurisdictional boundary of CDOT served by, or otherwise contributing to discharges to state waters from, municipal separate storm sewers owned or operated by CDOT." As a requirement of the Permit (Part I.B.1.b), CDOT was required to "develop and implement a program that ensures that new highway projects and significant highway modifications are reviewed for the need to include permanent stormwater best management practices." Based on the "sensitive" water criteria for the New Development Program established by CDOT, the project would be considered a significant highway modification requiring permanent best management practices (BMP).

The project is within the jurisdictions of the City of Pueblo and Pueblo County. These jurisdictions have programs that address the CDPS MS4 Phase II permit requirements. The City and County of Pueblo fall under the "Stormwater Discharges associated with Municipal Separate Storm Sewer Systems (MS4)" (permit number No. COR-070000). The general MS4 permit requires six program elements to either be in place or be developed to address the protection of water quality. These six elements are:

1. Public Education and Outreach on Stormwater Impacts
2. Public Involvement/Participation
3. Illicit Discharge Detection and Elimination
4. Construction Site Stormwater Runoff Control
5. Post-Construction Stormwater Management in New Development and Redevelopment
6. Pollution Prevention/Good Housekeeping for Municipal Operations

The Phase II Stormwater permit regulations require that the City and County submit plans for the development of these programs, if needed, as part of the permit application process. The general permit requires that these programs be developed and implemented within 5 years.

Of the six permit elements, the construction stormwater runoff control and post-construction stormwater management requirements will affect the project the most. CDOT has developed numerous programs that address stormwater quality. The construction and post-construction programs each have applicable sections that deal with actions required to protect water quality during construction activities and after construction is completed. CDOT is required to prepare and implement a Stormwater Management Plan (SWMP) to address typical construction issues such as erosion and sediment control. In addition to the SWMP, a construction dewatering discharge permit may be required for groundwater dewatering activities. The post-construction requirements are governed by CDOT's New Development and Redevelopment Program, which requires consideration of mechanisms to protect water quality on a long-term basis after the construction phase of the project is complete.

Water Resources

The project is within the Arkansas River Basin, which begins in the central mountains near Leadville and flows south and east to Kansas. The streams of concern to the project are the Arkansas River and Fountain Creek. The impacted streams in the project area are found in two major geological watersheds. These watersheds include the Upper Arkansas River, United States Geological Survey (USGS) Cataloging Unit: 11020002, and Fountain Creek, USGS Cataloging Unit: 11020003. The Upper Arkansas watershed occupies approximately 3,671 acres. In comparison, the Fountain Creek watershed occupies approximately 2,595 acres. The City of Pueblo lies at the downstream portion of the Fountain Creek watershed, and is at the lower end of the Upper Arkansas watershed.

Ground Water Quality

The Pueblo Upper Groundwater Basin (Upper Basin) and Pueblo Lower Groundwater Basin (Lower Basin) underlie the Arkansas River Basin, extending from the southeastern and central portion of the state, stretching from the continental divide east to the Kansas State line. The project area is located within the Lower Basin situated below Pueblo Reservoir. The Lower Basin aquifer consists of shallow alluvium 30 to 200 feet thick and 1,000-foot thick bedrock from the Sandstone Formation (CWCB, 2002). Primary uses of groundwater in the Lower Basin are agriculture, and there are some domestic and municipal uses of the bedrock aquifer. In contrast, the Upper Basin groundwater, located above Pueblo Reservoir, is generally used for domestic purposes. Depending on location in the Lower Basin, water yields range from 10 to 4,000 gallons per minute from the shallow alluvium, and 50 to 500 gallons per minute from the bedrock materials (CWCB, 2002).

Limited groundwater monitoring data were available for the project area focusing along the I-25 corridor. The City of Pueblo relies solely on surface water supplies for drinking water treatment. For this reason, the City of Pueblo's Engineering Division does not collect samples from or monitor wells. However, the City of Pueblo's wastewater treatment plant operates a small number of monitoring wells. The location of these wells is far beyond the project area, and available data would not provide pertinent information.

Two USGS monitoring wells were identified in Pueblo County. Descriptions of these wells are summarized in Exhibit 1 below. Data from these wells is restricted to water depth. From 2000 to 2005, groundwater levels below surface in Well 1 and Well 2 range from 12.5 to 10 feet, and 14 to 15 feet, respectively. Groundwater quality in the Upper Basin is generally potable with a few local exceptions resulting from natural and man-made contamination. In the Lower Basin, groundwater quality in the shallow alluvium is good in the upper portion of the reach and degrades to poor downstream and is only marginally useful for irrigation and stock watering due to salinity (CWCB, 2002). Groundwater in the bedrock aquifer is generally good.

EXHIBIT 1

United States Geological Survey Monitoring Well Data in Pueblo County, Colorado

Well Description Parameters	Well 1	Well 2
Well Identification Number	381834104362500	381544104362901
Latitude	38°18'33.2"	38°15'44.1"
Longitude	104°36'28.9"	104°36'28.8"
Gage datum (feet above Mean Sea Level)	4,737	4,796
Well depth (feet below land surface)	17	53.3

Source: www.USGS.gov

Stream Hydrology

Available gage data for mean monthly and annual streamflows are listed in Exhibit 2. These streamflows are used to calculate the potential effects that the project will have on the quality of the water in the streams. Not all of the streams had available gage data.

EXHIBIT 2**Mean Monthly and Annual Streamflows**

Monthly Mean Streamflows, cubic feet per second (cfs)												
Stream	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Arkansas River at Moffat Street ^A	90	74	232	396	1,100	1,810	954	631	218	195	160	82
Arkansas River near Avondale ^B	329	323	485	755	1,520	2,000	1,200	984	450	422	399	307
Fountain Creek at Pinon ^C	121	130	138	191	259	157	147	218	113	97	120	102
Fountain Creek at Pueblo ^D	126	140	144	206	257	159	152	228	107	103	134	114

Annual Mean Streamflows, cfs												
Stream	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Arkansas River at Moffat Street ^A	762	569	516	105	295	287	391	466	644	772	618	534
Arkansas River near Avondale ^B	1,282	830	764	284	525	552	635	724	970	991	846	796
Fountain Creek at Pinon ^C	456	144	129	78	94	144	107	125	170	103	128	116
Fountain Creek at Pueblo ^D	151	150	141	81	102	153	104	141	177	106	135	120

^AUSGS Station 07099970 - Arkansas River at Moffat Street at Pueblo, Colorado (January 1999 – December 2010)

^BUSGS Station 07109500 - Arkansas River near Avondale, Colorado (January 1999 – December 2010)

^CUSGS Station 07106300 – Fountain Creek near Pinon, Colorado (January 1999 – December 2010)

^DUSGS Station 07106500 - Fountain Creek at Pueblo, Colorado (January 1999 – December 2010)

Stream Water Quality

As stated previously, the reconstruction of I-25 has the potential to impact various watercourses in the area. These include Fountain Creek and the Arkansas River, and, to a lesser extent, Salt Creek, Saint Charles Reservoir Nos. 1 and 2, and Bessemer Ditch. There are also several unnamed ephemeral tributaries that cross under the highway that may be impacted. These streams are all part of the Arkansas River Basin. The Water Quality Control Commission (WQCC), which is part of CDPHE, is the rulemaking body responsible for the establishment of the acceptable water quality levels on all streams in Colorado. The WQCC has classified these streams for various uses as described in Regulation 32, "Classifications and Numeric Standards for Arkansas River Basin," amended November 14 2011, effective January 1, 2012. The affected segments of the Arkansas River Basin are described in Exhibit 3. The numeric water quality standards that have been established to preserve the beneficial uses or improve the water quality of the stream are listed in Exhibit 4.

EXHIBIT 3

Affected Water Quality Segments

Stream	Segment	Segment Description	Designated Uses ^A
Fountain Creek	2b, Fountain Creek Basin	Mainstem of Fountain Creek from a point immediately above the State Highway 47 bridge to the confluence with the Arkansas River	Warm Water Aquatic Life, Class 2 Recreation, Class E Water Supply Agriculture
Arkansas River	3, Middle Arkansas River Basin	Mainstem of the Arkansas River from a point immediately above the confluence with Wildhorse/Dry Creek Arroyo to a point immediately above the confluence with Fountain Creek, Valco Ponds and Fountain Lake	Warm Water Aquatic Life, Class 1 Recreation Class, E Water Supply Agriculture
Arkansas River	6, Middle Arkansas River Basin	Mainstem of the Saint Charles River from a point immediately above the CF&I diversion canal near Burnt Mill to the confluence with the Arkansas River	Use Protected Warm Water Aquatic Life, Class 2 Recreation, Class E Water Supply Agriculture
Arkansas River	1a, Lower Arkansas River Basin	Mainstem of the Arkansas River from a point immediately above the confluence with Fountain Creek to immediately above the Colorado Canal headgate near Avondale	Use Protected Warm Water Aquatic Life, Class 2 Recreation, Class E Water Supply Agriculture
Tributaries to Fountain Creek	4, Fountain Creek Basin	All tributaries to Fountain Creek that are not within the boundaries of National Forest or Air Force Academy lands including all wetlands, lakes, and reservoirs, from a point immediately above the confluence with Monument Creek to the confluence with the Arkansas River, except for the specific listings in segments 5, 6, 7a, and 7b.	Use Protected Warm Water Aquatic Life, Class 2 Recreation, Class E Agriculture

^AThe designated uses are defined in Regulation 31, "The Basic Standards and Methodologies for Surface Water," dated January 1, 2011. Specific uses are defined as follows:

Use Protected: These are waters that the WQCC has determined do not warrant special protection provided by the outstanding waters designation or the anti-degradation review process.

Warm Water Aquatic Life, Class 1: These are waters that (1) currently are capable of sustaining a wide variety of warm water biota, including sensitive species, or (2) could sustain such biota but for correctable water quality conditions. Waters shall be considered capable of sustaining such biota where physical habitat, water flows or levels, and water quality conditions result in no substantial impairment of the abundance and diversity of species.

Warm Water Aquatic Life, Class 2: These surface waters are not capable of sustaining a wide variety of cold or warm water biota, including sensitive species, due to physical habitat, water flows or levels, or uncorrectable water quality conditions that result in substantial impairment of the abundance and diversity of species.

Recreation, Class E: These surface waters are used for primary contact recreation or have been used for such activities since November 28, 1975.

Water Supply: These surface waters are suitable or intended to become suitable for potable water supplies.

Agriculture: These surface waters are suitable or intended to become suitable for irrigation of crops usually grown in Colorado and are not hazardous as drinking water for livestock.

EXHIBIT 4
Water Quality Standards for Classified Streams

Parameter	2b, Fountain Creek Basin	3, Middle Arkansas River Basin	1a, Lower Arkansas River Basin	4, Fountain Creek Basin
Dissolved Oxygen, mg/L	5.0	5.0	5.0	5.0
pH, s.u.	6.5-9.0	6.5-9.0	6.5-9.0	6.5-9.0
E. Coli, org/100 mL	126	126	126	126
Unionized Ammonia, mg/L	Acute = TVS Chronic = TVS	Acute = TVS Chronic = TVS	Acute = TVS Chronic = TVS	Temporary modification type (i) = TVS (old) Expires 12/31/2012
Total Residual Chlorine, mg/L	Acute = 0.019 Chronic = 0.011	Acute = 0.019 Chronic = 0.011	Acute = 0.019 Chronic = 0.011	--
Dissolved Sulfide, mg/L	0.002	0.002	0.002	--
Total Boron, mg/L	0.75	0.75	0.75	0.75
Total Nitrite, mg/L	1.0	0.05	0.05	10
Total Nitrate, mg/L	10	10	10	100
Total Chloride, mg/L	250	250	250	
Free Cyanide, mg/L	0.005	0.005	0.005	0.2
Dissolved Sulfate, mg/L	485	WS	329	--
			Temporary modification = existing quality Expires 12/31/2014	
Dissolved Arsenic, µg/L	Acute = 340	Acute = 340	Acute = 340	--
Total Recoverable Arsenic, µg/L	Chronic = 0.02-10	Chronic = 0.02-10	Chronic = 0.02-10	100
Total Recoverable Beryllium, µg/L	--	--	--	100
Dissolved Cadmium, µg/L	TVS	TVS	TVS	10 (Trec)
Total Recoverable Trivalent Chromium, µg/L	50	TVS	50	100
Dissolved Hexavalent Chromium, µg/L	TVS	TVS	TVS	100 (Trec)
Dissolved Copper, µg/L	TVS	TVS	TVS	200 (Trec)
Dissolved Iron, µg/L	WS	WS	WS	--
Total Recoverable Iron, µg/L	5,280	1,000	2,765	--
Dissolved Lead, µg/L	TVS	TVS	TVS	100 (Trec)

EXHIBIT 3

Affected Water Quality Segments

Stream	Segment	Segment Description	Designated Uses ^A
Dissolved Manganese, µg/L	WS/TVS	WS/TVS	290/TVS --
Total Mercury, µg/L	0.01	0.01	0.01 --
Dissolved Nickel, µg/L	TVS	TVS	TVS 200 (Trec)
Dissolved Selenium, µg/L	Acute = 42.3 Chronic = 28.1	Acute = 50.9 Chronic = 17.4	Acute = 19.1 Chronic = 14.1 Temporary modification = existing quality Expires 12/31/2013 20 (Trec)
Dissolved Silver, µg/L	TVS	TVS (Trout)	TVS --
Dissolved Zinc, µg/L	TVS	TVS	TVS 2,000 (Trec)

Notes:

All standards are chronic unless otherwise stated.

µg/L = microgram per liter

Acute = the level not to be exceeded by the concentration in a single sample or calculated as an average of all samples collected during a 1-day period.

Chronic = the level not to be exceeded by the concentration for either a single representative sample or calculated as an average of all samples collected during a 30-day period.

mg/L = milligram per liter

mL = milliliter

s.u. = standard unit

Trec = total recoverable

TVS = table value standards; refers to equations found in Table III of the WQCC "Basic Standards and Methodologies for Surface Water" Regulation 31.

WS = water supply; the standard for these parameters is based on either the secondary drinking water standard for that parameter or the ambient water quality, whichever is higher.

The WQCC has broken down all water bodies in Colorado into various segments. Each of these segments has been assigned water quality levels known as "water quality standards," that will protect the uses of the waters. These uses are defined in "The Basic Standards and Methodologies for Surface Water" Regulation 31. They are defined as follows:

1. **Use Protected:** These are waters that the WQCC has determined do not warrant special protection provided by the outstanding waters designation or the anti-degradation review process.
2. **Warm Water Aquatic Life, Class 1:** These are waters that (a) currently are capable of sustaining a wide variety of warm water aquatic life, including sensitive species, or (b) could sustain such aquatic life but for correctable water quality conditions. Waters are considered capable of sustaining aquatic life where physical habitat, water flows or levels, and water quality conditions result in no substantial impairment of the

abundance and diversity of species. "Aquatic life" includes both fish and invertebrate species.

3. **Water Aquatic Life, Class 2:** These are waters that are not capable of sustaining a wide variety of cold or warm water aquatic life, including sensitive species, due to physical habitat, water flows or levels, or uncorrectable water quality conditions that result in substantial impairment of the abundance and diversity of species. "Aquatic life" includes both fish and invertebrate species.
4. **Water Supply:** These surface waters are suitable or intended to become suitable as a drinking water supply.
5. **Agricultural:** These surface waters are suitable or intended to become suitable for irrigation of crops usually grown in Colorado and are not hazardous as drinking water for livestock.
6. **Recreation Class 1a:** These are surface waters in which primary contact uses have been documented or are presumed to be present. These uses include recreational activities in or on the water when the ingestion of small quantities of water is likely to occur such as swimming, rafting, kayaking, tubing, windsurfing, and water-skiing.

The WQCC has set standards that are protective of these uses. The standards for these segments are found in "Classifications and Numeric Standards for Arkansas River Basin," Regulation 32 and are listed in Exhibit 4. The exception to this is the Bessemer Ditch. The WQCC does not have the authority to establish water quality standards for ditches. It should be noted that discharges into ditches do require a NPDES permit. Limitations are established based on best available technology.

Additionally, the Water Quality Control Division (Division) of CDPHE is required through section 303(d) of the CWA to develop a list of water bodies within the state that are not meeting the water quality standards. The Division is then required to further evaluate the stream and develop a total maximum daily load (TMDL). The TMDL defines the amount of pollutants that each point and nonpoint source can discharge to the stream. Of the stream segments listed within the project area, three segments have been included in the Division's 2010 303(d) list. As detailed in Exhibit 5, the three listed segments are:

- Fountain Creek Basin Segment 2b
- Lower Arkansas River Basin Segment 1a
- Fountain Creek Basin Segment 4

The Middle Arkansas River Basin Segment 4d was previously listed in the Technical Memorandum for the project. However, it has been removed because the numeric standards were updated the segment is no longer classified as impaired and is not listed on the 303(d) list of impaired streams.

All three segments have been listed because the existing quality exceeds the underlying standard for dissolved selenium, dissolved sulfate, or *E. coli*.

Fountain Creek Basin Segment 2b and Lower Arkansas River Basin Segment 1a have existing water quality that exceeds the underlying standard for dissolved selenium. However, standard compliance is being maintained with the temporary modification in

place for selenium. It should be noted that high selenium levels have been noted in many locations in Colorado. The selenium sources are usually tied to fossil fuels, such as coal or oil, or the result of the natural weathering or irrigation of cretaceous marine shales and shale-derived soils. Natural weathering or irrigation of shales and shale derived soils results in high selenium levels where the soils have high alkalinity and receive low amounts of precipitation. Selenium has not been shown as a pollutant of concern associated with highway runoff.

EXHIBIT 5

Water-Quality-Limited Segments Requiring Total Maximum Daily Loads ^A

Stream	Segment	Segment Description	Portion	Impairment
Fountain Creek	2b, Fountain Creek Basin	Mainstem of Fountain Creek from a point immediately above the State Highway 47 bridge to the confluence with the Arkansas River	All	Selenium, <i>E. coli</i> (May-October)
	1a, Lower Arkansas River Basin	Mainstem of the Arkansas River from a point immediately above the confluence with Fountain Creek to immediately above the Colorado Canal headgate near Avondale	All	Selenium Sulfate
Tributaries to Fountain Creek	4, Fountain Creek Basin	All tributaries to Fountain Creek that are not within the boundaries of National Forest or Air Force Academy lands including all wetlands, lakes and reservoirs, from a point immediately above the confluence with Monument Creek to the confluence with the Arkansas River, except for the specific listings in segments 5, 6, 7a, and 7b	All	<i>E. coli</i>

^A The designated uses are defined in WQCC Regulation 93, "2004 Section 303(d) List Water-Quality-Limited Segments Requiring TMDLs," dated March, 2010.

Water Quality Sampling Sites

Various organizations were contacted to obtain water quality data. The USGS and CDPHE have water quality monitoring networks throughout the Arkansas River Basin. The water quality data was gathered by contacting USGS and thoroughly reviewing of the data gathered by CDPHE. Data from USGS was obtained for the sampling locations listed in Exhibit 6. This data is included in Appendix B. Contacts with the City of Pueblo and the Pikes Peak Area Council of Governments (PPACG) did not provide any updated data. It should be noted that data was not available for the Bessemer Ditch.

EXHIBIT 6

United States Geological Survey Sampling Locations

Sample Site	USGS Station Number	Period of Record ^A	Parameters
Arkansas River below Pueblo Reservoir	7099400	February 2007 to February 2012	Stream width, flow, temperature, conductivity, dissolved oxygen, pH, <i>E. coli</i> , ammonia, dissolved nitrite, dissolved nitrate + nitrate, total phosphorus, dissolved sulfate, dissolved chloride, hardness, dissolved magnesium, total iron, dissolved iron, total selenium, dissolved selenium
Arkansas River at Santa Fe Bridge at I-25 in Pueblo	7099970	January 2007 to February 2012	Stream width, flow, temperature, conductivity, total dissolved solids, dissolved oxygen, pH, <i>E. coli</i> , ammonia, dissolved sulfate, dissolved chloride, hardness, dissolved magnesium, total selenium, and dissolved selenium
Fountain Creek at Pinon	7106300	February 2007 to February 2012	Stream width, flow, temperature, conductivity, dissolved oxygen, pH, <i>E. coli</i> , dissolved ammonia, dissolved nitrate + nitrate, total phosphorus, dissolved sulfate, dissolved chloride, hardness, dissolved magnesium, total selenium, dissolved selenium, total arsenic, total copper, dissolved copper, total lead, dissolved manganese, total manganese, total zinc, and dissolved zinc
Fountain Creek at State Highway 50 East (La Junta exit) in Pueblo	7106500	February 2007 to February 2012	Stream width, flow, temperature, conductivity, dissolved oxygen, pH, <i>E. coli</i> , dissolved ammonia, dissolved nitrate + nitrate, total phosphorus, dissolved sulfate, dissolved magnesium, total selenium, dissolved selenium, total copper, total lead, dissolved manganese, total manganese, total zinc, and dissolved zinc
Arkansas River at Avondale about 10 miles east of Pueblo	7105800	January 2007 to February 2012	Stream width, flow, temperature, conductivity, dissolved oxygen, pH, <i>E. coli</i> , dissolved ammonia, dissolved nitrate + nitrate, total phosphorus, dissolved sulfate, dissolved chloride, hardness, dissolved magnesium, total selenium, dissolved selenium, total arsenic, total copper, dissolved copper, total lead, total manganese, dissolved manganese, total nickel, total zinc, and dissolved zinc

^AAs a result of an extensive peer review of data before it is released to the public, more recent data is not yet available. These data will be updated as more current data becomes available.

In addition to information on general parameters, daily monitoring data on total dissolved solids/conductivity was obtained from USGS to assist in determining possible impacts from snow removal activities such as salt or magnesium chloride applications. This information is included in Appendix B.

EXHIBIT 7

Total Dissolved Solids Data

Sample Site	Station Number	Period of Record
Arkansas River at Moffat Street at Pueblo, Colorado	07099970	March 6, 2007 to February 24, 2012
Fountain Creek at Pueblo, Colorado	07106500	February 14, 2007 to January 25, 2012

In addition to USGS data, state sampling data for several sites was obtained and is described in Exhibit 8 and the complete data are listed in Appendix C.

EXHIBIT 8

Colorado Department of Public Health and Environment Data

Sample Site	Station Number	Period of Record
Arkansas River near Nepesta at Highway 50	7520	2007 to 2008
Arkansas River above Wild Horse Creek	7292	2007
Fountain Creek at 4th Street Bridge	7360	2007 to 2008

Water Supplies

As summarized in Exhibit 9, there are several public water supplies in Pueblo County. No efforts were made to determine the location of any private wells or water intakes. The only current water supplies that could be impacted by the project are the St. Charles Mesa Water District and Pueblo Water Works. Most water suppliers take water out at the Pueblo Reservoir, which is upstream of the study area. This information was obtained from the CDPHE. It should be noted that a new water intake for the City of Colorado Springs is being contemplated for the Arkansas River, however, the exact location is not known at this time.

EXHIBIT 9

Current Water Supplies

Name	Water Supply	Location Information (Lat/Long)	Comments
Beulah Water Works District	Middle Creek	38 04 05 105 00 50 (Blake Mountain Road)	Upstream of impacted area
Colorado City Metropolitan District	Lake Beckwith	37 53 22 104 51 40 (Taylor)	Upstream of impacted area
Pine Drive Water District	#1 Inf. Fal./on North Creek	37 53 22 104 57 58 (State Highway 78)	Upstream of impacted area
Pueblo Board of Water Works	Arkansas River	--	--
Pueblo West Metropolitan District	Arkansas River to Pueblo Reservoir	38 16 10 104 43 39 (Pueblo Reservoir Dam)	Upstream of impacted area
Town of Rye	Greenhorn Creek	37 55 18 104 55 56 (Heller Lane)	Upstream of impacted area
St Charles Mesa Water District	Bessemer Ditch	38 16 10 104 43 39 (Pueblo Reservoir Dam)	Upstream of impacted area
St Charles Mesa Water District	Arkansas River	38 15 12 104 36 23 (Santa Fe Avenue)	Within impacted area

EXHIBIT 9
Current Water Supplies

Name	Water Supply	Location Information (Lat/Long)	Comments
Public Service - Comanche Plant	Arkansas River	38 16 10 104 43 39 (Pueblo Reservoir Dam)	Upstream of impacted area
Camp Jackson - YMCA Camp	Middle Muddy Creek	--	Upstream of impacted area

Point Source Discharges

Data were gathered to determine the direct point source discharges that were in the project area and that could be potentially impacted by the highway expansion. Exhibit 10 lists permitted discharges that were found in the Pueblo area as of 2005.

EXHIBIT 10
Point Source Discharges

Permit No.	SIC Code	Permitee Name	Facility Name	Location	Receiving Waters
CO0000612	4911	Public Service Company of Colorado	Comanche Station	Latitude (lat): 38.2467 Longitude (long): -104.6317 2005 Lime Road	St. Charles River
CO0000621	3312	CF&I Steel, L.P.	Rocky Mountain Steel Mills	lat: 38.2542 long: -104.5667 2100 South Freeway	Arkansas River
CO0026646	4952	Pueblo, City of	--	lat: 38.2542 long: -104.5667 1300 South Queens Avenue	Arkansas River
CO0040789	4952	Pueblo West Metro District	--	1370 East Grouse Drive	Pesthouse Gulch to Dry Creek
COG073502	1799	SDS Pueblo Dam Connections	--	lat: 38.271000 long: -104.722000	Arkansas River
COG130012	0273 0921	Colorado Division of Wildlife	Pueblo State Fish Hatchery	lat: 38.264444 long: -104.721111 500 Pueblo Reservoir Rd	Arkansas River
COG500035	1442	Transit Mix of Pueblo, Inc.	West Pit	lat: 38.2293 long:-104.7495 5475 State Highway 96 West	Arkansas River

EXHIBIT 10
Point Source Discharges

Permit No.	SIC Code	Permittee Name	Facility Name	Location	Receiving Waters
COG500082	1442	Transit Mix of Pueblo, Inc.	Pueblo East Pit	lat: 38.2692 long: -104.5336 2596 State Highway 96 East	Arkansas River
COG500086	1442	RBK Construction, Inc.	RBK #38 Pit	Baxter Road Rye, CO 81004	Arkansas River
COG500092	1442	Lafarge	Rich Pit	37400 Highway 95 East	Arkansas River
COG500205	1442	Transit Mix of Pueblo, Inc.	Barnhart Pit	End of Stockyards Road Pueblo County, CO 81001	Arkansas River
COG588022	4952	Meadowbrook Mobile Home Wastewater Treatment Facility (WWTF)	--	lat: 38.272778 long: -104.524444 5000 Red Creek Springs Rd	Arkansas River
COG589008	4952	Arkansas Point WWTF	Arkansas Point WWTF	lat: 38.257453 , long: -104.722688	West Pueblo Ditch
COG600512	5169	ICC Pueblo West	Interstate Chemical Company, Inc.	lat: 38.353410 , long: -104.649840	Tribuary to Arkansas River
COG600252	3728	BF Goodrich Aerospace	Pueblo Carbon Brake Facility	lat: 38.2795 long:-104.5069 50 William White Boulevard	Tributary to Arkansas River
COG603148	1629	James R Dilorio Water Reclamation Facility	James R Dilorio Water Reclamation Facility	lat: 38.257376 , long: -104.579468	Arkansas River
COG605014	3728	BF Goodrich Aerospace	Pueblo Carbon Brake Facility	lat: 38.2795 long:-104.5069 50 William White Boulevard	Arroyo Tributary to Arkansas River
COG605016	4911	Pueblo Power Plant	--	lat: 38.268333 long: -104.619722 105 Victoria Ave	Runyon Lake Trib to Arkansas River
COG641025	4941	Pueblo Board of Water Works	Whitlock Treatment Plant	lat: 38.2731 long: -104.6436 1920 West 11th Street	Arkansas River
COG641089	4941	Pueblo West Metropolitan District	Treatment Plant #1	lat: 38.3164 long: -104.7419 29 West Palmer Lake Drive	Tributary of Arkansas River

Source: USEPA Permit Compliance System Database and USEPA ECHO Clean Water Act Search April 9, 2012.

Stream Water Quality Baseline Conditions

Data analysis procedures developed by CDPHE and listed in *Guidance on Data Requirements and Data Interpretation Methods Used in Stream Standards and Classification Proceedings* (CDPHE, 2004) were followed to determine the existing water quality conditions in the project area in Segments 2b and 4 in the Fountain Creek watershed and Segments 1a, 3, and 4d in the Arkansas River watershed. Water quality data was obtained from the USGS and CDPHE for several monitoring stations in Fountain Creek and the Arkansas River. Numerous physical, biological, inorganic, and metal parameters were evaluated for each station to determine existing ambient water quality. The water quality pollutants of concern are those that are associated with highway runoff and arise from highway construction, maintenance, and vehicles. The parameters evaluated include:

- instantaneous discharge
- water temperature
- specific conductance
- dissolved oxygen
- biochemical oxygen demand
- pH
- fecal coliform bacteria
- suspended solids
- total ammonia
- dissolved ammonia
- total nitrite
- dissolved nitrite
- total nitrite plus nitrate
- total phosphorus
- dissolved sulfate
- dissolved chloride
- hardness
- dissolved magnesium
- total arsenic
- total cadmium
- dissolved cadmium
- total chromium
- total copper
- dissolved copper
- total iron
- dissolved iron
- total lead
- dissolved lead
- dissolved manganese
- total nickel
- dissolved nickel
- total zinc
- dissolved zinc

Based on the available in-stream USGS and CDPHE data, the water quality parameters of concern were assessed to establish a baseline water quality for the stream segments and water quality standards for designated uses of Fountain Creek and the Arkansas River. A statistical summary was developed for each USGS and CDPHE gauging stations for the water quality pollutants of concern, as listed in Exhibits 5, to provide baseline water quality conditions. The summary covers the past 5 years of the available data (2007- 2012). The data are included in Appendix B (Tables A1 through A6) and Appendix C (Tables A1 through A2).

Comparison of the existing water quality to the water quality standards for Segments 2b and 4 in the Fountain Creek watershed and Segments 1a, 3, and 4d in the Arkansas River watershed provides a reasonable estimate of the assimilative capacity of the water body to protect against degradation. Those parameters where the ambient water quality data exceeded the water quality numeric standards for their stream segment are noted and summarized in Exhibit 11. Ambient water quality concentration standards classified as “chronic” and “acute” were established at each of the USGS and CDPHE stations. Chronic standards were assessed for each station by evaluating the available chemical data values to determine if the ambient water quality concentration falls outside the percentile ranges established by CDPHE guidelines. Acute standards were assessed by comparing individual sample values against the standard.

EXHIBIT 11

Summary of Ambient Water Quality Data for Arkansas River and Fountain Creek

Station Number	Stream Segment Number	USGS Survey Station Name	Data Collection Period	Non-Attainment of Numeric Standards	Number of Values	Number of Censored Values	Existing Water Quality	Numeric Standards	Non-Attainment of Classified Uses
USGS Stream Monitoring Stations									
07099400	3, Middle Arkansas River Basin	Arkansas River near Pueblo Reservoir, Pueblo, Colorado	2/28/2007-2/12/2012	None	---	---	---	---	---
0799970	3, Middle Arkansas River Basin	Arkansas River at Santa Fe Bridge at I-25 Pueblo, Colorado	1/8/2007-2/24/2012	Dissolved Selenium – Chronic	19	0	21.7	17.4	Aquatic Life
07105800	1a, Lower Arkansas River Basin	Arkansas River at Avondale about 10 miles East of Pueblo, Colorado	1/8/2007-2/24/2012	E. coli	100	5	153	126	Recreation E
07106300	2b, Fountain Creek	Fountain Creek at Pinon, Colorado	2/15/2007-2/27/2012	None	---	---	---	---	---
07106500	2b, Fountain Creek	Fountain Creek at State Highway 50 East (La Junta exit) in Pueblo, Colorado	2/15/2007-2/27/2012	None	---	---	---	---	---
CDPHE Stream Monitoring Stations									
7520	1b, Lower Arkansas River Basin	Arkansas River near Nepesta at State Highway 50	2/2007- 2/2008	Total Recoverable Iron – Chronic Criteria	4	0	2750 ^A	1950	Aquatic Life
7292	3, Middle Arkansas River Basin	Arkansas River above Wild Horse Creek	1/2007-6/2007	Dissolved Manganese – Chronic Criteria	3	0	56.1 ^A	50 ^C	Drinking Water Supply
7360	2b, Fountain Creek	Fountain Creek at 4th Street bridge	2/2007-5/2008	None	---	---	---	---	---

^AData set is composed of less than 10 samples.

^BFor all surface waters with an actual water supply use, the less restrictive use of the following two options were applied as numerical standards (1) existing water quality as of January 1, 2000; or Iron = 300 µg/L (dissolved), Manganese = 50µg/L (dissolved), and SO₄ = 250 mg/L.

In the absence of site-specific loading data for the project area, a mass loading calculation was used to determine annual mass loadings for the project area from State Highway 47 to just south of Pueblo Boulevard in Pueblo. Mass loadings for urban stormwater runoff were estimated using methodology from *Evaluation and Management of Highway Runoff* (FHWA, 1996).

Pollutant loading rates were determined from the site median concentrations of pollutants for urban highways based on an average daily traffic of more than 30,000 vehicles, the coefficient of variation of the pollutant event mean concentration, drainage area and pervious area, and rainfall characteristics available for the Denver area. Complete statistical information was obtained from the Denver data set provided by the FHWA, as some of the data parameters, such as coefficients of variations, were not available for the Pueblo area. Rainfall characteristics in Pueblo are expected to be different than in Denver. Generally, Pueblo receives less rainfall than Denver. With limited rainfall, the amount of runoff generated from highway segments will impact the loading calculations. Small storm events will not generate as much highway runoff to dilute the potential pollutants being transported in the runoff, thus decreasing the dilution rate of the pollutants in stream and increasing the potential for stream concentrations to exceed the water quality standards. However, the number of wet weather events that would generate runoff would be less than in Denver. Due to limited project drainage information, the project area was divided into three 100 percent impervious segments with existing and proposed areas as shown in Exhibit 12. Segment 1 comprises the area above the Arkansas River from State Highway 47 to 1st Street; Segment 2 is at the Arkansas River Confluence (1st Street to Northern Avenue); and Segment 3 lies below the Arkansas River Confluence (from Northern Avenue to south of Pueblo Boulevard).

EXHIBIT 12
Impervious Area

Project Area Segments	Impervious Area for Each Alternative (Acres)		
	No Action Alternative	Existing I-25 Alternative	Modified I-25 Alternative
Segment 1	35.6	62.4	62.4
Segment 2	22.1	41.3	42.4
Segment 3	36.8	64.6	60.8
Total	94.5	168.3	165.6

Exhibit 13 shows the analysis conducted to determine the increase in annual mass loading rates from the project area for each project segment and alternative. Site characteristics and values for some parameters from FHWA were used directly in equations to determine discharge flow rate, runoff volume, and pollutant mass loading rate.

EXHIBIT 13

Expected Annual Mass Loading of Pollutants from Highway Runoff for No Action Alternative, Existing I-25 Alternative, and Modified I-25 Alternative

Pollutants	Parameters Analyzed							
	Total Suspended Solids	Total Organic Carbon	Chemical Oxygen Demand	Nitrate + Nitrite	Phosphorus (as PO ₄)	Total Copper	Total Lead	Total Zinc
Average Event Mean Concentration ^A (mg/L)	174	31	140	0.93	0.49	0.066	0.49	0.40
Drainage Area of No Action Alternative (ha)								
Segment 1	14.41	14.41	14.41	14.41	14.41	14.41	14.41	14.41
Segment 2	8.94	8.94	8.94	8.94	8.94	8.94	8.94	8.94
Segment 3	14.89	14.89	14.89	14.89	14.89	14.89	14.89	14.89
Drainage Area of Existing I-25 Alternative (ha)								
Segment 1	25.25	25.25	25.25	25.25	25.25	25.25	25.25	25.25
Segment 2	16.71	16.71	16.71	16.71	16.71	16.71	16.71	16.71
Segment 3	26.14	26.14	26.14	26.14	26.14	26.14	26.14	26.14
Drainage Area of Modified I-25 Alternative (ha)								
Segment 1	25.25	25.25	25.25	25.25	25.25	25.25	25.25	25.25
Segment 2	17.16	17.16	17.16	17.16	17.16	17.16	17.16	17.16
Segment 3	24.61	24.61	24.61	24.61	24.61	24.61	24.61	24.61
Annual Mass Loading of No Action Alternative (kg/yr)								
Segment 1	8379	1493	6741	45	24	3	24	19
Segment 2	5201	927	4185	28	15	2	15	12
Segment 3	8661	1543	6969	46	24	3	24	20
Annual Mass Loading of Existing I-25 Alternative (kg/yr)								
Segment 1	14686	2617	11816	78	41	6	41	34
Segment 2	9720	1732	7821	52	27	4	27	22
Segment 3	15204	2709	12233	81	43	6	43	35
Annual Mass Loading of Modified I-25 Alternative (kg/yr)								
Segment 1	14686	2617	11816	78	41	6	41	34
Segment 2	9979	1778	8029	53	28	4	28	23
Segment 3	14310	2549	11514	76	40	5	40	33
Percent Increase of Annual Load of Existing I-25 Alternative (%)								
Segment 1	75	75	75	75	75	75	75	75
Segment 2	87	87	87	87	87	87	87	87
Segment 3	76	76	76	76	76	76	76	76
Percent Increase of Annual Load of Modified I-25 Alternative (%)								
Segment 1	75	75	75	75	75	75	75	75
Segment 2	92	92	92	92	92	92	92	92
Segment 3	65	65	65	65	65	65	65	65

^ASource: FHWA, 1996.

ha = hectares

kg/yr = kilograms per year

mg/L = milligrams per liter

In general, pollutants in stormwater runoff from the highway are expected to increase approximately 65 to 92 percent over existing levels with the additional impervious area added to the existing highway. The largest increase in pollutants is expected in Segment 2 in both the Existing I-25 Alternative and Modified I-25 Alternative, 87 and 92 percent,

respectively. The expected percent increase in annual load from the highway is only an estimate and should not be viewed as an exact value. Actual site-specific stormwater monitoring data and well defined highway drainage basin calculations would be necessary to determine site-specific loading data information.

Because the annual mass loading estimation is based on various parameters, such as the mean annual rainfall volume and the average number of storm events per year, the expected annual mass loading calculations have limitations. If larger values for the average mean annual rainfall volume and the average number of storm events per year were applied to the analysis, the mean event mass loads and annual mass loadings would increase. However, because the comparison of mass loads is driven primarily by the increase in drainage area for the project, the percent increase from the existing annual mass loading to proposed annual mass loading would remain within the range of approximately 53 to 61 percent.

Stream Low Flow Analysis and Water Quality

A low flow analysis for acute and chronic conditions was conducted on the available streamflow data within the project area. The DFLOW algorithm was applied to the streamflow data to obtain low flow conditions in the project area. This algorithm is presently used by CDPHE for the preparation of permits, and it is in accordance with the policy for low flow analysis adopted by CDPHE in early 2001. As shown in Exhibit 14, along the Arkansas River, months of concern are from August through December when the stream flow conditions are at their lowest, resulting in less dilution capacity in the stream. Along Fountain Creek, stream flows are at their lowest from May through October.

Further analysis was conducted using the low flow conditions in the project area to obtain worst case scenarios for stream water quality during wet weather events generating highway runoff. Worst case scenarios were run for both construction alternatives for project Segment 1 and 2 that discharged directly into receiving waters. The analysis took into consideration the potential concentration of highway runoff estimated from FHWA data, highway impervious area, ambient stream water quality, rainfall characteristics, streamflow, and the existing water quality standards. Summary tables of the loading analysis are included in Appendix D (Tables A1 through A3).

In project area Segment 1 (Discharge to Fountain Creek), the loading analysis of the existing condition and two construction alternatives showed concentrations were at or below the water quality standards for: dissolved ammonia as nitrogen, dissolved nitrate plus nitrite as nitrogen, total arsenic, total chromium, total copper, total iron, and total zinc. Comparison of the Existing I-25 Alternative and the Modified I-25 Alternative showed that fecal coliform concentrations could be elevated above the water quality standard under the existing conditions and both Build Alternatives.

EXHIBIT 14
Annual Monthly Streamflows

Site Information		Flow Condition	Monthly Streamflow (cfs)											
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
USGS Station # 7099970	Arkansas River at Moffat Street	Acute	1.60	1.60	1.50	16.0	2.40	18.0	6.30	3.20	2.20	2.30	1.90	1.80
		Chronic	1.90	1.90	1.90	3.00	17.0	18.0	6.30	3.20	3.10	3.10	1.90	1.90
USGS Station # 7109500	Arkansas River near Avondale	Acute	153	171	193	190	183	220	151	96.0	90.0	116	134	146
		Chronic	167	176	210	266	266	322	151	151	151	151	152	152
USGS Station # 7106300	Fountain Creek at Pinon	Acute	58.0	70.0	49.0	32.0	21.0	20.0	7.60	8.40	17.0	21.0	47.0	59.0
		Chronic	67.0	71.0	49.0	38.0	33.0	24.2	24.2	24.2	34.0	36.0	48.0	62.0
USGS Station # 7106500	Fountain Creek at Pueblo	Acute	46.0	46.0	46.0	29.0	21.0	8.00	3.30	3.10	13.0	25.0	52.0	62.0
		Chronic	71.0	72.0	46.0	39.0	24.0	14.2	14.2	14.2	21.0	25.0	52.0	69.0

Note: Annual monthly streamflows calculated with DFLOW4 software. Period of record is January 1999 to December 2010.

Fecal coliform has not been shown as a pollutant of concern associated with highway runoff. Concentrations of total lead have the potential to be elevated for existing conditions and for both alternatives (when compared with the water quality standard for dissolved lead). It should be noted that comparison of the total lead concentrations with dissolved lead standards is a very conservative approach. A rule of thumb is to assume dissolved lead concentrations are approximately 85 percent of total lead concentrations. However, for stormwater discharges, most metals are associated with sediment and are not in the dissolved form. Therefore, the 85 percent rule may be too conservative.

In project area Segment 2 (Discharge to Fountain Creek), loading analysis showed that concentrations were at or below the water quality standards for both alternatives for: dissolved ammonia as nitrogen, dissolved nitrate plus nitrite as nitrogen, total arsenic, total chromium, total iron, and total zinc. Loading analysis for the project area in Segment 2 (Discharge to the Arkansas River) showed identical results as in project area in Segment 2 (Discharge to Fountain Creek), with the addition of potentially elevated total zinc concentrations above the water quality standard for both alternatives. Furthermore, analysis showed that fecal coliform concentrations were elevated above the water quality standard for both alternatives. Similarly, concentrations of total lead and copper have the potential to be elevated above the water quality standard for the existing condition and both alternatives.

Water Supplies and Point Sources

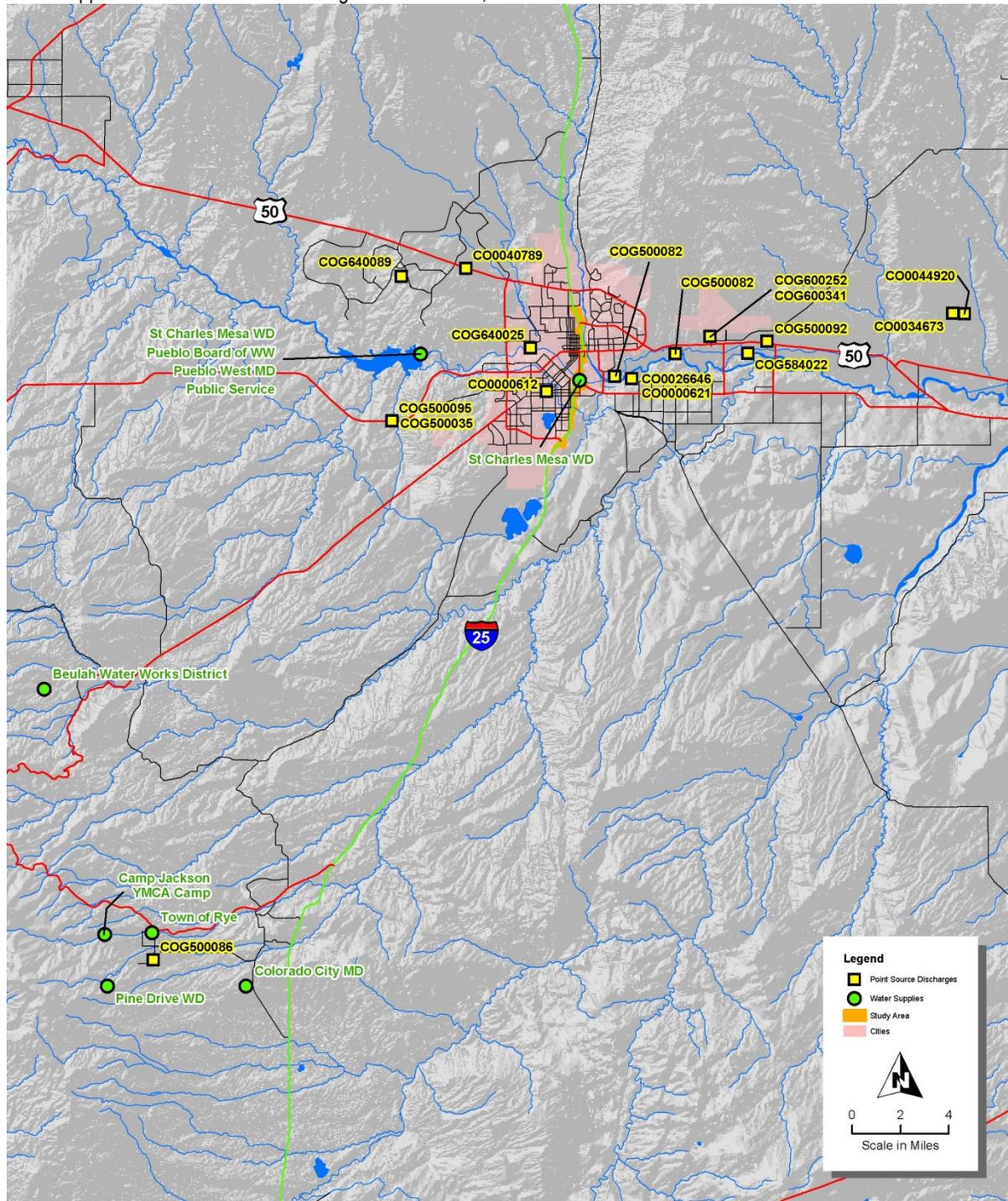
Exhibit 15 illustrates the location of the various water supplies and point sources in the vicinity of Pueblo. The only current water supplies that could be impacted are the St. Charles Mesa Water District and, to a lesser extent, Pueblo Water Works. The system source water for the St. Charles Mesa Water District (PWSID CO0151750) is a combination of surface water and groundwater as shown in Exhibit 16. Sources of Pueblo's drinking water provided by Pueblo Water Works include rivers, lakes, streams, and reservoirs originating in the mountains of Colorado near Leadville. The water is conveyed via the Arkansas River to Pueblo Reservoir. These two water suppliers provide the majority of the water for domestic use in Pueblo.

EXHIBIT 15
St. Charles Mesa District System Source Water

Source Name	Source Type	Water Type
Arkansas River	Intake	Surface water
Bessemer Ditch	Intake	Surface water
Well No 1 9711F	Well	Groundwater
Well No 10 RF185	Well	Groundwater
Well No 6 RF1189	Well	Groundwater
Well No 8 4557F	Well	Groundwater

Source: www.stcharlesmesawaterdistrict.org

EXHIBIT 16
Water Supplies and Point Source Discharges within Pueblo, Colorado



The majority of the point sources discharges are located outside the project area. Potentially, the closest point sources dischargers that could be impacted are east of I-25 and the Arkansas River (Permittee No. CO0000621, CF&I Steel, L.P., and Permittee No. CO0026646, City of Pueblo). These facilities both discharge to the Arkansas River within proximity of the proposed expansion in the project area. The closest point sources discharger located on the west side of I-25 and Arkansas River is Permittee No. CO0000612, Public Service Company of Colorado. This facility discharges to the St. Charles River west of I-25, and it is anticipated that this discharger will not be impacted.

Impacts

No Action Alternative

The No Action Alternative would result in impacts such as continued increased highway congestion and would cause contaminant concentrations in the highway runoff to increase due to high average daily traffic values. Because there are no BMPs currently in place to address existing and increasing future pollutant loadings from I-25 in Pueblo, further water quality degradation would be anticipated to the Arkansas River and Fountain Creek, as well as the surrounding wetlands.

Existing I-25 Alternative

The implementation of the Existing I-25 Alternative would require widening the highway and potentially replacing structures near interchanges in Segment 1 (State Highway 47 to 1st Street), Segment 2 (1st Street to Northern Avenue), and Segment 3 (Northern Avenue to south of Pueblo Boulevard) of the project area. These improvements will present erosion and sediment control issues related to the construction activities. Much of the erosion and sediment issues are related to earthwork that results in unprotected open areas while construction of new paved surfaces and structures progresses. These bare surfaces are highly susceptible to erosion from rain and wind as they lack protection that established vegetation normally provides.

Specifically, this alternative would widen and/or replace structures over the Arkansas River in Segment 2. Typical structure construction is anticipated to include construction of temporary access roads, traffic detours, demolition of the existing structures, placement of new abutments, placement of intermediate piers or bents, placement of the new structures, potential dewatering for foundations, and potential temporary stream diversions.

Construction from the existing structures or from the stream banks is preferred to minimize activities within the stream channels. Some activities, such as driving piers, must take place in the channel. Even in these cases, all attempts should be made to keep equipment out of the channel and limit the time that the activity occurs in the channel. Temporary stream diversions can be both an impact and mitigation. The construction of the diversion will likely have short-lived immediate turbidity effects, but can effectively isolate the flowing stream from the in-stream construction disturbance. Construction activities are anticipated to last for 48 to 60 months.

Alignment of the Existing I-25 Alternative toe of slope in Segment 1 has encroached into wetland boundaries in the northwest corner of State Highway 50 and Fountain Creek. In Segment 2, wetlands along the banks of the Arkansas River east of I-25 will be impacted.

Additionally, encroachment will occur during construction on the wetlands located at the southeast corner of I-25 and Santa Fe Avenue, and the east side of the I-25 interchange with Pueblo Boulevard. The construction has the potential to result in temporary erosion, sedimentation, and destruction of riparian vegetation in the immediate area.

After construction is complete and the roadway is in operation, the widened transportation corridor will have a larger impervious, or paved, area. It is estimated that the Existing I-25 Alternative will create 168 acres of impervious highway area. The larger impervious area will generate more runoff, as rainfall has less pervious area to infiltrate into the ground. The majority of pollutants on the corridor are generated by vehicle traffic, with some additional particulate matter settling out of the air. The combined roadway pollutants and potential erosion sediment are the main pollutant constituents in the post-construction stormwater runoff.

Exhibit 13 presents a summary of quantitative analyses showing that each Build Alternative is expected to have similar effects on contributing additional pollutant loadings to the receiving streams in the project area. The results suggest that the water quality impacts to waters within the project area are not distinguishing criteria for the selection of one package over another. However, loading analysis has shown that there is a potential for lead, copper, and zinc concentrations to be elevated above the water quality standard during storm events for the Existing I-25 Alternative.

Modified I-25 Alternative

The implementation of the Modified I-25 Alternative would require widening the highway and potentially replacing structures near interchanges in Segment 1 (State Highway 47 to 1st Street), Segment 2 (1st Street to Northern Avenue), and Segment 3 (Northern Avenue to south of Pueblo Boulevard). Alignment of the Modified I-25 Alternative toe of slope has a greater footprint than the Existing I-25 Alternative, specifically in the project area stretching from Summit Avenue to South Santa Fe Avenue, which is located in Segment 2. The Modified I-25 Alternative will have more encroachment on riparian areas near the confluence of the Arkansas River and Fountain Creek than the Existing I-25 Alternative. More encroachment can be expected on the wetland area located at the southeast corner of I-25 and Santa Fe Avenue as well.

The improvements proposed in the Modified I-25 Alternative would present similar erosion and sediment control issues related to construction activities as in the Existing I-25 Alternative. After construction is complete, the widened transportation corridor will have a larger impervious area than before. It is estimated that the Modified I-25 Alternative will create 166 acres of impervious highway area versus 168 acres for the Existing I-25 Alternative.

Loading analysis has shown that there is a potential for total lead, copper, and zinc concentrations to be elevated above the water quality standard during storm events for this alternative.

Cumulative Impacts

In general, cumulative impacts on the water quality can be expected to further degrade this urban watershed due to the continuous increase in imperviousness unless measures are

taken to address these impacts and/or the water quality. Development densities are anticipated to increase within the project area. This increase in density is anticipated to increase urban runoff and, if unmitigated, would have a degrading effect on the water quality of receiving streams. If permanent BMPs are not implemented at central discharge points to the receiving water to collect existing and additional runoff from the new improvements, the water quality of the wetlands, Arkansas River, and Fountain Creek will continue to degrade substantially. The water quality degradation could consequently have a negative impact on the sensitive habitat areas in the project area .

References

CWCB, 2002.

Colorado Department of Public Health and Environment (CDPHE), 2004. *Guidance on Data Requirements and Data Interpretation Methods Used in Stream Standards and Classification Proceedings*. August.

Federal Highway Administration (FHWA), 1996. *Evaluation and Management of Highway Runoff*.

United States Environmental Protection Agency (USEPA). USEPA Permit Compliance System Database and USEPA ECHO Clean Water Act Search. April 9, 2012.

APPENDIX A

Highway Runoff Data Sources

Highway Runoff Data Sources

In addition to determining the baseline water quality, it was also important to determine possible impacts on water quality from the highway. To do this, data on the quality of runoff from the highway was necessary. Data relative to the quality of stormwater runoff from highways was obtained from various sources. These are summarized in Exhibit A-1.

EXHIBIT A-1
Highway Runoff Data

Name	Source/Author	Date
Colorado Department of Transportation (CDOT), NPDES Permit Characterization Data	CDOT	1993
<i>Effects of Highway Runoff on Receiving Waters</i> , Volume I: Executive Summary: Federal Highway Administration Report FHWA/RD-84/062	T.V. Dupuis, P. Bertram, J. Meyer, M. Smith, N. Kobriger, and J. Kaster	1985
<i>Effects of Highway Runoff on Receiving Waters</i> , Volume II: Research Report: Federal Highway Administration Report FHWA/RD-84/062, 406 p.	T.V. Dupuis, P. Bertram, J. Meyer, M. Smith, N. Kobriger, and J. Kaster	1985
<i>Effects of Highway Runoff on Receiving Waters</i> , Volume III Resource Document for Environmental Assessments: Federal Highway Administration Final Report FHWA/RD-84/064	T.V. Dupuis, P. Bertram, J. Meyer, M. Smith, N. Kobriger, and J. Kaster	1985
<i>Effects of Highway Runoff on Receiving Waters</i> Volume IV: Guidelines for Conducting Field Studies: Federal Highway Administration Final Report FHWA/RD-84/065	T.V. Dupuis, N. Kobriger, and J. Kaster	1985
<i>Effects of Highway Runoff on Receiving Waters</i> , Volume V: Resource Document for Environmental Assessments: Federal Highway Administration Final Report FHWA/RD-84/066	T.V. Dupuis, W. Kreutzberger, J. Kaster, and T. Harris	1985
<i>A Review of Semivolatile and Volatile Organic Compounds in Highway Runoff and Urban Stormwater</i> , Open-File Report 98-409	United States Department of Transportation and USGS	1998
<i>Results of the Nationwide Urban Runoff Program</i> , PD84185537	United States Environmental Protection Agency	1983
<i>Evaluation and Management of Highway Runoff Water Quality</i> , Publication No. FHWA-PD-96-032	United States Department of Transportation and Federal Highway Administration	1996

Other Data Resources

In addition to the sources of information listed above, other data and information were necessary to determine the magnitude of impacts of the highway expansion on water quality. The documents listed in Exhibit A-2 contain data that were also used to evaluate water quality impacts.

EXHIBIT A-2
Miscellaneous Data

Document Name	Authors	Date
<i>Selenium Source Characterization Final Report - Investigation of Naturally Occurring Selenium, Pueblo, CO</i>	ARCADIS Geraghty & Miller	1998
"Trends in Precipitation and Streamflow in the Fountain Creek Watershed, Southeastern Colorado 1977-99," United States Geologic Survey (USGS) Fact Sheet 136-00	Robert W. Stogner, Sr. USGS	2000
<i>Water Quality Variations and Trends in Monument and Fountain Creeks, El Paso and Pueblo Counties, Colorado Water Years 1976-88</i> , Water Resources Investigation Report, 91-4176	Barbara Ruddy, USGS	1993
<i>Trends in Precipitation and Stream Morphology in the Fountain Creek Watershed, Colorado 1939-99</i> , Water Resource Investigation Report, 00-4130	Robert W. Stogner, Sr. USGS	2000
<i>Water Quality of Fountain and Monument Creeks, South Central Colorado, with Emphasis on Relation of Water Quality to Stream Classifications</i> , Water Resource Investigation Report, 88-4132	Patrick Edelman	1990
<i>Methodology and Significance of Studies of Atmospheric Deposition in Highway Runoff</i> , Open file report 01-259	United States Department of Transportation and USGS	2001
<i>Pilot Study of Environmental Effects of Caliber M1000 and CAST Magnesium Chloride Research Synthesis</i> , CDOT Research Study Progress Report	CDOT	2001
<i>Studies of Environmental Effects of Magnesium Chloride Deicer in Colorado</i> , Report No. CDOT-DTD-R-99-10	M.W. Lewis, CDOT Research Branch	1999
<i>The Effects of Calcium Magnesium Acetate (CMA) Deicing Material on the Water Quality of Bear Creek, Clackamas County Oregon</i> , 1999 Water Resources Investigations Report 00-4092	USGS, Tanner and Wood	2000
<i>Results from Winter 1997-1998: The Environmental Impact of Deicers to Boulder Creek</i>	Water Quality and Environmental Services, City of Boulder, Colorado, M. Rohweder	1998
<i>Assessing Biological Effects from Highway-Runoff Constituents</i> , Open File Report 99-204	United States Department of Transportation and USGS	1999

APPENDIX B

**United States Geological Survey
Water Quality Data**

TABLE B-1

Summary Statistics for Selected Water Quality Constituents at USGS Station Number 07099400 Arkansas River Near Pueblo Reservoir Pueblo, Colorado (Period of Record 2007 – 2012)

Constituent	Units	Number of Values	Number of Censored Values	Mean	Standard Deviation	Minimum	Lower Quartile	Median	Upper Quartile	Maximum	Existing Quality (Percentile)	Existing Quality	Water Quality Standard	Exceeds WQ Standard
<i>Physical and Biological Parameters</i>														
Stream Width	feet	43	14	99	21.7	64.0	80.0	100	120	140	---	---	---	---
Temperature	°C	93	0	13	6.2	2.3	6.8	13.2	18.4	22.5	85th	19.4	---	---
Instantaneous Discharge	ft ³ /s	93	0	866	979.1	47.0	115.0	463	1200	3720	---	---	---	---
Specific Conductance	uS/cm	93	0	380	78.6	203.0	319.0	409	433	560	---	---	---	---
Dissolved Oxygen	mg/l	26	0	9	1.0	7.6	8.5	9.2	10	11.1	15th	10.7	5	No
pH	Standard	46	0	8	0.2	7.6	8.0	8.1	8.3	8.6	Range 15th - 85th	8.4	6.5-9.0	No
E. coli	MPN/100 ml	1	0	2	NA	2.0	2.0	2	2	2	geometric mean	2	126	No
Total Dissolved Solids	mg/l	20	0	237	45.6	128.0	219.8	254.5	267	291	---	---	---	---
<i>Inorganic Parameters</i>														
Dissolved Ammonia as N	mg/l	26	13	0	0.0	0.0	0.0	0.02	0.036	0.08	85th	0.049	---	---
Dissolved Nitrite as N	mg/l	25	9	0	0.0	0.0	0.0	0.004	0.008	0.017	85th	0.0094	0.05	No
Dissolved Nitrate as N	mg/l	25	4	0	0.1	0.1	0.2	0.211	0.237	0.309	85th	0.25	10	No
Dissolved Nitrate + Nitrite as N	mg/l	26	0	0	0.1	0.1	0.2	0.214	0.239	0.315	85th	0.25	---	---
<i>Total Phosphorus</i>														
Dissolved Phosphorus	mg/l	25	3	0	0.0	0.0	0.0	0.015	0.019	0.041	85th	0.02	---	---
<i>Metals</i>														
Hardness	mg/l	20	0	168	28.0	99.7	160.3	179.5	186.5	198	Mean	168	---	---
Calcium	mg/l	20	0	47	6.8	30.3	45.8	49.7	52.25	54.1	85th	52.6	---	---
Magnesium	mg/l	20	0	12	2.7	5.9	11.2	13.2	14	15.2	85th	14	---	---
Chloride	mg/l	20	0	7	1.7	2.8	6.0	7.565	7.9825	8.67	85th	8.23	250	No

TABLE B-1

Summary Statistics for Selected Water Quality Constituents at USGS Station Number 07099400 Arkansas River Near Pueblo Reservoir Pueblo, Colorado (Period of Record 2007 – 2012)

Constituent	Units	Number of Values	Number of Censored Values	Mean	Standard Deviation	Minimum	Lower Quartile	Median	Upper Quartile	Maximum	Existing Quality (Percentile)	Existing Quality	Water Quality Standard	Exceeds WQ Standard
Sulfate	mg/l	20	0	90	23.5	37.1	78.0	99.8	107	121	85th	109	250	No
Dissolved Selenium	ug/l	7	0	4	0.6	2.9	3.5	4.2	4.3	4.5	85th	4.41	17.4	No

Notes:

--- = no stream standard or no value

°C = degrees Celsius

µg/L, micrograms per liter

µS/cm = microsiemens per centimeter at 25 degrees Celsius

ac = acute water quality standard

censored values = values below the reporting limit

ch = chronic water quality standard

ft³/s = cubic feet per second

mg/L, milligrams per liter

MPN = most probable number

MPN/ 100 mL = XX per 100 milliliters

TABLE B-2

Summary Statistics for Selected Water Quality Constituents at USGS Station Number 0799970 Arkansas River at Santa Fe Bridge at I-25 Pueblo, Colorado (Period of Record 2007 – 2012)

Constituent	Units	Number of Values	Number of Censored Values	Mean	Standard Deviation	Minimum	Lower Quartile	Median	Upper Quartile	Maximum	Existing Quality (Percentile)	Existing Quality	Water Quality Standard	Exceeds WQ Standard
<i>Physical and Biological Parameters</i>														
Stream Width	feet	30	4	141	55.1	40.0	90.5	159	182	210	---	---	---	---
Temperature	°C	51	0	11	6.2	2.5	4.8	9.6	15.3	22.4	85th	19.3	---	---
Instantaneous Discharge	cfs	51	0	688	919.6	25.0	71.5	293	931.5	3610	NA	NA	---	---
Specific Conductance	uS/cm	51	0	517	133	221	452	517	610	958	NA	NA	---	---
Dissolved Oxygen	mg/l	14	0	10	1.3	7.9	10.0	10.8	11.1	11.9	15th	8.6	5	No
pH	12s	30	0	8	0.2	8.0	8.3	8.4	8.5	8.7	Range of 15th - 85th	8.5	6.5 - 9	No
E. coli	MPN/100 mL	12	0	38	74.5	2.0	4.8	7.5	16	250	geometric mean	10.7	126	No
Total Dissolved Solids	mg/l	30	0	335	95.3	130	282	326	410	539	---	---	---	---
<i>Inorganic Parameters</i>														
Ammonia as N	mg/l	12	9	0	0.0	0.0	0.0	0.02	0.02	0.08	---	---	---	---
Chloride	mg/l	20	0	10	4.0	3.3	7.8	9.45	13.6	16.6	85th	14.1	250	No
Sulfate	mg/l	20	0	140	55.6	45.9	101.1	132	184.75	240	85th	193	250	No
<i>Metal Parameters</i>														
Hardness	mg/l	20	0	211	55.2	99.7	181	209	255	302	mean	211	---	---
Calcium	mg/l	20	0	58	13.6	29.3	50.7	57.15	68.0	80.7	---	---	---	---
Magnesium	mg/l	20	0	16	5.2	6.5	13.2	16.3	20.5	24.3	---	---	---	---
Dissolved Selenium	ug/l	19	0	13	8.0	1.9	6.2	10.7	21.1	27.1	85th	21.5	17.4	Yes
Total Selenium	ug/l	5	0	12	8.2	5.0	5.3	8.2	16.2	24	---	---	---	---

TABLE B-2

Summary Statistics for Selected Water Quality Constituents at USGS Station Number 0799970 Arkansas River at Santa Fe Bridge at I-25 Pueblo, Colorado (Period of Record 2007 – 2012)

Constituent	Units	Number of Values	Number of Censored Values	Mean	Standard Deviation	Minimum	Lower Quartile	Median	Upper Quartile	Maximum	Existing Quality (Percentile)	Existing Quality	Water Quality Standard	Exceeds WQ Standard
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Notes:

--- = no stream standard or no value

°C = degrees Celsius

µg/L, micrograms per liter

µS/cm = microsiemens per centimeter at 25 degrees Celsius

ac = acute water quality standard

censored values = values below the reporting limit

ch = chronic water quality standard

ft³/s = cubic feet per second

mg/L, milligrams per liter

MPN = most probable number

MPN/ 100 mL = XX per 100 milliliters

tr = trout

TABLE B-3

Summary Statistics for Selected Water Quality Constituents at USGS Station Number 07105800 Arkansas River at Avondale about 10 miles East of Pueblo, Colorado (Period of Record 2007 – 2012)

Constituent	Units	Number of Values	Number of Censored Values	Mean	Standard Deviation	Minimum	Lower Quartile	Median	Upper Quartile	Maximum	Existing Quality (Percentile)	Existing Quality	Water Quality Standard	Exceeds WQ Standard
<i>Physical and Biological Parameters</i>														
Stream Width	feet	177	10	65	24.9	34.0	52.0	61	70	280	---	---	---	---
Temperature	°C	177	0	14	6.6	0	8.5	13.5	19.5	28	85th	21.78	---	---
Instantaneous Discharge	cfs	241	0	708	1310	40.0	75.0	111	555	7680	NA	NA	---	---
Specific Conductance	uS/cm	177	1	719	181.4	231	605	759	813	1280	85th	854	---	---
Dissolved Oxygen	mg/l	40	0	8	1.3	6.0	7.3	8.3	9.125	11.2	15th	7.17	5	No
pH	Standard	41	0	8	0.2	7.6	8.1	8.3	8.4	8.6	Range of 15th - 85th	8.40	6.5-9	No
E. coli	MPN/100 mL	100	5	2589	10706	2.0	32.5	120	440	92000	Geometric mean	153	126	Yes
<i>Inorganic Parameters</i>														
Dissolved Ammonia as N	mg/l	30	1	0	0.2	0.0	0.1	0.164	0.250	0.979	85th	0.33	---	---
Dissolved Nitrate + Nitrite as N	mg/l	30	0	3	1.1	0.9	1.7	3.09	3.64	4.89	85th	3.91	---	---
Total Phosphorus	mg/l	30	0	2	1.1	0.4	0.7	1.12	1.75	4.99	85th	2.48	---	---
<i>Metal Parameters</i>														
Hardness	mg/l	30	0	178	50.6	67.9	142	196	219	241	mean	178	---	---
Calcium	mg/l	30	0	49	13.1	20.2	39.5	52	58.2	66.2	85th	61	---	---
Magnesium	mg/l	30	0	14	4.4	4.2	11.5	15.4	17.1	19.2	85th	18	---	---
Total Arsenic	ug/l	28	0	5	5.5	1.1	1.7	2.3	7.7	20.3	50th	2.30	10	no
Dissolved Copper	ug/l	30	1	3	1.1	0.9	2.3	2.75	3.48	5.5	85th	3.70	15	No
Total Recoverable Lead	ug/l	29	0	43	127	0.7	1.6	2.41	33.9	680	50th	2.41	NA	NA
Dissolved Manganese	ug/l	30	0	15	16.6	2.4	4.1	6.2	19.3	66.5	85th	30.19	290	No
Total Recoverable Nickel	ug/l	29	0	11	13.5	2.4	3.1	3.8	12.1	56.4	50th	3.8	NA	NA
Dissolved Zinc	ug/l	30	0	21	10.6	3.1	11.8	20.3	29.5	43.3	85th	30.89	203	No
Dissolved Selenium	ug/l	39	0	3	1.0	1.3	2.8	3.3	3.9	5.6	85th	4.03	14.1	No

TABLE B-2

Summary Statistics for Selected Water Quality Constituents at USGS Station Number 0799970 Arkansas River at Santa Fe Bridge at I-25 Pueblo, Colorado (Period of Record 2007 – 2012)

Constituent	Units	Number of Values	Number of Censored Values	Mean	Standard Deviation	Minimum	Lower Quartile	Median	Upper Quartile	Maximum	Existing Quality (Percentile)	Existing Quality	Water Quality Standard	Exceeds WQ Standard
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Abbreviations: ft³/s, cubic feet per second; μ S/cm, microsiemens/cm at 25 °C; mg/L, milligrams per liter; μ g/L, micrograms per liter; μ g/L, micrograms per liter; ---, no stream standard or no value; ac, acute water quality standard; ch, chronic water quality standard; tr, trout; censored values, values below the reporting limit.

TABLE B-4

Summary Statistics for Selected Water Quality Constituents at USGS Station Number 07106300 Fountain Creek at Pinon, Colorado (Period of Record 2007 – 2012)

Constituent	Units	Number of Values	Number of Censored Values	Mean	Standard Deviation	Minimum	Lower Quartile	Median	Upper Quartile	Maximum	Existing Quality (Percentile)	Existing Quality	Water Quality Standard	Exceeds WQ Standard
<i>Physical and Biological Parameters</i>														
Stream Width	feet	41	2	59	18.5	13.5	50.0	63	70	100	---	---	---	---
Temperature	deg C	40	0	15	7.0	3.3	9.8	15.4	20.1	30.5	85th	23.2	---	---
Instantaneous Discharge	cfs	40	4	156	266	6.8	40.3	77	112	1200	---	---	---	---
Specific Conductance	uS/cm	40	0	968	193	423	976	1020	1070	1210	---	---	---	---
Dissolved Oxygen	mg/l	33	0	8	1.4	5.9	7.0	8.2	9.0	11.4	15th	6.9	5	No
pH	Standard	40	0	8	0.2	7.9	8.0	8.2	8.3	8.5	Range of 15th - 85th	8.4	6.5 - 9	No
E. coli	MPN/10 0 mL	32	0	905	2539	2.0	19.8	70	193	12000	geometric mean	82	126	No
<i>Inorganic Parameters</i>														
Dissolved Ammonia as N	mg/l	23	16	0	0.035	0.010	0.014	0.02	0.02	0.181	85th	0.021	---	---
Dissolved Nitrate + Nitrite as N	mg/l	25	0	2	1.0	1.1	1.5	2.39	3.05	4.04	85th	3.88	---	---
Total Phosphorus	mg/l	23	0	1	1.0	0.3	0.5	1.17	1.435	4.38	85th	1.58	---	---
Sulfate	mg/l	28	0	221	58.6	86.5	213	243	257.75	290	85th	269.8	485	No
<i>Metal Parameters</i>														
Hardness	mg/l	6	0	286	78.7	127	310	312	317	339	mean	286	---	---
Calcium	mg/l	6	0	77	20.3	36.4	83.6	83.9	84.8	91.4	85th	86.6	---	---
Magnesium	mg/l	6	0	23	6.8	8.9	24.3	25.2	25.6	27	85th	26.0	---	---
Total Arsenic	ug/l	1	0	20.6	---	20.6	20.6	20.6	20.6	20.6	50th	20.6	---	---
Dissolved Copper	ug/l	1	0	1	---	1.0	1.0	1.0	1.0	1.0	85th	1	---	---
Total Recoverable Lead	ug/l	1	0	119	---	119	119	119	119	119	50th	119	---	---
Dissolved Manganese	ug/l	23	0	4	2.8	1.3	2.8	3.6	5	13.2	85th	6.3	50 ^A	No
Total Recoverable Nickel	ug/l	1	0	52	---	51.9	51.9	51.9	51.9	51.9	50th	51.9	---	---
Dissolved Zinc	ug/l	1	0	4	---	3.5	3.5	3.5	3.5	3.5	85th	3.5	---	---
Dissolved Selenium	ug/l	40	0	4	0.9	1.8	3.8	4.3	4.63	5.6	85th	4.8	28.1	No

TABLE B-4

Summary Statistics for Selected Water Quality Constituents at USGS Station Number 07106300 Fountain Creek at Pinon, Colorado (Period of Record 2007 – 2012)

Constituent	Units	Number of Values	Number of Censored Values	Mean	Standard Deviation	Minimum	Lower Quartile	Median	Upper Quartile	Maximum	Existing Quality (Percentile)	Existing Quality	Water Quality Standard	Exceeds WQ Standard
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Abbreviations: ft³/s, cubic feet per second; μ S/cm, microsiemens/cm at 25 °C; mg/L, milligrams per liter; μ g/L, micrograms per liter; μ g/L, micrograms per liter; ---, no stream standard or no value; ac, acute water quality standard; ch, chronic water quality standard; tr, trout; censored values, values below the reporting limit.

^aFor all surface waters with an actual water supply use, the less restrictive use of the following two options were applied as numerical standards (1) existing water quality as of January 1, 2000, or (2) Iron = 300 μ g/L (dissolved), Manganese = 50 μ g/L (dissolved), SO₄ = 250 mg/L.

TABLE B-5

Summary Statistics for Selected Water Quality Constituents at USGS Station Number 07106500 Fountain Creek at State Highway 50 (La Junta exit) in Pueblo, Colorado (Period of Record 2007 – 2012)

Constituent	Units	Number of Values	Number of Censored Values	Mean	Standard Deviation	Minimum	Lower Quartile	Median	Upper Quartile	Maximum	Existing Quality (Percentile)	Existing Quality	Water Quality Standard	Exceeds WQ Standard
<i>Physical and Biological Parameters</i>														
Stream Width	feet	88	3	71	16.3	32.0	60.0	73.55	84	111	---	---	---	---
Temperature	deg C	145	0	15	8.2	0.0	8.0	14.8	20.9	32	85th	24.4	---	---
Instantaneous Discharge	cfs	182	3	216	343.4	8.6	75.0	120	178.25	3000	---	---	---	---
Specific Conductance	uS/cm	143	0	1104	238.6	512.0	1010.0	1110	1220	1770	---	---	---	---
Dissolved Oxygen	mg/l	33	0	9	1.7	6.4	7.8	8.3	9.9	12.6	15th	7.3	5	No
pH	standard	51	0	8	0.2	7.8	8.2	8.3	8.4	8.8	Range of 15 - 85th	8.5	6.5 - 9	No
E. coli	MPN/100 mL	32	1	1310	4657.3	2.0	11.0	46.5	152.5	25000	geometric mean	58	126	No
Total Dissolved Solids	mg/l	35	0	852	202.3	332.0	745.0	813	910.5	1330	---	---	---	---
<i>Inorganic Parameters</i>														
Dissolved Ammonia as N	mg/l	23	18	0	0.0	0.0	0.0	0.018	0.02	0.072	85th	0.020	---	---
Dissolved Nitrate + Nitrite as N	mg/l	25	0	2	0.9	0.7	1.5	2.24	2.4	3.9	85th	3.6	---	---
Total Phosphorus	mg/l	23	0	2	2.7	0.1	0.4	0.78	1.215	9.33	85th	3.4	---	---
Chloride	mg/l	24	0	70	12.8	27.8	64.9	73.1	76.5	94.6	85th	78.5	250	No
Sulfate	mg/l	40	0	336	134.6	122.0	282.8	317	361.25	666	85th	418	485	No
<i>Metal Parameters</i>														
Hardness	mg/l	25	0	378	102.1	154.0	339.0	367	402	605	mean	378	---	---
Calcium	mg/l	25	0	89	17.2	41.7	82.9	90.8	97.8	115	85th	103	---	---
Magnesium	mg/l	25	0	38	15.6	12.2	31.7	34.2	39.1	77	85th	49.9	---	---
Total Arsenic	ug/l	1	0	28.7	---	28.7	28.7	28.7	28.7	28.7	50th	28.7	---	---
Dissolved Copper	ug/l	1	0	1	---	1.2	1.2	1.2	1.2	1.2	85th	1.2	---	---
Total Recoverable Lead	ug/l	1	0	212	---	212.0	212.0	212	212	212	50th	212	---	---
Dissolved Manganese	ug/l	23	0	8	12.3	1.1	3.6	4.1	5.95	60.6	85th	6.9	50 ^a	No
Total Recoverable Nickel	ug/l	1	0	97	---	97.1	97.1	97.1	97.1	97.1	50th	97.1	---	---

TABLE B-5

Summary Statistics for Selected Water Quality Constituents at USGS Station Number 07106500 Fountain Creek at State Highway 50 (La Junta exit) in Pueblo, Colorado (Period of Record 2007 – 2012)

Constituent	Units	Number of Values	Number of Censored Values	Mean	Standard Deviation	Minimum	Lower Quartile	Median	Upper Quartile	Maximum	Existing Quality (Percentile)	Existing Quality	Water Quality Standard	Exceeds WQ Standard
Dissolved Zinc	ug/l	1	0	4	---	4.4	4.4	4.4	4.4	4.4	85th	4.4	---	---

Abbreviations: ft³/s, cubic feet per second; μ S/cm, microsiemens/cm at 25 °C; mg/L, milligrams per liter; μ g/L, micrograms per liter; μ g/L, micrograms per liter; ---, no stream standard or no value; ac, acute water quality standard; ch, chronic water quality standard; tr, trout; censored values, values below the reporting limit.

^aFor all surface waters with an actual water supply use, the less restrictive use of the following two options were applied as numerical standards (1) existing water quality as of January 1, 2000, or (2) Iron = 300 μ g/L (dissolved), Manganese = 50 μ g/L (dissolved), SO₄ = 250 mg/L.

APPENDIX C

**Colorado Department of Public Health and
Environment Water Quality Data**

TABLE C-1

Summary Statistics for Selected Water Quality Constituents at CDPHE Station Number 5 Lower Arkansas River East of Pueblo, CO (Segment 1b)

Constituent	Units	Number of Values	Number of Censored Values	Period of Record (month/year)	Mean	Standard Deviation	Minimum	Lower Quartile	Median	Upper Quartile	Maximum	Existing Quality (Percentile)	Existing Quality	Water Quality Standard	Exceeds WQ Standard
<i>Physical and Biological Parameters</i>															
Water Temperature	°C	26	0	1/1996-2/1998	12	8.3	1.1	5.3	10.8	18.9	25	85th	22.8	Max 30°C	No
Dissolved Oxygen	mg/L	26	1	1/1996-2/1998	10.5	2.5	6.4	8.6	10.8	12.6	14.7	15th	7.6	5.0	No
pH	Standard	23	0	1/1996-2/1998	8.2	0.2	7.8	8.1	8.2	8.3	8.5	Range of 15 th -85 th	8.0-8.3	6.5-9.0	No
Fecal Coliform Bacteria	Colonies/100mL	17	1	1/1996-2/1998	321.6	658.4	10	30	150	232	27000	Geometric Mean	113.7	200	No
<i>Inorganic Parameters</i>															
Dissolved Ammonia as Nitrogen	mg/L	23	0	1/1996-2/1998	0.0041	0.0034	0.0009	0.0018	0.0028	0.0050	0.0142	85th	0.0071	NH ₃ (ch) = 0.1 NH ₃ (ac) = 0.31	ch=no ac=no
Total Boron	µg/L	12	0	3/1996-1/1998	109.8	53.9	22	79	100	135	220	85th	157	750	No
Dissolved Nitrite Plus Nitrate as Nitrogen ^A	mg/L	26	0	1/1996-2/1998	2.3	1.4	0.6	1.2	2	3.4	6.2	85th	3.7	NO ₂ = 1.0 NO ₃ = 10	No (nitrite?)
Dissolved Sulfate	mg/L	26	0	1/1996-2/1998	319	125	130	230	315	430	580	85th	435	SO ₄ = 1078	No
<i>Metal Parameters</i>															
Dissolved Arsenic	µg/L	13	7	1/1996-1/1998	1.2	0.4	1	1	1	1	2	85th	1.3	As(ac) = 50 (Trec)	No
Dissolved Cadmium	µg/L	26	1	1/1996-2/1998	0.7	0.3	0.3	0.4	0.5	0.8	1.3	85th	0.8	ac = 1 6.24 ac (trout) = 14.1 ch = 5.57	No
Dissolved Copper	µg/L	26	17	1/1996-2/1998	7.1	2.7	5	5	6	10	11	85th	10.8	ac = 39.97 ch = 24.07	No

TABLE C-1

Summary Statistics for Selected Water Quality Constituents at CDPHE Station Number 5 Lower Arkansas River East of Pueblo, CO (Segment 1b)

Constituent	Units	Number of Values	Number of Censored Values	Period of Record (month/year)	Mean	Standard Deviation	Minimum	Lower Quartile	Median	Upper Quartile	Maximum	Existing Quality (Percentile)	Existing Quality	Water Quality Standard	Exceeds WQ Standard
Dissolved Iron	µg/L	25	0	1/1996-2/1998	2899	4061	280	1200	2000	2500	18000	85th	2740	Fe(ch) = 300*	Yes
Dissolved Lead	µg/L	26	26	2/1997-4/1997	---	---	---	---	---	---	---	---	---	ac = 222 ch = 8.63	---
Dissolved Manganese	µg/L	26	2	1/1996-2/1998	15.7	11	5	6.8	14.5	18.3	48	85th	24.9	ac = 4389 ch = 2425 ch = 50	No
Dissolved Mercury	µg/L	14	14	1/1996-1/1998	---	---	---	---	---	---	---	---	---	ch = 0.01 (tot)	---
Dissolved Selenium	µg/L	26	1	1/1996-2/1998	14.3	9.5	5	9	12	17	48	85th	18	ac = 18.4 ch = 16 ^B	Yes
Dissolved Zinc	µg/L	26	2	1/1996-2/1998	16.5	10.6	9	12.8	16.5	20.3	24	85th	21.8	ac = 312 ch = 315	No
Hardness	mg/L	26	0	1/1996-2/1998	347	107.5	160	273	330	460	530	Lower 95% confidence of mean	306	---	---

Abbreviations: mg/L, milligrams per liter; µg/L, micrograms per liter; --- no stream standard or no value; ac, acute water quality standard; ch, chronic water quality standard; tr, trout; censored values, values below the reporting limit.

^ANitrate (NO₃) plus nitrite (NO₂) were not distinguished in data set.

^BTemporary modification for Se(ch) = 23, based on uncertainty. Expiration date of 12/31/07.

TABLE C-2

Summary Statistics for Selected Water Quality Constituents at CDPHE Station Number 15 Mainstream of Fountain Creek to Arkansas Confluence in Pueblo, CO (segment 2b)

Constituent	Units	Number of Values	Number of Censored Values	Period of Record (month/ year)	Mean	Standard Deviation	Minimum	Lower Quartile	Median	Upper Quartile	Maximum	Existing Quality (Percentile)	Existing Quality	Water Quality Standard	Exceeds WQ Standard
<i>Physical and Biological Parameters</i>															
Water Temperature	°C	24	0	1/1996-1/1998	9.8	7.3	0	3.6	9.4	16.1	21.1	85th	18.1	Max 30°C	No
Dissolved Oxygen	mg/L	24	0	1/1996-1/1998	10.8	2.2	7.6	9	11	12.5	14.5	15th	8.3	5.0	No
pH	Standard	23	0	1/1996-1/1998	8.3	0.2	7.8	8.1	8.3	8.4	8.6	Range of 15 th -85 th	8.0-8.5	6.5-9.0	No
Fecal Coliform Bacteria	Colonies/100mL	13	0	1/1996-1/1998	1331	3835	10	40	150	350	14000	Geometric Mean	149.3	200	No
<i>Inorganic Parameters</i>															
Dissolved Ammonia as Nitrogen	mg/L	23	0	1/1996-1/1998	0.0037	0.0023	0.0008	0.0018	0.0031	0.0049	0.0095	85th	0.0058	NH ₃ (ch) = 0.1 NH ₃ (ac) = 0.31	ch=no ac=no
Total Boron	µg/L	13	0	1/1996-1/1998	164.6	35.7	110	140	180	190	210	85th	192	750	No
Dissolved Nitrite Plus Nitrate as Nitrogen ^A	mg/L	24	0	1/1996-1/1998	4.3	1.9	0.8	3	4.4	6	7.0	85th	6.3	NO ₂ = 1.0 NO ₃ = 10	No (nitrite?)
Dissolved Sulfate	mg/L	22	0	1/1996-1/1998	330	98.5	31	295	350	380	480	85th	397	1b = 1078 2b = 490	No
<i>Metal Parameters</i>															
Dissolved Arsenic	µg/L	13	2	1/1996-1/1998	1.5	0.5	1	1	2	2	2	85th	2	50 (Trec)	No
Dissolved Cadmium	µg/L	24	0	1/1996-1/1998	0.8	0.3	0.3	0.5	0.6	1.1	1.4	85th	1.2	ac = 16.24 ac (trout) = 14.1 ch = 5.57	No
Dissolved Copper	µg/L	24	11	1/1996-1/1998	7	2.8	4	5	6	9	13	85th	10	ac = 39.97 ch = 24.07	No

TABLE C-2

Summary Statistics for Selected Water Quality Constituents at CDPHE Station Number 15 Mainstream of Fountain Creek to Arkansas Confluence in Pueblo, CO (segment 2b)

Constituent	Units	Number of Values	Number of Censored Values	Period of Record (month/ year)	Mean	Standard Deviation	Minimum	Lower Quartile	Median	Upper Quartile	Maximum	Existing Quality (Percentile)	Existing Quality	Water Quality Standard	Exceeds WQ Standard
Dissolved Iron	µg/L	24	0	2/1996-1/1998	16675	39853	500	2475	3700	7125	150000	85th	9425	Fe(ch) = 300 ^A	Yes
Dissolved Lead	µg/L	24	23	2/1997-4/1997	1	1	1	1	1	1	1	85th	1	ac =222 ch = 8.63	No
Dissolved Manganese	µg/L	23	9	1/1996-1/1998	9.5	10.6	4	4	6.5	9	45	85th	12	ac = 4 389 ch = 2425 ch = 50	No
Dissolved Mercury	µg/L	14	12	1/1996-1/1998	0.5	0.1	0.4	0.4	0.5	0.5	0.5	85th	0.5	ch = 0.01 (tot)	---
Dissolved Selenium	µg/L	24	0	1/1996-1/1998	20.3	9	6	16.5	20	22	45	85th	24.7	ac = 18.4 ch = 23 ^B	Yes
Dissolved Zinc	µg/L	23	16	3/1996-1/1998	12.3	3.8	8	10	11	14	19	85th	15.4	ac = 312 ch = 315	No
Hardness	mg/L	24	0	1/1996-1/1998	340	71.6	160	330	350	373	450	Lower 95% confidence of mean	311	---	---

Abbreviations: mg/L, milligrams per liter; µg/L, micrograms per liter; --- no stream standard or no value; ac, acute water quality standard; ch, chronic water quality standard; tr, trout; censored values, values below the reporting limit.

^ANitrate (NO₃) plus nitrite (NO₂) were not distinguished in data set.

^BTemporary modification for Se(ch) = 23, based on uncertainty. Expiration date of 12/31/07.

APPENDIX D

Low Flow Loading Analysis

Project Segment 1 - Discharge to Fountain Creek		Highway Runoff Conditions					Upstream Stream Conditions		Conditions Leaving Segment 1		Water Quality Standard Evaluation			
Alternative	Pollutants of Concern	Concentration (mg/L)	Runoff Coefficient	Rainfall Intensity (in/hr)*	Area (acres)	Runoff Flow (cfs) =CIA	Concentration (mg/L)	Acute Low Flow (cfs)	Concentration Downstream (mg/L)	Combined Flow Downstream (cfs)	Concentration in Stream after Highway Runoff Discharge (mg/L)	Water Quality Stream Standard (mg/L)	Potential to Exceed Water Quality Standard	
No Action Alternative	Total Suspended Solids ^A	798	0.99	0.032	35.60	1.13	NA	7.60	NA	8.73	NA	NA	NA	
	Fecal Coliform ^A	590	0.99	0.032	35.60	1.13	208.00	7.60	257.36	8.73	257.36	200.00	Yes	
	Dissolved Ammonia as Nitrogen	0.22	0.99	0.032	35.60	1.13	0.02	7.60	0.05	8.73	0.05	NA	No	
	Dissolved Nitrate + Nitrite as Nitrogen	1.636	0.99	0.032	35.60	1.13	3.88	7.60	3.59	8.73	3.59	10**	NA	
	Total Phosphorus	0.998	0.99	0.032	35.60	1.13	1.58	7.60	1.50	8.73	1.50	NA	NA	
	Total Arsenic	0.058	0.99	0.032	35.60	1.13	0.021	7.60	0.03	8.73	0.03	0.34 ^B	No	
	Total Chromium	0.04	0.99	0.032	35.60	1.13	0.004	7.60	0.01	8.73	0.01	0.05	No	
	Total Copper	7.033	0.99	0.032	35.60	1.13	0.07	7.60	0.97	8.73	0.97	0.036 ^B	Yes	
	Total Iron	10.3	0.99	0.032	35.60	1.13	0.105	7.60	1.42	8.73	1.42	5.28	No	
	Total Lead	1.78	0.99	0.032	35.60	1.13	0.12	7.60	0.33	8.73	0.33	0.198 ^B	Yes ^E	
	Total Zinc	0.929	0.99	0.032	35.60	1.13	0.30	7.60	0.38	8.73	0.38	0.351 ^B	Yes ^E	
Existing I-25 Alternative	Total Suspended Solids ^A	798	0.99	0.032	62.40	1.98	NA	7.60	NA	9.58	NA	NA	NA	
	Fecal Coliform ^A	590	0.99	0.032	62.40	1.98	208.00	7.60	286.85	9.58	286.85	200.00	Yes	
	Dissolved Ammonia as Nitrogen	0.22	0.99	0.032	62.40	1.98	0.02	7.60	0.06	9.58	0.06	NA	No	
	Dissolved Nitrate + Nitrite as Nitrogen	1.636	0.99	0.032	62.40	1.98	3.88	7.60	3.42	9.58	3.42	10**	No	
	Total Phosphorus	0.998	0.99	0.032	62.40	1.98	1.58	7.60	1.46	9.58	1.46	NA	NA	
	Total Arsenic	0.058	0.99	0.032	62.40	1.98	0.021	7.60	0.03	9.58	0.03	0.34 ^B	No	
	Total Chromium	0.04	0.99	0.032	62.40	1.98	0.004	7.60	0.01	9.58	0.01	0.05	No	
	Total Copper	7.033	0.99	0.032	62.40	1.98	0.07	7.60	1.51	9.58	1.51	0.036 ^B	Yes ^E	
	Total Iron	10.3	0.99	0.032	62.40	1.98	0.105	7.60	2.21	9.58	2.21	5.28	No	
	Total Lead	1.78	0.99	0.032	62.40	1.98	0.12	7.60	0.46	9.58	0.46	0.198 ^B	Yes ^E	
	Total Zinc	0.929	0.99	0.032	62.40	1.98	0.30	7.60	0.43	9.58	0.43	0.351 ^B	Yes ^E	
Modified I-25 Alternative	Total Suspended Solids ^A	798	0.99	0.032	62.40	1.98	NA	7.60	NA	9.58	NA	NA	NA	
	Fecal Coliform ^A	590	0.99	0.032	62.40	1.98	208.00	7.60	286.85	9.58	286.85	200.00	Yes	
	Dissolved Ammonia as Nitrogen	0.22	0.99	0.032	62.40	1.98	0.02	7.60	0.06	9.58	0.06	NA	NA	
	Dissolved Nitrate + Nitrite as Nitrogen	1.636	0.99	0.032	62.40	1.98	3.88	7.60	3.42	9.58	3.42	10**	No	
	Total Phosphorus	0.998	0.99	0.032	62.40	1.98	1.58	7.60	1.46	9.58	1.46	NA	NA	
	Total Arsenic	0.058	0.99	0.032	62.40	1.98	0.021	7.60	0.03	9.58	0.03	0.34 ^B	No	
	Total Chromium	0.04	0.99	0.032	62.40	1.98	0.004	7.60	0.01	9.58	0.01	0.05	No	
	Total Copper	7.033	0.99	0.032	62.40	1.98	0.07	7.60	1.51	9.58	1.51	0.036 ^B	Yes ^E	
	Total Iron	10.3	0.99	0.032	62.40	1.98	0.105	7.60	2.21	9.58	2.21	5.28	No	

Project Segment 1 - Discharge to Fountain Creek		Highway Runoff Conditions				Upstream Stream Conditions	Conditions Leaving Segment 1			Water Quality Standard Evaluation			
Alternative	Pollutants of Concern	Concentration (mg/L)	Runoff Coefficient	Rainfall Intensity (in/hr)*	Area (acres)	Runoff Flow (cfs) =CIA	Concentration (mg/L)	Acute Low Flow (cfs)	Concentration Downstream (mg/L)	Combined Flow Downstream (cfs)	Concentration in Stream after Highway Runoff Discharge (mg/L)	Water Quality Stream Standard (mg/L)	Potential to Exceed Water Quality Standard
	Total Lead	1.78	0.99	0.032	62.40	1.98	0.12	7.60	0.46	9.58	0.46	0.198 ^B	Yes ^E
	Total Zinc	0.929	0.99	0.032	62.40	1.98	0.30	7.60	0.43	9.58	0.43	0.351 ^B	Yes ^E

*FHWA data for Denver, CO used to estimate Rainfall Intensity (in/hr)

^aFHWA values for constituents of highway runoff were used. The more conservative number from available FHWA average values for constituents in highway runoff data were applied.

^bMore conservative water quality standards for dissolved constituents were applied where standards did not exist for total constituents.

^cPotential to exceed water quality standard for the dissolved constituent based on conservative evaluation of the total constituent against the dissolved water quality standard.

**Water supply standard.

Project Segment 2 - Discharge to Fountain Creek		Highway Runoff Conditions				Stream Conditions from Segment 1		Stream Conditions in Segment 2		Water Quality Standard Evaluation					
Project Alternative	Pollutants of Concern	Concentration (mg/L)	Runoff Coefficient	Rainfall Intensity (in/hr)*	Area (acres)	Runoff Flow (cfs) =CIA	Concentration from Segment 1 (mg/L)	Upstream Combined Flow From Segment 1 (cfs)	Stream Concentration (mg/L)	Acute Low Flow (cfs)	Concentration in Stream after Highway Runoff Discharge (mg/L)	Combined Flow Downstream (cfs)	Concentration in Stream Immed. Above Confluence (mg/L)	Water Quality Stream Standard (mg/L)	Potential to Exceed Water Quality Standard
No Action Alternative	Total Suspended Solids ^A	798	0.99	0.032	11.05	0.35	NA	8.73	NA	3.10	NA	12.18	NA	NA	NA
	Fecal Coliform ^A	590	0.99	0.032	11.05	0.35	257.36	8.73	128.00	3.10	233.99	12.18	233.99	200.00	No
	Dissolved Ammonia as Nitrogen	0.22	0.99	0.032	11.05	0.35	0.05	8.73	0.020	3.10	0.04	12.18	0.04	NA	NA
	Dissolved Nitrate + Nitrite as Nitrogen	1.636	0.99	0.032	11.05	0.35	3.59	8.73	3.60	3.10	3.54	12.18	3.54	10**	No
	Total Phosphorus	0.998	0.99	0.032	11.05	0.35	1.50	8.73	3.40	3.10	1.97	12.18	1.97	NA	NA
	Total Arsenic	0.058	0.99	0.032	11.05	0.35	0.03	8.73	0.029	3.10	0.03	12.18	0.03	0.34 ^B	No
	Total Chromium	0.04	0.99	0.032	11.05	0.35	0.01	8.73	0.004	3.10	0.01	12.18	0.01	0.05	No
	Total Copper	7.033	0.99	0.032	11.05	0.35	0.97	8.73	0.11	3.10	0.92	12.18	0.92	0.036 ^B	Yes ^E
	Total Iron	10.3	0.99	0.032	11.05	0.35	1.42	8.73	0.20	3.10	1.37	12.18	1.37	5.28	No
	Total Lead	1.78	0.99	0.032	11.05	0.35	0.33	8.73	0.21	3.10	0.34	12.18	0.34	0.198 ^B	Yes ^E
Total Zinc	0.929	0.99	0.032	11.05	0.35	0.38	8.73	0.46	3.10	0.41	12.18	0.41	0.351 ^B	Yes ^E	
Existing I-25 Alternative	Total Suspended Solids ^A	798	0.99	0.032	20.65	0.65	NA	9.58	NA	3.10	NA	13.33	NA	NA	NA
	Fecal Coliform ^A	590	0.99	0.032	20.65	0.65	286.85	9.58	128.00	3.10	264.79	13.33	264.79	200.00	Yes
	Dissolved Ammonia as Nitrogen	0.22	0.99	0.032	20.65	0.65	0.06	9.58	0.020	3.10	0.06	13.33	0.06	NA	NA
	Dissolved Nitrate + Nitrite as Nitrogen	1.636	0.99	0.032	20.65	0.65	3.42	9.58	3.60	3.10	3.37	13.33	3.37	10**	No
	Total Phosphorus	0.998	0.99	0.032	20.65	0.65	1.46	9.58	3.40	3.10	1.89	13.33	1.89	NA	NA
	Total Arsenic	0.058	0.99	0.032	20.65	0.65	0.03	9.58	0.029	3.10	0.03	13.33	0.03	0.34 ^B	No
	Total Chromium	0.04	0.99	0.032	20.65	0.65	0.01	9.58	0.004	3.10	0.01	13.33	0.01	0.05	No
	Total Copper	7.033	0.99	0.032	20.65	0.65	1.51	9.58	0.11	3.10	1.45	13.33	1.45	0.036 ^B	Yes ^E
	Total Iron	10.3	0.99	0.032	20.65	0.65	2.21	9.58	0.20	3.10	2.14	13.33	2.14	5.28	No

Project Segment 2 - Discharge to Fountain Creek		Highway Runoff Conditions					Stream Conditions from Segment 1		Stream Conditions in Segment 2		Water Quality Standard Evaluation					
Project Alternative	Pollutants of Concern	Concentration (mg/L)	Runoff Coefficient	Rainfall Intensity (in/hr)*	Area (acres)	Runoff Flow (cfs) =CIA	Concentration from Segment 1 (mg/L)	Upstream Combined Flow From Segment 1 (cfs)	Stream Concentration (mg/L)	Acute Low Flow (cfs)	Concentration in Stream after Highway Runoff Discharge (mg/L)	Combined Flow Downstream (cfs)	Concentration in Stream Immed. Above Confluence (mg/L)	Water Quality Stream Standard (mg/L)	Potential to Exceed Water Quality Standard	
	Total Lead	1.78	0.99	0.032	20.65	0.65	0.46	9.58	0.21	3.10	0.47	13.33	0.47	0.198 ^B	Yes ^E	
	Total Zinc	0.929	0.99	0.032	20.65	0.65	0.43	9.58	0.46	3.10	0.46	13.33	0.46	0.351 ^B	Yes ^E	
Modified I-25 Alternative	Total Suspended Solids ^A	798	0.99	0.032	21.20	0.67	NA	9.58	NA	3.10	NA	13.35	NA	NA	NA	
	Fecal Coliform ^A	590	0.99	0.032	21.20	0.67	286.85	9.58	128.00	3.10	265.21	13.35	265.21	200.00	Yes	
	Dissolved Ammonia as Nitrogen	0.22	0.99	0.032	21.20	0.67	0.06	9.58	0.020	3.10	0.06	13.35	0.06	NA	NA	
	Dissolved Nitrate + Nitrite as Nitrogen	1.636	0.99	0.032	21.20	0.67	3.42	9.58	3.60	3.10	3.37	13.35	3.37	10**	No	
	Total Phosphorus	0.998	0.99	0.032	21.20	0.67	1.46	9.58	3.40	3.10	1.89	13.35	1.89	NA	NA	
	Total Arsenic	0.058	0.99	0.032	21.20	0.67	0.03	9.58	0.029	3.10	0.03	13.35	0.03	0.34 ^B	No	
	Total Chromium	0.04	0.99	0.032	21.20	0.67	0.01	9.58	0.004	3.10	0.01	13.35	0.01	0.05	No	
	Total Copper	7.033	0.99	0.032	21.20	0.67	1.51	9.58	0.11	3.10	1.46	13.35	1.46	0.036 ^B	Yes ^E	
	Total Iron	10.3	0.99	0.032	21.20	0.67	2.21	9.58	0.20	3.10	2.15	13.35	2.15	5.28	No	
	Total Lead	1.78	0.99	0.032	21.20	0.67	0.46	9.58	0.21	3.10	0.47	13.35	0.47	0.198 ^B	Yes ^E	
	Total Zinc	0.929	0.99	0.032	21.20	0.67	0.43	9.58	0.46	3.10	0.46	13.35	0.46	0.351 ^B	Yes ^E	

*FHWA data for Denver, CO used to estimate Rainfall Intensity (in/hr)

^AFHWA values for constituents of highway runoff were used. The more conservative number from available FHWA average values for constituents in highway runoff data were applied.

^BMore conservative water quality standards for dissolved constituents were applied where standards did not exist for total constituents.

^CPotential to exceed water quality standard for the dissolved constituent based on conservative evaluation of the total constituent against the dissolved water quality standard.

**Water supply standard.

Project Segment 2 - Discharge to Arkansas River		Highway Runoff Conditions					Upstream Stream Conditions		Stream Conditions Upstream of Confluence		Water Quality Standard Evaluation		
		Concentration (mg/L)	Runoff Coefficient	Rainfall Intensity (in/hr)*	Area (acres)	Runoff Flow (cfs) =CIA	Concentration (mg/L)	Acute Low Flow (cfs)	Concentration Downstream (mg/L)	Combined Flow Downstream (cfs)	Concentration in Stream after Highway Runoff Discharge (mg/L)	Water Quality Stream Standard (mg/L)	Potential to Exceed Water Quality Standard
Project Alternative	Pollutants of Concern												
No Action Alternative	Total Suspended Solids ^A	798	0.99	0.032	11.05	0.35	NA	1.50	NA	1.85	NA	NA	NA
	Fecal Coliform ^A	590	0.99	0.032	11.05	0.35	678.00	1.50	661.35	1.85	661.35	200.00	Yes
	Dissolved Ammonia as Nitrogen	0.22	0.99	0.032	11.05	0.35	0.33	1.50	0.31	1.85	0.31	NA	No
	Dissolved Nitrate + Nitrite as Nitrogen	1.636	0.99	0.032	11.05	0.35	3.91	1.50	3.48	1.85	3.48	10**	No
	Total Phosphorus	0.998	0.99	0.032	11.05	0.35	2.48	1.50	2.20	1.85	2.20	NA	NA
	Total Arsenic	0.058	0.99	0.032	11.05	0.35	0.002	1.50	0.01	1.85	0.01	0.34	No
	Total Chromium	0.04	0.99	0.032	11.05	0.35	0.003	1.50	0.01	1.85	0.01	0.05	No
	Total Copper	7.033	0.99	0.032	11.05	0.35	0.007	1.50	1.34	1.85	1.34	0.023 ^B	Yes ^E
	Total Iron	10.3	0.99	0.032	11.05	0.35	0.020	1.50	1.97	1.85	1.97	2.77	No
	Total Lead	1.78	0.99	0.032	11.05	0.35	0.002	1.50	0.34	1.85	0.34	0.12 ^B	Yes ^E
	Total Zinc	0.929	0.99	0.032	11.05	0.35	0.04	1.50	0.20	1.85	0.20	0.234 ^B	No
	Total Suspended Solids ^A	798	0.99	0.032	20.65	0.65	NA	1.50	NA	2.15	NA	NA	NA
	Fecal Coliform ^A	590	0.99	0.032	20.65	0.65	678.00	1.50	651.28	2.15	651.28	200.00	Yes
Dissolved Ammonia as Nitrogen	0.22	0.99	0.032	20.65	0.65	0.33	1.50	0.30	2.15	0.30	NA	No	
Dissolved Nitrate + Nitrite as Nitrogen	1.636	0.99	0.032	20.65	0.65	3.91	1.50	3.22	2.15	3.22	10**	No	
Existing I-25 Alternative	Total Phosphorus	0.998	0.99	0.032	20.65	0.65	2.48	1.50	2.03	2.15	2.03	NA	NA
	Total Arsenic	0.058	0.99	0.032	20.65	0.65	0.002	1.50	0.02	2.15	0.02	0.34	No
	Total Chromium	0.04	0.99	0.032	20.65	0.65	0.003	1.50	0.01	2.15	0.01	0.05	No
	Total Copper	7.033	0.99	0.032	20.65	0.65	0.007	1.50	2.14	2.15	2.14	0.023 ^B	Yes ^E
	Total Iron	10.3	0.99	0.032	20.65	0.65	0.020	1.50	3.14	2.15	3.14	2.77	Yes
	Total Lead	1.78	0.99	0.032	20.65	0.65	0.002	1.50	0.54	2.15	0.54	0.12 ^B	Yes ^E
	Total Zinc	0.929	0.99	0.032	20.65	0.65	0.04	1.50	0.31	2.15	0.31	0.234 ^B	Yes ^E
	Total Suspended Solids ^A	798	0.99	0.032	21.20	0.67	NA	1.50	NA	2.17	NA	NA	NA
	Fecal Coliform ^A	590	0.99	0.032	21.20	0.67	678.00	1.50	650.78	2.17	650.78	200.00	Yes
	Dissolved Ammonia as Nitrogen	0.22	0.99	0.032	21.20	0.67	0.33	1.50	0.30	2.17	0.30	NA	NA
	Dissolved Nitrate + Nitrite as Nitrogen	1.636	0.99	0.032	21.20	0.67	3.91	1.50	3.21	2.17	3.21	10**	No
Modified I-25 Alternative	Total Phosphorus	0.998	0.99	0.032	21.20	0.67	2.48	1.50	2.02	2.17	2.02	NA	NA
	Total Arsenic	0.058	0.99	0.032	21.20	0.67	0.002	1.50	0.02	2.17	0.02	0.34	No
	Total Chromium	0.04	0.99	0.032	21.20	0.67	0.003	1.50	0.01	2.17	0.01	0.05	No

Project Segment 2 - Discharge to Arkansas River		Highway Runoff Conditions				Upstream Stream Conditions		Stream Conditions Upstream of Confluence			Water Quality Standard Evaluation		
Project Alternative	Pollutants of Concern	Concentration (mg/L)	Runoff Coefficient	Rainfall Intensity (in/hr)*	Area (acres)	Runoff Flow (cfs) =CIA	Concentration (mg/L)	Acute Low Flow (cfs)	Concentration Downstream (mg/L)	Combined Flow Downstream (cfs)	Concentration in Stream after Highway Runoff Discharge (mg/L)	Water Quality Stream Standard (mg/L)	Potential to Exceed Water Quality Standard
	Total Copper	7.033	0.99	0.032	21.20	0.67	0.007	1.50	2.18	2.17	2.18	0.023 ^B	Yes ^E
	Total Iron	10.3	0.99	0.032	21.20	0.67	0.020	1.50	3.20	2.17	3.20	2.77	Yes ^E
	Total Lead	1.78	0.99	0.032	21.20	0.67	0.002	1.50	0.55	2.17	0.55	0.12 ^B	Yes ^E
	Total Zinc	0.929	0.99	0.032	21.20	0.67	0.04	1.50	0.31	2.17	0.31	0.234 ^B	Yes ^E

*FHWA data for Denver, CO used to estimate Rainfall Intensity (in/hr)

^aFHWA values for constituents of highway runoff were used. The more conservative number from available FHWA average values for constituents in highway runoff data were applied.

^bMore conservative water quality standards for dissolved constituents were applied where standards did not exist for total constituents.

^cPotential to exceed water quality standard for the dissolved constituent based on conservative evaluation of the total constituent against the dissolved water quality standard.

**Water supply standard.